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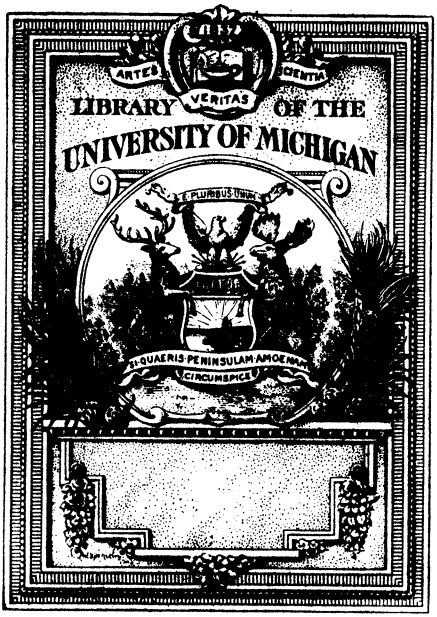
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SECTION D

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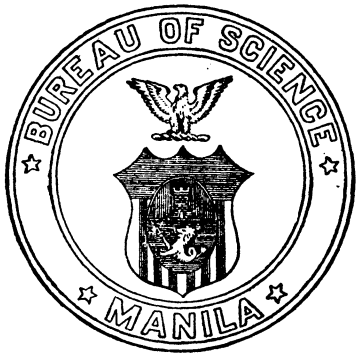

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THE CIGARETTE BEETLE (*LASIODERMA SERRICORNE* Fabr.) IN THE PHILIPPINE ISLANDS

By CHARLES R. JONES

(From the Entomological Section, Biological Laboratory, Bureau of Science, Manila, P. I.)

Nine plates

INTRODUCTION

The cigarette beetle (*Lasioderma serricorne* Fabr.) has been prominent for many years as a destroyer of stored vegetable products and is one of the worst pests in the tobacco industry. Its ravages, especially to the manufactured product in tropical countries, are very large. The annual loss in Manila varies from 6,000 to 13,000 pesos (3,000 to 6,500 dollars United States currency) per factory for cigars actually destroyed in the factory alone. This represents but a small fraction of the real loss, for these figures do not include the shipments of infested cigars, which give a bad reputation to Manila cigars, and lead to a far greater loss to the factory than does any occasional loss of goods or damage due directly to the cigarette beetle.

The Insular Collector of Customs [1] shows a decrease in the exportation to the United States of tobacco and tobacco products from 4,023,404 pesos in 1910 to 1,483,544 pesos in 1911. The bulk of this decrease can undoubtedly be attributed indirectly to

[1] Annual report of the work of the Bureau of Customs during the fiscal year 1911.

the cigarette beetle. It is the purpose of this paper to bring together the principal facts concerning the life history,[2] the methods used, and the value of fumigants, etc., in the control of the pest.

The life history and habits of *Lasioderma serricorne* have been carefully studied and numerous experiments conducted with repellents, traps, and chemicals.

CLASSIFICATION AND SYNONYMY

This insect belongs to the family Ptinidæ, and was described from America in 1792 by Fabricius,[3] as *Ptinus serricorne*. Gemminger and Harold [4] give the following synonymy:[5]

Lasioderma serricorne FABR., Ent. Syst. (1792), 1, 241; MULS., Ann. Soc. Linn. Lyon (1864), 12, 1, Pl. 1, fig. 10. LEC., Proc. Acad. Nat. Sci. Phil. (1865), 238.

Lasioderma flavescens DAHLB., Dej. Cat. 3. ed. (1837), 129.

Lasioderma rufescens STURM, Cat. (1826), 206.

Lasioderma testaceum DUFTSCHM., Fauna Austr. (1859), 3, 46; STURM, Deutschl. Fauna (1837), 11, 89. pt. 237, fig. P. Q.

DISTRIBUTION AND DISSEMINATION

All of the principal tropical and subtropical tobacco-producing districts abound with the cigarette beetle. In Cuba and the Philippines it can be found at any season of the year. Its habits and food are such as to aid in its spread without much effort on the part of the insect. For short distances and in factories the beetle spreads by crawling and by flight, and it has been transported to all parts of the temperate and torrid zones with shipments of infested cigars and bales of tobacco, where it enters and deposits its eggs.

The cars, boats, and other vehicles carrying infested tobacco also become agents of dissemination. In March, 1911, on a trip to the Cagayan Valley in northern Luzon on a steamship, I found adults of the cigarette beetle abundant. This boat a

[2] In working out the life cycle in the laboratory, a check was carried giving the factory conditions, and it was found that these coincided with the laboratory experiments.

[3] *Entomologia Systematica* (1792), 1, 241.

[4] *Catalogus Coleopterorum* (1869), 6, 1781.

[5] For titles of articles dealing with the economy of the beetle, see Nathan Banks, Bibliography of American Economic Entomology. Div. Ent. U. S. Dept. Agr.

week previously had discharged a cargo of tobacco from the valley in Manila.

LIFE HISTORY

Feeding habits.—It does its chief damage to cigars and cigarettes by eating small holes through the wrappers. Some of the substances on which it has been found feeding are undoubtedly more or less accidental. I have found the cigarette beetle breeding in raisins, rhubarb, yeast-cakes, and tobacco, while Chittenden [6] reports it as infesting cayenne pepper, ginger, rhubarb, rice, figs, yeast-cakes, dried fish, silk and plush upholstery, ergot, turmeric, and tobacco in all forms. In 1895 it was reported as doing great damage to prepared herbarium specimens in Washington. Skinner reports it as breeding in the bran of pincushions and in pyrethrum powder strong enough to kill cockroaches. J. B. Smith [7] gives the following articles attacked: Dried roots and seeds of all kinds, cane and rattan work of all kinds, books, gun wads, hellebore, licorice, belladonna, and saffron.

Egg.—Because of the secluded places in which the eggs are laid, such as inside the filler, in small folds in the dried tobacco, within the open tip of the cigar or cigarette, or under the overlapping edges of the wrapper, they are very difficult to detect. Even in very badly infested stock I have found the eggs on the outsides of cigars only in a very few cases. Small particles of the paste used in cigar manufacture may be mistaken for the eggs of the cigarette beetle, and those who may be familiar with this insect in all its succeeding stages are frequently unfamiliar with the egg.

The egg (Plate I, fig. 1) is a whitish, opaque, round, elongated object pointed at one end, the other being rounded and covered for a short distance with minute spines; general appearance smooth, shell rather tough and not easily broken. Average length, 0.47 millimeter; width, 0.23 millimeter.

The eggs are laid during both the day and the night; the time of most active laying is in the early part of the evening. They are deposited singly in small folds and crevices of leaf tobacco, most frequently along the midrib. Egg-laying begins from two to five days after the emergence of the adult, if copulation has

[6] *Bull. U. S. Dept. Agr., Bur. Ent.* (1896), **4**, 126; (1905), **54**, 68.
[7] *Bull. N. J. Agr. Exp. Sta.*, Jan. (1907), **203**, 35.

taken place. Unfertilized females apparently do not lay. Solitary females were kept from four to sixteen days in the laboratory without copulation and laid no eggs, while those that were allowed to copulate oviposited the first day afterwards. Egg-laying extends over a period of from six to eight days, gradually decreasing to the end. The maximum number of eggs is laid within three days after copulation.

The period of incubation of the egg varies greatly in the Philippines. Certain eggs have been observed to hatch within four days, while others kept under identical conditions took ten. There may be a variation of three days in the time required to hatch eggs laid by the same beetle on the same day. The average time required is six days. The following table shows the average length of the egg stage and the variation in hatching, from May to November, 1911:

TABLE I.—*Variation in incubation period of Lasioderma serricorne Fabr.*[a]

Date laid.	Hatchings.				Variation in hatching.	Average period of incubation.
	First.	Second.	Third.	Fourth.		
1911.					*Days.*	*Days.*
May 12	May 20				0	8
May 14	May 20	May 21	May 22		2	7
May 15	May 20	May 21	May 22		2	6
May 17	May 25				0	8
May 18	May 25				0	7
May 18	May 23	May 24			1	5.5
May 21	May 27				0	6
July 28	Aug. 5	Aug. 7			2	6.5
July 29 and 30	Aug. 4	Aug. 5	Aug. 6		2	6
August 6	Aug. 11	Aug. 12			1	5.5
August 7	Aug. 12				0	5
August 10 and 11	Aug. 17	Aug. 18	Aug. 19	Aug. 20	3	8
August 22	Aug. 26	Aug. 28	Aug. 30	Aug. 31	4	7
August 26	Aug. 31	Sept. 2			2	6
August 28	Sept. 2	Sept. 4			2	6
August 30	Sept. 2	Sept. 4	Sept. 6	Sept. 7	4	5.5
August 31	Sept. 4	Sept. 5	Sept. 6	Sept. 7	3	5.5
September 1 and 2	Sept. 6	Sept. 7			1	5
September 28	Oct. 2				0	4
November 19	Nov. 23	Nov. 24	Nov. 25		2	5.5
Average					2.2	6.1

[a] The eggs used in these tests were laid by different individuals, but were kept under the same conditions, and the record shows all eggs that hatched.

The percentage of eggs that do not hatch is very small. Experiments were conducted with 313 eggs, and of these only 14 failed, giving an average of 4.47 per cent.

Larva.—The larva (Plate I, fig. 2) hatches by eating its way through the large end of the egg, leaving an irregular hole in the shell. It is less than 1 millimeter in length and is covered with fine hair. The head is yellowish and the body semitransparent whitish or cream in older larvæ. The intestinal contents seen through the skin give it a dirty color, which varies with the quantity of food. It is a fleshy, wrinkled grub, its body usually curved. Fine particles of tobacco and dust, which adhere to the minute hairs on the body of the larva, often change its appearance to brownish. The young larvæ move about freely and, unless suitable food can be obtained, may wander to considerable distances. Each larva molts four or five times, then forms the pupal cell, and changes into a pupa. One larva was found to molt six times. The only change in appearance of the larvæ is in that of size. They develop slowly, requiring an average of fifty days in this stage. No descriptions or measurements were made of the larval stages. Daily observations were made and molts were recorded in the breeding experiments.

This insect damages cigars and cigarettes by eating small cylindrical galleries through the filler and circular holes through the wrapper. If the larva happen to get between two cigars, the wrapper of each may be slit lengthwise (Plate II, at "a"), but generally it bores straight through. Galleries, evidently made by a single larva, have been traced through three cigars. It is through the holes in the wrapper that the adults escape at maturity.

The method of attack upon leaf tobacco is similar in many ways to the attack upon cigars and cigarettes, the larvæ boring small round holes through the contiguous leaves. The greatest damage to leaf is apparently done to the first-grade wrapper. The finer and better qualities of tobacco afford better breeding conditions for the larva; hence the greater infestation in these grades. In many cases, first-grade wrappers must be used for filler, owing to the great number of small holes in it caused by the larvæ (Plate IX, fig. 1). Damage to the filler tobacco is less than to any other class, as this is of coarse texture and the attack made by the larvæ is generally along the midrib. The larvæ attack this part of the leaf, and do not feed promiscuously upon it as is the case in the finer grades of wrapper.

According to the general observations of those who are interested in tobacco and its products, infestation first appears in manufactured products on the higher and milder grades of cigars. The cheap grades and some of the strong *maduro* cigars often remain in the factories from one to two years without

becoming infested, while the higher and finer grades, such as Vegueros finos, Perfectos, Divinos, and Imperiales, show infestation within six or eight weeks. The same is true for cigarettes, the general or medium grades are less susceptible than such grades as Turkish or Sultanes. The injury done by the larvæ to the higher grade cigars and cigarettes is shown by Tables II and III.

TABLE II.—*Injury to different grades of cigars.*[a]

Date made.	Date examined.	Kind of cigar.	Number of boxes.	Number of cigars per box.	Total number cigars.	Number good.	Number infested.	Beetles—	
								Alive.	Dead.
	1911.								
1909	May 18	Londres	5	100	500	489	11	0	3
1910	July 27	Cazadores	6	50	300	0	300	66	149
Do	do	Cabinets	1	25	25	0	25	0	4
Do	do	Invictos	1	25	25	20	5	0	0
Do	do	Cesares	2	25	50	27	23	28	0
Do	do	Diputados	1	25	25	1	24	2	0
September to November, 1910.	July 27-29	Perfectos[b]	51	25	1,275	452	823	229	202
Do	do	Perfectos[c]	13	25	325	71	254	25	36
Do	July 27	Regalia	6	25	150	22	128	54	56
Do	do	Fashionables	3	50	150	3	147	40	206
Do	do	Londres finos	1	50	50	0	50	0	100
Do	August 12	Londres	5	100	500	300	200	0	43
Do	August 31	High life	6	50	300	28	262	51	35
Do	do	Media regalia	3	50	150	4	146	25	50

[a] Cigars of 1910 were all made from September 23 to November 15, boxed and kept in the general working room.

[b] Perfectos plain in box.

[c] Perfectos put up in tin foil but badly infested.

TABLE III.—*Injury to different grades of cigarettes.*[a]

Date examined.	Kind of cigarette.	Number of packages examined.	Total number of cigarettes.	Number good.	Number infested.	Insects found—	
						Alive.	Dead.
1911.							
June 30	El Pasig[b]	50	1,500	1,497	3	3	
June 30	Manila[b]	50	1,500	1,497	3	3	1
May 6	Sultanes[c]	1	100	41	59	2	58
June 2	Turkish[d]	100	2,400	1,487	913	72	7
June 5	do	11	264	67	197	0	18
June 29	do	100	2,400	903	1,497	235	28

[a] High-grade cigarettes with open ends, made about April 1 by machine.

[b] Value, 24 pesos per thousand.

[c] Value, 880 pesos per thousand.

[d] Value, 400 pesos per thousand.

The data for the above tables were obtained by carefully examining cigars taken from the general stock of various factories in Manila. The cigars were selected as near the same dates of making and boxing as possible.

From what has been said of oviposition, it will be seen that the larva, when full grown and ready to pupate, is usually inside the cigar or cigarette. It apparently makes little effort to get to the surface, but pupates wherever it happens to be, forming a flimsy cell (Plate I, fig. 5) of small particles of tobacco. When the larva is near the surface of the cigar, it eats a small round hole through the wrapper, and this is afterwards closed by the formation of the pupal cell, and the adult upon emerging only needs to break the flimsy cell to escape. In many cases the pupal cell is formed between cigars. Pupal cells vary in form in accordance with the place and conditions under which pupation occurs. Within cigars, the cells are usually ovoid. Where larvæ pupate against the sides of a cigar box or other substance, they simply form a dome over themselves. In leaf tobacco the pupal cells have no definite shape.

After the larva has confined itself within the pupal cell, it remains quiet for a period of from two to five days; it then shortens somewhat, molts, and the pupa results.

Pupa.—The pupa (Plate I, figs. 3 and 4) is of a whitish or cream color turning to brownish pink a short time before the emergence of the adult. The eyes are black and the mandibles brown. Upon emerging, the adult is very soft and pale brownish pink. It remains in the pupal cell about four days, during which time it hardens and the color changes to dark brown, after which it gnaws its way out. Laboratory experiments show that the minimum time spent in the pupal cell from the time it is formed by the larva until the adult emerges is eleven, the maximum fourteen, and the average 12.5 days.

Adult.—The adult beetles (Plate I, figs. 6 and 7) are small, brownish in color, and vary greatly in size; the latter is undoubtedly due to the quantity of food obtained by the larva. In every case it was observed that beetles obtained from the *high-grade, selected cigars* were about twice the size of those obtained from bales of lower grade tobacco. This shows plainly that the size of the adult is influenced by the quality of food eaten by the larva.

The adults are very lively and at almost any time can be found running about promiscuously upon the walls, windows, and furnitures of warehouses and tobacco factories. They fly freely in the early evening and during the night. They rest with head

and thorax drawn downward. (Plate I, fig. 7.) When disturbed, they drop, the head, thorax and legs are drawn close together, and they remain in this position for a few moments, feigning death. If not further molested, they soon crawl a short distance and then fly. As far as I have observed, the adults do not feed at all; therefore, there is no direct damage done by them. There was no noticeable damage done by the hundreds of beetles kept under observation in the laboratory for the egg-laying and other experiments. Table IV gives a record of an experiment in which 100 beetles were kept with 20 cigars:

TABLE IV.—*Results of keeping 100 beetles with 20 cigars.*[a]

Examinations.		
Date.	Adults dead.	Cigars injured.
Mar. 4	none	none
Mar. 11	26	none
Mar. 16	18	none
Mar. 19	53	none
Mar. 21	2	none
Mar. 22	1	none

[a] The open ends of the cigars had been closed previously by pasting tissue paper over them. This was to prevent the adults from entering the cigars at this point.

The beetles in this experiment had free access to the cigars and could at all times be seen running over them freely. Table V shows that no damage was done to leaf tobacco by the beetles.

TABLE V.—*Harmlessness of adults kept on leaf tobacco.*[a]

(Experiments started November 14. Five adults in each lot.)

Grade of tobacco used.	Amount fed.	Life of adults.		
		Minimum.	Maximum.	Average.
		Days.	*Days.*	*Days.*
Coarse filler	none	8	10	9
Fine filler	none	10	19	15
Wrapper, maduro	none	8	17	14
Wrapper, claro	none	10	15	14.5
Wrapper, Virginian	none	10	18	14.5

[a] This tobacco was carefully selected and the edges were trimmed with scissors so that the slightest amount of feeding could be detected. In all the experiments the adults laid eggs.

Copulation has been observed repeatedly in the laboratory and under natural conditions in the factories or warehouses, and takes place in from two to five days after the adults emerge.

The life of the beetle is determined more largely by the amount of energy stored at the time of emergence than by the external conditions, as is the case in many other insects. Table VI shows that the beetle in the adult stage consumes no food and that the average life is the same whether kept with or without tobacco.

TABLE VI.—*Length of life of adults.*

WITHOUT TOBACCO.

Date emerged.	Number of adults.	Died.		Lived.	Remarks.
		Date.	Number of adults.		
				Days.	
September 18 to 21	17	September 28	2	8	Large larvæ were collected from cigars; pupated and emerged in the laboratory. Adults kept collectively copulated, and laid eggs.
		October 1 to 16	13	[a]16.4	
		October 20	2	30	

KEPT WITH TOBACCO.

August 20	5	September 4 to 6	5	[a]16	Adults kept singly. Examined daily. These were bred from eggs, and reared in the laboratory.
September 29	1	October 14	1	15	
Do	1	October 20	1	21	
October 1	1	October 14	1	13	
Do	1	October 17	1	12	
October 6	1	October 20	1	14	
Do	2	October 24	2	18	
October 9	1	October 20	1	11	
Do	1	November 4	1	26	
October 24	1	do	1	10	

[a]Average.

Seasonal history.—This insect shows a continuous breeding period. Eggs, larvæ, pupæ, and adults can be found at any time of the year in tobacco warehouses and factories, but March and April seem to be the months of the greatest abundance of adults.

INSECTS MISTAKEN FOR THE CIGARETTE BEETLE

Many species of insects are found in dried tobacco in the Philippine Islands, and these are often mistaken for the cigarette beetle. Those most commonly mistaken are a species of Curculionidæ, the rice weevil (*Calandra oryzae* Linn.), a species of Bostrychidæ, the shot-hole bamboo borer (*Dinoderus brevis* Horn), and a species of Cleridæ. These insects are very abundant, especially the shot-hole borer. Its appearance in tobacco is easily accounted for. In the country all tobacco is cured in bamboo sheds, and as this beetle feeds upon and breeds in bamboo, its occurrence in tobacco is purely accidental.

The clerid is predaceous on the larvæ and pupæ of the cigarette beetle and, therefore, is to be considered as beneficial. It is not uncommon to find earwigs in tobacco bales; these are also mistaken for the cigarette beetle.

NATURAL CONTROL

There are many agencies concerned in the natural control of the cigarette beetle, the principal ones of which are the predatory enemies and parasites.

PREDATORY ENEMIES

So far, in the Philippines, but one species of insect has been found which preys upon the cigarette beetle. This is the Clerid mentioned above. (Plate I, figs. 10 to 13.) It can be found running freely through the bales of tobacco. It feeds ravenously, both in the larval and adult stages, upon the larvæ and pupæ of the cigarette beetle. Six adult Clerids devoured 31 larvæ of the cigarette beetle in a single night.

There is little doubt that birds, such as swallows and sparrows, which are very abundant in and around tobacco warehouses, especially in the country, play a part in natural control, but since no opportunity was afforded for a study of them it cannot be stated to what extent they are of value.

PARASITES

The parasites bred from the cigarette beetle belong to one species of Hymenoptera of the family Chalciiddæ (*Norbanus*[8] sp., Plate I, figs. 8 and 9.) This insect has been bred in the laboratory and has also been collected in the adult stage in infested

[8] Determined by Fullaway.

tobacco and cigars. It attacks the cigarette beetle only after the pupal cell is formed. By placing several of the parasites with cigarette beetle larvæ it was seen that the former, apparently frightened by the movements of the larvæ, did not attack them, but when pupæ were introduced they were attacked within a short time.

In one experiment pupæ of the cigarette beetle, in cells, were placed with the parasites. The latter immediately mounted the cells, and after traversing them several times began to pierce them with their ovipositors. Several attempts were made before the pupal cell could be pierced and, after locating the pupa, which was done by a sidewise motion of the body, oviposition into the pupa took place. The adult remained with the ovipositor in the cell from ten to fifteen minutes. Evidently a single egg only is laid in each pupa, as in no case did more than one parasite come from any of the pupæ. The life cycle of the parasite is from sixteen to seventeen days.

A very small white mite of the family Eupodidæ, genus *Rhagidia*, has also been found attacking the cigarette beetle in all stages except the adult, both in factories and the laboratory. Larvæ infested with mites have been placed in tobacco bales, and subsequent examinations, made at various intervals thereafter, failed to show that these parasites had been effectively established. It is doubtful if they will ever prove valuable as a parasite of the cigarette beetle.

ARTIFICIAL CONTROL

Many difficulties are encountered in the Philippine Islands in combating the cigarette beetle. Some of these are: that all tobacco in the provinces becomes infested at the time of curing, that the insects are packed in the bales of tobacco or gain access thereto after packing and the tobacco is stored from one to four years before being made into cigars, that the development of the insect is continuous throughout the year, that the infested stock is stored in close proximity to factories and in many cases in the factory itself, that the *mandalas* [9] are exposed and infested at all times, and that all stages of the insect are protected within the cigars or tobacco bales. The susceptibility of the tobacco to substances that would change its aroma,

[9] Mandalas are piles of tobacco in which fermentation is allowed to take place in the process of curing.

flavor, or burning quality must also be kept in mind, and only such substances used to kill the beetles as will not alter any of its original characteristics.

My first experiments were with repellents. Those that were repugnant to the beetles were also injurious to the cigars. Furthermore, traps for the adults were used with little better success. The solution of the problem is to place the factory in such a condition as to prevent the reinfestation of the treated stock and to obtain and use a substance that will kill the insects in all stages of development. By careful preparation of the factory and installation of proper apparatus, there will be no excuse for the shipment of infested stock from the Philippines and the consequent loss of trade caused by these damaged goods. Carbon bisulphide, hydrocyanic-acid gas, and high and low temperatures were experimented with and proved effective. The value of the first two as insecticides has long been recognized, but actual demonstration, as to use and dosage together with the care of the manufactured products after treatment, were deemed advisable.

It is popularly supposed, and frequently even by the manufacturers themselves, that the exposure of tobacco to great variations in temperature, to carbon bisulphide, and to hydrocyanic-acid gas may impair its quality and that by the use of the latter some of the cyanogens may be deposited in the cigars and make them injurious to the smoker. Experiments have been carried on to determine whether or not any one of the three essential characters of a good cigar—aroma, taste, and burning quality—is impaired by the two former treatments or whether any cyanogens are deposited in the cigars by the cyanide treatment. Qualitative and quantitative analyses of the tobacco and cigars were made for cyanogens, and by use of a special apparatus treated and untreated cigars were smoked and the smoke drawn through a solution of silver nitrate which was analyzed quantitatively for cyanogens. These experiments, which are described below, show that cyanogens in treated stock are not in excess of those in the untreated. Several treated and untreated cigars were also smoked by different habitual smokers, and the results show that the treated cigars are practically indistinguishable from the untreated.

At the factory of the Compañía General de Tabacos de Filipinas, a room (Plate III, fig. 1) was screened and freed from all insects by the use of hydrocyanic-acid gas and afterwards cigars

were made here from treated tobacco. The cigars were guarded in this room against reinfestation, and all experiments referred to as being made in a screened room were carried on here.

PREPARATION OF FACTORY

Before beginning the actual destruction of the cigarette beetle, it is necessary to place the factory in a condition to prevent the reinfestation of the treated stock. The first step is to free it from all stages of the beetle, which may be accomplished with hydrocyanic-acid gas in the manner hereafter described for the fumigation of tobacco.

In most cases in Manila, the drying, selecting, boxing, and labeling of cigars are carried on in one work room, and experiments have shown that these rooms may be absolutely protected after they are once freed from all stages of the beetle by covering the windows and doors with wire screens sufficiently fine (not coarser than 10 meshes to 1 centimeter) to prevent the passage of the adult beetles. Various sizes of mesh were tried and up to 8-mesh to the centimeter the beetles passed through readily. The 10-mesh was effective. The entrance to the compartment should have a screened vestibule with two screened doors (Plate III, fig. 1). As a further precaution against reinfestation, manufactured products should be kept in tin-lined boxes instead of being piled promiscuously on the floor, as is customary. The regular shipping boxes, which are tin-lined, can be used for this purpose if it is undesirable to have a special box. The cost of a tin-lined box large enough to hold 10,000 ordinary sized, boxed cigars is 7.50 pesos.

For the treatment of the tobacco the manufacturer may choose between fumigation and high or low temperature, but in either case only competent persons should be employed to do the work. In factories where steam drums are already installed, the latter would perhaps be preferable, but it would be advisable also to have a small compartment for fumigating the wrapper tobacco, for where the wrapper leaf is subjected to steam and an excess of moisture results from condensation, it becomes darker in color and less elastic. Cigars are classified in five grades in all factories, on the basis of color. They are supposed to be mild or strong according as the wrapper is light or dark, and are designated as follows: *claro, colorado claro, colorado, colorado maduro,* and *maduro.*

FUMIGATION

A compartment for fumigation (Plate III, fig. 2), 3.85 meters in length, 2.85 meters in width, 2.95 meters in height, containing 32.4 cubic meters, and suitable for 1,400 kilograms of leaf tobacco, can be constructed for less than 200 pesos. It should be lined with zinc, and have 3 shelves on each side, 1 meter wide and covered with poultry netting on which to lay the leaf tobacco. Where carbon bisulphide is to be used, the top shelf should be provided, at either end, with a small piece of board on which to set the dishes that contain the fumigant. The door should have 3 flanges padded with rubber packing, so that when it closes the compartment is absolutely tight. Such a compartment could be used either for the carbon bisulphide or the cyanide treatment.

The properties and characteristics of the chemicals used in fumigation should be thoroughly understood by the operator so that necessary precautions may be taken. Aside from this, fumigation is very simple. Tobacco should be treated in the leaf, and after being made into cigars should be placed immediately in the screened drying and selecting room. It is preferable to treat the leaf tobacco, as it is then loose and can be handled to better advantage. Furthermore, if cigars be allowed to stand after being made and fumigated before shipment, the beetles that were developing in them would be killed in the cigar and make the latter undesirable.

CARBON BISULPHIDE

Carbon bisulphide (CS_2) is a colorless, volatile liquid, having a specific gravity of 1.29 at 0°C., and is malodorous when mixed with air. It evaporates rapidly, and is extremely inflammable. As the vapor is heavier than air, carbon bisulphide must be placed at the top of the fumigating compartment. The gas is poisonous and should not be inhaled by the operator. Where one has a compartment especially prepared for fumigating, there need be no danger to the person doing the work.

Carbon bisulphide can be purchased in Germany or in the United States at a comparatively low figure. Its wholesale price delivered in Manila is 92 centavos per kilogram. Locally it retails for about 2.50 to 2.86 pesos per kilogram. It is put up in iron drums containing from 0.5 to 20 kilograms. Being

extremely inflammable, a spark of any description, even a lighted cigar or cigarette, may explode the fumes. Electric fans and lights should not be used inside the fumigating compartment, for there is danger of the production of sparks which will ignite the fumes.

The cigarette beetle in all its stages can readily be killed by carbon bisulphide of the concentration of 14.4 grams per cubic meter in air-tight vessels, where the fumes of carbon bisulphide come in direct contact with the insect. Where there is an abundance of tobacco in which the beetles are protected, a greater quantity of carbon bisulphide must be applied. Experiments prove that 32 grams of carbon bisulphide per cubic meter are very effective in the latter case, but in practical work it is recommended that slightly more (40 grams) be used in order to insure a satisfactory excess.

TABLE VII.—*Effect of different amounts of carbon bisulphide.*

Date.	Treatment.		Condition after fumigation.								Remarks.
	Quantity of CS_2 per cubic meter.	Length.	Eggs.		Larvæ.		Pupæ.		Adults.		
			Alive.	Dead.	Alive.	Dead.	Alive.	Dead.	Alive.	Dead.	
1911.	*Grams.*	*Hours.*									
June 23	32	36	-----	------	0	116	0	13	0	68	Tobacco fumigated in manos.
June 26	32	48	-----	------	0	17	0	0	0	18	
Aug. 2	14.5	16	20	0	0	12	0	6	0	20	Eggs were fumigated only 6 hours.
Sept. 13	24	24	2	337	33	167	0	10	0	50	Larvæ lived and some developed into adults, but did not feed after fumigation.
Sept. 20	34	17	0	80	0	125	0	50	0	75	

Table VII shows that the adults and pupæ are more susceptible to the gas than are the eggs and larvæ. The fumigations dated September 13 and 20, except in the amount applied and the duration of the experiment, were done under identical conditions. All pupæ and adults in both were killed. In the experiments of September 13 the larvæ appeared to be dead, but on the second day some revived; they did not feed; 18 pupated and 11 emerged, 5 lived until November 16 and then died; the adults laid no eggs.

Leaf tobacco, fumigated at the rate of 32 grams per cubic meter, was made into cigars on different dates, care was taken to prevent reinfestation, and cigars were examined at intervals. The following table gives results of these experiments:

TABLE VIII.—*The condition of cigars fumigated with carbon bisulphide (32 grams per cubic meter), made and kept under different conditions.*

Cigars and cigarettes.		Date made.	Date boxed.	Length of treatment.	Date examined.	Remarks.
Kind.	Number.					
				Hours.		
Londres	100	May 29	June 1	48	Aug. 24 Nov. 8 Jan. 8	Cigars fumigated in general compartment, made and guarded in screened room.
Pereire	100	June 28	June 30	24	July 13 Aug. 9 Sept. 8 Oct. 12 Nov. 10	Cigars made and kept in screened room. Cigars were in good condition at all examinations.
Conchas especiales	100	----do----	----do----	24		
Vegueros finos	100	----do----	----do----	24		
Londres	100	----do----	----do----	24		
Turkish cigarettes	200	June 30	June 30	24	July 13 Aug. 9 Sept. 8 Oct. 12 Nov. 10	Do.
Perfectos	50	July 1	July 2	24	July 13 Aug. 9 Sept. 8 Oct. 12 Nov 10	Tobacco taken from a lot of 1,400 kilograms that had been fumigated in large compartment; in good condition at last examination. Cigars made and kept in screened room.
Conchas especiales	50	----do----	----do----	24		
Vegueros finos	50	----do----	----do----	24		
Londres	50	----do----	----do----	24		
Perfectos	100	July 25	July 26	36	July 13 Aug. 9 Sept. 8 Oct. 12	Tobacco (fumigated) made in general work room, but kept in screened room. All remained uninfested.
Media regalia	100	----do----	----do----			
High life	100	----do----	----do----			
Panatelas	100	----do----	----do----			
Conchas especiales	50	Sept. 7	Sept. 7	18	Oct. 12 Nov. 10 Jan. 8	Cigars made in general room; kept in screened room. All remained uninfested.
Londres	50	----do----	----do----			

A check, in which samples taken from different lots of treated tobacco were made into cigars and subjected to factory conditions, was carried on simultaneously with these experiments, and in all cases, as shown in Table XVII, the cigars became reinfested.

The cost of fumigating 1,400 kilograms of leaf tobacco is about 15 centavos per 1,000 cigars, when the carbon bisulphide is purchased at the local price and is used at the rate of 1.25 kilograms to 32 cubic meters or 39 grams per cubic meter.

DIRECTIONS FOR USING CARBON BISULPHIDE

Fumigation is a simple process when the cubic contents of the fumigating compartment are known. Place the desired amount of leaf tobacco on the shelves, and for each cubic meter use at least 32 grams of the fumigant. Pour the liquid into shallow dishes, place the latter on the top shelf of the fumigating compartment, and close the door. After submitting the tobacco to the fumes of this gas for a period of at least twenty-four hours, the door may be opened and a current of air directed into the compartment in order to drive out residue fumes, before any person is allowed to enter. In all cases the fumigating compartment should contain its full capacity of tobacco, as the amount of carbon bisulphide used would necessarily have to be the same whether the compartment were full or only partly so. Treated tobacco should be taken directly to the working room in quantities large enough for only one-half day's work, and after the cigars are made they should be placed immediately in a screened drying and selecting room.

When not in use, the fumigating compartment should be kept closed to prevent reinfestation, and tobacco taken out should be returned to the compartment only for refumigation.

Precautions to be observed in the use of carbon bisulphide are as follows:

1. Carbon bisulphide is extremely explosive, and no sparks should come in contact with the fumes.
2. The gas is poisonous, and should not be inhaled.
3. Carbon bisulphide should be stored in a cool, dark place in glass-stoppered bottles or original drums.

HYDROCYANIC-ACID GAS

In order to generate a maximum [10] amount of hydrocyanic-acid gas, potassium cyanide, 98 per cent pure, commercial sulphuric acid, 93 per cent pure, and water should be mixed in the following proportions.

Potassium cyanide, 98 per cent	30 grams.
Sulphuric acid, commercial, 93 per cent	30 c. c.
Water	60 c. c.

These amounts will give the required quantity of hydrocyanic-acid gas for each cubic meter of the fumigation compartment.

[10] *Bull. U. S. Dept. Agr., Bur. Ent.* (1911), **90**, Pt. 1.

If it is desired to insure complete fumigation of a compartment of the dimensions described under "Fumigation" containing 32.4 cubic meters, then the following quantities should be used:

Potassium cyanide, 98 per cent	1 kilogram.
Sulphuric acid, commercial, 93 per cent	1 liter.
Water	2 liters.

If a greater proportion of water is used than described, the yield of gas is decreased by about 4 per cent for each additional liter until 7 liters of water are used, when the yield of gas begins to drop off even more rapidly as shown by Table IX:

TABLE IX.—*Percentage of available hydrocyanic-acid gas given off when different quantities of water are used.*

Relative proportion by weight of—			Proportion of available gas given off.
Potassium cyanide.	Acid.	Water.	
			Per cent.
1	1	1	87.84
1	1	2	93.75
1	1	3	89.95
1	1	4	86.25
1	1	5	81.68
1	1	6	79.65
1	1	7	73.47
1	1	8	43.27

Potassium cyanide can be obtained at any drug store or purchased in large quantities in Germany and in the United States; 98 per cent pure sells for 1.29 pesos per kilogram, delivered in Manila.

DIRECTIONS FOR FUMIGATING WITH HYDROCYANIC-ACID GAS

The compartment should always be filled to its full capacity with tobacco when fumigating. Hydrocyanic-acid gas is lighter than air and should be liberated at the bottom of the compartment. Earthenware jars should always be used for generators; sulphuric acid attacks metal, and glass is too fragile. When all is ready, mix the water and sulphuric acid in the generator, always by pouring the acid into the water; then, while the solution is still hot, add the cyanide. Better results are obtained with a hot solution. Never reverse the order of mixing. When

more than one generation is used for a given space, care must be taken to have the chemicals proportionately distributed between the generators. Under no circumstances should a person be in the compartment when evolution of this gas commences. The cyanide should be added to the sulphuric acid and water from the outside. This can be done easily by placing the cyanide in a paper bag and lowering it into each generator by means of strings which pass through screw eyes at the top of the compartment. Each string should be arranged so that one end hangs directly over the generating vessel and the other passes out through a small hole at the side of the door. After lowering the cyanide into the generator, the hole through which the strings pass must be closed to prevent the escape of the gas.

After exposing the tobacco to the fumes of this gas for a period of at least twenty-four hours, the compartment may be opened. The operator should hold his breath while opening the door, and should retreat immediately out of reach of the fumes. About fifteen minutes are sufficient to allow the fumes to pass away, provided a current of air can be directed into the compartment, otherwise a half-hour is not too long to wait before entering.

A poisonous bluish residue will be left in the generators and should be disposed of immediately by pouring it into holes in the ground and covering with earth or emptying it into the sewer trap and flushing for some time.

PRECAUTIONS

Hydrocyanic-acid gas is a most deadly poison, and there is no antidote. Do not inhale any of it. The potassium cyanide and sulphuric acid used for the production of hydrocyanic-acid gas are both poisonous and must be handled with due precaution. If the following points are carefully observed, there need be no danger from the use of these substances.

1. Always keep the sulphuric acid in glass-stoppered bottles, and take care not to get the acid on the skin or on the clothing, as it produces serious burns.

2. Potassium cyanide should never be handled with the bare hands, as small pieces might get under the finger nails, be transferred to the mouth, and produce cyanide poisoning. Gloves or wooden pincers are convenient for working with cyanide. Potassium cyanide should be kept in tightly covered vessels as otherwise it deteriorates rapidly.

3. Never reverse the order of mixing the chemicals. Always pour the

water in the generators first, then add the acid, and after closing the compartment lower the cyanide into the mixture.

4. Never enter the compartment after the evolution of the gas has begun.

5. In opening the compartment after fumigation, hold the breath and make a hasty retreat. At least fifteen minutes should elapse before returning to the vault.

Sulphuric acid may be purchased from the same sources as potassium cyanide. That of 1.84 specific gravity may be bought at 0.77 peso per kilogram, wholesale in Manila. At the above prices the cost of fumigating 1,400 kilograms of leaf tobacco would be 2.06 pesos.

In the experiments with the cyanide treatment, tobacco treated with the gas liberated from 32 grams of potassium cyanide per cubic meter of compartment made into cigars and kept under different conditions showed the following results:

TABLE X.—*Condition of cigars fumigated with hydrocyanic-acid gas (32 grams of potassium cyanide per cubic meter), when kept under different conditions.*

Kind of cigar.	Number of cigars.	Date made.	Date boxed.	Length of treatment.	Date examined.	Remarks.
				Hours.		
Perfectos	200	July 25	July 25	36	July 21	Cigars made in general room; guarded in screened room; boxed immediately; all good at each examination.
High life	200	---do---	---do---	36	July 28	
Media regalia	200	---do---	---do---	36	Nov. 8	
Panatelas	200	---do---	---do---	36	Jan. 8	
Conchas especiales	50	Aug. 24	Aug. 30	24	Sept. 27	Cigars fumigated after being made; kept in screened box in general drying room; cigars good at each examination.
Princesas	50	---do---	---do---	24	Nov. 8	
Londres	50	---do---	---do---	24	Jan. 8	
Boquets	50	---do---	---do---	24	Jan. 12	
Panatelas	200	Sept. 20	Sept. 27	36	Sept. 27	Filler was steamed and wrapper treated with cyanide. Made in general room; kept in screened box in dry room; cigars good at each examination.
Republicanos	200	---do---	---do---	36	Nov. 8	
Media regalia	200	---do---	---do---	36	Jan. 8	

In the laboratory experiments, 30 grams of potassium cyanide were found effective for all stages of the cigarette beetle, as is shown by Table XI. Where eggs were not removed from the leaf on which they were laid, 28 grams per cubic meter for twenty-four hours killed about 95 per cent of them.

TABLE XI.—*Effect of different amounts of hydrocyanic-acid gas.*

Date.	Treatment.		Stages of insects.								Remarks.
	Quantity of KCN per cubic meter.	Length.	Eggs.		Larvæ.		Pupæ.		Adults.		
			Dead.	Alive.	Dead.	Alive.	Dead.	Alive.	Dead.	Alive.	
	Grams.	*Hours.*									
July 29	35	22	20	0	-----	-----	-----	-----	-----	-----	Eggs removed from leaf.
August 2	28	24	29	1	-----	-----	-----	-----	-----	-----	
August 3	32	13	20	0	-----	-----	-----	-----	-----	-----	Eggs fumigated in leaf tobacco.
August 6	30	24	200	0	-----	-----	-----	-----	-----	-----	
September 14	10	18	49	3	106	94	4	27	46	16	Eggs fumigated where adults had laid them; they were well covered with other tobacco.
September 16	30	24	306	0	-----	-----	-----	-----	-----	-----	
November 29	10	40	-----	-----	-----	-----	-----	-----	66	4	

In a recent circular of the Bureau of Agriculture of the Philippines,[11] a dose of 9 grams of potassium cyanide per cubic meter was recommended as sufficient for killing this insect. In former experiments I had found that 28 grams per cubic meter were insufficient for killing the eggs, but for further confirmation I carried on several experiments with the amount recommended with the results shown in Table XII.

TABLE XII.—*Showing effect of hydrocyanic-acid gas liberated from 9 grams potassium cyanide per cubic meter.*

Date.	Length of treatment.	Stage of insect.				Remarks.
		Eggs.		Adults.		
		Alive.	Dead.	Alive.	Dead.	
	Hours.					
November 14	24	-----	-----	13	67	Adults in tobacco.
November 18	48	-----	-----	0	105	Adults exposed directly to fumes.
November 20	12	-----	-----	0	25	
November 21	36	-----	-----	0	50	
November 23	24	10	10	-----	-----	Eggs on tobacco leaf where they had been laid.
November 24	24	-----	-----	280	332	Adults allowed to get into manos of tobacco.
November 25	96	-----	-----	212	182	Adults, fumigated in manos of tobacco.
November 25	24	30	20	16	234	Fumigated with tobacco.

In no case, where tobacco was present, was the treatment with 9 grams of potassium cyanide per cubic meter effective, but in a glass jar, where adults were confined in a very small space and exposed directly to the fumes, it was effective. The

[11] The Cigarette Beetle. Cir. P. I. Bur. Agr. (1912), 5.

potassium cyanide with which these experiments were made was analyzed and found to be 98 per cent pure.

On November 24, 550 larvæ of *Lasioderma serricorne* were fumigated in tobacco waste for twenty-four hours with the gas liberated from 9 grams of potassium cyanide per cubic meter of compartment, and 171 were killed while 379 lived and developed into adults.

TEMPERATURES

Where it is not desirable to use chemical treatment for the control of the cigarette beetle, or in cases where machinery already is installed for steaming tobacco, the manufacturer can resort to steam as a weapon against this pest. The method of storing after treatment described under "Preparation of Factory" would always guarantee the stock.

In spite of the prejudice against steaming tobacco, experiments in smoking cigars made of steamed tobacco show that the treated cigars, although smoked by habitual smokers, are indistinguishable from the untreated. The only apparent damage done to the steamed tobacco is that suffered by the finest wrapper. As before stated, steaming the wrapper has a tendency to give it a darker color and the leaf becomes somewhat brittle. However, this can be avoided where the proper drum (Plate IV, fig. 1) is used and wrapper tobacco is placed in the center of the drum with filler tobacco all around it. Experiments have shown that in the treatment of the finest wrapper leaf about 5 per cent of the wrapper that would make *claro* or *colorado claro* cigars must be put into the *colorado, colorado maduro,* and *maduro* grades. While this causes absolutely no loss of tobacco, the manufacturers deem it a loss because of the preference in the market for the milder or lighter grades of cigars.

I had the opportunity of using a steaming drum especially prepared for tobacco with a view to the control of the cigarette beetle during the period of this investigation (Plate IV, fig. 1). This apparatus consists of a cylindrical drum within which is a track upon which runs a perforated car large enough to hold about 120 kilograms of leaf tobacco. After the leaf tobacco is placed in the car, it is pushed into the drum, and the door is clamped down tight upon rubber gaskets. The steam can be introduced at any pressure up to 8 atmospheres. The temperature in the drum varies from 96° to 102°, depending upon the pressure of the steam from the boiler. Another steam drum (Plate IV, fig. 2), which can be used but which is not as convenient as the one just described, can be obtained from London

for 1,300 pesos, or a common wooden compartment can be built in which the effective temperature could be secured. This latter could be erected at a cost not to exceed 100 pesos. The drum illustrated by fig. 1, Plate IV, is preferable, as in the two last mentioned, the tobacco must be removed by hand, and since there is no carriage the tobacco comes in direct contact with the sides of the drum or compartment and there is greater danger of getting it too wet by condensation.

After the tobacco has been subjected to the steam for twenty minutes at about 4 atmospheres, the exhaust is opened on the outside of the building. The door is then opened, the car pulled out on the track, and the tobacco shaken out. After steaming, at least one day is required to dry the tobacco before it can be made into cigars, and a small screened apartment for this purpose is necessary. After completion, the cigars should be guarded against reinfestation as in the cases of fumigation.

After steaming leaf tobacco in the drum for a period of twenty minutes at the above temperature, all insects found were dead. Experiments were tried with the cigarette beetle in all its stages, submitting them to temperatures from 60° to 90° C., for periods from ten to twenty minutes, and in each test all the insects were killed. The minimum effective temperature was not determined. However, this is not necessary as the temperature in drums while subjected to steam never falls below the killing temperature. Tobacco steamed as described above, placed in a screened room to dry, then made into cigars and kept under conditions to prevent reinfestation, proved good at the end of eight months.

Table XIII gives the results of the various temperature experiments.

TABLE XIII.—*Effects of different temperatures on different stages of the cigarette beetle.*

Temperature.	Time subjected.	Stage of insects.				Remarks.
		Eggs.	Larvæ.	Pupæ.	Adults.	
°C.	*Minutes.*					
90	20	20	.....	.....	20	All the adults were dead when removed. The larvæ, pupæ, and eggs were kept in dishes to determine if dead or not. All larvæ and pupæ turned black after two days. Eggs were kept two weeks and examined under the microscope. All were dried; none hatched.
85	10 to 35	60	70	15	20	
80	20	20	.....	.....	.....	
75	10 to 35	60	50	.....	.....	
70	20	40	.....	.....	.....	
65	20	20	.....	.....	.....	
60	20	20	20	20	20	Check eggs in these experiments all hatched.

These experiments were conducted with a moist heat such as would be found in the steam drum. The experiments of 75° and 80° were conducted at exposures from ten to thirty-five minutes. Cigars were partly hollowed out, the insects in different stages put inside the holes, and the cigars wrapped again with tobacco leaf and subjected to heat. A temperature as low as 60°C. for twenty minutes killed the cigarette beetle in all stages.

Table XIV gives the results of experiments with steamed tobacco made into cigars.

TABLE XIV.—*Results of experiments with cigars made from steamed tobacco and guarded against reinfestation.*

Kind of cigar.	Number of cigars.	Date made.	Treatment.		Date boxed.	Date examined.	Remarks.
			Temperature.	Duration.			
			°C.	*Mins.*			
Perfectos	100	June 24	96	20	June 30	July 13 Aug. 9 Sept. 8 Oct. 12 Nov. 10 Jan. 8	Cigars made and kept in a screened room; good at each examination.
Conchas	100						
Vegueros finos	100						
Londres	100						
Perfectos	100	June 27	102	25	June 30	July 13 Aug. 9 Sept. 8 Oct. 12 Nov. 10 Jan. 8	Do.
Conchas	100						
Vegueros finos	100						
Londres	100						
Panatelas	100	July 12	120	15	July 21	Sept. 27 Nov. 8 Jan. 8	Cigars made in general room and kept in screened room; good at each examination.
Perfectos	100						
Media regalia	100						
High life	100						
Panatelas	50	July 12	100	20	July 21	Sept. 27 Nov. 8 Jan. 8	Cigars made in general room and kept in tight tin boxes; good at each examination.
Perfectos	50						
Media regalia	50						
High life	50						

Cost of steaming.—As nearly all cigar and cigarette factories in Manila are at present equipped with machinery and boilers, the only cost to those who wish to use this method is that of the drum and its installation. Since the steaming process is of short duration, it would be difficult to calculate the actual cost of treating the tobacco where machinery is already installed.

In the application of steam, the principal requisite is that the wrapper tobacco should not become too wet.

Where cold storage is available, the cigars can be stored for a time with good results, provided a sufficiently low temperature

can be obtained. Proper receptacles for the cigars, together with as dry an atmosphere as possible, are necessary. Care must be taken to avoid mold which appears within a very short time on damp cigars. A zinc-lined box with rubber packing for the lid was found most satisfactory in the cold storage experiments. Cigars packed in wooden boxes contracted moisture and became more or less wet when taken out of cold storage.

It would undoubtedly be out of the question to install, in the various factories, cold storage plants of sufficient capacity and efficiency to give the proper degree of temperature for killing the cigarette beetle, but in places, such as Manila, where such a plant already exists, good results can be obtained by subjecting the manufactured product to cold for a given period of time. In the experiments to test the efficiency of cold storage, no attempt was made to determine the exact degree at which the insect is killed, and only those temperatures available at the Insular cold storage plant were used.

Four thousand Londres and 4,000 Coronitas cigars, packed in a tin-lined box, were placed in cold storage for eight weeks. Upon removal they had not molded, and were in good condition, while 1,000 other cigars placed in wooden boxes had absorbed moisture to such an extent that they had to be dried out again.

The following table is a summary of the results of cold storage upon the beetle in its different stages at the lowest temperatures available at the Insular cold storage plant.

TABLE XV.—*Effect of cold storage at 7°.8 C. upon the cigarette beetle in its different stages.*

Stage of insect.	Length of exposure.	Number of individuals exposed.	Number killed.	Remarks.
	Days.			
Eggs	1½	6	4	Two hatched, slightly retarded.
Do	2	5	5	
Do	3	58	58	Daily observations were kept on these. None hatched. Eggs were left in cold storage from 1.5 to 25 days. Check on these eggs (50) all hatched.
Do	4	14	14	
Do	5 to 25	1,271	1,271	
Larvæ	4	66	66	
Do	5	40	40	Larvæ whitish, but turned black soon after removal.
Do	7	187	187	
Pupæ	7	86	86	Pupæ all dead.
Adults	3	150	150	Some laid a few eggs in cold storage. None hatched.
Do	5	50	50	Some laid eggs in cold storage; none hatched.

It is plainly seen that at a temperature of −7°.8 the beetle in all stages can be killed in four days.

A similar experiment was carried on at the Bureau of Science where the temperature varied from 8° to 14°C. This did not kill the insect in any stage but only prolonged the period of development. Larvæ (full grown, at least 40 days old) lived one hundred fifty-seven days, but did not feed. Eggs were retarded in hatching; pupæ developed to adults, and these lived one hundred eleven days after emerging. The detailed data are given in Table XVI.

TABLE XVI.—*Effect of cold storage on the cigarette beetle in different stages, at temperatures varying from 8° to 14° C.*

Stage of insect.	Number.	Remarks.
Eggs	20	Taken out after 20 days; 14 hatched; 6 destroyed by mites.
Do	20	Taken out after 22 days; 3 hatched; 13 destroyed by mites.
Small larvæ	7	The longest life was 30 days.
Half-grown larvæ	30	Do.
Full-grown larvæ	30	The longest life was 157 days.
Pupæ	10	All developed and emerged; the last after a period of 30 days.
Adults	10	Emerged in cold storage, and lived 111 days.

Cost of cold storage.—At the division of cold storage of the Bureau of Supply, cigars would be stored according to the following schedule of charges:

TABLE XVII.—*Schedule of charges for storage space at the division of cold storage, Bureau of Supply.*

Space occupied.	Charge per cubic meter.	
	Per day.	Per 30 days.
	Pesos.	*Pesos.*
Less than 1 cubic meter	0.25	7.50
1 to 50 cubic meters	0.21	6.30
50 to 500 cubic meters	0.17	5.10
500 to 1,000 cubic meters	0.14	4.20
Over 1,000 cubic meters	0.11	3.30

From 10,000 to 12,500 boxed cigars occupy 1 cubic meter. At the above rate one could effectively treat cigars at 10 centavos per thousand by using 1 cubic meter of space for a period of four days. The ordinary tin-lined shipping box would be very

convenient. Cigars packed in this way should be subjected to cold for a period of at least six days. Large packages should be avoided as it takes longest for the cold to affect them.

MISCELLANEOUS EXPERIMENTS

A check, in which samples taken from different lots of treated tobacco were made into cigars and subjected to factory conditions, was carried on simultaneously with the foregoing experiments. The results have been indicated in Table XVIII.

TABLE XVIII.—*Results of experiments with treated stock where cigars were subjected to general factory conditions.*[a]

Kind of cigar.	Number of cigars.	Date made.	Treatment.		Date examined.
			Method.	Length.	
				Hrs. mins.	
Vegueros finos	50	July 1	Steam	0 20	August 27 and November 10.
Conchas especiales	50	...do	...do	0 20	
Do	50	...do	...do	0 25	Do.
Pereire	50	...do	...do	0 25	
Vegueros finos	50	...do	...do	48 00	Do.
Conchas especiales	50	...do	30 grams CS_2 per cu. meter.	48 00	
Perfectos	50	...do	32 grams KCN per cu. meter.	30 00	Do.
High life	200	June 1	38 grams CS_2 per cu. meter.	48 00	Do.
Perfectos	50	Sept. 7	Cigars untreated; general factory run.		October 12 and December 10.

[a] All of these cigars were made, dried, boxed, and kept in the factories with general stock. They became infested before the first examination. At the subsequent examination, only a few cigars were uninfested.

From the above it is plain that, although the tobacco was treated and all stages of the insect killed, as shown in Tables IX, XII, and XV, the treated cigars became infested as did the untreated. It is seen that infestation of manufactured tobacco can and does occur in the drying cabinets (Plates V, figs. 1 and 2) and selecting room, hence the importance of having these free from all stages of the cigarette beetle. Infestation may also occur after boxing, as many of the ordinary cigar boxes are defective. These facts demonstrate that the cigars must be kept under conditions which will prevent reinfestation. An open mandala where beetles have free access for oviposition is shown in Plate VI, fig. 1. The infestation of mandalas can be controlled to a certain extent by the use of a modern fermenting compartment (Plate VI, fig. 2). This can be so arranged as to prevent

the beetles from entering freely and it will give just as satisfactory results as the open mandala.

Tobacco stored in warehouses (Plate VII, fig. 1) and in general work rooms (Plate VII, fig. 2) furnishes a fresh supply of beetles at all times. Bales of infested tobacco should not be stored in the factory itself.

TRAPS

During the period of my study of the cigarette beetle, the manager of the Germinal cigar factory carried on light-trap experiments, placing a basin of petroleum under an electric light. This produced results far from satisfactory, no more than 5 to 8 beetles being caught in a single night, although the factory was badly infested at all times. I have found the most effective trap to be leaf tobacco itself. Several manos of leaf tobacco (Plate VIII, fig. 1) were placed in various parts of a warehouse. After a period of from twelve to twenty hours these were examined and the number of trapped beetles recorded.

TABLE XIX.—*Effectiveness of leaf tobacco as a trap for the cigarette beetle.*

Number of manos.	Length of time exposed.	Where exposed.	Number of adults.	Condition of manos.
	Hours.			
5	12	On bales of tobacco	155	Open.
5	12	do	255	Closed.
10	16	In window	28	Do.
10	12	On bales of tobacco	272	Open.
10	12	do	310	Closed.
10	20	do	461	Do.
5	18	In window	32	Do.
10	18	On bales of tobacco	557	Open.
15	18	do	640	Closed.
20	20	do	1,006	Do.

From Table XIX it will be seen that a great number of the adults may be trapped by this method. By carefully placing the trap manos in a fumigating box and by using one of the fumigants already suggested, the trapped beetles can be readily destroyed. Tobacco in manos can be used to good advantage as a trap in the general work room if, after working hours, all other tobacco be removed and these manos placed in various parts of the room. Before work is begun the following day, the manos should be collected and fumigated or the beetles shaken out into a pan of water and petroleum. Care must be exercised when collecting them not to jar the beetles from the tobacco.

SMOKING EXPERIMENTS

In view of the fact that there was thought to be a possibility of the deposition of cyanogen in the cigars by the cyanide treatment, several experiments were carried on to determine this point.

Cigars and leaf tobacco were treated with the requisite minimum of cyanide, 32 grams per cubic meter, and after treatment, analyses by chemists of the Bureau of Science showed the presence of hydrocyanic-acid gas in both the treated and untreated tobacco, but the amount was so small that in samples of less than 400 grams no quantitative determination could be made. The hydrocyanic-acid gas in 50 grams of treated tobacco was administered to a guinea pig without ill effects.

A series of treated and untreated cigars was smoked by means of an aparatus (Plate VIII, fig. 2), and the volatile products of combustion passed through a solution of silver nitrate, which was to fix the cyanogens which would ordinarily be taken in by the smoker, and afterward analyzed quantitively. Cigars of various brands were fumigated with cyanide and smoked simultaneously with a corresponding number of untreated cigars of the same brand. Hydrocyanic-acid gas was obtained in each case, and not infrequently the untreated cigars gave more of this product than did the treated. Any differences which really exist between the yield of hydrocyanic-acid gas from the treated and untreated cigars are so small in comparison with the total yield that they are negligible as shown by Table XX, which gives the actual amount of the tobacco smoked and of cyanides found.

TABLE XX.—*Hydrocyanic-acid gas (HCN) in treated and untreated cigars.*[a]

Number of cigars.	Cyanide treatment.		Tobacco actually smoked.	HCN gas found.	HCN per gram of tobacco smoked.	Average HCN per gram of tobacco smoked.	Remarks.
	Potassium cyanide per cubic meter.	Duration.					
	Grams.	*Hours.*	*Grams.*	*Grams.*	*Grams.*	*Grams.*	
12	32	24	78.40	0.0648	0.000826	0.00106	Cigars aërated 5 days before smoking.
12	32	24	81.17	0.1049	0.00129	----------	Cigars aërated 10 days before smoking.
12	none	none	74.2	0.0849	0.00114	0.00114	Cigars not treated and used as a check.

[a] Analyses by F. B. Beyer, division of general, inorganic, and physical chemistry, Bureau of Science.

Table XX shows that for each gram of treated tobacco actually smoked there was obtained from the products of combustion 0.00106 gram of hydrocyanic-acid gas, while in the untreated, for each gram of tobacco smoked, 0.00114 gram of hydrocyanic-acid gas was obtained, a difference of 0.00008 gram. This indicates that hydrocyanic-acid gas fumigation does not increase the normal cyanogen content of smoking tobacco.

In the combustion of any cigar a quantity of hydrocyanic-acid gas is produced. This quantity depends on a number of variable factors, such as the moisture, rate of combustion, firmness of the cigar, etc. This amount far exceeds that which it is possible for a cigar to absorb during fumigation. Since the simplest compounds are usually first to be destroyed by heat in the presence of air, it is more than probable that any hydrocyanic-acid gas retained from the fumigations is immediately converted into carbon dioxide, water, and nitrogen according to the following reaction:

$$4\ HCN + 5O_2 \rightarrow 4CO_2 + 2H_2O + 2N_2.$$

Furthermore, experiments confirm this fact and show that the hydrocyanic-acid gas actually obtained from treated cigars is, on the average, less than that from untreated cigars when smoked under identical conditions. Sixteen treated cigars were also placed in the smoking apparatus in sets of four, and air was drawn through each set for twenty minutes, and passed through a solution of silver nitrate. This solution was afterward analyzed for hydrocyanic-acid gas. The results were negative, thus showing that there exists in fumigated cigars no free hydrocyanic-acid gas.

In smoking treated and untreated cigars with the apparatus, particular attention was given to the requisites which are of importance in judging the burning qualities; these are, the uniformity of combustion, the capacity for retaining a light, and the color and firmness of the ash. In no case could any distinction be made between the treated and untreated cigars. Both held the fire well, and the ash was of the proper color and in most cases retained the shape of the cigar from the time of lighting until it was completely smoked. The burning quality is apparently not affected by treatment.

In judging the merits of the different cigars after the various treatments it was requested of those who smoked them that they note aroma, taste, and burning quality. Various lots of cigars of a given number were distributed to habitual smokers

more or less familiar with the brands which they were to smoke. Each lot contained an equal number of treated and untreated cigars, and each cigar was numbered. A card with numbers corresponding to those on the cigars accompanied each lot with the request that the smoker use two cigars of the same brand in succession, and give his opinion as to aroma, taste, and burning quality with such additional remarks on the various cigars as he saw fit. The smokers did not know which cigars were treated and which untreated and in no case were the cigars distinguished. Tables XXI to XXVIII give the results obtained from tests by 30 habitual smokers.

TABLE XXI.—*Twenty-five Perfectos treated with carbon bisulphide and 25 untreated Perfectos were used in this test.*

No. of cigar.	Treated.			Untreated.			Cigar preferred.	Remarks.
	Aroma.	Taste.	Burning quality.	Aroma.	Taste.	Burning quality.		
1	Good	Regular	Good	Good	Regular	Good	No choice	
2	do	Good	do	Bad	Bad	Bad	Treated	Could not smoke untreated.
3	do	do	do	Good	Good	Excellent	Untreated	Treated cigar good, but not better than average cigar.
4	do	Strong	do	do	do	Good	do	
5	do	Aftertaste	do	do	Strong	Even	do	Slight difference in treated and untreated.
6	do	Inferior	Even	Fair	Fair	do	do	
7	do	Good	Good	Good	Good	Good	No choice	
8	do	Strong	do	Bad	Bad	Bad	Treated	Treated cigar had taste of green tobacco.
9	do	Good	do	Good	Good	Good	No choice	
10	Superior	do	Fair	Excellent	Excellent	Excellent	Untreated	
11	Regular	Strong	Poor	Good	Mild	do	do	
12	Good	Good	Good	do	Strong	Good	Treated	
13	do	Slightly impaired	do	Fair	Fair	do	Untreated	Treated cigar had taste of green tobacco.
14	do	Fair	do	do	Strong	do	Treated	Preferred treated.
15	do	Good	do	do	do	Fair	do	Do.
16	do	do	do	Good	Good	Good	No choice	
17	do	Fair	do	Fair	Bad	Bad	Treated	
18	do	Good	do	Good	Good	do	No choice	Untreated had taste of green tobacco.
19	Fair	do	do	do	do	do	Treated	
20	Good	do	do	Bad	Bitter	do	do	
21	Fair	Fair	Fair	Excellent	Excellent	Excellent	Untreated	
22	Excellent	Excellent	Excellent	do	do	do	No choice	
23	Good	Good	Good	Good	Good	Good	do	
24	Fair	Fair	Fair	Fair	Fair	Fair	Treated	Preferred treated.
25	Good	Good	Good	Bad	Bad	Bad	do	

TABLE XXII.—*Twenty-five Bouquets made from steamed tobacco and 25 untreated Bouquets were used in this test.*

No. of cigar.	Treated.			Untreated.			Cigar preferred.	Remarks.
	Aroma.	Taste.	Burning quality.	Aroma.	Taste.	Burning quality.		
1	Good	Good	Good	Good	Good	Good	No choice	
2	do	Agreeable	do	do	Mild	do	do	
3	do	Good	do	do	Good	do	do	
4	Fair	Fair	Fair	Fair	Fair	Fair	do	
5	Excellent	Excellent	Good	Good	Good	Good	Treated	
6	Good	Good	do	do	do	do	No choice	
7	Fair	Fair	Fair	Fair	Fair	Fair	Untreated	Did not care for either.
8	do	do	do	do	do	do	No choice	Do.
9	Good	Strong	Good	Good	Good	Bad	Treated	
10	do	Good	do	do	do	Good	No choice	
11	do	do	do	do	Strong	do	Treated	
12	Fair	Fair	Fair	Fair	Fair	Fair	do	Preferred treated cigar.
13	Good	Biting	Good	Good	Good	Good	Untreated	
14	Fair	Good	do	do	do	do	do	
15	Poor	Poor	do	Fair	Fair	do	do	
16	Good	Good	Poor	Good	Good	Poor	No choice	Slight difference; favors untreated.
17	Natural	Normal	Good	Natural	Normal	Good	do	
18	Fair	Fair	Fair	Fair	Fair	Fair	do	
19	Superior	Good	Good	Good	Good	Good	Treated	
20	Good	Fine	do	Bad	Fair	Bad	do	
21	Poor	Bad	Poor	Fair	Good	Fair	Untreated	
22	Good	Fair	Good	Regular	Fair	Bad	Treated	
23	do	Good	do	Good	Good	Good	No choice	
24	do	do	do	do	do	do	do	
25	do	do	Fair	Fair	Fair	Fair	Treated	

TABLE XXIII.—*Twenty-two Princesas treated with hydrocyanic-acid gas and 22 untreated Princesas were used in this test.*

No. of cigar.	Treated.			Untreated.			Cigar preferred.	Remarks.
	Aroma.	Taste.	Burning quality.	Aroma.	Taste.	Burning quality.		
1	Good	Superior	Good	Bad	Regular	Bad	Treated	
2	Fair	Good	Fair	Fair	Good	Fair	No choice	
3	None	do	Good	Good	Fair	Good	Untreated	
4	Good	do	do	do	Good	do	do	
5	Ordinary	do	do	Ordinary	do	do	No choice	
6	Fair	Fair	Fair	Normal	Normal	Fair	Untreated	
7	Natural	Good	Good	do	Good	Good	No choice	
8	Poor	Poor	do	Good	do	do	Untreated	
9	Good	Good	do	do	Impaired	do	Treated	
10	Bad	Bitter	One sided	Bad	Bitter	One sided	No choice	
11	Good	Excellent	Good	Good	Fair	Good	Treated	Not so good as No. 7 (which was treated).
12	do	Good	do	do	Good	do	No choice	
13	do	do	do	do	do	do	do	
14	Fair	Fair	Fair	Fair	Fair	Fair	Treated	Thinks treated cigar superior to untreated.
15	Good	Good	Good	Good	Good	Good	No choice	Untreated slightly stronger than treated.
16	Poor	Poor	Poor	Medium	Medium	Medium	Untreated	Did not care for either.
17	Average	Average	Good	Sweet	Very good	Good	do	
18	Good	Good	do	Good	Good	do	No choice	
19	do	do	do	do	Peculiar	do	Treated	Untreated cigar stronger than treated.
20	Fair	Bitter	Fair	do	Good	do	do	Thinks treated cigar superior to untreated.
21	do	do	Good	Fair	Bitter	do	No choice	
22	Good	Good	do	Good	Good	do	do	

TABLE XXIV.—*Twenty Londres treated with carbon bisulphide and 20 untreated Londres were used in this test.*

No. of cigar.	Treated.			Untreated.			Cigar preferred.	Remarks.
	Aroma.	Taste.	Burning quality.	Aroma.	Taste.	Burning quality.		
1	Good	Good	Good	Fair	Good	Bad	Treated	
2	do	do	do	Good	do	Good	Untreated	Prefers untreated.
3	Strong	do	do	do	do	do	do	Slight difference; prefers untreated.
4	Fair	Fair	Fair	Fair	Fair	do	do	
5	do	do	Good	do	do	do	No choice	
6	Good	Good	do	do	Good	Fair	Treated	
7	do	do	do	do	Bitter	Bad	do	
8	do	do	do	Good	Fair	Good	do	
9	Fair	Fair	Fair	Fair	do	Fair	No choice	
10	Good	Good	Good	Good	Good	Good	do	
11	Poor	Bitter	Fair	Poor	Bitter	Poor	do	
12	Fair	Fair	do	Fair	Fair	Fair	do	
13	Good	Good	Good	Good	Good	Good	do	
14	do	do	do	do	do	do	do	
15	do	Fair	do	do	do	do	Untreated	
16	Poor	do	Fair	Poor	Fair	Fair	No choice	
17	Good	Good	Good	Good	Good	Good	do	
18	do	Mild	do	do	Mild	do	do	
19	do	Good	do	Strong	Bitter	do	Treated	
20	Fair	Fair	Bad	Fair	Bad	Fair	No choice	

TABLE XXV.—*Six Regalias made from steamed tobacco and 6 untreated Regalias were used in this test.*

No. of cigar.	Treated.			Untreated.			Cigar preferred.
	Aroma.	Taste.	Burning quality.	Aroma.	Taste.	Burning quality.	
1	Good	Good	Good	Good	Good	Good	No choice.
2	do	do	do	do	do	do	Do.
3	do	do	do	do	do	do	Do.
4	Fair	Medium	Fair	Fair	Fair	Fair	Treated.
5	Good	Good	Good	Good	Good	do	Do.
6	do	do	Fair	do	do	Good	Untreated.

TABLE XXVI.—*Twelve Imperiales treated with hydrocyanic-acid gas and 12 untreated Imperiales were used in this test.*

No of cigar.	Treated.			Untreated.			Cigar preferred.	Remarks.
	Aroma.	Taste.	Burning quality.	Aroma.	Taste.	Burning quality.		
1	Good	Good	Good	Good	Good	Good	No choice	
2	do	do	do	do	do	do	do	
3	do	Fair	do	do	do	do	Untreated	
4	Poor	Poor	Bad	Fair	Fair	Fair	do	
5	Good	Good	Good	Good	Good	No choice		
6	Fair	Fair	Fair	Fair	Fair	Fair	Treated	Did not care for either, but thought treated cigar the best.
7	do	do	Good	do	Good	do	No choice	
8	Good	Good	do	Good	Fair	do	Treated	
9	do	Excellent	do	do	Excellent	Good	do	Preferred treated cigar.
10	Natural	Natural	Even	do	Unpleasant	Even	do	
11	Good	Good	Excellent	do	Good	Excellent	No choice	
12	do	do	Fair	do	do	Fair	do	

TABLE XXVII.—*Ten treated and 10 untreated Divinos were used in this test.*

(Filler steamed; wrapper treated with carbon bisulphide.)

No. of cigar.	Treated.			Untreated.			Cigar preferred.	Remarks.
	Aroma.	Taste.	Burning quality.	Aroma.	Taste.	Burning quality.		
1	Good	Strong	Good	Good	Mild	Fair	No choice	
2	do	Good	do	Fair	Fierce	Bad	Treated	
3	Fair	Fair	Fair	do	Fair	Fair	No choice	
4	Good	Good	Good	do	Biting	do	Treated	
5	do	do	do	Good	Good	Good	do	Preferred treated cigar.
6	do	do	do	do	do	do	No choice	
7	do	do	do	Poor	Medium	do	Treated	
8	Natural	Natural	do	Natural	Natural	do	No choice	
9	Good	Good	do	Good	Good	do	do	
10	do	Superior	do	do	do	Bad	Treated	

TABLE XXVIII.—*Summary of Tables XXII to XXVII, showing in percentages the preference of smokers for treated cigars.*

Kind of cigar.	Number of each treated and untreated.	Relative number of cigars preferred by smoker.			Relative percentages of cigars preferred by smoker.			In favor of—		Percentage gain for treated.
		Treated.	Untreated.	No choice.	Treated.	Untreated.	No choice.	Treated cigars.	Untreated cigars.	
					Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*
Perfectos	25	11	8	6	44	32	24	12	0.0	12
Bouquets	25	8	5	12	32	20	48	12	0.0	12
Princesas	22	6	6	10	27.24	27.24	45.4	0.0	0.0	0.0
Londres	20	5	4	11	25	20	55	5	0.0	5
Regalias	6	2	1	3	33.32	16.66	49.98	16.66	0.0	16.66
Imperiales	12	4	2	6	33.32	16.66	49.98	16.66	0.0	16.66
Divinos	10	5	0	5	50	0.0	50	50	0.0	50

It will be noted that in all cases, but one, the treated have a gain in percentage over the untreated cigars. It is not the object of this table to show that these treatments improve the different cigars but simply to show that their qualities are not impaired thereby.

THE NECESSITY FOR REMEDIAL MEASURES

Using as a basis the approximate loss of cigars due directly to the ravages of the cigarette beetle during the past three fiscal years in the 19 factories of Manila which have had an export trade, we obtain the following results:

Fiscal year.	Cigars destroyed.	Value in pesos.
1909	1,116,056	35,290.70
1910	363,303	15,205.82
1911	942,856	36,451.00
Total, 3 years	2,422,215	86,947.52

By the methods of fumigation indicated in this paper, the cost of the chemicals and installation of the necessary apparatus would be as follows:

	Pesos.
Installation of apparatus in 19 factories	11,600.00
Chemicals for fumigation	242.22
Two employees, at 6,000 pesos per annum, for three years	36,000.00
Total	47,842.22

There is shown a net saving of 39,105.30 pesos. The losses given are for cigars actually destroyed in the factories and not for that of stock lost outside of the factory, due to the same cause, or the loss of trade due to the shipment of infested stock. These cannot be accurately estimated, although it is safe to say that the greater part of the 2,539,860 pesos [12] decrease in the exports of tobacco and tobacco products to the United States alone is to be attributed indirectly to the causes set forth above. On account of the free entry of tobacco and tobacco products into the United States, the trade should have shown an increase.

Inquiries at various factories in Manila, which formerly had a good export trade with the United States, revealed the fact that many, at the present date, have no export trade at all; and some of them are running at less than one-eighth of their capacity.

CONCLUSIONS

Data concerning the remedial measures which may be applied in the various tobacco factories in Manila for combating the cigarette beetle, have been furnished, and it has been shown that this insect can be absolutely controlled by the treatments indicated.

Forty-one per cent of the annual factory loss due to insects would pay for the necessary chemicals and labor and 13 per cent for installation of proper apparatus. There would thus be a saving of 46 per cent on this stock alone. These figures do not take into account the direct loss due to this beetle outside the factories or the indirect loss of trade.

At first, the work must be carried on by persons who realize the prime importance of accuracy and the necessity for keeping treated stock free from reinfestation. In the course of time as work progresses and the ordinary laborers become familiar with the ordinary operations, the salaries may be greatly reduced.

[12] Annual report of the work of the Bureau of Customs during the fiscal year 1911.

ILLUSTRATIONS

(Plate I, drawings by Espinosa; Plate IV, photographs by Martin; Plates II, III, and V to IX, photographs by Cortes.)

PLATE I

FIGS. 1 to 7. Stages of *Lasioderma serricorne* Fabr. *1*, Egg; *2*, larva; *3*, pupa, front view; *4*, pupa, side view; *5*, pupa cell; *6*, adult, back view; *7*, adult, side view.

FIG. 8. *Norbanus* sp. Parasite of *L. serricorne*, dorsal view.

9. *Norbanus* sp. Parasite of *L. serricorne*, lateral view.

10. Larva of Clerid predaceous on pupæ and larvæ of the cigarette beetle.

FIGS. 11 and 12. Pupa of Clerid.

FIG. 13. Adult Clerid.

PLATE II

Cigars showing infestation by cigarette beetle; *a*, character of injury where larva gets between two cigars.

PLATE III

FIG. 1. Screened compartment at factory where many experiments were conducted; *a*, two screened doors, with screened vestibule.

2. Fumigating compartment showing tobacco wrapper on shelves.

PLATE IV

FIG. 1. Steam drum used in the control of the cigarette beetle. The pile of leaf tobacco at the right has been steamed; *a*, car which holds about 120 kilograms of leaf tobacco; *b*, track to transfer car in and out of drum *d*; *c*, hinge joint where track swings back when door closes.

2. A revolving steam drum.

PLATE V

FIG. 1. Cigars dried out on open rack where the cigarette beetles have free access. A source of infestation.

2. Cigars in drying cabinet. A source of infestation.

PLATE VI

FIG. 1. Open mandalas (fermenting piles) to which the beetles have free access. These piles are infested at all times. The tobacco from these piles is taken to the work room and made directly into cigars.

2. Closed mandala which gives as satisfactory results as the open one. The beetles are practically excluded. The numbered sections of the open side fit in a grove at either end and may be removed from top to bottom.

PLATE VII

FIG. 1. Bodega (warehouse) showing how tobacco is stored. This tobacco is infested at all times.

2. Tobacco stored in stripping room. Badly infested, it furnishes a supply of beetles for the newly stripped filler and wrapper.

PLATE VIII

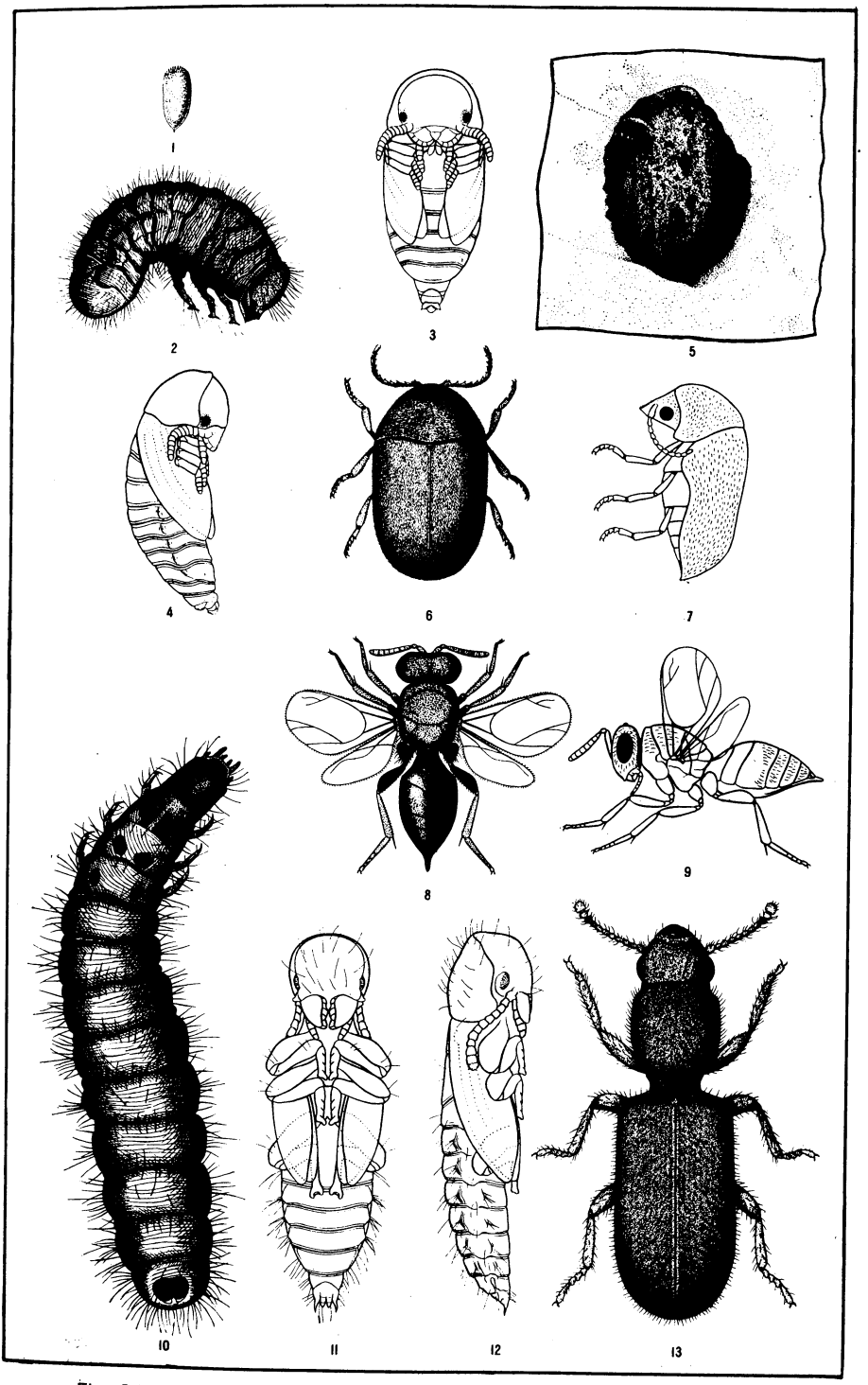
FIG. 1. Manos (hands) of first class tobacco. They contain 100 leaves each.

2. Apparatus used for testing cigars fumigated with hydrocyanic acid for the presence of cyanides and for testing the burning quality of the cigars. *a*, rubber nipple for holding the cigars; *b*, connected y-tubes for smoking a series of 4 cigars; *b'*, stand for support; *c c*, Wolfe's bottles with saturated solution of silver nitrate through which the smoke was passed; *c' c'*, glass tubes which conduct smoke into solution of silver nitrate; *d*, u-tube to catch any solution that may pass from *c; e*, stopcock by which suction is regulated; *f*, large jar of water which when syphoned through tube *g* furnishes draught.

PLATE IX

FIG. 1. Wrapper tobacco showing injury caused by larvæ of the cigarette beetle.

2. Freshly painted doors of a bodega where thousands of adult cigarette beetles were caught during one evening. Each small black dot is an adult cigarette beetle.



Figs. 1-7. *Lasioderma serricorne* Fabr., 8 and 9 *Norbanus* sp., 10-13 *Clerid beetle.*

PLATE I.

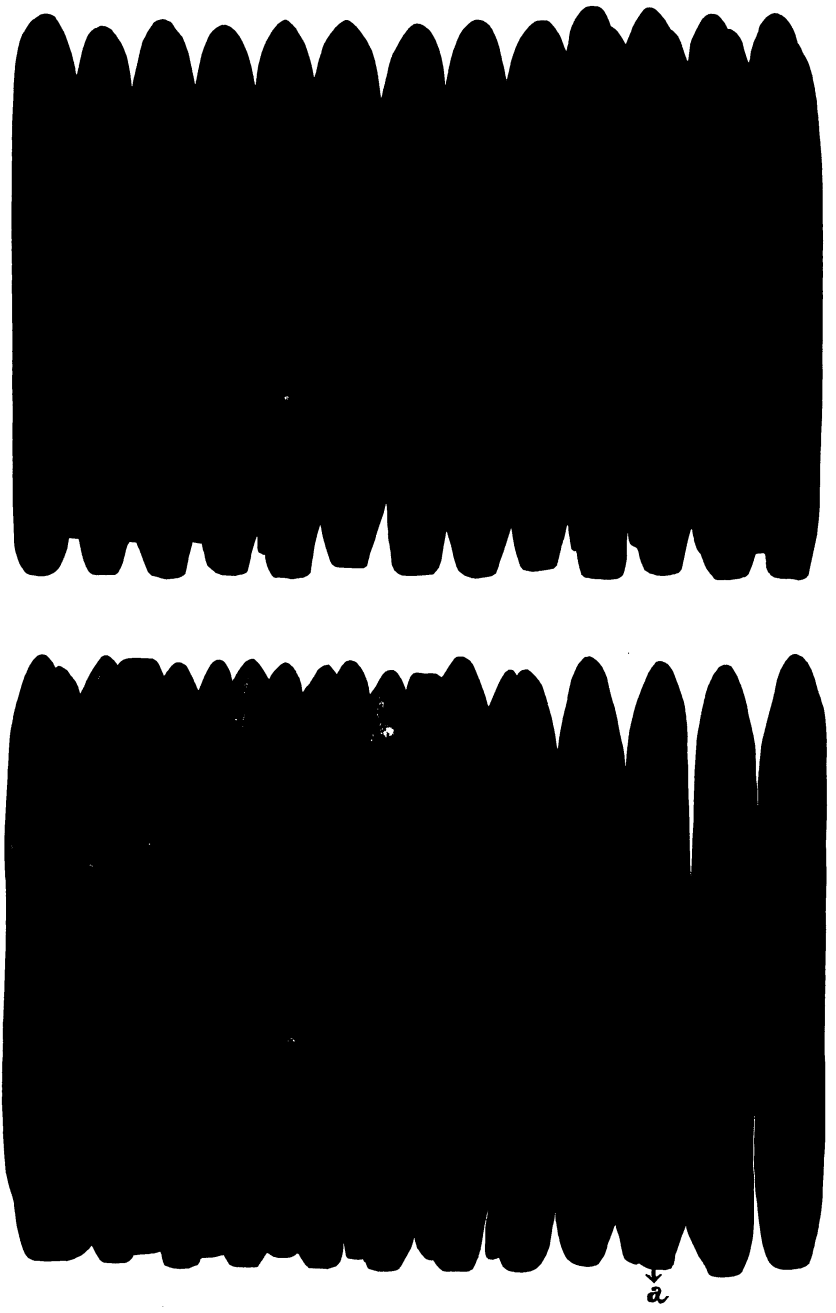


PLATE II. CIGARS INJURED BY CIGARETTE BEETLES.

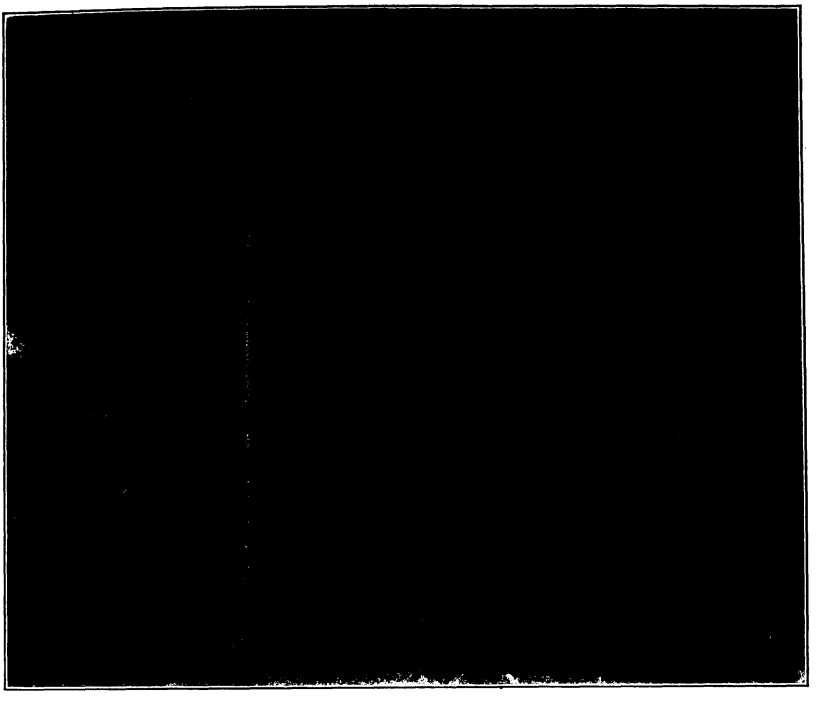


Fig 1. Screened compartment at factory; *a*, one of the two screened doors with screened vestibule.

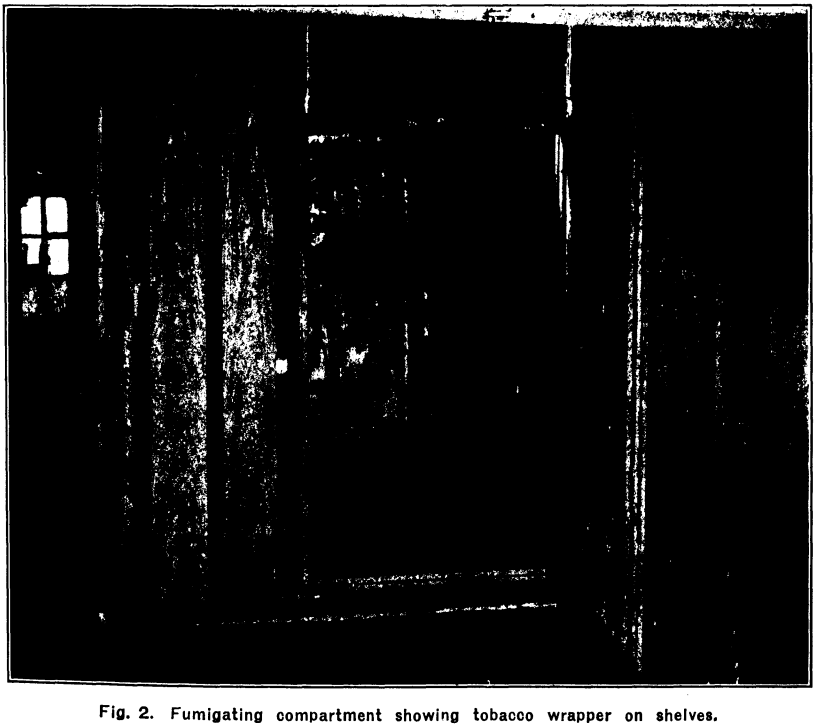


Fig. 2. Fumigating compartment showing tobacco wrapper on shelves.

PLATE III.

Fig. 1. Steam drum used in the control of the cigarette beetle.

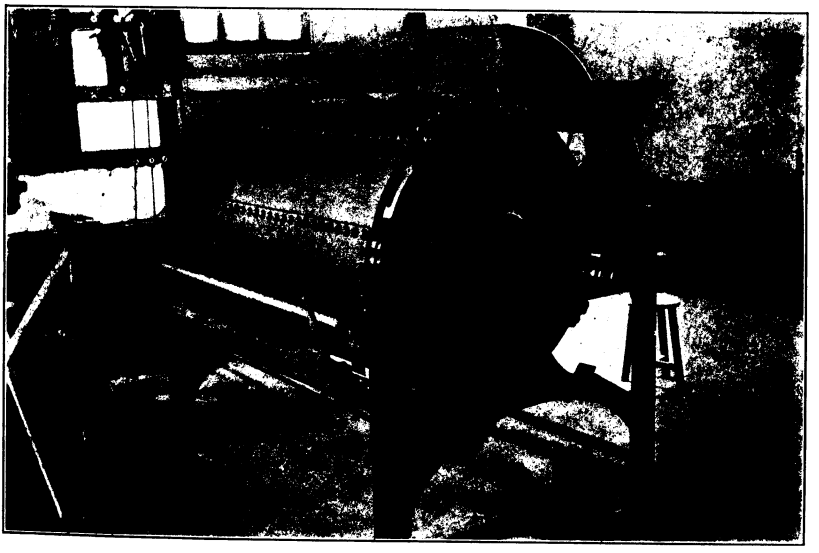


Fig. 2. A revolving steam drum.

PLATE IV.

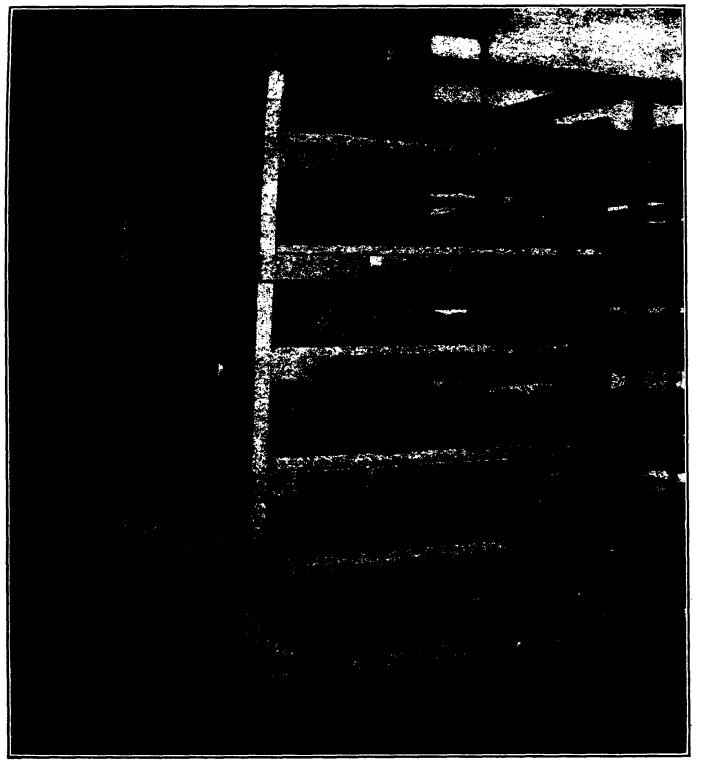


Fig. 1. Cigars dried on open rack.

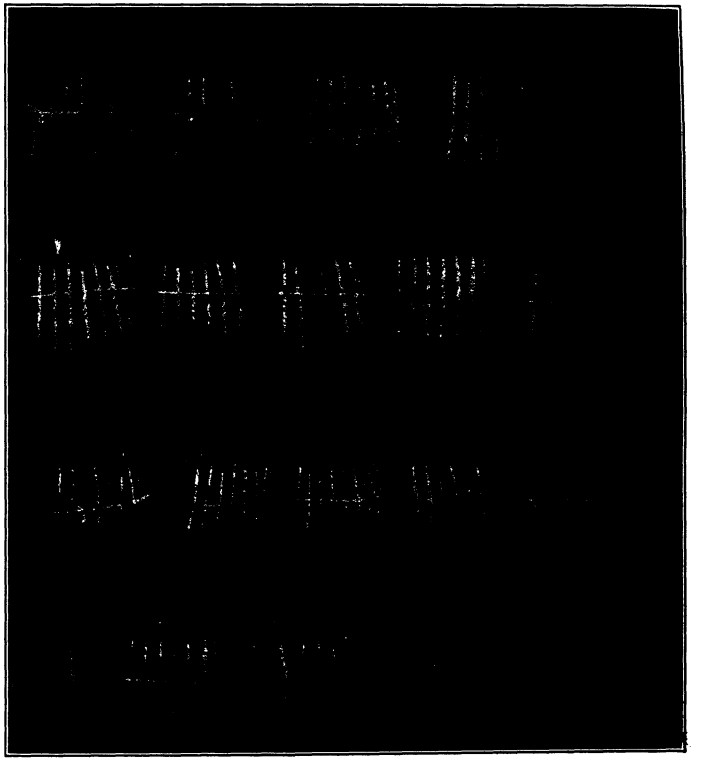


Fig. 2. Cigars in drying cabinet.

PLATE V.

Fig. 1. Open mandalas (fermenting piles) to which beetles have free access.

Fig. 2. Closed mandala which gives as satisfactory results as the open one.

PLATE VI.

Fig. 1. Bodega (warehouse) showing how tobacco is stored.

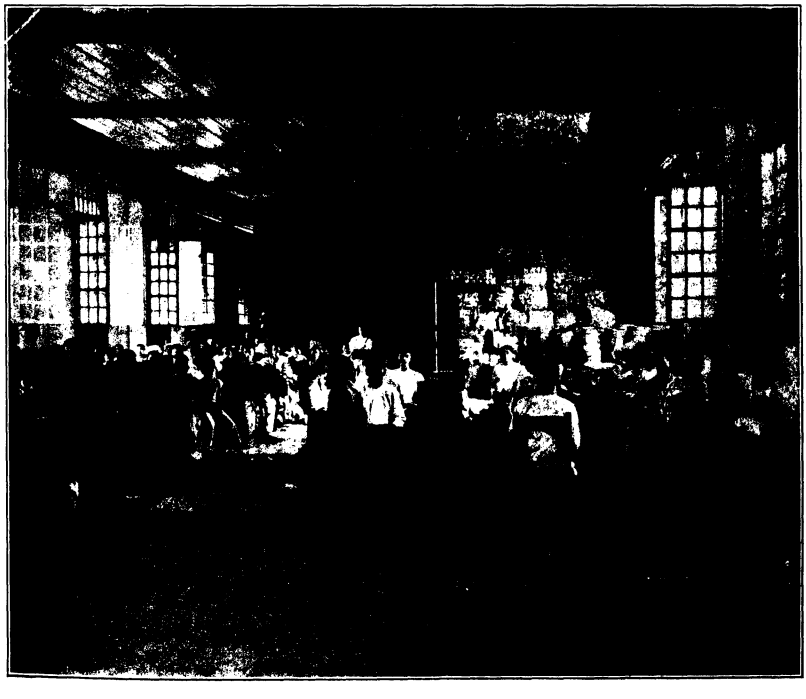


Fig. 2. Tobacco of the crop of 1908 stored in stripping room.

PLATE VII.

Fig. 1. Manos (hands) of first-class tobacco.

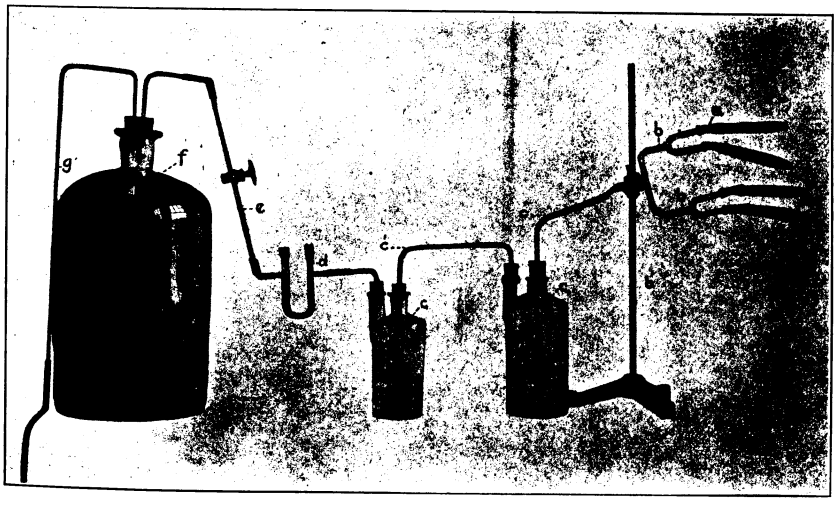


Fig. 2. Apparatus used for testing cigars.

PLATE VIII.

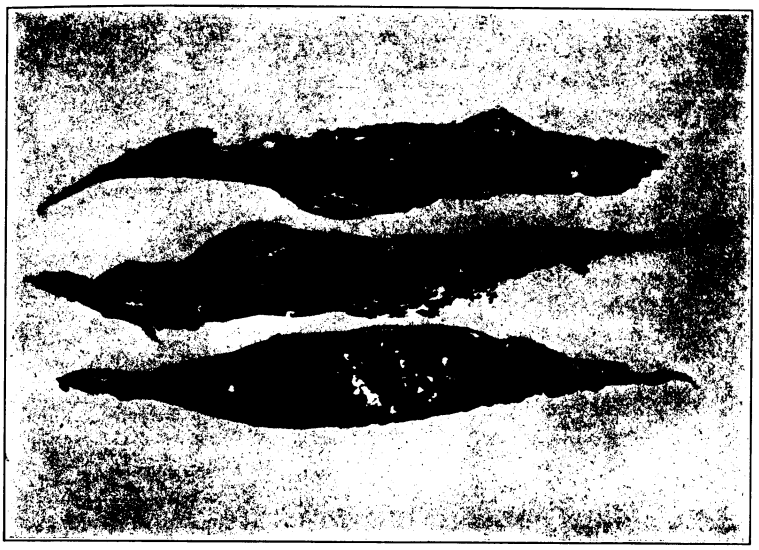


Fig. 1. Wrapper tobacco injured by larvæ of the cigarette beetle.

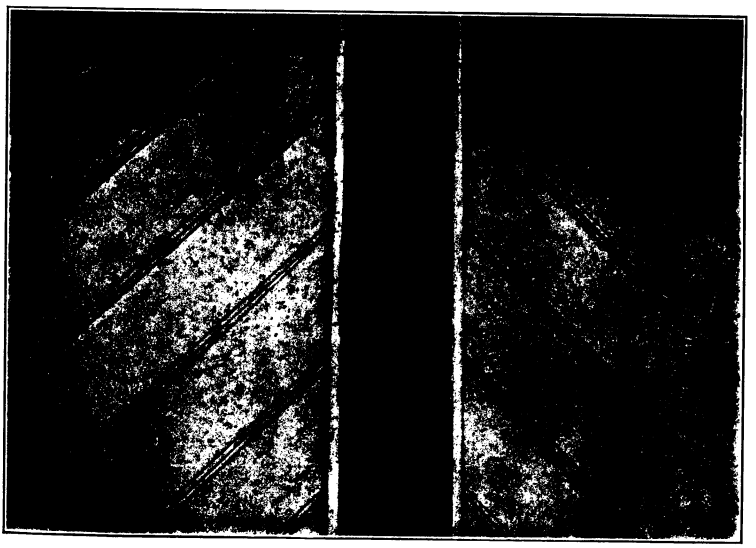


Fig. 2. Freshly painted doors of a bodega showing adult cigarette beetles.

PLATE IX.

LAGRIIDEN UND ALLECULIDEN DER PHILIPPINEN

(COLEOPTERA)

Von FRITZ BORCHMANN

(*Hamburg, Germany*)

Eine kleine, aber sehr interessante Sammlung von Lagriiden, Alleculiden und Meloiden, die mir vom Bureau of Science in Manila zur Bestimmung übergeben wurde, reifte in mir den Entschluss, eine Übersicht über die Fauna der ersten Gruppe zu geben. Die neuen Arten finden im Anschlusse daran ihre Beschreibung, denen ich die Beschreibung einiger neuer Arten aus anderen Sammlungen hinzufüge. Es waren bisher 4 *Lagria*-Arten und 1 *Casnonidea* von den Philippinen bekannt. Diese und die neuen Arten scheinen weder auf dem Festlande noch auf den andern Inselgruppen, vielleicht mit Ausnahme von Celebes, vorzukommen. Die Fauna enthält also auffallend viele endemische Arten. Manche Tiere scheinen in der Färbung ausserordentlich zu variieren. Daher sind bei der verhältnismässigen Seltenheit der Tiere die Arten oft recht schwierig zu trennen.

I. LAGRIIDAE

LAGRIA Fabricus

1. **Lagria cribratula** Schauf.
   Von Celebes.

2. **Lagria pruinosa** Chevr.
   In 3 typischen Exemplaren von LUZON, Benguet, Cabayan (11439, 11503, *R. C. McGregor*).

3. **Lagria ionoptera** Er.
   LUZON, Rizal, Montalban Gorge (5197, 5626, *Charles S. Banks*).

4. **Lagria prasinella** Fairm.
   Die 4 Exemplare weichen durch ihre trübe Färbung ab. Sie haben einen starken rötlichen Schimmer.
   LUZON, Benguet, Baguio (9924, *H. M. Curran*); Bued River (9873, *H. M. Curran*); Cagayan, Tuguegarao (10482, *H. M. Curran*); NEGROS, Negros Occ., Mt. Canlaon (129031, *Charles S. Banks*).

5. **Lagria hirticollis** Borchm.

PALAWAN, Iwahig (12359, *C. M. Weber*).

Ich beschrieb die Art von Pegu und Sarawak, Borneo.

6. **Lagria concolor** Blanch.

LUZON, Bataan, Lamao (9820, *H. E. Stevens*); NEGROS, Negros Occ., Nakalang (1396, *Charles S. Banks*); MINDANAO, Agusan River (13694, *W. Schultze*).

Die Art ist über einen grossen Teil des Festlandes und der Inselflur verbreitet.

7. **Lagria fulgidipennis** sp. nov.

Länglich, nach hinten etwas erweitert, stark gewölbt; Flügeldecken stark glänzend; kurz, fein und dicht behaart; schwarz, oft mit grünlichem oder dunkelblauem Schimmer, Kopf und Halsschild mit schwachem, grünen Erzschimmer, Flügeldecken mit starkem, dunkelgrünem Erzchimmer. Kopf rundlich, stark und dicht punktiert; Oberlippe kurz, vorn stark ausgerandet, Ecken, abgerundet, lang braun beborstet. Clypeus 2 mal so lang, vorn ausgerandet, dicht und grob punktiert, beborstet, von der Stirn durch eine tiefe gerade Querfurche getrennt, Stirn wenig gewölbt, uneben; Schläfen lang, gerundet; letztes Glied der Kiefertaster kurz, breit dreieckig, Aussenseite am längsten; Fühler mässig stark, die Schultern wenig überragend, nach aussen nicht verdickt, vom 5. Gliede an fast walzenförmig, 3. Glied wenig länger als das 4., Endglied etwas länger als das 10., gebogen, zugespitzt; Augen nierenförmig, stark gewölbt, Stirnabstand fast gleich 3 Augendurchmessern. Halsschild breiter als der Kopf mit den Augen, breiter als lang, nahe dem Vorderrande am breitesten, ziemlich stark gewölbt, grob und dicht punktiert, ein Exemplar hat einen deutlichen Mittelkiel, am Anfang des 2. Drittels beiderseits neben dem Kiel eine tiefe Grube, das 2. Exemplar hat keinen Mittelkiel, dafür aber an jeder Seite des Halsschildes 2 hinter einander stehende Gruben, alle Ränder des Schildes deutlich gerandet, Vorderecken stumpf, Hinterecken etwas vortretend, Hinterrand in der Mitte etwas ausgebuchtet; Schildchen rundlich, dicht punktiert, braun behaart; Flügeldecken nicht ganz doppelt so breit wie der Halsschild, stark gewölbt, mässig erweitert, Schultern stark gefaltet, etwas vorgezogen, hinter dem Schildchen flach quer niedergedrückt, Spitzen zusammen abgerundet, Scheibe mit einer beträchtlichen Zahl mässig starker, nicht scharf abgegrenzter Längsrippen, überall gleichmässig, ziemlich fein, nicht dicht punktiert; Epipleuren breit, allmählich verengt, weitläufig punktiert. Unterseite fein und ziemlich dicht punktiert, glänzender

als Kopf und Halsschild, Seiten des starkgewölbten Abdomens mit rundlichen Eindrücken, Abdominalfortsatz breit und kurz, breit gerandet. Beine braun behaart, Schenkel schwach verdickt, Schienen schwach gebogen, Hinterschenkel den Hinterrand des 3. Hinterleibsringes nicht erreichend, Füsse mit gelb beborsteter Sohle, 1. Tarsenglied der Hinterfüsse so lang wie die folgenden Glieder zusammen.

2 ♀ ♀. Länge: 19–20 mm.; Schulterbreite: 7 mm.

NEGROS, Mt. Canlaon, 800 m. (6456, *Charles S. Banks*).

Type ♀, in meiner Sammlung.

Die Art lässt sich schwer mit anderen vergleichen. Sie ist am nächsten mit *Lagria denticornis* Fairm. und *crassa* Borchm. verwandt, aber durch Färbung und Skulptur grundverschieden.

CEROGRIA Borchmann

8. **Cerogria dohrni** Borchm.

Cerogria dohrni BORCHM., Bull. Soc. Ent. Ital. (1909), 41, 212.

Luzon.

9. **Cerogria meloides** Borchm.

Cerogria meloides BORCHM., Bull. Soc. Ent. Ital. (1909), 41, 218.

Philippinen.

Genauere Fundorte sind mir nicht bekannt.

NEOGRIA Borchmann

10. **Neogria concolor** Borchm.

Neogria concolor BORCHM., Bull. Soc. Ent. Ital. (1909), 41, 225.

LUZON, Benguet, Irisan (973, *R. C. McGregor*).

Ich beschrieb diese Art von der Insel Mentawei.

CASNONIDEA Fairmaire

Die Gattung *Casnonidea* ist kaum von der Gattung *Nemostira* Fairm. zu trennen obgleich es sehr wünschenswert wäre. Auch *Hysterarthron* Thoms. gehört wahrscheinlich hierher. Dann müsste wenigsten *Nemostira* eingezogen werden. Als durchgreifender Unterschied zwischen den beiden ersten Gattungen führt der Autor an: Bei *Casnonidea* ist der Kopf breiter als der Halsschild; die Augen sind unterseits beträchtlich von einander entfernt und vorn nicht ausgerandet. Der Abdominalfortsatz ist schmal und über die Hüften verlängert. Als wichtigstes Merkmal wird angeführt, dass die Oberlippe nach der Basis und das Epistom nach dem Apex verengt ist, so dass die Mandibeln sichtbar sind.

Bei *Nemostira* ist der Halsschild breiter als der Kopf; die Augen sind vorn ausgerandet und stossen unterseits fast zusammen. Der Abdominalfortsatz ist breit und abgestutzt. Oberlippe und Epistom sind nicht verengt und bedecken die Mandibeln vollkommen. Alle angeführten Merkmale sind graduelle; keine gehen durch. Es gibt überall Übergangsformen in allen Graden. Oft sind die Merkmale gemischt. In der folgenden Zusammenstellung fasse ich als *Casnonidea* die Formen auf, die verengte Oberlippe und verengtes Epistom haben.

I. Hinterschienen des Männchens einfach.
A. Flügeldecken einfarbig.

11. **Casnonidea albopilosa** Schauf.
Vom Autor als *Lagria* von Celebes beschrieben.

12. **Casnonidea atricapilla** Fairm.
Süd-Celebes, Bantimoeroeng.

13. **Casnonidea impressifrons** Schauf.
Von Celebes als *Lagria* beschrieben.

14. **Casnonidea mollis** sp. nov.

Form der *Nemostira villosa* Borchm., etwas buckelig gewölbt, nach hinten mässig erweitert; glänzend rotbraun, Oberseite und äussere Hälfte der Schenkel und die Schienen dunkel metallisch grün, Augen und Fühler schwarz; glänzend; lang, ziemlich dicht und etwas anliegend, gelblich behaart. Kopf wie gewöhnlich, Oberlippe doppelt so breit wie lang, Ecken wenig abgerundet, vorn schwach ausgerandet, dicht punktiert, mit langen weisslichen Haaren; Clypeus etwas länger, ebenso skulptiert, von der Stirn durch einen flachen, gebogenen Eindruck getrennt; Stirn und Scheitel uneben, grob punktiert, letzterer mit einer kräftigen Mittelrinne; Schläfen kurz; Hals scharf abgesetzt; letztes Glied der Kiefertaster mässig breit dreieckig. Fühler die Schultern etwas überragend, kräftig, Glieder gestreckt, 3. Glied so lang wie das 4., Endglied kaum länger als das vorhergehende, fast gerade, etwas verdickt und dann plötzlich zugespitzt; Augen nierenförmig, gewölbt, Abstand unten gross, auf der Stirn $1\frac{1}{2}$ Augendurchmesser. Halsschild sehr wenig breiter als der Kopf mit den Augen, so lang wie breit, gewölbt, vorn stark gerundet, hinten etwas eingeschnürt, Hinterwinkel etwas vortretend, vorn fein, hinten breit, aufgebogen gerandet, Scheibe grob und nicht dicht punktiert, vor dem Hinterrande quer eingedrückt. Schildchen sehr klein, glänzend, glatt, mit leichtem Längseindruck, Spitze abgerundet. Flügel-

decken am Grunde doppelt so breit als der Halsschild, nach hinten etwas erweitert, gewölbt, Schultern rechtwinklig abgerundet, Spitzen zusammen abgerundet, Scheibe skulptiert wie bei *Nemostira villosa* Borchm., gestreift-punktiert, Zwischenräume flach, quer gerunzelt, Epipleuren schmal, grob punktiert. Unterseite stark glänzend, mit zerstreuten, groben, borstentragenden Punkten. Abdominalfortsatz kurz, breit, scharf und aufgebogen gerandet, Spitze etwas abgerundet. Beine lang behaart, Schenkel schwach verdickt, Schienen fast gerade, Hinterschenkel den Hinterrand des 3. Segmentes kaum überragend. Erstes Tarsenglied der Hinterfüsse so lang wie die folgenden Glieder zusammen.

2 ♀ ♀. Länge: 11–12.5 mm.; Schulterbreite: 3 mm.

LUZON, BENGUET, Irisan (971 und 1475, *R. C. McGregor*).

Type ♀, No. 971 in der Sammlung des Bureau of Science, Manila.

Die Art ist nahe verwandt mit *impressifrons* Schauf. und *villosa* Borchm. Sie unterscheidet sich von beiden durch ihre Färbung und die viel stärkere Wölbung der Flügeldecken. Auch *albopilosa* Schauf. gehört in diese Gruppe.

15. **Casnonidea perforata** sp. nov.

Gestreckt, nach hinten wenig erweitert, gewölbt, ausser den Beinen fast unbehaart; mässig glänzend; gelbbraun, Kopf mit Ausnahme des Clypeusrandes metallisch dunkel schwarzgrün, Augen und Fühler schwarz, Oberseite des Halsschildes rötlich, Flügeldecken wie der Kopf gefärbt, die Naht und die Epipleuren schmal, gelbbraun, Beine mit Ausnahme der gelben Schenkelbasis von der Farbe der Flügeldecken. Kopf typisch; Oberlippe quer, gewölbt, glänzend, vorn fast gerade, mit wenigen grossen Punkten; Clypeus skulptiert wie die Oberlippe, ebenso lang, Vorderrand gerade, gelb, von der Stirn durch eine tiefe gebogene Querfurche abgesetzt, Stirn mit einigen groben Punkten, sehr uneben, zwischen den Augen der Länge nach stark eingedrückt, Schläfen kurz, grob punktiert, plötzlich in den fast unpunktierten Hals verengt; letztes Glied der Kiefertaster messerförmig, zugespitzt; Fühler gleich der halben Körperlänge, schlank, die ersten 7 Glieder gestreckt, walzig, an der Spitze wenig breiter, 3. Glied wenig länger als das 4., 8.–10. Glied dreieckig, kurz, etwas abgeplattet, Endglied walzenförmig, schwach gebogen, fast so lang wie die 4 vorhergehenden Glieder zusammen; Augen stark gewölbt, nierenförmig, unten und oben stark genähert, Stirnabstand gleich $\frac{1}{2}$ Augendurchmesser von oben gesehen. Halsschild breiter als der Kopf mit den Augen, so lang wie

breit, gewölbt, dicht und grob punktiert, Vorderecken stark abgerundet, Seiten unmittelbar vor dem Hinterrande eingeschnürt, Hinterecken etwas vortretend, Vorder- und Hinterrand gerade, Vorderrand fein, Hinterrand stark aufgebogen gerandet. Schildchen rundlich, gelb, äusserst fein punktiert, mit einer feinen Mittelrinne. Flügeldecken nach hinten schwach erweitert, doppelt so breit als der Halsschild, Schultern fast rechtwinklig, Spitzen der Decken zusammen abgerundet, Scheibe sehr dicht, ziemlich grob, sehr tief, fast gereiht-punktiert, Punkte grösser als die Zwischenräume; Epipleuren schmal, weitläufig, flach punktiert. Unterseite glänzender, Brust weitläufig grob, Abdomen sehr zerstreut und sehr fein punktiert, Seiten uneben, mit einigen groben Punkten; Abdominalfortsatz breit, Spitze abgerundet, mässig breit gerandet. Beine mässig lang, schlank, Hinterschenkel den Hinterrand des 3. Segmentes überragend, Schenkel schwach verdickt, Schienen schwach gebogen; Füsse mit gelbbeborsteten Sohlen; 1. Tarsenglied der Hinterfüsse etwas kürzer als die folgenden Glieder zusammen.

Länge: 13 mm.; Schulterbreite: 4 mm.

Type ♂, MINDANAO, Davao, in meiner Sammlung.

16. **Casnonidea mimica** sp. nov.

Von derselben Form und Grösse wie die vorige Art, ebenfalls in der Form und Skulptur des Halsschildes und der Flügeldecken übereinstimmend, unterscheidet sie sich hauptsächlich durch die Farbe. Rotgelb, Kopf und Oberseite des Halsschildes dunkel metallisch blaugrün, Vorderrand des Clypeus gelb, Halsschild am Hinterrande schmal rotgelb gesäumt, Schildchen rotgelb, Flügeldecken braunrot mit schwachem, grünlichem Scheine, Epipleuren heller, Beine mit Ausnahme der rotgelben Schenkelbasis metallisch blaugrün, Fühler und Augen schwarz. Glieder 8–10 der Fühler sind nicht stark verbreitert, nur verkürzt. Im übrigen zeigen alle Teile grosse Übereinstimmung mit denen der vorigen Art. Vielleicht ist *mimica* nur eine Farbenvarietät.

Länge: 13 mm.; Schulterbreite: 3 mm.

1 ♂, MINDANAO, Camp Keithley (*Frau M. S. Clemens*).

Type ♂, No. 7297 des Bureau of Science, Manila, in meiner Sammlung.

Diese beiden Arten lassen sich weder bei *Nemostira* noch *Casnonidea* befriedigend unterbringen. Ausser anderen Eigentümlichkeiten (Fühlerbildung) macht die Flügeldeckenskulptur Schwierigkeiten. Die Arten könnten einer neuen Gattung zugewiesen werden.

17. **Casnonidea tenera** sp. nov.

Sehr gestreckt, gewölbt, glänzend, rotbraun, letztes Glied der Kiefer- und Lippentaster, die letzten Glieder der Fühler, die äusserste Spitze der Tibien und der Apex der Fussglieder leicht gebräunt, Augen schwarz, Flügeldecken dunkelbraun mit starkem blauen Glanze; oben nur am Kopfe und unten nur an den Beinen behaart. Kopf wie gewöhnlich; Oberlippe fast doppelt so breit als lang, Vorderrand gerade, Ecken stark abgerundet, Basis stark verengt, wenige zerstreute Punkte mit langen hellen Borsten; Clypeus stark glänzend, gewölbt, skulptiert wie die Lippe, von der Stirn durch eine gebogene glatte Furche getrennt; Stirn gewölbt, glatt, am Vorderrande mit einer dreieckigen Grube, Schläfen kurz, nach hinten etwas vortretend, Scheitel und Schläfen mit einigen Borstenpunkten, Endglied der Kiefertaster typisch; Fühler fadenförmig, die Mitte des Körpers nicht erreichend, fein gelblich behaart, 3. und 4. Glied gleich, Endglied so lang wie die 3 vorhergehenden Glieder zusammen; Augen sehr wenig ausgerandet, gewölbt, Stirnabstand nicht ganz $\frac{1}{2}$ Augendurchmesser. Halsschild schmäler als der Kopf mit den Augen, länger als breit, fast walzenförmig, Vorder- und Hinterrand gerade, Seiten vorn wenig gerundet, Vorderecken schwach gerundet, Hinterecken stark vorspringend, Vorderrand fein, Hinterrand breit und stark aufgebogen gerandet, Scheibe fein und zerstreut punktiert, vor dem Hinterrande quer eingedrückt. Schildchen dreieckig, glatt, Spitze etwas abgerundet. Flügeldecken fast doppelt so breit wie die Halsschildbasis, Seiten parallel, Schultern kräftig, etwas beulig, Spitzen zusammen eine etwas stumpfe Spitze bildend, Scheibe punktiert-gestreift, Punkte nach der Spitze zu sehr flach, Zwischenräume flach, nach den Seiten gewölbter, glatt, Apex mit einigen langen Borsten; Epipleuren schmal, etwas uneben, nicht sichtbar punktiert. Unterseite stark glänzend, Seiten der Brust und des Abdomens mit einigen groben Punkten, Mitte glatt, mit sehr wenigen langen Borsten; Abdominalfortsatz gleichseitig dreieckig, fast spitz, kräftig gerandet. Beine, Schenkel wenig verdickt, Hinterschenkelspitze den Hinterrand des 3. Segments überragend, Schienen gerade, mit dunklen Borsten; 1. Tarsenglied der Hinterfüsse so lang wie die folgenden Glieder zusammen; Fusssohlen wie gewöhnlich.

Länge: 11.5 mm.; Schulterbreite: 3 mm.

LUZON, La Laguna, Mt. Banajao (*Charles S. Banks*).

Type (♂ ?), No. 7176 des Bureau of Science, Manila, in meiner Sammlung.

Die Art ähnelt auffallend gewissen *Statira*-Arten. Sie unterscheidet sich von ihren Verwandten leicht durch ihre schmale Gestalt und ihre schöne Färbung.

B. Flügeldecken mit dunklem Apicalfleck.

18. **Casnonidea colon** sp. nov.

Gestreckt, gewölbt, stark glänzend, nach hinten nicht erweitert, fast unbehaart; lebhaft braungelb, Kopf mit Ausnahme der Oberlippe und des Clypeus und eine rundliche Makel dicht vor der Spitze jeder Flügeldecke glänzend schwarz. Kopf wie gewöhnlich. Oberlippe fast doppelt so breit wie lang, gewölbt, zerstreut punktiert, lang beborstet, vorn sehr schwach ausgerandet, nach hinten sehr schwach verengt; Clypeus ebenso breit wie die Lippe, etwas buckelig gewölbt, fast glatt, von der Stirn durch eine tiefe, wenig gebogene Furche getrennt; Stirn glatt, gewölbt, mit 2 parallelen Längsrinnen, Scheitel mit einer tiefen strichförmigen Grube; Schläfen sehr kurz, unpunktiert. Letztes Glied der Kiefertaster mässig breit, Spitze abgerundet; Fühler mässig dick, fadenförmig, kürzer als die halbe Körperlänge, 3. und 4. Glied gleich, Endglied so lang wie die 4 vorhergehenden Glieder zusammen, schwach gebogen, walzenförmig; Augen nierenförmig, mässig ausgerandet, gewölbt, Stirnabstand gleich einem Augendurchmesser. Halsschild $1\frac{1}{2}$ mal so breit wie der Kopf mit den Augen, so breit wie lang, fast kugelig, glatt, Vorderrand fein, Hinterrand stark aufgebogen gerandet, Vorderecken völlig verrundet, Hinterecken stark vortretend. Schildchen rundlich, glatt. Flügeldecken doppelt so breit wie die Halsschildbasis, parallel, gewölbt, gestreift-punktiert, Punkte gross und tief, nach hinten erlöschend, Zwischenräume ziemlich gewölbt, glatt, Schultern kräftig, Spitzen einzeln abgerundet; Epipleuren schmal, glatt. Unterseite glatt, nur die Seiten der Brust und des Abdomens mit zerstreuten groben Punkten. Abdominalfortsatz breit, Spitze wenig abgerundet, breit gerandet. Beine, Schenkel wenig verdickt, Schienen fast gerade, Spitze der Hinterschenkel überragt den Hinterrand des 3. Segmentes; Füsse wie gewöhnlich; 1. Tarsenglied der Hinterfüsse etwas länger als die folgenden Glieder zusammen.

Länge: 12 mm.; Schulterbreite: 3.5 mm.

1 ♂ von LUZON, gesammelt von *J. Röseler*, Naturhistorisches Museum in Hamburg. Diese neue Art hat grosse Ähnlichkeit mit *Casnonidea terminata* Fairm., unterscheidet sich aber gleich durch die abweichend gefärbten Beine und den sehr schmalen Kopf.

II. Hinterschienen des Männchens der Länge nach ausgehöhlt.

19. Casnonidea serra sp. nov.

♂, ziemlich schmal, nach hinten wenig erweitert, gewölbt, mässig glänzend, ausser den Beinen fast unbehaart; schwarz, Flügeldecken pechschwarz, mit bläulichem Scheine, Fühler braun, Spitze dunkler, Vorderrand des Clypeus gelblich; Kopf wie gewöhnlich; Oberlippe fast doppelt so breit als lang, Vorderrand fast gerade, Ecken abgerundet, Scheibe schwach und weitläufig punktiert, mit einzelnen langen Borsten, Clypeus so lang wie die Oberlippe, ebenso punktiert, gewölbt, von der Stirn durch eine gebogene, glatte Furche getrennt; Stirn fast glatt, vorn und zwischen den Augen ein ziemlich tiefer Eindruck, neben jedem Auge eine glatte Linie; Schläfen kurz, grob, runzelig punktiert, plötzlich in den stark abgesetzten Hals verengt. Letztes Glied der Kiefertaster schmal, messerförmig, 2. Glied nach der Spitze sehr verbreitert, 1½ mal so lang wie das 3., 4. zweimal so lang wie das 3.; Fühler gleich der halben Körperlänge, nach aussen nicht verdickt, alle Glieder länger als breit, vom 3. bis zum 10. allmählich kürzer werdend, 3. etwas länger als das 4. Glied, Endglied so lang wie die 4 vorhergehenden zusammen, etwas gebogen, zugespitzt. Augen nierenförmig, stark gewölbt, oben mehr als unten genähert, Stirnabstand gleich ½ Augendurchmesser. Halsschild etwas breiter als der Kopf mit den Augen, so lang wie breit, vor der Mitte gerundet erweitert, nach dem Hinterrande verengt, Vorderwinkel abgerundet, Hinterwinkel vortretend, Vorderrand fast gerade, fein gerandet, Hinterrand stark aufgebogen, Scheibe etwas flach gedrückt, grob und zerstreut punktiert, mit einer eingedrückten Mittellinie und einer ziemlich breiten Grube vor dem Hinterrande. Schildchen rundlich, glatt. Flügeldecken 1½ mal so breit wie der Halsschild, 2½ mal so lang wie breit, nach hinten wenig erweitert, zusammen zugespitzt, Seiten vor der Spitze schwach ausgerandet, Schultern rechtwinklig abgerundet, Scheibe am Ende des 1. Viertels quer, flach eingedrückt, gestreift-punktiert, Punkte in den Streifen tief und dicht, Zwischenräume schwach gewölbt, mit ziemlich groben Punktreihen, deren einzelne Punkte in unregelmässigen Abständen von einander stehen; Epipleuren schmal, glatt, etwas uneben. Unterseite und Beine sehr fein und zerstreut, die Seiten der Brust grob punktiert. Abdomen an den Seiten wenig uneben, letztes Segment am Hinterrande gelb, mit einer flachen Grube. Abdominalfortsatz breit, nur die äusserste Spitze abgerundet, mässig breit gerandet. Beine lang, kräftig, Spitze der Hinterschenkel den Hinterrand des 5. Segmentes erreichend, Schen-

kel ziemlich dick, Schienen gebogen, Hinterschienen 2 mal. Sie sind merkwürdig gestaltet. Sie sind in der Vorder- und Seitenansicht je 2 mal gebogen, die Spitze der Schiene ist vorn ausgeschnitten und die Hinterkante der Schiene verbreitert und kahnförmig ausgehöhlt, die Höhlung mit langen gelben Haaren bekleidet, die Ränder der Höhlung sind mit einer Reihe von Sägezähnen besetzt, die Spitze der Schiene ist dann noch, seitlich gesehen, stark verschmälert. Sohle der Füsse gelb beborstet; 1. Tarsenglied der Hinterfüsse so lang wie die folgenden Glieder zusammen.

♀, gestreckt, parallel. Clypeus, Fühler mit Ausnahme der 3 äussersten Glieder, Oberseite des Halsschildes, das Schildchen, der hintere Teil der Epipleuren, die Hüften und die Beine mit Ausnahme des Klauengliedes und ein grosser Fleck auf dem Metasternum rötlich braungelb; ausser einigen langen Borsten am Kopf und der steifen Beborstung der Tarsen und Tibien kahl. Kopf weitläufig und grob punktiert, Oberlippe quer, Ecken abgerundet, vorn schwach ausgerandet, stark glänzend, mit spärlichen, langen, weisslichen Borsten, Basis verengt; Clypeus, sehr uneben; letztes Glied der Kiefertaster dreieckig; Fühler schlank, nach aussen wenig verdickt, Endglied so lang wie die 3 vorhergehenden Glieder zusammen, walzenförmig. Halsschild grob und weitläufig punktiert, mit schwacher Längsrinne; Schildchen klein, zungenförmig, mit deutlicher Mittelfurche. Flügeldecken im 1. Viertel mit einem schwachen Quereindruck, Schultern rechtwinklig abgerundet. Beine kräftig, Schenkel mässig verdickt, Spitze der Hinterschenkel den Hinterrand des 4. Segmentes erreichend. Schienen schwach gebogen. Erstes Tarsenglied der Hinterfüsse so lang wie die 2 folgenden Glieder zusammen.

Länge: ♀ 14 mm.; Schulterbreite: 4.5 mm. ♂ 13 mm.; Schulterbreite: 4 mm.

BATAN, Batanes (*R. C. McGregor*).

Type ♀, No. 7783 in der Sammlung des Bureau of Science, Manila. ♂ in meiner Sammlung.

20. Casnonidea diversipes sp. nov.

Gestreckt, gewölbt, glänzend, ausser Kopf und Beine unbehaart; pechschwarz, Kopf schwarz, Halsschild und Flügeldecken mit starkem, blauem Metallschimmer. Kopf wie gewöhnlich; Oberlippe doppelt so breit als lang, vorn gerade, nach der Basis verengt, Vorderecken abgerundet, gewölbt, mit zerstreuten Punkten, lang beborstet; Clypeus stark glänzend, sehr fein und zerstreut punktiert, so lang wie die Lippe, von der Stirn durch

eine gebogene, glatte Furche getrennt; Stirn sehr fein punktiert, grob längsrunzlig; Schläfen schmal, allmählich gerundet, mit einigen groben Punkten; Fühler fadenförmig, 3. Glied länger als das 4., das 10. und 11. Glied fehlen den vorliegenden Tieren; Augen schwach nierenförmig, gewölbt, Stirnabstand etwa ½ Augendurchmesser. Halsschild etwas breiter als der Kopf mit den Augen, etwas länger als breit, gewölbt, vorn stark abgerundet, hinten schwach verengt, Vorderrand fein, Hinterrand stark aufgebogen gerandet, Hinterwinkel stark vortretend, Scheibe zerstreut und grob punktiert. Schildchen länglich, Spitze abgerundet, glatt, mit flacher Mittelrinne. Flügeldecken doppelt so breit als die Halsschildbasis, gewölbt, nach hinten schwach erweitert, Schultern kräftig, etwas gefaltet, Spitzen zusammen stumpf zugespitzt, Scheibe am Ende des 1. Drittels etwas flachgedrückt, gestreift-punktiert, Punkte in den Streifen dicht, nach der Spitze zu schwächer, Zwischenräume wenig gewölbt, nach den Seiten und nach hinten stärker, vollständig glatt; Epipleuren schmal, etwas querrunzlig, glatt. Unterseite glänzender, mit Ausnahme der grob punktierten Seiten der Brust und des Abdomens glatt; Abdominalfortsatz ziemlich schmal, Spitze wenig abgerundet, breit gerandet. Beine beim ♂ kräftig, mit kräftig verdickten Schenkeln, beim ♀ viel dünner, Spitze der Hinterschenkel den Hinterrand des 4. Segments überragend, Schienen beim ♀ fast gerade, beim ♂ die Vorder und Mittelschienen ebenfalls, aber die Hinterschienen in der Mitte in eigentümlicher Weise von oben nach unten durchgebogen, auch seitlich gebogen, die Unterseite fast in ihrer ganzen Länge ausgehöhlt, die Höhlung mit langen hellen Haaren besetzt, die Ränder der Höhlung erheben sich vor der Mitte beiderseits zu einem stumpfen, breiten Zahne. Füsse oberseits mit langen hellen Haaren, unterseits mit heller bürstenartig behaarter Sohle. Erstes Tarsenglied der Hinterfüsse so lang wie die folgenden Glieder zusammen.

Länge: 12–14 mm.; Schulterbreite: 3–3.5 mm.

2 ♂ ♂ von LUZON ohne nähere Bezeichnung des Fundortes aus dem Königl. Museum in Berlin.

21. **Casnonidea diversipes var. dissimilis nov.**

In der Grösse und dem ganzen Bau mit *diversipes* vollständig übereinstimmend, nur in der Färbung stark abweichend. Die Beine mit Ausnahme der dunklen Schenkelspitzen und der Halsschild bräunlich gelb, die Füsse und die Fühler gebräunt. Ein Exemplar hat ebenfalls gelbbraune Flügeldecken.

2 ♀ ♀ von Luzon aus dem Königl. Museum in Berlin.

Die neue Art steht durch die Bildung ihrer Hinterschienen in der Nähe der *C. serra* sp. nov., von der sie sich leicht durch die Färbung und die Bildung der Hintertarsen unterscheidet.

22. **Casnonidea concavipes** sp. nov.

Sehr gestreckt, nach hinten nicht erweitert, wenig gewölbt, mässig glänzend; hell gelbbraun, Kopf und Flügeldecken bedeutend dunkler, letztere mit bläulichem Schimmer (vielleicht noch nicht ausgefärbt), Fühler nach aussen bedeutend geschwärzt, die letzten Abdominalsegmente angedunkelt; mit sehr spärlichen, abstehenden, langen hellen Borsten. Oberlippe über doppelt so breit als lang, gewölbt, Vorderrand gerade, nach der Basis zu stark verengt, sehr zerstreut punktiert, mit einzelnen langen Borsten; Clypeus etwas länger als die Lippe, stark gewölbt, etwas buckelig, skulptiert wie die Lippe, von der Stirn durch eine tiefe, glatte, gebogene Furche getrennt; Stirn glatt, vorn eingedrückt, Mitte des Scheitels mit einer Grube; Schläfen kurz, grob punktiert. Fühler fadenförmig, die Körpermitte erreichend, 3. Glied etwas länger als das 4., Endglied walzenförmig, wenig gebogen, stumpf zugespitzt, so lang wie die 4 vorhergehenden Glieder zusammen (♂). Augen vorn sehr schwach ausgerandet, gewölbt, Stirnabstand weniger als $\frac{1}{2}$ Augendurchmesser. Halsschild sehr wenig länger als breit, gewölbt, so breit wie der Kopf mit den Augen, Vorderecken wenig abgerundet, Seiten nach hinten wenig verengt; Vorderrand fein, Hinterrand breit und aufstehend gerandet, Scheibe weitläufig und grob punktiert, vor dem Hinterrande quer eingedrückt. Schildchen dreieckig, fein und dicht punktiert, Spitze abgerundet. Flügeldecken parallel, kaum doppelt so breit wie die Halsschildbasis, Spitze zusammen zugespitzt, Skulptur wie bei *C. diversipes* sp. nov., Spitze mit einigen Borstenpunkten; Epipleuren sehr schmal, glatt. Unterseite wie bei *diversipes;* Abdominalfortsatz, ziemlich schmal, stark gewölbt, scharf gerandet, Spitze wenig abgerundet. Beine sehr kräftig, Schenkel stark keulig verdickt, Hinterschenkel fast den Hinterrand des 4. Segmentes erreichend; Vorder- und Mittelschienen fast gerade, Hinterschienen stark 2 mal gebogen, Unterseite der ganzen Länge nach ausgehöhlt und mit langen weisslichen Haaren besetzt, der innere Rand im letzten Drittel der Schienen stark, fast lappenförmig erweitert. Füsse wie gewöhnlich; 1. Tarsenglied der Hinterfüsse etwas kürzer als die folgenden Glieder zusammen.

Länge: 12 mm.; Breite nicht ganz 3 mm.

1 ♂ von SÜD-CELEBES, Bantimoeroeng, gesammelt von *C. Ribbe,* 1882.

Diese Art bildet mit *serra* m. und *diversipes* m. eine charakteristische Gruppe.

NEMOSTIRA Fairmaire

23. Nemostira marginata sp. nov.

Sehr gestreckt, fast parallel, mässig gewölbt, mässig glänzend, mit spärlichen hellen Borsten besetzt; rötlich gelbbraun, Beine und Flügeldecken etwas heller, Augen schwarz, die Naht und ein Streif neben dem Rande fast bis zur Spitze dunkelbraun. Kopf wie gewöhnlich, fast glatt; Oberlippe breit herzförmig, mit einigen langen Borsten, Clypeus vorn gerade, ebenso breit wie die Lippe, ebenso beborstet, stark gewölbt, von der Stirn durch eine breite, flache Grube getrennt; Stirn vorn mit einer stärker punktierten Grube; Schläfen kurz, mit einigen groben Punkten neben den Augen, plötzlich in den Hals verengt; erstes Glied der Maxillartaster messerförmig, Innenrand vor der Spitze ausgeschnitten; Fühler kaum halb so lang wie der Körper, schlank, gleichmässig dick, 3. und 4. Glied gleich, Endglied walzenförmig, wenig gebogen, zugespitzt; Augen nierenförmig, stark gewölbt, grob fazettiert, Stirnabstand geringer als 1 Augendurchmesser. Halsschild etwas länger als breit, so breit wie der Kopf mit den Augen, gewölbt, grob und weitläufig punktiert, vor dem Hinterrande mit einer kleinen Grube, Vorderecken stark gerundet, Seiten nach der Basis zu eingezogen, Hinterwinkel vortretend, Vorder- und Hinterrand gerade, ersterer fein, letzterer breit und aufgebogen gerandet. Schildchen rundlich, glatt. Flügeldecken nicht ganz doppelt so breit wie die Halsschildbasis, Schultern rechtwinklig abgerundet, Spitzen zusammen abgerundet, Scheibe im 1. Drittel flach niedergedrückt, gestreift-punktiert, Punkte in den Streifen grob und ziemlich dicht, Zwischenräume mässig gewölbt, jeder mit einer weitläufigen Reihe grober Borstenpunkte; Epipleuren schmal, fast glatt, Unterseite stark glänzend, nur die Seiten der Brust und des Abdomens grob punktiert, mit einzelnen Borsten; Abdominalfortsatz dreieckig, Spitze rundlich erweitert, breit gerandet. Beine, Spitze der Hinterschenkel den Hinterrand des 3. Segmentes erreichend, Schenkel mässig verdickt, Schienen schwach gebogen. Erstes Tarsenglied der Hinterfüsse nicht ganz so lang wie die folgenden Glieder zusammen.

2 ♂ ♂ und 1 ♀, dem der Vorderkörper fehlt.

Länge: 8–9 mm.

LUZON: Bataan, Lamao (*H. E. Stevens*).

Type ♂, No. 9821 des Bureau of Science, Manila, in meiner Sammlung.

Die Art hat grosse Ähnlichkeit mit *Casnonidea brevicollis* Fairm., zeigt aber ausser dem dunklen Rande der Flügeldecken noch eine dunkle Naht. Bei der neuen Art sind auch die Fühler und die Beine hell; der Halsschild ist länger als breit. Die Flügeldeckensculptur ist sehr ähnlich.

24. **Nemostira melanura** sp. nov.

Sehr gestreckt, parallel, der Länge nach wenig gewölbt, wenig glänzend, rötlich gelb, Kopf und Fühler dunkel rotbraun, Apex der Flügeldecken schwarz mit bläulichem Schimmer, ebenso die Kniee und die Schienen der Vorder- und Mittelbeine, Hinterschienen schwach gebräunt; alle Füsse dunkel; Oberseite fast unbehaart. Kopf wie gewöhnlich. Oberlippe schwach breit herzförmig, zerstreut punktiert, lang gelblich beborstet; Clypeus so lang wie die Lippe, stark gewölbt, glänzend, mit einzelnen Borsten, von der Stirn durch eine gebogene, tiefe, breite Furche getrennt; Stirn und Scheitel mit tiefer Mittellinie, grob punktiert; Schläfen sehr schmal, tief eingeschnürt, Hals vorn schmäler als hinten. Letztes Glied der Maxillartaster schmal dreieckig. Fühler etwas kürzer als die halbe Körperlänge, nach aussen nicht verdickt, Glieder gestreckt, 3. Glied sehr wenig länger als das 4., Endglied so lang wie die 4 vorhergehenden Glieder zusammen; Augen unten und oben stark genähert, nierenförmig, stark gewölbt, Stirnabstand weniger als 1 Augendurchmesser. Halsschild so lang wie breit, breiter als der Kopf mit den Augen, gewölbt, Vorderecken stark abgerundet, Seiten nach hinten verengt, vor den Hinterecken eingeschnürt, so dass die Hinterecken vortreten, Vorder- und Hinterrand etwas ausgeschnitten, vorn fein, hinten breit aufgebogen gerandet, Scheibe grob, zerstreut punktiert, mit deutlicher Mittelrinne und einer Grube vor der Mitte des Hinterrandes. Schildchen länglich, Spitze abgerundet, glatt. Flügeldecken kaum doppelt so breit als der Halsschild an der Basis, Seiten parallel, Spitzen einzeln abgerundet, Schultern gut entwickelt, Scheibe gestreift-punktiert, Punkte in den Streifen gross und dicht, nach hinten feiner werdend, Zwischenräume wenig gewölbt, glatt; Epipleuren schmal, gewölbt, glatt. Unterseite glänzender, fast glatt, nur die Seiten der Brust und des Abdomens mit zerstreuten groben Punkten; Abdominalfortsatz gleichseitig dreieckig, äusserste Spitze abgerundet, ziemlich breit gerandet. Beine, Schenkel gut verdickt, Spitze der Hinterschenkel fast den Hinterrand des 4. Segmentes erreichend,

Vorderschienen stark, Hinterschienen wenig, Mittelschienen gar nicht gebogen, Innenseite lang gelb behaart. Erstes Tarsenglied der Hinterfüsse so lang wie die 2 folgenden Glieder zusammen. Sohle der Füsse bürstenartig behaart.

Länge: 10–12 mm.; Schulterbreite: 3 mm.

NEGROS, Negros Occidental, Maao, Nakalang (*Charles S. Banks*).

Type ♂, No. 245 der Sammlung des Bureau of Science, Manila.

Die Art gehört in die Verwandtschaft von *atriceps* Fairm. Sie ist etwas grösser, hat ein abgerundetes Schildchen, dunkle Kniee, Schienen und Fühler, und ein längeres, anders skulptiertes Halsschild. Auch *atricapilla* Fairm. ist verwandt, unterscheidet sich aber durch die Färbung.

Casnonidea terminata Fairm. ist ebenso gefärbt, ist aber breiter; der Kopf ist so breit wie der Halsschild; die Fühler sind etwas gesägt und haben ein viel kürzeres Endglied. Die Flügeldeckenbildung ist abweichend.

25. **Nemostira melanura var. atripennis** nov.

Von gleicher Grösse, Körpergestalt und Skulptur wie *melanura*. Die Färbung ist durchweg dunkler. Die Flügeldecken sind schwarz mit bläulichem Schimmer und nur die Naht ist gelb gesäumt. Die Hinterschienen sind auch dunkel. Das Endglied der Fühler ist so lang wie die 3 vorhergehenden Glieder zusammen.

LUZON, Benguet Sablan (*W. F. Pack*).

Type (♀ ?), No. 1619 des Bureau of Science, Manila, in meiner Sammlung.

II. ALLECULIDAE

DIETOPSIS Solier

26. **Dietopsis sericans** Fairm.

LUZON, La Laguna, Magdalena (769 und 2847, *W. Schultze*).

Ausser dieser Art sind bisher keine weiteren Arten bekannt.

CISTELOMORPHA Redtenbacher

27. **Cistelomorpha distincticornis** Pic.

28. **Cistelomorpha subcostulata** Fairm.

LUZON, Benguet, Baguio (14873, *F. Worcester*).

29. **Cistelomorpha semipellita** sp. nov.

Oval, nach hinten sehr wenig verbreitert, stark gewölbt, Flügeldecken etwas dachförmig; Oberseite lebhaft gelbrot, letztes Drittel der Flügeldecken schwarz, Fühler mit Ausnahme der

3 roten Basalglieder schwarz (3. Glied an der Spitze gebräunt), Augen schwarz, Unterseite gelb (zuweilen die Brust und der Rand des Halsschildes rötlich), die beiden letzten Hinterleibssegmente glänzend schwarz, die Beine rötlich, die Kniee, die Spitzen der Tibien und der Tarsenglieder schmal gebräunt; mässig glänzend; sehr schwach behaart, der schwarze Fleck der Flügeldecken ziemlich lang, dicht, abstehend, schwarz beborstet. Kopf schmal, mässig dicht, ziemlich stark punktiert; Oberlippe etwa $1\frac{1}{2}$ mal so breit als lang, vorn ausgerandet, gelblich beborstet; Clypeus etwa doppelt so breit wie die Oberlippe, weitläufiger punktiert, in der Mitte mit einem flachen Längseindrucke, von der Stirn durch einen tiefen gebogenen Eindruck getrennt; Stirn gewölbt, glänzender, mit undeutlichen Eindrücken, Einlenkungsstelle der Fühler stark aufgebogen, hinter den Augen ein starker Quereindruck, Schläfen sehr kurz; letztes Glied der Kiefertaster schmal, schief abgestutzt; Augen stark gewölbt, nierenförmig; Fühler etwa gleich der halben Körperlänge, mässig dick, nach aussen nicht erweitert, Glieder gestreckt und an der Spitze schwach nach aussen erweitert, so dass sie etwas gesägt erscheinen, 3. Glied das längste, Endglied seitlich ausgerandet. Halsschild halbkreisförmig, überall fein und scharf gerandet, Scheibe mässig gewölbt, fein und dicht punktiert, vor dem Schildchen mit 3 im Dreieck stehenden schwachen Eindrücken, Vorderecken schwach angedeutet, Hinterwinkel rundlich rechtwinklig, Hinterrand 2 mal gebuchtet, vor den Ausbuchtungen je eine flache Grube. Schildchen dreieckig, abgestumpft, fein und dicht punktiert. Flügeldecken um die Hälfte breiter als der Halsschild, Schultern etwas gefaltet, stark entwickelt, Decken hinten zusammen abgerundet, hinter dem Schildchen etwas flachgedrückt, stark gestreift-punktiert, Zwischenräume stark gewölbt, vorn flach, Scutellarstreif kurz, der Naht sehr nahe, der 2. Zwischenraum nach hinten stark verschmälert, der 3. nach hinten verbreitert, Punktstreifen auf der Schulterbeule erloschen, Zwischenräume überall fein und dicht punktiert; Epipleuren vor der Spitze schwindend, allmählich verengt, fein und dicht punktiert, von den Flügeldecken auch an den Schultern scharf abgesetzt. Unterseite fein punktiert und kurz, fein gelblich behaart, Seiten des Abdomens uneben, ♂ im letzten Abdominalring in der Mitte des Hinterrandes eine flache Grube, Abdominalfortsatz spitz, so lang wie breit, fein gerandet. Beine kurz, Oberschenkel wenig verdickt, Schienen schwach gebogen, innerer Dorn der Hinterschienen fast doppelt so lang als der äussere, beide dünn

und spitz; 1. Tarsenglied der Hinterfüsse so lang wie die 2 folgenden Glieder zusammen.

Länge: 13–15 mm.; Schulterbreite: 6–7 mm.

LUZON, Benguet, Baguio (*F. Worcester*).

Type ♂, No. 11345 des Bureau of Science, Manila, in meiner Sammlung.

Die Art hat eine gewisse Ähnlichkeit mit *C. calida* All., ist aber breiter und weicht in der Färbung bedeutend ab. Von den Arten mit gefleckten Flügeldecken unterscheidet sie sich durch ihre Breite und Grösse und hauptsächlich durch die starke Behaarung des schwarzen Fleckes.

30. **Cistelomorpha anaematica** sp. nov.

Länglich-oval, gewölbt; nicht glänzend; schwefelgelb, Flügeldecken weisslich gelb, Augen und Fühler mit Ausnahme der ersten Glieder schwarz, Klauen und Dorne der Schienen gebräunt, zuweilen die beiden letzten Hinterleibsringe schwach rötlich; der ganze Käfer mit Ausnahme der etwas länger behaarten Schienen fein anliegend, kurz, gelb behaart. Kopf gestreckt, fein und dicht punktiert, Oberlippe vorn ausgerandet, Clypeus nicht breiter als die Lippe, Schläfen sehr kurz; letztes Glied der Kiefertaster fast walzenförmig, Spitze leicht gebräunt, letztes Glied kaum länger als das vorhergehende; Augen nierenförmig, gewölbt, Abstand auf der Stirn nicht ganz 2 Augendurchmesser, von oben gesehen. Fühler halb so lang wie der Körper, nicht verdickt, schwach gesägt, 3. Glied $1\frac{1}{2}$ mal so lang wie das 4., Endglied an der Seite ausgerandet. Halsschild fast so breit wie die Flügeldecken, halbkreisförmig, sehr fein und sehr dicht punktiert, gewölbt, sonst wie bei der *C. semipellita* sp. nov. aber ohne die Eindrücke. Schildchen wie bei *semipellita*. Flügeldecken $2\frac{1}{2}$ mal so lang als breit, an der Spitze zusammen abgerundet, beim Schildchen etwas flachgedrückt, gestreift-punktiert, Punkte nach hinten undeutlich werdend, Scutellarstreifen kurz, sehr undeutlich punktiert, Zwischenräume gewölbt, sehr fein und sehr dicht punktiert, 2. Zwischenraum schmal, 3. breit und so abwechselnd; Epipleuren wie bei *semipellita*. Unterseite fein punktiert, Seiten des Abdomens uneben. Abdominalfortsatz schmal, spitz, fein gerandet. Beine wie bei *semipellita*, Dorne der Hinterschienen dünn und spitz, innerer Dorn etwas länger als der äussere; 1. Tarsenglied der Hinterfüsse länger als die 2 folgenden Glieder zusammen.

Länge: 12 mm.; Schulterbreite: 4.5 mm.

LUZON, Bataan (*E. D. Merrill*).

Type, No. 1124 des Bureau of Science, Manila, in meiner Sammlung.

Diese Art hat viel Ähnlichkeit mit *flavovirens* Fairm., aber die bedeutendere Grösse und die verschiedene Skulptur der Flügeldecken scheiden sie. Sie hat auch Ähnlichkeit mit *hypoxantha* Fairm., aber ausser durch ihre Grösse weicht sie durch die nicht schwarzen letzten beiden Adbominalsegmente ab.

31. Cistelomorpha rufiventris sp. nov.

Länglich, gewölbt, glänzend; schwefelgelb, die stärker erhabenen Zwischenräume der Flügeldecken heller, Abdomen rötlich, Augen und Fühler mit Ausnahme der beiden Grundglieder schwarz, Schienen und Füsse, letztes Glied der Kiefer und Lippentaster braun; der ganze Käfer sehr fein und kurz anliegend gelb behaart. Kopf sehr gestreckt, Oberlippe quer, stark glänzend, sparsam punktiert, vorn ausgerandet, Clypeus ebenso skulptiert, doppelt so lang wie die Oberlippe, von der Stirn durch eine tiefe, gebogene Furche getrennt, Stirn gewölbt, uneben, stärker punktiert, Schläfen nicht vorhanden, Hals fast so breit wie der Kopf; letztes Glied der Kiefertaster so lang wie das vorletzte, nach aussen mässig erweitert, schief abgestutzt; Fühler etwa gleich der halben Körperlänge, schwach gesägt, 3. Glied um die Hälfte länger als das 4., Endglied an der Seite stark ausgerandet; Augen nierenförmig, stark gewölbt, Stirnabstand gleich 2 Augendurchmessern. Halsschild fast halbkreisförmig, gewölbt, fein und sehr dicht punktiert, überall fein gerandet, Scheibe hinten mit schwach angedeuteter Mittelfurche, Vorderwinkel schwach angedeutet, Hinterwinkel rechtwinklig, etwas vortretend, Hinterrand 2 mal gebuchtet, vor den Ausbuchtungen je eine kleine Grube; Schildchen dreieckig, Spitze abgerundet, fein und dicht punktiert; Flügeldecken wenig breiter als der Halsschild, nach hinten schwach erweitert, Spitzen zusammen abgerundet, gestreift-punktiert, Scutellarstreif kurz, die äusseren Streifen schwinden zum Teil vor der Spitze, Punkte in den Streifen dicht, Zwischenräume sehr wenig gewölbt, die ungeraden etwas erhabener und heller, alle sehr fein und dicht, punktiert; Epipleuren durch eine scharfe Kante von den Decken abgesetzt, schmal, reichen fast bis zur Spitze, sehr dicht, etwas runzelig punktiert. Unterseite fein und sehr dicht punktiert, Abdomen stark glänzend, an den Seiten uneben, letzter Ring mit einer tiefen dreiekigen Grube vor der Spitze. Abdominalfortsatz gleichseitig dreieckig, spitz, ziemlich breit gerandet. Beine, Schenkel schwach verdickt, Schienen

wenig gebogen, Spitze des Hinterschenkels erreicht den Hinterrand des 4. Hinterleibsringes, 1. Tarsenglied der Hinterfüsse fast so lang wie die folgenden Glieder (ohne Klauen) zusammen, Dorne der Hinterschienen dünn, gerade, der innere länger als der äussere.

Länge: 10 mm.; Schulterbreite: 3.5 mm.

SIBAY ISLAND (*D. C. Worcester*).

Type ♂, No. 11407 des Bureau of Science, Manila, in meiner Sammlung.

Diese charakteristische Art zeichnet sich von ihren Verwandten durch den vollständig rötlichen Hinterleib und die abwechselnd stärker erhabenen Flügeldeckenzwischenräume aus.

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A STUDY OF CAPRIFICATION IN FICUS NOTA

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Four text figures

It is a well-known fact in horticulture that Smyrna figs can be produced only through the agency of certain minute insects of the superfamily Chalcidoidea, which perform for the figs the act of cross pollination. The careful investigation of this marvelous symbiotic relationship between plant and insect was due, in the first instance, to European scientists. Americans in California took careful account of all the facts involved, in their introduction of the Smyrna fig into that State, building up there business involving many thousands of dollars, all hanging on the successful pollinating operations of these minute insects.

Observations were later extended to various wild figs, many new and strange forms of fig insects were described, and in some cases attempts made to trace the details of the symbiosis, as for instance by Cunningham on *Ficus roxburghii* in India.[2]

Superficial observations in Cuba and in Brazil had previously indicated to me very definitely the astounding extent and the very varied possibilities of this subject. The number of known species of figs is said to be above five hundred. In many of these the character of the caprification phenomena varies very

[1] Eisen, *Bull. Div. Pomol, U. S., Dept. Agr.* (1901), No. 9. This bulletin contains a full bibliography of the subject.

[2] *Ann. Royal Bot. Garden, Calcutta* (1889), 1, 13–47, pls. 1–4.

widely, and many of the insects involved seem to be quite confined to certain species of figs. At Los Baños, Philippine Islands, with *Ficus nota* (Blanco) Merrill [3] abundant, and occurring almost at the door of the bamboo shack in which I live, I have been enabled to begin a study of the caprification phenomena in this particular fig. In outlining my preliminary results I shall not repeat descriptions of the species or even detail its flower characters. *Ficus nota* is a tree of the section *Covellia*, apparently common throughout the Philippines.[4] The figs are produced often in enormous quantities at the base of the trunk and even to some little distance underground. Fruiting twigs also occur higher on the trunk and even on the branches, although the number produced above is small.

As usual among figs, certain trees of *Ficus nota* produce only gall flowers and no seed, but have fertile male flowers (stamens). Other trees of the same species produce only figs containing fertile female flowers destined to make seed, and these figs usually have no fertile stamens, although rudiments are frequently present in the area just within the ostiole commonly occupied by the stamens in gall figs. The young flower zone of the fertile fig is bright pink in color, which is rare in the caprifig form. Also the fertile figs, especially the young, incline to deep purplish in external color, with greenish or yellowish flecks, whereas the caprifigs are usually entirely green. This condition is locally common, but I do not know whether or not it is general throughout the Islands.

On trees bearing figs with gall flowers and stamens, the production and ripening of the figs is almost continuous, and the broods of gall insects thus overlap endlessly. There is no possibility of here distinguishing such seasonal procession as is indicated by the profichi, mammoni, and mammæ of the Smyrna caprifig; on the contrary, the seed-bearing trees, locally at least, seem to produce figs in regular crops. At the present writing (November), a crop of large figs just maturing may be found on fertile trees, but another crop of small figs is also coming on—some of them already being large enough to receive the insects coming from the gall-bearing trees.

If a large mature caprifig (gall fig) is opened, the walls of the

[3] Determined by E. D. Merrill, Bureau of Science.

[4] Blanco, Fl. Filip. ed. 1 (1837), 677 (*F. aspera nota*); Merrill, *Bur. Govt. Labs.* (1904), No. 17, 10; Elmer, *Leafl. Philip. Bot.* (1906), 1, 198 (from Leyte); (1911), 4, 1262 (describes the fertile tree, from Mindanao).

interior are found to be thickly massed with the densely packed brown galls produced from the modified ovaries of the infertile female flowers. In a narrow area about the inner mouth of the ostiole (now closed by thickly imbricated scales) are the closely placed bright pink, unopened, monandrous flowers. When kept under observation for a few days, they present a confused maze of activities. From certain of the galls appear numbers of queer, clumsy, wingless, yellow insects—the males of the blastophaga. Immediately after they emerge, they turn their attention to gnawing small holes in the still unopened galls. This quest for the female seems completely and continuously to occupy their attention. Many times holes are made and the gall then immediately deserted, and in such cases galls will be found to contain insects other than the blastophaga—guests or parasites. These small holes are made at any accessible point on the surface of the gall. In case the gall happens to contain a female blastophaga, the tip of the male abdomen, which is closely recurved under the body and projects forward between the forelegs and just beneath the mouth, is introduced into the gall without any change in general attitude of the body of the male, and copulation with the imprisoned female takes place. The beauty of this extraordinary position of the male abdomen is seen as the work of the male proceeds, since to reach all the galls in the lower layers it must push itself into crevices where any great movement of the body is impossible, and must fertilize females in galls which can only be reached by the anterior end of the body. Copulation accomplished, the males make no attempt whatever to enlarge the minute hole made for this purpose. The female gnaws her own way out immediately after copulation. This is in striking contrast to the case of the Smyrna fig insect, in which the male is supposed, as stated by Eisen, to liberate the female after copulation; however, observations on this point should be repeated. The male continues on its quest, rapidly gnawing into gall after gall, and repeating the act of copulation, until exhausted and dying. In its nervous haste, the male occasionally bites into the stamens also, but any intentional attack on the stamens, as described by Cunningham for *F. roxburghii,* does not occur in *F. nota,* nor can I see any reason for such attack beyond mere accident.

With the rapid emergence of the males, followed by the emergence of the females, the scene in the fig becomes exceedingly animated. During this time, males also of various guests and parasites (*Philotrypesis, Agaonella, Sycophaga,* and *Sycoryctes*)

begin to emerge and seek their respective females. These males show a perfectly astounding case of parallel development to suit the very circumscribed conditions with which they are surrounded. Representing 2 families of insects, 3 subfamilies, and various genera, they are yet all very similar in appearance—minute, yellowish, wingless, clumsy, often worm-like creatures, either blind or nearly so, they live their exceedingly short mature lives (of apparently only a few hours' duration) in darkness, never purposely leaving the interior of the fig in which they are born. Entirely unlike the female in almost every detail, and struggling together in large numbers, they present a most confusing sight even to the eye of the trained scientific observer. It is a matter of extreme difficulty correctly to associate the sexes, the observation of actual copulation being necessary sometimes to make the conclusion a certain one. When it is known that 6 species of guests and parasites may occur together in great number within a single fig, as I have commonly found in *F. nota,* the complexity of the problem as a whole, both taxonomically and biologically speaking, may be appreciated.

As the emergence proceeds, the fig becomes filled with an impatient mass of females, intent only on finding a way out. During this period the stamens rapidly reach full maturity, and, quite apart from any holes in the anthers due to the males, they dehisce naturally and regularly through two longitudinal slits (fig. 1, F). The trampling swarm of insects promptly dusts pollen thoroughly over their bodies. It is a beautiful point in the whole relationship that the fig remains closed until this is accomplished. The maturing of the stamens is accompanied, or at least very shortly followed, by the withering of the imbricated scales in the ostiole, beginning on the inside. I have not observed males gnawing these scales, and can see no reason why they should do as is described by Cunningham for *F. roxburghii.* That the females should immediately begin to crowd themselves through any opening offered is to be expected, and it is also entirely probable that they hasten the formation of this opening by gnawing, but it seems as if the shrinkage of the scales must be an entirely natural act in the final maturing of the fig. I have found malformed figs in which this opening was delayed, and the entire mass of contained insects dead. In *F. palmeri* from Lower California, as described by Eisen, no such ripening of the scales takes place, and the blastophaga does not attempt to gnaw through them, but has acquired the habit of opening a new passage through the softer wall of the fig near the ostiole.

That some males might accidentally crawl through, or be hustled through, an opening to the outside, is also to be expected, although apparently they would have absolutely nothing to accomplish by a voluntary act of this sort. A remarkable fact is here to be observed—that the emergence of all females from the figs and the death of the males is not at all the closing chapter in the history of the receptacle. The fig survives long after these events, and ultimately passes into a much thickened stage of ripening in which its appearance is much modified, and which is finally followed by softening and rotting or by the work of devouring animals.

It is likewise a remarkable fact that of the tens of thousands of blastophagas, guests, and parasites that are constantly emerging, I have taken none with the sweep net in surrounding foliage, although I have in this way gathered thousands of minute parasitic Hymenoptera in other groups. Apparently their flight is direct to other figs on the same tree or to other trees of this species. In case the female blastophaga passes to smaller figs on the same tree or on another caprifig, she proceeds at once to the ostiolar end of the receptacle and enters there, pushing her body back and forth between the closely overlapping scales in most laborious fashion, until the interior is reached. Whether the wings are broken off during this attempt, as stated by Eisen for the Smyrna blastophaga, or whether they are deliberately removed by the insect itself, as occurs in the females of many ants, I am not certain. In any event, entrance of the fig always involves dealation. I incline to believe that in part at least voluntary dealation may occur, since I have found the discarded wings adhering to the surface of the fig some little distance about the ostiolar opening, as well as among the scales that guard the mouth of the opening itself. Having accomplished entry to the fig, the female finds the specially modified funnel-shaped stigmas (fig. 1, A), awaiting the deposition of eggs. The eggs are inserted one through each style to just within the ovary, lying upon the ovule destined to furnish food to the developing larva. One female is capable of depositing very many eggs, although gall figs are commonly encountered in which very few ovaries are occupied. Often as many as a dozen females or more gain entrance to the same fig, so the oviposition is usually quite complete. The female dies immediately after egg laying is concluded.

However, in case the female has found her way to a tree bearing only figs destined to produce seed—and she seems

entirely incapable of detecting this fact—she enters the fig in the same way, but there encounters only stigmas of another type (fig. 1, C), not adapted to the reception of her eggs. She vainly searches the interior of the fig, over and over, involuntarily distributing to the normal stigmas the pollen with which her body was thoroughly dusted, until thwarted and exhausted, she finally dies. From one to a dozen or more dead bodies of females sacrificed to this service may be found in each young fertile fig. More or less rapid disintegration of the dead bodies of these females takes place in the liquor which commonly accumulates in the interior of the developing fig.[5]

None of the guests nor parasites of *F. nota* enters the fig by the ostiole for oviposition as does the blastophaga. They all possess ovipositors of extraordinary length with which the entire wall of the receptacle is pierced. Whether the eggs of the guests and parasites are inserted in the ovaries directly, or whether they hatch outside of the ovary and find their way through the style, is as yet unknown; indeed, the entire question of their specific relations to the blastophaga is an open one. That their larvæ must commonly develop in ovaries already occupied by blastophaga seems certain, and as the two cannot live in one and the same ovary, and as the guests and parasites certainly eventually occupy ovaries in enormous numbers, they must surely interfere seriously with the blastophaga; although whether as

[5] The presence of a liquor in the developing fig is a matter apart and a very interesting one—seemingly a question for the plant physiologist. The presence of liquor in the earlier stages would prevent the successful entrance of the female blastophaga. I have not seen much liquor in figs at the receptive age. Later there seems to be some connection between its formation and the occurrence of very heavy rains, at which times the figs may become fairly turgid with it. Mr. A. D. E. Elmer tells me that at times certain species of figs in the Islands produce this liquor in such quantities that it drips from them to the extent of forming pools on the ground beneath.

Cunningham mentions observing infusorians and "filariæ" in this liquor. These and bacteria would be expected under the circumstances. I was, however, especially interested in his mention of "filariæ." Many years ago when I first went to Cuba as agricultural botanist to the Estacion Central Agronomica, I at once began observations on the local fig insects. In one species the females frequently had the abdomen enormously swollen, and this I found packed with nematodes. Wheeler [*Am. Nat.* (1901), 35, 877] has published accounts of a similar "mermithergatism" in ants, due to the presence of *Mermis*. In one of the first figs of *F. nota* which I opened in these Islands, I found a female fig insect with abdomen distended by worms; and in the liquor of certain figs "filariæ" were common, although whether the same as the parasitic form or not is unknown. Here is a most interesting problem for the helminthologist.

direct parasites or as unwelcome guests remains to be determined. It is, of course, a well-known fact that many parasitic hymenopterous insects possess to a most remarkable degree the faculty of locating their hosts, even when these are hidden deeply within the tissues of plants, and boring through with great accuracy for the deposition of their eggs. Dr. E. B. Copeland suggests that this, together with the fact that none of these

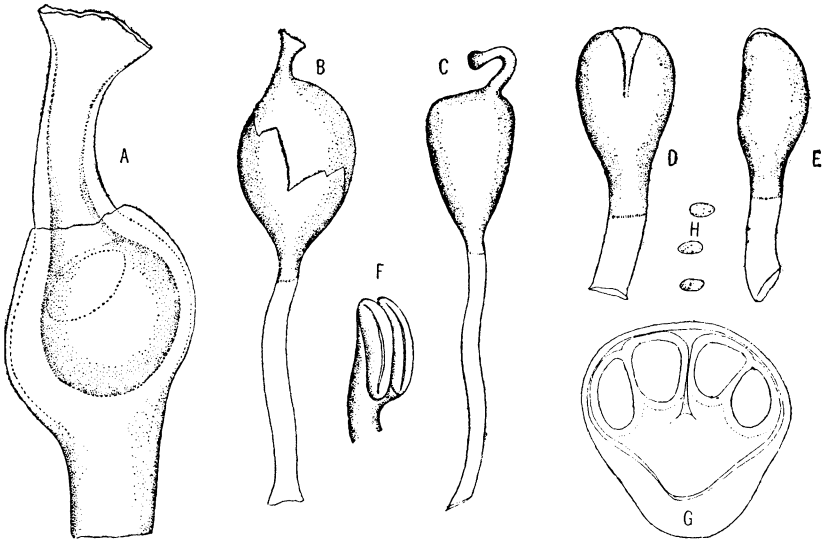

FIG. 1. Flower parts of *Ficus nota*. A, young gall flower at the time of reception of egg, with funnel-shaped style with undivided or unruptured perianth (1.5 by 0.5 mm.); B, nearly mature gall flower, long pedicelled form, with ruptured perianth (5 by 1.25 mm.); C, nearly mature fertile female flower, with normal stigma, long pedicelled form (5 by 1 mm.); D and E, mature monandrous male flower with unruptured perianth (3 by 1 mm.); F, the freed stamen dehiscing by 2 slits; cross section of unopened male flower; H, pollen grains, averaging about 7 by 12 microns.

insects seem to seek or deposit eggs in seed-bearing figs, appears to be prima facie evidence of parasitism or semiparasitism.

THE FIG INSECTS OCCURRING IN FICUS NOTA AT LOS BAÑOS

The classification of the fig insects is in a most undeveloped state, not only because very few of the existing species are described—or, if described, known in both sexes—but also because few of the characters given are of generic or subfamily value. It seems inevitable that new discoveries will completely modify the generic arrangement, and probably cause a recasting of the subfamilies. The statement made by Ashmead [6] that all Agao-

[6] *Mem. Carnegie Mus.* (1904), 1, 231.

nidæ are caprifiers is not true, if any with long ovipositors and which oviposit from the exterior of the fig are admitted to that family. His statement that the head in males of Idarniinæ is "long or oblong" must likewise be modified, since there are some with heads as broad as long, and others with the heads even broader than long. The degree of excavation of the upper surface of the head is very variable through the series of species. The ovipositor may be very short in Agaonidæ. Also the middle legs may be much slenderer than the others, and the male head may be more deeply foveate in certain Idarniinæ than in certain Agaonidæ, and any definite group line, between a long vermiform abdomen and a short pointed one, is impossible to draw. There is the greatest necessity of collecting more than usually extensive material in these groups for the right kind of study. The different species of figs should be carefully examined one by one, and large numbers of the contained insects, both male and female, collected in vials of alcohol, carefully labeled with the full name of the fig.

Family AGAONIDÆ

Subfamily AGAONINÆ

Blastophaga nota sp. nov.

Male.—Pale yellow throughout, the abdomen paler, naked except for the very large deformed posterior legs, almost the entire surface of which is minutely thickly pilose. Head, 0.7 mm. long by 0.43 mm. wide, subrectangular, slightly narrowed in front, with the sides broadly rounded; eyes wanting. Mandibles very strongly, deeply, and evenly bidentate. Antennæ inserted in deep narrow sulci which pass caudad from base of mandibles and converge at 0.25 mm. in length of head. Antennæ not exceeding tips of mandibles, 5-jointed, the pedicel and last joint long and subequal, and each about one-half the length of the scape, the third still shorter.

Pronotum trapezoidal, as broad caudad as head, but apically narrower. Mesonotum transverse, slightly wider than pronotum. Metanotum (used in males as including dorsulum) triangular, the angles broadly rounded, as wide as, and longer than, mesonotum. Abdomen vermiform, abruptly bent after the first segment, and closely reflexed under the thorax, its apex, at rest, extended forward to middle of head.

Fore and hind legs greatly distorted and modified, the middle legs normal. Fore tibiæ (fig. 3, E) greatly broadened apically, the apical angles produced into heavy incurved teeth; fore tarsi

2-jointed, the second twice the length of first. Middle tibiæ of normal form, but apically produced into several stout teeth; the tarsi have the first joint equaling the next 2 in length, the last as long as the 3 preceding. Hind tibiæ apically with a small bidentate process, and a stout movable tooth; the tarsal joints (fig. 3, D) greatly enlarged and swollen, becoming broader to the last which is subrectangular, the claws being attached to the lower apical angle; the last joint equals the first in length, and these are each much longer than the 3 intermediate ones. Male genitalia without armed claspers. Length, 3.5 mm.

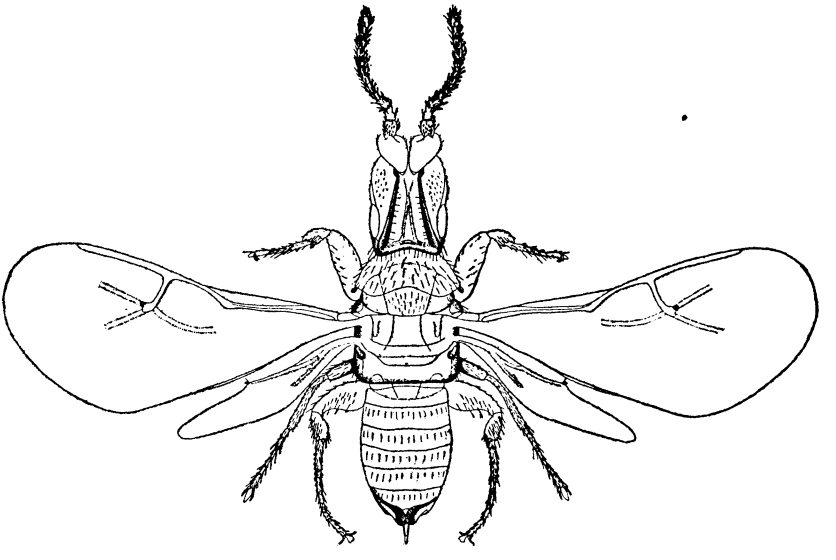

FIG. 2. Female of *Blastophaga nota*. The vestiture of the wings, consisting of very numerous minute bristles, is omitted. Note the remarkable projections from prothoracic spiracles.

Female (*fig. 2*).—Color dark brown, the legs paler, the wings large and very heavily pubescent. Head very large, subrectangular, somewhat swollen in front of the eyes which are in basal half of head. Upper surface of head with a deep broad excavation having calloused and spined margins, and broadened to the occiput where the median ocellus is inserted in its hind border and directed forward; the lateral ocelli obsolete. Antennæ 11-jointed, the scapes enormously swollen, contiguous, and entirely covering the mouth above, the pedicel with many short recurved spines, the third joint small and with a finger-like apophysis; the fourth still smaller; the fifth and following normal, and with numerous short longitudinal sense furrows.

Thorax strongly square-cornered caudad, where it is much broader than the abdomen. Whole body with numerous short stiff bristles, these occurring in single transverse rows on the abdominal tergites. Ovipositor very short. Postmarginal vein much longer than marginal, the stigmal slightly shorter than marginal. Fore tibiæ resembling those of male, about one-third the length of their femora, but the tarsi normally 5-jointed. The hind tibiæ about one-half the length of their femora, and at the inner apical angles with a stout spine and a minute bidentate process; hind tarsi very long, the first joint longer than the 2 following; the second to fourth subequal; the fifth about one-half the length of the first. Length, 2 mm.

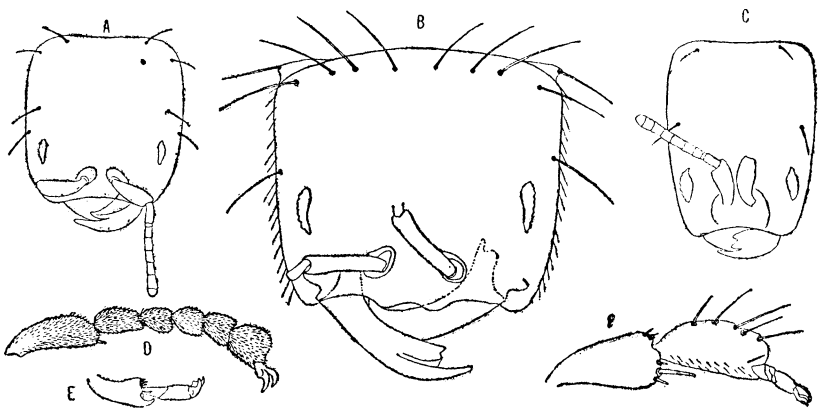

FIG. 3. Some anatomical details of fig insects. A, head of *Philotrypesis similis* (0.6 by 0.6 mm.); B, head of *Philotrypesis collaris*, the spined extensions shown at angles of occiput being below (size of head, 0.95 by 1 mm.); C, head of *Philotrypesis ashmeadii* (0.55 by 0.7 mm.); D, hind tibia and tarsus of *Blastophaga nota;* E, fore tibia and tarsus of *Blastophaga nota;* F, hind tibia and tarsus of *Sycoryctes philippinensis.*

This blastophaga is the normal inhabitant of the gall flowers and the active caprifier of *Ficus nota* at Los Baños, P. I.

AGAONELLA genus novum

Male.—Wingless and naked, wanting even thread-like or bristle-like rudiments. Head and thorax very narrow and attenuate and subequal in width; head more than 3 times longer than wide, the eyes consisting of oval pigment spots on the anterior third; abdomen white, long, vermiform, and generally carried extended caudad. Antennæ 3-jointed and inserted in depressed foveæ near the mouth; mandibles very stout and bidentate. Prothorax and metathorax subequal in length, the mesothorax shorter, the two last about one-half the depth of the first.

Legs short and subequal, femora all swollen, the tibiæ shorter than femora, stout, apically heavily spined; tarsi 5-jointed, as long as tibiæ, the fifth as long as preceding and with heavy simple claws.

Female.—With the ovipositor nearly twice the length of body, the abdomen waspish in shape. Head broader than long, margins evenly curved, the upper surface with a broad deep groove embracing insertions of antennæ and broadening backward to and including median ocellus. Antennæ 12-jointed, the scape very long and slender, 2 small ring-joints, the remaining segments subequal and bearing many longitudinal sense-organ grooves. Mouth parts small and more deeply included within the frame of the head than usual, the mandibles unidentate. Maxillary palpi 4-jointed, the second and fourth joints longest and subequal, the third distinctly shorter than the first. Labial palpi 2-jointed, the second joint a fourth longer than the first. Legs very long and slender, the middle pair considerably slenderer than the others. Middle and hind tibiæ as long as their femora and strongly spined apically, the tarsi nearly as long as the tibiæ and with proximal segment as long as, or longer than, the 3 following. Scutellum flat. Parapsidal furrows distinct. Wings heavily veined for this group, the marginal and postmarginal subequal, the stigmal shorter with a long club-shaped tip.

This very distinct genus—distinct in either male or female—shows some resemblances to *Agaon* from Africa, but is widely distinct from that or any other genus.

Agaonella larvalis sp. nov.

Male.—Head and thorax yellowish, abdomen soft and whitish. Body quite nude. Head rectangular in general outline, 0.55 mm. long by 0.18 mm. wide, varying from 0.17 mm. deep at base to 0.1 mm. at mouth. Scape of antennæ longer than the 2 succeeding joints, the third joint and apex of second somewhat inflated. The small antennal fossæ only separated by a carina. Prothorax subrectangular, similar in size and shape to the head; the mesothorax slightly shorter, similar in dorsal outline, but only one-half as deep; metathorax as long as prothorax, but only as deep as mesothorax. Coxæ large, long, parallel-sided, more than one-half the length of their respective thoracic segments, much longer than the swollen rounded femora. Tibiæ strongly broadened apically, and there armed on the outside with about 20 closely placed, short, heavy, tooth-like spines. Male genitalia consisting of 2 lateral, stout terete styles, with

long apical spines, and 2 short stout dark brown subrectangular claspers, each armed on its distal border with 2 short, stout, black teeth. Length, about 2.5 mm.

Female.—Metallic dark greenish in color, the wings iridescent, the legs pale yellow, the abdomen slender at base and strikingly waspish in shape, the ovipositor about twice the length of the body which is 2.5 to 3 mm. long. Head, 0.5 mm. wide, 0.35 mm. long, the eyes very strongly bulging, the face broadly rounded in front, the upper surface with a broad deep cavity that broadens caudad; antennæ inserted in small sockets which are in the middle of the face, and distant their width from each other, and as far from eyes as from anterior margin of head. Scape yellowish, long and very slender, its length 9 times the width, and equal to more than pedicel and first 4 joints of flagellum together; pedicel about one-fifth the length of scape and with the rest of the antenna, fuliginous; 2 small ring-joints; flagellum 8-jointed, the joints similar and with numerous very long sense furrows. Mandible small and unidentate. Labial palpi 2-jointed, the second one-fourth longer than first; maxillary palpi 4-jointed, the second and fourth the longest and subequal, the third distinctly shorter than the first. Thorax above with shining, but coarsely shagreened surface. Scutel very large, subelliptical. Abdomen waspish, very slender at base, in all of the specimens at hand with the ventral plates bent far forward, giving a most remarkable appearance to the whole. Ovipositor about twice the length of the body, sparsely haired and not at all swollen at the tips of the sheaths. The femora longer than tibiæ, the fore metatarsal joint as long as 2 succeeding joints, the mid and hind metatarsi longer than all succeeding joints together. The wings sparsely haired.

Common in *Ficus nota* at Los Baños, P. I.; probably a guest in its relation to the blastophaga.

Subfamily SYCOPHAGINÆ

Sycophaga nota sp. nov.

Male.—Slender, pale yellowish brown, the abdomen concolorous, not recurved under thorax, broadened to the apex where it is furnished with 2 long, slender, lanceolate, thickly and finely pilose laminæ connected with the last, and only, abdominal spiracles. Head, 0.38 mm. wide by 0.8 mm. long, and averaging 0.14 mm. more or less deep throughout; rectangular, parallel sided, the occipital angles strongly produced caudad, the median ocellus on occipital border and directed forward, the lateral ocelli wanting. Upper surface of head with a broad

shallow depression more than one-half its width extending from occiput to mouth. Antennæ small, inserted nearer to lateral margins of head than to each other, 4-jointed, the scape swollen, the second joint two-thirds of third, the fourth about one-half the length of second and not wider than third. Mandibles very large, their bases reaching sides of head, tridentate. Prothorax three-fourths the length of head, subtrapezoidal, slightly broader than head posteriorly, and slightly narrower anteriorly, the upper surface of all thoracic segments with a more or less distinct continuation of the median cephalic depression. The prothorax is, as usual, deeper than either meso- or metathorax. Meso- and metanotum subrectangular, the former divided by a transverse suture, nearly 0.6 mm. long, the latter, 0.5 mm. long. Legs all very similar in structure and armature, the posterior longest, the tibiæ along anterior and apical portions armed with some 20 to 30 short stout teeth which are thickly

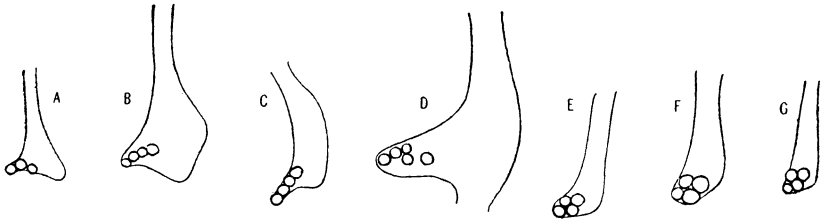

FIG. 4. Showing the very peculiar pustular organs in the clavate tip of the stigmal vein in the female wing; A, *Sycophaga nota;* B, *Sycoryctes philippinensis;* C, *Agaonella larvalis;* D, *Blastophaga nota;* E, *Philotrypesis similis;* F, *P. collaris;* G, *P. ashmeadii.*

set. Metatarsi as long as all remaining tarsal joints together, the fifth one-half of the first; the second, third, and fourth very small, subequal, and together about equal to one-half the fifth. Head and thorax smooth and naked, but abdomen minutely thickly longitudinally striolate, about 1.2 mm. long, about 0.3 mm. wide at base and 0.5 mm. at apex, the apical angles provided with 2 narrowly lanceolate laminæ, about 1.4 mm. long, which are very thickly and finely pilose throughout; these laminæ at base form a partial funnel surrounding the last, and apparently only, abdominal spiracle, which is very large; these terminal spiracles connect with 2 enormous tracheal trunks which are somewhat bent and coiled posteriorly, are together more than one-half the width of the abdomen anteriorly, and occupy a large part of its cavity; these great tracheal trunks pass forward, occupying nearly the entire body cavity, connect with the metathoracic and mesothoracic spiracles, have one con-

necting anastomosis in the prothorax, and then diminishing rapidly in size pass on to nearly the full length of the head. Male claspers are present as small dark-brown subrectangular pieces, that have at least 1 small apical tooth. Total length, without laminæ, 3.8 to 4 mm.

Female.—Dark yellowish brown, dorsum darker, end of abdomen and legs pale; ovipositor, occiput, and eyes blackish. Head slightly narrower than thorax, face very broad between eyes, narrowing above, slightly swollen, broadly rounded over the small mouth, and with no indication of longitudinal depression. Antennæ inserted in small sockets, which are separated somewhat more than their width, and are very close to the anterior margin of the head; antennæ 13-jointed, scape long and slender, the length more than 4 times the width, pale yellowish, the remaining joints fuliginous; pedicel narrower than scape and about one-half its length; 2 small ring-joints; remaining joints very similar, with numerous long sense furrows, the last 2 joints somewhat shorter than preceding. Lateral ocelli nearer eyes and nearer to occiput than to median ocellus. Whole body sparsely covered with short stiff hairs. Mesonotum with complete deep parapsidal grooves and coarsely shagreened. The scutellum smooth, large, and almost exactly quadrate. The metanotum with hind angles obliquely cut off and the surface minutely longitudinally striolate. Abdomen as broad as thorax and considerably longer. Head, 0.4 mm. long; thorax, 0.85 mm. long; abdomen, 1.25 mm. long. Ovipositor slender, 6 mm. long, rather sparsely haired, the tips of sheaths not at all swollen. Middle legs very much slenderer than the others; middle tarsi resembling hind tarsi, the fore tarsi very different; first joint of fore tarsi equals the 2 following together in length, the fifth joint equals the 3 preceding together; in mid and hind tarsi the first joint is nearly as long as the 3 following together, the 3 latter successively shorter, the fifth about as long as second; all of the tibiæ possess stout spines which are distinctly anteapical. Postmarginal vein longer than marginal, the stigmal short and weak.

Not at all common in gall figs of *Ficus nota*, at Los Baños, P. I., and apparently a guest. I have seen no previous remark on the altogether remarkable tracheal system in certain male Sycophaginæ—more remarkable in its way than that of the migratory Acrididæ. The terminal abdominal laminæ are indubitably a part of this tracheal system, surrounding and projecting from the large abdominal spiracles. They present very much the superficial appearance of certain branchial epi-

podites in some macrurous crustacea. The meaning of this enormous inflation and complex development of the tracheal system in male *Sycophaga* presents a most interesting subject for further investigation.

Family TORYMIDÆ

Subfamily IDARNIINÆ

Sycoryctes philippinensis sp. nov.

Male.—Pale yellowish and nude, with small pigment-spot eyes; long rectangular head, short abdomen, and the hind legs greatly lengthened with a laminately expanded first tarsal joint. Head subrectangular, the angles rounded, the lateral margins nearly parallel; length, 0.6 mm.; width, 0.3 mm., the small eyes on lateral margins at anterior third. Mandibles large, unidentate, inserted close together beneath anterior margin of head, and far from the lateral margins, this causing their strong extension cephalad, while at rest their points are crossed and resemble as viewed from above the crossed bill of *Loxia*. Antennæ inserted in small contiguous sockets, the distance of the width of each from the anterior margin of the head; antennæ little over one-half the length of head, 8-jointed, the scape stout and swollen, the pedicel slender and one-half the length of scape, next 2 joints irregular and subequal, the succeeding 2 very small and subequal, with next a club of 2 joints which is as long as the pedicel and broader. Head without longitudinal depression; ocelli all obsolete. Pronotum, 0.38 mm. long; mesonotum, 0.12 mm.; and metanotum, 0.33 mm. long; the pronotum much the deeper. Abdomen as long as thorax, narrowed to a point apically, but there with rather strongly compressed venter and greatly enlarged terminal spiracles. Anterior and middle legs normal in size, the tibiæ strongly enlarged apically and with several strong teeth at apical angles, the middle tibiæ only possessing also marginal teeth. In both fore and mid tarsi the last joint is the largest, the 3 intermediate very greatly reduced and subequal, and the basal joint about one-half the fifth in length. The hind legs of great size and length; coxæ parallel-sided and passing the middle of abdomen, while the femora exceed the abdomen; tibiæ broader at apex and larger than their femora, without marginal teeth, but with 1 very large and several smaller apical spines; tarsi (fig. 3, F) as long as tibiæ, the first joint greatly laminately expanded, as broad as tibiæ, longer than all remaining joints together, and at outer apical angle roundly extended beyond the insertion

of second joint to the length of that joint; the second, third, and fourth joints small, subequal, and together about equaling fifth joint in length; the first joint possesses on its outer margin 3 or 4 pairs of long, slender, curved spines. Male genitalia consisting of 2 blunt lateral styles, each with 2 apical spines, and 2 large subrectangular claspers each possessing 4 stout terminal teeth, these all being concolorous with the rest of the abdomen and not heavily chitinized or pigmented. The dimensions given above are from a specimen of average size; some specimens are slightly larger and others slightly smaller.

Female.—Above dark brown; the face and all lower parts pale; the legs light lemon yellow. Pro- and mesonotum, axillæ, and abdominal tergites coarsely reticulately shagreened; scutellum very large, flat, regularly subpentangular, and with the surface finely longitudinally shagreened. Mandibles unidentate; maxillary palpi 4-jointed; the first and third joints subequal, and about one-half the length of the second and fourth, which are subequal. Labial palpi 2-jointed; the first joint slender and longer than the strongly oval second. Hind tibiæ longer than their femora, and with only weak hairs and 1 large spine apically. Stigmal vein with an abruptly swollen subtrapezoidal tip. Head, 0.4 mm. long; thorax, 0.6 mm.; and abdomen, 1.2 mm. long; the ovipositor 9 mm. long, or more than 4 times the length of the body, slender, with comparatively few minute hairs, and with the sheaths distinctly swollen at tip.

Occurring in great numbers in November in gall figs of *Ficus nota* at Los Baños, P. I. I am inclined to regard this as a parasite in its relation to the blastophaga.

Philotrypesis similis sp. nov.

Male.—Head (fig. 3, A) subquadrate, the angles rounded, 0.6 mm. wide, and 0.6 mm. long, the pigment-spot eyes at anterior third and within the lateral margin. Face broadly excavated between the eyes, and sparsely transversely lineolate; antennal sockets small, separated a short distance, and with a weak longitudinal carina between them, about as far as their width from the anterior margin of the head. Antennæ, 0.5 mm. long; the scape, 0.15 mm., about twice longer than wide, pedicel very slender, one-half the length of scape, the single ring-joint small, the flagellum of 4 subequal points, each about one-half the length of the pedicel, and a barely indicated club of 2 joints. Mandibles large, bidentate, their basal margins remote from margins of head. Ocelli absent. Head above nearly nude, having only a few stiff bristles on the margins, but below rather thickly

bristly. Thorax with 2 filaments on either side; as broad as the head and 0.6 mm. long. Pronotum large, parapsidal grooves very faint, and with 2 strong setæ on each lateral margin. Sterna more heavily chitinized and very bristly. Abdomen as long as thorax, soft, paler in color, with few bristles, narrowing to an acute tip. Legs stout and strongly bristled. Hind femora more strongly swollen than the others; tibiæ all strongly broadened apically, the fore tibiæ shorter than their femora, the middle tibiæ as long as, and the hind tibiæ longer than, their femora; all the tibiæ are strongly armed with apical teeth, but only the middle and hind tibiæ have marginal teeth. Fore tarsi shorter than their tibiæ, 2-jointed, the second joint as long as the greatest width of their tibiæ; mid tarsi shorter than their tibiæ, 4-jointed, the first joint small, but as long as the 2 following together which are minute; the fourth large, twice longer than all the preceding together; hind tarsi longer than their tibiæ, first and second with apical angles produced in narrow lobes, longest behind and there provided with single long spines, second smaller than first, third minute, fourth as long as all the preceding together. Claws strong and with large fuliginous pulvilli. Male claspers rather elongate, slightly narrowed apically, the ends somewhat incurved and provided on the outer curve with a heavy retrorse spine, and near the point with a small porrect one.

Female.—Yellowish, with black markings on dorsum of abdomen, the ovipositor black, the legs pale yellowish. Head, 0.45 mm long; 0.55 mm. wide. Eyes strongly bulging, inner angles of eyes sharp, the face broader at mouth than at inner orbital angles. Lateral ocellus as near to eyes as to median ocellus, but nearer to the occipital margin. Maxillary palpi 4-jointed, the first and third very short, not one-half the length of the second, the fourth as long as all the preceding together, and narrowed gradually to the tip. Labial palpi with the second joint longer and broader than first, but apically narrowed to a teat-like point. Antennæ certainly with a distinct joint proximate of scape; scape 6 times longer than wide and with the pedicel pale yellow, the remainder fuliginous; pedicel one-third length of scape, swollen toward tip; 2 ring-joints very small; flagellum with 8 similar joints, the last 3, as usual, forming somewhat of a club. Parapsidal furrows distinct, but very shallow posteriorly. Scutel very large, suborbicular, but broader than long, convex; marginal vein very long, much longer than postmarginal; the stigmal very small and short and gradually

clavate at tip. Abdomen measured without the extended segments, 1.1 mm. long; first extended segment, 1.75 mm. long; the following, 0.4 mm. long, narrowing to its tip; ovipositor, 7 mm. long, the sheaths scarcely clavate at tip. Legs very slender, the middle much more so than the others. Fore tibiæ longer than their tarsi and shorter than their femora; mid and hind tibiæ as long as their tarsi but longer than their femora, joint 1 as long as the last 3 together, and 2 as long as 3 and 4 together.

Common in *Ficus nota* at Los Baños, P. I.

Philotrypesis ashmeadii sp. nov.

Male.—Exceedingly close in characters to *P. similis,* but head (fig. 3, C) distinctly longer than broad, 0.55 mm. broad by 0.7 mm. long. Scape dark brown, nearly 3.5 times longer than broad, pedicel less than half as long as the scape, flagellum pale yellowish, 8-jointed, the joints progressively wider, subequal in length save last 3, the last 2 forming a scarcely distinct club. All tibiæ as long as, or longer than, their femora; anterior margins of middle and hind tibiæ less numerously spined than in *P. similis;* first joint of hind tarsi short, not one-half as long as fourth joint, the latter much longer than all the preceding together; lobe of second joint not extending beyond the third. Male claspers long, parallel-sided, the outcurved blunt ends armed with 3 or 4 very stout black teeth.

Female.—Body clear brown; legs pale yellow. Differs from *P. similis* as follows: Lateral ocelli nearer to eyes than to median ocellus. Scape about 4 times as long as wide, pale yellowish; pedicel nearly one-half the length of scape, not as thick, and with the 3 ring-joints darker in color; flagellum fuliginous, of 5 similar segments, with a 3-jointed club. Abdomen measured without the extended segments, 1 mm. long; first extended segment, 2.4 mm., the second, 0.4 mm; ovipositor, about 5 mm. long, the sheaths distinctly clavate at tip.

Frequent in gall figs of *Ficus nota* at Los Baños, P. I. Probably parasitic on the blastophaga.

Philotrypesis collaris sp. nov.

Male.—The largest of the broad-headed, apterous males with short pointed abdomens to be found in the gall figs of *Ficus nota* at Los Baños. Head (fig. 3, B) subquadrate, 0.95 mm. long and 1 mm. broad, thus broader than long; a row of long stiff bristles along occipital margins; mandibles long and narrow, bidentate (the inner tooth subtruncate), and broadly overlapping; clypeus

broadly shallowly 2-lobed. Antennæ very small for so large a head, the small sockets remote, nearer to bases of mandibles and to front margin of head than to each other; scape a little over 4 times longer than wide, pedicel and flagellum together not as long as scape, the flagellum very pale in color, 8-jointed. Face deeply gradually excavated and finely sparsely transversely striolated. Prothorax as broad as head, with 2 large bristles on each lateral margin and 2 near the hind border; meso- and metathorax taken together shorter than the pronotum and becoming much narrower. Abdomen very small, narrower than metathorax, and rapidly narrowing to tip. Male claspers long and stout, with 3 stout black teeth at each tip. Fore legs to the tarsi, darker brown, remainder of legs pale yellow. Legs normal for *Philotrypesis,* but the lobes of first and second joints of hind tarsi with 2 long spines each, these joints together equaling the remainder of the tarsus in length. Body and legs entirely without the dense vestiture of stiff short bristles possessed by *P. similis* and *P. ashmeadii.*

Female.—Flagellum, top of head, meso- and metanotum, entire dorsum of abdomen, and ovipositor, blackish; remainder of body including pronotum, yellowish. Length of body without extended segments, 3.5 mm.; of first extended segment, 2 mm.; of second, 0.5 mm.; of ovipositor, about 4.5 mm. More similar to *P. ashmeadii* than to *P. similis,* having 3 ring-joints in the antennæ, and very similar in other characters.

Occasional in gall figs of *F. nota* at Los Baños, P. I. Probably parasitic on *Blastophaga.* It is very remarkable that 3 such similar species of *Philotrypesis* should occur in the same figs together, but although the females are somewhat alike the males are very distinct.

Synopsis of male fig insects found in Ficus nota at Los Baños.

a^1. Head far longer than broad; thorax without lateral filaments.
  b^1. First joint of hind tarsi not laminately expanded.
    $c.^1$ Abdomen vermiform.
      d^1. Hind tarsi greatly enlarged, modified, and pilose; abdomen permanently folded under thorax; antennæ 4-jointed: fore tarsi reduced..... **Blastophaga nota.**
      d^2. Hind tarsi normal; abdomen very long and directed caudad; antennæ 3-jointed; fore tarsi normal..... **Agaonella larvalis.**
    c^2. Abdomen enlarged apically and provided with 2 long, lanceolate, tracheal laminæ; antennæ 4-jointed, the scape swollen; fore tarsi normal..... **Sycophaga nota.**
  b^2. First joint of hind tarsi laminately expanded; antennæ 8-jointed, scape swollen; fore tarsi normal..... **Sycoryctes philippinensis.**

a^2 Head quadrate or subquadrate, abdomen short and pointed, thorax with 2 lateral filaments on either side.

e^1. Head about as broad as long, or slightly longer than broad; flagellum longer than the swollen scape; produced lobes of 2 basal joints of hind tarsi with a single spine each; head and body beneath with coxæ and femora thickly set with short stiff bristles; abdomen as long as, or longer than, thorax.

f^1. Head about as broad as long; 2 basal segments of hind tarsi as long as remainder of tarsus, the lobe of the second overlapping the last..... **Philotrypesis similis.**

f^2. Head slightly longer than broad; 2 basal segments of hind tarsi about one-half of the length of last segment, the lobe of the second not reaching the last..... **Philotrypesis ashmeadii.**

e^2. Head broader than long; flagellum shorter than the linear scape; produced lobes of 2 basal segments of hind tarsi with 2 spines each; head and body naked; abdomen shorter than thorax.

Philotrypesis collaris.

Synopsis of female fig insects found in Ficus nota at Los Baños.

a^1. Ovipositor very short; head long, subrectangular; antennal scapes enormously enlarged so as to cover the mouth..... **Blastophaga nota.**

a^2. Ovipositor very long; head never subrectangular; antennal scape never greatly enlarged so as to cover the mouth.

b^1. Last 2 abdominal segments not tubularly extended.

c^1. Abdomen narrowed basally, waspish in shape..... **Agaonella larvalis.**

c^2. Abdomen very broad at base, not narrowed or waspish.

d^1. Antennæ with 2 ring-joints; scutel quadrate..... **Sycophaga nota.**

d^2. Antennæ with 1 ring-joint; scutel pentangular.

Sycoryctes philippinensis.

b^2. Last 2 abdominal segments tubularly extended.

e^1. Antennal scape 4 times longer than wide; length of first extended abdominal segment, 2.4 mm.; ovipositor about 5 mm. long; color, clear brown..... **Philotrypesis ashmeadii.**

e^2. Antennal scape about 6 times longer than wide; color of body largely a sharply contrasting yellow.

f^1. Largely yellow with a few dorsal black spots; length of first extended segment, 1.75 mm.; ovipositor, 7 mm.

Philotrypesis similis.

f^2. Pronotum and underparts clear yellow, remainder of dorsum black; length of first extended segment, 2 mm.; of ovipositor, 4.5 mm..... **Philotrypesis collaris.**

ILLUSTRATIONS

TEXT FIGURES

(Drawings by the author)

FIG. 1. Flower parts of *Ficus nota.* A, young gall flower at time of reception of egg, with funnel-shaped style with undivided or unruptured perianth (1.5 by 0.5 mm.); B, nearly mature gall flower, long pedicelled form, with ruptured perianth (5 by 1.25 mm.); C, nearly mature fertile female flower, with normal stigma, long pedicelled form (5 by 1 mm.); D and E, mature monandrous male flower with unruptured perianth (3 by 1 mm.); F, the freed stamen dehiscing by 2 slits; G, cross section of unopened male flower; H, pollen grains, averaging about 7 by 12 microns.

2. Female of *Blastophaga nota.* The vestiture of the wings, consisting of very numerous minute bristles, is omitted. Note the remarkable projections of prothoracic spiracles.

3. Some anatomical details of fig insects. A, head of *Philotrypesis similis* (0.6 by 0.6 mm.); B, head of *Philotrypesis collaris,* the spined extensions shown at angles of occiput being below (size of head, 0.95 by 1 mm.); C, head of *Philotrypesis ashmeadii* (0.55 by 0.7 mm.); D, hind tibia and tarsus of *Blastophaga nota;* E, fore tibia and tarsus of *Blastophaga nota;* F, hind tibia and tarsus of *Sycoryctes philippinensis.*

4. Showing the very peculiar pustular organs in the clavate tip of the stigmal vein in the female wing; A, *Sycophaga nota;* B, *Sycoryctes philippinensis;* C, *Agaonella larvalis;* D, *Blastophaga nota;* E, *Philotrypesis similis;* F, *P. collaris;* G, *P. ashmeadii.*

ORIGIN MYTHS AMONG THE MOUNTAIN PEOPLES OF THE PHILIPPINES [1]

By H. Otley Beyer

(From the Division of Ethnology, Bureau of Science, Manila, P. I.)

Four plates

Beliefs as to the origin of the earth, and of the men, animals, plants, and various topographical features found in it, seem to survive with greater persistence than any other trait of primitive culture. These beliefs lie at the base of nearly all religions, and the myths in which the beliefs are preserved are the foundation of literature. The preservation and study of origin myths is, therefore, of much importance in the reconstruction of the history of mankind which is the chief aim of anthropology.

The peoples of the Philippines have a rich and varied mythology as yet but little explored, but which will one day command much attention. Among the Christianized peoples of the plains the myths are preserved chiefly as folk tales, but in the mountains their recitation and preservation is a real and living part of the daily religious life of the people. Very few of these myths are written; the great majority of them are preserved by oral tradition only.

Until recent years, it has been believed that all ancient records written in the syllabic alphabets which the Filipinos possessed at the time of the Spanish conquest had been lost. It is now known, however, that two of these alphabets are still in use, to a limited extent, by the wild peoples of Palawan and Mindoro; and ancient manuscripts written in the old Bisaya alphabet have been lately discovered in a cave in the Island of Negros. Many of these Negros manuscripts are written myths, and translations of them are shortly to be published. The Bisaya peoples, in general, have preserved their old pagan beliefs to a greater extent than have the other Christian Filipinos, and it is to be

[1] Read before The Philippine Academy, October 2, 1912. The paper is intended as an introduction to a series of more complete studies in Philippine mythology and religion.

hoped that the discovery of these manuscripts will stimulate further investigations.

Among the pagan mountain peoples, with which this paper will chiefly deal, there are no written myths except those which have been recorded by Europeans in modern times. Some of the myths are sung or chanted only, while others are repeated in the form of stories. In nearly every case, the repeating of the myths forms an important part of the religious ceremonies of the people. Many different grades of culture are represented among these mountain peoples, and we find a correspondingly unequal development of their mythologies. All classes are represented: *primitive,* such as the beliefs of the Mañgyans of Mindoro, the Tagbanwas of Palawan, and the Ilongots of northern Luzon; *mediocre,* as the beliefs of the pagan tribes of Mindanao; and *highly developed,* such as the elaborate polytheisms of the Ifugaos, Igorots, Kalingas, and the other peoples of the Mountain Province in Luzon.

Most of the myths and legends recorded here were collected by men well acquainted with the dialect of the people from whom the myth or legend was obtained; they are, therefore, of much greater value than if they had been secured through interpreters.

I shall next discuss a few myths from each of the classes just mentioned.

PRIMITIVE BELIEFS

Our knowledge of the more primitive tribes of the Philippines is very limited and is chiefly confined to the material culture, together with a few of the more obvious social traits. Nothing like a complete study of any one of these tribes has ever been made. Of the Ilongots, most of our knowledge [2] is contained in the records of the early Spanish missionaries of the first part of the 18th century, at which time an extensive exploration of the Ilongot country was made.[3] There are two modern sources of information: a paper by Worcester,[4] which deals chiefly with the material culture, and the notes of Dr. William Jones, who was killed while studying the ethnology of this people. Dr. Jones' notes are now in the possession of the Field Museum,

[2] A complete bibliography cannot be given within the limits of this paper, but a number of the most important printed titles and manuscripts have been cited.

[3] Blair and Robertson, The Philippine Islands. Cleveland (1906), 37; (1907), 48.

[4] *This Journal* (1906), 1, 812–818. Many plates illustrating Ilongot types and culture are given.

Chicago, and have not yet been published. Relating to the Mañgyans, there are three important papers by Worcester,[5] Gardner,[6] and Miller,[7] but these likewise deal chiefly with the material and general social culture, and give only fragmentary notes regarding the religious beliefs. Two papers, one by Worcester[8] and one by Venturello,[9] relate to the Tagbanwas. The religion of these people is interesting, although primitive. The general character of their beliefs may be seen by the following quotation from Worcester:[10]

I was especially interested in their views as to a future life. They scouted the idea of a home in the skies, urging that it would be *inaccessible.* Their notion was that when a Tagbanua died he entered a cave, from which a road led down into the bowels of the earth. After passing along this road for some time, he came suddenly into the presence of one Taliákood, a man of gigantic stature, who tended a fire which burned forever between two tree-trunks without consuming them. Taliákood inquired of the new arrival whether he had led a good or a bad life in the world above. The answer came, not from the individual himself, but from a *louse* on his body.

I asked what would happen should the man not chance to possess any of these interesting arthropoda, and was informed that such an occurrence was unprecedented! The louse was the *witness,* and would always be found, even on the body of a little dead child.

According to the answer of this singular arbiter, the fate of the deceased person was decided. If he was adjudged to have been a bad man, Taliákood pitched him into the fire, where he was promptly and completely burned up. If the verdict was in his favour, he was allowed to pass on, and soon found himself in a happy place, where the crops were always abundant and the hunting was good. A house awaited him. If he had died before his wife, he married again, selecting a partner from among the wives who had preceded their husbands; but if husband and wife chanced to die at the same time, they remarried in the world below. Every one was well off in this happy underground abode, but those who had been wealthy on earth were less comfortable than those who had been poor. In the course of time sickness and death again overtook one. In fact, one died seven times in all, going ever deeper into the earth and improving his surroundings with each successive inward migration, without running a second risk of getting into Taliákood's fire.

I could not persuade the Tagbanuas to advance any theories as to the nature or origin of the sun, moon, and stars. Clouds they called "the breath of the wind."

[5] The Philippine Islands and Their People. New York (1898), 362–434.

[6] A typewritten manuscript of 60 pages, entitled "The Hampáñgan Mañgyans of Mindoro" by Dr. Fletcher Gardner. U. S. A. (1905). In the records of the division of ethnology, Bureau of Science, Manila.

[7] *This Journal, Sec. D* (1912), **7**, 135–156.

[8] *Loc. cit.,* 76–122.

[9] *Smithsonian Misc. Colls.* (Paper No. 1700), **48**, 514–558.

[10] *Loc. cit.,* 109–111.

They accounted for the tide by saying that in a far-distant sea there lived a gigantic crab: when he went into his hole the water was forced out, and the tide rose; when he came out the water rushed in, and the tide fell. The thing was simplicity itself.

I asked them why the monkey looked so much like a man. They said because he *was* once a man, who was very lazy when he should have been planting rice. Vexed at his indolence, a companion threw a stick at him which stuck into him; whereupon he assumed his present form, the stick forming his tail.

From the foregoing, it is evident that the Tagbanwa beliefs are not highly developed. However, several items are of interest for comparison with the beliefs of the more cultured tribes to be later described. Of these items, those most to be kept in mind are the idea of a seven-storied underworld, and the name of the chief deity of that underworld, Taliákud. This name comes from the stem *tákud, túkud,* or *tókod,* which is common to many Philippine dialects and means "post" or "support." It is generally applied to the four legs or posts of the common Philippine house. Now, the belief in an Atlas, or god who supports the earth world, is widespread in the Philippines, and the name applied to this god is nearly always derived from this same stem *túkud.* The Ifugao Atlas is Tinúkud of the underworld, and I suspect that the Tagbanwa Taliákud of the underworld is a deity of the same character.

BELIEFS OF THE PAGAN TRIBES OF MINDANAO

The interior of Mindanao is occupied by some ten pagan tribes, the most important being the Manóbos, Mandayas, Atás, Bagóbos, Biláns, Tirurais, and Subánuns. These tribes are all remarkably alike in culture; much more so, in fact, than any other similar group of peoples in the Philippines; and this culture shows a close resemblance to that of the tribes in the interior of Borneo. In the development of their myths and of their religious beliefs, these peoples occupy a middle position between the more primitive and the highest developed types of the Philippines. John M. Garvan has recently completed a very extensive study of the Manóbo peoples of the Agusan Valley, in eastern Mindanao, and the following beliefs and myths are quoted from his unpublished notes.

ORIGIN OF THE EARTH AND ITS INHABITANTS

The story of the creation of the world is variable throughout the whole Agúsan Valley. In the district surrounding Talakógon, the creation is attributed to *Makalíduñg,* the first great Manóbo. The details of his great work are very meager. He set it up on posts (some say iron posts) with one in the center. At the central post he has his abode, in company with

a python, according to the version of some, and whenever he feels displeasure toward men, he shakes the post, thereby producing an earthquake, and at the same time intimating to man his anger. It is believed that, should the trembling continue, the world would be destroyed.

In the same district it is believed that the sky is round and that its extremities are at the limits of the sea. Somewhat near these limits is an enormous hole called *the navel of the sea* through which the waters descend.

It is said that in the early days of creation the sky was low, but that one day a woman, while pounding rice, hit it with her pestle and it ascended to its present position.

Another version of the creation, prevalent among the Manóbos of the Argauan and Híbung̃ Rivers, gives the control of the world to *Dágau*, who lives at the four fundamental pillars in the company of a python. Being a woman, Dágau dislikes the sight of human blood, and when it is spilled upon the face of the earth she incites the huge serpent to wreathe itself around the pillars and shake the world to its foundations. Should she become exceedingly angry, she diminishes the supply of rice either by removing it from the granary or by making the soil unproductive.

Another variation of the story to be heard on the Upper Agúsan, Simulau, and Umayan Rivers, has it that the world is like a huge mushroom and that it is supported upon an iron pillar in the center. This pillar is controlled by the higher and more powerful order of *diuwáta*, who on becoming angered at the actions of men manifest their feelings by shaking the pillar and thereby reminding men of their duties.

Three points in the beliefs just mentioned should be kept in mind. *First,* the recurrence of the idea that the earth world is supported by a post created by the chief deity and near which he dwells. *Second,* the belief in the *púsod nang̃ dágat,* or "navel of the sea," which is common to all of the pagan tribes of Mindanao and was also known by the ancient Bisáyas, Tagálogs, and other peoples now Christianized. It is extremely probable that this belief originated from some great whirlpool, known to the ancestors of the Philippine peoples or passed by them on their voyages.[11] *Third,* the belief that the sky was once very near the earth, and was raised to its present position by some deity. This belief is also common in northern Luzon.

The idea of the origin of curious-shaped rocks, hills, or mountains by petrifaction of some living animal or plant is common in the Philippines. Garvan gives the two following Manóbo legends of this character:

THE PETRIFIED CRAFT AND CREW OF KÁGBUBÁTANG̃

In the old, old days a boat was passing the rocky promontory of Kágbubátang̃.[12] The occupants espied a monkey and a cat fighting upon the

[11] I am informed by Dr. N. M. Saleeby that this myth is also known among the Malays of Sumatra and the Malay Peninsula.

[12] Kágbubátang̃ is a point within sight of the town of Placer, eastern Mindanao.

summit of the cliff. The incongruity of the thing suggested itself to them, and they began to give vent to derisive remarks, addressing themselves to the brute combatants, when, lo and behold! they and their craft were turned into rock. To this day the petrified craft and crew may be seen placed upon the promontory, and all who pass must make an offering,[13] howsoever small it be, to their vexed souls. To pass the point without making an offering might arouse the anger of its petrified inhabitants, and render the traveler liable to bad weather and rough seas.[14]

The imitation of frogs is especially forbidden, for it might be followed not merely by thunderbolts but also by petrifaction of the offender, and in proof of this is adduced the legend of *Añgó* of *Binaoi*.[15]

THE LEGEND OF AÑGÓ, THE PETRIFIED MANÓBO

Añgó lived many years ago on a lofty peak with his wife and family. One day he hied him to the forest with his dogs in quest of game. Fortune granted him a fine big boar, but he broke his spear in dealing the mortal blow. Upon arriving at a stream, he sat down upon a stone and set himself to straightening out his spear. The croaking of the nearby frogs attracted his attention, and, imitating their shrill gamut, he boldly told them that it would be better to cease their cries and help him mend his spear. He continued his course up the rocky torrent, but noticed that a multitude of little stones began to follow behind in his path. Surprised at such a happening, he hastened his steps. Looking back he saw bigger stones join in the pursuit. He then seized his dog, and in fear began to run, but the stones kept in hot pursuit, bigger and bigger ones joining the party. Upon arriving at his sweet-potato patch, he was exhausted and had to slacken his pace, whereupon the stones overtook him and one became attached to his finger. He could not go on. He called upon his wife. She with the young ones sought the magic lime[16] and set it around her husband, but all to no avail for his feet began to turn to stone. His wife and children, too, fell under the wrath of *Anítan*. The following morning they were stone up to the knees, and during the following three days the petrifying continued from the knees to the hips, then to the breast, and then to the head. Thus it is that to this day there may be seen on Binaoi peak the petrified forms of Añgó and his family.[17]

The sun, moon, and stars are great deities, or the dwelling place of such deities, in nearly all Philippine religions. The following Manóbo myth is interesting because of its resemblance to others from northern Luzon.

[13] The offering may be very small, even a little piece of wood, and is thrown overboard while passing the point.

[14] There is said to be a similar locality near Taganíto, eastern Mindanao.

[15] Binaoi is the name of an oddly shaped peak at the source of the River Añgdánan, tributary of the River Wáwa, Agúsan Valley.

[16] Limes and lemons are said to be objects of fear to the *búsao*.

[17] Garvan suggests these stories as illustrations of punishment following the imitating or making fun of animals, acts which are strictly tabú in Manóbo culture.

THE ORIGIN OF THE STARS AND THE EXPLANATION OF SUNSET AND SUNRISE

It is said that in the olden time the Sun and the Moon were married. They led a peaceful, harmonious life. Two children were the issue of their wedlock. One day the Moon had to attend to one of the household duties that fall to the lot of a woman, some say to get water, others say to get the daily supply of food from the fields. Before departing, she crooned the children to sleep and told her husband to watch them but not to approach lest by the heat that radiated from his body he might harm them. She then started upon her errand. The Sun, who never before had been allowed to touch his bairns, arose and approached their sleeping place. He gazed upon them fondly, and, bending down, kissed them, but the intense heat that issued from his countenance melted them like wax. Upon perceiving this he wept and quietly betook himself to the adjoining forest in great fear of his wife.

The Moon returned duly, and after depositing her burden in the house turned to where the children slept but found only their dried, inanimate forms. She broke out into a loud wail, and in the wildness of her grief called upon her husband. But he gave no answer. Finally softened by the loud long plaints, he returned to his house. At the sight of him the wild cries of grief and of despair and of rebuke redoubled themselves until finally the husband, unable to soothe the wife, became angry and called her his chattel. At first she feared his anger and quieted her sobs, but, finally breaking out into one long wail, she seized the burnt forms of her babes, and in the depth of her anguish and her rage threw them to the ground in different directions. Then the husband became angry again, and, seizing some taro leaves that his wife had brought from the fields, cast them in her face and went his way. Upon his return he could not find his wife, and so it is to this day that the Sun follows the Moon in an eternal cycle of night and day. And so it is, too, that stars stand scattered in the sable firmament, for they, too, accompany her in her hasty flight. Ever and anon a shooting star breaks across her path, but that is only a messenger from her husband to call her back. She, however, heeds it not, but speeds on her way in never-ending flight with the marks of the taro leaves [18] still upon her face and her starry train accompanying her to the dawn and on to the sunset in one eternal flight.

On myths such as these the religions of the pagan tribes of Mindanao are built up. These religions are by no means primitive, but are accompanied by sacrifices, sometimes human, and the ceremonies are performed by a well-developed priest class.[19]

[18] Some say that the spots upon the moon are a cluster of bamboos, others, that they are a *baléte* tree.

[19] Our information concerning these peoples is limited, but of much interest. Besides the work of Garvan, the chief sources are the Letters of the Jesuit Fathers and a paper on the Subánuns [Christie, *Pub. P. I. Bur. Sci., Div. Ethnol.* (1909), 6, pt. 1]. The latter does not record any myths, but gives several song-stories about great culture-heroes which throw much light on the character of the Subánun mythology and identify it with the mythologies of the other pagan tribes of Mindanao. These hero-stories are too long to be given here.

Let us now turn to the highest type of Philippine beliefs:

THE WELL-DEVELOPED POLYTHEISTIC RELIGIONS OF NORTHERN LUZON

I shall mention chiefly the Igorot, Bontok, and Ifugao peoples, as these three, in addition to holding the highest order of beliefs, are the best developed in general material and social culture of any of the Philippine mountain tribes. The Tiñggián, Kalinga, and other tribes in that region also have religions of high type, but our information concerning them is more limited.[20]

The literature relating to the Igorot-Bontok-Ifugao group is very considerable in extent, and I shall refer only to a few of the more important papers dealing particularly with religion and mythology.

Before taking up the mythology proper, we should have some idea of the religion as a whole. These peoples believe that the regions of the sky world, earth world, and underworld are peopled by an almost incalculable number of deities of varying character and powers. Some of these deities are the great beings who inspire the phenomena of nature, while others are guardian spirits, messenger spirits, or mischievous tricksters. The great nature deities are mostly of malevolent character, and are much feared. Ancestral souls and the souls of sacred animals are looked upon as mediators between gods and men. Pigs and chickens are sacrificed to the deities, and other articles of food and drink are provided for them. Many elaborate religious feasts and ceremonies are held at which priests officiate. The priests form a well-defined class, and in some districts there are also priestesses. A religious ceremony is required for every important act of life, and the priests and priestesses are usually busy people.

It would seem that a religion of this same general type was also common among the lowland peoples of the Philippines before they were Christianized by the Spaniards. Pigafetta, the first European to write of the Philippines, describes a ceremony, which he saw performed in Cebu in the year 1520, as follows:[21]

[20] The Tiñggiáns, or Itnegs, should be excepted, as there are important and accurate accounts of these people by Gironière, Reyes, Worcester, Cole, and others.

[21] According to the translation by James A. Robertson in Blair and Robertson, The Philippine Islands (1906), 33, 167–171.

In order that your most illustrious Lordship may know the ceremonies that those people use in consecrating the swine, they first sound those large gongs. Then three large dishes are brought in; two with roses and with cakes of rice and millet, baked and wrapped in leaves, and roast fish; the other with cloth of Cambaia and two standards made of palm-tree cloth. One bit of cloth of Cambaia is spread on the ground. Then two very old women come, each of whom has a bamboo trumpet in her hand. When they have stepped upon the cloth they make obeisance to the sun. Then they wrap the cloths about themselves. One of them puts a kerchief with two horns on her forehead, and takes another kerchief in her hands, and dancing and blowing upon her trumpet, she thereby calls out to the sun. The other takes one of the standards and dances and blows on her trumpet. They dance and call out thus for a little space, saying many things between themselves to the sun. She with the kerchief takes the other standard, and lets the kerchief drop, and both blowing on their trumpets for a long time, dance about the bound hog. She with the horns always speaks covertly to the sun, and the other answers her. A cup of wine is presented to her of the horns, and she dancing and repeating certain words, while the other answers her, and making pretense four or five times of drinking the wine, sprinkles it upon the heart of the hog. Then she immediately begins to dance again. A lance is given to the same woman. She shaking it and repeating certain words, while both of them continue to dance, and making motions four or five times of thrusting the lance through the heart of the hog, with a sudden and quick stroke, thrusts it through from one side to the other. The wound is quickly stopped with grass. The one who has killed the hog, taking in her mouth a lighted torch, which has been lighted throughout that ceremony, extinguishes it. The other one dipping the end of her trumpet in the blood of the hog, goes around marking with blood with her finger first the foreheads of their husbands, and then the others; but they never came to us. Then they divest themselves and go to eat the contents of those dishes, and they invite only women (to eat with them). The hair is removed from the hog by means of fire. Thus no one but old women consecrate the flesh of the hog, and they do not eat it unless it is killed in this way.

This ceremony, almost the same as described by Pigafetta, is in use among the Ifugaos to-day, although it is performed by men instead of by women and differs in a few minor details.

I shall next discuss the religion and mythology of the Igorots, Bontoks, and Ifugaos, treated separately and in more detail.

THE IGOROTS

These people occupy the subprovinces of Benguet, Lepanto, and Amburayan in the Mountain Province. The region of their purest culture is in northern Benguet and eastern Lepanto. Of the religion of this region, we have considerable information from the writings of Fr. Angel Perez, an Augustinian missionary; Sr. Sinforoso Bondad of Cervantes, Lepanto; and a number of personal observations made by myself.

The sun gods, and the deities of the sky world in general, occupy the most important place in the Igorot religion. Place-spirits and animal deities are likewise highly developed. At a place called Kágubátan,[22] at the foot of the sacred mountain Múgao in eastern Lepanto, is a small lake full of sacred eels which the people guard with great care. They believe that if these eels were killed the springs would all dry up and they would have no water for their terraced rice fields. The eels are fed every day with rice and sweet potatoes by the children of the village, who, as they approach the lakelet, sing a peculiarly sweet and mournful song, upon hearing which the eels all rise to the surface of the water and approach the shore to receive their food.

The Igorots have both priests and priestesses, and they perform many public and private ceremonies, both for the benefit of the great deities and for the countless minor spirits which inhabit the sacred mountains, cliffs, groves, trees, and bushes that are scattered throughout the Igorot country. Sacrifices of pigs or chickens are made at every ceremony. The ceremonies of the common people are more or less of a private nature, but those of the aristocracy and of wealthy men are nearly always public and general. The greatest ceremonies are those connected with war and marriage and the great public festival which proves a man's right to the title of nobility.

The Igorots have a high code of morals which is closely associated with their religious belief. They also have a scientific calendar and a considerable knowledge of astronomy which has effected many modifications in their religion. Their mythology is extensive, and they have a rich unwritten literature of epic poems, hero-stories, and historical legends. Most of the myths are too long to be given here, but for purposes of comparison I give the following short one which was collected by the Dominican, Fr. Mariano Rodriguez:

It has been mentioned above that among their tales and stories they preserve a tradition relating to their origin and beginning, after a great and dreadful flood which, a very long time ago, as their old people relate, covered the earth. All the inhabitants except a brother and sister were drowned. The brother and sister, though separated from each other, were saved, the woman on the summit of the highest mountain in the District of Lepanto, called Kalauítan, and the man in a cave of the same mountain.

[22] Note the similarity of this place-name to the Kágbubátañg of the Manóbo legend, p. 89.

After the water had subsided, the man of the cave came out from his hiding place one clear and calm moonlight night, and as he glanced around that immense solitude, his eyes were struck by the brightness of a big bonfire burning there on the summit of the mountain. Surprised and terrified, he did not venture to go up on the summit where the fire was, but returned to his cave. At the dawn of day he quickly climbed toward the place where he had seen the brightness the preceding night, and there he found huddled up on the highest peak his sister, who received him with open arms. They say that from this brother and sister so providentially saved, all the Igorots that are scattered through the mountains originated. They are absolutely ignorant of the names of those privileged beings, but the memory of them lives freshly among the Igorots, and in their feasts, or whenever they celebrate their marriages, the aged people repeat to the younger ones this wonderful history, so that they can tell it to their sons, and in that way pass from generation to generation the memory of their first progenitors.[23]

This myth of the great flood, and of the brother and sister who survived it, is common throughout northern Luzon. It is most highly developed by the Ifugaos, as we shall later see.

THE BONTOKS

The Bontoks are sometimes wrongly called Igorots, but have no more right to that name than have the Ifugaos. They are a distinct people, occupying a part of the subprovince of Bontok. They are in some respects unique, and possess certain social institutions and traits which have not been found elsewhere in the Philippines. Most of our information concerning them is contained in the monograph by Jenks;[24] in the bulky volume on the language by Seidenadel;[25] and in my own observations on the general culture and ethnology of the Bontoks. Jenks' monograph is excellent as an economic paper, but the few myths given are mostly children's stories. Seidenadel [26] gives several myths in the form of texts, and some of these I have freely translated as follows:

[23] Translated by Roberto Laperal from "Igorrotes," by Angel Perez. Manila (1902), 319–320.

[24] Jenks, Albert Ernest, The Bontoc Igorot, *Pub. P. I. Ethnol. Surv.* (1905), 1.

[25] Seidenadel, Carl Wilhelm, The First Grammar of the Language Spoken by the Bontoc Igorot, with a Vocabulary and Texts. The Open Court Publishing Co., Chicago (1909).

[26] *Opus. cit.*, 485–510. Seidenadel gives an interlinear literal translation, which is, in some places, slightly inaccurate. I have made a new free translation directly from the Bontok. The text was told in the form of a story rather than that of a myth, and contains much extraneous matter which I have omitted.

STORIES ABOUT LUMÁWIG

The sons of Lumáwig went hunting. In all the world there were no mountains, for the world was flat, and it was impossible to catch the wild pigs and the deer. Then said the elder brother: "Let us flood the world so that mountains may rise up." Then they went to inundate at Mabúd-bodóbud. Then the world was flooded. Then said the elder brother: "Let us go and set a trap." They used as a trap the head-basket at Mabúd-bodóbud. Then they raised the head-basket and there was much booty: wild pigs and deer and people—for all the people had perished. There were alive only a brother and sister on Mt. Pókis. Then Lumáwig looked down on Pókis and saw that it was the only place not reached by the water, and that it was the abode of the solitary brother and sister. Then Lumáwig descended and said: "Oh, you are here!" And the man said: "We are here, and here we freeze!" Then Lumáwig sent his dog and his deer to Kalauwítan to get fire. They swam to Kalauwítan, the dog and the deer, and they got the fire. Lumáwig awaited them. He said: "How long they are coming!" Then he went to Kalauwítan and said to his dog and the deer: "Why do you delay in bringing the fire? Get ready! Take the fire to Pókis; let me watch you!" Then they went into the middle of the flood, and the fire which they had brought from Kalauwítan was put out! Then said Lumáwig: Why do you delay the taking? Again you must bring fire; let me watch you!" Then they brought fire agaïn, and he observed that that which the deer was carrying was extinguished, and he said: "That which the dog has yonder will surely also be extinguished." Then Lumáwig swam and arrived and quickly took the fire which his dog had brought. He took it back to Pókis and he built a fire and warmed the brother and sister. Then said Lumáwig: "You must marry, you brother and sister!" Then said the woman: "That is possible; but it is abominable, because we are brother and sister!" Then Lumáwig united them, and the woman became pregnant. They had many children * * * and Lumáwig continued marrying them. Two went to Maligkoñg and had offspring there; two went to Gináañg and had offspring there; and the people kept multiplying, and they are the inhabitants of the earth * * *. Moreover, there are the Mayinit-men, the Baliwañg-men, the Tukúkan-men, the Kaniú-men, the Barlig-men, etc. Thus the world is distributed among the people, and the people are very many! * * *

Another story runs as follows:

The brother-in-law of Lumáwig said to him: "Create water, because the sun is very hot, and all the people are thirsty!" Then said Lumáwig: "Why do you ask so much for water? Let us go on," he continued, "I shall soon create water." Then they went on, and at last his brother-in-law said again: "Well, why do you not create water? It should be easy, if you are really Lumáwig!" Then said Lumáwig: "Why do you shame me in public?" And then they quarreled, the brothers-in-law. Then they climbed on up the mountain, and at last the brother-in-law said

again: "Why do you care nothing because the people are thirsty, and you do not create water?" Then said Lumáwig: "Let us sit down, people, and rest." Then he struck the rock with his spear, and water sprang out. Then he said to the people: "Come and drink!" And his brother-in-law stepped forth to drink, but Lumáwig restrained him, saying: "Do not drink! Let the people drink first, so that we shall be the last to drink." And when the people had finished drinking, Lumáwig drank. Then he said to his brother-in-law: "Come and drink." Then the brother-in-law stooped to drink, and Lumáwig pushed him into the rock. Water gushed out from his body. Then said Lumáwig: "Stay thou here because of thy annoying me!" Then they named that spot *ad Isik*.[27] Then the people went home; and the sister of Lumáwig said to him: "Why did you push your brother-in-law into the rock?" Then said Lumáwig: "Surely, because he angered me!" Then the people prayed and performed sacrifices. * * *

In the above stories we see the recurrence of the flood myth and the origin of fire, or rather the manner in which men received it. The story of bringing water out of a rock is interesting, and occurs again in Ifugao mythology in a slightly different form. It is possible, of course, that this is a biblical story which was brought in by some wandering Christians several generations past; but the flood legend is certainly native, and I see no good reason why the story of the miraculous drawing of water from a rock should not also be a native development in spite of its similarity to the Hebrew myth.

The Bontoks have hundreds of myths and stories about Lumáwig, who corresponds to the Ifugao Líddum, who is the good god who gave men fire, animals, plants, and all the useful and necessary articles of daily life. These myths are of great value, and it is to be hoped that a full collection of them will some day be made.

The Bontok religion is, on the whole, somewhat less developed than that of the Igorots and Ifugaos. The same general beliefs are held, however, and the ceremonial life is similar. Priests are the rule, rather than priestesses; and the same sacred animals are used, as in the other areas. In the social organization, the clan system is in a more perfect state of development than among any other people in the Philippines.

I shall now take up the last religion to be discussed, and the one which is at the same time the most highly developed:

[27] Place of anger.

THE RELIGION AND MYTHOLOGY OF THE IFUGAO PEOPLE OF NORTHERN LUZON [28]

The subject of the Ifugao religion is an extensive one, and I have no intention of discussing it in detail here. I shall merely give a few general facts, and a few of the more interesting myths. In addition to some minor papers by the Dominican fathers Malumbres and Campa, most of our information concerning the Ifugao religion is contained in three extensive manuscript monographs.[29] The myths that I shall give here are selected from the first and third of these manuscripts, and the general facts are taken from all three.

BELIEFS AND MYTHS OF THE KIÁÑGAN IFUGAOS

The Ifugao conception of the universe differs considerably in the different religious districts.[30] The Western Ifugao and Central Ifugao beliefs are closely associated, but stand quite apart from those of Kiáñgan Ifugao. The people of the latter area think of the universe as being composed of a large number of horizontal layers which are very similar one to the other. The upper face of each of these layers is of earth, while the

[28] There are about 127,000 Ifugaos, nearly all living in the subprovince of Ifugao. They are divided into a large number of hereditary clans, each of which has its own social and political organization. They are an agricultural people, and have developed their great stone-faced terraced rice fields to an extent probably not equaled elsewhere in the world. I do not believe that the physical type, language, or culture of these people is wholly a native development. The evidence seems to indicate that the present-day Ifugaos are the result of mixture, perhaps one or more thousand years ago, of several widely different native types with an incoming people of high culture. Indications seem to point to the highlands of Burma as the original home of this highly-cultured people, but this is a supposition that will require proof. Within historic times the Ifugaos have been almost entirely free from mixture of any sort.

[29] 1.—"The Religious Beliefs of the Kiáñgan Ifugaos," a manuscript of some 300 pages, by Juan Fernández Villaverde, translated and annotated by myself with the assistance of Mr. John M. Garvan.

2.—"The Religion of the Kiáñgan Ifugaos," a manuscript of 350 pages, by Roy Franklin Barton, with notes by myself.

3.—Unpublished notes. "The Religion of the Central Ifugaos," a manuscript of about 300 pages, by myself.

[30] The subprovince of Ifugao may be divided into five general culture areas which can be also considered as religious districts. These are: Kiáñgan Ifugao, Western Ifugao, and Central Ifugao, speaking the Pure Ifugao dialect; and Alímît Ifugao and Mayóyao Ifugao, speaking the Sub-Ifugao dialect. (Plate I.) Very little is known of the religion of Alímît Ifugao and Mayóyao Ifugao, and they will not be further discussed in this paper.

lower face of each of them is of a smooth blue stone called *múliñg*.[31] The layer on which we live is called the Earth World (Lúta). The four layers above us constitute the Sky World (Dáya), and are called, in order from the top down, Húdog, Luktág, Hubulán, and Kabúnian. The last is the layer immediately above the Earth World, and it is the blue-stone underfacing of this layer that we call the "sky." The Under World (Dálom) consists of an unknown number of layers beneath the one on which we live. All of the layers meet in the farthest horizon,[32] where lie the mythical regions of the East (Lágud) and other places.

Some of the Kiáñgan priests seem to have developed the further idea that this Dáwi, or farthest horizon, is in the form of a great celestial globe that surrounds the universe, forming its boundary, the inside face of which can be distinguished in the hazy distance where the deep blue of the sky fades into a very light blue or whitish color.[33] The Earth World, or layer on which we live, lies approximately at the center of the universe. It is therefore the largest layer, and the layers of the Sky World and Under World grow successively smaller as they approach the zenith and nadir of the celestial globe, the boundary of the universe.[34]

The inhabitants of the universe consist chiefly of an incalculable number of greater and lesser deities and spirits.[35] In addition to these, there are the souls of men, animals, and plants.

[31] Or *búliñg* (?).

[32] Dáwi (?).

[33] It can only be seen at this point for the reason that the earth beneath and the blue-stone underfacing of Kabúnian immediately above cut off the view. Ifugao astronomical knowledge, plus the circular nature of the horizon and the apparent slope of the whitish band above it, has doubtless given rise to this belief in a celestial globe surrounding the universe.

[34] The Ifugaos have no belief, that I have ever been able to discover, as to the *origin* of the universe. To their minds it has always existed and will always continue to exist.

[35] In the three previously mentioned manuscripts on the Ifugao religion, between two and three thousand deities are spoken of by name, and this is only a fraction of the number known to the Ifugaos. Of course, only a few of them are really *great* deities, but even such may be counted by hundreds. Of the very diverse and all-inclusive character of these deities, no accurate idea can be given within the brief limits of this paper. Suffice it to say there are gods of war, of industry (such as weaving, metal-working, etc.), and of beauty and love; nature-gods, cannibalistic gods, evil deities, mythical monsters, messenger spirits, guardian spirits; and hosts of mischievous elves and fairies.

They have always existed in the various regions of the universe, and were brought to the Earth World by the gods. Men are descended from the gods of the Sky World, as we shall see in the myths.

The mythology of the Kiáñgan Ifugaos is rich and varied. As an introduction to it, I have selected the following:

ORIGIN OF THE IFUGAOS [36]

I

Origin of the mountains.—The first son of Wígan, called Kabigát, went from the sky region Húdog to the Earth World to hunt with dogs. As the earth was then entirely level, his dogs ran much from one side to another, pursuing the quarry, and this they did without Kabigát hearing their barking. In consequence of which, it is reported that Kabigát said: "I see that the earth is completely flat, because there does not resound the echo of the barking of the dogs.[37]" After becoming pensive for a little while, he decided to return to the heights of the Sky World. Later on he came down again with a very large cloth, and went to close the exit to the sea of the waters of the rivers, and so it remained closed. He returned again to Húdog, and went to make known to Boñgáboñg that he had closed the outlet of the waters. Boñgáboñg answered him: "Go thou to the house of the Cloud, and of the Fog, and bring them to me." For this purpose he had given permission beforehand to Cloud and Fog, intimating to them that they should go to the house of Baiyuhíbi,[38] and so they did. Baiyuhíbi brought together his sons Tumiok, Dumalálu, Lum-údul, Mumbatánol, and Inaplíhan, and he bade them to rain without ceasing for three days. Then Boñgáboñg called to X . . . and to Mañgiuálat, and so they ceased. Wígan said, moreover, to his son Kabigát: "Go thou and remove the stopper that thou hast placed on the waters," and so he did. And in this manner, when the waters that had covered the earth began to recede, there rose up mountains and valleys, formed by the rushing of the waters.[39] Then Boñgáboñg called Mumbá'an that he might dry the earth, and so he did.

II

The first inhabitants of the Earth World.—Such being the state of affairs, Kabigát went to hunt once again; and, while following the dogs, that were chasing a quarry, he made a thrust with his spear into a

[36] Collected by Juan Fernández Villaverde, in 1894, from a celebrated Ifugao priest, Duminóñg of Kiáñgan. Translated, corrected, and annotated by myself with the assistance of Mr. John M. Garvan.

[37] This statement is significant, as it shows an understanding of the true cause of the echo. Ifugao cosmographical and astronomical knowledge is not very primitive, as a careful study of this myth will clearly demonstrate.

[38] God of the rain.

[39] Ifugao knowledge of the part played by erosion in the formation of the topographical features of the earth is clearly shown.

spring (or fountain) at the foot of a large tree. Immediately Kabigát returned to Húdog, bringing with him the captured quarry. When he had dressed and eaten the savory game, Kabigát said to his father Wígan that he had seen on the Earth World a spring and very good and beautiful trees for timber with which to make houses, and that accordingly he was desirous of going down to live at such a delightful place. His father answered him that if he so desired he might do so.

Some time after Kabigát had departed, and after he had cut excellent timber wherewith to build a house, Wígan said to his daughter Búgan: "Look, daughter! Thy brother Kabigát is down in Kai-áñg̃ building a house. I think that it would behoove thee to look after his meals." Búgan volunteered to descend with such a design. This intention having been carried out, she lodged herself in the upper part of the house, and her brother dwelt in the lower part.

In the meantime, Kabigát, reflecting on his solitude and want of company, and, seeing that the domestic chickens, even though related among themselves, produced other roosters and hens, resolved to know carnally his sister Búgan, during her sleep. Some time having expired, the sister noted that she had fruit in her womb. * * * Such was the sadness and melancholy that came upon her, that she did nothing else but to weep and bewail herself, and to seek by some means alleviation for her sorrow through a violent death. She pretended to her brother that she was going to look for *ísda*,[40] but what she did was to follow the course of the river until she arrived at its mouth in Lágud (the Eastern World). Upon arriving at the shore of the sea, she remained there weeping and waiting for someone to take away her life in a violent way. Soon her brother Kabigát (who had followed her) appeared there, and Búgan, upon discerning him, cast herself into the depths; but, instead of going to the bottom, she stopped at the rice granary of N̄gílîn Mañg̃óñg̃ol. The brother, who witnessed the tragedy, did not stop at trifles but at once cast himself after her into the depths of the ocean, stopping, by a strange coincidence, at the very same rice granary as his fugitive sister and spouse. She continued there, bemoaning her misfortune, when, behold! N̄gílîn, hearing her plaint, approached and inquired the cause of her affliction. She related to him her trouble, how she had conceived by her carnal brother when she was asleep. N̄gílîn soothed her as follows: "Do not be afflicted, daughter, by that. Are not the fowls of Kai-áñg̃ related among themselves, and yet they beget just like those that are not so?" The maiden became somewhat calm, but still, out of shame for what had happened, she refused to eat what N̄gílîn offered her. Then he said to her: "In order that thou mayst further assure thyself of what I tell thee, and in order that thou mayst quiet thyself, let us go and consult my elder brother Ambúmabbákal." And so they did. Ambúmabbákal, having been informed of the circumstances, burst out laughing and said to them: "Peradventure have ye not done well and righteously, there not being in existence any others but yourselves to procreate? However, for greater assurance, let us all go together to

[40] Shellfish, greens, fruits, meats, or fish that constitute the savory part of the meal, as contrasted with *kánon* which refers only to staple foods such as rice, sweet potatoes, etc.

set forth the case before Muntálog my father." Muntálog, having heard their story, applauded the conduct of the solitary brother and sister. He told them, accordingly, to calm themselves and to rest there for a few days,—and so they did.

III

The bringing of fire to the Earth World.—On the third day, Kabigát requested leave to return, but Muntálog answered: "Wait one day more, until I in my turn go to my father Mumbónañg." Muntálog found his father and mother seated facing each other; and, upon his arrival, his mother, Mumboniag, came forward and asked him: "What news do you bring from those lower regions, and why do you come?" The father also became aware of the presence of his son, through the questioning of the mother, and inquired likewise as to the reason of his coming. Muntálog answered: "I have come, father, to ask thee for fire for some Ifugaos who remain in the house of Ambúmabbákal." "My son," the father replied, "those Ifugaos of yours could not arrive at (or, come to) Mumbónañg without danger of being burned to cinders." Then he continued: "It is well! Approach me!"[41] Muntálog accordingly approached Mumbónañg, who said to him: "Seize hold of one of those bristles that stand out from my hair," and so Muntálog did, noticing that the said point faced the north, and he placed it in his hand. Then Mumbónañg said to him again: "Come nigh! Take this white part, or extremity, of the eye that looks toward the northeast, toward the place called Gonhádan." And he took it and placed it in his hand. And Mumbónañg said to him once more: "Come near again, and take the part black as coal, the dirt of my ear which is as the foulness of my ear." And so he did. Then Mumbónañg said to Muntálog: "Take these things and bring them to thy son Ambúmabbákal and to Ñgílîn, in order that the latter may give them to the Ifugaos." And he said again to Muntálog: "Take this white of my eye (flint), this wax from my ear (tinder), and this bristle or point like steel for striking fire, in order that thou mayst have the wherewith to attain what thou seekest (that is, *fire*), and to give gradually from hand to hand to the Ifugao; and tell him not to return to live in Kai-áñg, but to live in Otbóbon, and cut down the trees and make a clearing there, and then to get together dry grass; and that they make use of the steel for striking fire, holding it together in this manner, and burying it in the grass. And on making the clearing if they see that snakes, owls, or other things of evil omen approach, it is a sign that they are going to die or to have misfortunes. But if they do not approach them, it is a sign that it will go well with them in that place; that the soil will be productive, and that they will be happy."

IV

The journey to Ifugao land from the East.—Upon the return of Muntálog, at the termination of the fourth day, he said to Búgan and Kabigát: "Now ye can go but let Ñgílîn and Ambúmabbákal accompany

[41] Mumbónañg has a head covered with bristles, just like a porcupine, but radiating and sharp pointed like nails facing outward to penetrate any object on the outside. He possibly represents some constellation.

you as far as the house of Liñgan,[42] in order that there they may make the cloth or clothes necessary for wrapping the child according to the usage of the Earth World."

Liñgan actually furnished to them the cloth and the seamstress to make the swaddling clothes for the child—and then they continued their journey unto the house of Ambúmabbákal. The latter said to them: "Take this cloth and this pair of fowls, male and female, and do not return to live at Kai-áhañg but go to Otbóbon." And Ambúmabbákal accompanied them to the house of Ñgílîn á Mañgóñgan[43] and said to the latter: "It will be well if we beseech the *búni*[44] to take pity on these poor people, considering the great distance that still remains to them unto Otbóbon, and keeping in mind also the great heat that prevails." So they did, saying: "Ye *búni*, take pity upon these unhappy ones and shorten for them the distance." The prayer was heard, and after two or three days they found themselves at the end of their journey.

V

The peopling of Ifugao land.—Having arrived at Otbóbon, they built a temporary hut on fertile land. Later they constructed a good house, and it was just after it was finished that Búgan gave birth to a healthy boy; and the fowls also procreated.

The child grew a little, but there came to him an unlooked-for sickness. Then Kabigát remembered that Ambúmabbákal had advised them to offer fowls to their ancestors in case any sickness should come upon them. So they killed a rooster and a hen, and offered them to Ampúal, Wigan, and their other ancestors. The child recovered and began to grow very robust and plump. They named him Balitúk. Búgan conceived again, and she gave birth to a strong girl, to whom she gave the name of Liñgan. These children grew up, and, having attained a marriageable age, were married like their parents, and gave origin to the Silipanes.[45]

Their parents, Kabigát and Búgan, had a second son, on whom they placed the name Tad-óna, and then another daughter, whom they called Inúke. She and Tad-óna did what their parents and brother and sister had done, and gave birth to Kabigát, the second, and Búgan, the second. These latter two, imitating the preceding ones, were united in wedlock and begot sons and daughters who peopled the remainder of the Ifugao region.[46]

VI

Establishment of religious ceremonies.—Upon their marriage Tad-óna and Inúke did not offer pigs or fowls to the *búni* as was customary. This being observed by Líddum from Kabúnian, he descended and asked them: "Why have ye not offered sacrifices?" They answered him that they were ignorant of such a custom or ceremony. Then Líddum returned to Ka-

[42] The goddess of weaving.

[43] Or *Ñgílin an Maknóñgan* (?).

[44] Deities which the Ifugaos believe to be their ancestors.

[45] The people of Alímît Ifugao. (Plate I.)

[46] Tad-óna and Inúke are recognized as common ancestors by all the Kiáñgan Ifugaos, and the myths about them are legion.

búnian and brought them the yeast with which to make *búbûd*, or wine from fermented rice; and he taught Tad-óna the method of making it, saying: "Place it in jars on the third day," and he returned to the Sky World. On the fifth day he came down again to teach them the manner of making the *mum-búni*.[47]

Some version of the above myth is known to the people of every Ifugao clan, although the details of the story vary considerably in the different culture areas. The myth is also known to the Igorots and Bontoks, as we have already seen. I have in my possession some twenty different versions that have been collected from various clans of Central, Western, and Kiañgan Ifugao. These may all be classified into two general types, one of which is represented above.[48] An example of the other type, entitled The Ifugao Flood-Myth, is given later in this paper under the heading Central Ifugao Beliefs.

The god Wígan is one of the greatest and best known figures in Ifugao mythology. He has three sons, Kabigát, Balitúk, and Ihîk, and one daughter, Búgan. The following story about Ihîk is especially interesting because of its resemblance to one of the Bontok myths previously given.

THE STORY OF IHÎK [49]

Ihîk nak Wígan, in company with his brothers Kabigát and Balitúk, went to catch fish in the canal called Amkídul at the base of Mt. Inúde. After catching a supply of fish, they strove to ascend to the summit of the mountain; but, ever as they went up, Ihîk kept asking his brothers for water to satiate his devouring thirst. They answered him: "How can we find water at such an elevation? Water is found at the base of the mountains but not at their summits!" But Ihîk kept on importuning them. At last, when they were in the middle of their ascent, they came to an enormous rock. Balitúk struck the rock with his spear, and instantly there burst forth a large jet of water.

Ihîk desired to drink first but they deterred him, saying: "It is not just that thou shouldst drink first, being the last born of us brothers!" Then Kabigát drank, and afterwards Balitúk. Just as Ihîk was about to do so, Balitúk seized him and shoved the whole of his head under the rock, adding: "Drink! Satiate thyself once for all, and serve henceforth as a tube for others to drink from!" And so it came to pass that Ihîk on receiving the water through his mouth sent it forth at the base of his trunk. He said to his brothers: "You are bent on making me take the part of a water-spout! I shall do so, but bear in mind that I shall

[47] Ceremonies to the *búni*, accompanied by prayers and sacrifices.

[48] A version of the same type, but very different in detail, is contained in the unpublished notes of Mr. Roy Franklin Barton. I have also several others from the same area (Kiáñgan Ifugao) that were collected by Lieut. Maximo Meimban.

[49] For bibliographical reference, see Villaverde, *loc. cit.*

also take just vengeance on your descendants for this injury." In view of this threat, Kabigát and Balitúk did not dare to make use of the improvised fountain, and so they returned home.

This myth, which is very long, then relates how certain of the great deities befriended Ihîk by setting him free and assisting him in obtaining vengeance on his brothers and their descendants.

Another myth, showing an interesting resemblance to a Manóbo myth already given, tells how the sky region of Manaháut,[50] which was once very near the Earth World, was raised to its present position. The cannibalistic and voracious appetite of Manaháut was causing the slow extermination of the human race,[51] and the aid of the gods was invoked. The Ifugaos have a number of powerful deities who always remain in a sitting posture. One of these suddenly rose up, and, with his head and shoulders, thrust the sky region of Manaháut to a vast height above the earth, thereby preventing the extermination of the people.[52]

As a final example of Kiáñgan Ifugao mythology, I give the following story which is one of the best specimens of Ifugao literature.

THE STORY OF BÚGAN AND KIÑGGÁUAN, OR THE MARRIAGE OF A GODDESS WITH A MAN[53]

The wife of the god Hinumbían is Dakáue. She has no children except a daughter called Búgan. This Búgan was with her parents in Luktág. Let it be noted that these divinities of the highest region of the Sky World do not see directly that which takes place in the lower spheres, but the first calls the second, and the second the third, etc.

[50] Manaháut is the greatest and most hated *evil* deity of the Ifugaos.

[51] The memory of cannibalism so common in Ifugao mythology possibly dates back to a period of contact with human cannibals.

[52] The Ifugao version of the story states that the sky was so low that it interfered with the plying of the spear, while the Manóbo story relates that the rice pestle would strike against it. It is possible that this myth dates back to cave-dwelling ancestors—for the low roof of a cave would be an inconvenience of the same character as that which is here ascribed to the sky.

A further proof of this is the following Tagálog myth furnished me by Mr. Roberto Laperal: "In former times the sky was very low and could be touched with the hand; when men were playing, they would strike their heads against it whenever they jumped upward. This made them impatient, and one day they began to throw stones at the sky. The great god Bathala was very angry and removed the sky to its present position."

[53] For bibliographical reference, see footnote 36. A less complete version of this myth, differing somewhat in detail, is given by Barton in the second manuscript mentioned in footnote 29.

According to this order, the first or principal god, known as Buñgóñgol, charges or gives orders to his son Ampúal, who in turn orders his son Balittíon, and the latter orders and charges Líddum of the lowest sky region, or Kabúnian. This Líddum is the one that communicates directly with the Ifugaos. The said Búgan, daughter of Hinumbían, was at that time a maiden, while in Luktág, and her uncle Baiyuhíbi[54] told her to go down and amuse herself in the third sky region, Hubulán. So, according to the wishes of her relatives, she went down to Hubulán where Dologdógan, the brother of Balittíon, was. The said Dologdógan had gone to Hubulán to marry another Búgan. The first Búgan, daughter of Hinumbían, had been advised to marry in Luktág, but she did not wish to do so, and so they told her to go off and divert herself in Hubulán. Having settled down in this sky region, her uncles advised her to get married there, but neither did she wish this. In view of her attitude on this question, Dologdógan exhorted her to descend to Kabúnian, and go to take her abode in the house of Líddum her relative and the son of Amgalíñgan. The said Líddum wished her to marry in Kabúnian, but she also refused to do this. Near the house, or town, of Líddum (whose wife is called Líñgan) there was a village called Habiátan, and the lord of the village also bore this name. Such being the case, the said Habiátan went to the house of Líddum, and, upon seeing the young Búgan in the condition of maidenhood, he asked Líddum: "Why does this maid not marry?" The former answered him: "We have counseled her to it, but she does not wish to do so. I, upon seeing that she did not wish to get married, nor to follow my advice, said to her: 'Why dost thou not get married?' She began to laugh. I replied: 'Then, if thou dost not wish to get married in Kabúnian, it were better for thee to return to thy people and thy family of Luktág,' but she answered: 'That is not necessary, and I should like to stay with thee in thy house—and I shall take care to get married at my pleasure, when I see or meet someone of my liking, and then I shall tell thee.'" Habiátan, after hearing this story of Líddum, said to him: "According to this, I shall take the young Búgan to my *rancheria* and house in Habiátan to see if she wishes to marry my son Bagílat."[55] To which Líddum rejoined: "If Búgan so desire, it goes without saying that she can accompany thee at once." The maiden having been consulted, assented, and went off with Habiátan to his house and village. Having arrived at the said place, and after Búgan had observed somewhat the young Bagílat, as if Habiátan had asked her whether she desired to marry him, she answered: "How am I to wish to marry him (Bagílat), grim and fierce as he is, and making use of such an extraordinary spear! Moreover, he never stops—but is always running around in all parts of the Sky World, through the north and the south, through the east and the west;" and she told Habiátan that she did not wish to marry his son Bagílat, the Lightning, because that through his effects he harmed plants, fruits, and possibly might injure even herself. Then said Habiátan: "Thou art somewhat fastidious, and I see that thou couldst with great difficulty get married in these regions; it would be better that thou return once more to thy land." She answered that she did not desire to return any more to her people, and that accordingly she would betake

[54] God of the rain. [55] God of the lightning.

herself to some other point more to her liking. This dialogue being completed, she went down from the house of Habiátan, and, casting a glance at the four cardinal points, she saw that the weather was clear and calm, and descried on the Earth a place called Pañgagáuan, over (or on) Umbuk, where there was an Ifugao called Kiñggáuan—a young man, unmarried, naked, and without a clout (which he had thrown away because of its age), because he was engaged in making pits, or wells, for catching deer with a trap (according to the custom)—and there he had a hut. Upon seeing him Búgan exclaimed: "Oh! the poor man! and how unfortunate!" And, hiding the occurrence from Habiátan, she determined to return to her sky region of Luktág in order to manifest to her father, Hinumbían, that it was her desire to descend to the Earth World in order to get married with that poor Ifugao.

The paternal permission having been obtained, she made ready the necessary provisions—consisting of a vessel of cooked rice and a clout (or *bahág*). In this fashion she proceeded to Kiñggáuan's hut and entered it, saying: "Who is the owner of this hut?" "I," answered Kiñggáuan, "but I am ashamed to approach thee, because thou art a woman and I am naked." To which she replied: "Never mind! because here I have a clout for thee." But he did not approach for shame; and so she threw him the clout from afar, in order that he might cover himself. The surprised man expressed to her his astonishment, saying: "Why dost thou approach here, knowing that the appearance of a woman, when men are engaged in such an occupation, is of evil omen for the hunt?"[56] And she replied to him: "By no means shall it come to pass as thou thinkest, but, on the contrary, thou shalt be extremely lucky in it. For the present let us eat together, and let us sleep this night in thy hut. To-morrow thou shalt see how lucky we are in the hunt." The following day, upon going to visit the pits, they actually found them full. Kiñggáuan killed the quarry and spent the rest of the day in carrying the carcasses to his hut. He kept alive only two little pigs, a male and a female, which he delivered to Búgan that she might tie them in the dwelling-place while he was bringing in the rest of the dead game. On the second day Búgan asked the solitary one: "Why dost thou dwell in such evil places?" Kiñggáuan answered her: "Because my parents are so parsimonious in giving me what I need." Then said Búgan to him: "Let us go to Kiáñgan," and he consented. Leaving, then, the dead game in the hut, they carried with them only the two live "piglets." Kiñggáuan carried the male one, and Búgan the female one—arriving at the above-mentioned place on the nightfall of the second day.

Having arrived at Kiáñgan, they took up their lodging in the house of Kiñggáuan's mother—the man entering first and then Búgan. The mother of the former was surprised, and asked him: "Who is this woman?" The son answered: "I was at the hunting place and she presented herself to me there and I do not know whence she comes." The aged mother after having looked at them a little while—when seated—addressed herself to Búgan and asked: "Who art thou? How dost thou call thyself? From

[56]It is a common belief, widespread in the Philippines, that the appearance of a woman at a place where men are hunting will render the search for game fruitless. J. M. GARVAN.

whence dost thou come?" The maiden replied that her name was Búgan, that she was the daughter of Hinumbían and Dakáue, and that she belonged to the sky region of Luktág. But the reason of her descent to that terraqueous region, and of accompanying her son, was her having seen him so poor and deserted * * * "for which reason I took pity on him and came down to visit him and to furnish him with an abundance of game" * * * and she added that on the following day the mother should send many people to collect the dead game which they had left in the lonely hut of her son. By a coincidence, the mother of the young man was also called Búgan, with the addition of *na kantaláo*.

During all this, the young couple had already been united in the bond of matrimony—without any of the prescribed formalities—at the place called Pañgagáuan, and Búgan gave birth to a vigorous son to whom she gave the name Balitúk. The little pigs, also, which they had brought, gave forth their fruit. The child grew a little, but he did not yet know how to walk. His mother, Búgan, as a being from the Sky World, did not eat like the rest of the people of Kiáñgan, but desired only boiled rice, birds, and meat of game. Those of that region bore her much envy because of her being a stranger; and, because they knew she did not like certain vegetables of theirs, they strove to make her depart from their town and to betake herself to her birthplace of Luktág in the sky. Their envy toward her increased upon their seeing the abundance of her fowls and pigs. With the object, then, of disgusting her, and of driving her away, they attempted to surround her house with certain garden stuffs, greens, and fish. With these they succeeded effectively in making Búgan fall sick with an intense itch and fever; for which reason she abandoned that house and went to another place, while her husband moved to a rice granary. But they persecuted her again in her new place of lodging, surrounding it with the vegetables and other things spoken of above, and causing her nausea in a stomach accustomed to other food. In view of such wearisome tricks, Búgan proposed to Kiñggáuan her desire to return to her land with the new blossom of spring, their child. Her husband answered her: "I should well like to accompany thee, but I am afraid of ascending to so high a place." "There is no reason to be afraid," replied Búgan, "I myself shall take thee up in the *áyud* (a kind of hammock)." She accordingly strove to persuade him, but Kiñggáuan did not lay aside his fear; then she attempted to take him up bound to a rope, but neither did she effect this. During these labors, she soared aloft with the child to the heights of Luktág, but upon perceiving that her husband had not followed her she went down again, with her son in the band which the Ifugaos use for that purpose. (Plate III, fig. 2.) After conferring with Kiñggáuan, she said to him: "Thou seest the situation. I cannot continue among thy countrymen, because they hate me unto death. Neither dost thou dare to ascend unto Luktág. What we can do is to divide our son," * * * and, seizing a knife, Búgan divided her son Balitúk in the middle, or just above the waist, and made the following division: The head and the rest of the upper trunk she left to Kiñggáuan—that it might be easier for him to give a new living being to those upper parts—and she retained for herself the lower part of the trunk unto the feet; and as for the entrails, intestines, heart, liver, and even the very excrement, she divided

them—leaving the half for her husband. The partition having been completed, Búgan mounted to her heavenly mansion, taking with her the part of her son which fell to her lot, and, giving it a breath of life, she converted it into a new celestial being retaining the very name of Balitúk. On the other hand, the part which she had left to her husband, on the earth, began to be corrupted and decayed, because he, Kiñgáuan, had not been able, or did not know how, to reanimate it. The foul odor of the putrified flesh reached unto the dwelling place of Búgan in Luktág, and, having been perceived by her, she descended to Kabúnian in order to better acquaint herself with the happening. From Kabúnian she saw that the evil odor issued from the decomposition of the part of the entrails which she had left on the earth in charge of her husband, and which he had not reanimated. Then she broke forth in cries of grief, pity, and compassion—and, descending to Kiáñgan, she severely accused Kiñgáuan, saying unto him: "Why hast thou allowed our son to rot? And why hast thou not quickened him to life?" Upon which he answered that he did not understand the art of reanimation.

Búgan endeavored to remove the greatest possible portion of the corrupted part of her son. Consequently, she changed the head of Balitúk into an owl[57]—a nocturnal bird called *akúp* by the Ifugaos—whence the origin of the Kiáñgan custom of auguring evil from this bird, and the offering of sacrifices of fowls to Búgan, in order that no harm should come to them, and that the said owl should not return to them.

The ears she threw into the forest, and for that reason there come forth on the trees certain growths, like chalk, half spherical (certain species of fungi). The nose she threw away and changed it also into a certain species of shell which attaches itself to trees. Of the half of the excrement she made the bill of a small bird called *ído*, from which the Ifugaos augur well or ill, according to certain variations of its song.[58]

From the putrified tongue she produced a malady, or swelling, of the tongue in men, which is cured with a hot egg, or with a chicken, which they offer to their mother, Búgan.

From the bones of the breast she created a venomous serpent. From the heart she made the rainbow. From the fingers she made certain very long shells, after the form of fingers. From the hair, thrown into the water, she created certain little worms or maggots. From the skin she drew forth a bird of red color, called *kúkuk*. From the half of the blood she created the small bats (*litálît*). From the liver she drew

[57] It will be noted that most of the things created by Búgan from the corrupted half of Balitúk were pests and things of evil omen to torment the people of Kiáñgan as they had tormented her.

[58] *Ído*, or *ídu*, is the Ifugao name for the omen spirits. A certain small black and white bird called *pîtpît* is believed to be an omen spirit, and therefore it is also properly called *ído*. When an Ifugao is going on a journey and sees one of these birds, or hears its cry, he immediately stops and calls out to it. He tells it where he is going and why. If the bird flies away to one side or in a forward direction, it is a good sign; but if it flies backward along the path, uttering a sharp cry of fright, it is a very bad omen, and the man will probably return home and not continue on his journey until another day.

forth a certain disease of the breast. From the intestines she formed a class of somewhat large animals, resembling rabbits or rats (*amúnîn?*). From the bones of the arms she made pieces of dry or rotted wood that fall from trees upon passers-by who approach them.

The Balitúk that Búgan reanimated is in the sky region of Luktág.[59]

The myth just given is an example of one of the most interesting processes in the early development of literature. It is probable that originally it was only a simple origin myth, but it has been elaborated and developed until now it is worthy of its little niche in the world's literature.

[59] I am informed by Dr. Dean S. Fansler that he obtained from an Igorot of Túblai, Benguet, in May, 1910, a myth very similar to this story of Búgan and Kiñggáuan. The details are different, but some of the more important incidents are the same and I will give a brief summary of the myth here: A god named Dumágid, whose home is in one of the lower regions of the sky, came down to the earth and lived among the people. He taught the people many things, and often went hunting with them in the forest. But one day, when he was out in the woods alone, he met a beautiful girl by the name of Dúgai with whom he fell in love, and they were married. A son was born to them, and they named him Ovug. Shortly after this Dumágid informed the people that he must return to the Sky World to make report to the chief deity, Kabigat, but that he would soon come down again to the Earth World. But the people demanded that he take his wife with him, and that they leave their son as security for their return. Dumágid told Dúgai that the path was so hot that she might die, but this the people would not believe. So Dumágid and Dúgai started out, but as they approached the sun it grew so hot that Dúgai died. Dumágid returned her body to the earth, and went on to his home in the sky. Later he came back to the earth, in company with the god Bañgan di Bai-áñgan, and told the people that he must take his son Ovug to the Sky World. This the people refused to allow him to do, so Dumágid took a knife and divided his son Ovug into equal parts by cutting him straight down. When he had done this, he told the people to keep one half and make a new boy out of it. The other half Dumágid took with him to the Sky World and reanimated it. Then he looked down to the Earth World and saw that the half of his son there was becoming decayed because the people had not given it new life. So he came down with the boy he had made, and made another beautiful boy out of the decayed half. Then he made the two boys stand before the astonished people. For their greater astonishment, Dumágid asked the boy he had made in the Sky World to talk. He spoke very loud like sharp thunder, so that the people were frightened almost to death. Then Dumágid asked the other boy to talk, and he spoke low like the rolling thunder. Then the first boy went up to the Sky World whirling like fire, and thundered there. And it is believed that this is the origin of the lightning and the sharp thunder that comes after; and it is also believed that the low thunder is the voice of the second boy, or the one made on the earth.

CENTRAL IFUGAO BELIEFS

The exact difference between the Central Ifugao and the Kiáñgan beliefs is not an easy matter to determine. There has been much mixture between the two peoples accompanied by a corresponding exchange of ideas. The effect of this exchange in some cases has been to produce a deceptive similarity in beliefs and myths that originally were fundamentally different; while in other cases myths that were originally the same have been so greatly differentiated in the two areas that their unity can scarcely be recognized.

However, it would seem that some basic differences really exist, and the probability is that they are survivals from the ancient cultures of the peoples who went to make up the present distinctly composite Ifugao group. But the evidence at hand is not sufficient to warrant a full discussion of this question here, and I shall merely cite one example. Kiáñgan myths are nearly always told from the standpoint of the gods, and have to do with the dealings of the gods with one another and with men. On the other hand, Central Ifugao myths are told from the standpoint of men in their relations and dealings with the gods. This will be made plain by a comparison of the following Central Ifugao myth with the Origin of the Ifugaos previously given.

THE IFUGAO FLOOD-MYTH [60]

I

The Golden Age.—Ifugao knowledge of the prediluvian period is very vague. It is known, however, that the Earth World was entirely flat except for two great mountains, one in the east called Amúyao and one in the west called Kalauítan.[61] This level country was heavily forested, and all of the people lived along a large river that ran through the central plain between the two great mountains.

The period was something like a Golden Age, when things were much better than they are now. The people were demigods whose life was a happy one and their country a sort of Garden of Eden. To obtain rice, all that they needed to do was to cut down a stalk of bamboo, which was plentiful, and split open the joints which were filled with hulled rice ready to cook. Stalks of sugar-cane were filled with *baiyax*,[62] and needed only to be tapped to furnish a most refreshing drink. The river was full of fish, and the forests were filled with deer and wild hogs

[60] Collected by myself from various Ifugaos of Banáuol clan, in 1906. A similar but less complete version was collected at the same place by Levi E. Case, in May, 1905, and published in *This Journal, Sec. A* (1909), 4, 256–260.

[61] Or *Alauítan* in Sub-Ifugao. See Plates I and II.

[62] The Ifugao rice drink, usually known as *búbûd.*

which were much easier to catch than those of the present day. The rice grains of that time were larger and more satisfying, and a handful of them was sufficient to feed a large family.

But this Golden Age, like others, was not destined to last.

II

The flood, and the origin of the mountains.—One year when the rainy season should have come it did not. Month after month passed by and no rain fell. The river grew smaller and smaller day by day until at last it disappeared entirely. The people began to die, and at last the old men said: "If we do not soon get water, we shall all die. Let us dig down into the grave of the river, for the river is dead and has sunk into his grave, and perhaps we may find the soul of the river and it will save us from dying." So they began to dig, and they dug for three days. On the third day the hole was very large, and suddenly they struck a great spring and the water gushed forth. It came so fast that some of them were drowned before they could get out of the pit.

Then the people were happy, for there was plenty of water; and they brought much food and made a great feast. But while they were feasting it grew dark and began to rain. The river also kept rising until at last it overflowed its bank. Then the people became frightened and they tried to stop up the spring in the river, but they could not do so. Then the old men said: "We must flee to the mountains, for the river gods are angry and we shall all be drowned." So the people fled toward the mountains and all but two of them were overtaken by the water and drowned. The two who escaped were a brother and sister named Wígan and Búgan—Wígan on Mt. Amúyao and Búgan on Kalauítan. And the water continued to rise until all the Earth World was covered excepting only the peaks of these two mountains.

The water remained on the earth for a whole season or from rice planting to rice harvest.[63] During that time Wígan and Búgan lived on fruits and nuts from the forests that covered the tops of the two mountains. Búgan had fire which at night lit up the peak of Kalauítan, and Wígan knew that there was someone else alive besides himself. He had no fire, and suffered much from the cold.

At last the waters receded from the earth and left it covered with the rugged mountains and deep valleys that exist to-day; and the solitary brother and sister, looking down from their respective peaks, were filled with wonder at the sight.

III

The repopulation of the Earth World.—As soon as the earth was dry, Wígan journeyed to Kalauítan where he found his sister Búgan, and their reunion was most joyous. They descended the mountain and wandered about until they came to the beautiful valley that is to-day the dwelling place of the Banáuol clan—and here Wígan built a house. When the house was finished, Búgan dwelt in the upper part and Wígan slept beneath.

Having provided for the comfort of his sister, Wígan started out to find if there were not other people left alive in the Earth World. He

[63] About six months. The duration of the flood varies greatly in the different versions of this myth.

traveled about all the day and returned to the house at night to sleep. He did this for three days, and then as he was coming back on the third evening he said to himself that there were no other people in the world but themselves, and if the world was to be repopulated it must be through them. * * * At last Búgan realized that she was pregnant. She burst into violent weeping, and, heaping reproaches on his head, ran blindly away toward the East, following the course of the river. After traveling a long way, and being overcome with grief and fatigue, Búgan sank down upon the bank of the river and lay there trembling and sobbing.[64] After having quieted herself somewhat, she arose and looked around her, and what was her surprise to see sitting on a rock near her an old man with a long white beard! He approached her and said: "Do not be afraid, daughter! I am Maknóñgan, and I am aware of your trouble, and I have come to tell you that it is all right!" While he was speaking, Wígan, who had followed his sister, appeared on the scene. Then Maknóñgan placed the sanction and blessing of the gods upon their marriage, assuring them that they had done right, and that through them the world must be repeopled. He told them to return to their house, and whenever they were in trouble to offer sacrifices to the gods. After Búgan had become convinced in this manner, they left Maknóñgan and returned home.

In the course of time nine children were born to Wígan and Búgan, five sons and four daughters. The four oldest sons married the four daughters, and from them are descended all of the people of the Earth World. The youngest son, who was named Igon, had no wife.[65]

IV

The sacrifice of Igon.—One year the crops failed, there was much sickness, and everything went wrong. Then Wígan remembered the advice of Maknóñgan, and he told his sons to procure an animal for the sacrifice. They caught a rat and sacrificed it, but the evil conditions were not remedied. Then they went out into the forest and captured a large snake and sacrificed it to the gods, but the disease and crop failure still continued. Then Wígan said: "The sacrifice is not great enough, for the gods do not hear! Take your brother Igon, who has no wife, and sacrifice him!" So they bound Igon, and sacrificed him, and called upon the gods. And Maknóñgan came, and all the other great gods, to the feast. And they took away the sickness, and filled the granaries with rice, and increased the chickens, the pigs, and the children. Then Maknóñgan said to the people: "It is well, but you have committed an evil in spilling human blood and have thereby brought war and fighting into the world. Now you must separate to the north, south, east, and west, and not live together any more. And when ye have need to sacrifice to the gods, do not offer rats, snakes, or your children, but take pigs and chickens only."

And one of the sons of Wígan went to the north, and one to the south, and one to the east, and one to the west; and from them are descended the peoples of the Earth World, who fight and kill one another to this day because of the sacrifice of Igon.

[64] Incest is looked upon by the Ifugaos with horror, and is held to be one of the gravest of crimes.

[65] The number and names of the children of Wígan and Búgan are variable in the different Ifugao clans.

Many other illustrations might be given of the differences between the Central and Kiáñgan Ifugao religious conceptions, but the above will suffice for the purposes of the present paper.[66]

One more type of Ifugao origin myth merits our attention before we come to the conclusion. This type consists of the myths invented to explain the origin of the ancient Chinese jars, bronze gongs, amber-agate beads, and other rare articles of foreign manufacture on which the Ifugaos place a high value, and the origin of which they do not know. Many of these objects have been in the possession of the people for at least several hundred years. They were probably brought into the Islands by Chinese traders centuries before the coming of the Spaniards, and gradually found their way to the Ifugaos through the medium of their cursory commerce with the surrounding peoples.[67]

One of these myths, explaining the origin of three well-known jars, runs as follows.

LEGEND CONCERNING BAÑGGÍLÎT OF HINAGÁÑGAN, AND THE JARS THAT HE BROUGHT FROM THE VILLAGE OF SOULS [68]

A long time ago, before the coming of the Spaniards, there lived at Hinagáñgan a man called Bañggílît. He was a wealthy man, possessing four rice granaries and a *very* large house; but he was not a priest. His constant desire was to hunt in the forest.

One day Bañggílît went hunting in the forest and was overtaken by night. He called his dogs but they did not come. He made fire, cooked, and ate. Then one dog came to him, and he took it in lead and departed. Near by he found a path. The dog with him barked and the second dog answered, and they went on. And the dog with Bañggílît began to

[66] The frequent repetition of Búgan as the name of a female deity is worthy of further explanation. Búgan is the Ifugao ideal of feminine beauty. There is no single goddess of love and beauty such as Venus or Aphrodite, but an abstract ideal of womanly perfection. Therefore, all beneficent female deities are called Búgan, which is also the most common name among Ifugao women. When a man wishes to praise his wife, he speaks of her as *Búgan-ko* (my Búgan), and when a young man goes courting he often speaks of it as *mum-Búgan* (searching for a Búgan). Light, fleecy clouds, high in the sky, are often called "the wavy hair of Búgan." Such poetic usages are almost innumerable. It is an interesting conception, and is one of the proofs of Ifugao æsthetic development.

[67] A Chinese author, Chao Ju-kua, writing in the year 1280, mentions that porcelain jars and bronze gongs were two of the most important exports from China to the Philippines.—Blair and Robertson, The Philippine Islands (1906), 34, 181–191.

[68] Free translation of an Ifugao text obtained by myself in January, 1909, from Tugínai Páit (Plate III, fig. 3), an Ifugao of Amgodé clan, Central Ifugao.

whimper and whine, and to pull on the leash; and Bañggílît ran, and they went on. Suddenly it became light all around them, and they came out of the forest into a large group of people. And the people said among themselves: "Surely Bañggílît is dead," and they examined his body and asked: "Where were you speared?" And Bañggílît spoke and said: " I have not been speared! I went hunting and was overtaken by night, and my dog here ran ahead on our path. I followed, and came here, and lo! it is light here!"

And they took Bañggílît and went to their town—for there are many large towns there in the dwelling-place of souls. They wished to give him food, but he said: "Wait until my own food is exhausted, and then I will eat of your rice here." And they asked him: "How many days will you remain with us?" and Bañggílît answered that he would remain four days. Then the people began to laugh and one of them said: "Not four days but four *years* here!" "Ha!" cried Bañggílît, "I shall never do that! Wait until you see!" "Just so!" answered the other, "but one day here is the same as a year on the Earth World," but Bañggílît thought that he was lying.

Bañggílît visited all of the towns there. He worked in the rice fields and they gave him four jars as his wages. Then his host said to him: "Return home now, for you have been here four days, which, according to the usage of the Earth World, are four years." "Yes," answered Bañggílît, "I wish to go home now, as I am homesick for my family. You have been very good to me, for you have given me wages for my work." And the host said: "It was a gift; not wages, but a gift, that I gave you," and he led the way and pointed out to Bañggílît a ladder. "Go down that ladder, and in a short time you will arrive at your house," he said." Bañggílît started to go down, but one of the jars struck heavily against the ladder and was broken. He went down the ladder and at last arrived in the top of a betel-nut tree. He slid down the trunk of the tree to the ground, and the chickens were crowing and it was just dawn. And he looked at his surroundings and exclaimed: "Why this is my own house!" His relatives came out and said: "Who are you?" and he replied: "This is my house." They looked at him closely and cried: "Well now, it is Bañggílît who has been gone these four years!" And they sat down and talked long together. He showed them the jars, and they asked: "Where did you get those?" And he answered: " I brought them from the Sky World," and they were afraid and went to look for the ladder but it was no longer there.[69]

The above myth may well have been invented by some man who, unknown to his relatives and friends, wandered across

[69] The three unbroken jars brought by Bañggilît from the village of souls in the Sky World are still in existence and their location is as follows: The first jar is called *Inhyúwat,* and is owned by Bînwâg of Búwôt. The second is called *Ináyao,* and is owned by Ináyao of Hinagáñgan. The third is called *Búût,* and is owned by Búût of Hápao. These jars have an estimated value of several hundred pesos each, but, unless driven to it by dire extremity, their owners would not sell them for any price. (Plate IV, fig. 1.)

the mountains into Lepanto or Benguet and returned after four years with the jars in question. Hundreds of myths and legends of this type are current among the Ifugaos.

No representative collection of Philippine myths has yet been made, and the present paper can only be considered a beginning. I hope to be able to continue the work.

ILLUSTRATIONS

PLATE I

Sketch map of the subprovince of Ifugao, showing its location, boundaries, and division into culture areas.

PLATE II

FIG. 1. Mount Amúyao, the first of the two sacred mountains of the Ifugaos: elevation, 9,270 feet (2,826 meters). (Photograph by Martin.)

2. Mount Kalauítan, the second of the two sacred mountains of the Ifugaos; elevation 7,000 feet (2,134 meters). (Photograph by Miller.)

PLATE III

FIG. 1. An Ifugao priest. (Photograph by Beyer, Banaue, 1907.)

2. Ifugao mother and babe—showing the manner in which Búgan carried Balitúk. (Photograph by Martin, Kiáñgan, 1904.)

3. Tugínai Páit, of Amgodé clan, and his wife. (Photograph by Beyer.)

PLATE IV

FIG. 1. Scene at a Kiáñgan celebration. Note the Chinese jars in the foreground. Those that Bañggílît brought from the village of souls, in the Sky World, are of the type of the third jar from the left. (Photograph by Tomlinson.)

2. View from Ifugao toward the mythical region of the East. In the foreground are the Ifugao rice terraces—the most distinguishing feature of their culture. (Photograph by Beyer.)

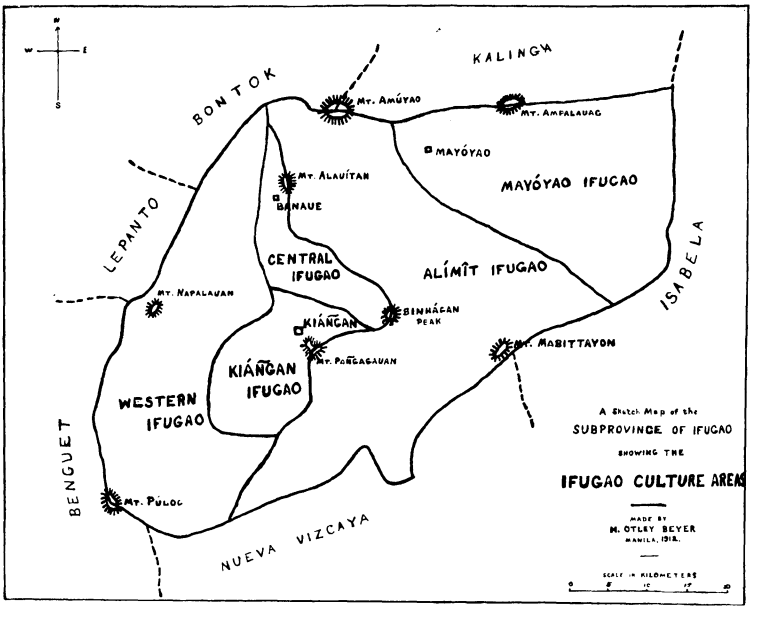

PLATE I. SKETCH MAP OF THE SUBPROVINCE OF IFUGAO.

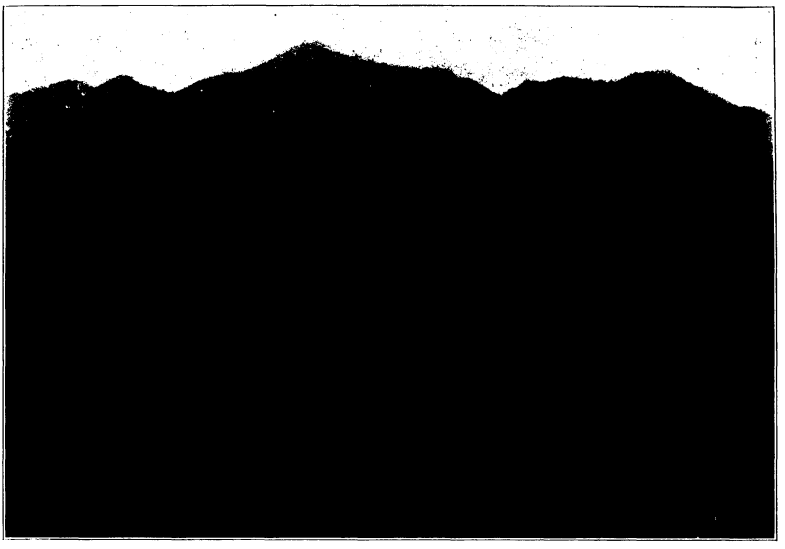

Fig. 1. Mount Amúyao, the first of the two sacred mountains of the Ifugaos.

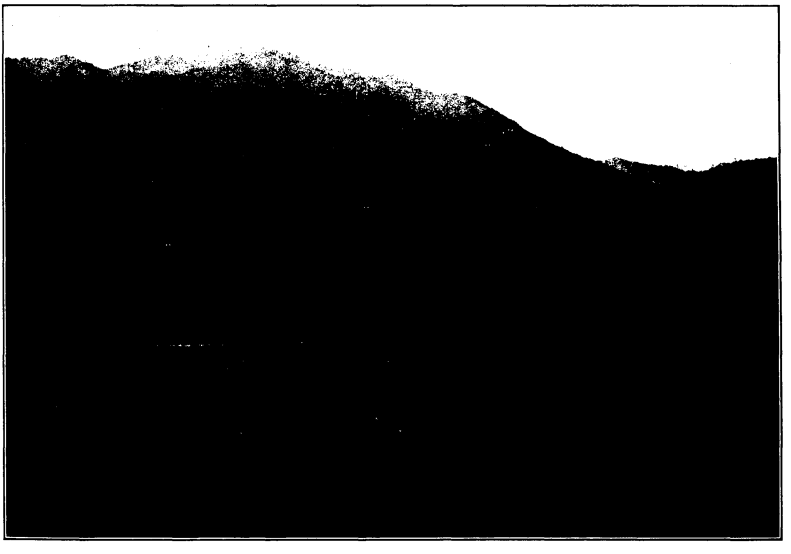

Fig. 2. Mount Kalauítan, the second of the two sacred mountains of the Ifugaos.

PLATE II.

Fig. 1. An Ifugao priest.

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Fig. 3. Tugínai Páit and his wife.

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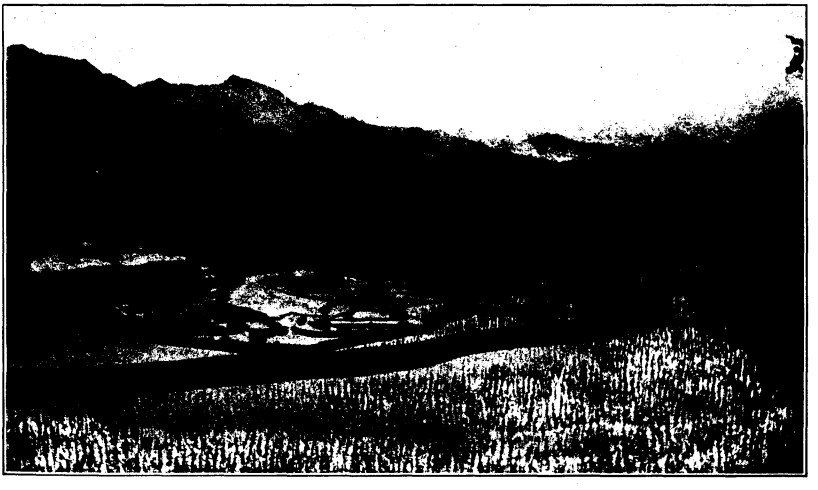


Fig. 2. View from Ifugao toward the mythical regions of the east.

PLATE IV.

THE HABITS OF SOME TROPICAL CRUSTACEA

By R. P. COWLES

(From the Zoölogical Laboratory, University of the Philippines, Manila, P. I.)

One plate and 3 text figures

On the northern shore of the Island of Mindoro in the Philippine Islands lies the almost land-locked bay of Port Galera, long famous for its beautiful "sea-gardens" and for the fact that it affords perfect safety for ships during typhoon weather. On the shores of this bay the University of the Philippines and the Bureau of Science established a temporary marine biological station which was in session during the months of March, April, May, and June of the year 1912. Here during this period I observed the habits of two well-known, peculiar marine crustacea. The results of these observations are given below.

SPONGE CARRYING OF CRYPTODROMIA

Among the many remarkable animals which may be found in Port Galera Bay are the brachyuran crustaceans belonging to the family Dromiidæ. The crabs of this family are of special interest because of their supposed primitive characters and because of the fact that some of the species carry pieces of foreign matter over their backs. These covers are usually held loosely by means of the dorsally placed fifth pair of legs, but in some cases they become firmly attached to the carapace.

Cryptodromia tuberculata Stimpson, the most abundantly represented species of the Dromiidæ in Port Galera Bay, lives on the underside of rocks in about the middle of the littoral zone, but it is easily overlooked because it is usually covered dorsally by a little piece of grayish sponge which it carries in the characteristic manner of the family. The protection afforded by this cover is further increased by the fact that there are as a rule other pieces of similar shape and size and even larger sheets of the same gray sponge, 4 or 5 millimeters thick and from 300 to 400 square centimeters in area, found living independently of the crab and adhering to the underside of the rock.

It is a surprise to the collector when, on turning over a rock covered with large and small patches of the gray sponge, he sees

some of the smaller patches suddenly become animated and crawl away. Another surprise is in store for him when he picks up one of these small patches and finds it to be the cover of a crab carefully hollowed out so as to fit the outline of the carapace, and lightly held in place by the last pair of legs whose dactyli are hooked into the inturned rim (fig. 1).

Zoölogists are familiar with the fact that *Cryptodromia tuberculata* generally carries a cover of some sort, usually a sponge, occasionally a piece of ascidian, or even rarely a leaf, but so far as I have been able to determine from the literature at hand the activities of the crab while obtaining its covering have not been described. The occurrence of large areas of the sponge encrusting the underside of the rock which sheltered the cryptodromia suggested the possibility of bringing the rock

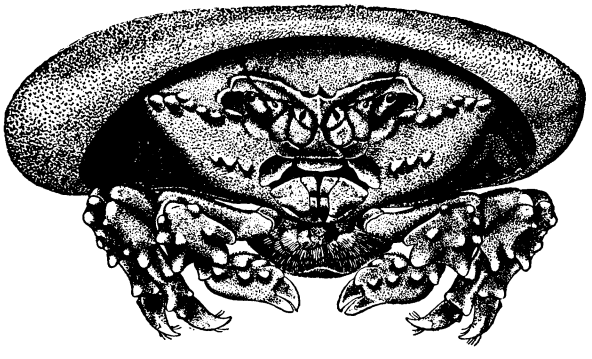


FIG. 1. *Cryptodromia tuberculata* Stimpson and its cover.

with the crabs and sheets of sponge intact into the laboratory and there observing the behavior in an aquarium. This was done, and at the same time the crabs were deprived of their covers. After being left undisturbed for about half an hour, it was found that several individuals had decorated themselves with new pieces of sponge which though irregular in outline were used as covers and held over the carapace by means of the last pair of legs.

In order to observe the details of the process of obtaining these new covers, a rock encrusted with a sheet of sponge was placed in a large glass dish of sea water so that the sheet of sponge was on the upper side of the rock. A naked cryptodromia which was placed in the middle of the patch of sponge soon moved toward the periphery. Here it settled down with the abdomen near the edge and the head facing the area of sponge. Then with the chelipeds it began to excavate a groove destined to cut

off a small piece from the sheet of sponge. After the piece had been isolated, the crab lifted the edge, pushed itself under, and finally dislodged the piece from the rock. The cryptodromia then caught hold of this new but ragged cover by means of its last pair of legs and carried it off. Four stages in this process are shown on Plate I. In the upper left hand corner of fig. 1 the crab is seen rather indistinctly cutting out the piece, in a similar region of fig. 2 the cutting is completed, in fig. 3 the crab has pushed its way under the newly separated piece of sponge, and finally in fig. 4 the piece is being carried off. All of the figures are of further interest in that they show at the right hand edge a little below the middle another cryptodromia whose original cover has not been tampered with. In addition to the sheet of gray sponge which may be seen in all the figures, there are also many patches of an ascidian (light in color both in nature and in the figure) which are sometimes used for covers.

The method of obtaining covers which I have described is undoubtedly the same as the one used by *Cryptodromia tuberculata* when living under natural conditions, for I have found individuals under rocks with similar unfinished covers which undoubtedly had been recently cut from sheets of the sponge. It is of interest to know that the new ragged covers cut out by the crabs in the laboratory began to assume a more regular appearance after a few days and to take on the shape of the covers found on the cryptodromia when living in the sea.

TUBE BUILDING OF ALPHEUS PACHYCHIRUS

It is well known by zoölogists that one of the "pistol crabs," *Alpheus pachychirus* Stimpson, lives in a tube which it constructs of the matted thread of a filamentous alga. Richters (1880)[1] and de Man (1888)[2] published this information, but Coutière (1899)[3] has not found the same species living in alga-tubes at Djibouti. So far as I have been able to ascertain without having access to the paper of de Man, the behavior of this crustacean while constructing the alga-tube has not been described, so the following notes may be of interest.

On the underside of the rocks in the littoral zone of Port Galera Bay there may be found the sac-like alga-tubes of *Alpheus*

[1] Beiträge zur Meeresfauna der Insel Mauritius und der Seychellen. Berlin (1880), 164.

[2] *Arch. f. Naturg.* (1888), 5.

[3] Thèses présentées à la Faculté des Sciences de Paris: Les "Alpheidae," morphologie externe et interne, formes larvaires, bionomie. Paris (1899), 500.

pachychirus. These tubes are often 25 to 30 centimeters long and 2 centimeters or more in diameter, but they may be much smaller than this. One end is usually wider than the other (fig. 2), and is firmly attached to the rock while the rest of the tube is fastened only at intervals. Several branches with openings may be present, the number varying in different tubes. A microscopic examination shows that the tubes are nothing more than a dense mat of filamentous algæ so well worked together as to resemble a piece of loosely woven cloth.[4]

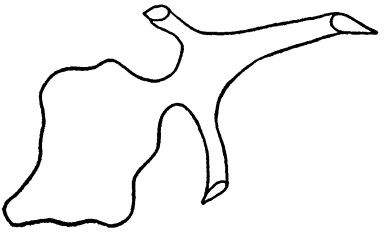


FIG. 2. Alga-tube of *Alpheus pachychirus* Stimpson. Outline sketch showing branches and openings.

Whether the alga-tube is used by the alpheus as a shelter throughout its life or whether it is only used during the breeding season, I am unable to decide. Coutière (1899) found *Alpheus pachychirus* at Djibouti without the alga-tube, but he attributed this to the scarcity of algæ. Professor L. E. Griffin in February, 1912, found about half-a-dozen tubes at Port Galera, and in each case there were two individuals, supposedly male and female, but neither was carrying eggs. During March, April, and May, 1912, I collected 10 or 12 tubes from the same locality and found with one exception a male and female in every tube. In this exceptional case there was only a female present, and she was ovigerous.

In order to see the method of tube-making, the following simple experiments were undertaken. An alga-tube containing a male and female alpheus was removed from a rock and slit open from end to end, after which it was laid out as flat as possible in the bottom of a dish of sea water. The two crustacea were then placed on the piece of matted alga where they remained for some time, inactive, so far as construction was concerned. Finally the male took advantage of a slight furrow in which it was lying lengthwise, turned itself on its back, and using the slender pair of chelate legs immediately back of the chelipeds reached up and drew the sides of the furrow close together. Then in the following manner it began to sew together the two

[4] In the opinion of Dr. Marshall A. Howe, of the New York Botanical Garden, this alga belongs to the Cyanophyceæ and is a species of *Plectonema* closely allied to, and perhaps identical with, *P. wollei* Farlow. The latter is a fresh-water form, however, while the former is marine.

edges of the mat thus apposed (fig. 3). The slender chelate leg of one side was thrust through the edge of the mat of the corresponding side and then bent over until the open chela was able to take hold of a thread of alga near the edge of the opposite side. The leg was then drawn back, pulling with it the thread which, however, still remained entangled in the opposite side, thus making a simple stitch. At the same time that the operation just described was taking place, a similar one was performed by the other slender chelate leg, the result being that from each side a thread was drawn out part way and pulled through the opposite side. In this manner the edges of the furrow were gradually fastened and a tube formed. The alpheus did not sew up the tube from one end to the other without a break, but stitched it together at intervals first and later closed up the spaces between. The movement of the slender chelate legs was very rapid so that after ten minutes a tube about 10

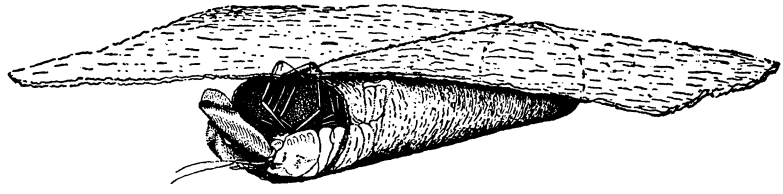


FIG. 3. A diagrammatic view of *Alpheus pachychirus* Stimpson sewing the edges of an alga-mat together.

centimeters long had been formed. At the end of this time, as the result of some signal from the male or simply by chance, the female, which had been resting quietly several centimeters away, backed into the new tube with the male.

Having seen the method of making a tube out of a continuous sheet of alga, I was anxious to determine if the alpheus could construct a new tube out of the fragments of an old one. A tube was opened and torn into such minute shreds that a large number of single filaments separated out. A pair of alpheus was placed in a dish of sea water where they soon retreated under a more or less flat stone so arranged that there was a space below it. The mass of individual filaments and small fragments of the alga were then placed in the dish. After about five minutes, one of the crustaceans began to draw the alga under the stone, and fifteen minutes later, on siphoning the water out of the dish in order to add more water, it was found that the filaments and the fragments had been so securely attached in several places to the underside of the rock that they remained

hanging after the water had been removed. On several occasions after refilling the dish the alpheus was seen pushing filaments upward in the attempt to attach them to the rock under which they were building the tube. They were successful in this, every now and then the filaments becoming caught on the sharp edges of the coral rock or entangled in some other kind of alga growing on the rock. After a time the mass of alga which had been drawn under the rock began to take on the shape of a tube as a result of the activity of the slender pair of chelate legs. These legs worked quickly, first here and then there, drawing free edges together and stitching them. When the alpheus found a hole in the rapidly forming tube, the slender legs came through, caught hold of the filaments of the alga, and manipulated them in much the same manner as a man might the thread with which he darns a hole in his sock; that is, by drawing the edges of the hole together and fastening them.

The next morning a fairly well-made tube was present in which the outer surface was uniform, the shreds having been worked into an even surface. The cavity was distinct, and the inner walls smooth. This new tube measured 11.5 centimeters in length, about 2.5 centimeters in width, had one opening to the exterior, and harbored the pair of alpheus.

ILLUSTRATIONS

PLATE I

FIG. 1. In upper left hand corner, a crab cutting out a piece of sponge.
2. The cutting completed.
3. The crab has pushed its way under the newly separated piece of sponge.
4. The piece is being carried away.

TEXT FIGURES

FIG. 1. *Cryptodromia tuberculata* Stimpson and its cover.
2. Alga-tube of *Alpheus pachychirus* Stimpson. Outline sketch showing branches and openings.
3. A diagrammatic view of *Alpheus pachychirus* Stimpson sewing the edges of an alga-mat together.

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

Cryptodromia tuberculata Stimpson making a cover. See text.

PLATE I.

THE COCONUT LEAF-MINER BEETLE, PROMECOTHECA CUMINGII BALY

By CHARLES R. JONES

(*From the Bureaus of Science and Agriculture, Manila, P. I.*)

Two plates

The coconut tree (*Cocos nucifera* L.) is attacked by a comparatively small number of insects, but the damage due to the ravages of these insects is rather large as compared with the injury of insects to some of the other crops of these Islands. This palm has several insect enemies that feed extensively upon the trunk and leaves, and in seasons favorable to insect development these entail a considerable loss upon the grower.

Banks [1] divides coconut insects into two classes—those that attack the trunk and those that damage the leaves. Barrett [2] discusses the insect enemies of the coconut. Froggott [3] deals extensively with the pests and diseases of the coconut palm. However, none of these papers record *Promecotheca cumingii* Baly, which in both the adult and larval stages feeds upon the leaves of the young coconut. I have made several observations on old bearing coconut palms, but have not found them infested by this pest. In all probability they are little affected by this insect.

This beetle belongs to the subfamily Hispinæ of the family Chrysomelidæ, which contains our worst leaf-eating beetles. Members of this subfamily are distributed generally throughout these Islands. There is little doubt that this species, or representatives of this subfamily, occur in all coconut-growing countries. Froggott [4] reports a species of this subfamily as being the most serious coconut pest of the Solomon Islands. The object of the present paper is to give an account of the habits and life history of the coconut leaf-miner beetle with methods for its control.

[1] *This Journal* (1906), 1, 143–169, 11 pls.; *ibid.*, 211–228, 10 pls.
[2] *Phil. Agr. Rev.* (1912), 5, 254, 3 pls.
[3] *Sci. Bull., N. S. W. Dept. Agr.* (1912), No. 2, 1–47; 7 pls., 10 figs.
[4] *Ibid.*, 24, 26.

LIFE HISTORY

Egg.—The eggs (Plate I, fig. 1) of *Promecotheca cumingii* are deposited singly on the underside of the leaflets and generally on the lower leaves of young palms. The beetle eats a small hole through the lower epidermis of the leaf, leaving the edges of the hole very rough. The egg is inserted in this hole, and cemented in place with a yellowish glutinous secretion which turns dark brown upon hardening, and resembles dried leaf-tissue. During this process the abdomen of the insect is moved with a rotary motion. After resting over the egg for a few seconds, the beetle moves away and begins feeding again. In several cases after the egg had been cemented in place, the adult was observed to pat it with her front feet.

The eggs are flat, semielliptical, brownish bodies shaped somewhat like a pumpkin seed. The outer surface or covering is very rough, and the eggs are very easily broken when this protective substance is removed. They are about 1.5 millimeters in length; 1 millimeter in width; and 0.3 millimeter in thickness. The period of incubation of 286 eggs averaged 13.5 days, of which the maximum was fifteen and the minimum thirteen days.

Larva.—Upon hatching, the larva (Plate I, figs. 2 and 3) eats its way through the egg wall and directly into the tissue of the leaflet where it spends its entire larval and pupal stages and is somewhat protected by the lower and upper epidermis of the leaflet. The larvæ are fleshy footless grubs, and average about 1.2 millimeters in length when newly hatched. The head is the largest segment; it is a translucent, shiny brown, and wedge-shaped with rounded sides. The mandibles are black, and can be drawn under the labrum. Two brownish lines form an X on the back of the head. Two whitish lines extending under the head-cast near the apex give it the appearance of an arrowhead. These markings are absent in later stages. In the older larvæ the head is slightly smaller than the following segment; the body is cream colored and semicylindrical, tapering from segment 1 to segment 11; the anal segment is about one-half the size of segment 1. Segment 1 is depressed anteriorly. Segments 1 to 11 are protruded into tubercles on both sides which give rise to setæ of 6 hairs each.

The average length of the full-grown larva is 9.54 millimeters, and the average width of the head cast is 1.54 millimeters. The average time required in the larval stage is thirty-two days; twenty-eight of these are spent in feeding and developing, and four days without feeding, during which time the larva changes

into a pupa. During development, the larva feeds upon the parenchyma of the coconut leaf, and, except when molting, it can be found at the extremity of the chamber opposite the egg. The larva eats in one direction, leaving the old eggshell at the starting point. When molting and when changing into a pupa, it recedes to the center of its chamber. A characteristic habit of the larva is the deposition of its excrement in two rows (Plate I, fig. 13), one on each side of the excavated chamber.

In studying the insect, adults were placed in gauze bags which were tied over the leaflets of the palm. The insects were removed daily to fresh leaves, and the leaflets containing the eggs were tagged, but still kept in the gauze sacks to exclude possible parasites. Daily observations were made on the eggs for hatching, and the larvæ were examined every two days for molts.

After the larval chamber had been opened, the leaf curled and dried and the larva soon died; therefore, it was necessary to take 4 larvæ of the same age each day for observation. In no case were more than two molts observed. The exact number of molts has not been definitely established, owing to the difficulties of observing the insect.

Pupa.—After the larva is full-grown it retires, as stated above, to the center of the chamber, where without forming any pupal cell it changes into pupa and adult. The average time occupied in the pupal stage is 7.3 days, of which the maximum was twelve and the minimum five days. The pupa (Plate I, figs. 4 and 5) is orange chrome or burnt sienna, and is covered with hairs; the head is smaller than the thorax, the eyes are black, the mandibles are brown, and the anterior tarsi are in a vertical position opposite each other as shown in Plate I, fig. 4. There are 2 rows of transverse black spines on each segment, the anterior of which consists of 6 spines. The pupæ average about 1.62 millimeters in width and 8.11 millimeters in length.

Adult.—The beetles (Plate I, fig. 6) vary from 7.5 to 10 millimeters in length, and are from 1.6 to 2 millimeters in width. The thorax is much narrower than the slender abdomen. The general color is brown ocher, the head is small, the eyes and mandibles are black, and the elytra are finely punctate in parallel furrows. The antennæ are 11-jointed. The tarsi are broad and flat. There is 1 spine on the inner side of each femur with a corresponding depression on the tibia. The body is pilose.

The beetles are sluggish and do not fly readily upon being disturbed. They rest by clinging slightly to the underside of the leaf, antennæ extended forward flat against the leaf. They crawl about promiscuously on the leaves of young coconuts, and

feed extensively upon the tissues between the veins of the leaflets. The injury has the appearance of a slight cut, but does not entirely penetrate the leaf (Plate II, fig. 1).

The injury done by the larva is greater than that of the adult, as a single larva will excavate a place in the leaf from 12 to 16 millimeters long and 1.5 to 3 millimeters wide (Plate II, fig. 2). The tissue affected soon dies and becomes brown, and in badly infested areas the trees soon have the appearance of unhealthy and half-dead palms. Where the palms are used for ornamental purposes, the effect is very displeasing. The palm itself is injured by the loss of these leaflets.

Control.—The palm leaf-miner undoubtedly has many enemies, both predacious and parasitic. Two species of hymenopterous parasites of the family Chalcidæ have been bred in great numbers, one from the egg (Plate I, fig. 9) and one from the larva and pupa (Plate I, figs. 7 and 8). These have not yet been identified. It is probable that these parasites keep this beetle in check, and were it not for them the leaf-miner would be a most serious pest to the coconut industry. Observations have shown that a little over 44 per cent of the larvæ and pupæ, and an average of about 5 per cent of the eggs are parasitized by chalcids. From these two parasites alone, the total percentage of mortality is at least 50, and probably very much greater.

The following table gives the results of the examination of 100 leaflets taken from infested palms:

TABLE I.—*Eggs, larvæ, and pupæ of Promecothera cumingii Baly taken from 100 leaflets of the coconut palm, August 3, 1910.*

Leaflets examined.	Eggs.	Larvæ and pupæ.	
		Alive.	Dead.
10	23	20	18
10	41	30	11
10	38	23	23
10	25	29	22
10	27	33	35
10	29	21	16
10	30	17	12
10	21	15	6
10	24	15	11
10	13	14	22
100	271	217	176

REMARKS.—Leaves taken at random from different palms. No account was kept of previous infected places, the only record was of places that contained stages of the leaf-miner. Percentage of larva parasitized, 44.7. Three leaves were found free from infestation.

As the eggs, larvæ, and pupæ of the leaf-miner are protected to a greater or lesser extent within the leaf tissue, hydrocyanic-acid gas is the only insecticide that could be used effectively. This method is only to be recommended in extreme cases, where infestation is very heavy. As the beetles are not very active and are almost invariably on the lower leaves of the young coconut palms, they can be readily gathered. The infested leaflets are readily recognized, and can be removed easily and burned, thus destroying the eggs, larvæ, and pupæ.

The adults can be removed by hand. Child labor may be employed, and if this method is practiced in the infested young coconut groves it will be an inexpensive and effective way of coping with the situation.

ILLUSTRATIONS

(Drawings by J. A. Dimayuga: photographs by M. del Castillo)

PLATE I

FIG. 1. Egg, 3 diameters.
2. Larva, dorsal view, 1½ diameters.
3. Larva, lateral view, 1½ diameters.
4. Pupa, ventral view, 1½ diameters.
5. Pupa, lateral view, 1½ diameters.
6. Adult, dorsal view, 1½ diameters.
7. Larva attacked by parasites, 17 diameters.
8. Larva attacked by parasites, 17 diameters.
9. Egg attacked by parasites, 17 diameters.
10. Egg, 30 diameters.
11. Coconut leaflets, showing injury by larva of coconut leaf-miner.
    a. Old larval cell.
    b. Newly hatched larvæ.
12. Coconut leaflets, showing injury by larvæ and adults.
    a. Larval injury.
    b. Adult injury by feeding.
    c. Hole where adult escaped.
13. Coconut leaflet, showing feeding larva and excrement placed along sides of chamber.

PLATE II

FIG. 1. Coconut leaflets, showing injury caused by the adults.
2. Coconut leaflets, showing injury caused by the larvæ.
    a. Hole where adult escaped.

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

Fig. 5.

Fig. 6.

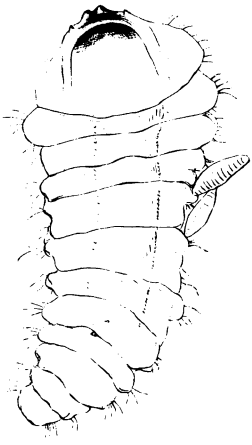


Fig. 7.

Fig. 9.

Fig. 10.

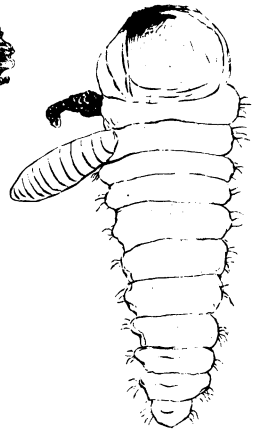


Fig. 8.

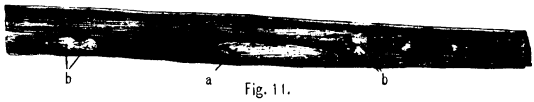


Fig. 11.

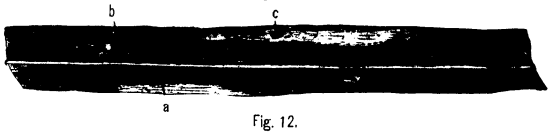


Fig. 12.

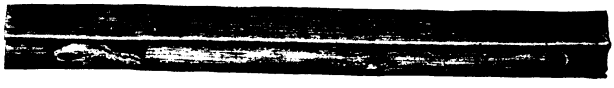


Fig. 13.

PLATE I. STAGES OF PROMECOTHECA CUMINGII BALY.

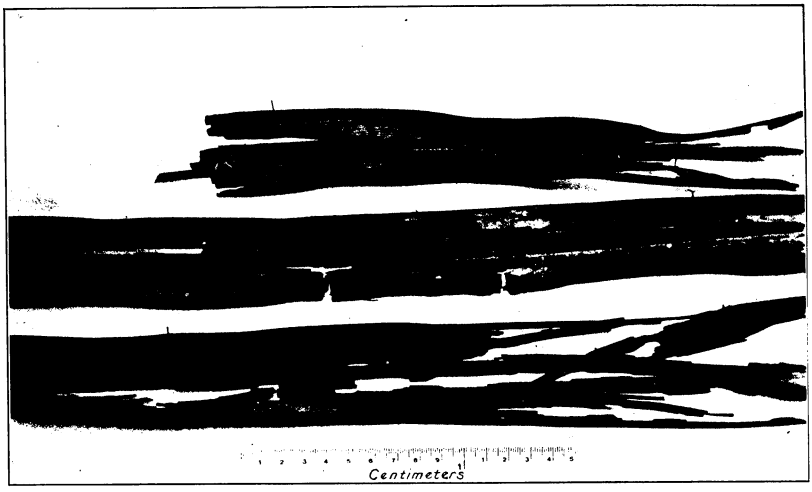


Fig. 1. Coconut leaflets, showing injury caused by the adults.

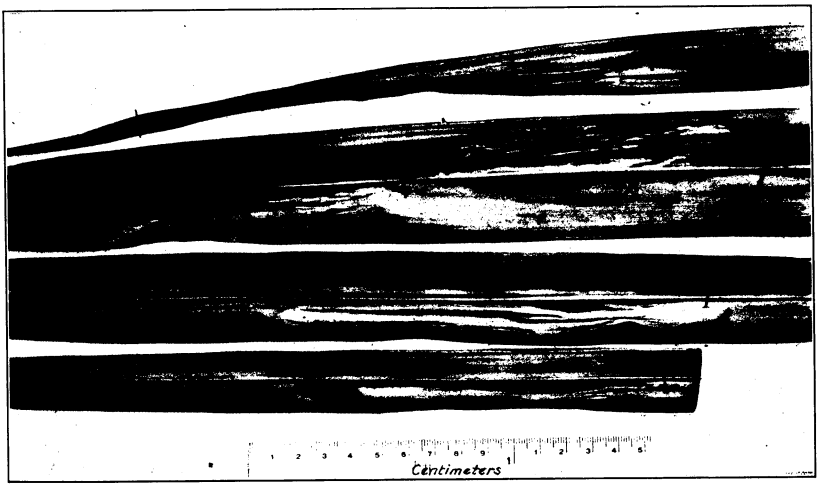


Fig. 2. Coconut leaflets, showing injury caused by the larvæ.

PLATE II.

NEUE KÄFER VON DEN PHILIPPINEN

Von K. M. HELLER

(*Kgl. Zoologisches und Anthropologisch-Ethnographisches Museum, Dresden, Germany*)

Mit 14 Figuren im Text

In diesem Beitrag zur Coleopteren Fauna der Philippinen werden folgende neue Arten und Varietäten, deren Kenntnis ich zum weitaus grössten Teil einer Sendung des Bureau of Science in Manila verdanke, beschrieben:

Curculionidæ

1. *Cepurellus cervinus* sp. nov.
2. *Ergania decorata* sp. nov.
3. *Ergania decorata* var. *zamboangana* nov.
4. *Nanoplaxes* (gen. nov.) *merrilli* sp. nov.

4a. *Nanoplaxes ferruginea* sp. nov. (ex India orientalis!).

5. *Cyamobolus* (?) *palawanicus* sp. nov.
6. *Asytesta philippinica* sp. nov.
7. *Sclerolips ochrodiscus* sp. nov.
8. *Endymia philippinica* sp. nov.
9. *Metialma obsoleta* sp. nov.
10. *Nauphaeus sexmaculatus* sp. nov.
11. *Cercidocerus flavopictus* sp. nov.
12. *Ommatolampus hæmorrhoidalis* var. *pygidialis* nov.
13. *Eutornus luzonicus* sp. nov.
14. *Eutornus stricticollis* sp. nov.
15. *Eutornus rufobasalis* sp. nov.

Brenthidæ

16. *Amphicordus* (gen. nov.) *inproportionatus* sp. nov.
17. *Henarrhodes* (gen. nov.) *macgregori* sp. nov.

Cerambycidæ

18. *Ocalemia prasina* sp. nov.
19. *Euryphagus maxillosus* var. *nigricollis* nov.
20. *Planodes schultzei* sp. nov.
21. *Agelasta mediofasciata* sp. nov.
22. *Euclea rhombifera* sp. nov.

Erotylidæ

23. *Encaustes palawanica* sp. nov.
24. *Encaustes tagala* sp. nov.
25. *Triplatoma exornata* sp. nov.

1. Cepurellus cervinus sp. nov.

Oblongo-ovalis, supra omnino unicolor dilute cervinus, subter albido-squamosus; rostro latitudine triplo longiore, dorso in medio et in lateribus carinulato, spatiis crebre punctatis ac setulis, transverse directis, obsitis; antennis fuscescentibus, scapo curvato, oculum attingente, funiculo septem articulato, articulo secundo primo distincte longiore, reliquis brevibus subquadratis, clava elongata (articulis 6 praecedentibus aequilonga), prothorace trapezoidali, longitudine fere duplo latiore; scutello punctiforme, nigro; elytris sat subtiliter striato-punctatis, spatio nono in quarto basali dilatato; corpore subter subrosaceo-albido-squamoso, mesosterno tuberculato, tarsis articulo secundo transverso-trapezoidali.

Long. 8.5, lat. 5. mm.

Hab. MINDANAO, Zamboanga, Port Banga, legit *W. J. Hutchinson* (Bur. Sci. Acc. No. 8692).

Länglich oval, oberseits gleichmässig hell rehbraun beschuppt. Rüssel dreimal so lang wie breit, in der Mitte und an den Seiten geleistet, dicht punktiert und spärlich mit quergestellten Börstchen besetzt. Stirn zwischen den Augen nur so breit wie die Fühlergeissel dick ist, oval; Fühler bräunlich, Schaft das Auge erreichend, gebogen, an der Spitze stark verdickt, zweites Geisselglied so lang wie die drei folgenden, ziemlich kugeligen zusammen, Keule fast so lange wie die ganze Geissel, ihr erstes Glied konisch, zwei Drittel der Keulenlänge einnehmend. Halsschild quer, die Seiten kaum merklich, der Hinterrand deutlich gerundet, der Vorderrand schwach ausgerandet, die ziemlich rechtwinkeligen Hinterecken am äussersten Rande weiss beschuppt. Schildchen klein, punktförmig. Flügeldecken ziemlich fein gereiht-punktiert, jeder Punkt auf dem Grunde mit sehr kleinem Börstchen, die Streifen, vom sechsten ab, vorn abgekürzt, das vorletzte Spatium im Basalviertel erweitert. Unterseite dicht weisslich, an den Seiten der Hinterbrust etwas rosa schimmernd beschuppt. Mesosternum zwischen den Mittelhüften nach vorn zu höckerartig vorgewölbt.

Der relativ lange Rüssel, sowie das zweite quer trapezoidale Tarsenglied, veranlassen mich diese Art in die von mir in der

Entomologischen Zeitung, Stettin (1908), 137, errichteten Gattung zu stellen. Da die Augen der hier beschriebenen Art wie bei *Cepurus* breit oval sind, so scheidet ihre Form als Gattungsmerkmal aus.

2. **Ergania decorata** sp. nov.

Nigra, sat dense ochraceo-squamosa; rostro crebre punctato, carinula mediana tenui, basi subquinque-carinulata; prothorace crebre punctato, squamulis in vittis tribus, una mediana et duabus lateralibus, contensatis; elytris striato-punctatis, scutello vittaque suturali in primo triente, macula oblonga, rectangulari, humerali fasciaque postmediana albido-squamosis.

Long. 11, lat. 6.2 mm.

Hab. LUZON, Los Baños, legit *E. M. Ledyard* (Bur. Sci. Acc. No. 13400).

So robust wie *E. proxima* Faust [Ann. Mus. Civ. Genova (1894), 238], ziemlich dicht lehmgelb beschuppt, drei Linien auf dem Halsschild, die Nahtwurzel, eine Schultermakel und eine Querbinde hinter der Deckenmitte weisslich. Rüssel dicht punktiert, mit feiner Mittelleiste, im Basalteil mit spärlichen Schüppchen und jederseits mit zwei undeutlichen Längsleistchen. Erstes und zweites Geisselglied der Fühler verlängert, die folgenden Glieder leicht quer und gelblich, die letzten zwei dunkler beborstet, die Keule schwarz. Halsschild dicht punktiert, jeder Punkt mit einem Borstenschüppchen, das mit seiner Spitze nach vorn gerichtet ist, in der Mittellinie und innerhalb des Seitenrandes sind die Schüppchen zu hellen Längsstreifen verdichtet. Schildchen fast quadratisch, hinten wenig breiter als vorn, gewölbt, weiss tomentiert. Flügeldecken stark gewölbt, gestreift-punktiert, die Punkte klein, aber tief eingestochen, 4. und 5., 6. und 7. Streifen je an der Spitze mit einander verbunden. Das erste Drittel der Naht, eine längliche Makel an der Wurzel zwischen dem 4. und 6. Streifen, eine Querbinde hinter der Mitte, die vom 2.–10. Streifen reicht und auf dem 4. und 8. Spatium nach vorn ausgezogen ist, weiss. Unterseite gelblich weiss beschuppt, ein Längsstreifen auf der Vorderbrust über den Vorderhüften sowie der Aussenrand der Hinterbrust rein weiss.

3. **Ergania decorata** var. **zamboangana** nov.

Praecedenti simillima, sed tomento principali nigro, loco ochraceo, maculis aequaliter dispositis sed macula vittiforme ad apicem in spatio tertio amplius.

Long. 11.1, lat. 6.2 mm.

Hab. MINDANAO, Zamboanga, legit *T. C. Zchokke* (Bur. Sci. Acc. No. 13614).

Genau sowie die vorhergehende Art, nur die Grundfarbe der Beschuppung schwarz und vor der Deckenspitze, auf dem 3. Spatium mit einer überzähligen weissen Längsmakel.

NANOPLAXES genus novum

Trypetidarum [1]

Corpus depressum. Rostrum filiforme. Antennae geniculatae, funiculo quinque-articulato. Caput transversum, oculi convexi. Prothorax transversus, lateribus rotundatis, basi truncata. Scutellum distinctum. Elytra oblonga, novem-striatis, pygidium obtegentia. Coxae omnes distantes, intermediae et posticae anticis remotiores. Mesosternum fere rectangulare, transversum, prosterno adpressum. Segmentum abdominale secundum duobus sequentibus aequilongum. Femora breves, clavata, inermes. Tibiae anticae apice uncinatae. Tarsi crypto-pentameri, articulo tertio bilobo.

Diese neue Gattung, die neben die Gattung *Plaxes* Pasc. [Ann. Mus. Civ. Genova (1885), 296] zu stellen ist, unterscheidet sich von ihr durch die schmälere Körperform, den an der Wurzel gerade abgestutzten Halsschild, die das Pygidium bedeckenden Flügeldecken und von allen Trypetiden durch die nur fünfgliederige Fühlergeissel.

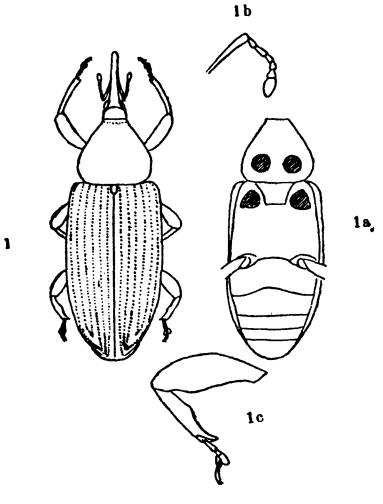


FIG. 1.

4. **Nanoplaxes merrilli** sp. nov. (figs. 1, 1a, 1b, 1c).

Rufus, elytris nigris, depressus; rostro prothorace aequilongo, lateribus ut fronte punctato, hic inter oculos foveola; prothorace transverso, maxima latitudine basin propiore, disco leviusculo, margines versus punctulato; scutello distincto, rufes-

[1] It is doubtful if Trypetidæ can stand as a family of the Coleoptera, based as it is on *Trypetes* described by Schönherr in 1836 (Gen. et Spp. Curc., 595), since the same term is used in Diptera, based on *Trypeta* described by Meigen in 1826 (Syst. Beschr. 5). C. S. BANKS.

centi, latitudine paulo longiore; elytris margine apicali subexplanato, punctato-striatis, spatiis 6., 7., et 8. basi abbreviatis, spatiis dorsalibus planatis, apicem versus subcostulatis; corpore subter parce, impressione ovali communi in segmentibus abdominalibus duabus anticis, ut segmento ultimo, densius punctatis ac parce flavo pilosis.

Long. tot. (usque ad rostri apicem) 6–6.5, lat. 2 mm.

Hab. LUZON, Bataan, Lamao, legit *E. D. Merrill.*

Dunkelrot, Flügeldecken glänzend, tief schwarz. Rüssel fein punktiert. Stirn mit Grübchen. Halsschild quer, auf der Scheibe fast glatt, nach den Seiten zu mit allmälig deutlicher werdender Punktierung, die Punkte längs des Hinterrandes am grössten. Schildchen klein, länglich viereckig, am Hinterrande etwas abgerundet, rot. Flügeldecken mit etwas ausgebreitetem Spitzenrand, punktiert gestreift, das vom 4. und 5. Streifen eingeschlossene Spatium in der vorderen Hälfte breiter als die es einschliessenden, die Streifen vom 5. ab stärker eingedrückt und ihre Spatien leicht rippenartig vortretend. Unterseite glänzend rotbraun. Vorderbrust zwischen den Mittelhüften, ein grosser, flacher, ovaler Eindruck, gemeinsam auf dem 1. und 2. Bauchsternit, sowie die Mitte des Analsternites dichter und deutlicher punktiert als die übrige Unterseite und fein gelblich und sparsam behaart.

Mir liegt ausser dieser Art noch eine zweite dieser Gattung vor, die ersterer so ähnlich ist, dass sie am besten gleich an dieser Stelle charakterisiert wird.

4a. **Nanoplaxes ferruginea** sp. nov.

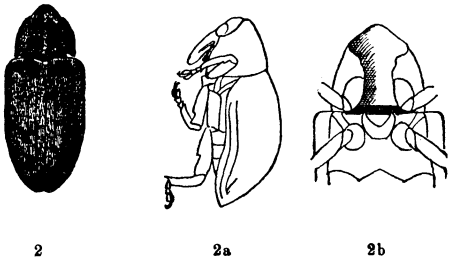
N. merrilli simillima, sed unicolor, ferruginea; prothorace omnino, linea mediana levi excepta, punctato; scutello fere quadrato; elytris fortius punctato-striatis, spatio tertio includentibus haud latiore.

Hab. INDIA ORIENTALIS, Pegu (ex coll. Gehr. *Dr. Wilhelm Müller,* Jena).

In Grösse und Körperform vollkommen der *N. merrilli* gleich und von ihr nur durch rotbraune Körperfärbung, kräftige zerstreute Punktierung des Halsschildes, die nur eine glatte Mittellinie frei lässt, gleichmässiger und stärker punktierte Deckenstreifen, nicht breiteres drittes Spatium, kürzeres, fast quadratisches Schildchen und fehlende Behaarrung auf den dichter punktierten Stellen der Körperunterseite unterschieden.

5. **Cyamobolus (?) palawanicus** sp. nov. (fig. 2, 2a, 2b).

Fuscus, dense albido- ac maculatim fuscescenti ferrugineo-squamosus; rostro subrecto, apicem versus paulo attenuato ac denudato, hic linea mediana levi, fronte inter oculos puncto impresso; prothorace latitudine longiore, basi bisinuato, lateribus in duabus trientibus basalibus fere parallelis dein convergentibus, disco macula quadrata fusca, per lineis cruciatis plus minusve in maculis quatuor subquadratis divisa; scutello minuto, rotundato, glabro; elytris albido-, macula basali, majore, transversa alterisque minoribus utrinque ad humeros, ad marginem lateralem, ante medium et pone suturae dimidiam partem posteriorem, fusco-squamosis, punctato-striatis, punctis remotis, striis duabus exterioribus fortius impressis, spatio octavo carinulato; corpore subter aequaliter ochraceo-squamoso, squamulis concoloribus, dissociatis, remotis, tibiis margine exteriore ad basin obtusangulariter flexo.



2 2a 2b

FIG. 2.

Long. 8, lat. 3.6 mm.

Hab. PALAWAN, legit *E. D. Merrill* (Bur. Sci. Acc. No. 6108).

Rotbraun, dicht kreideweiss beschuppt, mit rostbraunen, schwärzlich gekernten Flecken auf der Halsschildscheibe und an den Deckenwurzeln. Rüssel kürzer als der Halsschild, nur so lang wie die Halsschildseiten, vom Hinterrande bis zur Ausrandung über den Augen gemessen, etwas flachgedrückt und nach der Wurzel zu leicht verbreitert, diese mit feiner Mittelleiste und schmutzig weiss, mässig dicht beschuppt, Rüsselrücken im mittleren Teile der Mittellinie glatt, im übrigen ziemlich kräftig punktiert. Erstes Geisselglied länger und etwas dicker als das zweite, die folgenden fünf sehr kurz, das fünfte quer, Keule elliptisch, ungefähr so lang wie die fünf vorhergehenden Geisselglieder zusammen. Stirn zwischen den Augen mit eingestochenem Grübchen. Halsschild wenig breiter als lang, sein Vorderrand über den Kopf vorgezogen, der Hinterrand zweibuchtig, Oberseite dicht beschuppt, mit zerstreuten gröberen Punkten, der Vorder- und der Seitenrand in der vorderen Hälfte, sowie eine ungefähr quadratische Makel auf der Halsschildscheibe chocoladebraun beschuppt, letztere ist durch eine kreuzförmige weisse Linie mehr oder weniger in vier Makeln, mit schwärz-

lichem Kern, geteilt. Flügeldecken nur an der Wurzel mit anscheinend konstanter grösserer dunkelbrauner Quermakel, sonst vorherrschend weisslich beschuppt, nur beiderseits der Naht, hinter der Mitte, mit je einem grösseren Punkt und im Spitzenteil mit wenigen Pünktchen von rotbrauner Farbe, ausserdem mit blassbraunen Nebelflecken. Die Deckenstreifen stellen sich als Punktreihen mit isolierten Schüppchen dar, nur die zwei vorletzten und die Spitze der zwei, diesen vorhergehenden Streifen sind eingedrückt. Der äusserste Streifen ist in der hinteren Hälfte abgekürzt, der vorletzte im mittleren Teil stärker eingedrückt, so dass das vorletzte Spatium, das einige undeutliche gereihte Körnchen aufweist, in der hinteren Hälfte gekielt erscheint. Unterseite ziemlich dicht mit runden, nicht sehr kleinen, gelblich weissen Schuppen, von denen einige isoliert stehen, bedeckt.

Da die Stellung der Art in der Gattung *Cyamobolus* unsicher ist, so sei noch erwähnt, dass die Mittelbrust, ähnlich wie bei *Sclerolips* gebildet, die Hinterbrust in der Mittellinie kürzer als das erste Bauchsternit und dessen Hinterrand stumpfwinkelig ist. Das zweite Sternit ist länger als die zwei folgenden Bauchsternite. Schenkel ziemlich gleichbreit, unterseits nicht gefurcht, die hinteren das 3. Bauchsternit nicht überragend, alle stumpf gezähnt, Schienen linear, ihr Aussenrand an der Wurzel stumpfwinkelig geknickt, 2. Tarsenglied fast quadratisch, das dritte stark zweilappig.

6. Asytesta philippinica sp. nov.

Aterrima, opaca, rostro creberrime punctato, dorso in dimidia parte apicali basique utrinque lateribus carinulatis; prothorace latitudine basali paulo longiore, lateribus fossulatim, supra antice sat dense ac minute punctatis, punctis basin versus majoribus, omnibus setula albida, antrorsum directa, minutis; scutello minuto, subquadrato, intruso; elytris latitudine basali vix sesqui longioribus, basi truncatis et hic anguste albido-squamosis, reliquis atomis albidis parce adspersis, striato-fossulatis, stria prima in parte apicali abbreviata, secunda tertiaque eo loco punctatis, fossulis spatiis latioribus, spatio secundo in triente mediano cristato, ut reliquis remote ac minute seriato-granulosis; metasterno dense ochraceo piloso; femoribus posticis dimidia parte abdominis ex apice extantibus, granulis remotis, setuligeris obsitis.

Long. 7–8, lat. 2.9–3.5 mm.

Hab. SAMAR, legit *J. Whitehead,* altitudine 500 ped. (Mus. Dresdense) et LUZON, Laguna, Calauang, legit *R. C. McGregor* (Bur. Sci. Acc. No. 14206).

Matt schwarz, Rüssel sehr dicht punktiert, in der Apicalhälfte mit Mittelleiste, in der Basalhälfte mit Seitenrandleisten und daselbst spärlich mit nach vorn gerichteten Börstchen besetzt, die auf der Stirn noch zerstreuter stehen. Fühler bräunlich, das zweite Geisselglied länger als das erste, die übrigen Glieder, vom dritten ab, an Länge abnehmend, das letzte kugelig, die Keule etwas länger als die drei vorhergehenden Glieder, gestreckt elliptisch. Halsschild etwas länger als an der Basis breit, vorn verjüngt und vorgezogen, die grösste Breite hinter der Mitte, von da nach der Basis zu nur sehr wenig verengt, im vorderen Drittel fein zerstreut, nach hinten zu mit allmälig gröber werdenden Punkten, an den Seiten mit entfernten Grübchen, alle mit kurzem, nach vorn gerichtetem Börstchen. Flügeldecken grubig gereiht-punktiert, die Spatien viel schmäler als die Streifen und entfernt gereiht-gekörnelt, alle Punkte und Körnchen mit weisslichem Börstchen, die erste Reihe im Spitzenviertel abgekürzt, die zweite und dritte daselbst mit kleinen Punkten, das zweite Spatium im mittleren Drittel mässig hoch kammartig erhaben, Deckenwurzel mit feiner Querlinie, aus weisslichen Schüppchen. Hinterbrust schmutzig gelb, kurz beborstet, mit zerstreuten weisslichen Schuppenbörstchen. Abdomen schwärzlich tomentiert, namentlich das erste Bauchsternit mit zerstreuten weisslichen Schüppchen, hintere Hälfte des 2.–4. Bauchsternites kahl. Beine lang, die hinteren mit der Hälfte die Decken überragend, mit spärlichen, weisslichen Börstchen. Vorderschienen des Männchens leicht geschwungen, innen lang schwarz bewimpert.

Diese Art ist bemerkenswert da sie die erste ist, die aus dem malayischen Gebiete bekannt wird, alle übrigen Arten gehören der papuanischen Fauna an.

7. Sclerolips ochrodiscus sp. nov.

Niger, cinerascenti-nigro-squamosus, elytris nebulis nigro-, plaga thoracali medio basali, scutelloque ochraceo-squamosis; rostro depressiusculo, punctato, dorso late glabro, in triente basali carinula mediana; antennis refescentibus, postmedianis, scapo funiculo multo breviore, funiculi articulis tribus basalibus elongatis; prothorace squamulis majoribus ac obscurioribus punctatim adsperso; elytris in striis etiam squamosis, squamulis remote seriatis, dissociatis; segmento abdominali secundo tertio paulo longiore, tarsorum articulo primo fortiter elongato, secundo oblongo.

Long. 6.2–7.5, lat. 2.5–3.2 mm.

Hab. LUZON, Cap Engaño, legit *J. Whitehead* (in Mus.

Dresdense), et INSULA CALAYAN, legit *R. C. McGregor* (Bur. Sci. Acc. No. 649).

Bräunlich schwarz, eine eiförmige, oder fast quadratische Makel in der Mitte auf der hinteren Halsschildhälfte, sowie das Schildchen dicht ockergelb beschuppt, Flügeldecken mit einigen sammetschwarzen Nebelflecken. Rüssel schlank, flach gedrückt, auf dem Rücken glatt, nur im Basaldrittel mit feiner Mittelleiste, im übrigen ziemlich kräftig punktiert. Fühler rotbraun, hinter der Mitte eingefügt, der Schaft die Augen nicht erreichend, viel kürzer als die Geissel, diese mit drei verlängerten Basalgliedern, von denen das zweite das längste ist, Keule kaum länger als die drei vorhergehenden Glieder zusammen. Halsschild quer, die Seiten in der Basalhälfte nach vorn leicht divergierend, dann convergierend, die Basis zweibuchtig, Oberseite dicht bräunlich schwarz beschuppt und ausserdem mit etwas grösseren mehr abstehenden Schüppchen entfernt übersät. Schildchen klein, eiförmig, gewölbt. Flügeldecken an der Wurzel dreibuchtig und daselbst etwas breiter als die Halsschildbasis, die verrundeten Schulterecken sehr wenig vorgezogen, gereiht-punktiert, jeder Punkt mit einem isolierten Schüppchen, auch längs der Mitte der Spatien mit einer Reihe ähnlicher Schüppchen, zweites Spatium dicht hinter der Wurzel mit einer länglichen, sehr flachen Schwiele, die sowie eine unregelmässige Querbinde hinter der Deckenmitte und einige Nebelflecken in der Spitzenhälfte sammetschwarz beschuppt sind, 8. Spatium, namentlich in der hinteren Hälfte, leicht kielförmig erhaben, mit einer Reihe sehr kleiner, glänzender Körnchen. Unterseite dicht bräunlich schwarz beschuppt, Schenkel linear, ihre grösste Breite an der Wurzel, gezähnt, mit Furche zur Aufnahme der Schienen, Tarsen schlank, doch kürzer als die Schienen, rötlich, ihr erstes Glied mindestens so lang wie das Klauenglied, das zweite doppelt so lang wie an der Spitze breit.

Ich weiss diese Art in keine andere Gattung zu bringen wie in diese, mit der sie zweifellos nahe verwandt ist, aber sich von ihr dadurch unterscheidet, dass das zweite Bauchsternit nur wenig länger ist als das dritte, was später wohl die Errichtung einer neuen Gattung veranlassen wird.

8. **Endymia philippinica** sp. nov. (♀ !)

E. marmoratae Kirsch simillima, differt: elytris postice minus attenuatis, spatiis remote subtiliterque granulatis, scutello transverso, prothorace utrinque lateribus plus rotundatis, ante medium tuberculo rectangulari scutelloque transverso.

Long. 9.5, lat. 4 mm.

Hab. INSULÆ PHILIPPINÆ (sine patria exacta) ex coll. *Dr. Baden* (in Mus. Dresdense), et LUZON, Lamao, Bataan, legit *H. E. Stevens* (Bur. Sci. Acc. No. 9801).

Die durch die Fühlerbildung sehr charakteristische Gattung hatte bisher nur papuanische Arten aufzuweisen:

Endymia vipio PASC., Journ. Linn. Soc. (1871), 11, 200, Pl. VIII, figs. 5, 5a, 5b, 5c. Batjan, Dorey.

Endymia geminata PASC., Journ. Linn. Soc. (1873), 12, 43, Pl. I, figs. 13, 13a. Batjan.

Endymia marmorata KIRSCH (*Blepiarda*), Mittheil. Mus. Dresden (1877), 155. Neuguinea, Rubi.

Endymia effusa FAUST, Ent. Zeitg., Stettin (1890), 51, 190. Aru.

Die neue Art von den Philippinen steht der Fühlerbildung nach *E. marmorata* am nächsten, sieht ihr auch durch ihr Schuppenkleid sehr ähnlich, unterscheidet sich aber nicht nur von ihr, sondern von allen anderen Arten der Gattung durch den breiteren, nicht konischen Halsschild und die relativ kürzeren, hinten weniger verjüngten Flügeldecken. Da mir nur zwei Weibchen der neuen Art vorliegen (die Männchen sind durch verlängerte Vorderbeine und bewimperte Tarsen ausgezeichnet), so kann auch nur das Weibchen von *E. marmorata* zum Vergleich herangezogen werden; dieser zeigt, dass das zweite Geisselglied bei beiden Arten verlängert und etwas länger als die fünf folgenden Geisselglieder zusammen ist, dass aber die Keule, die bei *E. marmorata* nur so lang wie die sechs vorhergehenden Glieder ist, bei *E. philippinica* der ganzen Geissellänge gleichkommt. Halsschild an der Wurzel ein und ein Drittel mal so breit wie in der Mittellinie lang, am Vorderrande schmäler als die halbe Basis, im ersten Drittel mit einer Querreihe von undeutlichen Höckern, von denen die äusseren rechtwinkelig sind und nur sehr wenig über den Seitenrand vorragen. Die dichte Beschuppung des Halsschildes ist durch sehr grobe, zerstreute, borstenähnliche Schüppchen tragende Punkte unterbrochen und lässt beiderseits der Mittellinie an der Wurzel einen Quereindruck erkennen. Schildchen deutlich quer, kahl, dunkelbraun. Flügeldecken ganz wie bei *E. marmorata* scheckig beschuppt, die Schultern in grösserer Ausdehnung weisslich, 2. Spatium in der vorderen Hälfte mit zwei entfernten, Naht hinter der Mitte mit zwei gemeinsamen und der Spitzenteil der Decken mit nebelfleckigen, sammetartig braun beschuppten Erhabenheiten, die Spatien aber im Gegensatz zu *marmorata* mit sehr kleinen, entfernten Körnchen, die ein von hinten her eingestochenes, weisses Börstchen tragen. Unterseite spärlich weiss, Schenkel dichter beschuppt, letztere vor der Spitze mit undeutlicher dunkler

Querbinde, drittes Tarsenglied röter als die übrigen mehr bräunlichen.

Endymia effusa Faust.

Diese Art kommt nach einem mir vorliegendem, von J. Whitehead auf der Insel Samar in einer Höhe von 500 Fuss gesammelten Exemplare auch auf den Philippinen vor. Sehr wahrscheinlich fällt diese Art mit *vipio* Pasc., die Faust eben so wenig wie ich in Natura kannte, zusammen und sind die von Faust erwähnten Unterschiede nur auf verschiedenen Erhaltungszustand zurückzuführen, Sicherheit darüber kann jedoch nur ein Vergleich der Typen mit einander geben.

9. **Metialma obsoleta** sp. nov.

Nigra, squamulis setiformibus, ochraceis, sat dense tecta, elytris utrinque ante medium et ante apicem plaga nigricante, obsoleta; rostro apice obscure sanguineo, basi quinque carinulato, parce squamuloso; prothorace crebre punctato, disco parcius tomentoso, obscuriore; scutello minuto, intruso, ochraceo; elytris in striis, sat profundiis, indistincte punctatis, basi, in parte suturali concavis, aequaliter ochraceo-tomentosis, singulis plagis duabus transversis, nigricantibus; propygidio parce albido squamoloso, pygidio parce ochraceo-piloso; corpore subter pedibusque concoloribus.

Long. 5.5–5.7, lat. 3 mm.

Hab. MINDORO, Magaran, legit *C. M. Weber* (Bur. Sci. Acc. No. 13435).

Alle bisher beschriebenen indo-malayischen Arten der Gattung sind durch auffallend heller tomentiertes Schildchen und eben solche Nahtspitze ausgezeichnet, während die vorliegende philippinische Art die Oberseite gleichmässig schmutzig gelb tomentiert und nur auf den Flügeldecken je zwei undeutliche, schwärzliche Quermakeln zeigt. Rüssel in der Apikalhälfte rotbraun, unpunktiert, an der Wurzel spärlich ockergelb beschuppt, mit fünf, durch Punktstreifen getrennte Längsleisten. Fühler bräunlich, das erste und zweite Geisselglied verlängert, das zweite länger als das erste, alle folgenden quer, mit spärlichem Borstenkranz, bis zur rotbraun tomentierten Keule an Breite zunehmend, das letzte dieser angeschlossen. Halsschild dicht und fein raspelartig punktiert, mit kurzem Haarkleid, beiderseits der Scheibe mit undeutlicher, dunklerer Längsmakel. Flügeldecken mit tiefen, aber feinen und sehr entfernt punktierten Streifen, von denen der 7., 8. und 9. an der Schulter abgekürzt, der 3. und 8. vor der Spitze mit einander vereinigt sind, nur

der 9. und 10. erreicht den Spitzenrand. Jede Decke jederseits vor der Mitte und vor der Apikalschwiele mit unregelmässigem bräunlich schwarzem Querfleck. Propygidium und Pygidium mit Mittelkiel, ersteres mit weisslichen, rundlichen Schüppchen, letzteres sehr fein schmutzig gelb behaart. Unterseite gleichmässig einfarbig lehmgelb behaart-beschuppt. Erstes Bauchsternit des Männchens mit breiter Längsfurche, das Analsternit mit grossem, rundem Grübchen.

10. **Nauphaeus sexmaculatus** sp. nov.

Niger, squamulis nigris luteisque tectus, elytris singulis guttis quatuor, una humerali,, una marginali, postmediana, altera discali, minuta et una apicali majore ut corpore subter dense lutescenti-albido-tomentosis; femoribus anticis in triente apicali, tibiis anticis totis, nigris.

Long. 9, lat. 4 mm.

Hab. PALAWAN, Iwahig, legit *C. H. Lamb* (Bur. Sci. Acc. No. 12541).

In Gestalt und Skulptur dem *N. linearis* Hell. [Ent. Zeitg., Stettin (1908), 179], ähnlich, oberseits mit bräunlich schwarzen und schmutziggelben Schüppchen dicht und gleichmässig gesprenkelt, nur die Mittellinie des Halsschildes, vier Deckenmackeln und die Unterseite ganz schmutzig weiss beschuppt. Rüssel nur in der Basalhälfte spärlich beschuppt, sonst kahl, in der Apicalhälfte mässig dicht und kräftig punktiert, an der Wurzel leicht längsrunzelig, mit wenigen zerstreuten, groben Punkten. Kopf dicht punktiert, die gelblichen Schüppchen nur an den Augenrändern dichter stehend als die schwärzlichen. Halsschild in der Mittellinie länger als an der zweibuchtigen Wurzel breit, die Seiten nach vorn leicht convergierend, die Mittellinie, namentlich in der vorderen Hälfte leicht eingedrückt. Schildchen kurz elliptisch, von der Naht eingeschlossen, gelblich tomentiert. Flügeldecken elliptisch, an der Wurzel nicht breiter als die Halsschildbasis, hinter den Schultern sehr wenig erweitert, fein punktiert gestreift, die Naht in den vorderen zwei Dritteln, erstes und zweites Spatium in der vorderen Hälfte entfernt gereihtgekörnt, 4. Spatium an der Wurzel mit einem gelblichen Längsstrich, hinter der Mitte mit einem ähnlichen, aber viel kleineren, vor der Spitze mit einer grösseren, die äusserste Spitze von fünf Spatien bedeckenden Makel. Unterseite dicht gelblich, Vorderschenkel im Spitzendrittel, die Vorderschienen ganz, die Mittel- und Hinterschienen nur aussen an der Spitze schwarz beschuppt.

11. Cercidocerus flavopictus sp. nov. (fig. 3).

Fuscescenti-niger, supra vittis, fascia plagisque stramineis ornatus; rostro apice glabro et sat crebre, reliquo tomentoso ac parce punctato; prothorace vittis duabus dorsalibus, antrorsum convergentibus, vittaque laterali, tenuiore, ab angulos posticos usque ad medium extensa, stramineis; scutello toto, sutura in dimidia parte basali apiceque, macula transversa post humeros, fascia undulosa postmediana, ad suturam breviter interrupta, lineolaque ad apicem in spatio quarto, stramineo- reliquo fuscescenti-nigro-tomentosis; corpore subter albido, plaga laterali in metasterni lateribus, in episternis expansa, vitta prosternali utrinque ante coxis anticis fuscescentibus; segmentis abdominalibus tertio et quarto lateribus, ultimo toto, nigricantibus.

Long. (sine rostro) 15, lat. 6.2 mm.

Hab. MINDANAO, Agusan River, legit *A. Celestino* (Bur. Sci. Acc. No. 12524).

Dem *C. heros* Pasc. [Ann. & Mag. Nat. Hist. (1883), V, 19, 377, Pl. XI, fig. 3], zufolge der relative feinen Halsschildskulptur und der Anlage der Zeichnung verwandt. Rüssel mit haarfeiner, in der kahlen Spitzenhälfte erlöschenden Mittelleiste, daselbst fein und dicht in der Basalhälfte feiner und zerstreuter punktiert und rostgelb tomentiert, über den Augen ein mit der Rüsseltomentierung zusammenhängender Querstreifen ebenfalls so gefärbt. Fühlergeisselglied 3 und 4 stark quer, kürzer als das ebenfalls quere fünfte, Keule schwärzlich, so lang wie breit, beilförmig (Weibchen!). Halsschild zerstreut und fein punktiert, mit feiner Mittellinie, beiderseits der Scheibe mit je einem, nach der Wurzel zu divergierenden und hinten verbreiterten Längsstreifen, an den Seiten ein eben solcher, aber kürzerer, der unterhalb den Hinterecken beginnt und nach vorn sich verjüngend, bis zur Mitte des Seitenrandes reicht, beide strohgelb tomentiert. Schildchen rostbraun, spitz dreieckig. Flügeldecken mit 9 ganzen, feinen, einfachen Streifen, der erste an der Spitze etwas nach aussen gebogen, so dass die Naht daselbst verbreitert ist, die Spatien fein zerstreut-punktiert. Die Basalhälfte und das Spitzenviertel der Naht, die äusserste Wurzel des 1. und 2. Spatiums, eine von der Mitte des dritten Spatiums bis zum 7. Streifen nach aussen reichende, grosse Quermakel, im vorderen Deckendrittel, je eine nach aussen verbreiterte, leicht s-förmig geschwungene Querbinde, die fast bis zur Naht und nach aussen bis zum 7. Streifen reicht, sowie ein kurzer Längsstreifen, im

FIG. 3.

Spitzenviertel des vierten Spatiums, strohgelb tomentiert. Pygidium in der Basalhälfte mit gröberen Punkten, in der Mittellinie mit kurzen rostfarbigen Börstchen. Unterseite vorherrschend gelblich weiss tomentiert, ein von den Vorderhüften nach dem Vorderrande der Vorderbrust ziehender Streifen, die Seiten der Hinterbrust und mit ihr der angrenzende Teil der Hinterbrustepisternen, eine quere Makel je an den Seiten des 3.–4. Bauchsternites, das letzte fast ganz schwärzlich, Mittellinie des Abdomens mit einer Längsreihe von Kahlflecken.

12. Ommatolampus hæmorrhoidalis var. pygidialis nov.

Differt a specie typica: pygidio toto rufo-ferrugineo.

Long. 27, lat. 7 mm.

Hab. PALAWAN, Iwahig, legit *C. H. Lamb* (Bur. Sci. Acc. No. 13212.)

Von der Stammart allein nur durch das oberseits gelbrote Pygidium verschieden.

13. Eutornus luzonicus sp. nov. (fig. 5, 5a).

Aterrimus, nitidus, longirostri Faust affinis, sed minus elongatus, corporis in forma crenato Faust fere aequali; rostro basin versus, paulo angustato, ante antennarum insertionem paulo latiore, sat crebre, retrorsum sensim fortius punctato, dorso inter antennas canalicula brevi; prothorace maxima latitudine basin propiore, latitudine paulo longiore, sat dense, basin versus majus punctato; scutello transverso-ovali; elytris prothorace latioribus, latitudine duplo tertiaque parte longioribus, striato-punctatis, stria prima impressa, spatio octavo in parte apicali convexo, reliquo ut spatio nono decimoque acute tenuique carinulatis; corpore subter remote punctato, sternito anali punctis majoribus.

Long. 9.2, lat. 2.2 mm.

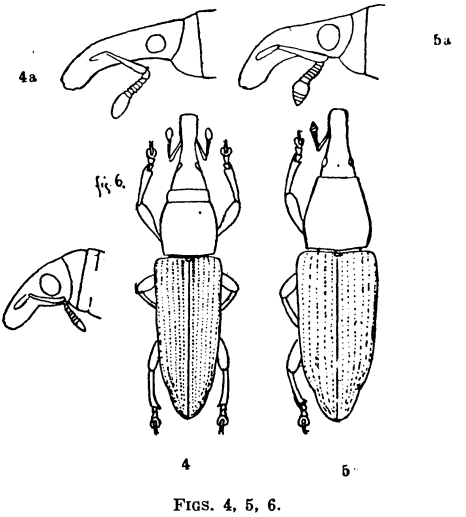
Hab. LUZON, Montalban Gorge, Rizal, legit *W. Schultze,* et Los Baños, legit *C. F. Baker.*

Glänzend schwarz, Rüssel so lang wie der Halsschild, leicht gebogen, Fühlerinsertion dicht vor der Mitte, der davor liegende Teil ziemlich parallelseitig und etwas breiter als der basale Rüsselteil, Punktierung ziemlich dicht und kräftig, Rüsselrücken zwischen der Fühlerinsertion mit undeutlichem, kurzem Längseindruck, zwischen den Augen mit Grübchen. Kopf vor der Einschnürung grob punktiert. Die Entfernung vom Augenhinterrand beträgt weniger als der Augendurchmesser. Fühlerschaft kräftig, alle Geisselglieder quer, die Keule kreiselförmig, ihre grösste Dicke näher der Basis. Halsschild wenig länger

als breit, seine grösste Breite näher der Basis, Vorderrandabschnürung oberseits seicht, in der Mitte unterbrochen, die ziemlich dichte Punktierung nach der Halsschildwurzel zu unmerklich gröber werdend. Schildchen klein, quer, etwas trapezoidal. Flügeldecken im Spitzenteil verengt, die nach der Spitze zu verbreiterte Naht leicht dachförmig gewölbt, die erste Punktreihe ganz, die übrigen Reihen, die kaum der Hälfte eines Spatiums an Breite gleichkommen, nur an der Spitze streifenartig eingedrückt, namentlich der dritte Streifen im Spitzenfünftel tief gefurcht, das zweite und achte Spatium daselbst wulstartig vortretend, letzteres, ausgenommen im basalen Viertel, das 9. und 10., namentlich in der Basalhälfte, mit sehr feiner Längsleiste. Im übrigen alle Spatien mit kaum wahrnehmbarer, zerstreuter Punktierung. Mittelbrust kräftig und dicht, Hinterbrust spärlicher, Abdomen feiner, im mittleren Teil undeutlich, Analsternit in der Basalhälfte grob punktiert, sein Seitenrand mit kleineren Punkten, die Apikalhälfte fast ganz glatt. Schenkel fein punktiert, etwas längsrunzelig, Schienen längsstreifig.

14. Eutornus stricticollis sp. nov. (fig. 4, 4a).

Praecedenti (E. luzonico) parum affinis; paulo minor, plus angustatus; rostro longiore, parte apicali apicem versus distincte dilatata, crebre, basin versus majus punctato, dorso inter antennas canalicula, fronte foveola; capite temporibus oculorum diametrum longioribus; prothorace lateribus aequaliter ac modice rotundatis, maxima latitudine in medio, crebe punctato, margine antico circum fortiter constricto, disco linea mediana levi; elytris similiter ut in luzonico, sed striis fortius punctatis, stria prima punctis basalibus transversis, spatio secundo striis confinibus vix latiore; corpore subter omnino dense punctato.



FIGS. 4, 5, 6.

Long. 8, lat. 1.9 mm.

Hab. LUZON, Montalban Gorge, Rizal, legit *W. Schultze* (Bur. Sci. Acc. No. 5196).

Dem *E. luzonicus* ähnlich, aber kleiner und gestreckter, der Rüssel länger und im Spitzenteil deutlich nach vorn verbreitert, dicht, nach der Wurzel zu gröber punktiert, zwischen der Fühlerinsertion, auf dem Rücken, mit kurzer, seichter Längsfurche, zwischen den Augen mit eingestochenem Punkt. Fühler rötlich braun, alle Geisselglieder quer, Keule elliptisch (bei *E. luzonicus* kreiselförmig). Halsschild, auch ohne der Vorderrandabschnürung, länger als breit, die Seiten gleichmässig und schwach gerundet, gleichmässig dicht punktiert, die Scheibe mit glatter Mittellinie, Vorderrand ringsum stark abgeschnürt. Schildchen klein, quer, trapezoidal. Flügeldecken wie bei *E. luzonicus*, nur gestreckter, mehr gleichbreit und mit gröberen Punktreihen, die Punkte an der Wurzel der ersten Reihe quer, das zweite und dritte wenig breiter als die anliegenden Punktreihen. Unterseite mässig dicht punktiert, 3. und 4. Bauchsternit im mittlerem Teil, Analsternit am Vorder- und Hinterrande glatt. Schenkel punktiert, Schienen längsstreifig.

15. Eutornus rufobasalis sp. nov. (fig. 6).

Niger, metasterno, abdomine elytrorumque basi rufo-brunneis; rostro prothorace multo breviore, latitudine vix sesqui longiore, equilato, subtiliter punctato; antennis pone oculos insertis, scapo clavato, funiculo articulis transversis, latitudine sensim crescentibus, clava conica, funiculi articulo ultimo vix latiore; prothorace oblongo, sat dense subtiliterque punctato, linea mediana, triente basali excepta, levi, margine antico constricto; scutello minuto, rotundato, elytris, sutura excepta, in triente basali rufis, punctato-striatis, sutura basin versus paulo dilatata, stria sexta septimaque tenuibus, haud impressis, antice abbreviatis, spatio paenultimo in parte apicali convexo; corpore subter metasterni lateribus distincte, abdomine subtilius punctatis, sternitis abdominalibus tertio quartoque, lateribus exceptis, glabris.

Long. 6, lat. 1.5 mm.

Hab. LUZON, Los Baños, legit *C. F. Baker.*

Glänzend schwarz, die Flügeldecken, die Naht ausgenommen, im vorderen Drittel, sowie die Hinterbrust und das Abdomen braunrot. Rüssel viel kürzer als der Halsschild, kaum doppelt so lang wie breit, sehr fein zerstreut punktiert. Fühler vor den Augen eingefügt, Schaft gebogen, den Hinterrand des Auges erreichend, die Geisselglieder quer an Breite zunehmend, das letzte so breit wie die Wurzel der konischen Keule. Entfernung des Augenhinterrandes von der Kopfeinschnürung etwas geringer als der kürzere Augendurchmesser. Halsschild länger als breit, an den Seiten gleichmässig und schwach gerundet, überall

fein mässig dicht, aber ziemlich tief punktiert, in den vorderen zwei Dritteln mit glatter Mittellinie, Vorderrand breit abgesetzt, Hinterrand gefurcht. Flügeldecken nicht breiter als der Halsschild, cylindrisch, mit feinen Punktstreifen, sechster und siebenter Streifen nur gereiht-punktiert, vorn abgekürzt, jede Decke an der Wurzel mit dunkelroter Längsmakel, die innen das erste Viertel des ersten Streifens tangiert, aussen aber fast bis zur Mitte des Aussenrandes nach hinten reicht so dass ihr Hinterrand schräg verläuft. Vorletztes Spatium im Spitzenteil mit dem zweiten vereinigt und daselbst gewulstet. Unterseite an den Seiten der Hinterbrust deutlich, der Hinterleib feiner punktiert, das dritte und vierte Sternit im mittleren Teil glatt.

AMPHICORDUS genus novum

Brenthidarum (*Amorphocephalidarum*)

Caput breve, transversum, post oculos constrictum. Rostrum capite duplo longiore, maris depressiusculum, dorso sulcatum, apicem versus vix dilatatum, feminae cylindricum. Antennae validae, prothoracis basin haud attingentibus, articulis 2.–4. subtransversis, articulo apicali acuminato, duabus praecedentibus unitis aequilongo. Prothorax oblongo-ovatus. Elytra prothorace plus capite breviora, supra levia. Metasternum abdomine aequilongum, segmenta abdominali 1. et 2. elongata, 3. et 4. brevissima. Femora valida, brevia compressa, subter ante apicem spinosa, postica segmento abdominali secundo haud superantia. Tibiae anticae curvatae, intermediae posticaeque compressae, apicem versus fortiter dilatatae, tarsi articulis basalibus brevibus, quinto reliquis aequilongo.

Kopf quer, hinter den Augen ringsum abgeschnürt, Rüssel ungefähr doppelt so lang wie der Kopf, flachgedrückt, ziemlich gleich breit. Fühler kräftig, die Halsschildwurzel bei weitem nicht erreichend, die einzelnen Glieder vom 2. ab quer, oder wenig breiter als lang, Endglied zugespitzt doppelt so lang wie breit. Halsschild gestreckt elliptisch. Flügeldecken walzenförmig, unverhältnismässig kurz, wenig länger als der Halsschild, nur an der Wurzel mit Suturalstreifen, sonst oberseits glatt, an der Spitze abgerundet. Hinterbrust so lang wie das Abdomen, das 1. und 2. Bauchsternit verlängert, das 3. und 4. sehr kurz, zusammen kaum so lang wie das halbe zweite. Schenkel kurz, zusammengedrückt, die hinteren das zweite Bauchsternit nicht überragend, unterseits in der Mitte mit Dorn. Schienen gekrümmt, Mittel- und Hinterschienen nach der Spitze zu verbreitert.

16. Amphicordus inproportionatus sp. nov. (fig. 7).

Nitidus, rufo-fuscescens, antennis subcompressis, articulo primo crasso, secundo transverso, reliquis longitudine paulo crescentibus, nono octavo paulo breviore; elytris ad basin stria suturali tenui, nigro-punctatis, stria octava tenuissima, nona fortiter impressa, in dimidia parte antica abbreviata, decima integra, in dimidia parte postica nonaque unita, spatio inter nonam et decimam striam in dimidia parte postica costato, in medio et ad apicem guttis fulvis, alteris guttis in spatio secundo ad basin et post medium, in spatio tertio in primo triente et in spatio quarto post medium; corpore subter obscure rufo, glabro.

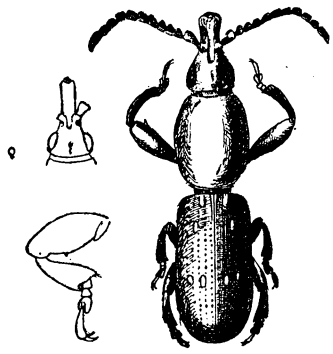


FIG. 7.

Long. 8–9, lat. 2 mm.

Hab. MINDANAO, Port Banga, legit *W. J. Hutchinson* (Bur. Sci. Acc. Nos. 8852, 12003).

Stark glänzend, dunkel rotbraun, durch die unverhältnismässig kurzen, glatten Decken auffallend. Rüssel beim Männchen mit Dorsalfurche, beim Weibchen hinter der Fühlerinsertion mit Eindruck, Scheitel in beiden Geschlechtern mit Medianeindruck. Fühler ziemlich dick, den Halsschildhinterrand bei weitem nicht erreichend, erstes Glied sehr dick und mindestens so lang wie das Endglied, das zweite quer, nach innen erweitert, die folgenden, bis zum fünften, etwas an Länge zunehmend, das achte kleiner als die es einschliessenden Glieder. Halsschild glänzend, glatt. Flügeldecken glatt, nur an der Wurzel mit Subsuturalstreifen, mit dunklen Punktreihen, von denen die 8. Reihe leicht, die 9. in der hinteren Hälfte stark eingedrückt ist, der zwischen ihnen liegende Zwischenraum ist gewulstet, verengt sich aber plötzlich vor dem Spitzenrand der Decken und zeigt vor der Mitte und vor seinem Ende eine gelbe Makel. Ähnliche Längsmakeln finden sich an der Wurzel und hinter der Mitte des zweiten Spatiums, im ersten Drittel des dritten Spatiums und hinter der Mitte auf dem vierten Spatium.

HENARRHODES genus novum

Brenthidarum (*Belopheridarum*) *prope Arrhenodes*

Antennae maris thorace plus elytris fere aequilongae, articulo ultimo longissimo, ante medium rostri insertae; caput longitudine

latiore, trapezoidale, ad basin constrictum, utrinque carinatum. Rostrum prothorace aequilongum, maris apice dilatatum. Elytra apice subtruncata, angulo externo dentato. Femora postica elytrorum apicem attingentia. Tarsi elongati, articulo primo ultimo paulo breviore.

Die Gattung unterscheidet sich von allen Belopheriden dadurch, dass die Hinterschenkel das zweite Abdominalsternit überragen und die Deckenspitze erreichen; von allen Brenthini der ersten Gruppe Schönfeldts (Genera Insectorum) durch die langen Fühler, die so lang wie der Halsschild und die Flügeldecken zusammen sind. Kopf quer, trapezoidal, an der Basis abgeschnürt, so dass die Schläfen wie bei *Arrhenodes* ohrförmig abgerundet sind. Scheitel gewölbt. Rüssel lang, ohne Mandibel so lang wie der Halsschild, beim Männchen an der Spitze dreieckig verbreitert und daselbst nur wenig schmäler wie der Kopf. Mandibel mässig lang, sichelförmig. Fühler des Männchens vor der Rüsselmitte eingefügt, die ersten fünf Glieder an Länge zunehmend, die folgenden wieder allmälig abnehmend, so dass das vorletzte etwas kürzer als das vierte Glied ist, letztes Glied das längste. Halsschild gestreckt elliptisch, ungefähr $1\frac{1}{2}$ mal so lang wie breit. Flügeldecken ähnlich wie bei *Arrhenodes*. Schenkel unterseits mit Dorn vor der Spitze, die hinteren die Deckenspitze erreichend. Die Tarsen lang, das erste Glied $\frac{3}{4}$ mal so lang wie das letzte, das zweite ungefähr $1\frac{1}{2}$ mal so lang wie breit.

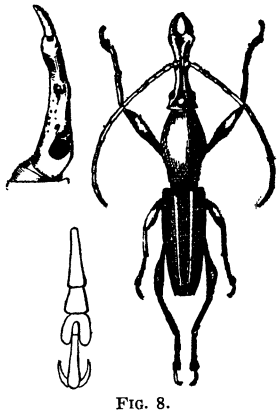


FIG. 8.

17. Henarrhodes macgregori sp. nov. (fig. 8).

Niger, prothorace, margine antico nigro excepto, rufo, elytrorum spatio secundo, apice excepto, fulvo; rostro dorso carinis duabus, retrorsum divergentibus; prothorace nitido, s u l c o basali; elytris punctato-striatis, stria prima (subhumerali) nona decimaque levibus, prima fortius impressa, stria nona in triente basali, stria decima in dimidia parte apicali abbreviatis.

Long. tot. ♂ 17–21, ♀ 14–17, lat. ♂ 3–3.8, ♀ 2–2.8.

Hab. LUZON, Benguet, Irisan River, legit *R. C. McGregor* (Bur. Sci. Acc. No. 1185).

Schwarz, Halsschild mit Ausnahme des schwarzen Vorderrandes, rot, zweites Deckenspatium, ausgenommen an der Spitze,

gelb. Rüssel des Männchens, ohne Mandibel, so lang wie der des Weibchens, 1½ mal so lang wie der Halsschild und cylindrisch; ersterer wie bei *Arrhenodes* und *Eupsalis* mit verbreiterter Spitze, sein Rücken mit zwei nach hinten divergierenden Längsleisten, die hinter den Augen im Bogen nach abwärts laufen; die Länge der ohrförmig abgesetzten Schläfen übertrifft nur um wenig den Augendurchmesser. Vor jedem Auge befindet sich, in beiden Geschlechtern, eine rundliche Erhabenheit, von ungefähr halben Augendurchmesser. Fühler vom 6. Glied ab ganz, die Basalglieder nur teilweise unterseits schwarz tomentiert. Flügeldecken an der Spitze etwas abgestumpft, die Aussenecke mit Zähnchen. Der erste Streifen an der Spitze mit dem neunten verbunden, glatt und tiefer eingedrückt, die übrigen, vom 2.–9. punktiert-gestreift. Der 9. Streifen ist im vordern Drittel, der 10. in der hinteren Hälfte abgekürzt, beide sind unpunktiert. Unterseite glänzend schwarz, nur die Hinterbrust und der Hinterleib in der vorderen Hälfte mit goldgelben Härchen spärlich, die Seiten der letzten drei Sternite dichter und mehr graulich fein behaart.

18. **Ocalemia prasina** sp. nov.

Viridi-metallica, femoribus, apice nigro-coeruleo excepto, rufis, tibiis, tarsis antennisque, articulis duabus ultimis cervinis exceptis, nigris; capite parte anteoculari, mandibulis haud computatis, parum transverso; fronte impressione aequilaterali-triangulari, glabra, reliqua sat rude, vertice subtiliter crebreque, collo remotius punctatis; prothorace subirregulariter, ad angulos posticos fortiter punctato, ad angulos anticos, ut vitta mediana, glabriusculis; scutello ferrugineo-piloso; elytris crebre fortiterque, apicem versus subtilius ac densius punctatis, apice oblique subsinuato-truncatis, marginibus subtilissime nigro-ciliatis; corpore subter plus aenescenti-viridi, sericeo, segmentis ultimis parum coerulescentibus.

Long. 20, lat. hum. 4.5 mm.

Hab. LUZON, Benguet, Baguio, legit *R. C. McGregor* (Bur. Sci. Acc. No. 11006).

Oberseite metallisch grün (wie bei *Gaurotes virginea*), die Schenkel, mit Ausnahme der schwärzlich stahlblauen Spitzen, gelbrot, Schienen, Füsse und Fühler, letztere mit Ausnahme der zwei rehbraunen Endglieder, schwarz. Kopf im Vergleich zu der mir vorliegenden *O. vigilans* Pasc., sehr breit, der Teil vor den Augen (ohne Mandibel) etwas breiter als lang, Stirn mit

gleichseitig dreieckigem, glattem Eindruck, die Fühlerhöcker sehr spärlich, der Scheitel dicht und tief punktiert, beiderseits der Mittelfurche mit einigen wenigen Punktgrübchen. Halsschild länger als an der Basis breit, Vorderrand kragenartig abgeschnürt, Basis mit tiefer Randfurche und in der Mitte mit tiefem Quereindruck, fein, aber ziemlich tief und viel sparsamer als der Kopf punktiert, ein Mittelstreifen und der abgeschnürte Vorderrand fast unpunktiert. Beiderseits innerhalb der Hinterecken, nahe dem Basalrand, mit einer Querreihe von zwei bis vier Punkten. Flügeldecken an der Spitze einzeln schräg ausgerandet, die äussere Spitze nach hinten ausgezogen, Nahtsaum fadenförmig erhaben, fein gekerbt punktiert, jede Decke mit zwei undeutlichen Rippen und dichter Punktierung, die an der Basis etwas gröber als im übrigen Teil ist und nur bei gewisser Beleuchtung zwischen den Punkten leichte Querrunzeln erkennen lässt. Unterseite sehr fein seidenartig behaart, die Hinterbrust und die Seiten des Hinterleibes äusserst fein punktiert, der Hinterrand der einzelnen Bauchsternite in mehr oder geringerer Ausdehnung geglättet. Vorder- und Mittelschenkel ganz, die hinteren mit Ausnahme des schwarzblauen Spitzenviertels, gelbrot, Schienen und Tarsen schwärzlich, die vorderen an der Wurzel bräunlich, die hinteren bläulich.

19. **Euryphagus maxillosus** var. **nigricollis** nov. (♀).

Differt a specie typica: capitis dimidia parte postica thoraceque, angulis posticis anguste rufis exceptis, nigris.

Hab. SIBUYAN ISLAND, legit *R. C. McGregor* (Bur. Sci. Acc. No. 1908).

E. maxillosus Oliv. lag mir in einer Anzahl von Dr. A. Schadenberg auf Luzon gesammelten Exemplaren vor, ohne dass sich darunter eine nennenswerte Abänderung gefunden hätte. Das von Herrn McGregor auf der kleinen, östlich von Mindoro gelegenen Insel Sibuyan gesammelte Weibchen zeichnet sich durch einen in der hinteren Hälfte schwarzen Kopf und schwarzen Halsschild aus. Die Verteilung der schwarzen Färbung des Kopfes ist derart, dass sie den hinter den Augen liegenden Teil einnimmt und zwischen den Fühlern in Form eines halbkreisförmigen Lappens auf die Stirn herabgezogen erscheint, ausserdem ist eine Quermakel auf der Kehle schwarz. Der Halsschild ist mit Ausnahme der roten Seitendorne und einem Streifen, der längs des Hinterrandes von den Hinterecken nach den Vorderhüften zieht, ganz schwarz.

20. **Planodes schultzei** sp. nov. (fig. 9).

Omnino aequaliter nigricans ac subtiliter ochraceo-tomentosus; elytris punctis dense ochraceo-tomentosis adspersis, fasciis tribus latis formantibus, una basali, una mediana, et una apicali; capite sat profunde punctato, fronte subrugosa; antennis rufescentibus, scapo rugoso-punctato, ut articulo tertio et quarto (his in apice exceptis) ochraceo-pilosis ac ut ceteris parce nigro-ciliatis; prothorace parce granulato-punctato, margine antico posticoque densius ochraceo-pilosis itaque pallidioribus; scutello semicirculari; elytris sat remote asperato-punctatis, humeris granulosis, sutura in dimidia parte apicali carinulata, elytris singulis pone medium sub-bicarinulatis; corpore subter subtiliter cinereo-tomentoso, segmento primo secundoque in lateribus longe fulvo-pilosis, segmentis reliquis in margine postico glabris.

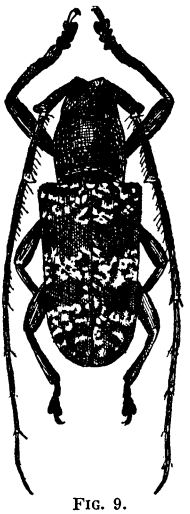


FIG. 9.

Long. corporis 22, antennarum 35, lat. elytrorum 7.5 mm.

Hab. PALAWAN, Iwahig, legit *W. Schultze* (Bur. Sci. Acc. No. 10842).

Überall ziemlich gleichmässig schwärzlich, fein lehmgelb tomentiert, die Fühler rötlichbraun, die Flügeldecken mit drei breiten Querbinden aus teilweise zusammenhängenden, dicht ockergelben Tomentpunkten, eine davon an der Basis, eine in der Mitte und eine im Spitzendrittel. Längs des Augenunterrandes und längs des Vorder- und Hinterrandes des Halsschildes ist die Tomentierung verdichtet und daher mehr weisslich. Kopf und Scheitel tief und zerstreut punktiert, die Stirn runzelig. Halsschild zerstreut und etwas raspelig punktiert, auf der Scheibe mit erlöschenden Punkten. Flügeldecken an der Wurzel und auf den Schultern gekörnt, im übrigen entfernt raspelartig punktiert, jede Deckenscheibe hinter der Mitte mit zwei undeutlichen Längsstreifen, die Naht in der Apikalhälfte mit schwacher Leiste. Unterseite gleichmässig grau tomentiert, nur das erste Bauchsternit jederseits am Hinterrande, das zweite jederseits am Vorderrande lang gelblich behaart. Hinter- und Mittelschienen aussen im Spitzenteil schwärzlich tomentiert.

Die zweite von den Philippinen von Newman im Entomologist (1842), 323, beschriebene Art ist:

20a. **Planodes quarternaria** Newman.

Sie wird a. ä. O. wie folgt charakterisiert: Nigra, lanugine fulva undique obsita, punctisque nigris irrorata; utriusque elytris maculae 2 dorsales nigrae; prima major, subrotundata, ante medium sita, secunda minor, oblonga, pone medium sita (corp. long. 0.75 unc., lat. 0.225 unc.).

21. **Agelasta mediofasciata** sp. nov. (fig. 10).

Picea, supra nigro-tomentosa, atomis dispersis, prothorace margine postico, elytris fascia mediana, albido-tomentosis; humeris subtuberculatim extantibus; antennis articulo tertio, quarto quintoque in dimidia parte basali, ultimo fere toto albidis; corpore subter, pro- et metasterno, marginibus segmentorum abdominalium articulisque tribus ultimis tarsorum, albido-tomentosis; episternis metasternalibus in dimidia parte anteriore nigris.

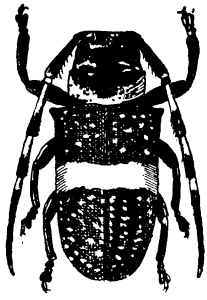


FIG. 10.

Long. 16, lat. 7 mm.

Hab. SIBUYAN, legit *R. C. McGregor* (Bur. Sci. Acc. No. 1902).

Von allen bekannten Arten durch die etwas höckerartig vorspringenden, rechtwinkeligen Schultern und die weisse Binde in der Deckenmitte ausgezeichnet. Schwarz, grösstenteils schwärzlich tomentiert, oberseits überall mit weissen Tomentpunkten bestreut, ebenso der ganze Basalrand des Halsschildes weiss, Stirn mit undeutlicher glatter Mittellinie, die weissen Tomentpunkte am Seitenrand etwas streifenartig zusammenfliessend. Fühler schwarz, 3., 4. und 5. Glied in der Basalhälfte, das letzte, mit Ausnahme der Wurzel, ganz weiss. Halsschild stark quer, an den Seiten mit groben, zerstreuten Punkten, die sich längs des weisstomentierten Hinterrandes fast bis zur Mitte erstrecken, die Scheibe vorherrschend schwarz. Schildchen quer, schwarz, in der Mitte an der Wurzel weiss tomentiert. Flügeldecken in der hinteren Hälfte mit eingedrücktem Suturalstreifen, an der Wurzel dicht und leicht raspelartig punktiert, mit gleich breiter, weisstomentierter Querbinde in der Mitte, die ungefähr halb so schmal ist wie der schwarze Basalteil der Decken, dieser sowie der schwarze Apikalteil mit weissen Tomentpunkten. Vorder- und Hinterbrust dicht weiss, Episternen und Epimeren der Mittelbrust vorherrschend schwarz, die Episternen der Hinterbrust nur in der vorderen Hälfte schwarz tomentiert. Abdominalsternite hinten weiss gerandet.

Die Art erinnert etwas an *A. sulphuræ* Pasc. aus Celebes.

22. **Euclea rhombifera** sp. nov. (fig. 11).

Aterrima, fronte utrinque vitta, prothorace vitta laterali ad medium marginis antici convergenti; elytris in disco signatura fere quadrata, diagonaliter disposita, macula marginali transversa, subapicali vittaque subsuturali, brevi, ad apicem, cretaceo-tomentosis; fronte irregulariter punctato, linea mediana indistincta, levi; scapo fortiter ruguloso-punctato, antennis articulo tertio quartoque in dimidia parte basali griseis; prothorace rude punctato, in dimidia parte basali vitta mediana levi; scutello nigro, transverso, subtriangulari; elytris ad basin sat rude, retrorsum sensim subtilius punctatis, ad suturam leviusculis; corpore subter maxima parte cretaceo-tomentoso, sternitis abdominalibus 2., 3., 4. in parte mediano, aut fere totis, nigro-glabris.

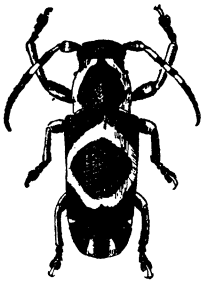


FIG. 11.

Long. 13.5–17, lat. 4–5 mm.

Hab. TICAO INSULA, legit *R. C. McGregor*, et NEGROS, Faraon, legit *H. M. Curran* (Bur. Sci. Acc. Nos. 1448, 1099 et 12209).

Tief schwarz, mit gelblich weisser Tomentzeichnung. Stirn unregelmässig und grob punktiert, mit undeutlicher, glatter Mittellinie, jederseits mit einem bis zum Hinterrande der Augen nach hinten reichenden Tomentstreifen. Erstes Fühlerglied grob runzelig, 3. und 4. Glied in der Basalhälfte grau. Halsschild etwas länger als breit, grob punktiert, in der Basalhälfte mit glattem Mittelstreifen, an den Seiten mit breitem, im vorderen Drittel nach der Mitte des Vorderrandes zu divergierenden Tomentstreifen, zuweilen auch der Basalrand schmal gelblich. Schildchen quer, schwarz. Flügeldecken kräftig punktiert, die Punkte nach der Naht und nach hinten zu etwas kleiner, Nahtsaum glatt, Mitte der Naht von einer fast quadratischen, weisslich tomentierten Figur umschrieben, die diagonal zur Naht orientiert ist, mit ihrer vorderen Ecke fast das Schildchen, mit ihrer hinteren Ecke das zweite Drittel der Naht erreicht, und deren Aussenecken als breites Band bis zum Seitenrande verlängert sind. Ausserdem am Rande jeder Decke, hinter dem zweiten Drittel, eine kleine Quermakel und neben der Nahtspitze ein kurzer Tomentstreifen von weisslicher Farbe. Unterseite dicht tomentiert, 2.–4. Bauchsternit nur in der Mitte, oder ganz kahl. Beine schwarz, Schenkel sehr fein grau pubescent, Vorderschienen mit schwarzen Wimpern.

Die Art ist am nächsten mit *E. illecebrosa* Pasc. verwandt, unterscheidet sich aber von ihr, ausser durch die abweichende Anlage der Tomentzeichnung, vor allem dadurch, dass die dunklen Teile der Decken und des Halsschildes, die bei *illecebrosa* bläulich schwarz und grösstenteils glänzend kahl, bei *rhombifera* tief schwarz und fein schwarz tomentiert sind. Halsschild relativ kürzer, kräftiger punktiert und in der hinteren Hälfte der Mittellinie mit kahler Längsschwiele. Zu den von G. A. Baer [Ann. Soc. ent. France (1886), 156] angeführten Arten von den Philippinen kommt ausserdem noch die ebenfalls durch die Deckenzeichnung leicht kenntliche *Euclea tagala* Hell. [Abh. u. Ber. Mus. Dresden (1898–99), 7, 6] hinzu.

23. **Encaustes palawanica** sp. nov. (fig. 12).

E. gigantea Boh. paulo minor, capite maculis rotundatis, obscure rufis, tribus, una mediana ad labri basim, altra utrinque ad oculi marginem interiorem; prothorace utrinque plaga fulva, oblongo-trapezoidali, margine interno et postico sinuatis; scutello valde transverso, pentagonali; elytris plaga magna, basali, scutellum vix tangente, margine postico triangulariter emarginato, fascia postmediana, laterali, valde coarctata, fere divisa, macula subquadrata in medium, pone suturam, lunula transversa, ante-apicali maculaque triangulari apicali, fulvis; tibiis in parte apicali fulvo-tomentosis.

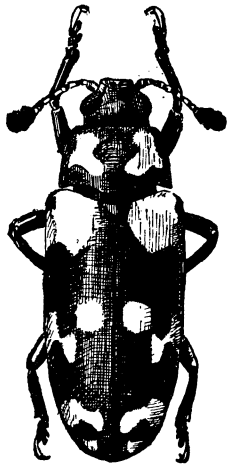


FIG. 12.

Long. 30, lat. 10 mm.

Hab. PALAWAN, Iwahig, legit *C. H. Lamb* (Bur. Sci. Acc. No. 13213).

Wenig kleiner als *E. gigantea* Boh. und sowie *E. tagala* sp. nov. dadurch ausgezeichnet, dass die Basalbinde der Decken am Vorderrand, innerhalb der schwarzen Schultern, ganzranding ist. Kopf in der Mitte des Basalrandes der Oberlippe und jederseits am hinteren Ende des inneren Augenrandes mit dunkelroter Makel. Halsschild quer, sehr fein und mässig dicht punktiert, beiderseits am Hinterrand, etwas näher dem Seitenrand als der Mittellinie, mit eingedrücktem Schrägstrichelchen. Schildchen stark quer, pentagonal. Flügeldecken mit Längsstreifen aus unregelmässig zusammengedrängten, feinen Pünktchen. Basal-

binde sehr breit, am Hinterrande winkelig ausgerandet. Mitte des Seitenrandes mit einer schräg nach hinten und nach der Naht zu gerichteten Binde, die stark eingeschnürt ist, vor ihrem Ende beiderseits neben der Naht, eine fast quadratische Makel; Spitzendrittel mit einer dreieckigen Längsmakel. Spitzendrittel der Schienen rostrot tomentiert.

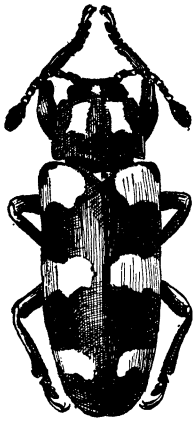


FIG. 13.

24. **Encaustes tagala** sp. nov. (fig. 13).

Niger, thorace maculis duabus, elytris sex fulvis ornatis; capite subtiliter punctato, fronte in medio verticeque glabriusculis; prothorace utrinque macula vittiforme (antice haud dilitata), postice thoracis dimidia parte paulo superante; elytris singulis maculis transversis tribus, latis, antica solum margine anteriore ad callum humeralem emarginata.

Long. 27, lat. 9 mm.

Hab. LUZON, Benguet, Irisan, legit *W. Williamson* (Bur. Sci. Acc. No. 6482).

Bedeutend grösser als *E. malayana* Guér. und dieser sehr ähnlich gezeichnet, die Basalmakel der Decken aber innerhalb der schwarzen Schultern ohne Ausrandung am Vorderrande. Kopf feiner punktiert, drittes Fühlerglied so lang wie das 6. und 7. zusammen. Halsschildform wie bei *E. malayana,* nur wenig flacher und auf der Scheibe noch feiner punktiert, beiderseits am Hinterrande, neben dem Scutellarlappen, flach eingedrückt, mit eingegrabenen Längsstrichelchen. Die ähnlich wie bei erwähnter Art geformten Halsschildmakeln sind kürzer und aussen, am vorderen Ende, nicht in die Breite gezogen. Schildchen sehr stark quer, breiter und kürzer wie bei *E. malayana.* Flügeldecken mit feinen, zerstreuten Pünktchen, die der undeutlichen Streifen unregelmässig und nicht stärker markiert. Die gelbroten Deckenmakeln an ihren Rändern weniger gezackt, die vordere ganzrandig und nur an den Schultern mackelartig ausgeschnitten. Unterseite und Beine, auch die in der vorderen Hälfte innen gekerbt-gezähnten Vorderschienen, wie bei der mit ihr verglichenen Art.

25. **Triplatoma exornata** sp. nov. (fig. 14).

Niger, elytris vix purpureo-aenescentibus, antennis pedibusque subrufescentibus, fronte utrinque lunula, prothorace (ut in T. macleayi Lac.) vitta in dimidia parte postica biramosa, marginem

posticum attingente, macula in medio marginis anticis, elytris in disco vittis parallelis, figuram ellipticam formantibus, ramis duabus ad marginem lateralem, duabus antrorsum, duabus postrorsum exmittentibus fasciaque anteapicali fulvis; prothorace angustiore quam in T. maclayi, lateribus minus rotundatis; elytris subtiliter seriatopunctatis, striis in parte apicali evanescentibus.

Fig. 14.

Long. 19, lat. 7 mm.

Hab. TAWI TAWI, legit *F. W. Foxworthy* (Bur. Sci. Acc. No. 12565).

Schmäler als. *T. maclayi* Lac., namentlich der Halsschild gestreckter, sein Randsaum der ganzen Länge nach kräftiger, Kopf und Halsschild mit ganz ähnlicher gelbroter Zeichnung, nur reichen die medianen Längsbinden in der hinteren Halsschildhälfte bis zum Hinterrand. Schildchen ebenfalls wie bei der erwähnten Art, stark quer, fünfeckig. Flügeldecken sehr schwach erzglänzend, mit feinen Punktreihen, die im Spitzendrittel erlöschen, die Spatien deutlicher wie bei *T. maclayi* zerstreut punktiert. Die gelbrote, sehr charakteristische Deckenzeichnung besteht aus zwei Längsstreifen, die das zweite bis vierte Fünftel des ersten und fünften Spatiums einnehmen und vorn und hinten in Form einer langgestreckten Ellipse verbunden sind und sowohl vorn wie hinten nach den Seitenrändern zu, als auch auf dem vierten Spatium nach der Wurzel, auf dem 3. Spatium nach der Spitze zu einen Ast entsenden, ausserdem vor der Spitze mit einer welligen Schrägbinde. Unterseite schwarz, Seitenrand der Vorderbrust, eine Makel zwischen den Vorderhüften, je eine Quermakel an den Seiten in der hinteren Hälfte der Abdominalsternite und das Analsternit ringsum am Hinterrande rot.

TEXTFIGURENERKLARUNG

FIG. 1. *Nanoplaxes merrilli* gen. et sp. nov.
2. *Cyamobolus* (?) *palawanicus* sp. nov.
3. *Cercidocerus flavopictus* sp. nov.
4. *Eutornus stricticollis* sp. nov.
5. *Eutornus luzonicus* sp. nov.
6. *Eutornus rufobasalis* sp. nov.
7. *Amphicordus improportionatus* gen. et sp. nov.
8. *Henarrhodes macgregori* gen. et sp. nov.
9. *Planodes schultzei* sp. nov.
10. *Agelasta mediofasciata* sp. nov.
11. *Euclea rhombifera* sp. nov.
12. *Encaustes palawanica* sp. nov.
13. *Encaustes tagala* sp. nov.
14. *Triplatoma exornata* sp. nov.

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FRANCISCO DE CARRIEDO Y PEREDO

By ALEXANDER E. W. SALT

(From the College of Liberal Arts, University of the Philippines, Manila, P. I.)

Three plates and one text figure

By common consent Francisco de Carriedo y Peredo has been called the greatest benefactor of the city of Manila. To his foresight and benevolence the inhabitants of Manila owed for over twenty years the possession of an excellent system of water supply, which they had lacked for over three centuries, and though, with increasing demands, it has now proved inadequate and has been largely supplanted by a newer and more complete system, it still remains as a valuable asset in time of emergency.[1]

While, however, Carriedo is recognized as a benefactor, the printed data as to the man himself, his charitable wisdom, and the progress of the work with which his name is associated is scanty in the extreme;[2] and he is commemorated only by a

[1] This was notably true during the severe drought of April and May, 1912.

[2] Blair and Robertson, The Philippine Islands. Cleveland (1907), 52, 320, has only a footnote of 12 lines copied from Vindel's Catalogo, and there is no mention of Carriedo in any of the current histories in English, Spanish, French, or German. The only existing monograph, Carriedo y sus obras. Manila (1882), by Francisco de Mas y Otzet, was written expressly for the inauguration of the water supply, and is mainly devoted to the attendant ceremonies.

fountain,[3] a bridge, and a street in Manila, and by a portrait on the 26-centavo [4] stamp (Philippine issue of 1906).[5] It is to remedy this defect that I have carefully examined all the manuscript material, especially in the archives of the city of Manila, that might bear on the subject, and present in this paper the result of my investigations.[6]

Francisco de Carriedo y Peredo was born at Ganzo, a hamlet in the town of Torrevalega, in the Province of Santander, Spain, on November 7, 1690, and died in Manila on September 7, 1743.[7] He came to the Philippines in 1722 in charge of the cargo of the *Santa Familia,* one of the Acapulco galleons, and thus secured the title of "general." [8] On June 26, 1727, he married Mariana de Cosio, daughter of Toribio (Florencio) José Miguel, Marquis of Torre Campo, thirty-third governor and captain-general of the Philippines (1721–1729).[9] His wife died childless [10] less

[3] The fountain bears the simple inscription (Plate I):

Á CARRIEDO
MANILA
1878–1884

[4] One centavo equals 0.5 cent United States currency; 100 centavos equal 1 peso, or 50 cents United States currency.

[5] The portrait is taken from a bust originally in the possession of the city of Manila, which has now disappeared. A photograph of the bust is in the Bureau of Archives of the Philippine Government (Record Division). As no picture of Carriedo was extant and no account of his appearance could be found, the bust, which was selected from over twenty entered for competition, is merely a creation of artistic imagination and is not here reproduced.

[6] At this juncture, I desire to express my obligations to the courtesy extended by the officials of the city of Manila in my work.

[7] Ganzo is in the archdeaconry of Santillana. The extract from the church register of the parish of San Martin, Ganzo, which records his baptism, may be translated as follows: On November 20, 1690, I, Juan Gutierrez Quixano, parish priest of San Martin, Ganzo, baptized, and anointed with holy oil Francisco, legitimate son of Joseph de Carriedo and Juliana de Peredo, born on the seventh day of the same month. His godparents were his grandparents, Juan de Carriedo and Ana de Peredo of the village of Quixas, and the witnesses, Juan Gomez and Bernardo Gomez.

[8] Audiencia y Chancilleria de las Islas Filipinas. Reales sentencias y autos definitivos. Manila (1736), 236. The sailing master, *piloto,* of a galleon bore the title of "capitan."

[9] The archives of the Cathedral of Manila contain a record of the marriage, of which the following is a translation: On June 26, 1727, in my presence, as judge, provisor, and vicar-general of this archbishopric, were married, by pledging of troth, Doña Mariana de Cosio, spinster, of the city of Santiago, Guatemala, legitimate maiden daughter of Don Thorivio José Miguel de Cosio y Campo, Marquis of Torre Campo,

than two years after her marriage, and was buried with her mother in the church of the Jesuits, then on the southwest corner of Calle Palacio and Calle Victoria.[11] (Plate II.)

There is also a record of her burial in the cathedral archives as follows: Doña Maria Ana de Cosio. On March 18, 1729, the body of Doña Maria Ana de Cosio, wife of General Don Francisco Carriedo, was laid in the church of the Jesuits. She had complied with the rites of the church. Her interment was public. Fee, 10 pesos. [Signed] Don Miguel Monroy.—Libro de entierros de Españoles (1633–1720), 420.

Carriedo himself survived his wife over thirteen years. He died in Manila, as has been said, on September 7, 1743, and was also buried in the Jesuit church. Before his death[12] he had

knight of the order of Calatrava, and member of His Majesty's Council, governor and captain-general of the Philippine Islands, and president of its Royal Audiencia and Chancillery, and of Doña Maria Ignacia de Miranda, Marchioness of Torre Campo and General Don Francisco Carriedo y Peredo. Don Miguel Enriques de Cosio and the Marchioness were witnesses. [Signed] Joseph de Ibarluzea.—Libro de casamientos de Españoles (August 19, 1716–June 14, 1751), 4, 97.

[10] I am indebted for these extracts from the cathedral archives to the courtesy of Father Eulogio A. Sanchez, canon of the Cathedral and rector of the parish. When the waterworks were opened, La Oceania Española discovered a legitimate son of Carriedo named Lucas, an ancestor by marriage of the Count of Lizarraga, then living in Manila. Investigation in the Cathedral archives reveals no trace of his existence. Moreover, Carriedo is sufficiently explicit in a statement attached to his will. "During my marriage, no child, son or daughter, was born to me." La Oceania Española (July 25, 1882); Libro de bautismos de Españoles (Jan. 16, 1718–May 12, 1757), 4.

[11] In 1906, the authorities of the military Medical Supply Depot on Calle Concepcion discovered the common gravestone of Doña Mariana de Carriedo and her mother, which was being used as a footstone. When the Jesuits were expelled from the Philippines in 1769, the gravestone was removed to a cemetery on Calle Concepcion. This afterwards became the headquarters of the Spanish engineer corps. Traces of the cemetery may still be seen in the grounds of the Medical Supply Depot. The stone may now be seen in the sala of the Ateneo Municipal de Manila, a school for boys on Calle Arzobispo, conducted by the Jesuits. The inscription on the stone, which is remarkably clear-cut, may be translated as follows: Here lies Doña Mariana Cosio, daughter of the most illustrious the Marquis and Marchioness of Torre Campo, governing these Islands, and wife of General Francisco de Carriedo y Peredo. She died on March 17, 1729, being twenty-two years of age. Here also lies her mother, the most illustrious Doña Maria, Countess of Miranda, Marchioness of Torre Campo, who died on November 19, 1729.

[12] There is no trace of the exact spot where he was buried, and the committee, appointed in 1885 to dig up the floor of the ruined church of the Jesuits in the hope of discovering his remains, had to report failure. Actas del Cabildo de Carriedo (hereafter quoted as "Actas de Carriedo") (Aug. 17, 19, 1885).

served the city on the municipal board as an "alcalde ordinario,"[13] and had amassed considerable wealth, probably from investments on the "Nao de Acapulco."[14] Consequently, when his will was proved by his executors, his nephew, Manuel Antonio de Peredo,[15] and the Marquis of Montecastro y Llanas Hermosa, he was found to have left over 77,000 pesos, besides personal property, reliquaries, and shares in the cargo of various galleons. He had, moreover, during his lifetime given a sum of 1,500 pesos to the Tertiary Order of Saint Francis to be invested for the benefit of the sacristy of Our Lady of Guidance, *Nuestra Señora de Guia,* in the parish church of Ermita.[16] The amount left under his will included legacies to relations in Spain, to servants and dependents in Manila, and to religious organizations in the Philippines, New Spain, and the mother country, besides large bequests for masses for his soul. His native village of Torrevalega was also benefited to the extent of a stone chapel and a bridge.

[13] The destruction of most of the records of the city of Manila during the British occupation of 1762–1764 has made it impossible to state exactly the length of his tenure of office, but we know that he was a "regidor" in 1733 and "alcalde ordinario" in 1736 and 1740.—Audiencia de las Islas Filipinas. Reales sentencias (1733), 169; (1736), 214, 274; Actas del Ayuntamiento de la ciudad de Manila (hereafter quoted as "Actas de Manila") (1739–1740), 246.

[14] While the risks were heavy, the returns were proportionately large, and the position of "general," with its accompanying salary of 4,125 pesos a year and its opportunities for trade, was one of the most profitable in the Philippine service.—Martinez de Zuñiga, Estadismo de las Islas Filipinas (1893), 1, 268; Churchill, Collection of Voyages (1764), 4, 491; Morga, Sucesos de las Islas Filipinas (Translated into English by James A. Robertson in Blair and Robertson, The Philippine Islands (1904), 14, 175–195; Jagor, Reisen in den Philippinen (1873), 14; Bourne, Introduction to Blair and Robertson, The Philippine Islands (1903), 1, 62–67.

[15] He was a native of Quevada, also a hamlet in the town of Torrevalega. He left for New Spain immediately after his uncle's death, but returned to Manila in 1750, and remained in Binondo until his decease in 1767. He was buried in the parish church of San Gabriel, Binondo.—Archivos de la Audiencia de las Islas Filipinas. Registro inventario del juzgado general y privativo de los bienes de difuntos (1767), 86.

[16] Archivos del Arzobispado. Libros de las obras pias (1743), 2, 32. The image of Our Lady of Guidance was venerated during the Dutch invasion of 1609, and the galleons were also commended to her care. Blair and Robertson, The Philippine Islands (1904), 17, 277. Ermita, as its name suggests, was originally the site of a small chapel of devotion, *visita,* which was founded by seculars, but transferred by Governor Tello to the Augustinians. Buzeta, Manuel, y Bravo, Felipe, Diccionario geográfico, estadístico, histórico de las Islas Filipinas (1851), 2, 77.

Among his relations mentioned are his sisters, Maria Mercia Carriedo, a nun in the convent of San Andrés de Aroyo, and Juliana Antonia Carriedo y Peredo; his brother, Juan Antonio de Carriedo (deceased); his nephew, José de Castañeda y Carriedo—all living in Spain—; and his uncle, Pedro Carriedo, of Valladolid, in the Province of Michoacan, New Spain, whom he makes his residuary legatee.

To the will is attached a request that he shall be buried in the habit of a Franciscan lay brother, and certain moneys are left to be expended on clothes for prisoners and inmates of hospitals on the day of his funeral. In all, the will contains 48 clauses and a codicil.[17] For our purpose, the most important clauses are numbers 34, 35, and the attached codicil. His great personal interest in the city of Manila had led him in December, 1733, to offer 14,000 pesos to the city of Manila and its merchants; and although this offer was then laid on the table it was now again repeated. The amount was to be divided into two portions of 10,000 pesos and 4,000 pesos. Both portions were to be invested, under definite conditions, by the city authorities, until they reached a specified figure, and were then to be devoted

[17] An authorized copy of the will was obtained by the authorities of the city of Manila in 1764 on the motion of Regidor Andrés de Barrio, bearing the imprimatur of Ramon Orendain, executive secretary. This, however, was lost in the transference of documents to the "Junta de Consolidación de Vales Reales" in 1809 (*vide post*, p. 176), and the municipal board did not possess another copy until 1883, when, by the energy of Regidor Ramón Aenlle, another was secured from Spain, authenticated by Candido Gomez Oreña, notary public of Santillana. This is now in the city archives. The amount left by Carriedo was increased in 1774 through the recovery by his attorney, Nicolas Diaz, of a sum (not stated), the amount of which was lent on a note of hand to Captain Andrés Blanco Bermudez.—Mas y Otzet, Carriedo y sus obras (1882), 45–46; Audiencia de las Filipinas. Reales sentencias (1744), 66; Año de 1883. Candido Gomez Oreña, notario publico de Santillana. Testimonio del poder para testar y memoria testamentaria del Exmo. Señor General Don Francisco de Carriedo y Peredo, otorgados en la Ciudad de Manila, 24 de Noviembre, 1883.

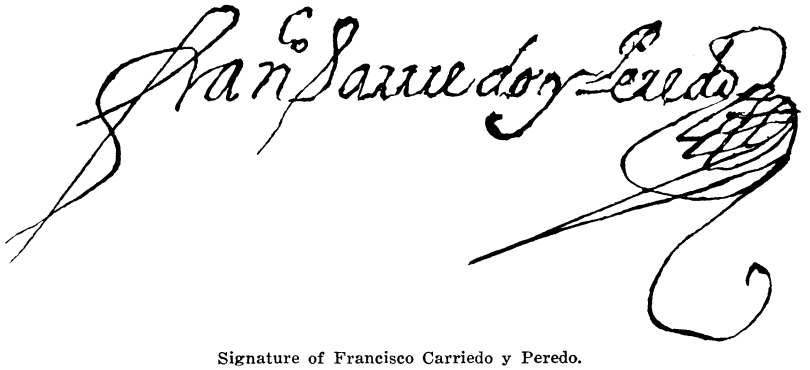
For a list of his charitable bequests in the city of Manila, one of which—to the "Santa Misericordia"—is still administered by the Franciscans, see Mas y Otzet, Carriedo y sus obras (1882), 38–44.

One of his tasks, that of executor to Sargento-Mayor Manuel de Miranda, involved him in a lengthy lawsuit with his sister-in-law's second husband, Captain Tomás Gomez de Angulo. In October, 1733, Angulo sued Carriedo for 2,805 pesos, 7 tomins, 6 granos (12 granos=1 tomin, 8 tomins=1 peso), the amount of his wife's dowry, and of certain sums spent from her first husband's estate during her widowhood, winning his

to their original purpose. From the larger of the investments, the citizens were to be provided with pure water; from the smaller, an industrial school for beggars was to be founded. Carriedo's plan with regard to the water supply was stated with great clearness, both in his will and in the attached codicil.

I hereby declare that in the month of December, 1733, I wrote to this city and to its merchants, offering them the sum of 10,000 pesos to carry water by means of a pipe line from San Pedro Macati, under terms and conditions laid down in the said proposal. This offer was considered by them at a meeting of the municipal board on November 5, 1734; but, after discussion, this acceptance was deferred. But since it has always been my purpose to take my part in a work that is acceptable to God, because of the great benefit that may accrue to the poor therefrom, I hereby request my executors after my death, when the value of my property has been estimated, to insist on the city and its merchants accepting 10,000 pesos, under similar conditions, which I do not wish changed or altered, excepting only that the place whence the water may most easily be carried may be changed, if it shall be found more convenient to bring water from the Maybonga River along the right bank of the Pasig to Santa Cruz, and not from San Juan del Monte. On these terms alone shall the 10,000 pesos be handed over.

The conditions are fourteen in number, and were evidently drawn in accordance with the testator's wishes by a second party,



Signature of Francisco Carriedo y Peredo.

suit on appeal to the audiencia in May of the following year. In February, 1734, he secured an additional 150 pesos which had been withheld by Carriedo from his nephews and nieces, while they were living in Parañaque. In 1737, however, he lost the guardianship of his stepchildren, which was transferred to their uncle. After Carriedo's death, the audiencia, on August 17, 1744, ordered 43,198 pesos, 6 tomins, 9 granos, to be paid over to Angulo from the Carriedo estate, but less than four months later, on December 2, reversed this decision, and deposited the bulk of the money in the treasury, which was in urgent need of funds.—Audiencia de las Filipinas. Reales sentencias (1732), 349–352, 520; (1733), 25–27; (1734), 252–253; (1737), 156, 194–195; (1744), 120–123, 199–202.

probably the Marquis de Montecastro, prior to the transference of the money in 1748.

(1) It was the wish of the deceased that, after 10,000 pesos had been handed over to and received by the city, it should be placed in a separate chest[18] with three keys to be kept, respectively, by the "alcalde," the oldest representative of the merchants, and the oldest "regidor."[19] All moneys accruing to the fund from the original amount, either by investment or loans, shall be kept entirely separate and distinct from all the municipal funds, from the rents, property, or investments, and shall be administered independently of and apart from such funds.

(2) Neither now nor hereafter shall the nucleus of this fund or its increment be touched, even for urgent or necessary cause, nor shall anything be taken from each by way of loan or aid, even in time of great need, nor shall any loan be made from it under bond or security, *except for the purpose for which it is intended.* In this event [*i. e.*, if the foregoing conditions are not complied with], the fund shall cease, and shall not continue for the purpose for which it has been left, but shall be diverted for another purpose provided for by the testator, who desires, under such circumstances, to debar the city and its merchants from the use of the said fund, and to transfer it to those who shall understand and interpret the conditions, which shall be kept, fulfilled, and exactly carried out as here stated.

(3) The city and its merchants shall decide as to the best and most convenient method of increasing the fund, either by making loans to trustworthy and creditable persons on their own bond or with proper securities, or by investment, as occasion shall offer.

(4) As the fund is increased by loans or by investments, there shall be a proportional increase of risk, in order that the fund may the more quickly reach the sum desired by the deceased.

(5) The fund shall be invested under the above conditions until it reaches the sum of 50,000 pesos, when there shall be invested or lent every year the sum of 12,000 pesos, the interest on the principal being added to the original amount.

(6) The sum of 60,000 pesos shall be always kept in the chest as a reserve to provide for any accident that may occur (which God forbid) from the loss of a vessel, or from difficulties or delay in the repayment of a loan.

[18] This was called the "caja de Carriedo."

[19] The municipal board, *cabildo*, at this period consisted of 2 *alcaldes* ("de primera y de segunda elección")—magistrates elected annually by the Spanish householders, *vecinos*—and 8 councillors, *regidores;* a constable, *alguacil mayor;* and a registrar, *secretario;* all of whom held office by purchase or by property right. This form of municipal government, which dates from Legaspi (June 24, 1565), was, as in the colonial cities, copied exactly from that existing in municipalities in Spain. Officially, the city authorities were known as "El muy ilustre y siempre leal Ayuntamiento de la ciudad de Manila." In judicial pleas, they were addressed as "El cabildo, justicia y regimiento." Here, however, the term used is "la ciudad y su comercio."—Martinez de Zuñiga, Estadismo de las Islas Filipinas (1893), 1, 358; Mallat, Les Iles Philippines (1846), 1, 358; Armstrong, Charles V (1896), 98–99; Dayot, Cedulario de la ciudad de Manila (1836).

(7) The water shall be carried by pipes of tile or Chinese clay along a channel made of brick, so that, even when the pipe line is injured by earthquakes, the water shall not be harmed. This channel shall commence at any place that shall be thought most convenient, providing always that the water shall not be salt.

(8) If it shall be found convenient without injury to the supply of water, there shall be built, at a certain distance one from the other along the pipe line, open reservoirs in which the water shall be purified by exposure to the sun, so that it may lose any impurities which it may have received from the pipes.

(9) The water shall be carried from the most convenient place in the neighborhood of Manila at the least possible cost, for which purpose a careful investigation shall be made as to which place provides the best water and whence it may be most conveniently carried. If it shall be found impossible to carry out the work with the interest and increment of 30,000 pesos, the sum shall be returned with the interest and property belonging to the fund, in order that the work may be done elsewhere. (*Cf.* Clause 2.)

(10) If the desired purpose of supplying the city with water be accomplished, three or four public fountains shall be placed in the city and in the suburbs; and, at the expense of the fund, water shall be carried to the convents of San Francisco and San Juan de Dios and to the monastery of Santa Clara.

(11) If any other convent or community house or private persons shall desire to avail themselves of the benefits of this gift, it shall be bestowed upon them under such terms and conditions as shall appear to be just; and, whatever sums they shall pay to the municipal board for this advantage, shall be applied to the fund to repair any necessary damages to the work and to pay the salary of those responsible for repairs and maintenance.

(12) If the investments made by the city shall so result that it shall be found possible to complete the work with 20,000 pesos or 24,000 pesos of money, no further investments shall be made; and all the capital and money over and above the 30,000 pesos which was designed for the establishment of the work shall remain on deposit in the hands of the city, on the understanding that, when rice is scarce and the price is high, it shall be sold to the poor at the original cost. If the amount on hand shall not be deemed enough for this purpose, it shall be increased by the city through investment, until it shall reach a sum that shall be sufficient to aid the necessitous in time of scarcity.

(13) The foregoing conditions on which rice shall be purchased shall be definite and unalterable so that, when rice is scarce, it may be purchased at a moderate cost. No attempt whatever shall be made, under any circumstances, to touch this reserve, to use it for any other purpose, or to lend it, even on the best security. In this event [*i. e.*, if the foregoing conditions are not complied with], the amount shall be returned.

(14) These conditions shall not be limited, infringed, or altered; but shall be fulfilled, carried out, and executed as expressed above.[20]

The water supply of Manila had been a serious problem from the first year of Spanish occupation. Although the early settler was less affected than the modern resident by the impure water

[20] Mas y Otzet, Carriedo y sus obras (1882), 48-51.

of the Pasig River,[21] he was not satisfied with its quality nor with that drawn from local wells, and was accustomed to have his water conveyed in cascos, either from Laguna de Bay or from old Cavite.[22]

As early as 1597, Governor Tello, in a letter to King Philip II, had expressed his intention of having water conducted into the city, "as it is needed by the citizens and creoles stationed here by your Majesty. Many have died on account of the poor water." Nothing definite, however, came of Tello's suggestion; and it was due to the energy of the Dominicans, and especially of Father Juan Peguero, that the first organized attempt was made to provide at least a portion of the city with fresh water. In 1602 they opened the convent of San Juan del Monte as a house of recreation, and at once looked for and discovered a spring of water flowing from the rock. This supplied local needs until 1686, when they determined to extend the benefit of the supply to the city, and laid a pipe line to convey the water from the source to the San Juan River, 750 meters distant.[23] Hence it was carried in bancas to the wharf opposite the gate of the convent in the Walled City. This task, which was not completed until 1690, occupied from 12 to 30 men working continuously for over three years, and large sums of money were spent from the provincial funds, without a single contribution from the government treasury or from any private individual. Under this plan,[24] although it was effective within a limited area,

[21] Attempts at public filtration were few and far between, although in 1833 the petty governor, *gobernadorcillo*, of the district of Tondo issued public notices (in Spanish and Tagalog), giving advice as to the proper methods.—Actas de Manila (833), 34.

[22] For bringing water from the lake or from the Maybonga River, the casco owners charged 80 pesos a journey, or 25 pesos if the casco was not manned by his own rowers. The water for sale was conveyed through the streets in carts drawn by belled carabaos or sold from licensed bancas (native canoes) at Santa Ana and San Pedro Macati. The wealthy often brought water from springs on their haciendas if these lay near the city.—Actas de Manila (1844), 20; (1854), 22; (1861), 68. Copia de una exposición de los regidores, Soler y Baden, sobre abastecimiento de aguas potables al vecindario de la ciudad de Manila (4 de Mayo, 1861).

[23] The letter is dated in Manila, April 29, 1597, and signed: Don Francisco Tello.—Simancas-Secular; Audiencia de Filipinas; cartas y expedientes del presidente y oidores de dicha Audiencia vistos en el Consejo, años 1583 a 1599; est. 67, caj. 6, leg. 18. Translated in Blair and Robertson, The Philippine Islands (1904), 10, 41–45. For a brief life of Father Peguero, see Blair and Robertson, The Philippine Islands (1906), 41, 255, note 79.

[24] I am indebted for this information to Father Malumbres, O. P. The manuscript account of the work, written by Father Peguero himself, is in the archives of the Dominican convent.—Reseña biografica, 81–82.

the suburbs were not touched, nor was water carried to the houses of private citizens, and it was to secure these advantages that Carriedo made his bequest.

The municipal board received the legacy in 1748. According to the terms of the will, they were not entitled to utilize the money at once, and, consequently, invested it in the Acapulco galleon and in ships trading to China, the Moluccas, and India. Owing to the destruction of the city archives by the British during the occupation of Manila (1762 to 1764), it is impossible to estimate the extent to which the fund increased in value during the first fourteen years of its existence. All that we know is that a considerable sum was seized when Admiral Cornish captured the city of Manila on October 6, 1762, and that, among other funds administered by the city, the Carriedo chest was also raided.[25] Fortunately, a nucleus was saved on the galleon *Filipino* on returning from Acapulco, amounting, in the case of the "obra pia de aguas," as one portion of the Carriedo bequest was now called, to 9,551.75 pesos, and of the "obra pia de pobres" to 2,472.37 pesos, the result of loans made in 1761 at 21.25 per cent.[26] The story of the salvation of these amounts is somewhat vague. Apparently, the captain of the *Filipino,* on being forewarned from Manila as to the presence of the British in Philippine waters, instead of following the usual route to Manila, abandoned his vessel, and landed his money and cargo on the northern coast of the Island of Samar,[27] whence it was conveyed, first, by sea to a port in Albay and, thence, overland to Bacolor in Pampanga. The total sum saved was probably large, although Ferrando's statement that, including the "situado" or annual subsidy from Mexico, it amounted to over 2,500,000 pesos is in all likelihood dictated by his partiality to Archbishop Rojo, who had accused Anda of fraud in the matter.[28]

[25] At the beginning of 1764, the municipal board reported that they had no funds and no supplies, and that their records and papers were in a pitiable condition.—Actas de Manila (1764), 14, 63.

[26] The term "obra pia" as applied to these two funds was first used in 1767 by Tomás Gomez de Angulo, city attorney of Manila. Carriedo uses the term "obra" in his will in the phrase "obra de conducir las aguas de San Pedro de Macati a Manila," and elsewhere. (*Vide ante,* pp. 171, 172.)

[27] The actual spot has been identified as Calbayogan at the west entrance of the port of Palápag. Archbishop Rojo merely says, "at Palapa," and Anda, "at the Province of Leyte." Blair and Robertson, The Philippine Islands (1907), 49, 51, 113, 208, 298.

[28] Anda's action is, however, defended by Montero y Vidal. Montero y Vidal, Historia de Filipinas (1887–95), 2, 115–116; Ferrando, Juan, y Fonseca, Joaquin, Historia de los dominicos en las Islas Filipinas (1870), 4, 624; Blair and Robertson, The Philippine Islands (1906), 44, 258–259; (1907), 50, 38.

The ruse of the captain of the *Filipino* was a great disappointment to Admiral Cornish, who had fully expected to capture the vessel. Captain Parker, whom he despatched for this purpose, encountered a galleon which he boarded and took among the Naranjos Islands, south of Sorsogon, on October 30, 1762. Much to his amazement, this prize turned out not to be the *Filipino* but the *Santisima Trinidad,* which had left Manila on August 1, and had been forced to run back because of adverse winds. The English admiral was severely criticized for allowing the *Filipino* to escape in this fashion, as, when she was discovered, she was nothing but a bare hulk.[29]

With the successful issue of the transference of the money from the Pacific Ocean to Pampanga, there are generally connected the names of Juan Valverde, a Spanish Dominican, and Francisco de San Juan, a native of Pagsanjan, in the Province of Laguna. The latter voluntarily equipped a troop of Tagalog archers who acted as an escort to Valverde, to whom was entrusted the safe delivery of the money, and on his return to Bacolor attached himself as a body servant to Anda, with whom he remained until his master's death at Imus in 1776.[30]

The "obra pia de pobres" remained in the possession of the city until 1809. It was invested at interest until December 28, 1787, after which it was allowed to lie fallow.

In 1788 the government decided to found a hospital for the poor, which was to be called the "Hospicio de San José." As this institution came within the terms of the will of Carriedo, there was no hesitation in transferring the fund, with an additional gratuity of 2,000 pesos out of the general city chest, to the hospital committee which had been appointed on September 12, 1809, and consisted of Ventura de los Reyes (one of the Philippine representatives in the Spanish cortes from 1810 to 1812), Antonio José Fernandez, Antonio Madrigal (a member of the municipal board), and Francisco de Paula Prieto. The total amount which was actually paid over on February 16, 1810,

[29] Le Gentil, *op. cit.;* Blair and Robertson, The Philippine Islands (1903), 2, 224–225, 264–265; (1907), 49, 57–59; Montero y Vidal, *op. cit.* (1887–95), 2, 16, 17, note 2.

[30] There is a painting of Anda's deathbed, with Francisco de San Juan by his side, by Rafael Enriquez, dean of the College of Fine Arts, University of the Philippines. The people of Pagsanjan, encouraged by the late Antonio Maria Regidor y Jurado (a Philippine historian whose merit has not been thoroughly recognized), have always purposed to erect a monument to San Juan in his native town.

was 5,444 pesos and 70 centavos. The instigation of the payment came from the board of consolidation of exchequer bills, *junta de consolidación de vales reales,* which had called for a statement as to the condition of all charitable foundations administered within the city of Manila, and which, on May 27, 1808, discovered a considerable discrepancy between the actual sum on hand and the sum reported by the city authorities as being in their possession.[31]

The "obra pia de aguas," on the other hand, was to pass through many vicissitudes before the will of the founder was to be complied with. The first interference in the course of its regular progress came in 1767, when Joseph de Castillo and Bruno Pastor Morales, as executors of Pedro Carriedo, began to lay claim to the fund, and reached a climax in 1788, when Francisco David instituted a suit in behalf of Hemeterio Josef Bolado y Azaños, first cousin and heir-at-law of the same Pedro Carriedo, against the corporation and government of the city of Manila for the recovery of 18,000 pesos, more or less, salvage from the wreck of *Nuestra Señora de Cavadonga,* which was the combined value of the two "obras pias."[32] The case was decided for the defendant in the municipal court, but on appeal to the "audiencia," the decision was twice reversed (January 22 and May 26, 1789).[33] The city, therefore, went beyond the local courts to the council of the Indies, and as a result of their favorable action received on January 2, 1792, all the books and documents bearing on the case.[34]

The second interruption came twelve years later from the board of consolidation of exchequer bills, of which we have spoken. This board was created by a royal order on November 8, 1804, and proposed to devote all the moneys and property belonging to charitable foundations in Manila to the benefit of

[31] Mas y Otzet, Carriedo y sus obras (1882), 57–58; Actas de Manila (1806), 272–273; (1807), 283–296; (1809), 259–261, 297–298; (1810), 23–25, 27–28, 31–33; Noticia de las obras pias y capellanias que tiene la noble ciudad de Manila (May 27, 1808).

[32] Probably the legacy made by Francisco de Carriedo was the result of an investment made on the *Nuestra Señora de Cavadonga* (Cabadonga, Cabdalonga), which was captured by Anson in 1742.—Kerr, History and Collection of Voyages (1811–1817), 11, 489–501; Archivos de la Audiencia Registro inventario del juzgado general y privativo de los bienes de difuntos (1768), 92.

[33] Audiencia de las Islas Filipinas. Reales sentencias (1789), 23–24, 147–148.

[34] Mas y Otzet, Carriedo y sus obras (1882), 55–56.

the hospitals of San Lazaro and San Juan de Dios.[35] Its formation was probably inspired by the exhaustive report, issued on June 23, 1797, by Angel de la Fuente, as a member of the board of secret revenues, with regard to the Jesuit funds.[36] As soon as it had been regularly organized, it proceeded on November 6, 1806, to request the city authorities to hand over the capital of both "obras pias" with the corresponding papers.[37] For a year and a half the city, with characteristic dilatoriness,[38] resisted this demand, until they were finally forced to obey a peremptory order that compliance must be made within eight days, and a grudging transference was accordingly made on March 28, 1808, with meager information as to the state of the funds.[39] The city at once combined with the merchants' association, the four orders of friars, and the Confraternity of the Holy Pity, which was responsible for the administration of many "obras pias," and appointed José Casal and Manuel Callejas as their representatives on a deputation which laid the whole matter before the home government in Madrid. As a result of this, they were finally permitted to retain their privileges, and the money was returned on June 6, 1809.[40] These troubles, naturally, checked to a certain degree the normal increase of the fund, but when it was handed over to the board of consolidation in 1808 it amounted to 32,187.50 pesos, nearly three and one-half times as much as it had been in 1765. The total amount was made up as follows:

Item.	Pesos.
Loan to insular government	16,705.00
Loans to private individuals	3,066.81
Amount owing from estates of José Garcia and Luis Varela	4,050.92
Cash on hand	8,364.77
Total	32,187.50

All this, save the amount due from the estates, was recoverable.[41]

Prior to 1815, the fund was increased by loans made at interest to those who wished to trade either on the Acapulco galleon

[35] Actas de Manila (1807), 174. The hospital of San Lazaro was established in 1578 by the Franciscan friar, Juan Clemente. It was transferred to its present location in 1784. It was supported by a tax on stamped paper, an "encomienda," a yearly contribution from the merchants, and certain "obras pias" in its possession.

[36] Blair and Robertson, The Philippine Islands (1907), 51, 57, note 20.

[37] Actas de Manila (1806), 256.

[38] *Ibid.* (1808), 120–121, 124–128, 130–131.

[39] *Ibid.* (1809), 56.

[40] *Ibid.* (1811), 45–47.

[41] Mas y Otzet, Carriedo y sus obras (1882), 57.

or on vessels to Java or the Coromandel coast of India, which were known as sea risks, *riesgos de mar*.[42] The amount that

[42] A contemporary manuscript, entitled: Cuenta sobre el caudal para la obra de agua. Liquidación formada de esta obra y cantidad de pesos que resulta a su favor producida de las correspondencias vencidas de las que se han dado para los riesgos de Nueva España y costa de Java: empieza en el principal y premio que se recaudaron del viaje del patache que en el año de 1761 se despacha para Acapulco y sucesivamente corro el giro de su aumento hasta el de 1787 inclusivo con la que se dió en la Fragata San José para Acapulco, gives a list of all investments made between 1765 and 1787, and is here summarized.

Date.	Vessel.	Destination.	Debtor.	Amount loaned.			Rate of interest.
				Pesos.	Tamins.	Granos.	
							P. cent.
1765	Santa Rosa	Acapulco	City of Manila	1,139	4	0	30
1766	San Carlos	do	Alonso Herrera	4,770	0	0	30
1767	Santa Rosa	do	Ignacio Barsola	3,350	0	0	30
1767	do	do	Juan Hurralde	1,500	0	0	30
1767	do	do	José Guevara	260	0	0	30
1768	San Carlos	do	Blas de Castrillon	2,600	0	0	30
1768	do	do	Alonso Herrera	2,600	0	0	30
1768	do	do	Francisco Barroso	1,000	0	0	30
1770	San José	do	Francisco Cortes Carrido.	3,000	0	0	30
1770	do	do	José Joaquin Martinez.	2,500	0	0	30
1772	San Carlos	do	Pedro Galarras	3,677	4	0	30
1772	do	do	Matias de Porras	3,577	4	0	30
1774	Concepcion	do	Antonio de Pacheco	8,973	6	6	30
1775	San José	do	Lorenzo Lopez de Buycoche.	1,060	1	6	30
1775	do	do	Matias Suarez	7,658	4	0	30
1777	Nuestra Señora del Rosario.	Java	Vicente Conde	4,800	0	0	12
1777	San Antonio de Padua.	Coromandel	Antonio Martinez	4,300	0	0	18
1777	Nuestra Señora del Carmen.	Java	Miguel de Memije	2,400	0	0	12
1777	San José	Acapulco	José Tamndis	4,066	6	3	25
1777	do	do	Matias Suarez	4,000	0	0	25
1777	do	do	Vicente Conde	4,000	0	0	25
1778	San Pedro	do	do	8,063	5	6	30
1779	San José	do	Ignacio Nagera	4,000	0	0	30
1779	do	do	Antonio Montenegro	4,000	0	0	30
1779	do	do	Demetrio Nazarra	3,000	0	0	30
1779	do	do	José Xavier Velarde	1,083	2	9	30
1779	do	do	Antonio Pacheco	3,000	0	0	30
1782	San Pedro	do	Manuel Camino	4,000	0	0	30
1782	do	do	Juan Verzosa	4,619	4	0	30
1782	San José	do	Antonio Conde	1,184	0	0	37
1786	San Andres	do	Manuel Conde	3,000	0	0	30
1786	do	do	Juan Portillo	3,000	0	0	30
1786	do	do	Luis Barrandegui	3,000	0	0	30
1786	do	do	José Casal	1,954	0	0	30
1787	San José	do	Juan Garcia	475	2	0	30

could be lent was determined a month before the ship sailed, and was then apportioned by the members of the municipal board among themselves, each member voting that his colleague should receive a share. The total apportionment never reached more than 12,000 pesos, and the sum allotted to each depended, primarily, on his political status, and, to a secondary degree, on his financial credit.[43] The rate of interest varied according to the length of the voyage and the possible danger involved in the enterprise. It was, however, lower than the current rates charged borrowers from "obras pias" administered by the religious orders, whose customary rate was 50 per cent to Acapulco, 35 per cent to India, and 25 per cent to China,[44] whereas the city exacted only 25 to 37.5 per cent on the "nao," 18 per cent to India, and 12 per cent to Java, besides deducting 3 per cent for expenses and one-eighth per cent for bringing silver from the port of disembarkation to Manila.[45] Luckily, the ships during this period fared well, and only once—by the wreck of the *San Andrés* on the Naranjos group, in 1798—was the whole investment (12,250 pesos) lost. In case the loan was not repaid at the completion of the voyage, a lien was made on the *boletas* (tickets conferring the right to ship on a "nao"),[46] unless such lien had been anticipated by previous creditors.[47] The number of bad debts thus incurred was surprisingly small. The most notable case in which a creditor who had outrun his finances escaped payment was that of José Blanco, a rice exporter by trade and a member of the municipal board, who borrowed money for investment on the *Magallanes* in 1804. In this case his *boletas* were seized by the insular government for misappropriation of funds in connection with cockpit licenses in Negros. His indebtedness finally became so large that he was given an allowance of 30 pesos a month to support his wife and family.

It may be noticed that loans were discontinued from 1782 to 1786 and that in the second voyage made in the former year an unusually high rate of interest was charged. This was due to the loss of the *San Pedro*. Besides this amount (8,619 pesos, 4 tomins) and the sum lent in 1777 for investment to Coromandel, all loans were repaid with interest on the return of the vessels to Manila.

[43] Actas de Manila (1810), 118; (1811), 47.

[44] *Ibid.* (1777), 174–178; Dias Arenas, Rafael, Memorias historicas de Filipinas (1850), 397; Jagor, Feodor, Reisen in den Philippinen (1873).

[45] *Ibid.* (1808), 28–29; (1809), 194–195; (1810), 23; (1811), 46–47.

[46] *Ibid.* (1808), 149–150, 156–157; (1809), 174–175.

[47] *Ibid.* (1814), 31. *Cf.* Martinez de Zuñiga, Estadismo de las Islas Filipinas (1893), 2, 185–186; Le Gentil, Voyages dans les mers de l'Inde (1779), 2, 205, 297–298; Churchill, Collection of Voyages, (1764), 4, 177.

He had planned to leave for China, when he was sentenced to eight years' imprisonment in Misamis and deprivation of civil rights for libeling the audiencia. Blanco, however, was an exception to the rule that the ordinary individual to whom money was lent generally punctually repaid both capital and interest.[48]

After the suppression of the "nao," [49] and the partial opening of Manila as a free port, marine risks were still preferred,[50] although they were intermitted while the insurgent fleets of the newly born republics were patrolling the eastern coast of southern America.[51] They were still made on ships trading to Acapulco, and at the same rate of interest. Local vessels, as before, were not allowed to participate in the advantages of the fund.[52] After 1820, the rate of interest was slightly reduced, varying from 25 to 30 per cent to New Spain, the variation depending on whether the loan was for one or two years, and from 15 to 18 per cent to India. As commerce developed, it became a not unusual practice to lend money on the cargo of a vessel trading between Manila and European ports, if the risk had been accepted at Lloyds, and bills of lading were taken as well as silver in repayment. After 1862, consequent on the depreciation of silver in South America, gold was substituted for silver.[53] The decision to leave the field of marine insurance and make investments only on land was not taken until 1850, and was arrived at as a result of the total loss of the barkantine *Quid Pro Quo* in 1847.[54] The possibility of land investment had been mooted as early as 1770, when a suggestion had been placed before the municipal board that it would be profitable to acquire certain lands recently vacated by the expulsion of the Jesuits. This, however, came to nothing, and it is not until 1819 that

[48] Actas de Manila (1806), 88–89, 147–148; (1807), passim; (1809), 174, 198–199, 219–220, 222–223, 300–301; Audiencia de Manila. Reales sentencias (December 2, 1809).

[49] Bourne, Historical Introduction to Blair and Robertson, The Philippine Islands (1903), 1, 66; Remarks on the Philippine Islands by an Englishman, *ibid.* (1907), 51, 149.

[50] Actas de Manila (1818), 228–230; (1819), 41, 63, 78–79.

[51] *Ibid.* (1818), 192.

[52] *Ibid.* (1834), 22.

[53] "Oro grueso Americano," Actas de Manila (1862), 155. In the old ledgers of the Banco Español-Filipino de Isabel II (established in 1851), the accounts are kept in ounces of gold.

[54] The last marine risk was taken on the barkantine *Mundaquez* and the frigate *Magnolia* in 1850. Actas de Manila (1850), 154; (1851), 82–89, 112; (1852), 29, 40–41. For the loss of the *Quid Pro Quo*, see *ibid.* (1847), 58–59.

the first chattel mortgage is recorded, and not until after 1830 does it become customary to make loans on house property and real estate. The rate of interest, which never reached more than 8 per cent, was the factor which at first retarded the common use of land loans, but sound principles of finance eventually prevailed over the attraction of large, but uncertain profits, and the determination "to keep to the land" had a very salutary effect upon the future of the fund, apart from the fact that the city acquired a considerable amount of land and houses, which it rented on a yearly lease,[55] and a half share in a theater.[56] The latter was acquired in 1853 as security for a loan to Joaquin Huett or Huit (White?), the son of Moses Huit, a citizen of the United States who was exporting rice from Manila as early as 1806. It was sold in 1859 for 7,011 pesos, 44 centavos.[57]

The interest charged under the new conditions dropped again before the middle of the century. Even for small loans on poor security, it was never more than 7 per cent, while on ordinary house property 6 per cent was the current rate.[58] The largest loan was one of 30,000 pesos to Maria Somes, widow of Benjamin Butler, on house property scattered all over the city, valued at 56,730 pesos and with an annual rental of 475 pesos.[59] A loan of 20,000 pesos was also made, in 1861, to Juan Esquivel, and in the following year to Aguirre and Company, the former on buildings on the Escolta, the latter on a sugar refinery worth 90,000 pesos. In this case, Matias Menchacatorre, the leading contractor in Manila, gave his personal bond.[60]

After 1864, owing to Esquivel's failure, the maximum loan was fixed at 10,000 pesos.[61] As had been ordained by the testator, the fund was kept in a chest, at first in the city hall, *casas consistoriales*, and then in a house of its own in San Miguel. This chest was not opened except in the presence of the members of

[55] Such houses were not always easy to dispose of if the city desired to sell. Actas de Manila (1845), 48; (1850), 122; Gaceta de Manila (Feb. 3, Sept. 5, 1875); Oficios del Ayuntamiento de Manila (Jan. 23, 1857); Cuentas de Carriedo (1857).

[56] Cuentas de Carriedo (1850); Actas de Manila (1853).

[57] In 1843 Joaquin Huett, then brigadier-general in the Spanish army, led the Spanish troops during the suppression of the revolt of the Filipino fanatic, Apolinario de la Cruz, in the Provinces of Laguna, Tayabas, and Batangas. Montero y Vidal, *op. cit.* (1895), 3, 37–55.

[58] Actas de Manila (1833), 26; (1835), 142–143.

[59] *Ibid.* (1857), 19; Cuentas de Carriedo (1857).

[60] Actas de Manila (1862), 173; Cuentas de Carriedo (1861–1862).

[61] Actas de Manila (1864), 27.

the municipal board, the keys being kept by the chief magistrate, *alcalde de primera elección.*[62] The accounts were presented at least every year, and, if necessary, every three months, for audit by the city treasurer,[63] who received 10 pesos a month from the fund and the necessary office help; namely, a clerk at 3 pesos a month for his trouble, although even this meager salary was often the subject of much heated discussion.[64] The secretary of the municipal board also received 25 pesos a month from the same source for preparing the minutes.[65]

At first the accounts were included in the regular city accounts, but, after 1852, a separate account was opened, and from January 1, 1853, the board met in special session after the regular meeting as the Carriedo Chapter, *Cabildo de Carriedo,* to consider the status of the fund and of past and future loans, and to examine notes and securities. From these meetings an interested member of the board always absented himself.[66]

The process of obtaining a loan was invariably the same. The applicant presented with his request his certificate of identification and, in the case of house property, a certificate of ownership and title deeds. All these documents were received by one of the alcaldes and passed on to the city attorney. If he approved, the property was inspected by a committee, consisting of the city engineer and the city architect, and the whole matter referred to the "alcalde de primera elección," who, if everything was satisfactory, instructed the city attorney to draw up the necessary papers and the treasurer to make the payment.[67]

Whether the loans were on house property, storehouses with their contents, on real estate, *a premio de tierra,* or even on jewelry, of which two instances are recorded, the time was generally one year, although, at the expiration of this period, it might be extended, if the interest were paid up, for another year.[68] After two years suit was taken for recovery by law.

[62] *Ibid.* (1818), 20.

[63] *Ibid.* (1867), 22. The treasurer, in connection with the Carriedo fund, is called variously "Contador comisionado de los fondos de Carriedo," "Contador de propios como encargado de contabilidad de Carriedo," "Archivero contador de propios y de la obra pia de Carriedo." Actas de Manila (1836), 59, 85; (1856), 38.

[64] *Ibid.* (1835), 37–38, 52.

[65] *Ibid.* (1851), 68.

[66] *Ibid.* (1832), 39; (1852), 14, 72.

[67] From 1838, on the advice of José Maria Jugo, an expert lawyer, all sessions were held in public. Actas de Manila (1838), 51–52, 80–81, 88, 97; Expediente. Juzgado tercero de Manila (March 11, 1865).

[68] Actas de Manila (1833), 27, 50–58; (1847), 78, 80.

If the request for a loan was granted, there was practically no delay in payment,[69] apart from the week which was needed for inquiries to be made as to the satisfactory nature of the loan.[70] Under ordinary circumstances, two sureties were required, who had to act in common—*en mancomun e insolidum*.[71] After 1856, a loan society, entitled "La Sociedad Filipina de Fianzas," often guaranteed repayment. No loan could be recalled without interest, once it had been made, and no debtor could sell mortgaged property without the consent of the city.[72] Refusal was based on unsatisfactory security or previous indebtedness. In the case of minors, the leave of the courts had first to be obtained.[73] From time to time a special review of the status of the fund, covering a period of ten years or more, was prepared by the "sindico procurador." This was termed a "coordinación," and was the subject of a special charge. He also received 5 per cent of every payment of interest up to date.[74] Apart from loans to private individuals, money was also loaned to the city—mainly for public improvement—and to the insular government, and given to the merchants of Manila through their *consulado*, or board of trade. The purposes for which the city required financial assistance were multifarious, and included such diverse objects as building the roof of the chapel in the Paco cemetery (1819), flooring the Bridge of Spain with stone, paying overdue salaries,[75] repairing the municipal blacksmith's shop on Calle San Fernando (1824), the payment of expenses incurred during the festivities in connection with the accession of Isabel II, sending deputies to Madrid (1825), building the Divisoria market (then and now the largest market in the Orient) (1851), building the Quinta market in the same year, and a new public slaughterhouse in 1872, and repairing the municipal theater in Binondo (1856) and the Ayala Bridge (1889).[76]

In 1833 money borrowed from the Franciscans was also repaid from the same source.[77] On the other hand, when the Escolta was partially destroyed by the great fire of August,

[69] *Ibid.* (1832), 51, 53; (1833), 43.
[70] *Ibid.* (May 12, 1824); (1832), 33, 47–48.
[71] *Ibid.* (1832), 33; (1856), 61.
[72] *Ibid.* (1832), 12, 19.
[73] *Ibid.* (1833), 11, 39.
[74] *Ibid.* (1833), 40; (1836), 36; (1862), 33–34.
[75] *Ibid.* (1832), 5, 19, 25, 29; (1834), 99–100.
[76] *Ibid.* (1815), 11, 17, 31, 37, 38; (1818), 139–140; (1819), 64; (April 3, 1824); (1832), 5, 17, 39; (1834), 94; (1835), 37–38, 52; (1850), 44; (1851), 124; (1856), 38; (1872), 25–26, 95; (July 13, 1889).
[77] *Ibid.* (1833), 26.

1881, the municipal board was unable to borrow, even at 8 per cent, for reconstruction and extension.[78]

The insular government first borrowed from the fund in 1786, ostensibly to buy rice. As they showed no desire to repay, the city, after waiting patiently for twenty-four years, at last, in 1810, demanded the money. This demand passed into the hands of the *tribunal de cuentas,* who put them off on the ground that they were unable to estimate the original cost of the rice, because they had not a sufficiently large staff to examine their accounts from 1785 to 1810. Finally, a partial repayment was made in 1811, and the rest returned in 1815, and with this the municipal board had to be satisfied.[79]

Further loans in 1805, 1806, and 1807 brought the same results. On these occasions, the government tried to evade payment on the ground that war was impending, and it was only the energy and persistence of Gregorio Zarza Dias that prevented loss.[80] In 1836 a loan for the coinage of copper money was more satisfactory. It was repaid monthly at 6 per cent.[81]

Notwithstanding their willingness to utilize the money at the disposal of the city, the central government would not invest their own funds for municipal purposes, and the proposal that the city should be allowed to borrow 12,000 pesos to construct reservoirs to assist the poor, and provide water "in case of war," never passed out of the region of discussion.[82]

The *consulado* in 1804 received 333 pesos to dispatch the frigate *Concepción.* Consequently, in 1812, they again applied for 1 per cent of the Carriedo fund to send the corvette *Fidelidad* to Acapulco to look for the *San Fernando,* which was overdue and was expected to bring authentic news as to the state of the revolution in the South American republics. The city consulted the law faculty of the University of Santo Tomás, and on their report in favor of a grant of 200 pesos, the grant was accordingly made.[83]

[78] *Ibid.* (1881), 205.

[79] In all, 5,056 cavans had been bought at a cost of 10,481 pesos, 1 tomin. Liquidación de los 10,481 pesos, 1 tomin que se destinaron al Posito para la compra de arroz a fin de precaver los eventos y escasez de este grano, y aliviar al público en los casos que ocurran—1789. Actas de Manila (1810), 198–200; (1811), 152–156.

[80] *Ibid.* (1805), 178; (1806), 144–145; (1807), 128–131, 136, 138, 139, 140–141.

[81] *Ibid.* (1836), 29, 51, 60–61, 91.

[82] *Ibid.* (1806), 85, 101.

[83] *Ibid.* (1812), 131, 134, 154–163, 176.

Outside the city, loans were not made; the exception being to Manuel Provira, governor of Capiz, in 1851, on the security of pottery works at San Pedro Macati.[84]

On the whole, the management of the "obra pia" was free from fraud or misappropriation. The exceptions occurred in 1823–24 and in 1850. In the latter year, the amount missing was comparatively small, consisting of 131 pesos and 15 centavos from the fund and 48 pesos and 90 centavos from the petty cash, *fondillo*.[85] The shortage in 1823–24 was far more serious. When the chest was opened on January 2, 1824, a deficiency of 1,576 pesos and 25 centavos was discovered. The city treasurer was at once ordered to make a thorough investigation, and reported, a week later, that the locks of the chest showed very slight signs of having been wrenched open. The senior alcalde immediately ordered new iron safes and transferred the keys to the treasurer in the presence of the secretary. When the matter came up for discussion, the city fathers decided that there had been no illegal attempt to open the chest, and placed the blame on the janitor of the casas consistoriales and his son, who were dismissed without warning on a charge of gross immorality and misconduct. To excuse themselves, the municipal board framed a letter to the governor-general, praising their own unblemished reputation, apologizing for the shortage, and offering to make it good out of the city funds with interest at 5 per cent. To this they received an answer that interest was unnecessary and that the deficit must be made up out of their own pockets. The governor's suspicions had probably been aroused by the fact that, on September 10, 1823, José Azcarraga claimed he had repaid half the annual interest on a loan, although no entry of the payment could be found in the Carriedo books.[86]

On the other hand, while fraud was rare, until the opening of the ledgers, the accounts were kept, in spite of repeated complaints by the government auditor, in a careless and unbusinesslike fashion, and debts were allowed to accumulate over a long period of time which might have been secured had more impartiality been shown in prosecution.[87] When the city was called to account for this laxity, as in 1852, prosecutions were

[84] *Ibid.* (1851), 39.

[85] *Ibid.* (1851), 32, 34–35, 52–53, 62.

[86] *Ibid.* (Jan. 2, 9, 14, Mar. 10, 1824); (Sept. 10, 1825). There is no pagination in the minute-books of 1824–1825.)

[87] *Ibid.* (1851), 114; (1852), 18–20, 22, 24–25, 27, 29.

immediately instituted by the responsible official, *agente de demandas*, with great vigor, but it was often too late to regain what had been lost through previous inactivity.[88]

In 1851 the first step toward investment in permanent securities was taken by the decision to purchase 63 shares in the Banco Español-Filipino de Isabel II, worth 200 pesos each. This bank had been incorporated on August 1, 1851, with a capital of 200,000 pesos in 200-peso shares from the "obras pias" of the four orders.[89]

The shares were consequently bought on March 30, 1852, and remained as an asset of the fund until its absorption in 1898, paying dividends varying from 8 per cent in 1875 and 1894 to 6 per cent in 1873.[90]

On February 12, 1869, on the motion of José Felipe del Pan, the municipal board also purchased 77 shares in the national bond issue of 200,000,000 *escudos* (1 *escudo* equals 50.1 cents United States currency). These shares were valued at 5,975 pesos and 20 centavos, and paid on the average 7.5 per cent dividend.[91]

In 1889 they were converted into 4 per cent treasury bonds at 85, bringing in 85 pesos a month.[92]

When the Carriedo fund ceased to be primarily a loan fund, it was transferred to the insular treasury, *caja de depositos de la tesoreria general de hacienda*, where it accumulated at 8 per cent.

After this, and indeed for some years before, it had developed with great rapidity, mainly owing to the business acumen of Esteban Balbas, Baltazar Giraudier, and Joaquin Inchausti. This development is shown in the following table[93] which is gathered from the statement presented on the last day of each year and which included a general balance sheet, a cash state-

[88] *Ibid.* (1851), 83; (1852), 48–54; Cuentas de Carriedo (1855–1895); Actas de Carriedo (Feb. 12, March 10, 1869).

[89] Blair and Robertson, The Philippine Islands (1907), 52, 117; The Philippine Census (1903), 4, 541.

[90] Cuentas de Carriedo (1855–1895).

[91] Actas de Carriedo (June 28, 1889).

[92] Legado de Carriedo. Cuaderno diario de las cobranzas y pagos (Sept. 1, 1874–Aug. 31, 1876).

[93] This list is complied partly from the Cuentas de Carriedo (1855–1895) and partly from the official list supplied by the municipal board to Francisco Mas y Otzet and published by him in El Diario de Manila (issue of July 24, 1882) which, however, can only be regarded as approximate.

ment, an expense account, and details as to receipts and amounts on loan.

Year.	Amount on hand.	Bad debts.	Year.	Amount on hand.	Bad debts.
	Pesos.	*Pesos.*		*Pesos.*	*Pesos.*
1767	9,887.62		1864	155,955.05	26,659.61
1768	11,318.00		1865	164,244.02	26,659.61
1770	12,849.62		1866	172,002.85	26,659.61
1772	14,698.25		1867	168.632.72	39,159.61
1774	24,088.52		1868	180,455.09	38,159.61
1777	24,066.77		1869	185,798.39	38,503.11
1779	28,809.62		1870	187,192.76	38,043.45
1783	35,751.64		1871	213,562.47	32,543.45
1786	36,193.14		1872	230,517.39	31,637.86
1788	39,477.14		1873	246,735.48	31,637.86
1814	36,351.55		1874	262,347.97	31,637.86
1815	40,382.52		1875	280,823.54	31,637.86
1817	40,402.52		1876	300,771.55	31,637.86
1818	41,020.27		1877	320,307.86	27,637.86
1819	41,923.27		1878	346,875.99	27,637.86
1820	47,680.56		1879	373,789.53	27,637.86
1821	48,087.12		1880	411,134.13	27,637.86
1823	48,063.25		1881	411,554.38	27,637.86
1824	51,063.25		1882	284,145.10	27,637.86
1826	59,963.25		1883	187,098.87	27,637.86
1828	46,187.25		1884	127,594.12	27,637.86
1831	61,309.75		1885	114,625.14	27,337.86
1836	89,655.76		1886	117,680.51	27,637.86
1855	106,419.56	42,806.86	1887	127,393.63	27,637.86
1856	108,713.88	41,433.10	1888	187,754.90	27,637.86
1857	114,017.11	40,740.24	1889	137,298.40	30,157.36
1858	122,627.78	37,382.11	1890	107,100.30	30,157.36
1859	129,198.32	28,382.61	1891	110,875.25	30,157.36
1860	136,649.32	26,659.61	1892	106,383.62	30,157.36
1861	140,528.93	26,659.61	1893	109,920.99	30,157.36
1862	146,340.00	26,659.61	1894	109,537.64	30,157.36
1863	157,674.03	26,659.61	1895	118,356.27	30,157.36

The decrease from 1881 was due to expenditure on the new water-supply system; the fluctuation after 1885 to receipts for the use of water and to the expense of upkeep and administration. There are no records of general receipts and expenditures subsequent to 1895. From 1889, the receipts from a tax on meat were added to the balance on hand, although they have been subtracted above.

* * * * * * *

We must now revert to the development of the scheme for which Carriedo expressly left his money, and consider the various plans, feasible and otherwise, which were presented to the city to "carry water by means of a pipe line * * * because of the great benefit that may accrue to the poor therefrom."

Notwithstanding the general agreement that something should be done to actualize the will of Carriedo, all the discussion of the subject produced nothing tangible, and despite several serious epidemics of cholera (notably in 1820), which the native population believed to be due to the poisoning of the water of the Pasig River by foreigners, no definite action was taken until March 7, 1841, when, in consequence of another outbreak of cholera, a royal order was issued calling for immediate action. The result was the appointment of a committee in 1843, headed by Gregorio de Borja Tarrius, whose duties were to prepare plans for bringing water from San Pedro Macati, or San Mateo, to examine the springs in the neighborhood of Manila (Malinta, Diliman, Maybonga, and San Juan del Monte were specified), and to make a careful study of the tides of Laguna de Bay in order to discover how far up the Pasig River the water was impregnated with salt.[94]

As the outcome of these suggestions, an exhaustive report which had been prepared between December, 1843, and March, 1844, was ready for consideration by the municipal board within a year. Only one member, however, José Bosch, who was in constant communication with the officers of the Spanish engineer corps stationed in Manila on the matter, was anxious to take immediate action. The rest of the board, in view of the strained finances of the city, due to large sums having been spent on the reception to Governor-General Claveria and on the celebration of the majority of Queen Isabel II, expressed their interest in a scheme for the purification of the Pasig water at San Pedro Macati, as in accordance with the desire of Carriedo, but laid all the proposals on the table.[95]

In 1845 and in 1853–54 the same story was repeated. In 1845, while a committee of the board composed of Juan Bautista Marcayda and Cristobal Arlegui were engaged on a project to supply the city with water by means of artesian wells, based on a new estimate of the population, the consumption of water per head, and its cost per water jar, *tinaja*, Tomás Cortes, colonel in command of the Spanish Engineer Corps stationed in Manila, was also preparing similar data, with clerical assistance from the city, with a view to running a pipe line from the San Mateo River, at a cost of 300,000 pesos.[96] His scheme, which was dated May 31, 1845, was warmly supported by José Bosch

[94] Actas de Manila (1843), 33, 36.
[95] *Ibid.* (1844), 23, 101.
[96] *Ibid.* (1845), 37.

and José Varela.[97] On the other hand, the committee was pledged to the filtration of the Pasig water, which Bosch opposed for several reasons, maintaining that no point could be found of a sufficient height from which to carry the filtered water into the city; that the vegetable matter and lime which impregnated the river water could not be removed; that an aqueduct over the Bridge of Spain, as suggested, was, in the condition of the bridge, not feasible; that 79,000 pesos, the amount then standing to the credit of the Carriedo fund, would not suffice for the construction of fountains or an aqueduct as had been contemplated from the outset; and, finally, that whenever Manila was exposed to war, the works could be easily destroyed. The committee, on December 12, 1845, however, gained the day, and a resolution was carried in favor of artesian wells at the cost of 30,000 pesos, provided they could be made to supply 40 *libras* (1 *libra* equals 0.1218 United States gallon) a minute to each inhabitant in Manila,[98] based on an estimate of population made by Cortes, who arrived at the following results:[99]

Walled City:		
Europeans (exclusive of garrison)	3,788	
Natives	2,500	
Garrison	7,000	
		13,288
Tondo		37,588
Binondo		58,048
Santa Cruz		19,768
Sampaloc		4,452
San Miguel		11,212
Hermita		17,680
Malate		19,292
Chinese		6,000
Transients		10,000
		218,724

Cortes had agreed to give the city 5,030,632 pints, *cuartillos*, of water a day, providing each inhabitant with 23 pints. He had also arranged to comply with the conditions laid down by the city, which were that, once work had commenced, it was to continue until its completion, although not beyond the period of a year, and that especial care should be taken to provide against earthquakes.[100] There is no record as to any artesian wells ever having been drilled, and the project was again shelved until 1853, when, consequent on the selection by the bureau of health of a committee of four druggists, headed by Jacobo Zobel,

[97] *Ibid.* (1845), 86, 96.
[98] *Ibid.* (1845), 86–89.
[99] *Ibid.* (1845), 96.
[100] *Ibid.* (1845), 39, 90–96.

to analyze the water obtained from streams and springs at Nagtahan, Mariquina, San Pedro Macati, and San Mateo, Saturnino Rilles Cristobal presented a scheme for carrying water through pipes from San Mateo to the King's Wharf in San Gabriel.[101] This scheme, which was to cost 200,000 pesos and was to be finished within two years, was entrusted to Lieutenant-General Felipe de la Corte, of the corps of engineers, for modification, and on April 26, 1854, he was paid for his work.[102] At the same time, de la Corte was forced to discard another proposition, which suggested the construction of a three-story building, each story being a reservoir, located sufficiently far from the mouth of the Pasig to prevent the intrusion of salt water. The water was to be pumped up through successive filters to the upper story, and thence carried by a pipe line to various central points in the city, carabaos being used instead of machinery to save expense.[103]

Unfortunately, inactivity brought nothing out of these plans. Another decade elapsed before, mainly owing to the energy of Felix de Huerta,[104] the steps were taken which were eventually to lead to the realization of the long-deferred wish of Carriedo.[105] Huerta was ably seconded by Governor-General Moriones, although the initiative was actually taken, before the arrival of Moriones, by Governor-General Lemery. On January 29, 1862, the municipal board received an authorization from the governor to appoint an engineer to prepare two alternative projects, based on those of Cortes and de la Corte, and suggesting the name of Luciano Oliver. On March 23, 1862, a committee was at once appointed to deal with this communication, and by May of the same year Eduardo Ruiz del Arco was at work on plans.[106]

[101] *Ibid.* (1853), 77, 81, 95, 111. The King's Wharf is now merged with the Queen's Wharf in the Muelle de la Industria. San Gabriel is synonymous with Binondo, the parish church of which is dedicated to the archangel.

[102] Actas de Manila (1854), 78.

[103] *Ibid.* (1853), 72–73.

[104] Felix de Huerta was a Franciscan friar, and at this time was in charge of the hospital of San Lazaro, Manila. In 1865 he issued a history of his order, entitled: Estado geográfico, topográfico, estadístico, histórico-religioso de la ... provincia de S. Gregorio Magno de religioso menores descalzos ... en las Islas Filipinas.

[105] Mas y Otzet, Carriedo y sus obras (1882), 59–60.

[106] This was aided by a contribution from the Economic Association of Friends of the Country. Blair and Robertson, The Philippine Islands (1906), 42, 320; Actas de Manila (1862), 45–46, 132; Actas de Carriedo (July 28, 1894); Expediente sobre el proyecto de traida de aguas a Manila (April 8, May 6, 1862).

His assistant was at first Eugenio de Otadui, engineer in charge of roads in Bulacan, and, when Otadui was forced by sickness to return to the provinces, Jorge Ponce de Leon. Work was, however, temporarily suspended by the disastrous earthquake of 1863, and it was not until 1868 that Genaro Palacios y Guerra, who was to actualize the desire of Carriedo and serve the city in the capacity, first, of consulting and then of acting city engineer for the next seventeen years, entered upon his duties.[107]

At the time of his appointment, Genaro Palacios was employed by the bureau of public works as head of the division of roads, canals, and bridges, and remained in its service on detail until 1878, when he became a city official on contract from the municipal board. By November, 1868, he was engaged on the preparation of plans, and in May of the next year he submitted a "proyecto" and an alternative, or "antiproyecto." The "proyecto" called for an elaborate system on the Roman plan, to cost 2,289,548 pesos and 75 centavos. It provided for the conduction of water for an estimated population of 300,000, in a rectangular stone aqueduct from a point above the town of Montalban, where a high masonry dam was to be built, to a point near the present northeast boundary of Manila. The aqueduct was to be of cross section, 1.5 meters wide by 2 meters high, and was to have a semicircular arched roof.[108]

It was rejected by the city on the ground of expense. Palacios, little discouraged by the unfavorable reception of the original scheme, promptly expressed his willingness to carry into effect the "antiproyecto," which was to cost only 745,509 pesos and which, with certain additions and modifications, became the Carriedo system as it remained in constant use until 1908.[109] According to the original plans, 2 pumps of about 15,000 cubic meters combined daily capacity were to be installed at some point in the *barrio* (village) of Santolan on the Mariquina River. Here the water was to be raised into a rectangular masonry conduit excavated, for the most part, out of *adobe* [110] formation, through two lines of 20-inch cast-iron pipe. This conduit, of external section 1.40 by 1.75 meters, was to be laid

[107] Mas y Otzet, Carriedo y sus obras (1882), 61; Actas de Carriedo (Dec. 23, 1868).

[108] Expediente económico relativo a la traida de aguas a Manila (April 8, May 6, 1862).

[109] Mas y Otzet, Carriedo y sus obras (1882), 59–60.

[110] The Spanish term is "toba." (AS "tuff.") Actas de Manila (1877), 87; Mas y Otzet, Carriedo y sus obras (1882), 2–3, 71–76; Dieck, Robert P., Water supply of the municipality of Manila. Manuscript (1902), 1–4.

to a grade of 1 in 5,000 and extended a distance of approximately 4,800 meters to the reservoir (El Deposito) on the highest point of the table-land of San Juan del Monte. An inverted syphon of 26-inch cast-iron pipe, 385 meters long, was to be inserted where the line crossed a deep ravine. The reservoir was to consist of two covered basins, hewn from the same rock material as at Santolan, in catacomb form, with a combined capacity of 56,000 cubic meters (16,000,000 United States gallons) to the overflow line of 33.51 meters, city datum.

Ventilation was to be provided by 207 shafts, which were to keep the water cool and free from vegetable matter. The reservoir was to contain about one and one-half days' reserve, in wet seasons about two days' supply.

From these basins the water was to flow in a line of 26-inch cast-iron pipe along a purchased right-of-way to the city, the first branch—at the Rotonda in Sampaloc—being about 3 kilometers from the reservoir, and the distribution taking place in smaller mains, opening into 280 fire hydrants and 390 public hydrants.

It would have seemed advisable, under modern conditions, in a western country to have commenced operations at once, but dilatoriness was characteristic of the Spanish régime in the Philippines, and in this instance there was no exception to the rule. The home government did not affix its official approval to the scheme until June 10 and October 15, 1875, and work was not actually started until 1878, over nine years after Palacios had begun on the plans.

This delay was due to two causes. In the first place, there were various official channels through which the project had to pass before it was ready for execution, and, in the second place, there was considerable difficulty in determining the source from which the money for upkeep, construction, administration, and operation was to be drawn.

Every engineering detail under discussion, however small, had not only to be considered by the department of public works, but had also to be indorsed in Madrid before action could be taken by the city, and the same process had to be followed in matters of finance, except that the insular treasurer and the insular auditor took the place of the department of public works. Even when structural and financial problems had been settled, the general public had to wait a further three years for the report of the committee of ways and means before the work was inaugurated, and although the city had sought to commence

operations in July, 1872, not a spadeful of soil was turned until six years later.

The financial difficulty arose from the fact that the amount of the Carriedo fund was far short of the estimate made by Palacios. When this was considered by the municipal board, they suggested making up the deficit from the following sources:

	Pesos.
From the Carriedo fund	250,000
By public subscription	100,000
By loan from the insular government	100,000
By sale of property belonging to the city	100,000
By a tax on the skins of animals slaughtered in the *matadero* (estimated at 40,000 pesos a year) for three years	120,000
By the refund from the insular government of money expended on the support of the municipal police ("Guardia Civil Veterana"), from July, 1872, to June, 1874, which had been undertaken in accordance with the royal order of June 11, 1872	80,000
Total	750,000

Under the scheme, which was finally approved in Madrid on October 16, 1876, by the council of the Philippines, a committee of officials appointed by the ministry of foreign affairs, the expenditure was to be met from the following sources:

	Pesos.
By amount available from Carriedo fund on December 31, 1880	389,509
By a tax of 1 per cent (estimated at 64,000 pesos a year) on every pound of meat of animals killed in the *matadero* for four years	256,000
By a loan from the insular government taken from the local improvement fund	100,000
Total	745,000

This scheme was transmitted to Governor-General Malcampo on October 26 of the same year, and received by him on November 17. The conditions attached were that the Carriedo fund should not be touched till the meat tax had been exhausted, that the work should be finished in 1880, and that Palacios should not exceed his original estimate.[111]

This implied that construction should commence on receipt of the authorization. As, however, the commencement was delayed until 1878, the city was enabled to dispense with any

[111] Expediente económico (1872–76), 1–9.

assistance from the insular government. This they did the more willingly as there was a general sentiment that the municipal board which had administered the Carriedo fund for so many years should undertake the sole responsibility of supplying the citizens with water.[112]

The other methods of securing money had been rejected for various reasons. A public subscription was objected to on the ground that the previous experiments in this direction—to erect a monument to Simon de Anda (1868), to relieve the sufferers from a typhoon in the Provinces of Laguna and Tayabas (1873), and a charity bazaar (1875)—had been comparative failures, that the burden of contribution fell ultimately not on the poor, for whom the water supply was intended, but on the rich, and that two subscription lists, for a monument to Andrés de Urdaneta and for the expenses of the recent Jolo war, had but recently been opened in Manila.[113] The tax on skins met with strenuous opposition from Regidor Gonzales, who maintained that other objects, such as the reconstruction of the city hall, the tearing down of the nipa houses in the stone-material district, the widening of the approaches to the Bridge of Spain, the naming of streets and plazas, and the opening of a general cemetery, needed more immediate attention. It was eventually dropped in favor of the meat tax, because the latter would be more productive.[114]

The city property was not sold because a valuation, on September 11, 1876, disclosed the fact that it would bring only 46,960.33 pesos instead of 100,000 pesos as had been calculated. In the matter of expenditure on the municipal police, the city received back 62,296 pesos, which were diverted to other purposes.[115]

The meat tax was authorized by a royal order on November 17, 1876. Its full title was a "tax of one per cent on every pound of beef and pork cleaned in the city slaughterhouse." The tax, which was to be farmed out to the highest bidder, was advertised by public contract on February 14, 1877. The salaries of the officials who were to supervise its collection and

[112] The home government was in favor of such a loan, in view of the fact that the Lozada Canal in Madrid had been built in 1859 under the same conditions.

[113] Expediente económico (1872), 230, 232, 239–240.

[114] Actas de Carriedo (Sept. 25, 1875); Expediente económico (1872–76), 19.

[115] Expediente económico (1872–76), 128, 209; Actas de Carriedo (Sept. 25, 1875); Actas de Manila (1875), 114, 166–167.

administer its profits were secured by a special appropriation. For the fiscal year 1877–78 the levy brought in 67,000 pesos in the hands of a lessee. When the contract ran out on June 30, 1878, the city became responsible for the collection and the administration of the tax, and the average profit per month was only 4,455.83 pesos. On February 1, 1879, it was again let for three years to Antonio de la Rosa for 56,273 pesos, a reduction of 18 per cent from the original amount.[116] The arrangement continued, under various lessees, until 1890 when it was raised to a minimum of 90,960 pesos, and, although this was reduced by 10 per cent, Mariano Yu-Chioco was willing on December 4, 1892, to pay 88,003 pesos for a two years' contract. In 1894, by order of the governor-general, dated September 30 of the same year, it was increased further by 1 per cent. It was finally abolished at the close of the military occupation on August 6, 1901.

Up to July 30, 1883, the total amount spent on the works was 688,365.47 pesos, of which the meat tax had contributed 323,292.81 pesos and the Carriedo fund the remainder.[117] This expenditure was not in accordance with the desire of the department of public works, who would have reduced the estimate to 513,664 pesos by substituting porcelain for cast-iron pipes, by using wood as fuel, by placing all the necessary clerical work in the hands of the regular office staff of the city, and by selling water from the hydrants, when the system was in operation. It was fortunate that the authorities in Madrid were vigorously opposed to the Chamorroy system in which porcelain was used, even though they were in general inclined to follow the will of Carriedo.[118]

Having thus overcome all the preliminary difficulties, the board chose August 28, 1878, the birthday of King Alfonso XII, after whose queen, Mercedes, one of the public fountains was to be called, as a fitting day to inaugurate the work of construction. The attendant ceremonies were simple, but impressive. A stone was blessed by Archbishop Payot and laid by the governor-general at what was later to be the distributing point—the Rotonda in Sampaloc. Under the stone were placed in a leaden casket commemorative medals and copies of the local papers and of the act authorizing the work. In all, 4,000 pesos were spent

[116] *Ibid.* (1877), 20–22; Expediente económico (1872–76), 210–213.
[117] *Ibid.;* 306.
[118] *Ibid.*, 8–19, 81.

on the celebration.[119] Operations now commenced in earnest, and advertisements were published in the official gazette, asking for bids for construction. The contract was let in sections. The only bidder for the building of the filtration chambers at the Deposito, of the inverted siphon, and for laying the pipe line from the watershed to the Deposito and thence to the distributing point in Sampaloc was Pablo Falcon, the amounts being, respectively, 10,718.50, 3,874, 7,708, and 6,447 pesos. There had originally been another bidder for the filtration chambers, Fermin Castella, whose bid, 9,030.40 pesos, was accepted by the municipal board. When, however, it was discovered that Castella already held a contract for street cleaning, after consultation with the city attorney, it was decided to reopen the bids on July 10, 1878. On the second occasion only Falcon answered the official advertisement. The contract for the construction of the machinery building and of the sheds for coal and stores was secured on June 4 by Mariano Rivera.[120] The representative of both contractors was Antonio de Ulloa.[121] All contracts were paid in monthly installments, as aliquot portions of the work were completed.[122]

Palacios received a monthly sum for clerical help, salaries, and incidental expenses, varying from 2,000 pesos in the early months of 1878 to 20,000 pesos in March, 1882, the month before the inauguration of the new system.[123] His own salary was at first fixed at 6,000 pesos (March 1, 1879). Less than a year later it was raised to 9,000 pesos (October 1, 1879). His assistant engineers, Felipe Jové y Padrol and Sebastian Vara y Saez, who were his own nominees, received at first 2,600, then 3,200, and finally 4,000 pesos. There were also two foremen of works at 600 pesos each. The machinery was bought in Paris through

[119] Actas de Manila (1878), 15–16, 19–20.

[120] Mas y Otzet, Carriedo y sus obras (1882), 56–68. Liquidación de las obras ejecutadas por contrata en la galería filtrante y esplanaciones para establecer el tubo ascensional de las máquinas elevatorias de abastecimiento de aguas potables a Manila (April 14, 1885); Actas de Manila (1878), 87–90, 100–102; (1897), 28; obras parciales del proyecto para el abastecimiento de aguas potables a Manila (Pliego de condiciones) (1878), 41–49.

[121] Actas de Manila (1878), 108–109.

[122] *Ibid.* (1878), 94–97.

[123] Cuentas de Carriedo (1878–83). *Cf.* Liquidación de obras ejecutadas en el abastecimiento de aguas potables a Manila. Memoria, planos, valoración (1885). These documents are a valuable asset for the history of Spanish engineering in the Philippines, as they give not only the wage list but also the cost of each work unit.

the agency of José de Echevarría, who was appointed purchasing agent on January 11, 1879. He received a commission of 1.5 per cent on all purchases, which were paid for through a draft on the Hongkong and Shanghai Banking Corporation for 200,000 pesos.[124] All materials from abroad were passed through the Manila custom-house free of duty.[125] The cast-iron pipes and lead were secured in Manila, partly through Frederic H. Sawyer [126] and partly through the old-established firm of Smith, Bell and Sons, who had bought out the Yengarie Sugar Company, a bankrupt concern at Mandaloyan, which had been organized in London to pipe sugar from the northern provinces (Bulacan, Laguna, and Pampanga) to the capital. New cast-iron pipe cost 33 pesos a ton delivered in Manila; the old piping from Mandaloyan 24 pesos and 80 centavos. Lead could be bought in bars for 75 pesos a ton from Mandaloyan. Sawyer also sold to the city such galvanized iron roofing as it required.[127]

During the process of construction, there were no serious hindrances, possibly due to the fact that from 1868 Palacios himself lived on the ground in a small house, which came to be known, under the name of the Casa de Depositos, as a favorite resort for wealthy citizens, and personally superintended all operations. Indeed, it was owing to his unfailing energy as well as to his tact and discretion that such troubles as did occur were so trivial. An illustration of his capacity in dealing with awkward problems may be found in the matter of the purchased right of way, which, according to the conditions of the "proyecto," had to be cleared for 5 meters on either side.[128] Although 50 parcels of land, valued at 9,523 pesos and 5 centavos, apart

[124] Actas de Manila (1878), 35–36, 64–65, 93; (1879), 84–88, 101–103; Expediente económico (1872–76), 182–183, 185–187; Actas de Carriedo (Nov. 22, Dec. 5, 1882).

[125] Expediente solicitando se exima del pago de derecho de Aduana todo el material que viene de Europa (1882); Actas de Manila (1885), 49, 50; Expediente económico (1872–76), 115, 142.

[126] Sawyer was an English engineer and agent for Handyside and Company of Liverpool and for the Eastern Sugar Company. He is the author of the book entitled The Inhabitants of the Philippines. Charles Scribners' Sons. New York (1890).

[127] Expediente económico (1872–76), 121–123, 245–289; Actas de Carriedo (Mar. 21, 1882); (June 24, Aug. 26, 1885); (Feb. 16, 1887); (June 25, 1890).

[128] *Ibid.* (Dec. 23, 1868); (Feb. 15, 1883); Actas de Manila (Aug. 6, Oct. 13, 1892); Expediente. Expropiación de terrenos para la traida de aguas. Documentos 1–5. Ramon Lopez Hermosa. Manila (1885); Oficios de la ciudad de Manila (June 11, 1878).

from such as were presented by the Augustinians and Paulists, the former being provided with free water for their house and hacienda at Mandaloyan as a *quid pro quo*, were expropriated on the personal valuation of Palacios, not a single complaint reached the municipal board.[129] Nor were operations attended by many accidents or untoward incidents. There was, indeed, one unavoidable fatality at the Deposito; there was a case of robbery involving the loss of some 600 pesos in cash; and, in 1881, two small typhoons occurred which did some damage to the pipe lines and to the roofs of the various buildings. There was also the inevitable delay due to miscalculation by the contractor as to the nature of the rock formation; but, on the whole, the work proceeded with more speed than might have been expected, and a misunderstanding which at one time presaged a dangerous outcome and was later the cause of serious friction was removed by mutual agreement. When Palacios was first appointed, it was arranged that the bureau of public works should supervise his work, while he was given a free hand as to the purchase of material by public contract. However, the extent of this supervision was not defined.[130]

The first point under discussion as to whether the necessary material should be bought through Madrid, or directly by the municipal board, or in both ways was soon decided by a compromise; but when Palacios was found to have made certain purchases during the month of February, 1878, without calling for a contract, the board felt that its dignity had been injured, and consequently called him to account for his action. Palacios,[131] in reply, called their attention to the procedure adopted in the case of the reconstruction of the Bridge of Spain, under which materials costing between 1,000 pesos and 5,000 pesos had been bought by contract or privately. In accordance with the authorization of the bureau of public works, materials which could be bought for less than 500 pesos had been bought privately on the sole responsibility of the engineer, and only materials above 1,000 pesos always by public contract. With the sarcastic remark that he would soon be prevented from buying even a *cavan* of lime without written permission, he expresses his will-

[129] Actas de Manila (1878), 94–95; Actas de Carriedo (Aug. 26, 1889); Expediente promovido por la Comunidad de PP. Agustinos proponiendo se concedan aguas gratuitas al convento de Manila y casa-hacienda de Mandaloyan (April 29, 1887).

[130] Actas de Carriedo (Dec. 19, 1882); (May 27, 1883); (Aug. 5, 1884); Expediente económico (1872–76), 176, 186, 199–200.

[131] Actas de Manila (1878), 20, 21, 26, 28–31, 76.

ingness to resign. His firm determination not to be interfered with in trivial details, so long as larger matters were proceeding toward a conclusion, produced the desired result. As Palacios was notably honest and careful and accounted for every item of expenditure, the city authorities deprecated any intention of censure and apologized for their hasty action. During the next four years there was no further friction, and, at the inauguration of the water supply, a memorable event in the history of Manila, the vigor and skill of Palacios met with due recognition.[132]

The actual opening of the system took place at eight o'clock on the morning of July 23, 1882, although the festivities continued without cessation from July 20 to July 24. July 23 was chosen to culminate the efforts of one hundred thirty-nine years, because it was the birthday of Maria Cristina, wife of King Alfonso XII, the then Queen-Dowager of Spain.

The program of the week was outlined by a proclamation issued by the governor-general through the official gazette, on July 18, and repeated the next day in greater detail through the same channel by Manuel Enriquez y Sequera, who was both civil governor of the Province of Manila and chairman of the municipal board,[133] *corregidor*. The program, as carried out, was in brief as follows: [134]

Monday, July 20.—Music and athletics in the suburbs and on the Paseo de Magallanes for prizes offered by the municipal board. Eight p. m., reception at Fort Santiago.

Tuesday, July 21.—Music and athletics as on Monday. Opening of the Monte de Piedad.

Wednesday, July 22.—Massed bands on the Luneta.[135] Fireworks on Bagumbayan field. Illumination and decoration of the Luneta ballroom.

Thursday, July 23.—Five a. m., massed bands. Six a. m., civic procession leaves the city hall for Sampaloc. Eight a. m., opening of the Carriedo fountain accompanied by a distribution of tokens and small coins. In the afternoon, horse racing on the Bagumbayan field. In the evening, free theatrical performances in the various theaters, and a grand invitation ball in the Theater of Varieties.

Friday, July 24.—As on Thursday.

The civic procession on Thursday consisted of thirteen official carriages, and was accompanied by allegorical floats, the most

[132] He was recommended for the Grand Cross of Isabel II, and was presented with the freedom of the city, an honor which he shared with Father Faura, the eminent Jesuit seismologist. Actas de Manila (Jan. 12, 1878), 81–85, 93; (1882), 105.

[133] Gaceta de Manila (July 18–19, 1882).

[134] Mas y Otzet, Carriedo y sus obras (1882), 93–102, 106–108.

[135] *Ibid.*, 118. The program of the massed bands and of the ball on July 23 is given in El Diario de Manila of the same date.

noticeable being those of the mestizo corporation of Santa Cruz, carrying a bust of Carriedo crowned with laurel; of the officials of Tondo, with a fountain from which flowed wine and water; and of the Chinese citizens of Manila, representing a sampan, and manned by Chinese children.[136] Before the opening ceremony, mass was celebrated opposite the fountain in a temporary structure erected by the house of Lorenzo Rocha who also entertained the officials at luncheon after the proceedings.[137] In addition to the bronze and silver medals, which the national mint was permitted to coin for two months, two gold medals were also struck, one of which was laid under a commemorative stone, while the other was presented to the Conde de Peracolls as the head of the Carriedo family.[138] The invitation ball was given in the Theater of Varieties on Calle Arroceros, and the Italian Opera Company, from whom it was taken for the night, was reimbursed by being excused the rent of the building for ten nights. During the whole celebration, the streets were decorated by day and illumined by night.[139] There were decorative arches on the south side of the Bridge of Spain, and of the Santa Cruz and Carriedo Bridges, and on Plaza Goiti.

Alms were distributed in commemoration of the event to the hospitals, the prisons, and the poor;[140] a degree was conferred in every department of the university; money was given to every parish priest within the municipal radius for a mass for the soul of Carriedo; and every child born or person married within the week received a liberal present,[141] thirty-seven couples and parents of eleven children availing themselves of this latter offer.[142] In addition, two of the local newspapers, El Diario

[136] Mas y Otzet, Carriedo y sus obras (1882), 107. The whole description by Maz y Otzet, who was the official historiographer, is very vivid.

[137] Actas de Carriedo (July 23, 1882). Invitaciones. Traida de aguas. Inauguración de la primera fuente (1882).

[138] The medals had on the obverse the words "Reinando Alfonso XII. Commemoración de la traida de aguas potables. 24 de Julio, 1882," and on the reverse "Gobernando Filipinas el General Marques de Estella. Carriedo y el Municipio de Manila."—El Comercio de Manila (July 30, 1882); Mas y Otzet, Carriedo y sus obras (1882), 118; Actas de Carriedo (Nov. 12, 1884); Actas de Manila (1882), 104.

[139] *Ibid.* (1882), 93–96, 97. The chairman of the entertainment committee throughout the celebration was Francisco de Paula Rodoreda, whose widow is still resident in Manila.

[140] Mas y Otzet, Carriedo y sus obras (1882), 102–103.

[141] *Ibid.*, 127–129.

[142] Actas de Manila (1884), 191.

and El Comercio, gave special essay and deportment prizes to the children in the schools.[143]

On August 8, the final touch was given to the ceremonies by a solemn requiem mass in the cathedral, at which the sermon was preached by Francisco Sanchez y Luna.[144]

The permanent memorials were a stone in the City Hall and the Carriedo fountain. The proposal for a monument fell through, ostensibly owing to disagreement as to the site, actually because of general unwillingness to be taxed for the purpose, especially as the total cost of the celebration had already exceeded the original estimate of 16,000 pesos by 3,630.75 pesos, notwithstanding the fact that all the wood had been supplied by Mariano Ocampo.[145]

Fortunately, the opening of the system anticipated and, in some measure, alleviated the cholera epidemic which broke out during the next month, and raged with great intensity in the early part of 1883, as water, more or less fresh, could now be obtained from the public hydrants. The regulations for private service were not drawn up until a later date. Palacios was at work on them in 1884, but they were not passed by the municipal board until December 4, or printed until 1885, and even at the latter date the necessary material for house connections had not arrived from Europe, and had to be provided by the concessionnaires.[146] The regulations of 1885 differed in this respect from those of 1899, and were also affected by the existence, at first, of two methods of supply, either by a pipe giving a uniform amount every twenty-four hours, or by a meter, instead of by the general meter service adopted under the direction of William D. Conner, first lieutenant, Corps of Engineers, U. S. A., the first American engineer in charge of sewers and water supply.[147]

In 1912 the Division of Sewers and Waterworks Construction was separated from the Department of Engineering and Public Works, and is now administered as a separate department. During the Spanish régime, considerably more license was

[143] Actas de Carriedo (March 8, March 11, Dec. 6, 1888); Actas de Manila (1878), 65.

[144] *Ibid.* (1882), 104–106; Actas de Carriedo (April 15, July 29, 1885).

[145] *Ibid.* (Feb. 6, 1883).

[146] *Ibid.* (April 19, April 29, Oct. 24, 1884); Gaceta de Manila (Nov. 12, 1884); Actas de Manila (1884), 191. In 1886, a complaint was raised that too much attention was being paid to private service.

[147] Regulations for the public and private services of the Carriedo waterworks of the city of Manila (1889).—Reglamentos para el uso público, gratuito y a domicilio privado, mediante distribución de las aguas potables del canal de Carriedo. Manila (1885).

granted under the terms of contracts made with house owners than now, although defaulters in payment were treated with like severity. The price of water (about 4 centavos of the present coinage a cubic meter), with a reduction for a larger quantity, was slightly less (the price is now 5 centavos), although the Spaniards had a curious arrangement under which it was estimated that each day a native servant would use 25 liters, a member of the family or a European 50, a horse 80, while 40 liters were allowed for a 2- or 4-wheeled carriage, and 2 liters for each square foot of garden. The meter used was called the Kennedy meter, and was purchased from Tylor and Sons, of Loughborough, England.[148]

The two pumps were in position on October 1, 1883, and the first test was made after they had been at work for over a year in November, 1884. Under this test, one of the pumps was kept continuously at work for twenty-four hours, the other for seventy-two hours, with from 16 to 22 revolutions a minute, and a pressure of 54 to 60 pounds to the square inch.[149] The coal used not only for this test, but also on other occasions, always came from South Wales (Cardiff) or Australia. Native (Cebu) or Japanese coal was always declared to be expensive or too wasteful.[150]

An experiment with the Japanese coal brought from the Ranaloza colliery showed that, although it was 3.3 per cent cheaper than Australian coal, 10 per cent more was consumed, and it was also more moist and dirty, and produced more ash.[151]

The price of coal, which was bought by public contract in lots of from 200 tons upward, varied from 10.78 pesos to 15 pesos a ton, with an extra peso for haulage to the Deposito.[152]

The cost of upkeep, as originally calculated by Palacios, was 58,113 pesos, and the expenditure kept within the estimate, although the appropriation did not allow for any extensive developments. In 1885, a radical change was made in the arrangement by the resignation of Palacios, owing to friction with the author-

[148] Cartas del Corregimiento de Manila (Nov. 20, 1885); Expediente económico (1872–76), 267–270.

[149] Actas de recepción de las máquinas elevatorias (1883); Appendix (Nov. 7, 1884).

[150] Actas de Carriedo (Dec. 27, 1895).

[151] *Ibid.* (Sept. 21, Dec. 6, 1888).

[152] For the current prices in various years, *cf.* Actas de Carriedo (April 15, 1884); (Nov. 17, 26, 1886); (March 20, 1888), (April 7, 1889); (Feb. 21, 1890); (Feb. 25, 1892); (Jan. 11, 1893); (May 24, 1895); (Feb. 11, 1896); and (April 11, 1897).

ities on the question of salary. As has been stated, there had been some disagreement on the subject of contracts, but this had been smoothed over, and, although he and the municipal board were not always at one as to the location of fountains and the direction of the pipe line, these were matters of detail which were soon adjusted. The immediate cause of his resignation was his refusal, in which he was joined by his assistants, to pay the government tax of 10 per cent of all salaries of officials over 100 pesos a month, which had been ordered on November 18, 1878. Palacios was not averse to accept the deduction, provided that it only affected his salary as an official of the bureau of public works, but definitely refused to allow his salary as city engineer to be touched. The city would not adopt the suggestion of the insular auditor that his salary might be proportionately increased to meet the deduction, considering that he was already being paid enough, so he sent in his resignation on March 24, to take effect on April 30, 1885. It was accepted by the board, who tendered him their thanks for his valuable services, although somewhat curtly, and allowed him his passage money and expenses to Spain.[153]

His position was temporarily filled by the city architect, Juan José de las Hervas, who was given 3,000 pesos for the additional work, with an assistant at 2,000 pesos.[154] In 1887 Hervas was succeeded by Manuel Ramirez y Bazan from the bureau of public works at 5,000 pesos a year.[155]

Despite the resignation of Palacios, the system continued to run fairly smoothly, although certain small difficulties would probably have been lessened, if not entirely removed, by his presence. He could not, indeed, have anticipated the disastrous effect of typhoons, which on two occasions wrought considerable damage,[156] or even avoided scarcity of water, which in 1895 was the source of bitter complaint.[157] But he would probably have guarded more closely against the possibility of accidental [158] or

[153] *Ibid.* (Feb. 15, March 1, Sept. 28, 1883); (Feb. 6, 1884); (Jan. 20, 1886); (April 16, 1887); Actas de Manila (1882), 165–166, 177–178; Expediente. Traida de aguas potables a Manila. Administración facultativa (1885), 394.

[154] Actas de Carriedo (March 2, 1887).

[155] *Ibid.* (Feb. 15, March 1, Sept. 23, 1883); (Feb. 6, 18, 1884); (Jan. 20, 1886); (April 16, 1887); Actas de Manila (1882), 165–166, 177–178; Expediente. Traida de aguas potables a Manila. Administración facultativa (1885), 394.

[156] Actas de Carriedo (March 2, 1887).

[157] *Ibid.* (July 7, 1895).

[158] *Ibid.* (Nov. 4, 1884); (Sept., 1892).

forced leakage,[159] and would have established a filtration plant at the Deposito to prevent impurities in the water.[160] Moreover, he would have taken keen interest in the carrying out of his original plan for fighting fire. A small fire brigade was operating by January, 1885, as soon as the first fire hydrants had been installed. The first hydrants were procured from the Dominicans at 10.25 pesos apiece,[161] while the second supply of one hundred was bought by contract from Wilks and Company at 8.50 pesos each, the cost of private installation being fixed at 1 peso. The first fire that the new fire brigade was called to was in the nipa barrio of Santiago (San Fernando de Dilao) in January, 1885, and another was successfully attacked in Tondo in the following month.[162]

To Palacios also was due the project for the organization of the waterworks' employees into a special corps, entitled the "cuerpo de fontaneros," who at a later date were given permission to carry arms,[163] and the arrangement for proper hospital service in case of injury or sickness. It is almost impossible to estimate the benefit conferred upon the city by Palacios. If Carriedo deserves commemoration as the originator of the system, Palacios deserves equal honor as the man who despite many difficulties made the system an actuality.[164]

By the will of Carriedo, a gratuitous supply of water had been promised to definite institutions, but this permission was largely extended, the only condition being that the institutions should be of public benefit, *establecimientos de beneficiencia.*[165] In all, more than 50 applications were received, although only 32 were considered with favor. Among those who were unsuccessful

[159] *Ibid.* (Aug. 15, 1885). In February, 1887, the natives of San Juan del Monte were discovered tapping the main pipe. *Ibid.* (Feb. 4, 1887).

[160] In June, 1885, the assistant engineer answered a series of complaints with the assurance that river water was always dirty, and that all filtration should take place at home. *Ibid.* (June 1, 1885); (Aug. 27, 1890); (Aug. 25, 1893).

[161] *Ibid.* (March 27, 1886); (March 1, 1887); Expediente sobre contracción de las 100 bocas de incendio (1885).

[162] *Ibid.* (Jan. 22, Feb. 28, 1885).

[163] The actual appointments to the "cuerpo" were not made until April 5, 1887, although the appropriation was passed on September 21, 1886. Expediente para la creación de doce plazas de peones fontaneros y dos capataces. Incidente relativo al personal de la traida de aguas que necesitan licencias para traer armas (1894); Actas de Manila (1885), 58–60.

[164] Major T. F. Case when City Engineer of Manila, paid a well-merited tribute to his remarkable care and accuracy. Annual Report. Municipal Board. City of Manila (1903), 58-59.

[165] Actas de Carriedo (July 11, 1889).

were the authorities of the colleges of Santa Isabel and Santa Rosa and of the school of San Carlos, the military authorities at Fort Santiago, the officers of the Jolo regiment in the Luneta barracks and those stationed in the Malate and artillery barracks, the military hospital, the captain of the port, and Francisco Godinez, whose houses—6–8 Calle Real, Intramuros—had been occupied by the municipal board while the city hall was being repaired.[166] The excessive number of free beneficiaries was the subject of a complaint in 1892, and, although a committee was appointed to inquire into the matter, in 1894 Gumersindo del Valle was still voicing the objections. The present number, nine, is in exact conformity with the expressed terms of the will, with such additions as have been rendered necessary by concessions made during the period of construction.[167]

Del Valle's action was also prompted by the increasing exhaustion of the Carriedo fund and the inadequacy of the appropriation to meet expenditure, mainly owing to the growing cost of administration, which swallowed up the meat tax in its entirety.[168] The minimum appropriation was originally fixed by Palacios at 58,113 pesos, divided in the following proportion: Twenty-one thousand, five hundred seventeen pesos for distribution and service, 22,596 pesos for office help and police, and 14,000 pesos for upkeep and repairs. Before this amount passed the municipal board in 1884, an attempt was made to reduce it to 54,313.10 pesos, by a committee composed of Mariano Bertolucci and Jacobo Zobel. This, however, fell through, and until 1897 the original estimate was duly passed each year.[169] As a matter of fact, the average expense was considerably below this sum. Del Valle's calculations, which were based not on the official figures but on personal investigations, show that up to June 30, 1894, the total amount spent had been 1,025,940 pesos. Of this, he claims that 544,315 pesos had been spent on construction, and 480,652 pesos on running the system. Unfortunately, he assumed that the work on construction ceased automatically when the Carriedo fountain was opened, whereas there was a

[166] *Ibid.* (May 26, Aug. 18, 1886); (May 5, Sept. 14, Oct. 24, 1888); (Jan. 15, July 11, Oct. 24, 1889); (Aug. 4, 11, 1892).

[167] *Ibid.* (Sept. 22, 1892); (Feb. 5, 1894).

[168] Del Valle believed that a portion, at least, of the meat tax should be devoted to the improvement of the city markets. Actas de Carriedo (Sept. 22, 1894).

[169] Copia del expediente de los presupuestos de las obras de abastecimiento de aguas potables a Manila para conservar dichas obras. . . (March 26, 1884); Expediente económico (1872–76), 774; Actas de Carriedo (Nov. 20, 1883).

considerable sum spent in this direction even after July 24, 1882. Allowing, however, for the general correctness of his figures as regards expenditure which can be authenticated from the account books of the fund and of the meat tax, we may draw up the following balance sheets:

Carriedo fund, June 30, 1894.

	Pesos.		Pesos.
To interest on Carriedo fund prior to January 1, 1882	63,482.72	Expenditure from fund during period of construction	253,406.00
Carriedo fund in hand, January 1, 1882	411,554.38	Expenditure, July 24, 1882, to June 30, 1894	192,780.00
Interest on fund January 1, 1882, to June 30, 1894	98,204.90	Balance on hand, June 30, 1894	[a] 127,056.00
	573,242.00		573,242.00

Meat tax, June 30, 1894.

	Pesos.		Pesos.
Receipts, May 1, 1877, to June 30, 1894	681,953.00	Expenditure during period of construction	290,909.00
		Expenditure, July 24, 1882, to June 30, 1904	285,845.00
		Balance on hand, June 30, 1894	105,199.00
	681,953.00		681,953.00

(*c*) *Combined funds.*

	Pesos.		Pesos.
Receipts from Carriedo fund	573,242.00	Expenditure during period of construction	544,315.00
Receipts from meat tax	681,953.00	Expenditure, July 24, 1882, to June 30, 1904	478,625.00
		Balance on hand, June 30, 1904	232,255.00
	1,255,195.00		[b] 1,255,195.00

The majority of the board were at one with Del Valle as to the necessity of economy, although pumps and a new deposito

[a] This amount was on deposit in the Banco Español-Filipino, and consisted of 114,456 pesos in cash and recoverable notes and 12,600 pesos in bank stock. Twenty-five thousand three hundred three pesos worth of bad debts ("creditos incobrables") have been omitted as an asset.

[b] Cuentas de Carriedo, passim.

were urgently needed, and the aqueduct required enlargement. It was determined, consequently, to use well and river water for street sprinkling,[170] and, by a process of consolidation, to reduce the cost of management.[171] The failure of the concern to pay its way was undoubtedly due to poor business management and the long-existent dislike of the city officials to subject their accounts to audit.[172]

Between 1895 and 1897, the troubles due to the insurrectionary movement and the lack of available funds seriously affected the work of distribution. The enlargement of reservoirs by the construction of a new deposito, at a cost of 170,000 pesos to hold 40,000 cubic meters, was proposed and agreed to, but never carried out.[173] Two more pumps were procured through the agency of the colonial office from Mirlees, Watson, and Jardine of Glasgow, who had installed the original engines, but were not set up until after the arrival of the American forces in 1898,[174] and work on the aqueducts was suspended by the events of the same year.[175] The growth in consumption, which was 1,000,000 meters in 1886 and 3,500,000 meters in 1902, called for these developments, and the city declared its intention of finding a new source of supply and establishing

[170] *Ibid.* (July 24, 1894). *Cf. Ibid.* (April 25, 1889); Expediente sobre establecimiento del riego en los paseos y calzadas de esta capital con agua del canal de Carriedo (Sept. 21, 1886).

[171] Actas de Carriedo (Jan. 23, 1895).

[172] *Ibid.* (June 15, 1892). *Cf.* Incidente promovido por el tribunal de cuentas pidiendo se presenten las cuentas de los fondos de la obra pia de Carriedo. (A series of letters from June 22, 1871, to August 30, 1876.) Incidente promovido por la Tesorería General de Cuentas (1876). A statement of the accounts for 1855 was not secured until January 2, 1874.

[173] Actas de Carriedo (Oct. 20, 1893).

[174] Dieck, R. P., Water supply of the city of Manila (manuscript), 4; Actas de Carriedo (Oct. 17, 1892); (Aug. 14, 1886); Presupuesto de las obras que se necesitan ejecutar en Santolan (Nov. 10, 1898).

[175] Documentos de varias obras de ampliacion de Acueducto de Carriedo. (The contract was let on June 22, 1896, to Francisco Martinez for 39,970.50 pesos. Work was commenced on February 28, 1897, and was to be finished by August 28, 1898.) The Spanish authorities did not pay the liabilities incurred in these improvements, nor their coal bill, and by the decision of the Supreme Court of the United States that the *city of Manila as constituted in 1910 is liable for the obligations of the city incurred prior to the cession of the Philippines to the United States*, the balance of the Carriedo fund, consisting, when the functions of the Spanish "Ayuntamiento" were taken over on August 13, 1898, of 18,000 pesos in securities, was absorbed. Esperanza Trigas Otero et al. v. City of Manila. Ricardo Aguado v. City of Manila. *Cf.* U. S. Supreme Court. October term (1910), No. 207; Acts of the Philippine Commission (1901), chl. 68–75; Philippine Reports (1903–1912), 9, 513–526, Cases 3282, 3449, 3558, 3703.

a new system as soon as it was possible. Work was consequently commenced in 1903, and the new system opened on November 12, 1908. Water is now brought from an almost virgin watershed of 100 square miles in area, whence it is carried to a storage reservoir at Montalban capable of holding 210 million gallons (United States measurement), and thence to two distributing reservoirs at San Juan del Monte, one of which, 90 feet (about 27 meters) above sea level, can hold 18 million and the other, at 111 feet (about 35 meters), 54 million gallons.

This system is only barely adequate to the new demands of the city of Manila, and the remarkable increase in the water service will be shown by the following comparison from a private memorandum dated April 20, 1887, and from a calculation based on the service of the year 1910–11.[176]

Date.	Length of pipe line.	Public hydrants.	Public fountains.	Hydrants for fire and street sprinkling.	Services in operation—	
					Free.	By payment.
	Meters.					
1887	58,361.45	408	11	752	[a]13	[b]82
1912	176,062.89	219	13	618	9	5,722

[a] In 1892 this had increased to 32.

[b] In 1895 this had increased to over 800. Actas de Carriedo, May 24, 1895.

That the American occupation has resulted in the acquisition by Manila of a modern system of water supply which would do credit to the most progressive twentieth century city does not in any way detract from the forethought and wisdom of Carriedo, who may still be called the greatest benefactor of the city of Manila.

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[176] I am indebted for this calculation to the courtesy of Mr. Abraham Gideon, Chief of the Department of Sewers and Waterworks Construction, Manila.

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ILLUSTRATIONS

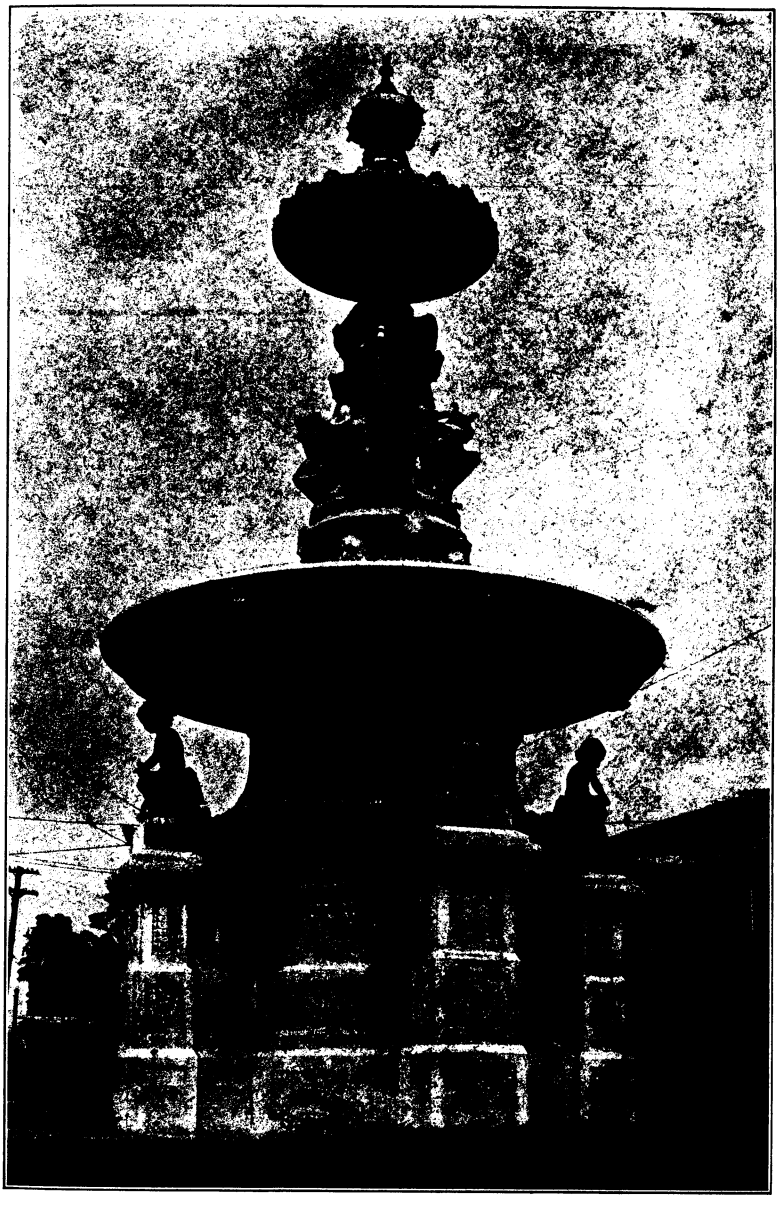

PLATE I. CARRIEDO FOUNTAIN.

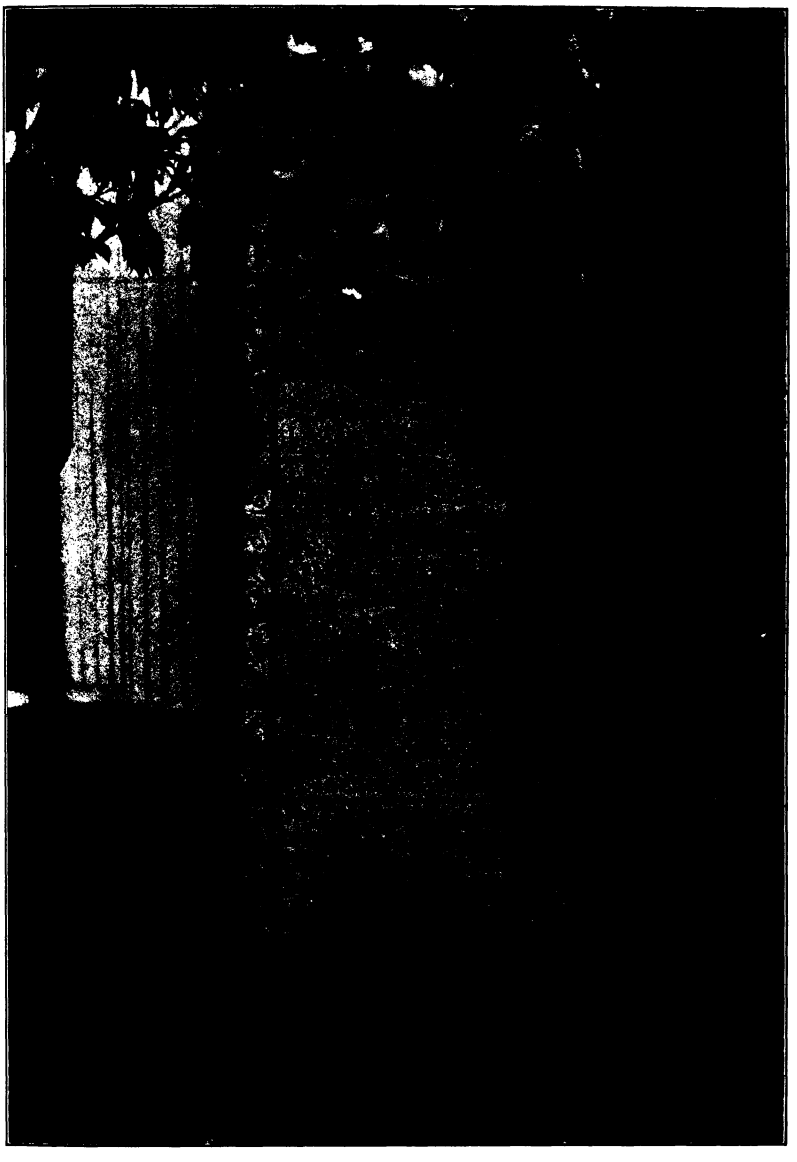

PLATE II. COMMON GRAVESTONE OF DOÑA MARIANA DE CARRIEDO AND HER MOTHER.

PLATE III. PLAN OF MANILA DRAWN UNDER THE DIRECTION OF GENARO PALACIOS (1875).

ÜBER CHRYSOMELIDEN UND COCCINELLIDEN DER PHILIPPINEN: II. TEIL [1]

(COLEOPTERA)

Von J. WEISE

(*Berlin, Niederschönhausen, Germany*)

CHRYSOMELIDÆ

1. **Lema torulosa** Lac., Mon. Phytoph., Mem. Liège (1845), 3, 345.

Nach einem Exemplare ohne Fühler beschrieben, wurde von Herrn Ribbe bei Manila gefangen. Die Fühler sind länger als der halbe Körper, mässig schlank, schwarz, Glied 1 rotgelb. Beim ♂ ist der Vorderrand des Thorax in der Mitte zweimal leicht ausgebuchtet, dahinter liegen 3 vorn vereinte Gruben; die mittlere ist ziemlich gross, viereckig, die seitlichen haben die Form einer breiten Schrägfurche. Der grösste Teil des Kopfschildes ist schwarz.

TICAO ISLAND (6540, *R. C. McGregor*).

2. **Aspidolopha semperi** Lef., Ann. Soc. Ent. Fr. (1886), 192.

Thorax einfarbig rotgelb, mit 4 wenig gesättigt gefärbten, schlecht bemerkbaren Makeln in einer Querreihe in der Mitte. Auf den Flügendecken ist ein kleiner runder Fleck auf der Schulterbeule, und hinter der Mitte eine Quermakel schwarz. Diese hat zackige Ränder, tritt nahe an die Naht heran, bleibt aber vom Seitenrande weit entfernt. Sie ist innen mässig breit und verschmälert sich nach aussen.

LUZON, Mt. Arayat, Pampanga (2978, *W. Williamson*).

Diese Art ist eine typische *Aspidolopha,* und es lässt sich daher nicht entschuldigen, dass der Verfasser einer Clytriden-Monographie sie zur Gattung *Clytra* stellte. Die *Clytra philippinensis* Lef., loc. cit. 191, gehört nach der Beschreibung ebenfalls zu *Aspidolopha,* und die Frage, ob *A. manilensis* Ws., Deutsche Ent. Zeitschr. (1900), 448, nur eine dunkler gefärbte und feiner punktierte Form davon, oder eine gute Art ist, bleibt weiterer Beobachtung vorbehalten.

[1] Nebst Bemerkungen und Neubeschreibungen von 2 Borneo- und 4 Java-Arten.

3. **Gynandrophthalma impicta** sp. nov.

Dilute lutea, subtus pubescens, supra nitidissima, obsolete punctulata, antennis apicem versus infuscatis, articulo tertio minutissimo.

Long. 3.8–4.8 mm.

MINDANAO, Zamboanga (*T. C. Zschokke*).

Type, No. 13641, in der Entomologischen Sammlung des Bureau of Science, Manila.

Blass bräunlich gelb, oberseits lackartig glänzend, die Spitze der Mandibeln und die letzten Fühlerglieder angedunkelt, nämlich Glied 4 bis 7 auf der erweiterten Innenecke, die folgenden Glieder fast ganz. Die Art ist durch den Fühlerbau ausgezeichnet, Glied 1 ist dick, annähernd kugelig, 2 viel kürzer und wenig schmäler, quer, 3 ist äusserst klein, leicht zu übersehen; es bildet einen kurzen, feinen Cylinder, die folgenden Glieder sind nach innen zahnförmig erweitert, quer, das 4. nur wenig schmäler als die übrigen. Stirn mit einem Längseindrucke und einigen Punkten zwischen den Augen. Thorax und Schildchen zerstreut punktuliert. Flügeldecken mit einem weiten Quereindrucke hinter der Schulter, äusserst fein gereiht-punktiert, die Punkte nur in der Nähe des Quereindruckes, an den Seiten und dicht vor der Spitze unter stärkerer Vergrösserung bemerkbar.

4. **Exema philippina** sp. nov.

Quadrato-elongata, atra, opaca, prothorace carinis sex, elytris subseriatim punctatis, singulo tuberculis decem munitis.

Long. 2.5–2.7 mm.

LUZON, Manila (*Charles S. Banks*).

Type, No. 7018, in der Entomologischen Sammlung des Bureau of Science, Manila.

Den beiden bis jetzt bekannten asiatischen Arten mit 6 feinen Längsleisten auf dem Thorax und 3 auf dem Pygidium sehr ähnlich, aber breiter gebaut und ohne merkliche Längsleisten auf den Flügeldecken. Länglich viereckig, matt, schwarz, Kopf und Thorax dicht und fein nabelig punktiert, die Punkte werden auf dem vorderen Abfalle des Thorax, namentlich im mittleren Teile, grösser und tiefer. Flügeldecken in Reihen punktiert, die durch je 10 niedrige Höcker gestört werden. Der 1. liegt an der Basis in der Ausrandung des Thorax, der 2. dahinter zwischen der zweiten und dritten Punktreihe, neben diesem, aussen an der 4. Reihe, befindet sich der 3. Höcker, welcher in Form einer schräg nach vorn und aussen laufenden Querleiste

mit der dicken Schulterbeule verbunden ist. In der Mitte liegen Querhöcker (einer an der Naht, der andere am Seitenrande), dahinter 3 (einer an der Naht, die beiden andern weiter nach aussen hintereinander), vor dem Hinterrande der Flügeldecken endlich 2 Höcker.

5. **Coenobius manilensis** sp. nov.[2]

Oblong-ovalis, niger, nitidus, antennis articulis 5 primis, pedibus anticis, tibiarum posticarum apice tarsisque testaceis, prothorace utrinque stria profunda oblique impresso, disco postice parce punctulato, elytris punctato-striatis. Long. 2 mm.

LUZON, Rizal, Montalban (*Charles S. Banks*).

Type, No. 5220, in der Entomologischen Sammlung des Bureau of Science, Manila.

Durch die Punktierung des Thorax und die Farbe der Beine von den ähnlichen asiatischen Arten verschieden, am nächsten mit dem grösseren *C. sulcicollis* Baly aus Japan verwandt, bei dem Kopf und Thorax rot gefärbt sind.

An den Fühlern sind die ersten 5 Glieder gelbbraun, die folgenden erweiterten Glieder pechschwarz. Der Thorax ist glatt,

[2] Von Borneo liegt mir eine breiter gebaute Art vor:

Coenobius basalis sp. nov.

♀ ovalis, fulvus, pectore, limbo basali prothoracis scutelloque nigris, elytris (limbo apicali excepto) nigro-coeruleis, punctato-striatis.

Long. 2 mm.

BORNEO, Kina Balu.

Durch Staudinger erhalten.

Der Körper ist gelblich rot, Fühler, Taster und Beine heller und mehr gelb, Seiten der Mittelbrust und die ganze Hinterbrust schwarz, der vordere Teil des ersten Bauchringes angedunkelt; ebenso ist ein Basalsaum des Thorax und das Schildchen schwarz. Die Flügeldecken sind sehr dunkel metallisch blau, ein Saum am Hinterrande, der von dem letzten Punktstreifen begrenzt wird, rotgelb. Der Thorax ist ziemlich glatt, vor dem dicht und stark punktierten Streifen, welcher den Hinterrand emporhebt, liegt eine weniger tiefe und unregelmässig punktierte Querlinie, die an den Seiten tiefer und breiter wird, hier schräg nach aussen und vorn läuft und in $\frac{1}{3}$ Länge nahe dem Seitenrande endet. Die Zwischenstreifen der Flügeldecken sind breit, leicht gewölbt, glatt und glänzend.

Bucharis constricticollis und *Melixanthus aterrimus* Jacoby, in Ann. Mus. Civ. Genova (1896), 382 und 383, haben auf der Stirn zusammenstossende Augen sowie ein lanzettliches Schildchen und gehören daher mit *Bucharis oculatus* und *laevicollis* Jac., die ich bereits, Deutsche Ent. Zeitschr. (1903), 33, Anmerkung 1, richtig stellte, zu *Coenobius;* dagegen ist *Coenobius discoidalis* Baly, Trans. Ent. Soc. Lond. (1877), 212, mit getrennten Augen, ein *Isnus*.

die vertiefte Punktreihe vor dem Hinterrande dicht und stark, ausserdem befinden sich in der Mitte auf der hinteren Hälfte der Scheibe wenig dicht stehende feine Punkte. Die Querlinie hinter dem Vorderrande ist fein, aber tief; hinter ihr liegt eine 2. feinere Linie und jederseits hinter der Mitte eine kurze Quervertiefung, welche sich zu einer Rinne ausbildet, die schräg nach vorn und aussen zum Seitenrande zieht, wo sie, etwas vom Rande entfernt, wenig vor der Mitte endet. Die Punktstreifen der Flügeldecken sind mässig stark und tief, der 4. ist hinten abgekürzt, der 6. sehr kurz. Beine pechschwarz, die Vorderbeine, die Spitze der Schienen an den 4 Hinterbeinen und die Tarsen sind gelbbraun. In der Basalhälfte der Vorderschienen ist der Rücken leicht angedunkelt.

6. **Scelodonta aeneola** Lef.

Die Fühler sind nicht „an der Basis rotgelb," wie in der Diagnose steht, sondern die ersten 5 oder 6 Glieder kupferrot, das 3. bis 5. zuweilen mit metallisch grünem Anfluge; die 3 schwärzlichen Querflecken jeder Flügeldecke heben sich sehr undeutlich aus der dunkel metallischen Grundfarbe heraus.

LUZON, Montalban Gorge (9505, *W. Schultze*) ; Bataan, Lamao (9822, *H. E. Stevens*).

7. **Scelodonta nitidula** Baly.

Baly hat die Art von Borneo und Singapore beschrieben, Jacoby, Ann. Mus. Civ. Genova (1889), 279, von Sumatra nachgewiesen, und ich erhielt sie durch Staudinger von Java. Ob diese Tiere wirklich auf *S. nitidula* zu beziehen sind steht dahin, denn die Fühler sind nicht „einfarbig schwarz" (was bei keiner mir bekannten *Scelodonta* vorkommt), sondern haben die ersten 5 Glieder metallisch kupferig grün, ebenso ist die Querstrichelung des Thorax nahe dem Vorderrande nicht durch „einige tiefe Punkte," sondern durch eine dichte, einfache Punktierung ersetzt. Die Art ist vielleicht am besten an der Skulptur der Flügeldecken zu erkennen, auf denen die Punktreihen einander paarig genähert und die graden Zwischenstreifen vorn und hinten gewölbt sind. Der Schenkelzahn, namentlich an den Mittelschenkeln, ist bei den Palawan-Stücken merklich grösser als bei denen von Java.

PALAWAN, Iwahig (12287, *C. M. Weber*).

8. **Pagellia signata** sp. nov.

Oblong-ovalis, fulva, antennis apicem versus prothoraceque (apice excepto) infuscatis, elytris fortiter punctato-striatis, in-

terstitiis costiformibus, limbo laterali usque pone medium maculisque tribus in singulo elytro nigris, sutura rufescente, femoribus posticis apice pectoreque nigris.

Long. 3–3.4 mm.

LUZON, Manila (1391, 1604, *Charles S. Banks*).

Neben *P. acuticosta* Lef. gehörig, länglich eiförmig, mässig gewölbt, rötlich gelb, die 5 Endglieder der Fühler und der Thorax mit Ausnahme eines Streifens am Vorderrande, zuweilen auch noch der Scheitel jederseits angedunkelt, zuletzt schwärzlich, Schildchen und Naht der Flügeldecken rotbraun. Auf den Flügeldecken ist ausserdem ein Seitensaum bis hinter die Mitte nebst 3 Makeln schwarz, die 1. auf der Schulter, die 2. hinter dem Basaleindrucke, die letzte hinter der Mitte.

Makel 2 und 3 werden vom dritten und fünften Punktstreifen begrenzt. Bei den dunkelsten Exemplaren dehnt sich Makel 3 bis an die Naht und den Seitenrand aus, und es entsteht so hinter der Mitte eine gemeinschaftliche Querbinde. Unterseits ist die Mittel- und Hinterbrust, sowie die Spitze der Hinterschenkel schwarz. Kopf mässig dicht, fein punktiert, die Punkte der Stirn strichförmig, und meist zu längeren feinen Längsstrichen vereint. Thorax äusserst dicht, fein längsrunzelig punktiert, vor der Mitte gerundet-verengt. Der Hinterrand bildet eine feine Leiste, vor welcher zuerst eine feine, einreihig punktierte Querrinne, sodann ein schmaler glatter Querstreifen liegt. Flügeldecken in den Schultern heraustretend und breiter als der Thorax, dahinter ziemlich parallel, im letzten Drittel verengt und an der Spitze gemeinschaftlich breit abgerundet, auf der Scheibe etwas abgeflacht, tief gestreift, und in den Streifen dicht und kräftig punktiert; der 7. und 8. Streifen vereinen sich vor der Mitte zu einem.

9. **Lindinia tibialis** Lef.

Die Art ist 5-6 mm. lang, lebhaft und glänzend bräunlich rot gefärbt, Fühler gelblich, Spitze der Schenkel nebst Schienen und Tarsen schwarz, Klauen rot. Mit dieser Form wurde zugleich *L. tibialis* Aberration *nigripes* gefangen, bei der die Beine, Mittel- und Hinterbrust und der grösste Teil des ersten Bauchsegmentes tief schwarz gefärbt sind. Übergangsstücke fehlen.

LUZON, Benguet, Trinidad (8168, 8233, *Charles S. Banks*).

10. **Chrysopida nigrita** sp. nov.

Elongata, subcylindrica, nigra, parum nitida, antennis articulis 4 primis, vertice femoribusque leviter aeneo indutis, prothorace tumido, opaco, parce obsoletissime punctato, elytris

infra basin impressis, striato-punctatis, subtiliter griseo-pubescentibus, fasciis duabus glabris.

Long. 8 mm.

LUZON, Benguet, Irisan River (*R. C. McGregor*).

Type, 7219 in der Entomologischen Sammlung des Bureau of Science, Manila.

Schwarz, die ersten 4 Fühlerglieder zuweilen rotbraun, nebst dem Raume zwischen Fühlerwurzel und Auge, dem oberen Rande des Scheitels, dem Schildchen und der Basalhälfte der Schenkel mit einem wenig in die Augen fallenden metallisch dunkelgrünen Anfluge. Clypeus mässig dicht und fein punktiert, von der Stirn tief geschieden; letztere sparsam punktuliert, mit einer durchgehenden Mittelleiste, die unten in eine kurze Rinne übergeht. Thorax länger als breit, an den Seiten schwach gerundet, oben höckerartig gewölbt, matt, sparsam und äusserst verloschen punktiert, an den Seiten greis behaart. Flügeldecken in regelmässigen Reihen vor der Mitte stark, dahinter schwach punktiert, sehr kurz und fein greis behaart mit 2 kahlen Querstreifen. Der 1. liegt vor der Mitte, hinter dem kräftigen Quereindrucke, der die Basalbeule emporhebt, und ist ziemlich breit, der 2. hinter der Mitte ist schmäler. Unterseits sind ein dreieckiger Raum an den Seiten der Hinterbrust und die Epimeren dicht weisslich behaart, der Schenkelzahn ist kräftig, spitz.

11. **Colasposoma rugiceps** Lef.

LUZON, Bataan, Lamao (9148, *W. Schultze*).

12. **Abirus philippinensis** Baly.

MINDORO, Mansalay (11406, *D. C. Worcester*); PALAWAN, Bacuit (11808, *C. M. Weber*).

13. **Phytorus gibbosus** Lef.

LUZON, Bataan, Limay (11936, *R. J. Alvarez*).

14. **Phytorus lineolatus** sp. nov.

Ellipticus, convexus, testaceo-rufus, nitidus, antennis pedibusque fulvis, prothorace minus dense subtiliter punctato, limbo laterali sublaevi, elytris punctato-striatis, striis brunneis, margine laterali haud dilatato, femoribus posticis dente minuto armatis.

Long. 5–6 mm.

BATAN ISLAND (*R. C. McGregor*).

Type, No. 7786, in der Entomologischen Sammlung des Bureau of Science, Manila.

In der Grösse dem *P. puncticollis* Lef. ähnlich, jedoch ohne Spur einer Erweiterung des Seitenrandes der Flügeldecken; grösser, bedeutend breiter gebaut als *P. simplex* Lef., den ich von Borneo besitze.

Elliptisch, hoch gewölbt, gesättigt bräunlich rotgelb, Fühler und Beine heller und mehr gelblich, die Punkte in den Streifen der Flügeldecken in einem schwärzlich-braunen Kreise eingestochen, so dass die Decken dunkel liniert erscheinen. Kopfschild am Vorderrande in 3 Bogen ausgeschnitten und hier breiter als lang, nach oben etwas verengt und von der Stirn scharf geschieden. Letztere ist unten glatt, mit kurzer Mittelrinne, darüber verloschen punktiert. Thorax doppelt so breit als lang, vor der Basis am breitesten und von hier aus nach vorn gerundet-verengt, wenig dicht, fein und namentlich flach punktiert, an den Rändern fast glatt. Flügeldecken an der Basis so breit wie der Thorax, mit abgerundeter Schulterecke, an den Seiten bis $\frac{1}{4}$ der Länge erweitert, dann ziemlich parallel, im letzten Drittel verengt und hinten nicht breit gemeinschaftlich abgerundet, oben fein gestreift und in den Streifen fein punktiert. Die inneren Zwischenstreifen sind fast eben, die äusseren leicht gewölbt. Die Vorderschenkel sind einfach, die Hinterschenkel haben ein Zähnchen.

15. **Cleoporus cruciatus** Lef.

MINDORO, Magaran (12272, *C. M. Weber*).

16. **Oides metallica** Jac.

Wurde auf Borneo von Herrn J. E. A. Wahr in einem Exemplare gefangen, welches durch das oberseits schwärzliche erste Fühlerglied abweicht.

17. **Oides flavida** Duviv.

LUZON, Laguna, Mt. Makiling (8598, *Charles S. Banks*).

18. **Oides sternalis** sp. nov.

Ovalis, convexa, albido-flava, nitida, elytrorum disco dilute ochraceo, antennis articulis tribus ultimis infuscatis, metasterno piceo; capite, prothorace scutelloque sublaevibus, elytris sat crebre subtilissimeque punctatis.

Long. 7.5 mm.

LUZON, Cagayan, Tauit (*D. C. Worcester*).

Type, No. 11825 in der Entomologischen Sammlung des Bureau of Science, Manila.

Den übrigen Philippinen-Arten namentlich *O. subtilissima, flavida* und *elliptica* Duviv. überaus ähnlich, aber an den Fühlern sind die 3 letzten Glieder und die Spitze des achten Gliedes schwärzlich, die Hinterbrust (ohne die Seitenstücke) pechschwarz. Thorax etwa dreimal so breit als lang, nach vorn schwach verengt, die Hinterecken breiter abgerundet als die Vorderecken, die Scheibe fast glatt. Auf den Flügeldecken sind die Punkte sehr fein, erscheinen aber grösser, weil sie von einem feinen, bräunlich durchschimmernden Ringe umgeben sind. Die Scheibe hat aussen, hinter der Schulter, einen schwachen Quereindruck; zuweilen liegt etwas hinter diesem, dicht vor der Mitte, eine kleine, gerundete schwärzliche Makel.

19. **Aulacophora uniformis** Chap.

Bei reichlichem Materiale dürfte sich herausstellen, dass diese vom Autor subopac genannte Art nebst *A. albicornis* Chap. nur Skulptur- und Farbenabänderungen von *A. rosea* F. sind. Unter den auf Negros gefangenen Exemplaren mit einfarbig roten Flügeldecken befanden sich auch solche, die hinter der Mitte jeder Decke eine gerundete, schwarze Makel besitzen, welche vom Seitenrande und der Naht ungefähr gleichweit entfernt bleibt: ab. *bipunctata.*

NEGROS, Mount Canlaon (12879, *Charles S. Banks*).

20. **Morphosphaera peregrina** sp. nov.

Nigra, nitida, articulo ultimo antennarum albido, scutello, elytris pectoreque rufo-brunneis, abdomine fulvo; prothorace punctulato, elytris sat dense punctatis.

Long. 6–6.5 mm.

PALAWAN, Bacuit (*C. M. Weber*).

Type, No. 11800, in der Entomologischen Sammlung des Bureau of Science, Manila.

Kopf schwarz, fast glatt, mit einer Querfurche zwischen den Augen und einer weiten Mittelrinne zwischen den Fühlern. Letztere reichen bis hinter die Mitte der Flügeldecken und sind ähnlich verdickt wie bei *M. sumatrana* Jac., schwarz, Glied 1 lang, 2 kurz und dünn, 3 um die Hälfte länger als 2 und nach der Spitze hin etwas erweitert, 4 so lang als die beiden vorhergehenden zusammen, aber, nebst den folgenden Gliedern, dicker. Diese nehmen allmählich an Länge etwas ab, Glied 10 und 11 sind eine Spur dünner, 10 wird nach der Spitze hin rötlich, 11 ist gelblich weiss. Thorax fast dreimal so breit als lang, vorn un-

bedeutend schmäler als hinten, die Seiten leicht gerundet, Vorderecken stumpf, Hinterecken abgerundet, die Scheibe zerstreut und sehr fein punktiert, glänzend schwarz, Schildchen und Flügeldecken hell rötlich braun, ersteres glatt, letztere mässig dicht punktiert. Die Punkte nehmen nach aussen und auf dem Abfalle zur Spitze an Stärke ab. Unten ist die Mittel- und Hinterbrust blass rötlich braun, der Bauch mehr gelblich, Beine schwarz, Enddorn der Schienen sehr klein, Klauen mit Basalzahn. Vordere Hüftpfannen offen.

Die Art, von der mir 2 nicht ganz ausgehärtete Stücke vorliegen, weicht durch die Färbung und den nach vorn wenig verengten Thorax erheblich von den übrigen Arten ab.

21. **Galerucella philippinensis** Boh.

LUZON, Benguet, Trinidad (8203, *Charles S. Banks*).

22. **Galerucella mindorana** sp. nov.

Albido-flava, dense brevissimeque cinereo pubescens, antennis ab articulo quarto nigris, fronte deplanata, punctata, prothorace crebre punctulato, impressionibus obsoletis, elytris creberrime subruguloso-punctatis, disco leviter brunnescentibus.

Long. 5.5 mm.

MINDORO, Bongabon (*W. Schultze*).

Type, No. 8393, in der Entomologischen Sammlung des Bureau of Science, Manila.

Der *G. sumatrana* Jac. sehr ähnlich, kleiner, die Fühler schwarz, nur die 3 ersten Glieder und die Basis des vierten hell bräunlich gelb, die Stirn bildet mit dem Scheitel eine grosse, abgeflachte und dichtrunzelig punktierte Fläche, und die Vertiefungen des Thorax (eine Mittelrinne und eine Querrinne jederseits davon) sind sehr flach und verloschen. Die feine und äusserst dichte Punktierung der Flügeldecken ist in beiden Arten ähnlich, zu zarten Querrunzeln verbunden.

23. **Pseudocophora ventralis** sp. nov.

Brunneo-flava, nitida, ventre flavo, metasterno pedibusque quatuor posticis nigris.

Mas: segmento ultimo abdominali trilobato, lobo intermedio deplanato, elytris infra basin fovea magna suturali, antice tuberculum conicum suturalem terminata, impressis.

Femina: pygidii apice toruloso.

Long. 5–5.8 mm.

PALAWAN (*Staudinger*).

Den übrigen, bis jetzt bekannten 17 Arten [3] in der Körperform ähnlich, aber durch die Färbung leicht zu unterscheiden. Der Körper ist glänzend rötlich gelbbraun, die Hinterbrust und die 4 Hinterbeine schwarz, der Bauch weisslich gelb. Beim ♂ ist der breite Mittelzipfel des Analsegmentes abgeflacht, das Pygidium breit abgestutzt, und jede Flügeldecke besitzt unmittelbar an der Naht eine ovale Grube, die vorn durch einen zahnförmigen Höcker begrenzt und vom Schildchen geschieden wird. In dieser Grube ist die Nahtkante fein und nicht besonders hoch, in der Mitte unmerklich verdickt und mit einem Büschel von kurzen, weisslichen Härchen besetzt, die nach aussen gerichtet sind. Der Höcker ist vorn, dicht unter der Spitze, leicht grubig vertieft, hinten sparsam bewimpert. Beim ♀ ist der hintere, wulstartig verdickte Teil durch eine tiefe, gebogene Querfurche

[3] In meiner Sammlung befinden sich noch folgende zwei Arten:

Pseudocophora monticola sp. nov.

Fulva, nitida, pectore, abdomine pedibusque quatuor posterioribus nigris.

Mas: segmento ultimo ventrali trilobato, lobo intermedio deplanato, elytris infra basin fovea magna, antice tuberculum suturalem conicum, crassiusculum terminata, impressis.

Femina: pygidii apice toruloso.

Long. 5–5.5 mm.

BORNEO, Kina Balu (*Staudinger*).

Von *P. ventralis* nur in folgenden Punkten verschieden: Der Hinterleib ist tief schwarz, wie die Hinterbrust und die 4 Hinterbeine, der zahnförmige Nahthöcker des ♂ hinter dem Schildchen etwas dicker und höher, die Erhebung der Nahtkante in der Mitte der Grube ebenfalls deutlicher, stärker behaart und die wulstartige Verdickung am Hinterrande des Pygidium beim ♀ ist vorn von einem tiefen, aber weiten, gebogenen Quereindrucke begrenzt.

Pseudocophora flavipes sp. nov.

♂ flava, pectore, abdomine (medio segmenti ultimi excepto) elytrisque nigris, his pone medium fulvis, infra basin fovea magna impressis.

Long. 4.5 mm.

JAVA (*Scriba*).

Kopf, Fühler, Thorax und Beine sind hell gelb, ebenso ein Längsstreifen in der Mitte des letzten Bauchsegmentes, welcher genau die Breite des Mittelzipfels einnimmt, der übrige Teil des Bauches, die Hinterbrust und die Flügeldecken sind schwarz, letztere mit einem gemeinschaftlichen rotgelben Flecke, welcher die hintere Hälfte einnimmt und nur einem am Hinterrande etwas erweiterten schwarzen Seitensaum frei lässt. Bei dem mir allein vorliegenden ♂ hat jede Flügeldecke hinter dem Schildchen an der Naht eine ovale Grube, die aussen und vorn nicht scharf begrenzt ist, keinen Zahn, aber hinter der Mitte eine verdickte und leicht erhöhte Nahtkante besitzt. Der gelbe Mittelzipfel des Analsegmentes ist ebenfalls abgeflacht.

vom vorderen geschieden. Die Punktierung der Flügeldecken ist wie bei den anderen Arten, hinter der Mitte fein und verworren, vor derselben dichter und stärker und unregelmässig gereiht.

24. **Dercetes soluta** sp. nov.

Testaceo-flava, nitida, antennis articulo ultimo apice infuscato, prothorace latera versus punctulato et parce punctato, elytris infra basin haud impressis, crebre punctatis, fascia basali communi et maculis duabus in singulo pone medium nigris.

Long. 5.5–6 mm.

LUZON, Benguet, Trinidad (*Charles S. Banks*).

Type, No. 8201, in der Entomologischen Sammlung des Bureau of Science, Manila.

Durch die nach hinten nicht erweiterten Flügeldecken, auf denen keine Spur eines Eindruckes hinter der Basis vorhanden ist, von den meisten übrigen Verwandten[4] abweichend. Der Körper ist hell bräunlich gelb, Beine und Flügeldecken blasser gelb, die Endhälfte der letzten Fühlerglieder angedunkelt und die Flügeldecken schwarz gezeichnet. Diese Zeichnung besteht aus einer gemeinschaftlichen Querbinde und zwei Makeln auf jeder Decke. Die Binde liegt an der Basis und nimmt etwa $\frac{1}{5}$ der Länge ein, sie verbreitert sich aussen und zieht dort saumförmig bis zur Mitte. Die innere Makel ist quer, innen breiter als aussen, vorn bogenförmig, hinten mehr gradlinig begrenzt, beginnt wenig vor der Mitte und dehnt sich von der Nahtkante bis neben die 2. Makel aus. Diese bildet einen Saum am Seitenrande ungefähr von $\frac{1}{2}$ bis $\frac{3}{4}$ der Länge und berührt zuweilen an der inneren Vorderecke die 1. Makel. Der Thorax ist in der Mitte glatt, nach den Seiten hin fein punktiert, mit eingestreuten stärkeren Punkten. Die Flügeldecken sind in den Schultern breiter als der Thorax, dahinter fast parallel, am Ende schmal abgerundet, auf der Schulter glatt, sonst fein punktiert.

25. **Haplosonyx albicornis** Wiedem.

PALAWAN, Iwahig (10738, *W. Schultze*); Mt. Capoas (12383, *C. M. Weber*).

26. **Haplosonyx banksi** sp. nov.

Subparallela, convexa, fulva, antennarum articulis intermediis fuscis, prothorace lateribus subparallelo, disco utrinque foveo

[4] Diese Arten wurden seither als *Antipha* Baly, Ann. Nat. Hist. (1865), III, 16, 251, geführt, müssen aber den älteren Namen *Dercetes* Clark, *Ibid.* (1864), III, 15, 146, erhalten.

rotunda impresso, elytris saturate cyaneis, hic illic viridiaeneo-micantibus, crebre punctatis.

Long. 14–15 mm.

NEGROS OCCIDENTAL, Bago (*Charles S. Banks*).

Type, No. 6276, in der Entomologischen Sammlung des Bureau of Science, Manila.

In der Körperform dem *H. chalybaeus* Hope (*elongatus* Baly) am ähnlichsten, aber die Flügeldecken stärker gewölbt, mit viel höherer, besser begrenzter Basalbeule und ganz verworrener Punktierung; in der Färbung mehr dem *H. nigripennis* Jac.[5] ähnlich, jedoch schlanker gebaut, die Beine einfarbig rotgelb, der Eindruck jederseits auf dem Thorax nicht quer, sondern rund, grubenförmig, der mittlere Teil der Scheibe fast eben. Die Fühler sind in allen drei Arten schwärzlich, die ersten drei Glieder rötlich gelbbraun, ähnlich auch die drei letzten, oder das Endglied heller als die beiden vorhergehenden, mit schwarzer Spitze. *H. concinnus* Baly, der dem *nigripennis* Jac. verwandt sein dürfte, ist durch das 3. Fühlerglied ausgezeichnet, welches ganz gegen die Gattungsdiagnose viermal so lang als Glied 2 und ziemlich so lang als Glieder 4 und 5 zusammen sein soll.

27. **Haplosonyx fulvicornis** sp. nov.

Crassiusculus, fulvus, prothorace fovea transversa utrinque impresso, elytris cyaneis vel cyaneo-viridibus, subtiliter punctatis.

Long. 13–18 mm.

LUZON, Cagayan, Tapil (*H. M. Curran*).

Type, No. 10664, in der Entomologischen Sammlung des Bureau of Science, Manila.

Breiter gebaut als *H. nigripennis* Jac., rotgelb, nur die Flügeldecken metallisch dunkel blau bis bläulich grün, glänzend. Fühler bis zur Mitte der Flügeldecken reichend, beim ♂ viel dicker als beim ♀, Glied 3 kaum doppelt so lang als 2, 4 wenig länger als die beiden vorhergehenden zusammen. Der Thorax ist fast dreimal so breit als lang und hat ziemlich parallele, vor der Mitte nur leicht gerundet-erweiterte Seiten, auf der Scheibe jederseits eine grosse Quergrube und im mittleren, etwas abgeflachten Teile 2 sanfte Vertiefungen, vor der Mitte und vor dem Schildchen. Die Flügeldecken sind fein und wenig dicht punktiert, mit einer kräftigen, gut umgrenzten Basalbeule.

[5] *Haplosonyx nigripennis* erhielt ich von Borneo, Bangkei und Celebes. Bei ihm sind die Flügeldecken sehr dunkel blau bis violett gefärbt, ohne grüne Beimischung, in seltenen Fällen rein schwarz.

28. **Haplosonyx philippinus** sp. nov.

Oblongus, fulvus, nitidus, antennis flavo-albidis, articulo tertio parvo, tibiis tarsisque plus minusve infuscatis, prothorace subtiliter punctato, utrinque profunde transversim impresso, elytris minus dense subtiliter punctatis, punctis ante medium hinc inde subseriatis.

Long. 10.5–12 mm.

MINDANAO, Agusan River (12535, *A. Celestino*).

Wenig grösser als *H. sumatrae* Weber und von diesem durch helle Unterseite und Fühler, das kurze 3. Fühlerglied, deutliche Punktierung des Thorax und verloschenere Punktierung der Flügeldecken verschieden, auf denen Punktreihen nur vor der Mitte angedeutet sind. In Farbe und Fühlerbildung mit *H. indicus* Jac. fast übereinstimmend, die Flügeldecken aber vor der Mitte nicht doppelreihig punktiert und gerunzelt. Die Beine sind in den hellsten Stücken einfarbig rotgelb, haben aber auf dem Rücken der Schienen und Tarsen einen dunklen Anflug; andere Exemplare, deren Oberseite mehr rot gefärbt ist, haben schwärzliche Schienen und Tarsen.

29. **Cynorta signifera** sp. nov.

Elongata, citrina, nitida, metasterno abdomineque (lateribus excepto) nigricantibus, capite, prothorace scutelloque fulvo indutis, elytris obsolete sulcatis (apice excepto) nigro limbatis, singulo maculis duabus nigris, 1, 1.

Long. 5.5–6 mm.

PALAWAN, Bacuit (*C. M. Weber*).

Type, No. 12262, in der Entomologischen Sammlung des Bureau of Science, Manila.

Der *C. 4-plagiata* Ws. in Körperform und Farbe ähnlich, citronengelb; Kopf, Thorax und Schildchen mit etwas rötlicher Beimischung, Hinterbrust (ohne die Seitenstücke) nebst der Mitte des Bauches schwärzlich, die Spitze des Bauches und die Seiten gelblich, ein Saum am Vorder- und Seitenrande und an der Naht, sowie 2 Makeln auf jeder Decke schwarz. Der Nahtsaum ist in $\frac{1}{4}$ der Länge und der Seitensaum nach der Mitte hin verbreitert, beide verengen sich nach hinten und lassen den Hinterrand frei. Der Basalsaum ist schmal. Die Makeln jeder Flügeldecke sind klein bis mässig gross, länger als breit, oval, die 1. liegt in $\frac{1}{4}$ der Länge in dem weiten aber kräftigen Eindrucke, welcher den Basalhöcker emporhebt, die zweite etwas hinter der Mitte. Fühler sehr schlank, fast so lang als der Körper, die Spitze des letzten Gliedes unbedeutend angedunkelt. Stirn und Thorax fast glatt, weitläufig und sehr verloschen

punktuliert; auf letzterem sind die beiden Quereindrücke zu einer weiten und ziemlich tiefen bogenförmigen Querfurche vereint. Flügeldecken dicht mit äusserst feinen, von einem dunkel durchscheinenden Hofe umgebenen Punkten besetzt; die Scheibe ist vom Eindrucke hinter der Basis bis auf den Abfall zur Spitze der Länge nach sanft gefurcht, mit leicht gewölbten Zwischenstreifen.

Das ♂ hat keine Stirnauszeichnung, aber einen durch 2 Einschnitte gebildeten quadratischen Mittelzipfel des letzten Bauchringes.

30. **Cynorta discoidea** sp. nov.

Elongata, citrina, nitida, postpectore abdomineque (lateribus excepto) nigris, scutello brunneo, elytris obsolete sulcatis, pone basin transversim impressis, impressione vittaque pone humeros fuscis.

Long. 6 mm.

PALAWAN, Iwahig (*W. Schultze*).

Type, No. 12264, in der Entomologischen Sammlung des Bureau of Science, Manila.

Der vorigen ähnlich, unterseits dunkler gefärbt, wie auch die Seitenstücke der Hinterbrust schwarz sind, das Schildchen braun und die Flügeldecken völlig abweichend gezeichnet. Hier ist der Basaleindruck neben der Naht und eine Längsbinde jeder Flügeldecke braun bis schwärzlich. Diese Binde beginnt hinter der Schulterbeule, nach aussen von dem dunklen Querflecke im Basaleindrucke, und läuft grade nach hinten. Bei dem einen der vorliegenden beiden Stücke endet sie plötzlich dicht hinter der Mitte, bei dem andern setzt sie sich, indem sie schnell nach aussen biegt, neben dem abgesetzten Seitenrande bis vor die Spitze fort. Auch die Naht ist angedunkelt. Die Skulptur der Oberseite ist ähnlich wie in der vorigen Art, der Thorax hat aber einen weiten und tiefen graden Quereindruck, der den grössten Teil desselben einnimmt.

31. **Monolepta baeri** All., Naturaliste (1888), 3, fig. 1.

Diese hübsche Art wurde von Herr Banks auf Luzon gefangen. Sie ist schwarz, Fühler grösstenteils rötlich gelbbraun, das Kopfschild, 2 Längsbeulen des Scheitels, 2 Basalmakeln des Thorax und 4 Makeln auf jeder Flügeldecke (1, 1, 1, 1) weisslich gelb. Makel 1 ist die kleinste, länglich, hinter der Basis nahe dem Schildchen, 2 und 3 liegen in der Mitte der Scheibe in ungefähr $\frac{1}{3}$ und $\frac{2}{3}$ Länge, 4 ist quer und befindet sich vor dem Hinterrande, nahe der Naht.

LUZON, Zambales, Olongapo (7584, *Charles S. Banks*).

32. **Monolepta puncticollis** All., Naturaliste (1888), 3, fig. 2.

Der Name erweckt die falsche Vorstellung, dass der Thorax stark oder dicht punktiert sei, die richtige Bezeichnung wäre etwa *„maculicollis,"* weil der Thorax 4 schwarze Makeln besitzt, 2 grössere, dicht neben einander, in der Mitte, und 2 kleine, weit getrennte nahe der Basis. Bei dem einzigen mir vorliegenden ♂ ist der Seitenrand der Flügeldecken hinter der Schulter auf eine kurze Strecke in leichtem Bogen erweitert und verdickt und mit einem schmalen Längsgrübchen besetzt. Etwas weiter nach innen liegt in der braunen Querbinde eine grössere runde Grube. Die Fühler sind verhältnismässig dick, gelbbraun, Glied 11 schwärzlich.

LUZON, Manila (3725, *Charles S. Banks*).

33. **Monolepta hieroglyphica** Motsch. ab. *simplex.*

Bei der Stammform aus Vorder- und Hinterindien, Nias, Sumatra, etc. verlängert sich die schwarze Querbinde der Flügeldecken, die vor der Mitte liegt, auf der Scheibe jeder Decke nach hinten in einen Ast, der sich zuletzt nach aussen krümmt. Dieser Ast fehlt den Stücken von Luzon stets. In allen übrigen Merkmalen stimmen diese Tiere mit *M. hieroglyphica* überein. Mit letzterer, die Motschulsky, Etud. ent. (1858), 104, fälschlich als *Luperodes* betrachtete, ist *M. elegantula* Boh., Resa Eug. (1859), 183, identisch.

LUZON, Benguet, Trinidad (8199, *Charles S. Banks*).

34. **Monolepta (Candezea) palawana** sp. nov.

Ovalis, convexa, nigra, nitida, capite antico, antennis tenuissimis et elytrorum apice fulvis, ventre flavo, fronte, prothorace scutelloque rufis; prothorace obsolete transversim impresso, elytris crebre punctatis.

Long. 6 mm.

PALAWAN, Bacuit (*C. M. Weber*).

Type, No. 11806, in der Entomologischen Sammlung des Bureau of Science, Manila.

Durch eigentümliche Farbenverteilung ausgezeichnet. Mittel- und Hinterbrust und die Flügeldecken sind tief schwarz, die Beine pechschwarz, der Bauch blass gelb, der Kopf unterhalb der Fühler und diese selbst, sowie etwa das letzte der Flügeldecken rotgelb, Stirn, Thorax und Schildchen rot. Die Fühler sind sehr dünn, Glied 3 doppelt so lang als 2, 4 länger als 2 und 3 zusammen. Thorax doppelt so breit wie lang, an den Seiten leicht gerundet, mit einem weiten und flachen Quereindrucke

nahe der Mitte der Scheibe; in der Mitte fast glatt, nach den Seiten hin punktiert, über den Vorderecken dichter und feiner als dahinter, Flügeldecken in den Schultern breiter als der Thorax, dahinter bis an die Abrundung zur Spitze wenig erweitert, hinten gerundet abgestützt, ohne Basaleindruck, dicht und ziemlich fein punktiert.

35. **Nacrea philippina** sp. nov.

Oblonga, convexa, fulva, nitida, prothorace sublaevi vix vel haud impresso, elytris subtiliter punctatis, latera versus sublaevibus, limbo lato basali et laterali nigro-coeruleis interdum aeneomicantibus.

Mas: antennis articulo tertio valde dilatato, compresso, unidentato.

Long. 7.5–8 mm.

PALAWAN, Iwahig (*C. M. Weber*).

Type, No. 11642, in der Entomologischen Sammlung des Bureau of Science, Manila.

Durch Skulptur und Färbung, sowie den kleinen Zahn am Innenrande des dritten Fühlergliedes beim ♂ ausgezeichnet. Rötlich gelb, stark glänzend, ein Saum am Vorder- und Seitenrande der Flügeldecken schwärzlich blau, zuweilen grünlich schimmernd. Dieser Saum nimmt vorn den Raum von der Basis bis an den Quereindruck in etwa ¼ der Länge ein und zieht sich, bald etwas schmäler, bald breiter, am Seitenrande bis zur Naht in der Spitze, so dass ein mehr oder weniger grosser, schildförmiger, gemeinschaftlicher Scheibenfleck (vorn abgestutzt, an den Seiten parallel, hinten abgerundet) rotgelb bleibt. Bei frischen Exemplaren lässt der Seitensaum oft den Rand selbst frei und ist hinten abgekürzt. Der Thorax ist quer, vor der Mitte am breitesten, nach vorn etwas mehr als nach hinten, im ganzen aber wenig verengt, die Scheibe sanft gewölbt, glatt, die beiden normalen Gruben kaum angedeutet. Die Flügeldecken sind wie in den anderen Arten gebaut, hinten gerundet abgestutzt, innen sehr fein punktiert, aussen gewöhnlich fast glatt. Das 2. zusammengedrückte und stark erweiterte Fühlerglied des ♂ ähnelt dem von *N. fulvicollis* Jac., hat aber am Innenrande ein spitzes Zähnchen.

Bei einem ♂ sind beide Fühler gleichmässig verkrüppelt, 9-gliedrig, Glied 3 breiter als gewöhnlich, 4 nach oben erweitert, 8 in der oberen Hälfte und 9 vor der Spitze verdickt.

Die Gattung wurde von Jacoby zuerst *Neocharis* (vergebener

Name!) und später *Metellus* genannt. Diese Bezeichnung kann jedoch nicht Geltung erlangen, da Baly inzwischen den Namen *Nacrea* eingeführt hatte. Sonach würde die Gattung folgende Gestalt haben:

Nacrea BALY, Trans. Ent. Soc. Lond. (1886), 29 (März).
Neocharis JAC., Proc. Zool. Soc. Lond. (1881), 448.
Metellus JAC., Ann. Mus. Civ. Genova (1886), 63 (Otober); Ent. Zeitg. Stett. (1899), 298.
1. fulvicollis JAC., Proc. Zool. Soc. Lond. (1881), 448; Notes Leyd. Mus. (1884), 56. Java.
maculata BALY, Trans. Ent. Soc. Lond. (1886), 29; JAC., Ent. Zeitg. Stett. (1899), 298.
femoralis ALL., Ann. Soc. Ent. Belg. (1889), comptes rendus 115; JAC., Ann. Soc. Ent. Belg. (1894), 197.
2. apicipennis BALY, Trans. Ent. Soc. Lond. (1886), 29. Java.
3. laevipennis JAC., Ann. Mus. Civ. Genova (1886), 62; Ent. Zeitg. Stett. (1899), 297, Taf. 1, Fig. 12. Sumatra.
4. nigripennis JAC., Ent. Zeitg. Stett. (1899), 297. Sumatra.
5. costatipennis JAC., Ann. Mus. Civ. Genova (1886), 498. Sumatra.
6. philippina WS., huj. op. Palawan, Mindoro.

36. **Sermyloides banksi** sp. nov.

♂ oblongo-ovata, flavo-testacea, supra vix aeneo-micans, nitidula, antennis crassiusculis, articulo tertio ante medium dilatato, prothorace subtilissime punctulato, elytris sat crebre punctatis.

Long. 7.5 mm.

NEGROS OCCIDENTAL, Mt. Canlaon (*Charles S. Banks*).

Type, No. 12938, in der Entomologischen Sammlung des Bureau of Science, Manila.

Von den übrigen Arten durch bedeutend stärkere Fühler und den einfarbig rötlich gelben Körper ausgezeichnet, welcher wie gewöhnlich oberseits eine Spur metallisch grünen Schimmers zeigt und mässig glänzt. Der Kopf des ♂ (mir liegen 2 Exemplare vor) ist normal gebaut; die Fühler sind hoch auf der Stirn eingefügt, so dass der obere Rand der Stirnhöcker, welche einen ziemlich flachen, durch die Mittellinie geteilten Querstreifen bilden, in gleicher Höhe mit dem oberen Augenrande liegt. Der Raum unter den Fühlern ist viereckig, schwach concav, und trägt über dem abgestutzten Vorderrande jederseits ein kurzes, schräg aufgerichtetes Stäbchen. An dessen Spitze ist ein viel längeres, häutig durchscheinendes, weissliches Stäbchen befestigt, welches aus mehreren Härchen gebildet zu sein scheint und schräg nach innen gerichtet ist, so dass sich die Spitzen beider Stäbchen berühren. Die Fühler sind nicht ganz

so lang als der Körper, Glied 2 sehr klein, die übrigen lang und unter sich ziemlich von gleicher Länge, nur Glied 4 eine Spur länger, und die 3 Endglieder etwas kürzer. Die Glieder sind vom 3. an leicht zusammengedrückt und das letzte endet in eine deutlich abgesetzte Spitze, die durch eine dicht bewimperte Kante vom Basalteile getrennt ist. Thorax an der Basis mehr als doppelt so breit wie lang, nach vorn anfangs wenig, zuletzt stärker verengt, äusserst zart punktulirt. Die Borstenporen sind gross, die 1. liegt hinter den Vorderecken, die 2. in den Hinterecken. Schildchen lang dreieckig, Flügeldecken ziemlich dicht punktiert, mit verloschenen Pünktchen in den Zwischenräumen.

Mit *Sermyloides* Jac., Notes Leyd. Mus. (1884), 64, ist *Praeochralea* Duviv., Ent. Zeitg. Stett. (1885), 245, identisch und die in den Sammlungen meist vertretene Art *basalis* Jac., loc. cit., 65, synonym mit *Galleruca pallicornis* Fabr., Syst. Eleut. (1801), 1, 482.

37. **Ozomena weberi** sp. nov.

♀ nigra, capite prothoraceque, rufis, elytris cyaneis vel viridiaeneis, creberrime subseriatim punctatis et obsolete elevatolineatis.

Long. 5.5–6 mm.

PALAWAN, Bacuit (*C. M. Weber*).

Type ♀, No. 11782, in der Entomologischen Sammlung des Bureau of Science, Manila.

Gestreckt, schwarz, Brust und Bauch mit blauem Schimmer, Kopf, Thorax und Vorderbrust rot, Flügeldecken metallisch dunkel blau oder grün. Fühler etwas kürzer als der Körper, Glied 2 klein, 3 fast so lang als 1, die folgenden bis zum zehnten Gliede nehmen allmählich eine Spur an Länge ab und sind nebst dem dritten dicht behaart. Thorax ziemlich glatt, so lang als breit, an den Seiten unbedeutend gerundet, die beiden Gruben der Scheibe gross und tief. Schildchen schwarz, glatt. Flügeldecken sehr dicht punktiert, mit feinen, leicht erhöhten Längslinien, zwischen denen die Punkte in 2 bis 3 unregelmässige Reihen geordnet sind. Es liegen 2 ♀ vor.

Die Art dürfte durch die einfarbig schwarzen Fühler und die Verteilung der beiden anderen Farben leicht zu erkennen sein. Bei frischen Stücken sind die Hüften nebst der Mitte der Mittel- und Hinterbrust rotbraun.

38. **Nisotra gemella** Er.

Durch die Punktierung der Flügeldecken in klaren Doppelreihen ausgezeichnet und wahrscheinlich nur auf die Philippinen beschränkt, obwohl verschiedene andere Arten aus der Indisch-malayischen Fauna darauf bezogen worden sind.

LUZON, Rizal, Montalban Gorge (9508, *W. Schultze*).

39. **Acrocrypta variabilis** Duviv.

An den Fühlern sind die 3 Endglieder weiss und von den 3 pechschwarzen Querbinden der Flügeldecken ist die 1. auf einen Basalsaum beschränkt, die beiden andern sind ziemlich breit, die vordere, in $\frac{1}{3}$ der Länge, ist mit dem Seitensaume verbunden.

MINDANAO, Zamboanga (13649, *T. C. Zschokke*).

40. **Aphthona wallacei** Baly, Trans. Ent. Soc. Lond. (1877), 178.

Geflügelt, unten schwarz, die Beine, mit Ausnahme der Hinterschenkel, und die ersten 4, seltener 5 oder 6 Fühlerglieder rotgelb, Oberseite metallisch dunkel blau, violet oder grün, äusserst zart gewirkt, matt. Nasenkiel leistenförmig, Stirnhöcker quer, schief gestellt, ringsum scharf begrenzt, Flügeldecken verloschen punktiert. Zuerst von der Insel Flores beschrieben.

PALAWAN, Bacuit (12350, *C. M. Weber*).

41. **Longitarsus manilensis** sp. nov.

Alatus, oblongus, convexiusculus, pallide flavescens, ore femorum posticorum apice ventreque nigris, antennis, (base excepta) fuscis, elytris subtiliter punctatis, sutura infuscatis.

Long. 2 mm.

LUZON, Manila (*W. Schultze*).

Type, No. 2703, in der Entomologischen Sammlung des Bureau of Science, Manila.

Den kleinen, europäischen Arten *L. pratensis, tantulus, nanus*, etc. ähnlich, blass gelb, mässig glänzend, Thorax, Mitte des Kopfes und die ersten 4 Fühlerglieder mehr rötlich, der Mund schwarz, der Scheitel bei ausgefärbten Stücken angedunkelt und die Fühler vom fünften Gliede ab schwärzlich. Unterseits sind die Seitenstücke der Hinterbrust, der Bauch und die Hinterschenkel auf dem Rücken in der oberen Hälfte schwarz. Nasenkiel hoch und ziemlich scharf, Stirn über den Fühlern mit einem Querstreifen von Punkten, ohne Höckerchen, darüber glatt. Thorax viereckig, um die Hälfte breiter als lang, ver-

loschen punktuliert. Flügeldecken deutlicher als der Thorax verworren punktiert, ein feiner, beiderseits abgekürzter Nahtsaum braun.[6]

[6] Leicht wieder zu erkennen dürfte die folgende Art sein:

Longitarsus vittipennis sp. nov.

Alatus, sat elongatus, convexus, testaceo-flavus, nitidus, antennis articulis 4-9 fuscis, ore, femoribus posticis apice nigris, elytris substriato-punctatis, sutura vittaque media postice abbreviata nigris.

Long. 2 mm.

JAVA, Montes Tengger (*Frühstorfer*).

Die Stirnhöcker sind nicht getrennt, sondern bilden einen schwach gewölbten Querstreifen, der oben in eine gerade Querrinne abfällt, der Nasenkiel ist hoch und sehr scharf. Fühler so lang als der Körper, die ersten 3 Glieder rötlich gelbbraun, die folgenden 6 schwärzlich, Glied 10 weisslich gelb, ebenso die Basis des letzten, während der übrige Teil etwas angedunkelt ist. Thorax viereckig, wenig breiter als lang, zerstreut und verloschen punktiert, Schildchen schwärzlich. Flügeldecken in den Schultern breiter als der Thorax, ziemlich cylindrisch, hinten gemeinschaftlich abgerundet, auf der Scheibe fast regelmässig gereiht-punktiert, ein feiner Nahtsaum und eine Längsbinde jeder Decke schwarz. Die Binde beginnt schmal an der Basis, läuft dann auf der Innenseite des Schulterhöckers nach hinten und endet in $\frac{3}{4}$ Länge; sie erweitert sich hinter der Schulter und nimmt in der Mitte genau $\frac{1}{3}$ der Breite ein, so dass sie hier von der Naht und dem Seitenrande gleichweit entfernt bleibt.

Nach der Beschreibung steht diese Art wohl dem *L. annulicornis* Jac. am nächsten.

Zu den Gattungen mit offenen vorderen Hüftpfannen gehört auch *Thrasychroma* Jac., die vom Autor an eine ganz falsche Stelle gebracht worden ist.

Mir liegt davon noch folgende Art vor:

Thrasychroma javana sp. nov.

Subtus testacea, antennis (basi excepta), tibiis apicem versus tarsisque fuscis, capite, prothorace scutelloque testaceo-flavis, prothorace latera versus subtiliter punctato, elytris metallico-cyaneis, subtiliter punctatis.

Long. 3.8–4 mm.

JAVA, Tjitatjap (*Drescher*).

Der *Thr. submetallica* Jac., Ann. Mus. Civ. Genova (1885), 71, sehr ähnlich, breiter gebaut, die 3 oder 4 ersten Fühlerglieder nebst der Unterseite rötlich gelbbraun, die übrigen Fühlerglieder, sowie Schienenspitzen und Tarsen schwärzlich. Thorax ohne merklichen grünen Metallschimmer, an den Seiten nicht dicht und etwas feiner als die Flügeldecken punktiert.

Diese Gattung ist sehr kenntlich an dem langen dritten Fühlergliede und den 2 Quergruben des Thorax, von denen sich eine jederseits nahe der Mitte befindet. Die Gegend vor dem Schildchen is abgeflacht und der Hinterrand dort leistenförmig aufgebogen.

42. **Dimax media** sp. nov.

Breviter-ovalis, convexa, fulva, nitida, antennis articulis 5–10 nigris, tarsis leviter infuscatis, prothorace subtiliter punctato, impressione sublaterali parce punctata, elytris dorso brunnescentibus, apice dilutioribus, dorso subtiliter punctatis.

Long. 5–5.5 mm.

PALAWAN, Bacuit (*C. M. Weber*).

Type, No. 12265, in der Entomologischen Sammlung des Bureau of Science, Manila.

Breit oval, stark gewölbt, rotgelb, glänzend, die Fühlerglieder 5 bis 9 schwarz, 10 weniger dunkel gefärbt, die Tarsen gebräunt. Flügeldecken dunkel braun, an den Rändern und vor der Spitze heller und mehr rötlich. Fühler halb so lang als der Körper, Glied 1 das längste, 2 das kürzeste, kaum doppelt so lang wie breit, 3 um die Hälfte länger als 2, die 4 folgenden und das Endglied dem dritten ungefähr gleich, 8 bis 10 etwas kürzer. Stirnhöcker flach, dreieckig, durch die Spitze des Kopfschildes getrennt, seicht umgrenzt. Thorax wenigstens doppelt so breit als lang, die Seiten sanft gerundet, ziemlich parallel, an der vorderen Borstenpore, die vor der Mitte eingestochen ist, leicht heraustretend, davor wulstartig verdickt und fast gradlinig verengt. Die Scheibe ist schwach gewölbt, nicht dicht, aber flach und fein punktiert, vor der Mitte etwas stärker als dahinter; nahe den Seiten glatt, mit einigen kräftigen Punkten in dem Längseindrucke über dem Seitenrande. Der hintere Borstenkegel ist kurz, stark. Flügeldecken wenig dichter und stärker als der Thorax punktiert, mit einer weitläufigen stärkeren Punktreihe am abgesetzten Seitenrande. Die Schulterbeule ist ziemlich gross, der normale grubenförmige Eindruck dahinter ist mässig stark.

Ausser den in Ins. Deutschl., **6**, 1052, angegebenen Merkmalen von *Dimax* sind noch folgende zu erwähnen: Der Thorax hat einen mehr oder weniger tiefen Eindruck parallel dem Seitenrande und auf den verworren und fein punktierten Flügeldecken liegt eine kleine grubenförmige Vertiefung hinter der Schulter. Die Arten sind über die Indisch-malayische Fauna verbreitet, aber von Baly und Jacoby ohne Grund zu *Sphaeroderma* gerechnet worden. In vielen Sammlungen ist z. B. *Dimax laevipennis* Jac. (*Sphaeroderma*) aus Sumatra vertreten, auch dürfte hierher der *Argopus angulicollis* Clark, Ann. Mag. Nat. Hist. (1865), 148, gehören.

43. **Sphaeroderma negrosanum** [7] sp. nov.

Subhemisphaericum, fulvum, nitidum, antennis articulis sex ultimis nigris, prothorace, subtilissime punctato, elytris subtiliter punctatis, punctis hinc inde seriatis, seriebus 8 et 9 integris.

Long. 2.2-2.5 mm.

NEGROS OCCIDENTAL, Bago (*Charles S. Banks*).

Type, No. 251, in der Entomologischen Sammlung des Bureau of Science, Manila.

Fühler halb so lang als der Körper, die ersten 4 Glieder rotgelb, das 5. rotbraun, die folgenden etwas verbreiterten Glieder schwarz. Thorax doppelt so breit wie lang, die Seiten leicht gerundet und nach vorn convergierend, die Scheibe stark querüber gewölbt und nicht dicht, sehr fein punktiert. Flügeldecken mässig dicht, fein punktiert, vor der Mitte sind einige kurze Punktreihen bemerkbar, die 8. und 9. Reihe sind deutlich und vollständig, der Raum zwischen der 9. Reihe und dem Aussenrande ist mässig breit, fast glatt.

44. **Enneamera thoracica** Baly.

Es wurde nur 1 Exemplar gefangen, bei dem der Thorax schwarz ist, ein schmaler Saum auf dem abgesetzten Seitenrande, in den Vorderecken makelförmig verbreitert, und ein Streifen am Innenrande von den Epipleuren der Flügeldecken bräunlich gelb.

LUZON, Benguet, Cabayan (*D. C. Worcester* und *R. C. McGregor*).

45. **Enneamera nigra** Jac., Ann. Mus. Civ. Genova (1896), 137.

Ist von Mentawei beschrieben; ich erhielt 2 Stücke von Palawan durch Herrn Oberdörffer.

[7] Durch die Färbung ausgezeichnet ist:

Sphaeroderma cyanescens sp. nov.

Breviter-ovatum, convexum, subtus piceum, antennis articulis 3 primis palpisque fulvis, supra cyaneum, nitidum, prothorace sublaevi, elytris subtiliter striato-punctatis.

Long. 2 mm.

JAVA ORIENTALES, Montes Tengger (*Frühstorfer*).

Die Fühler sind schlank und reichen bis hinter die Mitte der Flügeldecken, die 5 Endglieder sind unbedeutend verdickt. Der Thorax hat fast gradlinige, nach vorn wenig convergierende Seiten und ist ziemlich glatt, nur vor dem Hinterrande sind unter starker Vergrösserung einige Pünktchen zu bemerken. Die Flügeldecken sind mit regelmässigen feinen, einfachen Punktreihen versehen und haben in den Zwischenstreifen eine kaum bemerkbare Punktreihe; die beiden ersten Reihen an der Naht sind durch stärkere Punkte in den Zwischenstreifen gestört. Die Punkte der neunten Reihe werden vor der Mitte kräftig.

46. **Enneamera neglecta** sp. nov.

Rotundato-ovato, sat convexa, sordide testaceo-flava, nitida, capite, antennis (articulis 2 vel 3 primis testaceis exceptis), femoribus posticis apice, pectore et interdum abdomine nigris, tarsis infuscatis.

Long. 3.5-4 mm.

PALAWAN, Iwahig (*C. M. Weber*).

Type, No. 11988, in der Entomologischen Sammlung des Bureau of Science, Manila.

Kleiner, breiter gebaut als *E. thoracica,* grösser als *nigra,* der Kopf ist sparsam, der Thorax dichter und sehr fein punktiert, letzterer ausserdem mit feineren Punkten in den Zwischenräumen. Flügeldecken nicht dicht und sehr fein punktiert, die Zwischenräume äusserst dicht und fein punktuliert.

47. **Botryonopa collaris** Ws., Ann. Soc. Ent. Belg. (1911), 75.

PALAWAN, Iwahig (12546, *C. H. Lamb*).

48. **Botryonopa bipunctata** Baly.

MINDORO, Magaran (11731, *C. M. Weber*).

49. **Anisodera thoracica** Chap.

MINDANAO, Zamboanga (13642, *T. C. Zschokke*).

50. **Callispa flavescens** Ws., Ann. Soc. Ent. Belg. (1911), 75.

LUZON, Rizal, Montalban Gorge (9270, *W. Schultze*).

51. **Bronthispa depressa** Baly.

LUZON, Manila (11902, *Charles S. Banks*).

52. **Promecotheca cumingi** Baly.

PALAWAN, Puerto Princesa (10775, *W. Schultze*).

53. **Promecotheca apicalis** Ws., Ann. Soc., Ent. Belg. (1911), 75.

TICAO ISLAND (7482, *R. C. McGregor*).

54. **Gonophora apicalis** Baly.

LUZON, Rizal, Montalban Gorge (5342, *Charles S. Banks*).

55. **Gonophora femorata** sp. nov.

Pallide fulva, subopaca, antennis, elytrorum apice extremo, femorum apice, tibiis tarsisque nigris, ventre rufo vel infuscato; elytris tricostatis, costa tertia obsoleta.

Long. 5 mm.

NEGROS OCCIDENTAL, Bago (1611, *Charles S. Banks*), PALAWAN, Bacuit (11678, *C. M. Weber*).

An der Färbung der Beine sofort zu erkennen. Letztere sind schwarz, die Vorderschenkel in der Basalhälfte, die übrigen,

namentlich auf der Unterseite, noch weiter rötlich gelb, ebenso sind die Fühler einfarbig schwarz und die äusserste Spitze der Flügeldecken ist schwärzlich. Die anderen Teile des Körpers sind blass rotgelb, der Bauch dunkler. Am meisten erinnert die Art an *G. fulva* Gest. von Sumatra, ist aber breiter gebaut und hat dickere Fühler. Thorax etwas breiter als lang, die gezähnelten Seiten an der Basis parallel, davor gerundet erweitert, vorn stärker verengt und nahe den Vorderecken eingeschnürt, die Scheibe gewölbt, uneben. Ausser der feinen Mittelrinne die in einem erhöhten Streifen liegt, bemerkt man noch die 4 gewöhnlichen Vertiefungen, welche mehr oder weniger zahlreich punktiert sind. Auf den Flügeldecken sind die beiden ersten Rippen kräftig, glänzend, die 3. ist schwach, undeutlich, zwischen die 3. und 4. Punktreihe schiebt sich vorn eine überzählige Reihe.

56. **Monochirus callicanthus** Bates.

LUZON, Manila (10550, *Charles S. Banks*).

57. **Monochirus moestus** Baly.

LUZON, Benguet, Bued River (9833, *H. M. Curran*).

58. **Dactylispa dimidiata** Gest.

BOHOL (6782, *A. Celestino*).

59. **Dactylispa infuscata** Chap.

MINDORO, Magaran (10768, *W. Schultze*).

60. **Dactylispa vittula** Chap.

CEBU, Danao (7560, *W. D. Smith*).

61. **Platypria ferruginea** sp. nov.

Subtus flavo-testacea, supra ferruginea subopaca, prothorace utrinque lobo elongato quinque-spinoso, elytris, bilobatis, lobo antico 5-spinoso, postico 3-spinoso, dorso striato-punctatis, bispinosis, humeris 4-spinosis.

Long. 5 mm.

MINDORO, Magaran (*C. M. Weber*).

Type, No. 13437, in der Entomologischen Sammlung des Bureau of Science, Manila.

In der Grösse und Bewaffnung der Seitenlappen des Körpers mit *P. longispina* Chap. übereinstimmend, aber durch die gleichmässig rostrote Farbe der Flügeldecken und deren Bedornung sehr verschieden. Am Seitenrande der Flügeldecken befinden sich zwischen den beiden Lappen 2 Dörnchen (selten einer), hinter dem zweiten Lappen 6 Dornen, von denen die beiden ersten mässig lang, die folgenden kürzer sind und nach der

Nahtecke hin kleiner werden. Die Schulter trägt 4 Dornen in einer Längsreihe, der letzte ist wenig höher aber bedeutend dicker als die vorhergehenden; auf der Scheibe stehen 2 dicke Dornen, der 1. vor der Mitte auf der ersten Rippe ist der stärkste von allen, der 2. hinter der Mitte auf der zweiten Rippe ist etwas kleiner als der 4. Schulterdorn. Ausserdem sind hinter der Mitte noch mehrere Dörnchen zu bemerken.

62. **Megapyga coeruleomaculata** Boh.

LUZON, Laguna, Los Baños (13083, *E. M. Ledyard*).

63. **Prioptera palawanica** sp. nov.

Subrotundata, convexa, testaceo-flava, nitida, antennarum articulo ultimo nigro, prothorace sublaevi, elytris subtiliter, hinc inde seriatim punctatis, antice retusis, gibbosis, disco antico fovea magna impressis, singulo maculis quatuor magnis nigris.

Long. 9–9.5 mm.

PALAWAN, Bacuit (*C. M. Weber*).

Type, No. 11786, in der Entomologischen Sammlung des Bureau of Science, Manila.

In die zweite Abteilung der Gattung gehörig[8] und von *P. 4-impressa* Boh., mit der sie am nächsten verwandt ist, durch folgende Punkte zu unterscheiden: Der Körper ist in beiden Geschlechtern breiter gebaut, heller und mehr gelblich gefärbt, die Flügeldecken erweitern sich hinter der Basis nicht geradlinig und sehr schwach, sondern in leichtem Bogen bis hinter die Mitte und sind auf der Scheibe weniger uneben und merklich feiner punktiert. Insbesondere erhebt sich die Querleiste, welche das ansteigende Basaldreieck begrenzt, an der Naht zu einem niedrigen, stumpfen Höcker, die Grube hinter $\frac{1}{4}$ der Länge ist wenig grösser, aber viel flacher und die 2. Grube, schräg nach hinten und aussen von der ersten, ist nur noch angedeutet. Die zahlreichen und kräftigen Querrunzeln, welche die beiden ersten Punktreihen der *P. 4-impressa* durchsetzen, sind in der vorliegenden Art fast geschwunden und die Punktreihe zwischen der Scheibe und dem Seitendache ist nicht halb so kräftig; dafür sind

[8] Ich teile *Prioptera* in 2 Abteilungen:

1. Die Wölbung der Thoraxscheibe setzt sich in der Mitte bis auf das Seitendach fort und teilt dies dadurch in einen grösseren, ausgebreiteten Teil vorn und einen grubenförmigen Teil hinten. Hierher gehören wenige Arten z. B. die Type der Gattung, *P. 8-puntata* Fabr. sowie *nigricollis* Ws.

2. Das Seitendach des Thorax ist gleichmässig ausgebreitet und bildet einen Längsstreifen mit ziemlich parallelen Rändern, der von der Scheibe der ganzen Länge nach durch einen bogenförmigen Längseindruck getrennt wird. Hierher gehört *P. westermanni* Bohn., und das Gross der Arten.

aber die 4 schwarzen Makeln jeder Decke bedeutend grösser. Die 3 ersten sind oval; die 1. nimmt die Grube und einen Teil davor ein, die 4. hinter der Mitte auf dem Seitendache ist quer und zieht ein Stück auf die Scheibe hinauf.

64. **Prioptera sinuata** Ol., ab. **deficiens** Ws.

Bei diesen Stücken fehlen die schwarzen Makeln 2 und 3 der Flügeldecken, während Makel 4 und namentlich 5 grösser als gewöhnlich sind.

65. **Aspidomorpha fraterna** Baly.

PALAWAN, Bacuit (11789, *C. M. Weber*).

66. **Aspidomorpha biradiata** Boh.

LUZON, Laguna, Calauang (14165, *R. C. McGregor*).

67. **Aspidomorpha bilobata** Boh.

LUZON, Laguna, Calauang (14179, *R. C. McGregor*).

68. **Aspidomorpha orbicularis** Boh.

SIBAY ISLAND (11409, *D. C. Worcester*).

69. **Aspidomorpha fusconotata** Boh.

In der Zahl, Grösse und Anordnung der braunen bis pechschwarzen Makeln auf den Flügeldecken sehr veränderlich. Leicht falsch zu deuten scheint mir die Angabe von Boheman [Mon. Cassid. (1854), 2, 280], „der Nahthöcker ist mit einem kleinen schwärzlichen Ringe versehen." Dieser Ring ist fast immer vorhanden, besteht aber meist aus 2 Bogen unmittelbar hinter dem Höcker, wenn dieselben vorn geschlossen sind, reichen sie grade auf die höchste Stelle des Höckers.

LUZON, Bataan, Lamao (9795, *H. E. Stevens*) ; Cagayan Valley, Ilagan (9797, *H. E. Stevens*).

Hierher rechne ich auch 1 Exemplar von Luzon und eines von der Insel Dalupiri (11573, *D. C. Worcester* und *R. C. McGregor*), welche 2 dunkelbraune Seitenäste besitzen. Der 1. liegt dicht hinter dem Schulterrande, ist ziemlich breit und zuweilen nur hinten durch eine feine Linie mit der dunklen Zeichnung der Flügeldecken verbunden; der 2., hinter der Mitte, ist schmal.

70. ? **Metriona westringi** Boh.

Die hierher gehörigen Arten sind durch Boheman oberflächlich beschrieben worden und noch heute nicht specifisch zu unterscheiden, weil sich aus Mangel an reichlichem Materiale nicht nachweisen lässt, wie weit die Zahl und Grösse der gelben Reliefmakeln auf den Flügeldecken zu oder abnehmen kann.

Das typische Stück Boheman's soll 9 solcher Flecken auf jeder Flügeldecke haben, wovon einer an der Basis liegt.

LUZON, Bataan, Lamao (9796, *H. E. Stevens*).

PALAWAN, Bacuit (11793, *C. M. Weber*).

71. **Metriona recondita** Boh., Mon. Cassid. (1862), 4, 396.

MINDANAO, Agusan River (13688, *W. Schultze*).

COCCINELLIDÆ

1. **Chilocorus ruber** Ws.

PALAWAN, Bacuit (12328, *C. M. Weber*).

2. **Phaenochilus monostigma** sp. nov.

Oblongo-hemisphæricus, fulvus, nitidissimus, elytris ante medium macula communi, elliptica nigra.

Long. 4 mm.

MINDANAO, Agusan River (*W. Schultze*).

Type, No. 13686, in der Entomologischen Sammlung des Bureau of Science, Manila.

Länglich halbkugelig, hell rötlich gelb und oben stark glänzend, eine gemeinschaftliche gerundete Makel der Flügeldecken schwarz. Diese Makel ist länger als breit, beginnt unmittelbar hinter dem kleinen Schildchen und endet in der Mitte. Stirn länglich viereckig, nach unten wenig verengt, ziemlich dicht- und fein punktiert und kurz behaart, Augen unten in ein Dreieck verlängert, dessen Spitze abgerundet ist. Thorax stark quer, nach vorn zusammengedrückt, die schwach gerundeten, fast parallelen Seiten daher steil abfallend, nach vorn in einen dreieckigen, sparsam behaarten Zipfel verlängert, der bis zum unteren Augenrande reicht. Die Scheibe ist äusserst fein und nicht dicht punktiert. Die Flügeldecken sind hoch gewölbt und fallen gleichmässig bis an den abgeschrägten, nicht breit abgesetzten Seitenrand ab; sie sind sehr fein flach punktiert. In der äusseren Hälfte werden die Punkte grösser und tiefer, aber der Rand ist fast glatt. Die Bauchlinien bilden einen Viertelkreis, der vor dem Hinterrande des ersten Segmentes nach aussen läuft.

3. **Serangium spilotum** sp. nov.

Subhemisphaericum, testaceum, prothorace (limbo laterali interdum excepto), scutello elytrisque nigris, nitidis, his in singulo macula elongata, sublunata, rufa.

Long. 2.5 mm.

LUZON, Manila (*G. Compere*).

Type, No. 10244, in der Entomologischen Sammlung des Bureau of Science, Manila.

Kopf kurz und breit, rötlich gelbbraun, glänzend, die Stirn von der Mitte der Augen bis zum Vorderrande mit einem breiten, halb aufstehenden gelben Haarbüschel besetzt. Thorax $2\frac{1}{3}$ mal so breit als in der Mittellinie lang, schwarz, an den Seiten zuweilen rötlich gelbbraun gesäumt, nicht dicht, in der Mitte feiner und sparsamer als an den Seiten punktiert, jeder Punkt mit einem aufgerichteten weisslichen Härchen besetzt. Schildchen dreieckig, glatt. Flügeldecken unter starker Vergrösserung kaum sichtbar punktiert, nahe dem Seitenrande mit einer vorn unregelmässig verdoppelten stärkeren Punktreihe, in welcher in jedem Punkte ein weissliches, nach aussen gerichtetes Härchen entspringt. Die rote Längsmakel jeder Decke reicht ungefähr von $\frac{1}{4}$ bis $\frac{2}{3}$ der Länge und hat eine annäherend mondförmige Gestalt; ihr Innenrand liegt nahe der Naht und läuft dieser parallel, der Aussenrand ist ähnlich wie der Seitenrand gebogen. Die Unterseite ist dunkel rötlich gelbbraun, mit helleren Beinen; der vorgezogene Teil des Prosternum ist angedunkelt.

4. **Pullus brunnescens** Motsch.

LUZON, Benguet, Twin Peaks (8197, *Charles S. Banks*).

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A DESCRIPTION OF SOME PHILIPPINE THALASSEMÆ WITH A REVISION OF THE GENUS

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Two plates and 3 text figures

During a residence at the marine biological station of the University of the Philippines and the Bureau of Science at Port Galera, Mindoro, in 1912, I collected 3 species of *Thalassema*. One of these, *Thalassema sorbillans* Lampert, was described from the Philippines in 1883 and has not been recorded elsewhere. Another, *Thalassema semoni* Fischer, has been previously recorded from Amboina by Fischer, and from the Maldive Islands by Shipley, but has not before been found in the Philippines. The third species is new, and I have called it *Thalassema griffini* in honor of Dr. L. E. Griffin by whose aid and encouragement I have been able to complete this paper. Later in the year, Mr. A. L. Day, of this laboratory, on a trip of the Government cableship *Rizal*, obtained one specimen of a species which seems to be *T. formosulum* Lampert. A brief description of this specimen has been included.

Thalassema sorbillans Lampert.

Thalassema sorbillans LAMPERT, Zeitschr. f. wiss. Zool. (1883), **39**, 340; SHIPLEY, Willey's Zool. Results (1899), pt. 3, 352.

Numerous specimens of this species were collected from a sandy beach on Buquete Island, Port Galera. The sand was fine, containing much organic matter to a depth of about 15 cm.; at this depth it passed abruptly into a layer of coarse, clean

gravel. *Thalassema sorbillans* was found in the top layer of sand, more than 100 specimens being collected in a space 1 meter square. I was able to keep a number of individuals alive in an aquarium for several days, but was so busy with other work that I did not have much time for observing them. They were able to burrow in the sand without any difficulty, and fed by taking up pellets of sand and passing them through the intestine.

The body of this species is from 3 to 5 cm. in length, and the proboscis is more than half as long as the body. Both the body and proboscis may be extended to about twice the usual length when the animal is feeding or moving about on the surface of the sand. The diameter of the largest specimens measures from 14 to 16 mm. The body is rather pointed at both ends, and 2 short curved setæ are borne from 5 to 10 mm. back of the mouth on the ventral surface. The body wall is so thin that the internal organs often may be seen through it. Small papillæ are scattered over all parts of the body, but are most numerous and prominent on the posterior region.

As in Lampert's specimens, there are 13 bundles of longitudinal muscles. Even in the largest specimens these are very small and thin, and in the smaller and younger individuals they cannot be detected by means of the microscope.

Cross sections were made of the central part of the body wall of 4 specimens ranging from the youngest to the oldest, in order to compare the dermal muscle layers. In the youngest specimen the longitudinal muscle is continuous and of very nearly uniform thickness. In the next individual there are 13 longitudinal swellings of the longitudinal muscle, although it remains continuous all the way around the body. In the third specimen the bundles have become thicker, while between the bundles the muscle has decreased considerably in thickness. In the fourth and oldest specimen the longitudinal bundles are comparatively thick, while the muscle between the bundles has become attenuated, as if it had been pulled out, until it has a thickness of only one row of fibers in some places, and in others it even has disappeared entirely. In all the sections the oblique muscle layer is very thin, but it is continuous and uniform in thickness, and follows the outline of the longitudinal muscles. In the spaces in which that muscle is lacking, the oblique layer is separated from the circular layer only by connective tissue.

The color of the living worm is a rich brownish pink. The presence of the longitudinal muscles is indicated in the larger specimens by 13 white longitudinal lines. The proboscis is pale cream color on the dorsum; faint green lines run along the edges

of the groove on the ventral side. In formalin both the body and proboscis become nearly colorless.

There are 3 pairs of unusually small nephridial sacs, of which the posterior pair is always the largest. In a specimen 7 cm. long the sacs measured, respectively, 2, 3, and 5 mm. in length. The anterior pair always lies in front of the ventral setæ, the second pair about an equal distance back of the setæ, and the second and third pairs are always about twice as far apart as the first and second. Each sac bears 2 spirally twisted nephridia which enter the sac by a common opening on the dorsum just within the attachment of the sac to the body wall.

The anal trees are long, brown in color, and open into the rectum on the left side. Lying between them is a small spherical diverticulum of the rectum (fig. 1). The anal trees are covered with short ciliated funnels which are plainly visible under a magnification of 50 diameters.

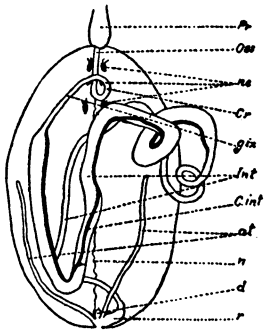

FIG. 1. Diagram of the internal organs of *Thalassema sorbillans* Lampert. *pr*, proboscis; *ne*, nephridial sacs; *oes*, œsophagus; *cr*, crop; *giz*, gizzard; *int*, intestine; *c. int*, collateral intestine; *r*, rectum; *d*, diverticulum; *at*, anal trees; *n*, nerve.

The alimentary canal has a total length of about 36 cm. in the largest specimens. It may be divided into 5 parts—œsophagus, crop, gizzard, intestine, and rectum. This form differs from the majority of echiuroids in that there is no muscular pharynx, the mouth opening directly into the thin-walled œsophagus, which is a straight tube about 1 cm. long. The "heart" is attached to its dorsal surface, and the two connecting blood vessels pass around it. Behind the "heart," the crop forms a loop, which when straightened out is about 1 cm. long. From it the gizzard, or "midgut," runs transversely to the left. This organ has a length of about 2 cm., and is smaller in diameter than the crop. At the end of the gizzard the canal widens greatly, the walls become much thinner, and the intestine may be said to begin at this point. The intestine is divided into two parts. The first part has a diameter of from 4 to 5 mm., a length of about 15 cm., and bears the collateral intestine throughout its length. The latter organ is about 1 mm. in diameter, and its walls are thicker than those of the main part of the intestine. Both of its openings into the intestine may easily be found. The second part of the intestine, which begins at the end of the collateral intestine, is a little longer than the first part, but is much

smaller in diameter. The course of the intestine is rather complex, but seems to be nearly constant in the specimens I have examined. From the gizzard it runs posteriorly on the left side almost to the rectum. Then it turns to the right, and extends forward to a point about even with the posterior surface of the crop. Here it turns ventrad, and passing under the other parts runs posteriorly until it reaches the left side of the rectum again. Turning to the right it forms an S-shaped loop and enters the rectum from the right. The rectum is less than a centimeter long; its diameter is only a little greater than that of the intestine. In addition to the intestine, it receives the anal trees, and bears a small spherical rectal diverticulum.

The œsophagus is attached to the body wall for the first 5 mm. of its length by means of 2 sheets of muscular filaments which run laterally to the wall just back of the mouth. The remainder of the canal is held in place by means of thick muscular bands which extend latero-ventrad from its ventral surface to the body wall. These bands are very numerous along the upper part of the intestine, but decrease in number toward the posterior end. The rectum has a radial mesentery, and the diverticulum is attached by filaments to the sheath of the nerve cord.

In one specimen dissected a very remarkable variaton of the crop was noted (Plate I, fig. 1). In place of the simple loop, the walls of the tube had grown together in such a way as to form a heart-shaped sac which was partially divided into 2 chambers by the fusion of the adjoining walls of the tube. The œsophagus was slightly constricted where it entered the sac, and the gizzard was somewhat shorter than usual.

The vascular system of *Thalassema sorbillans* agrees very closely with that of other species of the genus which have been described in detail. The dorsal blood vessel enters the body cavity from the proboscis. It runs backward on top of the œsophagus until it reaches the posterior part where it is enlarged to form a sac-like "heart." Out of the posterior end of this "heart" run 2 vessels which pass around the œsophagus on opposite sides and join the ventral vessel. This vessel runs forward, and divides into 2 branches which enter the proboscis as the lateral vessels of that organ. The body cavity is filled with a clear fluid containing brownish red corpuscles. In the cœlomic fluid of all the specimens which were examined there were also great quantities of the "corpuscular bodies" which have been described by Ikeda (20).

The nervous system consists of a long ventral cord which

runs from behind the mouth to the anus. At its anterior end it divides into 2 branches which run around the œsophagus and enter the proboscis. The cord bears no ganglia, but it gives off numerous small branches which supply the body walls.

Thalassema semoni Fischer.

Thalassema semoni FISCHER, Zool. Forschungsr. in Australien, etc. Semon (1896), 5, pt. 3, 338; SHIPLEY, Willey's Zool. Results (1899), pt. 3, 351; Fauna and Geography of the Maldive and Laccadive Archipelagoes Echiuroidea (1902), 1, pt. 2, 129.

Two specimens of *Thalassema semoni* Fischer were collected on Buquete Island in holes in a sandstone rock along with many specimens of *T. griffini* (see page 249).

The body when extended was about 7 cm. long. The proboscis was about three-fourths that length, and was broad, flat, and slightly truncated. The proboscis broke from the body very easily, and did not leave a visible scar. Both of the specimens were perfect when they were found, but their probosces were broken off before they could be brought to the laboratory. The bodies of the preserved specimens are 4 cm. in length and 15 mm. in diameter; the probosces are greatly contracted. The body wall is rather tough, and is covered uniformly with papillæ. The two ventral hooks are present, but are very small and inconspicuous. The longitudinal muscle layer is continuous, showing no division into bundles.

Both the body and the proboscis were olive green when the animals were alive. In formalin they turned to dirty gray.

There are 2 pairs of nephridial sacs each bearing spirally twisted nephridia. The sacs are very long in proportion to the length of the body, the posterior pair in one specimen being longer than the body when straightened out. They are constricted at intervals, and contain partly developed eggs. The anterior pair opens in front of, and the second pair behind, the ventral hooks.

The anal trees are slender brown tubes about two-thirds as long as the body. They are covered with very small ciliated funnels.

The alimentary canal is about 34 cm. long. It is composed of 5 parts—pharynx, œsophagus, midgut, intestine, and rectum. The pharynx is about 5 mm. long and 2 mm. in diameter, and has thick muscular walls. It is held in position by means of 2 lateral mesenteries. The œsophagus is very much twisted, but has a length of about 2.5 cm. when it is removed and straightened out. Its walls are very much thinner than those of the pharynx. The next part of the canal, which I have called the

midgut, is about 5 cm. long; it runs backward from the end of the œsophagus for about half its length, then turns on itself forming a U, and runs forward again where it turns to the right. The walls of this part are thicker than the œsophagus, but there is no indication of any separation into crop and gizzard such as is found in many other forms. The intestine as usual is composed of two parts. The first part, bearing the collateral intestine, is about 10 cm. long, and is much wider than any other part of the canal except the rectum. The second part is longer and narrower than the first part, and is filled with small regular pellets of sand. The rectum forms the last 15 mm. of the canal. It is a sac-like organ about 8 mm. in diameter, and bears the anal trees at its lower end.

The vascular and nervous systems agree in almost every respect with the typical forms of the genus.

Thalassema formosulum Lampert.

Thalassema formosulum LAMPERT, Zeitschr. f. wiss Zool. (1883), **39**, 339; SHIPLEY, Willey's Zool. Results (1899), pt. 3, 340.

One individual of this species was collected by Mr. A. L. Day near Catbalogan, Samar. It was brought up on a cable from a depth between 10 and 24 fathoms. The bottom was of fine mud.

The length of the preserved specimen is 4.5 cm., and its greatest diameter is 18 mm. The proboscis is about 1 cm. long, and forms a tube at the mouth. The body is slightly pointed in front, while the posterior end is broad and flat with the anus opening on a small projection. The body wall is very thin, and is sparsely covered with small round white papillæ which are nowhere arranged in rings.

The longitudinal muscles show 7 narrow bundles, the spaces between the bundles being from two to three times as wide as the bundles. On sectioning, the dermal musculature was found to be unusually thick in proportion to the remainder of the body wall. The longitudinal muscle was found to be continuous, although it has the 7 thickenings which have been mentioned. The muscle of the bundle is between two and three times as thick as that of the region between the bundles. In all 3 layers the muscle has an unusual lack of compactness; the fibers, which are very large as compared with other forms, being scattered in a loose connective tissue which is full of small sinuses. The ventral setæ are long and hooked, with orange-colored tips. Internally, they are attached to the body wall by strong radial muscles, and their ends are connected by a powerful interbasal muscle.

In formalin the body is colorless, except the flattened posterior end, which is white.

There are 2 pairs of very small nephridia which open behind the ventral setæ. Owing to the smallness of the nephridia and the poor state of preservation of these organs, the character of the internal openings could not be determined.

The anal trees are about 2.5 cm. long and rather broad and sac-like. They are suspended from the body wall by muscular filaments. The structure of the funnels could not be distinguished. A spherical, rectal diverticulum is present.

The intestine was filled, except for the first 2 cm., with very small sausage-shaped pellets of mud.

Although this specimen is somewhat larger than *T. formosulum* as described by Lampert, the number and position of the nephridia, the arrangement of the longitudinal muscles, and the general external appearance of the specimen seem to justify identifying it as this species.

Thalassema griffini sp. nov.

Locality.—Port Galera, Mindoro. This species was first collected on the inner side of Buquete Island in a soft blue sandstone rock just above low-water mark. The rock was honeycombed with burrows made by a boring mollusk (*Gastrochæna?*), and the *Thalassema* was found in these old burrows along with *Gebia* and other crustaceans. In order to get them out, it was necessary to break up the rock with a crowbar. They were found in this place in considerable numbers during the entire time the station was occupied (March 12 to June 18). They were also collected in great numbers on the outer side of the island during most of the month of April. Here there is a small cove with a rock bottom into which numerous shallow potholes have been worn by wave action. These are partly filled with sand, gravel, and small stones. *Thalassema* was collected from the deeper holes. In one hole not over 60 cm. in diameter, 11 specimens were found and in another, 10, along with an equal number of sipunculids. They seemed to lie directly on the rocks with the sand and gravel covering them, and no definite burrows or openings could be observed on the surface. On the 1st of May they had entirely disappeared from this place, and could not be found there during the remainder of our stay at the station.

Size.—The bodies of the largest specimens reach a length of from 12 to 14 cm. when fully extended, with a diameter of from 10 to 12 mm. The proboscis varies in length from 5 to 8 cm.

If the animal be irritated, its body contracts to the shape and size of a large olive, and the proboscis is much shortened. I succeeded in killing specimens fairly well expanded by leaving them in sea water to which a little atropin was added from time to time.

The greatest thickness of the extended body is just back of the mouth, from which it tapers to a point at the posterior end. The two setæ are orange tipped, and are placed on the ventral surface near the mouth. The body wall is tough, and the longitudinal muscles are prominent. They are found in 17 or 18 bundles, the proportion of specimens having 18 bundles to those having 17 being nearly as 5 to 1. The surface of the body is covered with small papillæ which are especially prominent on the terminal regions, those of the posterior end being arranged in more or less definite rings.

Color.—In the living specimens the general color of the body is red, with broad white stripes running lengthwise. These correspond in number to the longitudinal muscles. The proboscis is bright green on the ventral side along the edge of the groove, and shades to a cream color on the dorsal surface. The tip is bright yellow, and the groove is pale yellow. When the circular muscles contract, the surface of the body is broken into deep red squares which appear and disappear as the peristaltic wave passes along the body.

Nephridia.—All of the specimens examined possess 3 pairs of nephridial sacs, the anterior pair always opening in front of the setæ. Each sac bears 2 spirally coiled internal openings. The sacs are always very much elongated, in some specimens the posterior sac being as long as the body; all contained eggs or spermatozoa when collected.

Anal trees.—These organs are clear transparent sacs, and are about one-half the length of the body. They are covered with microscopic, sessile, ciliated funnels.

THE BODY WALL

(FIGS. 3, 4, AND 5)

For the purpose of description it will be necessary to divide the body wall into three parts; namely, the anterior and posterior terminal regions and the middle portion. The anterior and posterior terminal regions are thickly covered with papillæ, and show no differentiation of the longitudinal muscle into bundles. In preserved specimens they extend for about 1 cm. from each end of the body. On the middle portion, the papillæ are smaller and scattered, and the longitudinal muscle is divided

into 18 distinct bundles. The body wall is rather thick in both terminal regions, but becomes much thinner in the middle of the body.

As in other forms the wall is made up of a corium—consisting of the cuticle, epidermis, and dermis—the muscular layer, and the endothelium. The corium layer resembles the usual forms very closely. The cuticle is very thin and transparent. The epidermis consists of a layer of long cylindrical cells, the inner ends of which are produced into fine tapering processes such as are described by other writers. All over the surface and especially in the terminal regions, the epidermis is pushed out by thickenings of the dermis to form small papillæ. In the epidermal layer of these papillæ are found groups of long club-shaped cells which have a granular appearance and open on the surface by common pores in the cuticle. The dermis consists of a clear ground substance containing numerous long anastomosing fibers and very few cells, which gives it a more or less reticular appearance. Its thickness varies greatly in different places as it forms the main internal mass of the dermal papillæ. Inclosed in the dermis are found numerous large rounded bodies containing granules which stain deeply with hæmatoxylin. They do not appear to be connected with the surface, and no explanation of their function has occurred to me.

On taking up the study of the dermal muscle layer it was found to be so different from any other form that it seemed worthy of a rather detailed description. The description and drawings were nearly finished when a paper by Spengel(43) was received; Spengel describes specimens of *T. erythrogrammon,* in which the skin muscle layer is very much the same as in *T. griffini.* Spengel has compared 7 different specimens which have been described at various times as *T. erythrogrammon.* They are:

1. The original example of the species found by Rüppell in the Red Sea.
2. A specimen described by Lampert in 1883 as *T. caudex* and later referred to the species *T. erythrogrammon.*
3. An example in the Vienna Royal Museum, from Bourbon, identified and described by von Drasche in 1881.
4. Sluiter's specimen from the Island of Billiton, between Sumatra and Borneo, described in 1883.
5. A specimen collected by Willey in the China Straits near New Guinea and described by Shipley in 1899.
6. An example from the Bahamas described by C. B. Wilson in 1900 and a specimen from Florida in the possession of Spengel.
7. Specimens collected by Gardiner at the Maldive Islands and identified by Shipley in 1902.

Spengel has studied the dermal muscle layer of all of these forms, and on the basis of the difference in this structure he has divided the genus *Thalassema* into three separate groups, without regard to the number of longitudinal muscle bundles which they display. In the forms which have been described as having separate bundles of longitudinal muscle, he finds that "all have an uninterrupted, continuous layer of longitudinal muscle which is regularly thickened and intermittently thinned," thus giving the appearance of separate bundles except when examined very carefully under the microscope. He says also that in all forms the circular or ring muscle forms a continuous uniform sheet. Therefore, he separates his groups according to the degree in which this thickening and thinning of the longitudinal layer is found and the manner in which it occurs.

The first group for which he retains the generic name *Thalassema* and for which he takes the type species, *T. neptunii* Gaertner, as the type, has the following characteristics. The longitudinal muscle is of uniform thickness throughout, and the oblique muscle is also of uniform thickness and completely covers the longitudinal layer. The second group to which he gives the generic name *Listriolobus* is characterized as follows: The longitudinal muscle is thickened into bundles at intervals, and is not interrupted between the bundles, but simply becomes thinner, forming undulations. The oblique layer is like that of *Thalassema;* that is, of uniform thickness and completely covering the longitudinal layer. To this genus he assigns *T. erythrogrammon* of Sluiter and Wilson and the specimen which he has from Florida. To the third group he gives the old generic name of Rüppell—*Ochetostoma.* This group is characterized by having the main part of the longitudinal muscle interrupted by "intervals," so that longitudinal bundles are formed which appear to be separated, but are in reality connected by a very thin layer of longitudinal fibers between the bundles. The oblique muscle does not follow the longitudinal layer in the intervals, but bridges the intervals on septal bands of connective tissue. Also, the oblique muscle is not a continuous sheet as in the other forms, but is separated into bundles over the "intervals," so that these are connected with the cœlom by openings between these oblique bundles. In this genus he places the original *T. erythrogrammon* of Rüppell and Lambert's *T. caudex.* The position of the other specimens he does not define.

The dermal muscle layer of *T. griffini* bears a very close resemblance to that of *T. erythrogrammon* Rüppell, but there are some differences from the condition which Spengel describes

and some points have been noted which he does not bring out in his description. In *T. griffini* the dermal muscle layer consists of four parts. The first of these is a single layer of muscle cells lying at the base of the dermis, which runs in a longitudinal direction and covers the body throughout, completely separating the corium from the deeper muscle layers. This layer is so thin that it is very difficult to see in cross sections of the body wall, but it is easily found by peeling off the corium in glycerine and then examining with the microscope. On account of its position and relations to the surrounding parts, I have called it the external limiting muscle. Within the external limiting muscle are the three regular muscular layers—the circular or ring muscle, the longitudinal muscle, and the oblique muscle.

In order to make clear the relations between these muscles, it will be necessary to describe the middle or longitudinal layer first. In the two terminal regions which have been mentioned, the longitudinal muscle forms a thick continuous sheet without any separation whatever into bundles (fig. 5). At about 1 cm. from each end, this sheet gradually becomes separated into 18 large longitudinal bundles. In cross section these bundles have the shape of a more or less regular isosceles triangle with the base lying against the inner oblique layer and the apex turned outward. Between the bundles are the "intervals" of which Spengel speaks. He says that in Rüppell's specimen of *T. erythrogrammon* a very thin, but continuous, layer of longitudinal muscle continues across the intervals from the apex of one bundle to the next. In *Thalassema griffini* traces of this layer may be found, but in place of the continuous layer of which Spengel speaks it is broken up into small bundles of fibers and these bundles are scattered across the interval. These little bundles rarely consist of more than 10 muscle fibers, and they are in almost all cases separated by a space greater than the width of the bundles and in some cases the space between them may be as wide as half the whole interval. They are surrounded by connective-tissue fibers and overlaid by the endothelium (fig. 3).

The circular muscle on the outside of the longitudinal muscle is a continuous sheet in the terminal regions, about half the thickness of the longitudinal layer. In the middle region of the body the circular layer also changes in character. It becomes much thinner, and is spread out flat over the large longitudinal bundles, but over the intervals between them it is drawn together more or less to form bundles which are connected by a very thin layer of fibers.

The oblique or diagonal muscle on the inner side of the

longitudinal layer is also continuous over the terminal regions although somewhat irregular in thickness, and it follows closely the outline of the longitudinal layer. In the middle region its condition is exactly like that described by Spengel; that is, between the longitudinal bundles, the oblique fibers are gathered into compact cords which bridge the intervals (fig. 2). On reaching the edges of the longitudinal bundles, the oblique fibers spread out fanwise, so that the middle of the longitudinal bundle is covered by a complete, but thin, layer of oblique fibers. The oblique fibers do not pass freely across the intervals, but lie on the inner edge of extremely thin connective-tissue septa which rise from the outer side of the interval (fig. 4) which, as Spengel says, are like dams across the interval, separating it into a great number of small 4-sided compartments opening into the cœlom between the oblique bundles. These "septal bands" are, as Spengel says, composed of the cell-poor connective tissue of the muscle layer, but in my specimens the septal bands have been found to contain a few isolated muscle fibers.

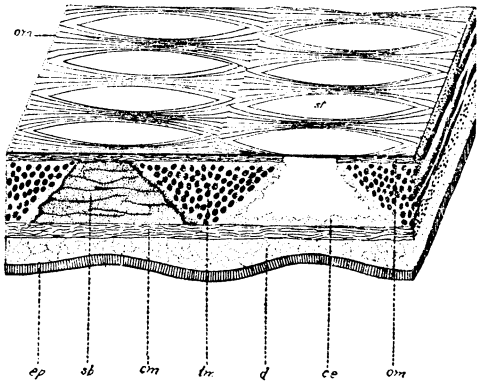

FIG. 2. Diagram of the body wall of *Thalassema griffini* sp. nov. *ep*, epidermis; *d*, dermis; *cm*, circular muscle; *lm*, longitudinal muscle in transverse section; *om*, oblique muscle; *sb*, septal band; *ce*, cœlomic epithelium; *st*, stomata in cœlomic surface.

The entire inner surface, including the intervals, the oblique muscles, and the bands, is covered by an endothelium composed of small, rounded, irregular cells. From this description it will be readily seen (1) that the body wall is divided into 18 longitudinal intermuscular spaces; that is, "intervals," by the 18 longitudinal bundles; and (2) that these intervals are again divided transversely into rows of narrow compartments, "stomata," by the septal bands and oblique bundles. As each one of these "stomata" is connected with the cœlom, they are, of course, filled with the cœlomic fluid, and as Spengel points out the contraction of the muscles would account for the small square "Buckeln der Haut" which are so characteristic of the living animal.

As to the function of these stomata, when we consider that they are covered only by the corium and a very thin layer of

circular muscle, it seems very reasonable to assume that they are more or less closely associated with the respiration of the animal.

The importance of the dermal muscle layer, as a means of classification, will be discussed later.

THE ALIMENTARY CANAL

The alimentary canal is about four times as long as the body. For the first fourth, its course is definite, but the remainder seems to vary a little in different individuals. As in most worms the differentiation of the various parts of the canal is so slight that it has been very difficult to assign definite names and functions to them. This form does not seem to agree with any of the published descriptions which are at hand. The part of the canal from the mouth to the beginning of the intestine has been described differently in almost every species. Reitsch calls it simply "intestine buccal;" Spengel divides it into pharynx, œsophagus, and crop; Jameson speaks of the pharynx, œsophagus, gizzard, and crop of *T. neptunii;* Embleton divides this region of *Echiurus unicinctus* into pharynx, crop, and gizzard; and Ikeda describes a pharynx, œsophagus, crop, and midgut in *T. tænoides.* Moreover, this difference is not simply a difference in names but in the structure of the parts themselves. For example, in *Echiurus unicinctus,* the gizzard, which has very thick walls of circular muscle, reduced epithelium, and no glands, corresponds in position to the midgut of *T. tænoides* in which the epithelium is folded and glandular and in which thin layers of both longitudinal and circular muscles are present.

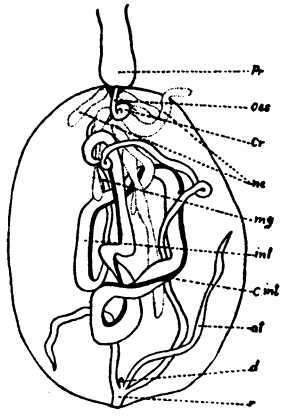

FIG. 3. Diagram of the internal organs of *Thalassema griffini* sp. nov. *pr,* proboscis; *ne,* nephridial sacs; *oes,* œsophagus; *cr,* crop; *mg,* midgut; *int,* intestine; *c. int,* collateral intestine; *r,* rectum; *d,* diverticulum; *at,* anal trees.

In *T. griffini* three distinct regions can be made out in this part of the alimentary canal. These may be called œsophagus, crop, and midgut for want of better terms to describe them. They are followed by the intestine and rectum. The œsophagus is a straight tube about 1 to 2 cm. long and 2 mm. in diameter. The epithelium is ciliated, and is slightly folded. The muscle layer is rather thicker at the anterior end than in any other part, but the difference is not great enough to justify speaking

of it as a pharynx. The upper part is held in position by means of a mesentery radiating to the body wall. At the posterior end, the dorsal surface is covered by the "heart," and the two "connecting vessels" pass around it on opposite sides. The crop is about 1 cm. long and from 2 to 3 mm. in diameter. It forms a loop at the end of the œsophagus and turns to the left. It is the thickest part of the canal, the thickness being due, not to muscles, but to the large villus-like folds of the epithelium. The remainder of the canal in front of the intestine is the midgut. It passes posteriorly from the crop almost to the end of the body and forms a U, turning again anteriorly. Here it widens into the intestine. The midgut has a little larger diameter than the crop, but the walls are very thin, and the folds of the epithelium are much reduced. The beginning of the intestine is marked by the opening of the collateral intestine, the siphonal groove not extending beyond it. The intestine can as usual be divided into 2 parts, the first part in this species being much shorter than the second, which begins at the end of the collateral intestine and extends to the rectum. It bears a siphonal groove all the way to the rectum. The first part is the widest region of the alimentary canal, having a diameter of about 4 mm., while the second part is considerably smaller. The walls of both are very thin. The rectum is short, and into it on the left side open the 2 anal trees. A small spherical diverticulum lies between them, and is attached by muscular filaments to the sheath of the nerve cord.

The œsophagus, crop, and intestine are held in place by means of thick muscular filaments attached to their ventral surface. The midgut is not attached to the body wall. A radiating mesentery connects the rectum to the posterior part of the body wall.

Microscopic structure.—The wall of the œsophagus (fig. 6) is composed of three layers—the epithelium, the muscle and connective-tissue layer, and the cœlomic endothelium. The epithelium consists of a layer of very long, slender, ciliated cells with small nuclei at their bases. Lying between the ordinary cells and opening on the surface are a great many long club-shaped gland cells containing a granular material which is more or less vacuolated. The submucous layer consists of a connective tissue in which the muscle fibers are held. It varies in thickness on account of the folding of the epithelium. The connective-tissue cells are small with large nuclei and very long fibrous outgrowths. In the inner part of this layer, muscle fibers of

various kinds are regularly scattered, becoming more compactly arranged toward the outer surface. In the upper part of the œsophagus, from which the figure is taken, the muscle is moderately thick, but it gradually becomes thinner and less compact toward the posterior end. The endothelium consists of irregular, rounded cells which are very indefinite and indistinct, and seem to lie in a matrix of some kind. The basement membrane is distinct.

The structure of the crop (fig. 7) differs considerably from that of the œsophagus. The folds of the mucous membrane increase so greatly that the surface seems to be covered with villi. The epithelium is of the pseudo-stratified columnar type, ciliated in the anterior part. The nuclei of the cells present a very peculiar arrangement of the chromatin. In the newly formed cells lying near the base of the epithelial layer, the chromatin is in the form of many small discrete granules which do not appear to be connected by any chromatin network. As the cells approach the surface of the epithelium, the number of these granules decreases. Finally, near the surface the nuclei of some cells are clear and apparently altogether lacking in chromatin. Small droplets of mucin appear in a fairly regular row just below the inner surface of the epithelium. The main part of the villi consists of connective tissue. In the outer part of the submucous layer is a thin layer of circular muscles, and on the outside of this, particularly toward the posterior end, is a thin layer of longitudinal fibers. The endothelium is more regular than that of the œsophagus.

The walls of the midgut are much thinner than those of either the œsophagus or crop. The projections of the mucous membrane are in the form of low, parallel ridges running longitudinally, with a thin layer of epithelium and a very loose connective-tissue layer. Here we have a definite sheet of longitudinal muscle fibers on the inside, but this has a thickness of only 2 or 3 fibers, and outside of it is a thin layer of circular muscles. In both the crop and the midgut the circular muscles are scattered loosely in the connective tissue.

The walls of the first part of the intestine are very thin, but have much the same general structure as the midgut. The submucous layer is very loose, so that in some places there seem to be sinuses. The collateral intestine has thicker walls, but they seem to be of the same general arrangement as the main part of the intestine. The second part of the intestine has the siphonal groove running its entire length to the rectum.

Vascular and nervous systems.—These two systems of organs do not require description as they agree very closely with the ordinary forms.

Reproductive system.—In all the specimens which were dissected, the nephridial sacs were full of spermatozoa or well-developed eggs; also, in the stomata of the body wall numbers of unripe eggs were often encountered, but although sections were studied from almost every part of the body, including the sheath of the nerve cord, the blood vessels, the body walls, and the nephridial sacs, no traces of reproductive tissue of any kind were discovered. Therefore, it seems probable that the formation of ova or spermatozoa must be limited to definite seasons. From the finding of the partially developed eggs in the stomata, it would seem probable that they are developed from the body wall.

A REVISION OF THE GENUS THALASSEMA

Since the publication of Shipley's paper on the revision of the Echiuroidea in 1899, in which there is given a key to the genus *Thalassema* and a brief outline of the characters of the then known species, there has been no attempt to revise the genus as a whole. In the meantime, the number of known species assigned to this genus has increased from 22 to 35. Also, a number of the species mentioned by him have been obtained in new localities, and in some cases important details have been added to the descriptions.

Shipley bases his classification, first, on the condition of the longitudinal muscles of the dermal muscle layer and, secondly, on the number of pairs of nephridia. In 1912, Spengel(43) provisionally divides the group into 3 genera on the basis of the microscopic structure of the dermal muscle layer, without regard to the number or arrangement of the nephridia. The characteristics of these 3 genera have been stated already (page 252). In regard to the first two genera, *Thalassema* and *Listriolobus*, the comparison of the muscle layers of *T. sorbillans* at different stages (page 244) seems to indicate that these two are too closely related to be separated into distinct genera; the condition found in the *Listriolobus* type—a thickening and thinning of the muscular layer—seems to be brought about, from the form in which the muscle is uniform in thickness, by a growth in the regions of the bundles and a consequent pulling apart and thinning of the interbundle region. In fact, in the 4 individuals of *T. sorbillans* which were examined, all the stages from one

with a slight thickening but an almost continuous and uniform layer to a differentiation into distinct bundles may be seen. In *T. formosulum* a condition midway between the two extremes seems to exist. In the case of *T. griffini* and of *T. erythrogrammon* of Rüppell, if we study only that part of the dermal muscle layer in which the bundles are seen, it would seem to be entirely different from the other forms (figs. 3 and 4), and only a study of the development of the species would show how this differentiation has occurred. However, a glance at a section of the body wall taken in the anterior terminal region (fig. 5), in which the longitudinal muscle is continuous and uniform in thickness, will cast grave doubts on the essential difference of this characteristic also. From these facts it seems probable that with more material at hand it would be possible to arrange a series showing the gradual differentiation of the muscles from *T. neptunii* at one end to *T. griffini* at the other.

Therefore, it does not seem advisable to take the dermal muscle layer as the essential characteristic for a division of the group. The other character suggested and used by Shipley in his key to the species of *Thalassema;* that is, the number of pairs of nephridia, seems then to be the most important and essential ontogenetic character on which to base the larger divisions of the group, going back as it does in the ontogeny of the group to the disappearance of the segmentation. It seems probable that the most primitive type in the group is that in which 3 or more pairs of nephridia are present; the greater number of pairs, the more primitive the form. Undoubtedly, the simplest forms in that group are those which have a continuous and uniform longitudinal muscle layer. From this type the differentiation of the nephridia occurs in two directions. First, that in which more than 2 nephridia are developed in each segment; as, for example, in *T. elegans* Ikeda. Secondly, that in which the nephridia decrease in number to 2 pairs or 1 pair. As proof of this, a note on the variation of the nephridia in *T. neptunii* by Stewart(44) is of interest. He found, in dissecting some specimens of this species from Plymouth, 1 individual in which a third unpaired nephridium was present, on one side, midway between the first and second pairs. By taking careful measurements on this abnormal individual and a number of other normal specimens, he came to the conclusion that this abnormal nephridium represented a segment, lying between the 2 segments which regularly bear the nephridia, from which in normal individuals the original pair of nephridia has been lost.

From a study of the position of the nephridia of those forms having only 1 pair of nephridia, it seems probable that that pair represents the most anterior pair in those forms with 2 and 3 pairs and that in the differentiation from 3 pairs to 1, first, the middle pair disappears and then the posterior pair. Therefore, in this arrangement of the species of the group, it has been divided; first, according to the number of nephridia and, secondly, according to the arrangement of the muscles and other less essential characters.

In examining the various species of *Thalassema* which have been described, 1 species is found which varies from the *Thalassema* type in such essential characteristics that I propose to make it the type of a new genus, and possibly it ought to be made the type of a new family. This is the species described by Ikeda(20) as *T. tænoides*. Its most striking character is its enormous size, its total length being some 2 meters. On taking its internal structure into account, there are two very deep lying and essential differences from the *Thalassema* type. They are: first, the number and arrangement of the nephridia and, secondly, the position of the longitudinal muscle in the dermal muscle layer. In all other species of *Thalassema* the nephridia are always in pairs or paired groups, the greatest number of pairs recorded being 4, in *T. decameron* Lanchester; and of paired groups, 8, in *T. gogoshimense* Ikeda.

In this form there are an enormous number of nephridia which are not arranged in pairs, but are scattered irregularly on each side of the nerve cord. Ikeda says:

> They were never less than 200 in total number, and in certain individuals I have estimated this to be nearly 400. Moreover, unlike all other known Echiuroids, there is no indication of their segmental arrangement nor of their strictly paired disposition. On the contrary, they occur densely and irregularly crowded together in two longitudinal zones, one on each side of the ventral nerve cord, beginning in front just behind the ventral hooks and extending posteriorly to a length of 10 to 18 cm.

Also, there are no spirally twisted internal openings, but all the nephridia end in a terminal funnel.

In all the *Thalassema* where descriptions of the dermal muscle layer are given, the longitudinal muscle always is found lying between the circular and oblique layers. In this species Ikeda says that the muscle layers are as usual, but his figure of the body wall shows that the thick longitudinal layer lies directly under the corium and to the outside of both the circular and oblique layers.

On account of these characters, I propose to erect the genus *Ikeda* with the following characteristics:

Genus **IKEDA** novum

Nephridia, indefinite in number, not arranged in pairs, and provided with terminal funnels; longitudinal muscle of the dermal musculature lying on the outside of the circular and oblique layers. This genus at the present time includes only the type species, *Ikeda tænoides* (Ikeda).

On account of the scattered condition of the literature on *Thalassema,* it has seemed advisable to give as nearly as possible a complete bibliography of each species of *Thalassema,* and this has been added at the end of the key to the genera *Thalassema* and *Ikeda* which follows.

Key to the genera Thalassema and Ikeda.

a^1. Gephyrea in which the nephridia are arranged in pairs. The longitudinal muscle of the dermal muscle layer lies between the circular and oblique layers. No posterior ring of setæ.. Genus **Thalassema** Gaertner.

b^1. Forms possessing 1 pair of nephridia.

c^1. Longitudinal muscles continuous.

d^1. Nephridia without spirally coiled internal openings.

e^1. Proboscis about as long as the body and forming a tube just before it joins the body. Anal trees very short and transparent like glass..... **T. diaphanes** Sluiter.

e^2. Proboscis small. Anal trees of moderate size with irregular branches ..... **T. faex** Selenka.

e^3. Proboscis less than half the length of body. Anal trees bear large funnels situated close together on long stalks. **T. owstoni** Ikeda.

e^4. Proboscis about ½ length of body. Anal trees as long as body with few short, ciliated funnels..... **T. fuscum** Ikeda.

e^5. Proboscis trilobed at tip. Anal trees short and sac-like. **T. gigas** Max Müller.

e^6. Proboscis short. Anal trees short, with funnels on short stalks. Anal trees attached to body by means of muscular filaments. **T. arcassonensis** Cuenót.

d^2. Nephridia with spirally coiled internal openings.

e^1. Proboscis bilobed. Anal trees branched with funnels at tips of branches ..... **T. lankesteri** Herdman.

c^2. Longitudinal muscles forming bundles which may or may not be separated.

d^1. Nephridia with spirally coiled internal openings.

e^1. 10–11 muscle bundles. Proboscis about ⅓ the length of body. **T. hupferi** Fischer.

b^2. Forms possessing 2 pairs of nephridia.

c^1. Longitudinal muscle continuous.

d^1. Length of proboscis 3 to 4 times the length of body when expanded. **T. neptunii** Gaertner.

d^2. Proboscis ¾ as long as body. Anal trees thin and brown and over half as long as body..... T. semoni Fischer.

d^3. Proboscis short. Anal trees short..... T. sabinum Lanchester.

c^2. Longitudinal muscles forming bundles which may or may not be separated by "intervals."

d^1. 7–8 muscle bundles. Proboscis ⅓ as long as body. Anal trees broad and sac-like..... T. formosulum Lampert.

d^2. 8 muscle bundles. Proboscis several times as long as the body. T. mellita Conn.

d^3. 8–10 muscle bundles. Anal trees small..... T. exilii Fr. Müller.

d^4. 13 muscle bundles. Proboscis longer than body. Anal trees short with simple diverticula, each ending in a funnel. T. pellucidum Fischer.

d^5. 14 muscle bundles. Anal trees longer than half the body. Rectal diverticulum present..... T. manjuyodense Ikeda.

d^6. 17–19 muscle bundles. Proboscis shorter than body. Anal trees long with short branching outgrowths..... T. baronii Greef.

b^3. Forms possessing 3 pairs of nephridia. Always with spirally coiled internal openings.

c^1. Anterior pair of nephridia opening in front of ventral setæ.

d^1. Longitudinal muscles continuous.

e^1. Proboscis one-half as long as body. Anal trees long and brown with few small funnels..... T. inanense Ikeda.

e^2. Proboscis as long as body. Anal trees long and brown with microscopic funnels..... T. moebii Greef.

d^2. Longitudinal muscles forming bundles which may or may not be separated by "intervals." No interbasal muscle. Funnels of anal trees always sessile.

e^1. 13 muscle bundles. Proboscis over ½ as long as body. Anal trees long with microscopic funnels. Rectal diverticulum. T. sorbillans Lampert.

e^2. 14 muscle bundles. Proboscis shorter than body. Anal trees thin and brown. Rectal diverticulum. T. erythrogrammon Max Müller.

e^3. 15–16 muscle bundles. Anal trees ½ as long as body with prominent funnels..... T. stuhlmanii Fischer.

e^4. 15–17 muscle bundles. Anal trees with numerous funnels. Rectal diverticulum..... T. leptodermon Fischer.

e^5. 16–18 muscle bundles. Proboscis ⅓ as long as body. Anal trees with long brown tubes..... T. caudex Lampert.

e^6. 17–18 muscle bundles. Proboscis short. Anal trees with well-marked funnels..... T. kokotoniense Fischer.

e^7. 17–18 muscle bundles. Proboscis ⅔ as long as body. Anal trees ¾ length of body with small funnels. Rectal diverticulum. T. griffini sp. nov.

c^2. All three pairs of nephridia open behind the ventral hooks. Longitudinal muscle continuous.

d^1. Proboscis absent (?). Anal trees thin, long, and brown. T. vegrande Lampert.

d^2. Proboscis short. Anal trees ½ the length of body with small funnels ..... T. mucosum Ikeda.

b^4. Forms possessing more than 3 pairs of nephridia.

c^1. 4 pairs of nephridia. Longitudinal muscle divided into 10 bundles. **T. decameron** Lanchester.

c^2. Nephridia arranged in paired groups, each group containing a varying number of nephridia. Longitudinal muscle continuous.

d^1. 7 paired groups with 1–3 nephridia in each group.....**T. elegans** Ikeda.

d^2. Nephridia in female in 3 pairs. In male in 3 to 8 paired groups with 1–4 nephridia in each group..... **T. gogoshimense** Ikeda.

a^3. Gephyrea of unusually large size in which the nephridia are indefinite in number, not arranged in pairs, and are provided with terminal funnels. The longitudinal muscle of the dermal muscle layer lies on the outside of the circular layer..... Genus **Ikeda** Wharton nov.

b^1. Body length 40 cm. Proboscis length 150 cm., nephridia 200–400 in number. Anal trees 6–7 cm. in length, fixed at the tip by a muscle, and covered with tubules bearing funnels.... **Ikeda tænoides** (Ikeda).

NOTE. *T. viridis* Verrill, *T. verrucosa* Studer, and *T. papillosum* (Delle Chiaje) have not been included in the key. The first two because of the indefiniteness of their descriptions, and the last because I have not seen the description.

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(35) IDEM. Fauna and geography of the Maldive and Laccadive Archipelagoes. Echiuroidea (1902), 1, pt. 2, 127–130, 1 pl.

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(37) SLUITER, C. Beiträge z. Kenntnis der Gephyreen aus dem Malayischen Archipel. *Natuurk. Tijdschr. v. Nederl. Ind.* (1881), 41, 495.

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(39) IDEM. Gephyreens provenant des campagnes de l'Hirondelle et de la Princesse Alice 1886–97. Resultats des campagnes scientifiques accomplies sur son yacht pu Albert I. Prince de Monaco (1900), 15, 30.

(40) IDEM. Gephyriens provenant des campagnes de la Princesse Alice, 1898–1910. *Ibid.* (1912), 36.

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(48) IDEM. Eggs of Thalassema from Beaufort, N. C. *Annals N. Y. Acad.* (1902), 14, 137.

(49) VON DRASCHE. Über eine neue Echiurus-Art aus Japan, etc. *Verhandl. d. k. k. zool. bot. Ges. Wien* (1881), 30, 621–628, Pl. 30.

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ILLUSTRATIONS

PLATE I

FIG. 1. Abnormal crop of *Thalassema sorbillans* Lampert. × 10. (Drawn by Santos.)

2. *Thalassema griffini* sp. nov. Natural size. (Drawn by Espinosa.)

3. Transverse section of the body wall of *Thalassema griffini* sp. nov. from the middle region. (Zeiss ocular 1, objective D, camera lucida outline, reduced ½.)

ep, epidermis.
ep. gl, epidermal glands.
d, dermis.
cm, circular muscle.
lmb, longitudinal muscle bundle.
lmf, interbundle longitudinal muscle fibers.
cm, oblique muscle.
st, stomata.
ce, cœlomic epithelium.

4. Longitudinal section of the body wall of *Thalassema griffini* sp. nov. through an interval in the middle region. (Zeiss ocular 1, objective D, camera lucida outline, reduced ½.)

ep, epidermis.
ep. gl, epidermal glands.
d, dermis.
dgl, dermal gland.
lmf, longitudinal muscle fibers.
cm, circular muscle.
omb, oblique muscle bundles.
sb, septal bands.
ce, cœlomic epithelium.
st, stomata.

PLATE II

FIG. 5. Transverse section of the body wall of *Thalassema griffini* sp. nov. through the anterior terminal region. (Zeiss ocular 1, objective D, camera lucida outline, reduced ½.)

ep, epidermis.
ep. gl, epidermal glands.
d, dermis.
dgl, dermal glands.
cm, circular muscle.
lm, longitudinal muscle.
om, oblique muscle.
ce, cœlomic epithelium.

6. Transverse section through the anterior part of the œsophagus of *Thalassema griffini* sp. nov. (Zeiss ocular 3, objective $\frac{1}{12}$, camera lucida outline, reduced ½.)

epth, epithelium.
gl, glands.
ml, muscle layer.
end, endothelium.

7. Transverse section through the crop of *Thalassema griffini* sp. nov. (Zeiss ocular 3, objective $\frac{1}{12}$, camera lucida outline, reduced ½.)

epth, epithelium.
ml, muscle layer.
md, mucous droplets.
end, endothelium.
ct, connective tissue with sinuses.

TEXT FIGURES

FIG. 1. Diagram of the internal organs of *Thalassema sorbillans* Lampert. *pr*, proboscis; *ne*, nephridial sacs; *oes*, œsophagus; *cr*, crop; *giz*, gizzard; *int*, intestine; *c. int*, collateral intestine; *r*, rectum; *d*, diverticulum; *at*, anal trees; *n*, nerve.

2. Diagram of the body wall of *Thalassema griffini* sp. nov. *ep*, epidermis; *d*, dermis; *cm*, circular muscle; *lm*, longitudinal muscle in transverse section; *om*, oblique muscle; *sb*, septal band; *ce*, cœlomic epithelium; *st*, stomata in cœlomic surface.

3. Diagram of the internal organs of *Thalassema griffini* sp. nov. *pr*, proboscis; *ne*, nephridial sacs; *œs*, œsophagus; *cr*, crop; *mg*, midgut; *int*, intestine; *c. int*, collateral intestine; *r*, rectum; *d*, diverticulum; *at*, anal trees.

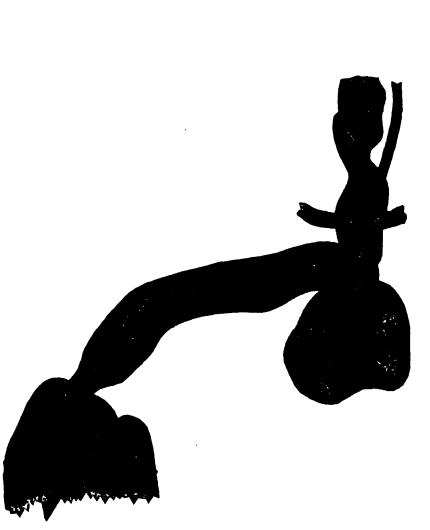

Fig. 1.

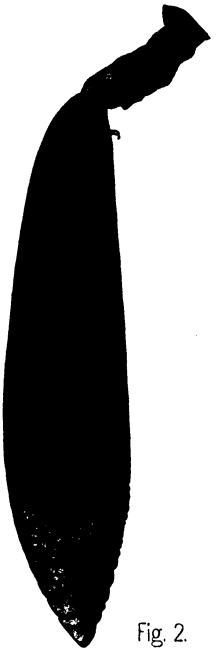

Fig. 2.

Fig. 1. Abnormal crop of Thalassema sorbillans Lampert.
2. Thalassema griffini sp. nov.

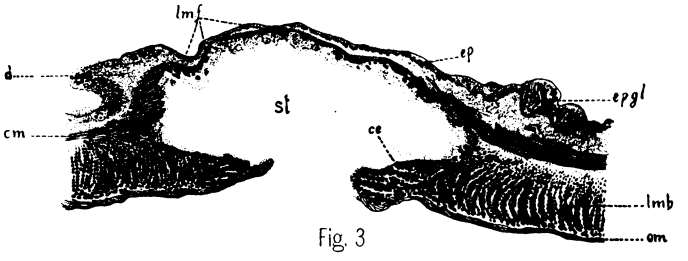

Fig. 3

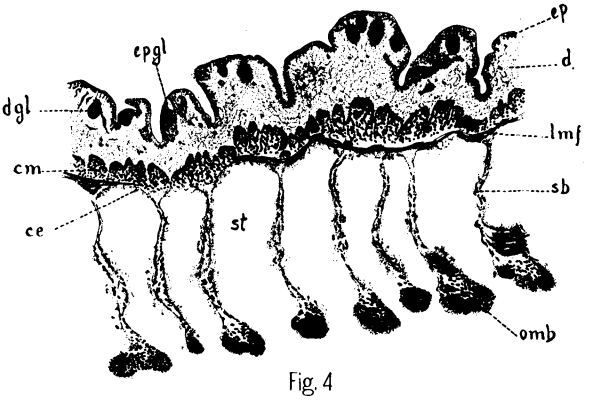

Fig. 4

Fig. 3. Thalassema griffini sp. nov. Transverse section of the body wall.
4. Thalassema griffini sp. nov. Longitudinal section of the body wall.

PLATE I.

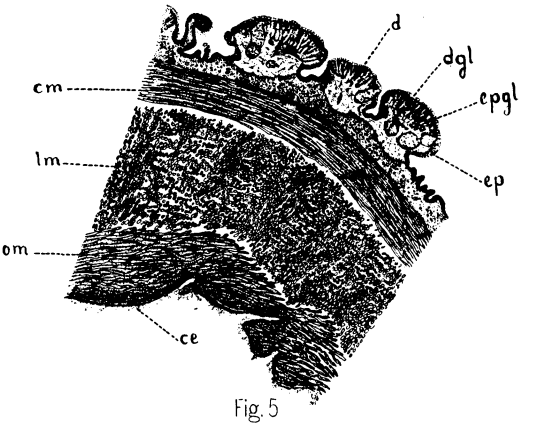

Fig. 5

Fig. 5. Transverse section of the body wall.

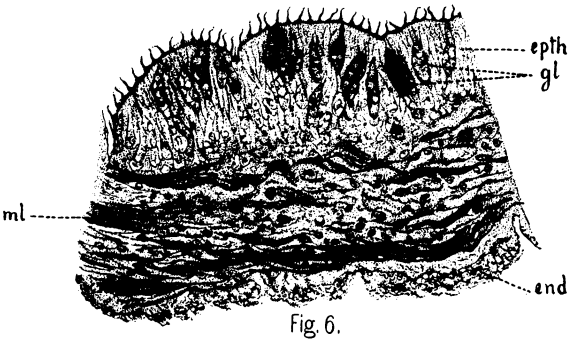

Fig. 6.

Fig. 6. Transverse section through the anterior part of the œsophagus.

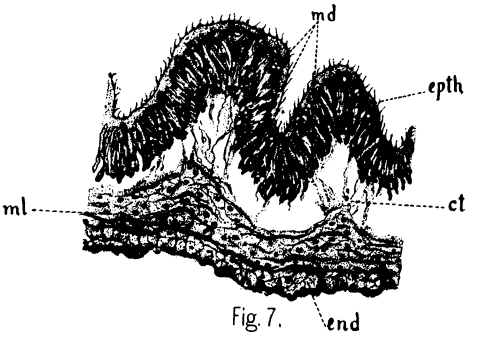

Fig. 7.

Fig. 7. Transverse section through the crop.

PLATE II. THALASSEMA GRIFFINI SP. NOV.

NOTES ON THE TERMITES OF JAPAN WITH DESCRIPTION OF ONE NEW SPECIES

By MASAMITSU OSHIMA
(Of the Institute of Science, Government of Formosa)

Two text figures

In his important paper, Die Termiten Japans,[1] Holmgren has given in all 12 species of termites from Japan and Formosa, of which one was referred to *Leucotermes speratus* (Kolbe) and another identified with *Coptotermes formosæ* described before by me, while the rest were considered by him to be new to science. In coming to that result, all the previous works of Japanese entomologists on the subject were left in complete disregard; how this came about is easy to perceive in as much as they all appeared in the language of the authors.

Now from a renewed examination of the termite material at my disposal and of the relevant literature known to me, it seems justifiable to make the following remarks: First, of the 12 termite species recorded by Holmgren, all except two, namely, *Hodotermopsis japonicus* Holmgren and *Leucotermes speratus* (Kolbe), were provided with scientific names in accordance with the rules of binomial nomenclature in use among systematists, and were described and figured in more or less detail by Japanese authors; so that in the cases of the 10 species indicated the specific names given by Holmgren should give way to the earliest proposed names, since, for all I can see, there is no reason to deny the application of the law of priority to the cases in question. Secondly, I shall add 3 more species to the termite fauna of Japan and outlying islands, raising the total number to 15. One of the forms added is a new species, *Calotermes ogasawaraensis*, from the Bonin Islands; the other two are species which were described by me before, *Calotermes inamurai* Oshima and *Leucotermes flaviceps* Oshima.

The classification adopted in the following list is that of Holmgren.[2] References to papers, reports, or periodicals published in Japanese are indicated with asterisks; a list giving their original titles will be found at the end of this paper.

[1] *Annot. Zool. Jap.* (1912), 8. [2] Termitenstudien (1912).

Order ISOPTERA

Family PROTERMITIDÆ Holmgren

Subfamily TERMOPSINÆ Holmgren

Genus **HODOTERMOPSIS** Holmgren

1. Hodotermopsis japonicus Holmgren.

Hodotermopsis japonicus HOLMGREN, Annot. Zool. Jap. (1912), 8, 112.

Locality.—Type specimens (*Watase* coll.) from Amami-Oshima, an island south of Kyushyu.

Subfamily CALOTERMITINÆ Holmgren

Genus **CALOTERMES** Hagen

2. Calotermes (subg. ?) **inamurai** Oshima.

Calotermes? inamurai OSHIMA, *Report Term. III (1912), 61; Pl. 1, figs. 5, 6, 21, 22; Pl. 2, figs. 2, 19.

Female.—Reddish brown above, paler below; head and pronotum glossy; head quadrangular, anterior border nearly straight, posterior border rounded; eyes large, round, and prominent; ocelli in contact with eyes; antennæ 19-jointed, twice as long as head; 2d and 3d joints subequal; labrum short, not covering tip of mandible; pronotum subreniform, with concave anterior border, posterior border nearly straight, slightly concave in the middle.

Measurement.	Mm.
Length of head	1.72
Width of head	1.56
Length of pronotum	1.19
Width of pronotum	1.84

Soldier (*larger form*).—Head cylindrical, reddish yellow; labrum, antennæ, and pronotum paler; mandibles 1.6 mm. long, blackish brown, toward basal portion reddish brown, outer margin arcuate, apex incurved; left mandible with 3 teeth, 2 apical teeth sharply pointed, the 3d tooth broad, with apex bifid; near bases of 2d and 3d teeth is a small tooth-like projection; right mandible with 2 strong triangular teeth; labrum very short, anterior margin arcuate, twice as broad as long; antennæ 15-jointed; basal joint cylindrical, narrower in the middle; 2d and 4th joints subequal, quadrilateral; 3d joint invertedly conical, anteriorly much enlarged; pronotum quadrilateral, broader than head; anterior border strongly concave; posterior border nearly straight, slightly concave in the middle; lateral margins arcuate; posterolateral corners broadly rounded; anterolateral angles

quadrate; apex of tibia provided with 3 spines, of which two project downward and the other outward.

Measurement.	Mm.
Length of head with mandible	4.06
Length of head without mandible	2.91
Width of head	1.97
Length of body	9.50

Soldier (smaller form).—Agreeing with the larger form of soldier in all characters, but differing in dimensions of head and body.

Measurement.	Mm.
Length of head	2.25
Width of head	1.75
Length of body	7.00

Locality.—Kuraru, Formosa. Type specimens in the Institute of Science, Government of Formosa.

Remarks.—This species is named for Mr. T. Inamura, who collected the specimens. In the absence of winged specimens, subgeneric determination of the species cannot be made with certainty.

Subgenus **Neotermes** Holmgren

3. **Calotermes (Neotermes) koshunensis** Shiraki.

Calotermes koshunensis SHIRAKI, * Trans. Ent. Soc. Jap. (1909), 2, 241; OSHIMA, * Report Term. I (1909), 29; * Zool. Mag. Tokyo (1910), 22, 344; * Report Term. II (1911), 2; * The Insect World (1911), 15, 361, Pl. 18, fig. 13; * Report Term. III (1912), 59, Pl. 1, figs. 1, 19, 20; Pl. 2, figs. 5, 8, 20, 25.

Calotermes koshunensis? NAWA, * The Insect World (1911), 15, 94, Pl. 7.

Calotermes (Neotermes) koshunensis HOLMGREN, Annot. Zool. Jap. (1912), 8, 114.

Localities.—Shiraki's types, which are preserved in the Agricultural Experiment Station, Government of Formosa, are from Kusukusu in southern Formosa. Outside of Formosa, specimens have been recorded by Nawa from the Loochoo Archipelago, and by Holmgren and Oshima from Botel Tobago Island (*Oshima* and *Hozawa* colls.; June, 1911).

Subgenus **Glyptotermes** Holmgren

4. **Calotermes (Glyptotermes) satsumensis** (Matsumura).

Termes sp. MATSUMURA, * Thousand Insects (1904), 1, 24, fig. 9.

Termes satsumensis MATSUMURA, * Systematic Entomology (1907), 1, 53, fig. 43.

Calotermes sp. SHIRAKI, Trans. Ent. Soc. Jap. (1909), 2, 241.

Calotermes satsumensis YANO, * The Insect World (1910), 15, 404; * Report Forestry Station Jap. (1911), No. 9, 64, Pl. 4, figs. 1–3; OSHIMA, * Report Term. III (1912), 63.

Glyptotermes longicephalus OSHIMA, * Report Term. III (1912), 64, Pl. 1, fig. 2, Pl. 2, figs. 6, 26.

Calotermes (*Glyptotermes*) *satsumaensis* HOLMGREN, Annot. Zool. Jap. (1912), 8, 116.

Localities.—The types collected by Matsumura and preserved in the Agricultural College of Sapporo are from Satsuma. Another locality of the species is Tausha in Formosa (*Oshima* and *Hozawa* colls.; May, 1911).

5. **Calotermes (Glyptotermes) fuscus** Oshima.

Glyptotermes fuscus OSHIMA, * Report Term. III (1912), 67, Pl. 1, fig. 15.

Calotermes (*Glyptotermes*) *hozawæ* HOLMGREN, Annot. Zool. Jap. (1912), 8, 118.

Localities.—Kuraru, southern Formosa (*Inamura* coll.), types in the Institute of Science, Government of Formosa. In 1911, Hozawa collected the species in the same place.

Subgenus **Cryptotermes** Banks

6. **Calotermes (Cryptotermes) kotoensis** Oshima.

Calotermes kotoensis OSHIMA, * Report Term. III (1912), 56, Pl. 2, figs. 3, 4, 17, 18; NAWA, * The Insect World (1912), 16, 440.

Calotermes (*Cryptotermes*) *formosæ* HOLMGREN, Annot. Zool. Jap. (1912), 8, 119.

Localities.—The types in the Institute of Science, Government of Formosa, are from Botel Tobago Island (*Oshima* coll.; June 14, 1911). Holmgren has recorded the species from the same locality (*Hozawa* coll.; June 14, 1911) and Nawa from the Loochoo Archipelago (*Iwasaki* coll.; Sept. 27, 1912).

7. **Calotermes (Cryptotermes) ogasawaraensis** sp. nov.

Male.—Light brown above, head and pronotum darker; paler below; legs, antennæ, and gula pale yellowish; head quadrangular, anterior border slightly rounded; eyes round and prominent; ocelli scarcely in contact with eyes; antennæ 14-jointed, longer than head; 2d joint slightly longer than 3d; pronotum subreniform, broader than head; anterior border slightly concave, posterior border arcuate; posterior border of mesonotum and metanotum straight, the latter half as long as the former; anterior wing-stumps much larger than, and entirely covering, the posterior ones; wings 6.5 mm. long, 2 mm. broad, transparent, silvery when dry; costal, subcostal, radius, and radius-sector dark brown; subcostal rudimentary; radius joining the

costal on the basal fourth of wing; radiussector with 7 branches, the first one branches out from the point of basal fifth of wing; median and cubitus colorless, the former arcuate and joining the radiussector beyond the starting point of its fourth branch. The cubitus runs medially through the wing, and gives 11 branches to the posterior border.

Measurement.	Mm.
Length with wings	8.50
Length without wings	5.50
Length of head	1.12
Width of head	0.85
Length of pronotum	0.61
Width of pronotum	1.00

Soldier.—Pale yellow above, anterior half of head nearly black, posteriorly blackish purple; antennæ pale yellow; head quadrangular, truncated in front, and disposed at right angles to mandibles; posterior border rounded; antennæ 13-jointed, 2d joint cylindrical, twice as long as 3d; 4th joint ring shaped; below the antennal fossa is a strong spine, projecting anteriorly; mandibles subtriangular, with incurved tip, slightly curved upward in lateral view; cutting edge of left mandible with 2 small teeth near its apex and a strong basal tooth; that of right mandible with a broad tooth in the middle; rudimentary eye ovate and colorless; jugular sclerites very large, longer than half the length of head; pronotum semicircular, distinctly emarginate at middle of anterior border; mesonotum and metanotum together shorter than length of pronotum; hind legs not reaching to tip of abdomen.

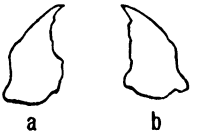

FIG. 1. *Coptotermes kotoensis* Oshima. Mandibles of soldier. *a*, left mandible; *b*, right mandible.

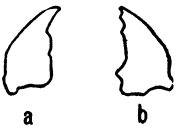

FIG. 2. *Coptotermes ogasawaraensis* sp. nov. Mandibles of soldier. *a*, right mandible; *b*, left mandible.

Measurement.	Mm.
Length of head with mandible	1.61
Length of head without mandible	1.39
Width of head	1.29
Length of pronotum	0.84
Width of pronotum	1.23

Locality.—Ogasawarajima or Bonin Islands, in the subtropical region of the Japanese Archipelago; collected by Mr. M. Ishida on August 23, 1912.

Remarks.—This species is closely allied to *C. kotoensis* Oshima. However, a close comparison of the two species shows several discrepancies. In the present species the antennæ of the imago

are 14-jointed, the 2d joint being shorter than the 3d, while in *C. kotoensis* they are 16- or 17-jointed with the 2d joint longer than the 3d. Moreover, in the former the pronotum is much broader than the head instead of being narrower or subequal as in the latter. In the soldiers, the most notable difference lies in the dentition of the mandibles, as shown in the following figures; and, further, in *C. ogasawaraensis* the angle between forehead and mandibles is a right angle instead of being oblique as in *C. kotoensis.*

Family MESOTERMITIDÆ Holmgren

Subfamily COPTOTERMITINÆ Holmgren

Genus **COPTOTERMES** Wasmann

8. Coptotermes formosanus Shiraki.

Coptotermes formosanus SHIRAKI, * Trans. Ent. Soc. Jap. (1909), 2, 239; OSHIMA, * Report Term. I (1909), 33, Pl. 1, figs. 1, 2, 3, 11, 12; * Report Term. III (1912), 75, Pl. 1, figs. 1, 28, Pl. 2, figs. 3, 21.

Coptotermes gestroi OSHIMA, * Zool. Mag. Tokyo (1910), 22, 376; NAWA, * The Insect World (1910), 14, 597; OSHIMA, * Report Term. II (1911), 5.

Coptotermes formosæ HOLMGREN, Termitenleben auf Ceylon (1911), 192; Termitenstudien (1911), 2, 74; YANO, * Report Jap. Forestry Station (1911), No. 9, 62, Pl. 4, figs. 12–20; HOLMGREN, Annot. Zool. Jap. (1912), 8, 121.

Localities.—Shiraki's type was obtained in Taihoku, Formosa. This is one of the commonest species in Formosa, and has been recorded also from Japan proper, Shikoku, Kyushyu, Loochoo Archipelago, and Hachijojima.

Remarks.—*Coptotermes formosanus* is a species so very closely allied to *C. gestroi,* that Wasmann, the original describer of the latter, asserted, in a letter to Professor Watase, that the Formosan specimens represent true *C. gestroi;* however, they differ from this in the soldier having a narrower head.

Genus **ARRHINOTERMES** Wasmann

9. Arrhinotermes japonicus Holmgren.

Paratermes canalifrons OSHIMA, * Report Term. III (1912), 69, Pl. 1, figs. 13, 23, Pl. 2, figs. 9, 12.

Arrhinotermes japonicus HOLMGREN, Annot. Zool. Jap. (1912), 8, 122.

Localities.—Botel Tobago Island (*Oshima* and *Hozawa* colls.; June, 1911).

Remarks.—In 1912, I described this species under the name of *Paratermes* (n. g.) *canalifrons,* at the time believing it to be identical with Sjöstedt's *Termes* (*?*) *canalifrons,* for which I proposed the generic name above indicated. Now I see my mistake, and accept Holmgren's generic identification and the specific name given by him.

Subfamily LEUCOTERMITINÆ Holmgren

Genus **LEUCOTERMES** Silvestri

10. **Leucotermes speratus** (Kolbe).

Termes speratus KOLBE, Berl. ent. Zeitschr. (1885) **25**, 145, Pl. 6; MATSUMURA, * Systematic Entomology (1907), **1**, 54, fig. 44; OSHIMA, * Zool. Mag. Tokyo (1908), **20**, 514.

Termes flavipes OSHIMA, * Zool. Mag. Tokyo (1909), **20**, 515.

Leucotermes speratus SHIRAKI, * Trans. ent. Soc. Jap. (1909), **2**, 230; OSHIMA, * Zool. Mag. Tokyo (1910), **22**, 414; NAWA, * The Insect World (1910), **14**, 547; YANO, * Report Jap. Forestry Station (1911), No. 9, 58, Pl. 4, figs. 4–11; OSHIMA, * Report Term. III (1912), 71, Pl. 1, fig. 11, Pl. 2, figs. 10, 13; HOLMGREN, * Annot. Zool. Jap. (1912), **8**, 124.

Termes (*Leucotermes*) *speratus* OSHIMA, * The Insect World (1911), **15**, 356, Pl. 18, figs. 4, 6.

Locality.—This species is the commonest termite in all parts of Japan proper.

11. **Leucotermes flaviceps** Oshima.

Leucotermes flaviceps OSHIMA, * Report Term. III (1912), 74, Pl. 1, fig. 10, Pl. 2, figs. 15–17.

Soldier.—Head pale yellow; mandibles reddish brown, basally paler; head cylindrical, flattened, posterior corner slightly rounded, anterior angles quadrate, lateral margins straight and parallel, ratio of length to width 1:0.60–0.62; mandibles saber shaped, with apex incurved, slender, and slightly curved upward in lateral view; cutting edge of left mandible with 3 small basal teeth; right mandible smooth; antennæ with 16 joints, the 3d joint narrowest and shorter than the 2d; labrum lanceolate, with whitish apex which is provided with 2 or 3 delicate hairs; pronotum narrower than head, lateral margins converging posteriorly, anterior angles acutely rounded, posterior angles broadly rounded; middle of anterior border emarginate, posterior border straight; abdominal papillæ present; body 4.5 mm. long.

Leucotermes flaviceps; measurements of head of soldier.

Locality.	Length.	Width.	Ratio of length to width.
Botel Tobago	1.56	0.97	1:0.62
Do	1.56	0.97	1:0.62
Do	1.75	1.06	1:0.61
Do	1.56	1.97	1:0.62
Do	1.72	1.03	1:0.60
Do	1.72	1.03	1:0.60
Horisha	1.72	1.06	1:0.62
Do	1.75	1.03	1:0.58
Do	1.75	1.03	1:0.58
Do	1.88	1.03	1:0.60

Worker.—Head pale yellow, antennæ 16-jointed, the 2d joint as long as the 3d and 4th taken together, the 4th ring shaped; pronotum as in soldier, decidedly narrower than head.

Localities.—Botel Tobago Island (*Oshima* coll.; June 18, 1911). Types in the Institute of Science, Government of Formosa. Taihoku, Horisha, Kankao, Formosa (*Oshima* coll.).

Remarks.—The head of the soldier is considerably narrower in *L. flaviceps* than in *L. speratus.* In my specimens of the former the ratio of head length to width is 1:0.60–0.62, while in the latter it is 1:0.62–0.70. Further, in the soldier of *flaviceps* the posterior border of the protonum is straight instead of being emarginate in the middle as in *speratus.*

A large number of *Leucotermes* collected by me in Taihoku, Horisha, and Kankao (Formosa) seem, as the result of comparisons, to be referable to the present species. This species is very closely related to *L. speratus,* and Holmgren and Yano have expressed the belief that the two should be united. Indeed, with the large series of the imago on hand, I have found it scarcely possible to draw a fast line between them. However, if we compare the soldiers, there exist some points of difference which seem to justify the separation of the two forms. Thus the soldier of the above-mentioned species has a head considerably narrower than that of *speratus,* and the middle of the posterior border of its pronotum is nearly straight instead of being clearly emarginated as in *speratus.*

Family METATERMITIDÆ Holmgren

Genus **ODONTOTERMES** Holmgren

Subgenus **Cyclotermes** Holmgren

12. Odontotermes (Cyclotermes) formosana (Shiraki).

Termes formosana SHIRAKI, * Trans. Ent. Soc. Jap. (1909) 2, 234; OSHIMA, * Report Term. III (1912), 81, Pl. 1, figs. 7, 26, 27, Pl. 2, figs. 11, 18.

Termes vulgaris SHIRAKI, * Trans. Ent. Soc. Jap. (1909), 2, 233; OSHIMA, * Report Term. I (1909), 37, figs. 9, 10; * Zool. Mag. Tokyo (1910), 22, 379; MATSUMURA, Die schädl. und nützl. Insecten v. Zuckerrohr Formosas (1910), 2, Pl. 1, figs. 2, 3, 4; SHIRAKI, * Special Report Agr. Exp. Station, Formosan Govt. (1910), No. 1, 1, Pl. 14, fig. 6; OSHIMA, * Report Term. II (1911), 7.

Termes vulgaris ? NAWA, * The Insect World (1911), 15, 281, Pl. 15.

Odontotermes formosanus HOLMGREN, Annot. Zool. Jap. (1912), 8, 127.

Odontotermes (*Cyclotermes*) *formosanus* HOLMGREN, Termitenstudien (1910), 3, 38.

Localities.—This is one of the commonest species in Formosa. Holmgren has recorded it from Hongkong (*Ransonet* coll.), Bangkok (*Ransonet* coll.), Canton, and Fotschau and Nawa from the Loochoo Archipelago (*Iwasaki* coll.). Recently I collected specimens at Amoy, China.

Remarks.—As this species agrees with *Termes vulgaris* Haviland in habits and in characters, except dimensions of body and wing, I, at one time, regarded it as identical with the latter. I now learn from Holmgren that the species is distinct from *T. vulgaris;* therefore, the specific name first given by Shiraki must stand.

Genus **CAPRITERMES** Wasmann

Subgenus **Capritermes** Holmgren

13. **Capritermes (Capritermes) nitobei (Shiraki).**

Eutermes nitobei SHIRAKI, * Trans. Ent. Soc. Jap. (1909), **2**, 238; OSHIMA, * Report Term. I (1909), 40.

Eutermes longicornis OSHIMA, * Zool. Mag. Tokyo (1910), **22**, 411; * Report Term. II (1911), 9; NAWA, * The Insect World (1912), **16**, 18, Pl. 1, fig. 6.

Capritermes nitobei OSHIMA, * Report Term. III (1912), 82, Pl. 1, figs. 9, 14, Pl. 2, figs. 4, 5.

Capritermes sulcatus HOLMGREN, Annot. Zool. Jap. (1912), **8**, 130.

Localities.—Type specimens preserved in the Institute of Science, Government of Formosa, are from Maruyama, Formosa. In addition to the types, I have collected specimens at Kuraru and Kusukusu, Formosa.

Genus **EUTERMES** Müller

Subgenus **Eutermes** s. str. Holmgren

14. **Eutermes (Eutermes) takasagoensis Oshima.**

Eutermes takasagoensis OSHIMA, * Report Term. III (1912), 86, Pl. 1, figs. 4, 12, Pl. 2, figs. 1, 23.

Eutermes (*Eutermes*) *piciceps* HOLMGREN, Annot. Zool. Jap. (1912), **8**, 132.

Localities.—Kankao, Formosa (*Oshima* coll.; June 10, 1911), Botel Tobago Island (*Oshima* coll.; June 16, 1911). Recently Holmgren has recorded the species from Christmas Island and Nawa from Ishigakijima, Loochoo Archipelago.

15. **Eutermes (Eutermes) parvonasutus Oshima.**

Eutermes parvonasutus OSHIMA, * Report Term. III (1912), 83, Pl. 1, fig. 16, Pl. 2, figs. 14, 28, 29.

Eutermes (*Eutermes*) *watasei* HOLMGREN, Annot. Zool. Jap. (1912), **8**, 134.

Localities.—The types from Kankao, Formosa (*Inamura* coll.), are preserved in the Institute of Science, Government of Formosa. Hozawa collected the species at Hokuzanko, Formosa, on May 23, 1911.

LIST OF PUBLICATIONS IN JAPANESE, REFERRED TO IN THIS PAPER, WITH THEIR ORIGINAL TITLES

Report Term. I. (M. Oshima.)—Daiichikwai Hakugi Chosa Hokoku. (Published by the Government of Formosa, 1909.)

Report Term. II. (M. Oshima).—Dainikwai Hakugi Chosa Hokoku. (Published by the Government of Formosa, 1911.)

Report Term. III. (M. Oshima).—Daisankwai Hakugi Chosa Hokoku. (Published by the Government of Formosa, 1912.)

Report Jap. Forestry Station.—Ringyo Shiken Hokoku. (Published by the Department of Agriculture and Commerce, Tokyo.)

Special Report Agr. Exp. Station.—Noji Shikenjo Tokubetsu Hokoku. (Published by the Agricultural Experiment Station, Government of Formosa.)

Systematic Entomology (S. Matsumura).—Konchyu Bunruigaku, Tokyo, 1907.

Thousand Insects (S. Matsumura).—Senchu Zukai, Tokyo, 1904.

The Insect World.—Konchyu Sekai. (A monthly journal published by Nawa in Gifu.)

Trans. Ent. Soc. Jap.—Nihon Konchyu Gakkwai Kwaiho, Tokyo.

Zool. Mag. Tokyo.—Dobutsugakuzassi. (A monthly journal published by the Zoological Society of Tokyo.)

ILLUSTRATIONS

TEXT FIGURES

TWO SPECIES OF TERMITES FROM SINGAPORE

By MASAMITSU OSHIMA
(Of the Institute of Science, Government of Formosa)

In July, 1912, I received from Dr. C. Inagaki, of the Taihoku Hospital, and from Mr. J. Kondo, architect of the Formosan Government, a collection of termites made by them in Singapore. A study of the material showed that it represented two species, one of which is apparently an undescribed form.

Coptotermes gestroi Wasmann.

Imago.—Reddish brown above, head darker; head round, densely covered with hairs; eyes round and prominent; ocelli oval, separated from eye by a distance less than their short diameter; fontanelle indistinct, dotted, slightly elevated; antennæ 21-jointed, 2d joint longer than 3d; pronotum semicircular, slightly broader than head, emarginate in the middle of posterior border. Wing hyaline, costal margin pale brown; 11 mm. long, 3.5 mm. broad; radius running near to, and parallel with, costa; median nerve with 1 or 2 branches in apical area, scarcely reaching to tip of wing and running nearer to cubitus than to radius; cubitus with 7 branches.

Measurement.	Mm.
Length with wings	15.00
Length without wings	8.50
Length of head	1.56
Width of head	1.50
Length of pronotum	0.94
Width of pronotum	1.56

Soldier.—Head reddish yellow, suborbicular, provided with long hairs; sides converging anteriorly; a broad prominence above epistome ending in a large foramen; antennæ 14-jointed, 2d joint longer than 3d; labrum lanceolate, apex white and pointed, with a few small hairs, reaching to middle of mandibles; mandibles 1 mm. long, saber shaped, with incurved piercing tip, cutting edge smooth; gula narrow below, gradually widening toward apex, anterior border narrowed; pronotum semicircular, with bilobed anterior border, emarginate in the middle of pos-

terior border; mesonotum as broad as pronotum, narrower than metanotum; abdomen oblong; abdominal papillæ present.

Measurement.	Mm.
Length of head	1.56
Width of head	1.46
Length of pronotum	0.50
Width of pronotum	0.94
Length of body	5.50

Worker.—Antennæ 14-jointed, 2d joint longer than 3d; pronotum much narrower than head, semicircular, with bilobed anterior border; body 5 mm. long.

Habitat.—Singapore.

Remarks.—This species is closely allied to *Coptotermes formosanus* Shiraki, but differs in the dimensions of the imago and in the width of the soldier's head. Its habit of killing gum trees is remarkable.

Termes (Macrotermes) singaporensis sp. nov.

Imago.—Head and thorax chestnut brown, in the middle of forehead a pale brownish spot; mouth parts and antennæ yellowish brown; abdomen brown, darker on dorsum, but paler along posterior margins of sternites; legs yellowish brown; head round, slightly longer than broad, with slightly concave anterior and rounded posterior borders; epistome vaulted, posterolateral angles not extending to anterior angle of head; middle of vertex slightly concave, with a small elevated median spot; eyes very large, rounded; ocelli round and prominent, distant from eyes by less than half their diameter; antennæ 19-jointed, slightly longer than head, 2d joint cylindrical, as long as 3d; labrum longer than broad, reaching to apex of mandibles, with rounded anterior border; pronotum semicircular, broader than head, with anterior border nearly straight and slightly elevated in the middle parts, posterior border arcuate and considerably concave in the middle; anterior angles depressed and obtusely rounded; mesonotum and metanotum as broad as pronotum; metanotum with markedly concave posterior border, posterior angles slightly rounded; wing-stumps moderately large, the anterior subequal to the posterior. Wing fuscous, transparent, with yellowish brown costal margin; radius running near to, and parallel with, costa; median nerve branches out from wing-stumps, and runs nearer to cubitus than to radius, giving 6 branches to posterior border of wing; cubitus running midway through wing, not reaching to apex, but giving off 12 branches; legs slender; tibiæ provided with 2 bristles at

apical end, 4th joint longer than the proximal 3 joints taken together; a stout tooth-like projection present at base of apical claw.

Measurement.	Mm.
Length with wings	28.00
Length without wings	12.00
Length of head	2.19
Width of head	2.09
Length of pronotum	2.03
Width of pronotum	2.36

Soldier (*larger form*).—Head reddish brown, darker anteriorly; thorax, abdomen, and legs dark yellow; head quadrilateral, slightly narrowed anteriorly, considerably rounded on sides, dorsally vaulted, ventrally flattened; vertex inclined; in the center of head a small fontanelle present; antennæ 17-jointed, 2d joint longer than 3d; labrum lanceolate, with white apex, broader proximally than distally, not reaching to middle of mandible; mandibles shorter than half the length of head, saber shaped, with incurved and upcurved apex, with smooth cutting edge; left mandible serrated along inner basal margin; pronotum saddle-shaped, with lateral margins converging posteriorly, anterior margin bilobed and slightly convex, posterior margin emarginate at middle, anterolateral angles quadrangular, posterolateral angles broadly rounded; mesonotum broader than pronotum, oval, with distinctly bilobed posterior border; metanotum broader than mesonotum, with nearly straight posterior border; abdomen rather small, ovoid.

Measurement.	Mm.
Length of head with mandible	5.00
Length of head without mandible	3.69
Width of head	3.06
Length of pronotum	1.09
Width of pronotum	2.44
Length of body	9.50

Soldier (*smaller form*).—Head pale yellow, pronotum paler, abdomen and legs whitish; head quadrangular, slightly narrower anteriorly, with rounded posterior border, sides convex, dorsally vaulted; without fontanelle; antennæ 17-jointed, 3d joint slightly longer than 2d; labrum lanceolate, with white apex, reaching beyond middle of mandibles; mandibles slender, saber shaped, with smooth cutting edges; inner basal margin of left mandible with a few small teeth; pronotum saddle-shaped, narrower than head, its anterior border convex, with a slightly bilobed projecting portion in the middle; posterior border emarginate in the middle; anterior angles acutely rounded; pos-

terior angles broadly rounded; mesonotum and metanotum agree with those of the larger form soldier.

Measurement.	Mm.
Length of head with mandible	3.29
Length of head without mandible	2.28
Width of head	1.97
Length of pronotum	0.98
Width of pronotum	1.47
Length of body	6.79

Worker (*larger form*).—Head pale yellow, round, dorsally slightly vaulted and with a pale fontanelle spot; epistome markedly swollen, along its posterior border a semilunar concavity; antennæ 18-jointed, longer than head; 2d and 3d joints cylindrical, subequal; 4th joint very small; pronotum half as long as broad, divided into 2 portions by a transverse furrow, with anterior border elevated, and forming a right angle with dorsal surface, bilobed in the middle area; anterior angles acutely rounded; lateral margins posteriorly strongly converging; posterior angles broadly rounded; middle of posterior border emarginate; mesonotum narrower than pronotum, quadrangular, with convex lateral margins; metanotum very large, semilunar, markedly broader than mesonotum, with rounded lateral margins; abdomen oblong-ovoid; abdominal papillæ short.

Measurement.	Mm.
Length of head	1.88
Width of head	1.84
Length of pronotum	0.50
Width of pronotum	1.03
Length of body	5.50

Worker (*smaller form*).—Head pale yellow, round, with slightly vaulted dorsal surface; antennæ 17-jointed; 2d joint cylindrical, longer than 3d.

Measurement.	Mm.
Length of head	1.16
Width of head	1.19
Length of body	4.00

Habitat.—Singapore.

Remarks.—The nearest relative of this species appears to be *Termes* (*Macrotermes*) *gilvus* Hagen, but the two species differ widely in the shape and dimensions of the thoracic segments in the same castes of each.

THE CHRYSIDIDÆ OF THE PHILIPPINE ISLANDS [1]

By A. MOCSÁRY
(*Budapest, Austria-Hungary*)

I received, not long ago, from Professor C. F. Baker of Los Baños, P. I., a small collection of Philippine Chrysididæ, accompanied by a letter in which he asked me to write an article on the Chrysididæ of the Philippine Islands.

1. **Ellampus (Holophris) marginellus** Mocs., Természetrajzi Füzetek. (1890), **13**, 51, n. 12.

LUZON, Los Baños, duo specimina (*Baker*); etiam in Sumatra et Singapore (*Mus. Hung.*) inventus.

2. **Ellampus (Holophris) bakeri** sp. nov.

Mediocris, sat robustus, subaurato-viridis, nitidissimus, parce pilosus; pronoto margine antico anguste, centro mesonoti et abdominis segmentis dorsalibus: secundo maxima parte et tertio basi violascentibus; verticis margine postico, pronoti maxima parte postica, mesonoto et abdominis segmentis dorsalibus laevibus ac politis; cavitate faciali profunda, laevi; antennis sat crassis, haud longis, fuscis, articulis duobus primis viridibus, tertio brevi, quarto dimidio tantum adhuc longiore; fronte dense subtilius, pronoti lateribus fortius, mesopleuris sparsim crassius, scutello ac postscutello adhuc fortius profundiusque punctato-reticulatis; abdominis segmento dorsali tertio margine apicali rotundato-integro et anguste sordide-albo hyalino; ventre pedibusque aurato-viridibus, tarsis rufis; alis basi hyalinis, apice late subfumatis, venis pallide-fuscis.

♀, long. 4 mm.

Ellampo marginello Mocs. maior, magis robustus, ex parte aliter coloratus, scutello longitudinaliter non striato, iam satis distinctus.

LUZON, Los Baños, specimen unicum (*Baker*).

3. **Hedychrum stantoni** Ashmead, Can. Ent. (1904), **36**, 283, ♂. Insulae Philippinae (*Ashmead*).

4. **Hedychrum philippinum** sp. nov.

Submediocre, sat robustum, cyaneo-viride, parce breviterque pilosum; vertice post stemmata nigro, pronoti fascia abbreviata,

[1] Proof read by C. F. Baker.

antice dilatata, ante marginem posticum, mesonoti ad areas distinctas non divisi scutellique medio, postscutello et abdominis segmentis dorsalibus: primo basi centro et secundo macula magna discoidali tertioque vitta centrali violascentibus; cavitate faciali profunda, dense concinne transverse striata; antennis tenuibus, fuscis, cano-puberulis, articulis duobus primis cyaneis, tertio longo, 4-5 simul sumptis aequilongo; genis linearibus, fere nullis; pronoto longo, capite multo longiore, sed eius latitudinis, transverse rectangulo, lateribus ante medium sinuatis; postscutello gibbo-convexo; metanoti dentibus postico-lateralibus longis, acute triangularibus, spiniferis, externe profunde, postice levius sinuatis; fronte verticeque valde dense subtiliter, pronoto cum mesonoto scutelloque parum dispersius crassius profundiusque, postscutello adhuc fortius punctato-reticulatis; mesopleuris punctatura pronoti; abdominis segmentis dorsalibus: primo dense subtiliter, lateribus multo fortius rugosiuscule punctato, basi centro canalicula longitudinali laevi ac polita, secundo carinula mediana nulla, disco parum disperse, haud crasse, sed profunde aequaliter punctato, tertio punctatura densiore subtilioreque rugulosa, ante marginem apicalem arcuatim impresso, lateribus utrinque sine dente distincto, sed tantum angulatis; ventre nigro-aeneo, nitido, sparsim punctulato, segmentis centro macula viridi; femoribus tibiisque subaurato-viridibus, tarsis fuscis; alis basi hyalinis, parte apicali leviter fumatis, venis piceis.

♀, long. 5 mm.

Species: pronoto, metanoti dentibus postico-lateralibus et praesertim de punctatura segmenti dorsalis secundi abdominis facile cognoscitur. Species enim huius generis asiaticae, mihi cognitae, punctatura multo subtiliore gaudent.

LUZON, Los Baños, specimen unicum (*Baker*).

5. **Stilbum cyanurum** Forst. var. **amethystinum** Fabr.

LUZON, Los Baños (*Baker*), 11 specimina. Varietas haec fere totam Africam Asiamque inhabitat. Etiam in America sept., inventum est.

6. **Stilbum cyanurum** Forst. var. **flammiceps** var. nov.

Praecedenti penitus simile, sed capite toto concinne ignito. LUZON, Los Baños, specimen unicum (*Baker*).

7. **Chrysis (Holochrysis) philippinensis** Bisch., Mittheil. Kgl. Zoolog. Museum Berlin (1910), 4, 452, ♀.

LUZON (*Bisch.*).

8. **Chrysis (Dichrysis) bidenticulata** sp. nov.

Submediocris, elongata, minus robusta, parallella, cyaneo-viridis, parce breviterque albido-pilosa; macula ad stemmata, occipitis medio, collo, fascia non satis distincta pronoti, mesonoti lobo medio, macula parva scutelli, fascia mediana indeterminata abbreviataque abdominis segmentorum dorsalium primo, macula magna secundi et tertio basi violascentibus; cavitate faciali subangusta, sed profunda, dense subtiliter punctato-coriacea, lateribus argenteo-sericeo pilosa, superne arcuatim acute marginata, margine aream transversam reniformem eximiam, a stemmatibus longe remotam, includente; antennis brevibus, tenuibus, fuscis, cano-puberulis, articulis tribus primis aurato-viridibus, tertio proportionaliter brevi, secundo dimidio tantum longiore; genis brevibus, fere nullis; pronoto sat longo, transverse rectangulo, angulis obtusis, lateribus acute marginatis medioque sinuatis, antice in medio vix impresso, capite breviore, sed fere aequilato; postscutello gibbo-convexo, metanoti dentibus postico-lateralibus sat longis, acute-triangularibus, externe truncatis, postice leviter sinuatis; mesopleuris normalibus, undique acute marginatis; vertice ac pronoto dense minus fortiter, mesonoto cum scutello postscutelloque parum dispersius, sed fortius sat profunde punctato-reticulatis; abdominis segmentis dorsalibus: primo basi triimpresso, dense sat profunde, secundo parum subtilius rugosiuscule punctato, carinula mediana indistincta, angulis postico-lateralibus rectis, tertio dense subtilius irregulariter rugosiuscule punctato, convexo, ante seriem leniter incrassato, foveolis sat profunde immersis mediocribus, haud numerosis, 10 tantum distinctis, orbiculatis, centralibus maioribus, margine apicali valde brevi, dense punctulato et leniter arcuato lateribus a margine parum remotis utrinque denticulo parvo triangulari armatis; ventre pedibusque subaurato-viridibus, illo segmentis secundo basi utrinque et tertio apice nigro-maculatis, his tarsis fuscis; alis hyalinis, venis piceis, cellula radiali lanceolata subcompleta, tegulis viridi-cyaneis.

♂, long. 6 mm.

Species: de cavitate faciali, area insigni frontali, genis, pronoto, punctatura abdominis et dentibus analibus facillime cognoscitur.

LUZON, Los Baños, tria specimina conformia (*Baker*).

9. **Chrysis (Trichrysis) sauteri** Mocs., Annal. Mus. Hung. (1912), 10, 381, n. 53.

LUZON, Los Baños, specimen unicum (*Baker*).

Ex insula Formosa descripta.

10. **Chrysis (Trichrysis) singalensis** Mocs., Monogr. Chrysid. (1889), 324, n. 363.

LUZON (*Buysson*), (*Bisch.*). Praeterea in India or. et Java.

11. **Chrysis (Trichrysis) luzonica** Mocs., Monogr. Chrysid. (1889), 328, n. 369.

LUZON (*Mocsáry*); Los Baños (*Baker*).

12. **Chrysis (Trichrysis) aspera** Brullé, Hist. nat. d. Insectes. Suites à Buffon. Hyménoptères (1846), 4, 46, n. 35. Mocsáry, Monogr. Chrysid. (1889), 328, n. 369, ♀.

LUZON, Manila (*Brullé*).

13. **Chrysis (Trichrysis) miri** Brown, Phil. Journ. Sci. (1906), 1, 685, ♂.

LUZON, Manila (*Brown*).

14. **Chrysis (Trichrysis) bakeri** sp. nov.

Submediocris, elongata, parallella, minus robusta, cyaneo-viridis, parce breviterque albo-pilosa; vertice ad ocellos et mesonoti lobo medio nigro-violaceis; mesonoti lobis lateralibus et abdominis segmentis dorsalibus duobus primis in lateribus et secundo etiam margine apicali anguste viridi-subauratis; occipitis medio et segmento secundo maxima parte cyaneis; cavitate faciali subangusta, sed profunda, dense subtilissime transverse striata, lateribus punctato-coriacea et argenteo-sericeo pilosa, superne arcuatim acute marginata, margine ramulum utrinque non satis distinctum et stemma anticum includentem emittente; antennis brevibus, sat tenuibus, fuscis, cano-puberulis, articulis tribus primis viridi-auratis, tertio mediocri, secundo dimidio adhuc longiore; genis brevibus, linearibus; pronoto brevi, transverse rectangulo, angulis acutis, antice in medio profundius impresso, lateribus acute marginatis medioque sinuatis, capite multo breviore, sed vix angustiore; postscutello convexo, metanoti dentibus postico-lateralibus acutis subspiniformibus; mesopleuris normalibus, undique acute marginatis; vertice parum subtilius, thorace toto fere aequaliter dense minus crasse ac profunde punctato-reticulatis; abdominis segmentis dorsalibus: primo dense minus crasse ac profunde punctato et basi longitudinaliter canaliculato, canalicula laevi ac polita, secundo dense rugosiuscule subtilius punctato, carinula mediana indistincta, angulis postico-lateralibus rectis, tertio convexo, punctatura fere secundi, sed parum fortiore, confusa, supra seriem incrassato, foveolis sat profunde immersis, paucis, sex tantum distinctis, duobus centralibus magnis, reliquis multo minoribus, orbiculatis, per carinulam medianam in spinam sat longam acutam

productam interruptis, margine apicali hoc modo tridenticulato, denticulis lateralibus brevibus acute triangularibus, lateribus ante dentem externum lenissime sinuatis; ventre pedibusque subaurato-viridibus, illo segmento secundo basi utrinque nigro-maculato, his tarsis fuscis; alis hyalinis, venis fuscis, cellula radiali lanceolata completa, tegulis subaurato-viridibus.

♂, long. 5.5 mm.

Chrysidibus singalensi Mocs. et luzonicae Mocs. similis et affinis; sed a priore minor, magis gracilis, fronte areata, corpore toto subtilius punctato, abdominis segmentis dorsalibus: secundo carinula mediana indistincta, tertio utrinque transverse non impresso, dentibus analibus gracilioribus; a luzonica vero: colore ex parte, corpore graciliore, punctatura abdominis segmentorum dorsalium multo subtiliore, dentibus analibus longioribus magisve acutis, praesertim distincta.

LUZON, Los Baños, specimen unicum (*Baker*).

15. **Chrysis (Tetrachrysis) fuscipennis** Brullé, Hym. (1846), 4, 38, n. 24, ♀; Mocsáry, Monogr. Chrysid. (1889), 370, n. 424, ♂ ♀.

Insulae Philippinae (*Brullé*); LUZON (*Mocsáry*), Los Baños (*Baker*). Fere e tota Asia Australiaque cognita.

16. **Chrysis (Tetrachrysis) diademata** Mocsáry, Monogr. Chrysid. (1889), 414, n. 489, ♂.

Insulae Philippinae (*Mocsáry*).

17. **Chrysis (Tetrachrysis) atrata** Bisch., Mittheil. Kgl. Zoolog. Museum Berlin (1910), 475, ♂.

LUZON (*Bisch.*).

18. **Chrysis (Pentachrysis) lusca** Fabr., Syst. Piez. (1804), 171, n. 7; Mocs., Monogr. Chrysid. (1889), 527, n. 618, ♂ ♀.

Insulae Philippinae (*Bisch.*). Inde ab India orientali in magna parte Asiae diffusa.

19. **Chrysis (Pentachrysis) palawanensis** Mocs., Term. Füzetek. (1899), 22, 487, ♀.

Insulae Philippinae (*Mocsáry*).

20. **Chrysis (Hexachrysis) comottii** Grib. var. **igniceps** Mocs., Term. Füzetek (1892), 15, 233, n. 28, ♀.

Insulae Philippinae (*Mocsáry*); LUZON, Manila (*Bisch.*).

21. **Chrysis (Hexachrysis) laevicollis** Buyss., Ann. Soc. Ent. France (1897), 560. (An *C. lynceae* F. var. ?)

LUZON (*Buysson*).

NEW GENERA AND SPECIES OF PSYLLIDÆ FROM THE PHILIPPINE ISLANDS [1]

By D. L. CRAWFORD
(*Cornell University, Ithaca, New York*)

One plate and 1 text figure

Professor C. F. Baker of the College of Agriculture, Los Baños, P. I., recently sent me some specimens of a very interesting psyllid which he had collected on leaves of *Ficus ulmifolia* Lam. This species of Psyllidæ bears some resemblance to the members of the genus *Pauropsylla,* which are more or less tropical in distribution; and most, if not all, of them produce malformations on the leaves of various trees—*Ficus* among others. Several Psyllid larvæ have been mentioned as making galls on leaves of various species of *Ficus* in Java, and it is possible that the specimens before me are the adults of one of these species. However, none of these forms has been named, so that no confusion will result from assigning a name to the Philippine species.

A second collection of Psyllidæ from the Philippine Islands, sent by Professor Baker, contains some very interesting forms. There is represented in the collection one new and very interesting genus, as well as a new species of a genus described from Formosa, an interesting new species of *Pauropsylla,* and one new species of another genus, *Euphalerus.* The new species of *Pauropsylla* is especially interesting because of the light it throws upon the value of certain venational characters.

Genus **PAUROCEPHALA** novum

Body robust, surface shagreened; thorax strongly arched; head very strongly deflexed, not quite as broad as thorax; vertex convex in front, coarsely shagreened; front globosely swollen beneath antennal insertions, lobes or cones wanting; labrum large. Eyes large, globose; ocelli large, prominent, posterior pair elevated, anterior in front; antennæ longer than width of head; rostrum very long, prominent. Thorax broad; propleurites similar to those of *Pauropsylla;* metascutum with a prominent, erect, conical, tubercle dorsad. Wings hyaline, more or

[1] Proof read by C. F. Baker.

less oval in shape, rounded apically; pterostigma present. Genitalia of male simple; anal valve and claspers without processes.

Type of genus: *Paurocephala psylloptera* sp. nov.

Paurocephala psylloptera sp. nov.

Length of body, 1.7 mm.; length of forewing, 2.1 mm. Male much darker than female, almost uniformly dark reddish brown, with anterior femora and a spot above forewings yellowish; abdomen lighter; female orange to light reddish brown; antennæ, tibiæ, and eyes brown. Body sparsely and briefly pubescent.

Head greatly deflexed, almost perpendicular; vertex broader than long, surface irregular, deeply concave on occipital margin, with posterior ocelli greatly elevated, roundly convex in front; anterior ocellus large, between antennal bases; frons swollen beneath antennal insertions; labrum very large, globose from in front. Antennæ nearly twice as long as width of head, slender.

Thorax broad, strongly arched; pronotum long, ascending,

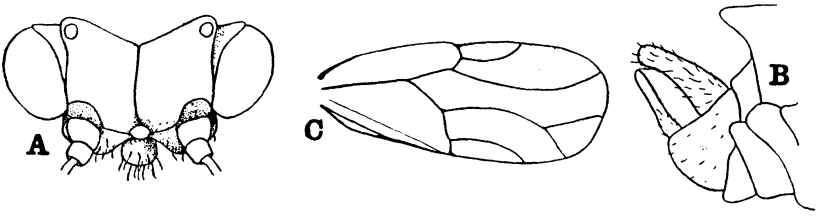

FIG. 1. *Paurocephala psylloptera* Crawford. A, head, front view; B, male genitalia; C, forewing.

longest at center; dorsulum long. Metascutum with a prominent, acute, erect, conical process dorsad. Mesosternum very large, extending far ventrad, rostrum projecting forward beneath head. Legs slender; hind legs very long; hind tibiæ very spinose. Forewings hyaline, narrowed basally, broadest subapically, broadly rounded or slightly angular on apical margin, more than two and a half times as long as broad; cubital petiole and discoidal subcosta equal in length; first marginal cell elongate, narrow, a little longer than pterostigma; second broad and large.

Abdomen long. Male: fifth tergite produced caudad over genital plate; anal valve simple, longer than claspers which are slender, arched, pubescent within. Female genitalia flexed sharply downward, rather long; both plates acute at tip, dorsal longer than ventral.

Described from 3 males and 3 females from Los Baños, P. I. (*Baker*, August, 1912). Collected on *Ficus ulmifolia*.

Genus **DYNOPSYLLA** novum

Body large, robust, pubescent. Head very deeply cleft in front between antennæ; vertex very deeply depressed between posterior ocelli, with a horn-like process in front of each posterior ocellus directed forward and upward; genal cones wanting; frons small, elliptical. Eyes and ocelli large. Antennæ very long, longer than body or at least as long, slender; basal segment very elongate and large, much longer than II. Thorax broad; pronotum short, much depressed below dorsulum. Legs stout and large; hind tibiæ unarmed at base, but with several very large spines at apex. Forewings membranous, very large, powerful, angulate at apex, veins heavy; venation atypical; hind wings much smaller, frenulum conspicuous.

Type of genus: *Dynopsylla cornuta* sp. nov.

This genus belongs to the subfamily Carsidarinæ, being related rather closely to several genera therein, including *Carsidara*. The absence of the basal spur on the hind tibiæ, I believe, is of minor importance.

Dynopsylla cornuta sp. nov. (Plate I, figs. A, E, H, I, M.)

Length of body, 3.8 mm.; length of forewing, 4.9 mm.; width of head with eyes, 1.2 mm.; length of basal segment of antennæ, 0.5 mm.; flagellum, 5.8 mm. General color dark reddish brown; genæ, pleura, femora, tibiæ, and basal half of flagellum light brown; notum with lighter stripes. Body very large and robust; head, basal antennal segment, thorax, venter of abdomen, genital segment, legs, and wing veins with long pubescence.

Head much narrower than thorax, short, relatively small, very deeply cleft in front and above, with anterior ocellus in front at base of cleft and posterior ocelli much elevated; vertex produced into a large horn-like process in front of each posterior ocellus and closely behind antennal insertions. Frons small, elliptical, covered by genæ except around front ocellus; genæ very large, long, produced forward on inner margin of antennal insertions; clypeus small, situated far back. Eyes large. Antennæ as long as body to tip of wings, one-half longer than body alone, slender; basal segment unusually long and large, more than three times as long as II; III–VI subequal in length; VII–VIII a little shorter than preceding ones; IX–X short; terminal setæ very short.

Thorax large, stout, strongly arched; pronotum short, greatly depressed below dorsulum; metascutellum large, with 2 short cariniform processes above for supporting the wings. Legs

large, stout, relatively short, hairy; femora deeply grooved for reception of tibiæ; fore and second tibiæ with a fringe of stiff spines at apex; hind tibiæ with 4 very large spur-like spines at apex within; tarsi very large and long.

Wings large, membranous, about two and a half times as long as broad, acute at apex, veins large, setigerous; first marginal cell very large; first cubital very short; radius touching second cubital, and latter touching second furcal; with dark bands, as shown in the figure.

Abdomen large. Male genital segment relatively small; claspers short, broader at apex than at base, rather flat; apical margin rather square; anal valve longer than claspers, constricted near apex. Female genital segment about half as long as rest of abdomen, subacute at apex, dorsal plate slightly longer than ventral.

Described from 2 males and 1 female collected at Los Baños, P. I. (*Baker*, December, 1912).

Pauropsylla triozoptera sp. nov. (Plate I, figs. B, C, J, N.)

Length of body, 2.5 mm.; length of forewing, 3.6 mm.; width of vertex with eyes, 0.95 mm. General color dark reddish brown, vertex lighter; metapleurum, metasternum, legs, and basal half of antennæ yellowish brown. Body robust, surface smooth, sparsely pubescent.

Head nearly as broad as thorax, short, deeply concavely depressed between posterior ocelli, front margin convex; vertex much broader than long; frons visible from ocellus to clypeus, narrow. Genal cones wanting. Eyes and ocelli large, prominent; antennæ about as long as head and thorax combined, slender; segment IX broadened at tip, bearing a long seta apically without.

Thorax very thick dorsoventrally; mesosternum extending far down and forward; pronotum much depressed below dorsulum. Legs moderately long. Forewings large, membranous, hyaline, rhomboidal, rather square at apex, about one and two-thirds times as long as broad; venation similar to that of congeners except that the cubital petiole is wanting, as in *Trioza*.

Female genital segment nearly as long as rest of abdomen, deflexed, acute at apex, plates subequal in length.

Described from 1 female from Los Baños, P. I. (*Baker*).

Although this species differs from others of the genus *Pauropsylla* in one venational character which has been considered of great diagnostic importance, nevertheless I do not hesitate to in-

clude it in this genus because of the unquestionably close relationship in all other respects. In *P. depressa* Crawford the cubital petiole is very short, approaching the condition found in the present species. This is only another bit of evidence showing that too much importance has been ascribed to such venational characters.

Pauropsylla triozoptera setifera var. nov.

Corresponds very closely with the species in nearly every respect except the following. Veins of forewing set with conspicuous setæ; often all of the veins setigerous, but sometimes only a part of them. Dorsum of thorax more pubescent than in the species. Claspers of male stouter and larger. Male in some cases very light colored and the female sometimes dark.

There seems to be more or less gradation in the number of setæ on the wing veins. In some specimens of the species there may be seen a very few widely scattered hairs, but usually the veins are entirely without them. However, in some specimens of the variety the number is reduced, but never to such an extent as in the species.

Described from 3 males and 4 females collected on the leaves of *Columbia serratifolia* DC.,[2] Los Baños, P. I. (*Baker*).

Epipsylla pulchra sp. nov. (Plate I, figs. D, G, K, O.)

Length of body, 2.3 mm.; length of forewing, 3.1 mm.; width of head with eyes, 0.93 mm. General color light reddish brown, with 2 conspicuous white stripes bordered narrowly by black extending from the tip of genal cones along vertex and notum and uniting on metascutellum; another similar short stripe from each posterior ocellus to antennal insertion; a third pair on under and outer side of cone beneath antennal insertion. Body surface covered sparsely with stiff black hairs.

Head about as broad as thorax, moderately long, somewhat deflexed; vertex fully half as long as broad between eyes, slightly depressed along each white stripe; cones only slightly longer than vertex, divergent, subacute, porrect, pubescent. Antennæ about twice as long as body without wings, very slender, segment VIII longest.

Thorax arched; propleurites very narrow, as in *Psylla*. Legs slender, wings membranous, rounded at apex, two and a third times as long as broad, light brown throughout; veins slightly setigerous; pterostigma wanting.

[2] Determined by Mr. E. D. Merrill.

Male genital segment moderately large; claspers slender, flattened a little distad, with a second smaller pair between them; latter more slender, shorter, flattened at apex; anal valve broad, large, somewhat longer than claspers.

Described from 1 male from Los Baños, P. I. (*Baker*).

This is apparently very closely related to *Epipsylla albolineata* Kuwayama [3] from Formosa. The chief differences between the two species are: the two additional pairs of stripes in *pulchra*, size of vertex and cones, color of wings and male genitalia; only one pair of claspers is mentioned for *E. albolineata*.

Euphalerus nigrivittatus sp. nov. (Plate I, figs. F, L.)

Length of body, 2.8 mm.; length of forewing, 3 mm.; width of head with eyes, 1.1 mm. General color whitish, with a black vitta on each side of body extending from tip of cone along side of same over eye and side of thorax, the two vittæ uniting on mesonotum and extending on dorsum of abdomen; vitta continued along posterior margin of forewing around apical margin; anterior and mid tarsi black. Surface of body finely reticulated.

Head about as broad as thorax, continuing descending plane of notum, with cones about as long as broad between eyes, with a small foveal impression on each side of median line near center; cones broader than long, not deflexed nor depressed below plane of vertex, almost contiguous on inner margin, rather square on apical margin, pubescent. Antennæ about as long as body, slender.

Thorax broad, robust, somewhat arched. Propleurites rather narrow, partially concealed by the large eyes. Forewings large, hyaline, about half as broad as long, slightly rhomboidal, veins setigerous; marginal cells long; pterostigma very small; black stripe narrow on posterior margin, broader on apical and extending into radial cell.

Abdomen large. Female genital segment about half as long as rest of abdomen, rather thick, ventral plate slightly shorter than dorsal.

Described from 1 female from Los Baños, P. I. (*Baker*).

This bears some resemblance to an Indian species of this same genus, *E. vittatus* Crawford,[4] but is much larger and differs in several characters, such as shape of forewing, antennæ, and sculpturing of vertex.

[3] *Trans. Sapporo Nat. Hist. Soc.* (1907), 2, 178.

[4] *Records Indian Mus.* (1912), 7, 423, 431.

Euphalerus citri (Kuwayama).

Diaphorina citri KUWAYAMA, Trans. Sapporo Nat. Hist. Soc. (1907), 2, 160.

Euphalerus citri (KUWAYAMA) CRAWFORD, Records Indian Mus. (1912), 7, 424.

This species is mentioned here because of its occurrence in the Philippine Islands. Many specimens were collected several years ago on *Citrus* in Luzon by Mr. George Compere. This fact is mentioned in the second article cited above. The species is probably of general distribution throughout the Orient.

ILLUSTRATIONS

PLATE I

FIG. A. *Dynopsylla cornuta* Crawford. Forewing.
B. *Pauropsylla triozoptera* Crawford. Forewing.
C. *Pauropsylla triozoptera* Crawford. Apex of left antenna.
D. *Epipsylla pulchra* Crawford. Male claspers, rear view.
E. *Dynopsylla cornuta* Crawford. Head and prothorax, lateral view.
F. *Euphalerus nigrivittatus* Crawford. Forewing.
G. *Epipsylla pulchra* Crawford. Forewing.
H. *Dynopsylla cornuta* Crawford. Head, front view.
I. *Dynopsylla cornuta* Crawford. Tip of hind tibia and basal tarsal segment.
J. *Pauropsylla triozoptera* Crawford. Head, front view.
K. *Epipsylla pulchra* Crawford. Male genitalia, lateral view.
L. *Euphalerus nigrivittatus* Crawford. Head, dorsal view.
M. *Dynopsylla cornuta* Crawford. Male genitalia, lateral view.
N. *Pauropsylla triozoptera* Crawford. Head and prothorax, lateral view.
O. *Epipsylla pulchra* Crawford. Head, lateral view.

TEXT FIGURE

FIG. 1. *Paurocephala psylloptera* Crawford. A, head, front view; B, male genitalia; C, forewing.

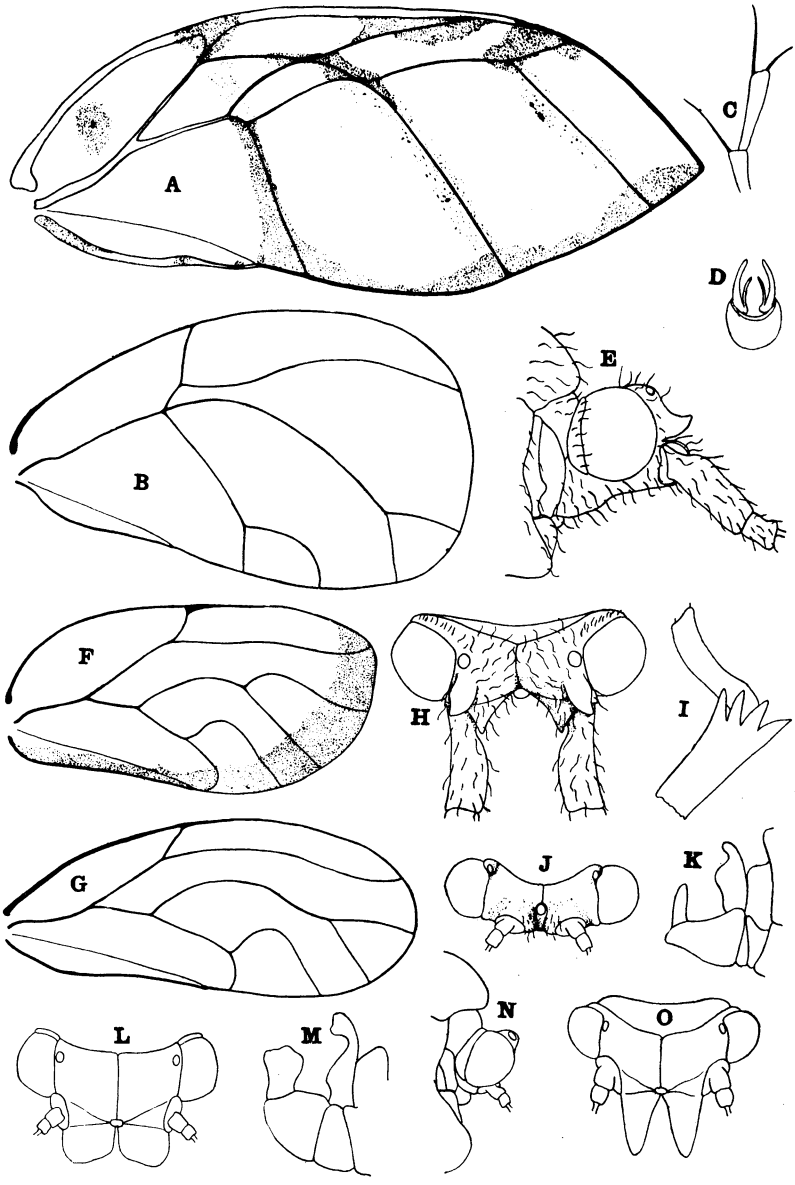

PLATE I. DETAILS OF NEW PHILIPPINE PSYLLIDÆ.

ZWEI NEUE PHILIPPINISCHE CLERIDEN

Von SIGMUND SCHENKLING
(*Berlin-Dahlem*)

Callimerus schultzei sp. nov.

Niger, supra densissime albo- vel ochraceo-squamosus, ore, antennis pedibusque albis, prothoracis linea mediana elytrorumque limbo et lineis tribus curvatis denudatis.

Long. 6-6.5 mm.

LUZON, Benguet, Baguio (*Charles S. Banks*).

Typus No. 1598 in der Entomologischen Sammlung des Bureau of Science, Manila.

Cotypen (No. 1392, Negros Occ., Bago; *Charles S. Banks*) im Deutschen Entomologischen Museum zu Berlin-Dahlem.

Gehört in die Gruppe *C. gratiosus-pulchellus*, die gleichfalls auf den Philippinen vorkommen und bei denen die Oberseite ebenfalls sehr dicht beschuppt und ausserdem dicht behaart ist. Bei frischen, unabgeriebenen Stücken ist der Kopf ganz dicht beschuppt, auf dem Halsschild scheint aber die Längsmitte stets unbeschuppt zu sein. Auf den Flügeldecken sind ausser Naht und Rand 3 gebogene Querlinien kahl und daher schwarz, nämlich: eine hufeisenförmige Binde (öffnung nach der Basis der Flügeldecken) im vorderen Fünftel, die Basis nicht erreichend; eine kurze, ziemlich breite Querbinde dicht hinter der Mitte, die nicht ganz bis zur Längsmittellinie der Flügeldecken reicht und hier in eine halbmondförmig gekrümmte Binde übergeht, deren Enden die Naht nicht erreichen und deren vorderer Arm etwas länger ist als der hintere; endlich eine Querbinde im hinteren Fünftel, die die Naht gleichfalls nicht erreicht; alle 3 Binden stehen mit dem kahlen Seitenrande in Verbindung. Die Flügeldecken lassen auf den kahlen Stellen eine dichte, ziemlich grobe Punktierung erkennen. Brust und Hinterleib an den Seiten dicht weiss oder gelblich beschuppt. Beine lang, hell behaart.

Ich widme diese Art freundschaftlich Herrn W. Schultze, Assistent für Entomologie am Bureau of Science in Manila.

Dasyceroclerus banksi sp. nov.

Flavo-brunneus, supra longe nigro et albo setosus, antennis brunneis, articulis duobus flavis, elytris seriatim punctatis, flavis, humeris fasciisque duabus, e maculis longitudinalibus compositis, nigris vel brunneis, pedibus albis, femorum apice, tibiarum anteriorum annulo tarsisque brunneis vel nigris.

Long. 6–7 mm.

PALAWAN, Bacuit (*C. M. Weber*).

Typus No. 12364 in der Entomologischen Sammlung des Bureau of Science, Manila.

Cotypen im Deutschen Entomologischen Museum zu Berlin-Dahlem.

Unter der Artengruppe, deren Mittelschienen auf der Mitte dunkel geringt sind, leicht an der Färbung kenntlich. Die Glieder der dunkeln, aber meist durchscheinenden Fühler dünn, fast parallel, einzeln lang behaart, das Endglied allmählich zu einer stumpfen Spitze verschmälert, $1\frac{1}{2}$ mal so lang als das vorhergehende. Die gange Oberseite mit aufgerichteten langen schwarzen, an den Körperseiten weissen Borsten. Halsschild oben ziemlich gleichmässig gewölbt, braungelb, kurz dicht graugelb behaart, auf den in der Mitte gerundet erweiterten Seiten mit einem Grübchen. Flügeldecken vor der Mitte etwas eingedrückt, mit regelmässigen Reihen ziemlich feiner Punkte, die Punktierung hinter der Mitte mehr einzeln und zuletzt erlöschend. Die am Ende zugespitzten Flügeldecken sind braungelb und wie der Halsschild dicht kurz gelblich behaart, die Schultern (mitunter der halbe Basalrand) und zwei aus Längsflecken zusammengesetzte Querbinden hinter der Mitte schwarz oder braun, zuweilen auch ein runder Fleck hinter dem Schildchen jederseits der Naht schwarz. Unterseite braungelb, Brust schwärzlich. Beine weissgelb, die Schenkelspitze, ein Ring auf der Mitte der Vorder- und Mittelschienen und die Tarsen dunkel.

Herrn Charles S. Banks, Entomologist des Bureau of Science, Manila, gewidmet.

STUDIES IN PHILIPPINE DIPTERA, I *

By M. Bezzi

(*Turin, Italy*)

An extended series of studies on Philippine Diptera has been made possible by copious material furnished by Professor C. F. Baker, nearly all which has been taken in the vicinity of Los Baños, Laguna Province, Philippine Islands, by Julian Valdez y Hernandez, Professor Baker's Cuban collector.

It seems advisable to preface this series of papers with an enumeration of the species of Diptera hitherto known from the Philippine Islands. In his paper of 1882 Osten Sacken [1] brought together all that was then known of the Diptera of the Islands, and added much to the then scant knowledge of this region. The collection studied by him contained about 250 species, only a few of them described. Formerly this collection was in Turin in the hands of the late Professor L. Bellardi. In the Bellardi collection, now in the University Museum, some of this Philippine material is yet to be found. In the general work of 1895 by Elera [2] nothing is added to the Diptera; and but few species, except in one family, have been added subsequently by Brues, Ricardo, and Speiser. In one family, the Culicidæ, numbers of species have been described by Giles, Ludlow, C. S. Banks, and Knab.

CATALOGUE OF THE DIPTERA HITHERTO RECORDED FROM THE PHILIPPINE ISLANDS

BIBIONIDÆ [3]

Plecia fulvicollis Fabr. 1805.

TENDIPEDIDÆ (CHIRONOMIDÆ)

Tendipes trochanteratus Thoms. 1869. *Pelopia manilensis* Schin. 1868.

* Proof read by C. F. Baker.

[1] Diptera from the Philippine Islands brought home by Dr. Carl Semper. *Berl. ent. Zeitschr.* (1882), 26, 83–120 and 187–252.

[2] See the account by Dyar, *Journ. N. Y. Ent. Soc.* (1904), 12, 58–59.

[3] Osten Sacken records also an undetermined *Lycoria* (*Sciara*).

CULICIDÆ

ANOPHELINÆ

Anopheles pallidus Ludl. 1905.
Anopheles formosus Ludl. 1909.
Myzorhynchus pseudobarbirostris Ludl. 1902.
Myzorhynchus barbirostris Wulp. 1884.
Myzorhynchus sinensis Wied. 1828.
Myzorhynchus vanus Wulp. 1860.
Myzorhynchus ? mcgregori Banks 1909.
Myzomyia rossii Giles 1899.
Myzomyia rossii indefinata Ludl. 1904.
Myzomyia rossii mangyana Banks 1906.
Myzomyia ludlowii Theob. 1903.
Myzomyia thorntonii Ludl. 1904.
Myzomyia ? funestus Giles 1900.
Nyssorhynchus theobaldii Giles 1901.
Nyssorhynchus fuliginosus Giles 1901.
Nyssorhynchus philippinensis Ludl. 1902.
Nyssorhynchus freeræ Banks 1906.
Nyssorhynchus lineatus Ludl. 1908.
Nyssorhynchus stephensii Liston 1901.
Nyssorhynchus flavus Ludl. 1908.
Nyssorhynchus ? kochii Don. 1901.

MEGARHININÆ

Toxorhynchites lewaldii Ludl. 1904.
Toxorhynchites argenteotarsis Ludl. 1906.
Toxorhynchites (*Worcesteria*) *gratus* Banks 1906.

CULICINÆ[4]

Banksinella luteolateralis Theob. 1901.
Stegomyia fasciata Fabr. 1805.
Stegomyia fasciata persistans Banks 1908.
Stegomyia scutellaris Walk. 1859.
Stegomyia amesii Ludl. 1903.
Stegomyia aurostriata Banks 1906.
Stegomyia punctolateralis Theob. 1903.
Stegomyia crassipes Wulp. 1892.
Stegomyia leucomeres Giles 1904.
Stegomyia striocrura Giles 1904.
Stegomyia desmotes Giles 1904.
Stegomyia nigritia Ludl. 1910.
Stegomyia quasinigritia Ludl. 1911.
Kingia gregoryi Ludl.
Blanchardiomyia obturbans Walk. 1860.
Blanchardiomyia fusca Theob. 1903.
Blanchardiomyia joloensis Ludl. 1904.
Blanchardiomyia panalectoros Giles 1901.[5]
Howardina (*Scutomyia*) *nivea* Ludl. 1903.
Howardina (*Scutomyia*) *samarensis* Ludl. 1903.
Quasistegomyia gardnerii Ludl. 1905.
Neomacleaya indica Theob. 1907.
Popea lutea Ludl. 1905.
Hulecoeteomyia pseudotæniata Giles 1901.
Ochlerotatus (*Finlaya*) *poicilia* Theob. 1903.
Ochlerotatus (*Finlaya*) *flavipennis* Giles 1904.
Ochlerotatus (*Finlaya*) *melanoptera* Giles 1906.
Ochlerotatus (*Finlaya*) *aranetana* Banks.
Ochlerotatus (*Reedomyia*) *pampangensis* Ludl. 1906.

[4] There is also recorded *Mucidus mucidus* Karsch, which, however, seems doubtful.

[5] *Grabhamia spenceri* is a North American species.

Ochlerotatus (*Reedomyia*) *niveoscutellata* Theob.
Ochlerotatus (*Pecomyia*) *cæca* Theob. 1901.
Ochlerotatus (*Pseudoskusea*) *nigritarsis* Ludl. 1908.
Ochlerotatus (*Duttonia*) *alboannulis* Ludl. 1911.
Mansonioides uniformis Theob. 1901.
Mansonioides chrysogona Knab. 1909.
Mansonioides annulipes Walk. 1857.
Mansonioides annulifera Theob. 1901.
Etorleptiomyia luzonensis Ludl. 1905.
Aedomyia catasticta Knab 1909 (*squammipenna* Arrib.).
Tæniorhynchus argenteus Ludl. 1905.
Tæniorhynchus lineatopennis Ludl. 1905.
Tæniorhynchus aureosquamatus Ludl. 1909.
Tæniorhynchus ager Giles 1901.
Tæniorhynchus pagei Ludl. 1910.
Chrysoconops aurites Theob. 1901.
Chrysoconops conopus Frauenf. 1867.
Culex microannulatus Theob. 1901.
Culex vishnui Theob. 1908.
Culex sitiens Wied. 1828.
Culex impellens Walk. 1860.
Culex ludlowi Blanch. 1905 (*annuliferus* Ludl.).
Culex alis Theob. 1903.
Culex annulioris Theob. 1901.
Culex hirsutus Theob. 1901.
Culex vagans Wied. 1828.
Culex rubrithorax Meig. 1850.
Culex argentinotus Banks 1909.
Culex taytayensis Banks 1909.
Culex auropunctis Ludl. 1910.
Culex fatigans Wied. 1828.
Culex concolor Desv. 1825.
Culex tigripes Grandpr. 1900.
Culex fragilis Ludl. 1903.
Culex rizali Banks 1906.
Theobaldiomyia gelida Theob. 1901.
Theobaldiomyia gelida var. *cuneata* Theob. 1901.
Theobaldiomyia whitmorei Giles 1904.
Oculiomyia fulleri Ludl. 1909.
Pardomyia quadripunctis Ludl. 1910.
Hodgesia niveocapitis Ludl. 1911.
Mimomyia (*Ludlowia*) *chamberlainii* Ludl. 1904.
Mimomyia (*Ludlowia*) *minima* Ludl. 1907.
Uranotænia falcipes Banks 1906.
Uranotænia lateralis Ludl. 1905.
Uranotænia cæruleocephala Theob. 1901.
Uranotænia powelli Ludl. 1909.
Uranotænia ? philippinensis Giles 1904.
Pseudouranotænia parangensis Ludl. 1908.
Pseudouranotænia triangulata Ludl. 1908.
Anisocheleomyia albitarsis Ludl. 1905.
Harpagomyia cæruleovittata Ludl. 1905.

SABETHINÆ

Wyeomyia nepenthicola Banks.
? Dendromyia scintillans Ludl. 1904.

CHAOBORINÆ

Chaoborus manilensis Schin. 1868.

TIPULIDÆ

Dicranomyia saltans Dol. 1857.
Libnotes semperi O. S. 1882.
Libnotes termitina O. S. 1882.
Libnotes familiaris O. S. 1882.
Mongoma tenera O. S. 1882.
Eriocera perennis O. S. 1882.
Eriocera mansueta O. S. 1882.
Tipula pedata Wied. 1821.
Pachyrrhina luconica O. S. 1882.
Pachyrrhina ortiva O. S. 1882.
Pselliophora suspirans O. S. 1882.
Pselliophora idalia O. S. 1882.
Pselliophora doleus O. S. 1882.
Scamboneura dotata O. S. 1882.

STRATIOMYIDÆ

Artemita azurea Gerst. 1857.
Ptilocera amethystina Vollen. 1857.
Ptilocera smaragdina Walk. 1849.
Tinda indica Walk. 1851 (*bispinosa* Thoms. 1869).
Rosapha bicolor Big. 1877.[6]
Negritomyia maculipennis Macq. 1849.
Musama ? paupera Walk. 1864.
Nemotelus albiventris Thoms. 1869.
Eulalia claripennis Thoms. 1869.
Eulalia ochropa Thoms. 1869.[7]
Microchrysa flaviventris Wied. 1824 (*annulipes* Thoms. 1869).

TABANIDÆ

Chrysops cincta Big. 1892.
Chrysops dispar Fabr. 1798.
Chrysops manilensis Schin. 1868.
Chrysops signifer Walk. 1861.
Chrysozona lunulata Macq. 1867.
? Diachlorus flavipennis Macq. 1850.
Tabanus ixion O. S. 1882.
Tabanus vanderwulpi O. S. 1882.
Tabanus striatus Fabr. 1794 (*manilensis* Schin. 1868).
Tabanus factiosus Walk. 1860.[8]

RHAGIONIDÆ

Atherix limbata O. S. 1882.
Chrysopilus ferruginosus Wied.
Chrysopilus correctus O. S.[9]

ASILIDÆ

Leptogaster princeps O. S. 1882.
Stichopogon peregrinus O. S. 1882.
Damalina cyanella O. S. 1882.
Damalina semperi O. S. 1882.
Damalis immeritus O. S. 1882.
Damalis vitripennis O. S. 1882.
Damalis nigellus Wulp. 1872.
Laphria dimidiata Macq. 1846.
Laphria partita Walk. 1857.
Laphria phalaris O. S. 1882.
Laphria pseudolus O. S. 1882.
Laphria scapularis Wied. 1828.
Promachus forcipatus Schin. 1868.
Promachus maculosus Macq. 1834.
Promachus manillensis Macq. 1838.
Promachus varipes Macq. 1838.
Philodicus integer Macq. 1846.
Philodicus longipes Schin. 1868.
Philodicus albispina Thoms. 1869.
Neoitamus ? longistylus Wied. 1828.
Ommatius chinensis Fabr. 1794.
Ommatius nanus Walk. 1851.
Ommatius retrahens Walk. 1859.[10]
Emphysomera aliena O. S. 1882.

[6] The species, *R. habilis* Walk. 1860, was given by Kertesz, *Cat. Dipt.* (1908), **3**, 8, as from the Philippine Islands, but this error is corrected in *Ann. Mus. nation. Hung.* (1909), 379.

[7] Osten Sacken also records some unnamed species of *Geosargus* and *Ptecticus*.

[8] Osten Sacken also records 1 *Chrysozona* and 10 undetermined species of *Tabanus*.

[9] Osten Sacken mentions 3 undetermined species of *Chrysopilus*.

[10] Osten Sacken records also undetermined species of *Leptogaster*, *Damalis*, *Maira*, *Laphria* (7), *Promachus* (3), *Ommatius* (6), *Asilus* (12), and *Proctacanthus*. Macquart has erroneously recorded *Microstylum dux Wied.* and *Hoplistomerus serripes* Fabr.

BOMBYLIDÆ

Hyperalonia oenomaus Rond. 1875.
Hyperalonia flaviventris Dol. 1857.
Hyperalonia umbrifera Walk. 1849.
Anthrax distigma Wied. 1828.[11]

THEREVIDÆ

Psilocephala lateralis Esch. 1822.

EMPIDIDÆ

Elaphropeza exul O. S. 1882.[12]

DOLICHOPODIDÆ

Agonosoma vittatum Wied. 1819.
Agonosoma crinicorne Wied. 1874.
Diaphorus aeneus Dol. 1856.
Diaphorus maurus O. S. 1882.[13]

SYRPHIDÆ

Asarcina aegrota Fabr. 1805.
Asarcina consequens Walk. 1856.
Baccha pedicellata Dol. 1856.
Graptomyza literata O. S. 1882.
Graptomyza microdon O. S. 1882.
Eristalis agyrus Walk. 1849.
Eristalis babytace Walk. 1849.
Eristalis plistoanax Walk. 1849.
Megaspis errans Fabr. 1787.
Axona chalcopyga Wied. 1830.
Tubifera celeber O. S. 1882.
Milesia bigoti O. S. 1882.
Milesia ritsemae O. S. 1882.
Milesia semperi O. S. 1882.[14]

PHORIDÆ

Aphiochaeta banksi Brues 1909.
Aphiochaeta curtineura Brues 1909.[15]

TACHINIDÆ

Scopolia spinicosta Thoms. 1869.
Rutilia dubia Macq. 1843.
Sarcophaga frontalis Thoms. 1869.
Sarcophaga spininervis Thoms 1869.
Sarcophaga brevis Walk. 1864.
Sarcophaga sericeonitens Walk. 1861.
Rhynchomyia indica Rond. 1875.
Stomatorrhina muscina Rond. 1875.
Stomatorrhina lateralis Wulp. 1881.
Cosmina prolata Walk. 1860.
Phumosia abdominalis R. D. 1830.
Lucilia tagaliana Big. 1877.
Lucilia philippinensis Macq. 1843.
Lucilia fortunata Walk. 1860.
Lucilia ditissima Walk. 1861.
Chrysomya dux Esch. 1822.[16]

[11] Osten Sacken records a *Hyperalonia* near *Tantalus* and an undetermined *Anthrax*.

[12] Osten Sacken has also a *Noeza* sp.

[13] Osten Sacken records an undetermined *Agonosoma* and a *Diaphorus*.

[14] Osten Sacken records some undetermined species of *Syrphus* (2), *Sphaerophoria, Baccha* (2), *Neosseia, Graptomyza, Eristalis* (3), *Tubifera*, and a *Milesia* near *conspicienda* Walk.

[15] Osten Sacken records an undetermined species of *Phora* and a species of *Dorylas* (*Pipunculus*).

[16] Osten Sacken records also some undetermined species of *Dexia, Prosena, Masicera, Miltogramma*, etc.

MUSCIDÆ

Musca conducens Walk. 1860.
Musca niveisquama Thoms. 1869.
Musca bivittata Thoms. 1869.
Musca favillacea Walk.
Anthomyia manillensis Frauenf. 1867.
Lispa grandis Thoms. 1869.[17]
Coenosia picicrus Thoms. 1869.

SCIOMYZIDÆ

Sepedon javanensis R. D. 1830.

CELYPHIDÆ

Celyphus obtectus Dalm.
Celyphus scutatus Wied. 1830.
Celyphus levis Wulp. 1881.

LAUXANIIDÆ

Lauxania latifrons Thoms. 1869.[18]

LONCHAEIDÆ

Lonchaea punctipennis Walk. 1860.

ORTALIDÆ

Scholastes cinctus Guér. 1830.
Lamprogaster placida Walk. 1849.
Notopsila sexpunctata O. S. 1882.
Notopsila curta O. S. 1882.
Rivellia fusca Thoms. 1869.
Pseudepicausta chalybea Dol. 1859.
Plagiostenopterina calcarata Macq. 1843.
Plagiostenopterina trivittata Walk. 1849.
Plagiostenopterina aenea Wied. 1823. (*abrupta* Thoms.).
Antineura stolata O. S. 1882.
Antineura sericata O. S. 1882.
Philocompus cupidus O. S. 1882.
Xenaspis polistes O. S. 1882.
Naupoda platessa O. S. 1882.[19]

TRYPANEIDÆ

Chaetodacus ferrugineus Fabr. 1794.
Chaetodacus icarus O. S. 1882.
Adrama determinata Walk. 1857.
Enicoptera proditrix O. S. 1882.
Gastrozona cassandra O. S. 1882.
Acanthoneura maculipennis Westw. 1848.
Acanthoneura alcestis O. S. 1882.
Ptilona brevicornis Wulp. 1880.
Rioxa lanceolata Walk. 1857.
Rioxa manto O. S. 1882.
Spheniscomyia sexmaculata Macq. 1843 (*melaleuca* Walk.).
Acidia fossata Fabr. 1805 (*elimia* Walk.).
"*Acinia*" *stellata* Macq. 1843.[20]

DIOPSIDÆ

Diopsis subnotata Westw. 1848.
Teleopsis belzebuth Big. 1874.
Teleopsis motatrix O. S. 1882.
Teleopsis selecta O. S. 1882.
Sphyracephala cothurnata Big. 1874.

[17] Osten Sacken mentions an undetermined species of *Lispa*.
[18] Osten Sacken records also 10 undetermined species of *Sapromyza*.
[19] Osten Sacken mentions an undetermined *Lamprogaster*.
[20] Osten Sacken records also a *Rioxa* and a *Tephritis*.

SEPSIDÆ

Sepsis revocans Walk 1860.
Sepsis linearis Walk. 1849.[21]

TYLIDÆ

Taeniaptera chrysopleura O. S. 1882.
Taeniaptera galbula O. S. 1882.
Taeniaptera nigripes Wulp. 1881.
Taeniaptera monedula O. S. 1882.
Taeniaptera coarctata Walk. 1861.
Trepidaria territa O. S. 1882.
Eurybata hexopla O. S. 1882.
Eurybata semilauta O. S. 1882.
Telostylus maccus O. S. 1882.
Gymnonerius duplicatus Wied. 1830.
Gymnonerius fuscus Wied. 1824.

PSILIDÆ

Chyliza selecta O. S. 1882.

CHLOROPIDÆ

Chlorops vittipennis Thoms. 1869.
Gaurax dimorphus O. S. 1887.

EPHYDRIDÆ

Dryxo digna O. S. 1882.
Dryxo spreta O. S. 1882.
Notiphila sternalis Thoms. 1869.
Discomyza obscurata Walk. 1860.
Ephydra pleuralis Thoms. 1869.[22]

DROSOPHILIDÆ

Drosophila ananassae Dol. 1859.
Drosophila hypocausta O. S. 1882.

GEOMYZIDÆ

Cyrtonotum arcuatum O. S. 1882.

HIPPOBOSCIDÆ

Ornithoctona nigricans Leach (*batchiana* Walk.).
Olfersia nigrita Speis. 1905.
Myiophthiria reduvioides Rond. 1878 (*capsoides* Rond.).[23]

Total, 283 species.

FIRST CENTURY OF THE BAKER COLLECTION

The types of the new species here described are to be found in the collection of Prof. C. F. Baker, and cotypes, so far as specimens were available, in my collection.

1. **Evaza bipars** Walk. 1857.

A rare species, previously known only from Borneo, New Guinea, and New South Wales.

[21] Osten Sacken has 2 other species determined as *Sepsis testaceus* and *S. basifera*, by Walker.

[22] Osten Sacken records also a *Paralimna* sp.

[23] *Cyclopodia dubia* Westw., recorded by Walker, belongs to some other species.

2. **Ptilocera smaragdina** Walk. 1849.

I think that Osten Sacken's specimens are identical with these.

3. **Rosapha bicolor** Big. 1877.

An endemic and very characteristic species.

4. **Negritomyia maculipennis** Macq. 1849.

A common species, widely spread over the Malayan Archipelago and New Guinea.

5. **Microchrysa flaviventris** Wied. 1824.

Common throughout the whole Oriental Region, and found also in New Guinea.

6. **Solva flavipes** Dol. 1858.

Described from Amboina and recorded also from New Guinea. In our specimens the antennæ are yellow at the base, and the dark abdominal spots are almost fused together, forming a longitudinal stripe.

7. **Solva vittipes** nom. nov. (*vittata* Dol., 1858, not of Walker, 1837.)

Very distinct by the black longitudinal stripe on the underside of the hind femora. The abdomen is sometimes entirely black. The wings are wholly hyaline, not infuscated at the tip; the coxæ, however, are yellow, and the stripe of the femora is complete, differing therefore from the recently described *S. javana* Meij. of Java.

8. **Chrysops signifer** Walk. 1861.

Previously known from Batchian and Borneo.

9. **Tabanus rubidus** Wied. 1821.

Recorded from India, Java, and Sumatra. The single specimen examined shows the pattern of the abdomen as described by Schiner for his *T. manilensis;* but in regard to the form of the frontal callus, I think that Ricardo is right in considering the latter species as synonymous with the following.

10. **Tabanus striatus** Fabr. 1794.

Common over all the Oriental Region. Both sexes are represented in the collection, the males being the more numerous.

11. **Chrysopilus ferruginosus** Wied. 1879.

A common oriental species. Our specimens correspond very well with others formerly received from Formosa.

12. **Chrysopilus correctus** O. S. 1882.

A very distinct endemic species.

13. **Laphria dimidiata** Macq. 1846.

Widely spread over the Malayan Archipelago.

14. **Philodicus longipes** Schin. 1868.

An endemic species. I think it very probable that *Erax integer* Macq., 1846, is the same species.

15. **Ommatius chinensis** Fabr. 1794.

This is *O. fulvidus* of Osten Sacken's paper, a common species in the Oriental Region.

16. **Emphysomera aliena** O. S. 1882.

An endemic species.

17. **Systrophus sphecoides** Walk. 1860.

We have a single specimen which corresponds well enough with the description of this species. Previously known only from Celebes and Macassar.

Thorax entirely black, with a yellow vertical stripe from the humeri to the front coxæ which are black; metasternum distinctly bluish, with many transverse furrows. Front legs almost entirely yellow, only the femora brownish below, and the last tarsal joints dark.

18. **Agonosoma vittatum** Wied. 1819.

A beautiful species, widely spread over the Oriental Region.

19. **Paragus serratus** Fab. 1805.

Common in the Oriental (and also in the Ethiopian) Region, and also known from Formosa.

20. **Melanostoma planifacies** Macq. 1848.

A true *Melanostoma,* very distinct by the form of the face as described by de Meijere. Previously known only from Java. The previously unknown male has the abdomen entirely yellow, with very narrow black lines at the hind margins of the segments; genitalia of greater size, black, placed asymmetrically, the strong yellow penis prominent below. Legs entirely yellow.

21. **Asarcina ægrota** Fabr. 1805.

A common oriental species, known also from Formosa. Sack places it in the genus *Didea,* but it seems better to allow it to remain in the present genus, on account of the form of the oral opening, of the position of the ocelli, and of the presence

of a very distinct thoracic collar. The species is wanting in the synopses given by me in my papers on the genus, but it is easily known from any other by the broad blackish band on the wings.

22. **Syrphus nectarinus** Wied. 1830.

This species is only an oriental variety of the common *S. balteatus* DeG.

23. **Baccha pulchrifrons** Aust. 1893.

A distinct species previously known only from Ceylon and Java.

24. **Baccha purpuricolor** Walk. 1859.

Seems to be a common species. Known before from Key Island and Mysol.

25. **Graptomyza brevirostris** Wied. 1820.

Formerly known from Java and the Nicobar Islands. A well differentiated species, new for the Philippines.

26. **Megaspis errans** Farb. 1787.

A common species in the Oriental Region.

27. **Syritta orientalis** Macq. 1842.

Formerly known only from India and Java.

28. **Eumerus flavicinctus** Meij.

Described from Java. Easily distinguished by the yellow scutellar margin. It seems to me very probable that *E. figurans* Walk. from Celebes is the same species.

29. **Eumerus bimaculatus** Dol. 1858.

A species described from Amboina, well distinguished by the coloration of the abdomen. The enigmatical *Citibaeus aurata* Walk. from Borneo seems to be an allied form.

30. **Prosena pectoralis** Walk.

Seems to be a common species. Formerly recorded only from New Guinea.

31. **Stilbomyia fulgida** Big. 1859.

A very fine species, originally from Celebes, and new to the Philippines. From Formosa I have received the allied *S. fuscipennis* Fabr.

32. **Lucilia fortunata** Walk. 1860.

Corresponds very well with the description of the type from Celebes, and is a true *Lucilia*.

33. **Pseudopyrellia lauta** Wied. 1830.

Described from Java and common in the Oriental Region.

34. **Stomoxys calcitrans** L. 1758.

A specimen from the Philippines is identical with others from Europe. Very common.

35. **Lispa pectinipes** Beck.

Our specimens agree with cotypes from Cairo in my collection. Formerly known from Egypt, Canary Islands, and Delagoa Bay. Stein has recorded it also from Java.

36. **Pygophora lobata** Stein. 1900.

Described from Singapore and New Guinea, and recorded from Java. Easily distinguished by the shape of the antennal arista and by the enormous male genitalia. The female is without doubt that described by Stein, and is very different from the male; there are specimens of both sexes in this collection.

37. **Sepedon plumbellus** Wied. 1830.

This is *S. javensis* of Osten Sacken's Enumeration, page 193, a species which, according to Hendel's paper, 1911, is widely spread in the Oriental Region and New Guinea.

38. **Sepedon violaceus** Hendel. 1909.

Described from Hongkong, recorded from Calcutta, and common in Formosa. The present specimens have the tip of the wings distinctly infuscated.

39. **Celyphus levis** Wulp. 1881.

This species has the arista dilated, and is certainly not a *Paracelyphus*. It seems to be variable in the coloring of the body and legs, from black to brownish yellow. The determination for the present is doubtful.

40. **Steganopsis bakeri** sp. nov.

Male.—Very near *S. pupicola* Meij. from Java, distinguished by the greater size, the front tarsi being entirely black, and the femora not being yellow at apex.

Length of body, 4 mm.; of antennæ, 1 mm.

A very distinct and interesting species, belonging, without any doubt, to this genus, erected in 1910 by de Meijere. The anterior fronto-orbital bristle is turned forward, as shown in his figure, and not backward as stated in the description.

Head entirely shining black; frons as broad as the eye, with a middle longitudinal furrow and some transverse furrows; face cylindrical, oblique, with very numerous but thin transverse

furrows; prælabrum broad, prominent, shining black; proboscis and palpi black; antennæ very long, brownish yellow near the base, the third joint blackish, very much restricted after the insertion of the arista which is plumose. Thorax shining black, thickly punctulate, very short pilose; pleuræ whitish yellow; chest and sternopleuræ shining black, but the last with a narrow yellow streak on the upper margin. Bristles: 2 pairs of dorsocentral, 1 humeral, 1 præsutural, 2 notopleural, 3 supra-alar, 1 fine mesopleural, and 1 sternopleural. Scutellum black, flattened, punctulate as is the mesonotum, bare, with 4 strong bristles, the apical not crossed. Metanotum shining black. Halteres black. Abdomen flattened, entirely shining black, and very short blackhaired. Genitalia very small and black. Legs shining black; middle and hind tibiæ yellow with black tips; middle and hind tarsi yellow; front legs entirely black, the femora reddish beneath; front tarsi distinctly broadened. Wings brownish, almost black along the costal margin to the second vein; veins black, arranged as in *pupicola*.

41. **Pachycerina apicalis** sp. nov.

Male.—Very closely related to *P. javana* and *P. seychellensis* Lamb, 1912, but distinguished by the coloration of the wings, which have a brown costal margin and a narrow whitish apical lunule between the ends of second and fourth veins.

Length of body, 2.5 mm.; of antennæ, 0.8 mm. Frons opaque yellow, reddish toward the eyes, with a round opaque black spot on the ocelli, not prolonged forward; frontoörbital bristles inserted on brownish dots; face shining reddish, slightly convex, not prominent, with a round black shining spot on each side; prælabrum reddish; palpi black at the apex; antennæ yellow, the third joint very long, brownish black; arista short plumose, not feathered. Mesonotum shining reddish, almost bare; brown longitudinal stripes very indistinct; a broad yellowish streak extending from propleura along mesopleura to the hypopleura. Thoracic chætotaxy normal; 1 mesopleural and 1 sternopleural bristle. Scutellum, like mesonotum, with 4 bristles, the apical two parallel. Abdomen shining reddish, scarcely pilose; genitalia round, light yellow. Legs entirely yellow; front tarsi black, the first joint with yellow base. Wings with the second longitudinal vein, at the base, very divergent from the third, afterward passing near to the costa; third and fourth veins straight and almost parallel. Wings grayish; the costa brown from the end of the first vein to the end of the second, from whence it continues more diffused, to the hind margin of the

wing, ending below the apex of the fourth vein. The whitish apical lunule is very distinct.

42. **Lauxania (Sapromyza) lucida** Meij. 1910.

Described from Java. An entirely shining yellow species with a black ocellar dot, and with the acrostichal bristles arranged in 6 series. The third antennal joint is darkened.

43. **Lauxania (Sapromyza) punctipennis** Meij. 1908.

Described from Java, and distinguished by the pattern of the wings, which is very like that figured by Lamb for his *S. striata.*

44. **Lauxania (Sapromyza) ornatipennis** Meij. 1910.

Formerly known only from Java, and easily distinguished by the coloration of the wings, antennæ, and legs. The allied *L. lunifera* Meij. has been found in Formosa.

45. **Trigonometopus albiseta** sp. nov.

Allied to *brevicornis* Meij. from Java, and exhibiting also 2 pairs of frontoörbital bristles (*T. monochæta* Hendel has only a single pair), but very distinct in the color pattern of wings and legs.

Female.—Length of body, 3.5 mm. Head grayish yellow; frons with a broad brown middle stripe; a black triangular spot between antenna and eye; a vertical brown stripe on each side of the face below; 2 horizontal stripes on the cheeks below the eyes, the superior being broader; antennæ light yellowish, the second joint darkened above, the third not pointed; arista whitish, rather long pubescent. Mesonotum and scutellum yellow, with 4 equidistant brown stripes on the back, the 2 middle ones prolonged on the scutellum; there is also a short brown notopleural stripe; mesopleura dark brown, toward the middle with a yellowish horizontal stripe; sternopleura brown, with the superior border yellow. There are 3 pairs of strong dorsocentral and 2 pair of præscutellar bristles. Halteres whitish. Abdomen yellow, each segment with a brown hind border, which is narrower in the male and broader in the female, the abdomen of the latter becoming almost all brown. Male genitalia rounded, yellow. Legs with the coxæ yellowish white; tibiæ with black apices; middle and hind femora outwardly with a broad oblique black band near the base; tarsi darkened. Wings whitish gray, last portion of the fourth longitudinal vein as long as twice the preceding and without stumps; costal cell hyaline; a brown fore border from the end of the auxiliary vein to the end of the second

vein, reaching below to the second vein; a broad apical brown band, fused with the costal border and reaching the hind margin of the wing; a whitish apical lunule between ends of second and fourth veins; the 2 cross-veins have also broad dark margins, the dark margination of the hind cross-vein forming a preapical band.

46. **Trigonometopus bakeri** sp. nov.

Somewhat allied to the preceding species, showing also 2 pairs of orbital bristles, but well distinguished by the unicolorous yellow legs, long and thin brown arista, and different color pattern of head and wings.

Length of body, 5 mm. Head yellow; frons with a very narrow middle longitudinal brown stripe; a small black spot between antennæ and eyes; face retreating, wholly yellow, without black stripes, the lateral carinæ only being narrowly brown; cheeks with a short black stripe just below the eye. Antennæ short, wholly yellow, the third joint rounded at the apex; arista brown, very long, hair-like, short pubescent. Mesonotum and scutellum as in the preceding species, but with the brown stripes broader, the notopleurals being almost fused with the externals. Halteres with brown knob. Abdomen dark yellow, lighter at the base; segments with a black hind border which is broadened laterally; genitalia small, yellowish; venter pale, bristles black. Legs wholly whitish yellow, without any distinct dark marking; tarsi darkened at apices; front femora like the preceding, with 3 or 4 very long bristles beneath. Wings narrow and long; third and fourth veins parallel; cross-veins less approximate; distal portion of fourth vein once and a half as long as the preceding, without stumps. The brown of the costal margin fills up the costal cell, and, beginning at the base, is dilated to the fourth vein, after the hind cross-vein; there is no hyaline apical lunule; the cross-veins are very narrowly bordered with fuscous.

Genus **LONCHAEA** Fallén.

This collection includes very numerous species of this important genus, partly reared from different kinds of fruits by Professor Baker. None of these species are at all similar to any of those described by Kertesz, Meijere, or Lamb. I present here a table separating the species, remarking that all of them agree in the following characters: eyes bare; cheeks narrow; antennæ reaching the epistome; legs entirely black.

Key to species of Lonchaea.

a^1. Squamulæ brown, black behind.

b^1. Scutellum on the sides with numerous short bristles; arista long plumose; abdomen black, very shining; length about 5 mm. **citricola** sp. nov.

b^2. Scutellum having, besides the usual bristles, only a few short bristles near the apex; arista short plumose; abdomen brownish, less shining; length about 3 mm. **ficiperda** sp. nov.

a^2. Squamulæ white or light yellowish; white haired.

c^1. Males.

d^1. Last abdominal segment twice as long as the preceding, deeply excavate in the middle, terminating in the form of two points, and being long pilose. **excisa** Kert.

d^2. Last abdominal segment shorter, not excavated, and more or less pilose.

e^1. Last abdominal segment less pilose; hypopygium small, with a prominent yellow penis. **filifera** sp. nov.

e^2. Last abdominal segment long pilose; hypopygium more developed, but without prominent penis. **setifera** Meij.

c^2. Females.

f^1. Arista rather long plumose as usual; scutellum with some bristly hairs on the sides and at the apex.

g^1. Scutellum not pollinose, shining black; abdomen brownish; wings hyaline; ovipositor exserted. **ficiperda** sp. nov.

g^2. Scutellum grayish pollinose; abdomen shining black; ovipositor retracted. **filifera** sp. nov.

f^2. Arista very short plumose; scutellum aeneous, not pollinose, with the usual 4 bristles and only a pair of shorter bristly hairs between basal and apical bristles. **calva** sp. nov.

47. **Lonchaea citricola** sp. nov.

A shining black species, distinguished by the black squamulæ and very bristly scutellum, and by its greater size. It was reared from *Citrus* fruits, together with *Monacrostichus citricola* sp. nov. It seems to be allied to *L. biroi* Kert. and *L. obscuripennis* Meij.

Male.—Length of body, 4.5 to 5 mm. Frons opaque velvety black, one-fifth as broad as of the head; face gray pollinose; arista black, yellowish at the base, rather long plumose; third antennal joint broad; lunule black; palpi black and bristly. Mesonotum and scutellum not pollinose, the latter with very numerous bristly hairs on the sides, at least 14 or 15 pairs, 2 or 3 of which are apical. Last abdominal segment short and not specially pilose; hypopygium very small, with the penis not prominent. Wings grayish hyaline, with yellowish veins.

48. **Lonchaea ficiperda** sp. nov.

A small, brownish, less shining species, distinguished by the different coloring of the squamulæ in both sexes. Reared from maggots in fruits of *Ficus megacarpa* Merrill.

Male and female.—Length of body, 3 to 3.2 mm.; of the exerted ovipositor, 1.3 mm. Face and frons as in *L. citricola*, the frons of the female twice as broad as that of the male. Third antennal joint narrow; arista black, shorter plumose. Scutellum not pollinose, with 3 or 4 pairs of lateral bristly hairs, 2 or 3 on the sides and 1 on the apex. Halteres black. Abdomen of the male with the last segment short and not especially pilose; hypopygium small, with penis not distinct. Wings hyaline.

49. **Lonchaea excisa** Kertesz, 1901.

A shining black species, well distinguished by the shape and pilosity of the last abdominal segment of the male, as figured by Meijere. *L. plumata* Lamb, 1912, from the Seychelles seems to be a very closely allied species, if not the same. The pollinose scutellum bears 3 or 4 pairs of small bristles, 1 pair being apical.

50. **Lonchaea filifera** sp. nov.

A shining black species, with white squamulæ in both sexes, distinguished by the prominent yellow penis of the male.

Male and female.—Length of body, 3.5 mm. Frons of male rather broad, one-fourth of the width of the head, somewhat shining sericeous; antennæ slightly brownish at the base, the third joint gray, arista rather long pilose. Mesonotum posteriorly and scutellum pollinose, the latter with 3 or 4 pairs of small bristles, 1 pair being apical. Last abdominal segment of male once and a half the length of the preceding, not setose; hypopygium very small; penis prominent, in the shape of a thin pale yellow hair, longer than the usually black surrounding hairs; of the female ovipositor only the point is visible. Wings hyaline or slightly infuscated.

51. **Lonchaea setifera** Meijere, 1910.

A shining black species, closely allied to the preceding, but distinct by the last abdominal segment, as figured by Meijere. Scutellum the same as in the preceding.

52. **Lonchaea calva** sp. nov.

Shining æneous on mesonotum and scutellum, black on the abdomen. Very distinct from any other species in the short pilose arista and the bare scutellum.

Female.—Length of body, 3 mm.; of ovipositor, 1 mm. Frons

as broad as one-fourth the width of the head; arista black, very short pilose. Scutellum small, with only a pair of lateral small bristly hairs. Halteres black. Ovipositor exserted. Wings hyaline.

53. **Plagiostenopterina ænea** Wied. 1830.

A common species in the Oriental Region. Known also from Formosa.

54. **Plagiostenopterina calcarata** Macq. 1843.

Well distinguished by its beautiful shining blue coloring and by the strong trochanteral spine of the male.

55. **Plagiostenopterina trivittata** Walk. 1869.

Distinguished by the color pattern of the thorax; the same as *P. zonalis* Rondani, from Borneo. Walker placed it originally in *Dacus*.

56. **Elassogaster sepsoides** Walk. 1861.

Described from Amboina and Batchian, and as *E. unimaculatus* Kert. from New Guinea. Found also in Formosa. Its similarity to *Sepsis viduata* Thoms. is very striking.

57. **Rivellia basilaris** Wied. 1830.

Described originally from Sumatra, and recently recorded from Formosa.

58. **Rivellia fusca** Thoms. 1869.

An endemic species.

59. **Gorgopsis cristiventris** Gerst. 1860.

A very peculiar species, described originally from Amboina.

60. **Naupoda platessa** O. S. 1882.

A very interesting endemic species.

61. **Chrysomyza ænea** Fabr. 1794.

A common species in the Orient. Known also from Formosa.

62. **Chætodacus caudatus** Fabr. 1805.

Common in the Oriental Region. A specimen in this collection agrees with the description of the var. *nubilus* Hendel, from Formosa, having the posterior cross-vein only shaded below, but it has the brown spot at the apex of the femur.

63. **Chætodacus cucurbitæ** Coq. 1899.

The present material agrees with my specimens from India. The allied *synnephes* Hendel, from Formosa, has four scutellar bristles.

64. **Chætodacus ferrugineus** Fabr. var. **pedestris** nov.

Mesonotum, pleuræ, and metanotum intensely black, with the typical yellow streaks and spots; the brown spots on the frons very well marked, including a central large round dot. Tibiæ dark brown, the posterior ones black; all the femora with a broad black ring before the apex most strongly developed on the fore pair, on the middle and hind pairs distinct at least on the underside. Costal border of the wings broader and darker.

Length of body, 6 to 8 mm.

This form of the variable species is closely allied to *C. dorsalis* Hendel from Formosa (which may be a form of *C. ferrugineus*), but is at once distinguished by the color of the legs. The typical Indian form has the legs more yellow; var. *obscuratus* Meij. has no yellow lateral stripes on the dorsum; *C. cilifer* Hendel has the yellow lines, but shows a wholly black abdomen.

Genus **MONACROSTICHUS** novum

According to my paper on Indian trypaneids, true species of *Dacus* are wanting in the Oriental Region, where are to be found only species of *Bactrocera* and *Chaetodacus*. Professor Baker has, however, sent to me what is in certain characters a true *Dacus*, but it has no anterior supra-alar and no præscutellar bristles. This form shows, however, so many other unique peculiarities, that I think it better to erect for it a new genus, the type of which might perhaps be considered *Dacus longicornis* of Wiedemann (not of Guérin-Méneville which is a *Bactrocera*), although it is certainly well represented by the new species *M. citricola*. It may be characterized as follows:

Like *Chætodacus*, but without anterior supra-alar and præscutellar bristles; antennæ very long and geniculate; abdomen conspicuously constricted about the base, club-shaped as in *Conops;* front femora with some spines beneath near the apex; second abscissa of the fourth longitudinal vein very sinuose before the small cross-vein, the discoidal cell being therefore very distinctly narrowed near the base.

A particular feature of this genus (or at least of the species described below), and which I have never before noted in any trypaneid known to me, is the presence of a single but rather strong, acrostichal bristle placed on the middle line before the suture, and therefore not paired. Of 5 specimens examined, 3 do not have this peculiar bristle, 1 has it on the suture, and 1 before the suture.

The type of the genus is *Monacrostichus citricola* sp. nov.

The genera of true Dacinæ known from the Oriental Region can be distinguished as follows:

Key to the genera of Dacinæ of the Oriental Region.

a^1. Femora not spinose beneath; anterior scutellar and præscutellar bristles present.
  b^1. Wings banded..... **Bactrocera** G.-M.
  b^2. Wings not banded..... **Chætodacus** Bezzi.
a^2. Femora spinose, at least those of the first pair.
  c^1. Anal cell drawn out in a long point; second basal cell dilated; arista bare; abdomen club-shaped.
    d^1. The first 2 joints of the antennæ united in a single joint, forming a unique peduncle..... **Callantra** Walk.
    d^2. The first 2 joints of the antennæ wholly separated. **Monacrostichus** gen. nov.
  c^2. Point of the anal cell very short; second basal cell not dilated; arista short plumose; abdomen cylindrical; all the femora spinose.
    e^1. Antennæ much longer than the face..... **Meracanthomyia** Hendel.
    e^2. Antennæ shorter than the face..... **Adrama** Walk.

Key to the presumptive species of Monacrostichus.

a^1. Wings cinereous, tawny along the costa and along the veins, blackish toward the apex; face with a broad triangular black spot in the middle; mesonotum tawny with a black dot on each side of the fore border; length "8 lines;" (Waigoe.) (This species is perhaps a *Xenaspis*)..... **sepedonoides** Walk.
a^2. Wings grayish hyaline, with a brown streak along the costal border; length 8–9 mm.
  b^1. Dark costal margin of wings extending to the fourth vein; anal cell with a brown streak; face with an elongated black mark on each side; femora broadly blackish brown. (Gosford, N. S. W.). **aequalis** Coq.
  b^2. Brown costal border not reaching the fourth vein; anal streak wanting.
    c^1. Face with a black oral border; brown border of wings passing the third vein; femora yellowish or blackish.
      d^1. Palpi yellow; face with a black dot on each side; yellow spot on sternopleura small; femora yellowish (Java). **longicornis** Wied. (*vespoides* D.)
      d^2. Palpi black; face broadly black below; spot on sternopleura broad; femora blackish, somewhat yellow at both ends (Java). **conopsoides** Meij.
    c^2. Face in the middle with a transverse black band united with the black antennal cavities; this band is dilated below toward the middle and prolonged to the mouth; dark yellowish costal area of wings hardly passing the third vein; femora yellow, with a broad black streak below; palpi yellow..... **citricola** sp. nov.

65. Monacrostichus citricola sp. nov.

A very distinct waspish-looking fly, which seems to be allied to *longicornis*, but is easily distinguished from that and its allies by the peculiar color pattern of the face. Professor Baker

has reared this from *Citrus* fruit, at Los Baños, P. I., together with *Lonchaea citricola* sp. nov.

Male and female.—Length of body, 9–10 mm.; of wing, 8–9 mm.; of the antennæ, 3 mm.; of the ovipositor, 1.5–3 mm. Head as described by Meijere for his *conopsoides;* frons without lateral spots, but with a large rounded middle spot; the peculiar black middle band of the face with the yellow portion over it prominent in the form of a broad tubercle; the palpi are sometimes infuscated, brownish; third antennal joint black; arista dark reddish; there is only the basal pair of frontoörbital bristles. Mesonotum blackish brown, with 2 approximate broad longitudinal gray bands; the median triangular yellow spot behind the suture is well developed; pleural yellow stripe ending on the middle of the sternopleura; metanotum black, yellow laterally, this yellow uniting with the yellow hypopleural spot. Scutellum yellow, narrowly black at the base, with a pair of weak apical bristles. Pteropleural bristle distinct, but not very strong. First abdominal segment black; second black with a narrow yellow hind border, and a broad yellow median band interrupted centrally by a black line; other segments reddish yellow, with golden pubescence, and a broad black band on anterior half; third segment of the male not ciliated; ovipositor short, flattened, reddish with brownish base. Legs yellowish red, all the femora below with a broad black longitudinal band; hind tibiæ brown; first joint of all the tarsi whitish. Front femora with 3 or 4 black spines near the apex. The dark yellowish costal area of wings extends caudad to fourth vein as far as the origin of basal cross-vein, after which it extends little caudad of the third; anal cell hyaline, its point very long and acute, the stump of the sixth vein very short.

66. **Enicoptera proditrix** O. S., 1882.

A very fine species, which on account of its complete chætotaxy cannot be placed among the Dacinæ, which it resembles only in the want of the sternopleural bristles. Enderlein has recently recorded this species from Sumatra.

67. **Gastrozona capillata** sp. nov.

This and the following species can be placed in my genus *Gastrozona* on account of the form of the antennæ, want of ocellar bristles, and color pattern of the wings; but they differ from the typical species in having very numerous (6 or 7) lower frontoörbital bristles.

Female.—Length of body, 6 mm.; of ovipositor, 1.5 mm.

Head whitish; frons yellow; a black spot on the middle of the occiput; all the bristles black, the genal bristles rather strong; no distinct ocellar bristles; the 6 pairs of lower frontoörbitals are bent inward; antennæ yellow, not reaching the epistome, the third joint rounded at the apex; arista long but thinly plumose; palpi yellow, short pilose, very much dilated. Mesonotum shining black; the humeri and a broad oblique band crossing the metapleura and reaching the pteropleura are whitish; hypopleura and sides of metanotum also whitish; chætotaxy complete, nearly all the bristles black, only the 2 or 3 mesopleural ones yellow. Scutellum wholly white, with 4 black bristles and some yellow hairs on the middle. Squamulæ grayish; halteres whitish. Abdomen shining black, with black pile and bristles at end; first segment yellow with yellow pile; a quadrate yellow spot toward the middle of the penultimate segment; ovipositor flattened, shining black. Venter yellow. Legs with coxæ and tarsi entirely pale yellow; all the bristles yellow; middle tibiæ with a single black spur; row of hairs on the hind tibiæ short but strong. Wings with the third vein bristly to the end; small cross-vein a little before the middle of the discal cell. Wing pattern brown, very similar to those of Plate VIII, figs. 17 and 18, of my paper on Indian trypaneids; but the brown costal area is entire, not interrupted after the stigma, which is wholly black, showing only a small hyaline spot before the base and another beyond the apex; the subapical cross band is united with the costal band; the band on the hind cross-vein is prolonged obliquely to the anal vein, forming a band almost parallel to the hind margin.

68. **Gastrozona luteiseta** sp. nov.

A yellow species with black and white markings, allied to the preceding, but distinguished by a different wing pattern, and entirely yellow bristles, only the dorsocentrals being black.

Male.—Length of body, 6 mm. Head and its appendages as in the preceding, but all of the bristles, including those of the occipital row, yellow; no ocellar bristles. Mesonotum yellow with yellow pile; the white pleural markings as in the preceding species; a spot over the humeri and the hind border of the back along the base of the scutellum, black; a spot on the hypopleura and metanotum black; chætotaxy normal, the bristles yellow, only the two dorsocentrals black. Scutellum whitish, yellow on the sides above, with 4 yellow bristles, and numerous and long yellow hairs on the middle. Squamulæ and halteres white. Abdomen wholly yellow, shining; there are on the middle 2

parallel, longitudinal black stripes, from the second to the fourth segment; sides of last segment black beneath; genitalia yellow; hairs yellow, but some black bristles on last segment. Legs entirely as in the preceding. Wings with a similar pattern, but the costal area is yellow, not brown, and distinct from the costa, the costal cell with the stigma being hyaline; the gray band on the hind cross-vein is isolated and narrow; there is a small gray spot toward the middle of the anal vein; the apical and subapical bands are gray, not brown.

69. **Acanthoneura maculipennis** Westw.

This characteristic and not rare species is represented by a male.

70. **Ptilona brevicornis** Wulp.

Our specimens represent the typical form, very distinct by reason of its reduced chætotaxy. I have seen it also from Formosa.

71. **Rioxa caeca** sp. nov.

Very near the female of *lanceolata* (as described by Enderlein), but distinguished by the want of the apical hyaline spot of the wings.

Female.—Length of body, 9 mm.; of ovipositor, 2.5 mm. Head with its appendages yellow; all the bristles black; orbital bristles 2 and 3, the first very small. Mesonotum and pleuræ light yellow, dark brownish on the back but without distinct color pattern; chætotaxy complete. The middle pair of lateral bristles on the scutellum only a little weaker than the others. Halteres yellow with brownish knob. Abdomen shining black, the basal yellowish middle stripe very narrow, less distinct, not surpassing the third segment. Legs with the tarsi entirely pale yellowish. Wings with the characteristic black foremargin of *R. lanceolata,* without any hyaline spot on the stigma and without any hyaline indentation; there are only 2 very small hyaline discal dots, one near the base of the first posterior cell, the other near the apex of the discal cell; 2 larger dots are to be seen in the second posterior cell at the hind margin; a dot on the apex of the third posterior cell, which is hyaline in its greater part as is also the axillary cell. There is also a yellowish, less distinct, spot just over the small cross-vein; the hyaline apical spot between the ends of third and fourth veins is wholly wanting. The second longitudinal vein is a little wavy, but not so much so as in *Acanthoneura.*

Genus **SPILOCOSMIA** novum

It is necessary to erect this new genus for a species in this collection which shows a striking coloring of the body, combined with a pointed third antennal joint, and want of ocellar bristles. Head broad; eyes rounded; third antennal joint not reaching the epistome, and with its external angle very pointed; arista plumose; orbital bristles, 2.2 mm.; occipital row with thin, black bristles; genal bristle strong. Palpi rather narrow, bristly. Thoracic chætotaxy complete; a very strong pteropleural; 2 mesopleurals. Scutellum with 4 bristles. Abdomen bristly at the end. Front femora with a row of bristles beneath; middle tibiæ with 2 spurs; hind tibiæ with a row of strong hairs. Wings broad, with a strong costal bristle; stigma short; second vein straight; third vein bristly over its whole length; a small cross vein after the middle of the discal cell; anal cell drawn out in a long point. Body yellow with black spots. Wings with yellow and brown cross bands, without basal streaks.

Type: *Spilocosmia bakeri* sp. nov.

This genus seems to be allied to the Bornean *Chelyophora* Rondani.

72. **Spilocosmia bakeri** sp. nov.

A yellow species, with 12 black spots on the body and with 1 yellow and 2 brown bands on the wings.

Male.—Length of body, 8 mm. Head pale yellow; frons darkened in the middle above the antennæ; there is also a very small black ocellar dot; a rounded black spot occurs on the face toward the middle of the epistome; antennæ yellow; palpi yellow, with black bristles. Mesonotum and scutellum entirely shining yellow; the rounded black spots are as follows: One on the humeral callus, 1 on each side of the median dorsal suture, at the second notopleural bristle, 1 at the inner supra-alar bristle (the largest of all), and 1 on the end of the scutellum. All the bristles are black. Squamulæ and halteres yellow. Abdomen elongate, entirely shining yellow, black pilose; last segment with a black spot on each side. Genitalia black. Venter yellow, with a marginal black line from second to fifth segment. Legs entirely yellow, black setose. Wings with yellow veins; stigma yellow; from it arises a yellow band which passes over the basal cross-veins to the anal cell; the 3 brown bands are narrow; the first band begins near the middle of the costa between the ends of the first and second veins, and passes obliquely over the small cross-vein to the hind margin, reaching it at the end of the anal

vein; the second begins a little before the end of the second vein, and, passing over the hind cross-vein, ends (where it is dilated) at the hind margin near the middle of the third posterior cell; the third band has the shape of an apical arch, which extends from the end of the second vein to the end of the fifth; this last band is broader than the others, but is interrupted toward the middle by an oblique hyaline streak, which ends at the apex of the fourth vein.

73. **Spheniscomyia sexmaculata** Macq. 1843.

A widely spread species, the distribution of which is from South Africa to the Philippines and Formosa.

74. **Rhabdochaeta bakeri** sp. nov.

Nearly allied to the type species of the genus (*R. pulchella* Meij. from Java), but distinguished by the scutellar bristles and wing pattern.

Male and female.—Length of body, 2.5 mm. Head and its appendages as in *R. pulchella;* third antennal joint very decidedly pointed; palpi feathered; frontoörbital bristle dilated. Thorax as in *R. pulchella;* scutellum with 6 dorsal bristles; there is a pair of smaller white bristles before the basal pair, which are longer and darker; the apical pair is crossed, and under this is to be seen another pair of smaller bristles, which are also crossed. Ovipositor short and truncate, and of a shining reddish color. Middle and hind femora with a single dark ring (the apical), which is mostly indistinct. Pattern of wings very much like that of *R. pulchella,* but around the blackish spot placed just above the hind cross-vein there are 3 reddish brown spots disposed in a triangle; the largest spot is in the discal cell, just below the small cross-vein. The coloring of the spots is very much like that of the similar spots in *Schistopterum moebii* Beck.

75. **Oxyna parca** Bezzi. 1912.

The present specimens are identical with those from India.

76. **Oxyna sororcula** Wied. 1830.

Agrees with my Canarian specimens.

77. **Trypanea amoena** Frauenf. var.

Some of our specimens agree with those from India, but differ in the want of the superior part of the brown streak issuing from the stigma and in the lack of the brown spot on the fifth vein.

78. **Diopsis subnotata** Westw. 1848.

A characteristic species, very distinct by its great size.

79. **Teleopsis belzebuth** Big. 1874.

The specimens from Formosa, referred to this common Philippine species by Hendel, seem to belong to some other species.

80. **Sepsis viduata** Thoms. 1869.

A very distinct dark species, previously known only from China.

81. **Sepsis spectabilis** Meij. 1906.

Previously known from Singapore and New Guinea.

82. **Taeniaptera galbula** O. S. 1882.

This fine Philippine species has recently been found also in Formosa.

83. **Eurybata semilauta** O. S. 1882.

An endemic species, very distinct in the peculiar wing pattern.

84. **Telostylus maccus** O. S. 1882.

The present specimens differ from the type by the want of the black spots on sternopleura and on hypopleura; the propleural spot is, on the contrary, very broad. This variability shows, perhaps, that *T. maccus* is only a form of the typical species *T. binotatus* Bigot; the allied *T. decemnotatus* Hendel from Formosa is possibly, also, only an extreme form.

85. **Telostylus niger** sp. nov.

Very near *T. maccus* in all plastic characters, but distinguished by the general black coloring, by reason of which it seems to be allied to the recently described neotropical *T. vittatus* Cressen.[24]

Female.—Length of body, 5.5 mm.; of antennæ, 2 mm.; of ovipositor, 1.3 mm. Head black; frons velvety black with a red spot above the antennæ; face red, with a velvety black spot on the cheeks; a pair of orbital bristles, 2 pairs of verticals, and a pair of crossed postverticals; antennæ red, the third joint a little infuscated near the tip; arista longer than remainder of the antennæ, white and short white pilose. Thorax brownish black on the dorsum, shining black on the pleuræ; on each side of the suture there is a dark reddish triangular spot, and above the root of the wings a broad velvety black one. Scutellum black, with 4 bristles, the basal pair very small. Halteres pale yellow. Abdomen shining black, short black haired; ovipositor with red tip. Legs reddish yellow, hind coxæ, tarsi, and fore tibiæ black; femora with a narrow black ring on the last third;

[24] *Ent. News* (1912), **23**, 390.

middle and hind tibiæ darkened. Wings as in *T. maccus*, but the apical third infuscated; there is also an infuscation on the fourth vein between the cross-veins.

86. **Gymnonerius fuscus** Wied. 1824.

Known also from Formosa through Hendel.

87. **Megamerina annulifera** Big. 1886.

A very distinct species, originally described from Celebes, and well placed in this genus by its author. The frons bears a distinct frontoörbital bristle.

88. **Gobrya bacchoides** Walk. 1860.

I think that Walker is in error in describing the arista of this species as pubescent; in the specimens before me it is very clearly plumose as described and figured by Meijere for his Javan *G. simulans*. This last, however, has a shining black abdomen, while in *G. bacchoides* there are 2 yellow bands, 1 narrower at the end of the second segment and 1 broader at the end of the third. The position of this strange insect among the Tylinæ is very doubtful; it has also but a superficial likeness to the Psilinæ; it is probably better to place it in a special subfamily Megamerininæ with some other genera, such as *Toxara*, *Syringogaster*, and *Syrittomyia*.

89. **Chyliza elegans** Hendel. 1913.

We have a female specimen of this species which was only recently described from Formosa. It differs from *C. selecta* in having the 2 basal joints of antennæ deep black, the legs entirely yellow, and the frons black toward the middle.

90. **Metopostigma sauteri** Beck. 1911.

This species is described as being common in Formosa. Our specimens agree very well with the description, but the frons shows in its anterior part an oblique brown spot on each side, of which Becker says nothing.

91. **Chlorops ochracea** Beck. 1911.

Originally described from Java, and easily distinguished by the black antennæ and the wholly yellow pleuræ and legs.

92. **Chromatopterum elegans** sp. nov.

This pretty species seems to be more nearly allied to the Ethiopian *C. delicatum* than to the Australian *C. pubescens*.

Female.—Length of body, 2.5 mm. Head whitish yellow; occiput entirely shining black; frontal triangle of greater size,

shining black and smooth, convex, reaching the base of the antennæ, where it is rounded and not pointed, and allows only a narrow streak of the yellow color on each side; antennæ short, dark yellow, the third joint almost rounded and brownish; arista brown, microscopically pubescent. Thorax shining black, but there are on the mesonotum before the suture 2 pale yellow parallel streaks, which thus give it the appearance of having 3 united black stripes; pleuræ shining brown, with a broad whitish stripe in the notopleural region, which reaches the middle of the mesopleura. Scutellum shining black, pale yellow toward the middle above; 2 very strong apical bristles. Halteres pure white. Abdomen shining black, pale yellow on the venter. Legs with the coxæ yellow; last tarsal joint blackish; hind femora darkened on the last half. Wings as figured by Becker [25] but the black fore border not surpassing the second vein at the base; apical brown spot surpassing the third vein and reaching the middle between the end of the third and fourth veins.

93. **Gaurax nigricornis** Beck. 1911.

Our specimens agree very well with the description in the coloring of the antennæ, legs, and wings; but the scutellum is entirely black above, being also as coarsely punctate as the mesonotum, and only below reddish or yellowish; the brown fore border of the wings covers almost all of the third vein.

94. **Gaurax dimorphus** O. S. 1882.

A female specimen is before me which I take to be the female of Osten Sacken's male, while the female of Osten Sacken's species belongs probably to some other species. This was not known to Becker. From Osten Sacken's description of the male there are the following differences: the basal joints of antennæ are black; the face and palpi are black; the first abdominal segment and the middle of the second are pale yellow; all the coxæ are yellow; middle femora narrowly black near the base; hind tibiæ broadly black toward the middle; hind femora wholly yellow.

95. **Pseudeurina maculata** Meij. 1904.

A very distinct species previously known only from Java.

96. **Notiphila sternalis** Thoms. 1869.

An endemic species and a true *Notiphila.*

[25] *Ann. Mus. nat. Hung.* (1910), Pl. 13, fig. 10.

97. **Paralimna nitens** sp. nov.

Near *P. javana* Wulp., but distinguished by the color of the head and of the thorax; *P. chinensis* Wied. seems to be another allied species, while *P. sinensis* Schiner is very different.

Male and female.—Length of body, 3.5 mm. Head black, shining on the occiput; face, cheeks, and prælabrum light gray; frons dull, shining along a middle broad longitudinal stripe, with 2 small white dots on each side near the eyes, velvety black in front; cheeks velvety black above, with a white spot; antennæ short, black, the second joint with a white spot above; arista with 9 or 10 rays; palpi and proboscis black. Thorax on the pleuræ of as light a gray color as that of the face, shining black on the dorsum, dark gray on the sides and along the suture. Scutellum gray on the basal half, dull black on the apical. Halteres yellowish. Abdomen dull black and black pilose; second segment almost entirely whitish gray; third, fourth, and fifth with a broad apical band of the same color, which is broadly interrupted in the middle. Legs black, gray pollinose, the first joint of the front tarsi and the first 2 joints of the others are yellow. Wings grayish hyaline, with yellowish veins.

98. **Discomyza maculipennis** Wied. 1830.

Widely spread over the Australian and Oriental Regions. *D. obscurata* Walk. is very probably the same species.

99. **Ochthera innotata** Walk. 1860.

Our specimens agree with this species in the entirely black legs. Originally described from Macassar and Ceram. The front is shining black, showing only a narrow yellowish streak on each side near the eye. Antennæ very short; arista with 3 rays. Thorax and scutellum coarsely punctate, with bluish reflections toward the middle. Abdomen with grayish spots on the sides of the segments, only those of the last segment being visible from above and forming an interrupted cross band. Middle tarsi sometimes yellowish. Scutellum with 2 distinct but small apical tubercles; no apical bristles (perhaps broken in these specimens).

100. **Chalcidomyia apicalis** Meij. 1911.

This Javanese species is very distinct. The antennæ, which were broken in the specimen described by Meijere, are, in our specimens, of the same shape as in the other species. The sternopleura has no yellow spot on the upper hind corner.

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THE MORPHOLOGY OF EUDENDRIUM GRIFFINI SP. NOV.

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Two plates and 5 text figures

Eudendrium griffini sp. nov.

Trophosome.—Hydrocaulus nonfascicled, irregularly branched, more or less recumbent, attaining a length of 35 mm. or more and a height above the hydrorhiza of from 10 to 20 mm.; pedicels long, varying from 6 to 13 mm. in length and sometimes showing from 2 to 6 more or less perfect annulations just above point of junction with hydrocaulus; diameter of hydrocaulus, 0.17 mm. Hydrorhiza resembling hydrocaulus, sometimes anastomosing to form a network over surface of support, rooted by short processes characterized by a cap of enlarged ectoderm cells. Perisarc, 1.5 to 3 $\mu\mu$ in thickness; color of perisarc over entire trophosome, transparent white to light yellow. Male hydranths and sexually immature or sterile female hydranths long, slender, and vase-shaped, varying in length from 2 to 3.5 mm.; fertile female hydranths shortened and thickened and often atrophied; all hydranths with a "sense ring" near proximal end consisting of 2 zones of enlarged glandular ectoderm separated by a groove; tentacles, 50 to 70 in 2 or 3 closely appressed rows, directed distally so as to hide the hypostome, and bearing numerous small nematocysts in groups of 2 or 3; hypostome short and slender, distinctly trumpet-shaped; when extended, about 0.35 mm. in height and 0.18 mm. in diameter at widest point, with a zone of large nettling cells near the distal end.

Gonosome.—Female gonophores of the streptospadiceous type with the spadix almost completely encircling the ovum, but with proximal end not recurved or bifurcated, borne on the hydranth in verticils of from 4 to 6 just distal to the sense ring. Ova often found attached to perisarc of pedicels. Male gonophores 2- or 3-chambered, paddle shaped, often bifurcated distally in a vertical plane, typically 2 to a hydranth on opposite sides, occasionally 1 or 3.

Color.—The live hydroid is dull sepia brown. Alcoholic specimens are white, and those fixed in corrosive sublimate are grayish pink.

Habitat.—In shallow tide channels on coral reef, Bantayan Island, P. I.

Type.—No. C894, zoölogical collection, University of the Philippines.

Systematic position.—*Eudendrium griffini* is a very distinct form of the genus. It resembles *E. parvum* Warren ('08) in its growth habits, but differs from it in the shape of its hydranths, in the form and arrangement of its male gonophores, and in the absence of scattered annulations. It differs from any other described species of *Eudendrium* in the number of its tentacles, having from 50 to 70 borne in 2 or 3 rows, and in the form of its hydranths with their long, tapering pretentacular region and their relatively small hypostome hidden by the distally directed tentacles.

This hydroid was collected by Dr. Lawrence E. Griffin in the shallow tide channels which are found on the inner portion of the coral reef at Bantayan Island.[1] It grew there in considerable quantities on stones, sponges, and seaweed. Some good

[1] Bantayan Island is a small island belonging to the Province of Cebu, P. I., and lying about 30 kilometers to the westward of the northern end of Cebu Island. The island and its outlying islets are low and flat, connected by reefs, large areas of which are exposed at low tide. The most extensive reef is on the west coast of Bantayan Island opposite the town of Bantayan, extending nearly a mile from the shore. It is crossed by several channels from 20 to 50 meters wide which contain from 0.5 to 1.5 meters of swiftly running water at low tide. This species of *Eudendrium* was found in great quantities along the edges of these tidal channels, attached to grasses, sponges, and dead branches of corals, and sometimes densely covering an area as much as 10 centimeters square. Many of the colonies must have been out of water at extreme low tides. At a little distance the living colonies resemble tufts of brown moss. The color of the entire colony in life is a rather rich dark sepia brown. The individual polyps are colored a light sepia. The colonies were found only in those parts of the reefs which were free from mud and silt. L. E. G.

specimens were obtained, but no attempt was made to secure a series for extensive study. The only female material collected was part of a colony which formed a dense growth on a sponge, most of the hydranths bearing verticils of gonophores. One large male colony, bearing gonophores, was also growing on a sponge. The other colonies, four in number, were growing on the flat leaves of a seaweed, *Thalassia hemprichi* (Ehrenberg) Ascherson; [2] they bore only a few gonophores, all immature. All measurements, descriptions, and figures are based on preserved material.

The hydrocaulus is monosiphonic, in the form of numerous outgrowths of single or branched stems from a creeping filiform hydrorhiza, which branches irregularly to form a network over the surface of attachment. These outgrowths are more or less recumbent, their height above the hydrorhiza being only 1 to 2 centimeters. They are numerous, crowded, and form a dense growth, having the appearance of a great number of single pedicils arising from a common hydrorhiza. When branching occurs, as it usually does, it is irregular as shown in fig. 1. The buds arise both from the hydrorhiza and the hydrocaulus. The only annulations to be found on *Eudendrium griffini* are from 2 to 6 more or less regular wrinkles found at the proximal end of some of the pedicels.

The hydranth of *Eudendrium griffini* is vase-shaped, unusually long and slender, graceful in form, and delicate in appearance. It expands gradually from a base often less than twice the diameter of the pedicel to a region just proximal to the tentacle zone which is from two and one-half to three times the diameter of the pedicel. This increase in width is small when compared with the length of the hydranth below the tentacle zone (1.2 to 2 mm.). All measurements of hydranth lengths in this paper refer to the length from the base of the hydranth to the tip of the tentacles. These measurements are used because of the position of the tentacles, which are distally directed and are so numerous and closely packed as to hide the hypostome. This was possible as the tentacles have not contracted irregularly in killing and fixing as do those of so many hydroids. All hydranth measurements, also, unless otherwise specified, are for the normal male hydranth which I find to be normal for the species. The average length of the hydranths (thus measured) is 2 to 3 mm., but they vary remarkably in length and proportions. The length of the

[2] Identified by Dr. W. R. Shaw, assistant professor of botany, University of the Philippines.

tentacles is fairly uniform—1.2–1.5 mm.—the difference in length of the hydranths being mainly due to variation in the region below the tentacle zone. At the base of the hydranth there is a groove separating two regions of very large ectoderm cells, the whole corresponding to the sense ring of Weismann ('81), Congdon ('06), and others. The large ectoderm cells just distal to the ring contain a considerable number of large, irregularly placed nematocysts.

The trumpet-shaped hypostome is slender and small in proportion to the size of the hydranth, measuring, when extended, about 0.35 mm. in height and 0.18 mm. in diameter at the widest part which is near the distal extremity. When expanded, it is very short and broad with a wide aperture and everted lips. Because of the small size of the hypostome, the large number of tentacles, and their being distally directed, the hypostome is only rarely to be seen in uncleared specimens.

Under the low power of the microscope the tentacles have a very rough appearance due to the irregularity of the ectoderm and to the presence, especially in their distal portions, of numerous small nettling cells in groups of 2 or 3.

The female gonophores are carried in a verticil of from 4 to 6 just above the sense ring on the shortened, and oftentimes partially atrophied, female hydranths. Each gonophore is in the form of a circular tube of endoderm, continuous with the endoderm of the hydranth, having the ovum in its crook, the whole surrounded by a layer of ectodermal cells continuous with the hydranth ectoderm. They measure when mature about 0.5 mm. in height, 0.5 mm. in breadth, and about 0.25 mm. in thickness. In many cases the endodermal tube relaxes and allows the ovum, encased in mesoglœa, to hang down beside the pedicel, to the perisarc of which it becomes attached, and where it remains after the tube and, in the majority of cases, the hydranth have entirely disappeared.

The male gonophores are also borne on the hydranths, usually 2 to a hydranth. I have noticed several cases where only 1 gonophore was produced and a few in which there were 3, but in far the greater number of cases there are 2 gonophores developed on opposite sides of the hydranth near the tentacle zone. They are paddle shaped and 2- or 3-chambered, measuring in length about 0.6 mm., in breadth about 0.4 mm., and in thickness about 0.3 mm., and are often longitudinally divided at their outer extremities. The shortest axis of the gonophore is in the line of the greatest axis of the hydranth.

This species is named in honor of Dr. Lawrence E. Griffin, chief of the department of zoölogy of the University of the Philippines, through whose kindness I was enabled to use the material and at whose suggestion I took up the study of this interesting form. Any value which this paper may have is due largely to his help, and I wish to thank him here for his kindly aid and advice.

GENERAL MORPHOLOGY

Hydrorhiza.—The hydrorhiza differs but little from the hydrocaulus in appearance. It is slightly thicker, with a heavier perisarc and a more irregular appearance due to wrinkles in the perisarc, to its very irregular branching, and to the presence of particles of the substance of attachment which remain attached to its sides and undersurface. Its perisarc, also, often has a slightly more yellowish tinge than that of the hydrocaulus. The main tubes are from 0.18 to 0.20 mm. in diameter and their branches from 0.18 to 0.19 mm. The main hydrorhizal tubes are rooted by finger-like outgrowths which are swollen at their distal end and characterized by a cap of unusually large ectoderm cells. Branches are given off all along the hydrorhiza which may either be hydrocauli or continuations of the hydrorhiza. The hydrorhizal branches sometimes anastomose, forming a network over the surface of attachment. This is best seen in those colonies growing on seaweed (fig. 2). These hydrorhizal branches are simply the finger-like processes spoken of above, but here found growing on the surface instead of rooted in it. They differ from the hydrocaulal elements in that they originate as a simple evagination of the cœnosarc, never assuming the appearance or structure of a hydranth, whereas the hydrocaulus buds arise as hydranth buds on the hydrorhiza and show hypostome, tentacle zone, and sense ring before the pedicle is produced.

It may be interesting to note here that in two instances hydrorhizal elements were found apparently developing hydranth buds at the end of the tube. This was noticeable because of the length of the tube as compared with the stage of development of the bud, which contrasted strongly with conditions as found in the hydrocaulus where young buds have little or no pedicel. In both these instances the hydrorhizal elements extended some distance beyond the surface of attachment, thus simulating the habit of a hydrocaulus.

Hydrocaulus.—A single hydrocaulus may bear from 1 to 10 or 12 hydranths, each on a separate pedicel. The length of these pedicels (6 to 13 mm.) in proportion to the size of the hydranth

is unusual for *Eudendrium*. The branching is very irregular. The hydrocaulus originates as a hydranth bud on the hydrorhiza. As this hydranth develops, the pedicel is produced between it and the hydrorhiza and becomes decidedly elongated. In its simplest form the hydrocaulus consists of this pedicel and terminal hydranth (fig. 1, a). The pedicel may remain single or send off a bud, which usually appears near the distal end (fig. 1, b). While the bud grows and develops a pedicel of its own, the original pedicel still increases in length, and a form results such as is shown in fig. 1, c. Both of these pedicels may bud and send off new pedicels, or, as is more commonly the case, only the terminal pedicel buds, producing a form such as is seen in text fig. 1, d and e. The production of pedicels along the original outgrowth from the hydrorhiza usually continues until there are several unbranched pedicels arising from the original hydrocaulal trunk as in fig. 1, e. This may be the permanent form of the hydrocaulus, or one or more of the upper pedicels may produce buds which develop into hydranths with pedicels as in fig. 1, f, g,

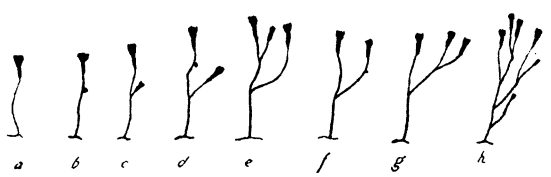

FIG. 1. The branching of *Eudendrium griffini*.

and h. In a closely packed colony, the lower pedicels of such hydrocauli have as a rule lost their hydranths (fig. 1, h), which is probably due to crowding and inability to get food, while the terminal one or two hydranths, especially in a female colony, are sterile and attenuated and drop off at about the time of the maturing of the gonophores. The intermediate hydranths appear to be normal, healthy individuals either bearing gonophores or, if not, being of normal size and appearance. The degeneration of the terminal hydranths may be attributable to senility since they are the original and oldest hydranths of the hydrocaulus.

The hydrocauli are so numerous and the hydranths borne by them so close together that a healthy colony forms a mossy growth over the entire surface of attachment, hiding the hydrorhiza and the hydrocaulus with the exception of the pedicels. This gives the colony a superficial appearance more like *Stylactis* or *Tubularia* than like *Eudendrium*. In the recumbent position of its hydrocauli and in the close resemblance between its hydrocauli and the hydrorhizal elements, this species differs decidedly

from the typical *Eudendrium* with its tree-like growth habits. In this particular, *E. griffini* resembles *E. capillare* Alder (Allman, '72) and still more strongly *E. parvum* Warren ('08).

Hydranth.—The hydranth is unusually long and slender. Its length, which is very variable, depends on several factors. Some of these factors are sex; stage of sexual development; preserving material; and, of course, age. Male hydranths, whether sexually mature or not, are long and slender, averaging between 2 and 2.5 mm. in length. Among the male hydranths are a few attenuated, sterile hydranths, sometimes as much as 4 mm. in length. In section they show decided signs of degeneration and breaking down of the tissues. The oldest and largest male colony is living on a sponge which has grown up around the hydrocaulus, making it impossible to determine in every case the position of these hydranths on the hydrocauli, but in a number of instances they were found to be the terminal hydranths. Also, a number of terminal pedicels were found which had lost their hydranths. Furthermore, none of these degenerating hydranths were found which could be proved not to be terminal; and, finally, all terminal hydranths found in this colony were sterile and showed some signs of degeneration. In the female colony, as in the male, the terminal hydranths are sterile and the intermediate hydranths are fertile. The sexually mature female hydranths are very greatly shortened and thickened, averaging about 1.2 mm. in length. The terminal hydranths show the same attenuation and breaking down of tissues found in terminal hydranths of the male colony, often dropping off, leaving fragments of their tissues attached to the pedicel. In the female colony, sexually immature hydranths are few and not fully grown. These young fertile hydranths, however, are of much the same proportions as those of the male colony, which would seem to show that the type of hydranth found in the normal male may be called normal for the species. All but one of the male colonies are very young with no long hydrocauli and consequently no very old hydranths. Hence, if the attenuated condition of the terminal hydranths is due to senility, we would expect to find that the terminal hydranths of the young colonies exhibit it much less markedly than those of the older colony, and such is the case. The terminal hydranths of these colonies while longer than the other hydranths are by no means as long as in the older male and female colonies and show no

FIG. 2. A young colony of *Eudendrium griffini* growing on a piece of seaweed.

signs of degeneration. Furthermore, none of these terminal hydranths bear gonophores, although they are the longest and oldest in the colony, thus making it probable that we have in *E. griffini* a distribution of function, at least, if not two distinct types of zoöids. Whether we have here two types of individuals, nutritive and reproductive, or whether this condition is simply due to the greater age of the terminal hydranths, or whether, as seems most probable, the conditions under discussion are due both to a distribution of function and to the effect of age, cannot be fully determined until more and, perhaps, living material is available.

The shortening of the gonophore-bearing female hydranths may be attributed to the absorption of their protoplasm by the gonophores as suggested by Hargitt (Congdon, '06) in the case of the spadix tubes of *E. ramosum,* and it may be considered as a stage in the atrophy of the fertile hydranth which is very common in this as in other species of the genus. The normal hydranth of the female colony seems to be similar to that of the male colony, that is, long and slender, yet when gonophores are present on a hydranth it is always found to be shortened. This shortening is more marked in hydranths bearing mature gonophores and less so in those where gonophores are few or just appearing; and it is followed by the atrophy of the hydranth and the depositing of some of the ova on the pedicel.

This atrophy is found in *E. griffini* only in the sexually mature female hydranth, not in the male as is the case in many species of *Eudendrium.* If the shortening of the fertile hydranth and its ultimate atrophy, so characteristic of the genus *Eudendrium,* is due, as seems probable, to the appropriation of its food supply and tissues to provide for the rapid growth of the gonophores and ova, we would expect to find the extent of the process varying in different sexes of the same species or in the same sex of different species in proportion to the number of gonophores borne by a single hydranth. That is, where many gonophores are borne on a single hydranth, we would expect to find a great shrinkage of the hydranth and its early and complete atrophy; and, conversely, where few gonophores are borne on a hydranth, we would expect to find only a slight shortening of the hydranth and little if any atrophy. The female hydranths of almost all described species, as well as the male hydranths of many species, such as *E. ramosum, E. racemosum,* and *E. capillare,* are examples of the first condition. Here we have the production of many gonophores on a single hydranth accompanied by atrophy.

The male hydranths of *E. maldivense* Borradaile ('05) which bear one or several gonophores and those of *E. griffini* which usually bear two are examples of the second condition, where we have few gonophores to a hydranth and little or no signs of shortening or atrophy.

At the base of the hydranth and lying just above the termination of the perisarc is a region in which the ectoderm cells are very large, stain heavily, and contain a considerable amount of granular material. This region is separated from the upper portion of the hydranth by a groove, most conspicuous in hydranths not fully grown. This region of large ectoderm cells together with the groove and another region of enlarged ectoderm cells just above the groove constitute a "sense ring" similar to that spoken of by Weismann ('81), Congdon ('06), and Warren ('08) for *E. racemosum, E. capillare, E. hargitti, E. parvum,* and *E. angustum.* The cnidophore described by Weismann ('81) and mentioned by Congdon ('06) was found in only two specimens of *E. griffini,* both fertile females, and seemed to be in the nature of an aborted gonophore.

The hypostome, which is very small in proportion to the size of the hydranth, arises from the center of the distal end and is usually hidden by the tentacles. When extended, it is very slender with a very small aperture, but when expanded it is very short with everted lips and an aperture wider than its greatest diameter below the aperture. In most species of *Eudendrium* the hypostome is large and conspicuous, but in *E. griffini* the opposite is true, giving the hydranth an appearance quite different from that of the typical species of the genus.

The tentacles are from 50 to 70 in number. This is almost double the number possessed by any known species of the genus, the nearest approach to this number being found in *E. hargitti* Congdon which has from 35 to 42 tentacles. The tentacles arise in 2 or 3 closely packed rows, and in preserved specimens extend almost directly forward, forming a dense fringe which completely hides the hypostome. The tentacles have a roughened appearance due to the irregularity of the ectoderm, and in cleared specimens have the characteristic segmented appearance of hydroid tentacles. They are armed, particularly in their distal portions, with numbers of nematocysts in groups of 2 or 3, giving them a spiny appearance.

Gonophores.—The female gonophores are found in regular verticils on the hydranths just above the sense ring. They are of the typical streptospadicious form of the genus, being very similar to those described and figured by Agassiz ('62) for

E. dispar Agassiz and by Allman ('72) for *E. insigne* Hincks.[1] They differ from those described by Congdon ('06) and others for *E. ramosum* in that the spadix is never recurved or bifurcated. There are no orthospadicious gonophores found in this species, although the ova from the regular streptospadicious gonophores which become imbedded in the perisarc of the pedicels of atrophying hydranths have a superficial resemblance to that type of gonophore.

The process by which this deposition of the ova on the pedicel takes place seems to be somewhat as follows: The endodermal tube of the gonophore relaxes; whether from death of the tissues or because of some stimulus afforded by the results of atrophy in the hydranth was not determined. This relaxation allows the whole weight of the ovum to rest on the ectodermal covering. This layer, probably weakened by lack of nutrition due to the atrophy of the hydranth, is unable to support the weight and breaks away. This allows the tube, with the ovum on its inner surface, covered with the mesoglœa and remnants of the ectoderm, to hang down along the pedicel (Plate I, fig. 3). The pressure of the ovum against the pedicel forms a depression in the perisarc (Plate II, fig. 4), and, the mesoglœa becoming attached to the perisarc, glues the ovum in position. The perisarc then becomes thickened at this point, the endodermal tube disintegrates, and we have the ovum firmly attached to the perisarc of the pedicels (Plate I, fig. 4). Upon superficial examination this imbedded egg might be mistaken for a form of orthospadicious gonophore like that found in *E. ramosum,* but my material furnishes specimens showing all the stages in the process described, and I have been unable to find any orthospadicious gonophores.

That this process is due to the early atrophy of the fertile female hydranths and the necessity of giving the ovum some place of support during fertilization and the early stages of development is the only explanation which seems to be plausible. The fact that in most cases when the ovum is so placed on the pedicel the hydranth has either entirely disintegrated or is beginning to show signs of disintegration gives a strong basis for this supposition.

The male gonophores of *E. griffini* are not borne in verticils as is usually the case in this genus, but in a single pair on opposite sides of the hydranth near the distal end of the hy-

[1] Figured by Allman in his Monograph on the Tubularian Hydroids under the name *E. humile* Allman.

dranth (Plate I, fig. 1). They are 2- or 3-chambered, very similar to those described by Agassiz ('62) for *E. dispar*. The width of the gonophore is greater than its thickness, and the division of the distal end when it occurs is in a vertical plane.

HISTOLOGY

Perisarc.—The perisarc in this hydroid is a transparent white or pale yellow. It is extremely thin, being from 1.5 to 2.5 $\mu\mu$ in thickness on the pedicel and only slightly thicker on the hydrorhiza. This seems to be much thinner than the perisarc of the better known species of *Eudendrium*. In *E. parvum* Warren ('08), with a hydrocaulus only 0.10 mm. in diameter, the thickness of the perisarc is 4.4 $\mu\mu$, and in *E. angustum* Warren ('08), with a hydrocaulus 0.19 mm. in thickness, nearly the same as in the present species, the perisarc is 6.1 $\mu\mu$ thick. The thinness of the perisarc of *E. griffini* may account to some extent for the recumbent growth habit of most of its hydrocauli.

As mentioned before, the perisarc of the proximal end of many of the pedicels and hydrocauli is irregularly wrinkled or annulated. There is also a thickening of the perisarc at the junction of the hydrocauli and hydrorhiza, and a thickening is found on the distal end of the pedicels of those hydranths whose gonophores have begun to relax.

Near the upper end of the pedicel, the perisarc thins very rapidly. In one specimen, in which the normal thickness of the perisarc was 2.5 $\mu\mu$, this thickness was maintained to within 0.7 mm. of the sense groove. At 0.15 mm. below the groove it had thinned to 1.6 $\mu\mu$, at 0.10 mm. it was 1 μ thick, and at 0.01 mm. it was only 0.8 μ in thickness. At a point opposite the lower limit of the "cambium tissue" of Jickili and Seeliger, usually between 0.15 and 0.2 mm. from the base of the hydranth, the perisarc seems to lose its stiffness, becomes very thin, and is much wrinkled (Plate I, fig. 1). It seems, typically, to end in a groove in the cambium tissue near its upper limit. This groove is by no means as definite as that figured by Warren for *E. angustum* Warren ('08) and *E. parvum* Warren which seems to be the equivalent of the groove of the sense ring. I do not find a double perisarc as noted by Warren in *E. angustum*.

In sections of the pedicels of some young hydranths, where the perisarc is being formed, a very peculiar condition is found. The ectoderm cells, which are comparatively large, seem to send off tube-like continuations of the cell walls, which, twined together, form the first perisarcal covering. These tubes seem to

coalesce and run together to form the smooth perisarc of the mature pedicel.

Cœnosarc.—There is very little variation in the ectoderm of the cœnosarc, except in the region immediately below the hydranths and in the processes of the hydrorhiza used for attaching it to the surface on which it is growing. In the normal cœnosarc, the ectoderm is a very thin layer, consisting of flat, 6-sided, or irregular cells averaging 38 by 7 $\mu\mu$. These cells seem to be much larger and in a more flourishing condition in the upper part of the pedicel than in the lower portions (Congdon '06). Indeed, sections of the lower portions of pedicels often show a very thin ectoderm from 3.5 to 5 $\mu\mu$ in thickness, while in the upper regions of the pedicel the ectoderm layer is from 6 to 10 $\mu\mu$ thick. The ectoderm of the cœnosarc as a whole takes a more diffuse and darker stain than the endoderm. The nuclei are small, and the nucleolus when present stains a slight brownish tinge in Delafield's hæmatoxylin or safranin. The ectoderm sends out scattered extensions to the perisarc. Some of these extensions contain a central region of mesoglœa, but most of them are protoplasmic processes. These are particularly numerous near the distal end of young pedicels where the perisarc is being formed from tubes produced by the ectoderm cells.

The hydranth is joined to the pedicel by a constricted region. Covering this neck and extending below it for some distance and above it to the groove of the sense ring is a region of enlarged, heavily staining, glandular ectoderm, evidently similar to the cambium of Jickili ('82), of Seeliger ('49), and others. The ectoderm of this region consists of cells distinctly different from those of the normal ectoderm. They are large, rough, irregular cells, with their long axes at right angles to the long axis of the stem, filled with pigment granules, and very evidently glandular in their nature. Where eosin or Congo red was used as a plasma stain, these cells were the only ones to take the counterstain, and with Delafield's hæmatoxylin they stain a diffuse bluish pink which contrasts with the sharp blue of the endoderm or the more diffuse blue of the other ectoderm cells. Weismann considered the upper portion of this region to belong to the sense ring, but in *E. griffini* there seems to be no real distinction except in size between the cells of that part of the sense ring below the groove and those of the cambium region; indeed, one joins the other without a break. The maximum thickness of these cells of the lower part of the sense ring or, as seems the more natural terminology, the upper part of the cambium region, is 60 $\mu\mu$.

This thickness is only found in the shortened and widened fertile female hydranths, that in the normal hydranth being about 30 $\mu\mu$. These cells have the characteristic "dunklere Färbung" of the ectoderm of the base of hydra.

The endoderm of the cœnosarc consists of rather large cells with well-defined cell walls. An average cell measures 31 $\mu\mu$ in length, 12 $\mu\mu$ in breadth, and 21 $\mu\mu$ in thickness. The nuclei are more easily distinguishable than are those of the ectoderm. They are small, spherical in shape, with no definite chromatin figure excepting a more or less constant nucleolus which stains a blackish tint in hæmatoxylin. They are found near the distal wall of the cell. The cytoplasm is much denser than that of the hydranth endoderm, and contains, toward the distal end, thickened granular protoplasm which takes a deep stain. Near the upper end of the pedicel the cells are crowded together and consequently elongated (fig. 3). Zoöxanthellæ are not so numerous here as in the endoderm of the hydranth, many cells containing none, others from 1 to 3.

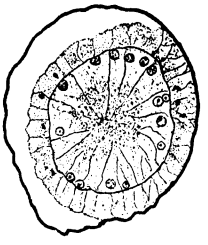

FIG. 3. Cross section of a pedicel just below the hydranth in *Eudendrium griffini*.

Hydranth.—The ectoderm of the lower part of the sense ring has already been discussed under the cœnosarc. It is separated from the rest of the hydranth by the groove of the sense ring. The ectoderm of the hydranth above the sense ring is much the same throughout, differing mainly in the size of the cells. The cells are flattened, rough, and irregular, stain deeply, and contain a considerable amount of granular material. The nuclei are small and easily distinguishable. The ectoderm, although thin, is distinct on the body of the hydranth below the tentacles, but it thins out rapidly on the base of the tentacles and is almost undistinguishable in many places on their distal portions.

The ectoderm of the tentacles seems to consist of a very thin layer of protoplasm lying between the mesoglœa which has here become very thin and an outer continuous wall corresponding to the cell walls of more normal ectoderm. There seems to be little if any separation of this layer into individual cells, and nuclei cannot be distinguished. The nematocysts cause decided swellings of this thin layer of ectoderm (Plate I, fig. 2). It is worth noting that the ectoderm of all sides of the tentacles is of the same thickness, not being, as in so many hydroids, thick on one side of the tentacle and thin on the other. So thin is this ectodermal layer and so close together are the mesoglœal

layer and the outer wall that, under any but the highest magnifications, the ectoderm seems to be lacking and the whole looks to be a single, slightly thickened layer of mesoglœa. The ectoderm cells of the hypostome are large and distinct, the shape of the cells depending on the amount of contraction of the hypostome when fixed. Those of the distal end are enlarged, and contain large nematocysts which form a zone just below the aperture (Plate II, fig. 3). This zone of nematocysts on the hypostome was noted by Congdon ('06) in *E. hargitti* Congdon, and it was considered by him to be a case of usurpation by the hypostome of the protective function of the tentacles, as the tentacles of *E. hargitti* have very few if any nematocysts. This hypothesis does not seem to apply in the case of *E. griffini*, however, as the tentacles are very heavily armed with nematocysts. The ectoderm of the upper portion of the sense ring is very striking. It consists of very large, elongated cells, thicker than broad, with roughened outer ends (Plate II, fig. 5). The first 3 layers above the groove seem to be glandular, having a granular deposit in their distal portions. These cells in the male hydranth average between 25 and 30 $\mu\mu$ in thickness, but they are much thicker in the shortened female hydranth. This region of thickened ectoderm of the sense ring is furnished with a number of large oval nematocysts.

The threads of these nematocysts are long and, when extended, stain deeply in hæmatoxylin, often making a very noticeable fringe just above the sense groove (Plate I, fig. 1). Doctor Griffin, who collected this hydroid, tells me that these nematocysts are discharged with sufficient force to pierce the skin of the back of the hand or the arm, inflicting a severe sting.

The typical endoderm of the hydranth consists of very large, lightly staining cells much thicker than broad. The free ends of some of these cells seem to have amœboid properties, sending out pseudopodia into the gastric cavity. The cell walls are distinct, and the nuclei are situated near the cell wall at the distal end of the cell and only occasionally show nucleoli. While remarkably clear and lightly staining, these cells are not vacuolated. Scattered among these cells, however, in the upper walls of the gastric cavity are found a number of gland cells with vacuolated protoplasm and granular content (Plate II, fig. 1). The average cells measure 75 by 45 by 25 $\mu\mu$. Each cell contains at its inner end from 3 to 10 or more zoöxanthellæ.

The endoderm cells of the gastric cavity, which average about 75 $\mu\mu$ in thickness, become much elongated on the upper surface of the gastric cavity surrounding the opening from the hypostome

to form a mass of very long, deep-staining, gland cells about 160 $\mu\mu$ in maximum length and exhibiting the bulging shape characteristic of gland cells. These cells often contain one or more zoöxanthellæ at their proximal end, sometimes one or two near their distal end, and numerous vacuoles and deeply staining material in several forms, such as small spheres, large spheres, granules, spindles, etc. They show very little, if any, traces of mucus by the toluidin blue test. The endoderm cells change rather abruptly from these very long, slender, dark-staining cells to the smaller, clearer cells of the passage from the hypostome to the gastric cavity and then to the slender closely packed cells of the hypostome. These endoderm cells of the hypostome are very characteristic, having their long axis at right angles to the long axis of the hypostome, which gives them a columnar appearance. They have very well-defined cell walls and distinct, but small, nuclei. They contain irregularly placed masses of very deeply staining granular material, and many of them, particularly toward the distal end of the hypostome, have densely staining areas composed of small vacuoles with very dense protoplasm between them (Plate II, fig. 3).

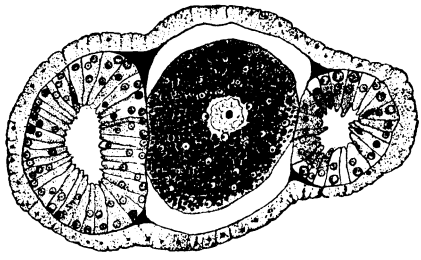

FIG. 4. Transverse section of a female gonophore and egg from *Eudendrium griffini*.

The endoderm extends into the tentacles as a solid core of large disk-shaped cells. These cells average 19 $\mu\mu$ in diameter. Their pheriphery is lined with zoöxanthellæ to the number of 25 or 30 which gives them a very characteristic appearance in sections or in surface view. The nuclei of these endoderm cells are situated in the center of the cell with radiating fibers of dense, deeply staining protoplasm (Plate II, fig. 2). This is best brought out in sections stained with Bismarck brown. These nuclei show irregular nucleoli, and take a rather light but diffuse stain.

Gonophores.—The ectoderm of the female gonophore, which is, of course, merely a continuation of that of the hydranth, is considerably thicker than that of the hydranth above the sense ring, being about 16 $\mu\mu$ in thickness at its thickest point. The cell walls are more distinct, and the protoplasm stains much less deeply than in the hydranth. The ectoderm nuclei are rather small, but are deeply staining. The endoderm cells of the spadix resemble in shape those of the upper cœnosarc, being long and slender, about 35 $\mu\mu$ in length by 7 $\mu\mu$ in thickness. These cells,

however, differ from the typical endoderm of the gastric cavity by having a greater staining capacity and containing much granular material. The mesoglœa is thin, about 1 μ in thickness except at the inner edges of the spadix where it is thickened as a reinforcement to the tube. The egg itself lies in a cavity lined with mesoglœa. It seems to be attached along the inner edge of the spadix. The ovum is large, sometimes reaching a length of 0.3 mm. and a breadth of 0.15 mm., its long axis being parallel to the sides of the hydranth. The bulk of the egg is made up of large polyhedral deutoplasmic granules which give the egg a reticulated appearance. The nucleus is large, 26 $\mu\mu$ in diameter, with a nucleolus 3.5 $\mu\mu$ in diameter. Scattered among the deutoplasmic granules in the egg are many zoöxanthellæ. They are especially numerous around the nucleus of the egg and near the periphery, probably ingested by the egg with endoderm cells (Congdon '06). Of these zoöxanthellæ, especially in the younger eggs, many are in stages of division (fig. 4).

Congdon ('06) says with regard to the question of the included bodies found in hydroid eggs:

> There has been a diversity of view as to the fate of the nuclei of cells absorbed by hydroid eggs as well as to the method of absorption. Ciamician, '79, applied the term "Pseudozellen" to spherical bodies found in the egg of *Tubularia mesembryanthemum* which he considered to be formed after the nuclei of the absorbed cells had disappeared. Brauer, '91, published the results of the study of the same species, in which he agreed with the conclusion of Ciamician as to the origin of the pseudo-cells. Also, in a contribution to the development of *Hydra*, he says that pseudo-cells are formed in the cytoplasm and are not degenerating nuclei.
>
> The three papers already mentioned, by Döflein, Smallwood, and Allen described the nuclei of absorbed cells as undergoing divisions and degenerative changes characteristic of pseudo-cells. That name is therefore applied to them.
>
> In this species, the history of the nuclei does not exactly correspond to any that have been outlined above but finds its closest parallel in the persisting of nuclei as pseudo-cells.

Congdon himself ('06) finds the included bodies of the egg of *E. hargitti* to be nuclei of included endoderm cells, but he does not find them passing through the division stages described by Smallwood ('99) and Döflein ('96) for *Tubularia* and *Pennaria*. In the egg cell of *E. griffini* there are to be found a number of zoöxanthellæ, many of them in stages of division, which in size, position, and appearance agree so closely with the included nuclei as figured by Congdon ('06) that the question arises whether Congdon and, perhaps, the other authors mentioned above have not mistaken included zoöxanthellæ for nuclei of included endoderm cells. Since the absorption of endoderm

cells by the egg cell is an admitted fact, if any zoöxanthellæ were found in the hydroid described, they would be taken in with the included cells. Furthermore, since inclusion in the egg cell has been shown to be an important means of transmission of these algæ from generation to generation of hydroids (Mangan, '09), we would expect to find them in the egg cells of any hydroid which contains zoöxanthellæ. Allen's ('00) figures of *Tubularia* (*Parypha*) *crocea* show several "included nuclei" which look suspiciously like zoöxanthellæ, one of them (fig. 1, a, p. 305) even showing a pyrenoid with the surrounding clear area. Whether the spherical bodies in the eggs of *E. ramosum* and *E. hargitti*, in *Pennaria*, in *Tubularia*, and other hydroids be the nuclei of included endoderm cells, as described by Congdon, Allen, and others, or bodies which develop after the breaking down of the included nuclei as held by Ciamician and Brauer, or zoöxanthellæ as I believe, must be left for future workers to decide, but the fact remains that sections of the ova of *E. griffini* show no included nuclei or pseudo-cells and do show many unmistakable zoöxanthellæ which resemble in form and position the pseudo-cells and included endoderm nuclei described and figured by the above-mentioned authors.

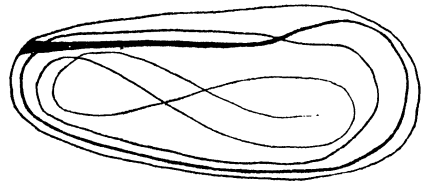

FIG. 5. Outline of a large nematocyst and thread from *Eudendrium griffini*.

The ectoderm of the male gonophore is about twice as thick as the normal ectoderm of the hydranth wall. It is composed of narrower cells more closely packed together, with more definite outer walls and more granular contents. A few small nematocysts are found in the ectoderm, and several large nematocysts are usually found either in the ectoderm of the base of the gonophore or in the ectoderm of the hydranth immediately above or below the base of the gonophore. The endoderm which constitutes the spadix consists, in the stalk of the gonophore, of a single layer of cells much like those of the female gonophore, being granular and deeply staining. In the region of the sperm chambers they are large irregular-shaped cells with their long axes parallel to the long axis of the gonophore. The sperm cells themselves are closely crowded in the chamber between the ectoderm and endoderm, making a characteristic labyrinthian figure (Plate II, fig. 6).

Nematocysts.—The nematocysts of *E. griffini* are of two very distinct types—large oval nematocysts found in a zone just above

the groove of the sense ring and in a zone just below the distal end of the hypostome and small tear-shaped nematocysts found on the tentacles and now and then in almost all parts of the colony. The large nematocysts average about 17 $\mu\mu$ in length by 6.5 $\mu\mu$ in diameter. The thread is not coiled about a central axis as in *Hydra,* etc., but in a number of coils laid the long way of the capsule (fig. 5). The nematocysts of the zone just distal to the sense ring measure 16 by 6 $\mu\mu$. They have long coarse threads which, when discharged, form a fringe around the base of the hydranth. The nematocysts of the hypostome measure from 18 to 19 by 7.5 $\mu\mu$. Those of the tentacles and those scattered through the ectoderm of the cœnosarc are alike in form and size. They are small, tear shaped, about 7.5 $\mu\mu$ in length, and taper from a basal width of about 3.5 $\mu\mu$ to a point. They can be seen to lie in a clear nonstaining capsule (Plate II, fig. 2, a).

Zoöxanthellæ.—Any description of the morphology of *E. griffini* would be incomplete did it not include some mention of the zoöxanthellæ which are found in large numbers and in great regularity of position within the cells of this hydroid, and, since the literature on this subject is scattered and incomplete and the resemblance which these algæ often show in form and position to cell nuclei is apt to cause confusion, I give a short description of those found in *E. griffini* and a comparison with those found in *Millepora.*

Zoöxanthellæ are found living symbiotically within the cells of many of the lower marine and fresh-water animals, particularly in the phylum Cœlenterata. They usually give a green, yellow, or brown color to their hosts. In the case of *E. griffini* they give the hydroid a sepia-brown color, which fades in the preservative to white or faint yellow. Mangan ('09) in describing the zoöxanthellæ of the medusæ and ova of *Millepora* says:

> These cells have been figured by Moseley ('81) who was able to examine fresh material. He remarks that they closely resembled those of other hydroids. They contained irregular granules of a bright gamboge-yellow colour, the cell-contents frequently dividing into two, and sometimes, more rarely into four. In the older portions of the colony the pigment was of dark-brown hue. The spherical nucleus exhibited a mass of closely-packed chromatin granules. A pyrenoid was always present, the clear space around which, in most cases, gave the reaction for starch. The pigment-bearing granules, varied in number and size, did not always stain to the same degree, and in some cases had a little starch associated with them. The cell membrane did not respond to cellulose tests. I observed in a few

cases division of a cell into four. Their average diameter was somewhat over 9 $\mu\mu$.

Those in *E. griffini* are spherical in outline, 6 to 6.5 $\mu\mu$ in diameter, and have a very distinct nucleus and pyrenoid. The nucleus, which is roughly spherical, or oval, stains very deeply in hæmatoxylin, safranin, hæmacalcium, Bismarck brown, etc., and seems to be a homogeneous mass, not showing the granular composition found by Mangan ('09) in the nuclei of the zoöxanthellæ of *Millepora*. The granules in the cytoplasm are numerous and irregular, seeming to form a sort of network. This shows very clearly in sections stained with Delafield's hæmatoxylin and counsterstained with eosin. In sections stained with eosin alone these granules are strikingly shown, together with the pyrenoid and its surrounding clear area. As this stain does not bring out the nuclei, it is useful in distinguishing between them. The pyrenoid, with its surrounding clear space, has a very characteristic luminous appearance. It is spherical, and stains much less deeply than the nucleus. The clear area about the pyrenoid is very definite in its boundaries. The sharply spherical shape, the lightly staining pyrenoid with its luminous clear area, and the deeply staining nucleus enable one to distinguish between the algæ and the cell nuclei which they often resemble closely to the untrained eye.

Under the low power of the microscope a cleared or stained hydranth of *E. griffini* appears covered with minute dots and the tentacles appear marked with transverse rows of closely packed dots. This is due to the zoöxanthellæ which inhabit the endoderm cells, and are easily seen through the thin ectoderm. The endoderm cells of the entire colony—cœnosarc, hydranth, tentacles, and gonophores—contain these algæ in numbers varying with the region, the number in a region seeming to depend on the amount of light there available. In general, they are found at the bases of the cells, forming a layer just inside the mesoglœa. In the gonophores they are scattered through the endoderm of the spadix, and in the female are found in the egg cell and in the male at the edges of the sperm chambers. If living in the ectoderm, they are few and scattered, and I have been unable to identify any of the few spherical bodies of the ectoderm cells as zoöxanthellæ. They are least numerous in the cœnosarc, but here there are often as many as three or more to a cell, and most numerous in the tentacles where they form a closely packed layer just within the peripheral walls of the large disk-shaped endoderm cells. In the walls of the gas-

tric cavity they are found in large numbers, the large endoderm cells containing from 3 to 10; in the mass of glandular endoderm cells surrounding the proximal aperture of the hypostome and in the endoderm of the hypostome itself they are not so numerous. Their presence in such enormous numbers in the tentacles is without doubt due to the fact that there they receive most freely the light which is so essential for the carrying on of the photosynthetic processes. They are often found dividing into 2 and more rarely into 4. This division is particularly frequent among those included in the ovum as noted by Mangan ('09).

SUMMARY

Eudendrium griffini is a very distinct species. Its most important distinguishing characteristics are the large number of distally directed tentacles, the long and slender hydranth body, the small size of the hypostome, the presence of but 2 male gonophores to a hydranth, and the deposition of the ova on the pedicels.

The terminal hydranths of both male and female hydrocauli are sterile, making it probable that we have two types of zoöids, nutritive and sexual, or at least a distribution of function. In older colonies they are attenuated, and in various stages of degeneration, due probably to their being the original and oldest individuals of the hydrocauli.

As a result of the early atrophy of the female hydranths, the gonophores relax and allow the ova to hang down beside the pedicels, in which their weight makes a depression and where they become attached by their mesoglœal envelope and probably remain during their early developmental stages.

Great numbers of zoöxanthellæ inhabit the endoderm cells of the cœnosarc, gastric cavity, and tentacles, lying in the bases of the cells next the mesoglœa. They are found in the process of division. They are not so numerous in the cœnosarc, but in the large endoderm cells of the tentacles they form a closely packed layer just within the peripheral walls, as many as 30 or more being found in a single cell. No nuclei of included cells or pseudo-cells are found in the ova of *E. griffini*, and, inasmuch as the zoöxanthellæ show a marked resemblance in form and position to the included nuclei and pseudo-cells figured by other authors, it seems very probable that the spherical bodies found in hydroid ova and described as included nuclei or pseudo-cells were in reality zoöxanthellæ taken in by the ova with absorbed endoderm cells.

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ILLUSTRATIONS

(All drawings are from camera lucida outlines. Plate I, fig. 1, is from a drawing by T. Espinosa; all other figures are from drawings by the author.)

PLATE I

FIG. 1. A typical hydranth of *Eudendrium griffini* sp. nov. with 2 immature male gonophores. × 15.

2. A female hydranth with gonophores, showing the shortening of the fertile female hydranth. × 21. (Tentacles indicated.)

3. A female hydranth with 2 relaxed gonophores, showing the ova, incased in mesoglœa, hanging down beside the pedicel. (The upper portion of the hydranth is not shown.) × 48.

4. An atrophied female hydranth, showing 2 ova attached to the perisarc of the pedicel. The spadix of 1 gonophore remains attached to the hydranth, the other has disappeared. × 48.

PLATE II

FIG. 1. The upper portion of a median longitudinal section through one side of a normal hydranth of *Eudendrium griffini* with extended hypostome. × 47.

a, hypostome.
b, large nematocyst.
c, nucleus.
d, zoöxanthella.
e, gland cell.
f, tentacle.
g, mesoglœa.
h, vacuoles.

2. A few cells from the distal portion of a longitudinal section of a tentacle. × 172.

a, nematocyst.
b, the extremely thin ectoderm layer.
c, zoöxanthella.
d, nucleus of endoderm cell.

3. A few cells from near the distal end of the hypostome, seen in longitudinal section. × 307.

a, ectoderm.
b, mesoglœa.
c, large nematocyst.
d, zoöxanthella dividing in four.
e, vacuoles.
f, nucleus.
g, granular material.

4. A few cells from the wall of the hydranth in longitudinal section. × 172.

a, ectoderm.
b, zoöxanthella.
c, nucleus.

5. Portion of a longitudinal section through the region of the sense ring. × 172.

a, nucleus,
b, zoöxanthella.
c, nematocyst.
d, groove of sense ring.
e, enlarged glandular ectoderm cells of the sense ring.

6. A longitudinal section of a male gonophore of 1 chamber. × 78.

a, sperm.
b, zoöxanthella.
c, nematocyst.

TEXT FIGURES

FIG. 1. The branching of *Eudendrium griffini.*
2. A young colony of *Eudendrium griffini* growing on a piece of seaweed. ×2.
3. Cross section of a pedicel just below the hydranth in *Eudendrium griffini.* × 87.5.
4. Transverse section of a female gonophore and egg from *Eudendrium griffini.* ×175.
5. Outline of a large nematocyst and thread from *Eudendrium griffini.* × 1500.

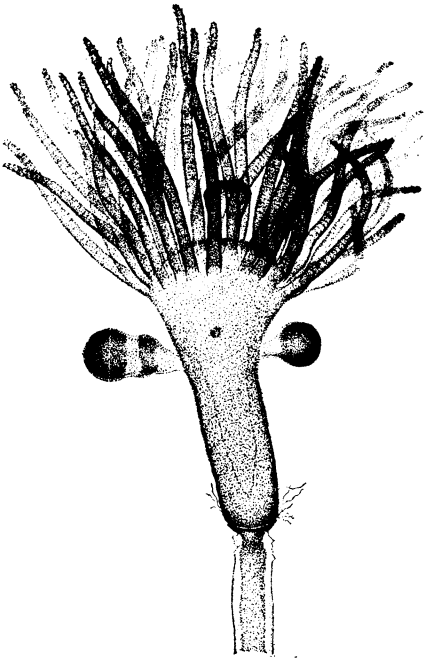
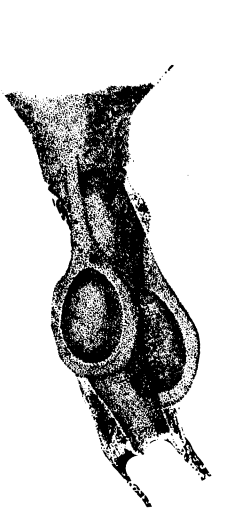


Fig. 1.



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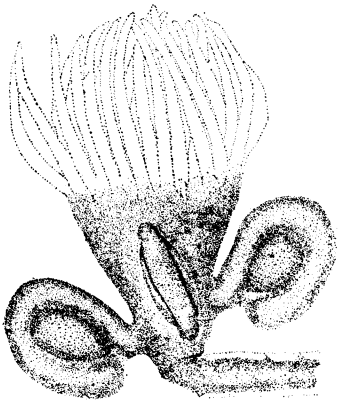
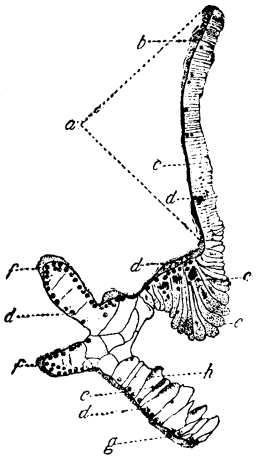


Fig. 2.

Fig. 4.

PLATE I. EUDENDRIUM GRIFFINI SP. NOV.



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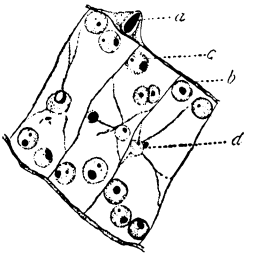

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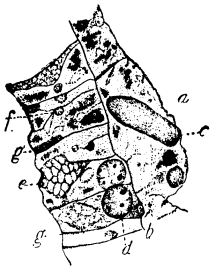

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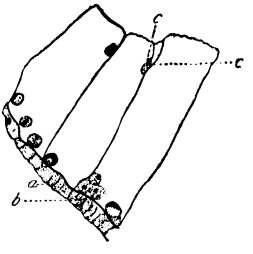

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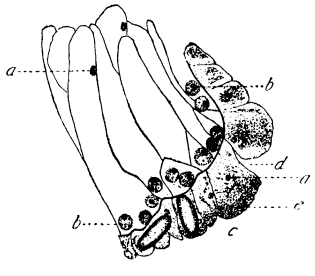

Fig. 5.

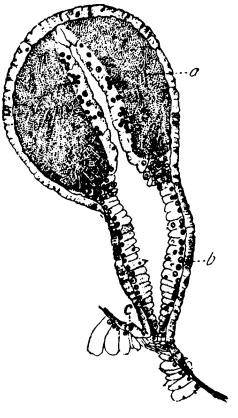

Fig. 6.

PLATE II. EUDENDRIUM GRIFFINI SP. NOV.

FILIPINO EARS: IV. ILONGOT AND MAÑGYAN

By ROBERT BENNETT BEAN

(From the Anatomical Laboratory, Philippine Medical School, Manila, P. I.)

Twenty plates

This is a study of contrasts and parallels. The Ilongots live in the interior of Luzon; the Mañgyans in the interior of Mindoro; both are said to have Negrito blood. Considering the individual as a whole and the characteristics of the individuals independently of each other, the two tribes are both alike and unlike in physical make-up, and other contrasts and parallels will develop as the study continues.

FRONT AND PROFILE HEAD VIEWS

PLATE I

Four Mañgyans of Bulalacao, Mindoro, appear in this plate, and the four, although different in some respects, resemble each other in important characteristics. The Mañgyan of figs. 1 and 2 has modified Iberian ears, type A, and the Mañgyan of figs. 3 and 4 has modified Iberian, type B; the two have relatively long faces and straight noses and their general similarity is evident. European (East Indian?) blood lies back of these men somewhere in their ancestry. The two other Mañgyans, figs. 5, 6, 7, and 8, resemble types other than the European, although some resemblance to the latter may be seen. The man of figs. 5 and 6 has modified Alpine ears, wide face, prominent cheek bones, narrow, aquiline nose, and is similar to the North American Indian, especially in profile. The man in figs. 7 and 8 looks like a woman, and but for the brown color might be taken for a European. The face is rather wide, but not so wide as that of the man in figs. 5 and 6; the nose is long, high, slender, and straight; and the ears are modified Iberian, type A.

PLATE II

By contrast with the Mañgyans of Plate I, the Ilongots of Plate II have short, broad faces, short broad noses that are depressed at the bridge and turned up at the tip, and ears that are

not Iberian, although an indication of slight eversion of the concha is present; nor are they true Primitive ears, but a modified Primitive of peculiar type. The ear may be described as follows: Short and not broad, with overturned and inrolled upper helix, slightly everted concha, and small pendant lobule, resembling somewhat the true Negrito ear. It is found exactly as described, or somewhat modified, on all the Ilongot men and women, although on the latter it partakes more of the Primitive type. The Ilongots are modified Primitive people in contradistinction to the Mañgyans who are modified Iberians.

The hairy face of certain Ilongots is a noticeable feature, and one in striking contrast to the smooth physiognomy of the Malays in general. It would be of scientific value to determine the hereditary characteristics of the face hair, to determine if its presence and absence follow Mendel's laws, or if it blends in inheritance.

PLATE III

The Ilongots of this plate have longer faces and longer, straighter noses, with higher bridges than the Ilongots of Plate II, and the ear is more like the Alpine, although it still is distinctively the Ilongot ear. Varying quantities of hair appear on the face, from the Ilongots in figs. 1 and 2 with goatee and moustache to the smooth face of the man in figs. 7 and 8, which indicates that presence and absence of hair on the face may blend in heredity.

PLATE IV

The Ilongot women of this plate are decidedly Primitive in type, and also the Mañgyan girl (figs. 7 and 8), although the noses are not broad and the nostrils do not turn forward to such a degree as in the pure Primitive. Therefore, they would come under the head of modified Primitive people, or blends of the Primitive type. The ear is characteristically Primitive, although retaining the Ilongot type already noted. The small, prominent forehead, the vertical profile of the face, and the small, receding chin complete the picture of a Primitive type. The Mañgyan girl, so much like the Ilongots, is only another parallel between the two tribes.

PLATE V

To continue the parallel and contrasts, a Mañgyan man (figs. 1 and 2) is placed beside an Ilongot woman (figs. 3 and 4) and an Ilongot man (figs. 5 and 6) is placed beside a Mañgyan

man (figs. 7 and 8). All have ears of a like kind, a combination of Primitive and Iberian C not unlike the ear of the Igorots. The ear is oblong, with everted concha, square lobule, and slightly overturned upper helix, and it stands almost flat against the head. In many respects this ear resembles the B. B. B. In conjunction with this ear the nose is straight and the face is oval and elongated, and projects slightly forward, except in the Ilongot man where the Primitive characteristics of the Ilongots are retained.

PLATE VI

This plate shows a series of gradations in ear form from the modified Iberian (fig. 1) to the modified Primitive in fig. 4, and paralleling the change in ear form is the transition from a straight nose with a high bridge to a retroussé with depressed bridge. Three of the individuals are Mañgyans (figs. 1, 3, and 4), and one is an Ilongot (fig. 2). Two of the Mañgyans, a man and a woman (figs. 3 and 4), are more Primitive than the Ilongot who is a modified Iberian, which may indicate that the Ilongots represented by the photographs are not all modified Primitives and the Mañgyans are not all modified Iberians.

The Mañgyan woman from Baco River (figs. 5 and 6) is a Primitive with Primitive nose, face, and ears; whereas the Mañgyan woman from Bulalacao (figs. 7 and 8) is a modified Primitive as indicated by the same features modified, which is additional evidence of the Primitive among the Mañgyans. The Primitive Mañgyan girl of figs. 7 and 8, Plate IV, is another link in the chain of evidence. Here, as elsewhere, the women are more Primitive than the men.

PLATE VII

The Mañgyan of figs. 1 and 2 is a modified Primitive man, and the one of figs. 3 and 4 is a modified Iberian B with Alpine characteristics in ear form and physiognomy, which indicate that the Primitive form is not confined to the women. The two Mañgyans of figs. 5, 6, 7, and 8 are supposed to have Negrito blood because of the curly hair of the one and the Negrito features of the other. However that may be, the one is a modified Primitive and the other a modified Australoid-Iberian, which does not exclude the possibility of Negrito blood. The ears have Negritoid qualities, especially those of the man in figs. 7 and 8. If it be true that this man is part Negrito, he is an evident ex-

ample of the dominance of straight hair over kinky in a population where straight hair predominates, else he is a pure recessive from a Negrito cross.

PLATE VIII

The Mañgyans of this plate form a separate group coming from Lalanigan, but as usual both Primitive and Iberian characteristics appear, although the noses of these Mañgyans are inclined toward the Australoid type—broad, straight, and heavy. The woman of figs. 1 and 2 has almost pure Iberian ears, type B, of the kind often seen on American Negroes. The men of figs. 3, 4, 5, and 6 have modified Primitive ears and the man of fig. 7 has modified Iberian ears, type B, that are not so pure as those of the woman of figs. 1 and 2. The woman of fig. 8 has ears that resemble the Iberian in the lower part and the Primitive in the upper part, but it is difficult to determine the exact character of the ear in the last two individuals because only the side view is given and the position is bad in both. This group of Mañgyans cannot be differentiated from Negroes by ear form, and although the hair is straight the features are not unlike those of the Negritos.

PLATE IX

Negrito blood is evident in at least one man in this plate (fig. 3), and it may be present in others, especially in the man of figs. 1 and 2 who has wavy hair, Negrito ears (modified Primitive), and Negrito features. The man of fig. 4 has modified Iberian ears, type B. The man of figs. 5 and 6 is a modified Primitive in ear form and features, with the Mongoloid fold at the inner canthus of the eye, which is not a Negrito characteristic. The only other individual in this series of pictures with a well-marked inner fold is the Igorot of Plate V, figs. 5 and 6, who is also a modified Primitive with ears that resemble the ears of some Siberian women photographed by Frau Dina Jochelson-Brodsky.[1] The three women are from eastern Siberia, north of the Sea of Okhotsk, and are modified Primitive in type. They are of the Turko-Mongol stock, and are related to the Eskimo on the one hand and the Chinese on the other. This stock may have entered the Philippines through the Chinese or Japanese, and it is probable that the men with the Mongoloid fold of the inner canthus

[1] *Arch. f. Anthrop.* (1906), 5, Pl. II, fig. 1, and Pl. III, figs. 1 and 2.

mentioned above have derivative Mongolian blood somewhere in their ancestry. This assertion is supported by the similarity of the Siberians and Ilongots in respect to their Primitive features and ear forms, and one is led to believe that the same stock exists in the two peoples, however it came about.

PLATE X

The Ilongots of this plate are modified Alpine in respect to ears and physiognomy, with Primitive attributes well marked in the man and woman in the lower part of the plate. The man of figs. 1 and 2 resembles the North American Indian, and the one in figs. 7 and 8 resembles the Igorots, although the ears are Ilongot in character and not unlike true Negrito ears. The man of figs. 3 and 4 and the woman of figs. 5 and 6 have Alpine ears with modified Primitive characteristics. The woman is more Primitive than the man.

PLATE XI

In marked contrast to the smooth-haired Ilongots of the previous plates are the curly-haired Ilongots of Plate XI who are supposed to be of mixed Negrito blood. The evidence is in the hair alone.

They vary in character from the decided Primitive of figs. 1 and 2 to the modified Primitive or Alpine in fig. 6, with varying intensity of hair curl in decreasing rate to the woman of figs. 7 and 8 with straight hair. If the curly hair is due to Negrito blood, the indication is that Primitive and Negrito are synonymous terms. However, it is not impossible that the curly hair of the Negrito is a character separable from the type of the individual, and thus may occur on pure Iberians as noted on one Zambales Negrito, or it may occur on pure Primitives as seen in this instance. The hair of the pure Iberian Zambales Negrito was kinky, and the hair of this pure Primitive is curly, which indicates also that there may be blending in hair form.

PLATE XII

The men of this plate have familiar faces similar to those that have often been seen in the backwoods of the Atlantic States in America, and their ears partake of a modified Alpine type. The two men in the upper part of the plate have more Iberian than Primitive in their make-up, and the two in the lower part have

more Primitive than Iberian. The curly hair of the man in figs. 5 and 6 may indicate Negrito blood. The man in figs. 7 and 8 is not unlike pictures I have seen of the Ainos. This element may have existed among the early Ilongots and has persisted only in this group. Such types as these are found also in Mindanao, and may be remnants of what has been called the Indonesian, which Montano maintains may be encountered in the interior of Luzon and Mindanao. It cannot be denied that there are European types in these places, and this may be only a rare type of their expression in a remnant that has remained little contaminated by surrounding blood. The hairy Ilongots may be referred also to the hairy Ainos, and if not derived from them are of the same stock.

PLATE XIII

The women of this plate partake largely of modified Iberian characteristics in gradually increasing amount from fig. 1 to fig. 8, although the Primitive characteristics are also present. These women resemble Igorot women more than Ilongot, and there must have been some infiltration of Igorots from the west. The women of figs. 1, 2, 7, and 8 are strikingly like the Igorot women of Bontoc or Benguet. Both women have Igorot ears (Iberian C modified). These individuals pertain to the early Indonesian of Montano and other writers.

To summarize: The Mañgyans are largely Iberian and the Ilongots are largely Primitive. The former give evidence of Negrito characters, especially those from the interior of the Island of Mindoro. The Ilongots, especially those of Oyao and Canadem, are similar to Siberians of the Mongol stock, which may be due to Chinese elements among them. Some Ilongots also resemble Negritos and others resemble Igorots. The Ilongots have hairy faces, whereas the Mañgyans' faces are glabrous.

VIEWS OF THE FULL FIGURE

PLATES XIV AND XV

The four men in Plate XIV are Mañgyans, and the four in Plate XV are Ilongots. The Mañgyans are long legged, the Ilongots short legged, an indication of Iberian in the former and Primitive in the latter. Other characteristics that have been described may be seen, such as the long face and long nose of the Mañgyans and the broad face and broad nose of the Ilongots. The headdress and belts of the two peoples are the same

in style but different in structure. The clout of the two is different, the apron of the Mañgyan being an additional distinction.

PLATE XVI

The difference noticed in Plates XIV and XV between the long legs of the Mañgyans and the short legs of the Ilongots is emphasized in the four men of this plate, and the other characteristics may also be seen. The necklaces of the Mañgyan men are very elaborate, and add distinction to their long necks.

PLATE XVII

The women of this plate well represent the Mañgyan group, from the young girl on the left who is mixed Primitive to the old woman on the right who is Australoid, probably part Negrito. The changes in the breasts with advancing age may be seen also. Several styles of skirts are to be noted, from its complete absence, through the small apron, to the full skirt.

PLATE XVIII

The Mañgyans of Banganay have much Negrito blood, and the various conditions of wavy and curly, to almost kinky, hair may be seen in this plate. The long and short legs, the modified Iberian ears, the modified Primitive ears, and the Australoid noses are to be noticed. These are the remnants of Negritos said by Meyer to exist in Mindoro, yet they are Mañgyans not greatly unlike others that have been portrayed.

PLATES XIX AND XX

The Ilongots of these plates give evidences of intermixture with people having longer legs than themselves, because they have legs of intermediate length, whereas those of the Ilongots are usually short. Their features and ears are more Igorot than Ilongot, although the Ilongot characters are present in both. Their costumes are similar to those of other Ilongots but more elaborate, and certain points of similarity to the Mañgyans may be seen, such as the apron and the neck ornaments, although these are only incidental in the make-up of the fully armed warrior.

To summarize the full figures: The Mañgyans are long legged, the Ilongots short legged, although some of them have legs of intermediate length; from which it may be inferred that the Ilongots are more Primitive and Alpine than the Mañgyans, who are more Iberian and Australoid than the Ilongots.

CONCLUSIONS

The presence of Negrito types among the Mañgyans, with straight hair and glabrous faces, indicates that these two characters are dominant in a population where they predominate, and the two characters may follow Mendel's laws in cross mating.

The presence of all grades of hair from the kinky to the curly and straight, and the presence of all grades of abundance of hair on the face from full heads to the glabrous condition, indicates also that these characters blend in heredity.

The Mañgyans who resemble the Negritos are more like the Mariveles Negritos than like those of other parts of the Philippines, whereas the Ilongots that resemble the Negritos are more like the Negritos of other parts of the Philippines and less like those of Mariveles than are the Mañgyans.

The Mañgyans of the interior resemble Negritos; those of the coast resemble Europeans. The Ilongots of Oyao and Canadem resemble the Siberian type; other Ilongots, the European type; others, the hairy Aino; and yet others are modified Negritos.

ILLUSTRATIONS[2]

Plates I to VII and XIII to XVII; Plate IX, figs. 4 to 6; Plate X, figs. 1, 2, 7, and 8; Plate XI, figs. 1, 2, 7, and 8; and Plate XII, figs. 1 to 6 are from photographs by Charles Martin. Plate XVIII is from photographs by Dean C. Worester. Plate X, figs. 3 to 6; Plate XI, figs. 3 to 6; Plate XII, figs. 7 and 8; and Plates XIX and XX are from photographs by Merton L. Miller.

PLATE I. MAÑGYANS

FIGS. 1, 2, 3, 4, 7, and 8. Front and profile views of Mañgyans of Bulalacao, Mindoro. Note long, wavy hair and light beards, showing admixture of Negrito blood. Note effeminate features of man in figs. 7 and 8. FIGS. 5 and 6. A Mañgyan chief.

PLATE II. ILONGOTS

FIGS. 1 and 2. Front and profile view of typical Ilongot man. FIGS. 3 and 4 Front and profile views of Ilongot man. Note the very scanty beard and earrings in the upper margins of the ears. FIGS. 5. 6, 7, and 8. Front and profile views of typical adult Ilongots. Note typical Ilongot hair net.

PLATE III. ILONGOTS

FIGS. 1 and 2. Front and profile views of middle-aged Ilongot man. Note the remarkable features of this individual who is of a type far superior to that of the majority of his tribe. FIGS. 3, 4, 5, and 6. Front and profile views of typical Ilongot men. FIGS. 7 and 8. Front and profile views of young Ilongot man.

PLATE IV. ILONGOT AND MAÑGYAN WOMEN

FIGS. 1 and 2. Front and profile views of Ilongot woman. FIGS. 3 and 4. Front and profile views of Ilongot girl just approaching maturity. FIGS. 5 and 6. Front and profile views of mature, married Ilongot woman, showing typical headdress. FIGS. 7 and 8. Front and profile views of young Mañgyan girl.

PLATE V. MODIFIED IBERIAN EARS, TYPE C

FIGS. 1 and 2. Front and profile views of Mañgyan man. FIGS. 3 and 4. Front and profile views of adult Ilongot woman. FIGS. 5 and 6. Front and profile views of Ilongot man in his prime, of Oyao, Province of Nueva Vizcaya, Luzon. He shows with great plainness the admixture of Negrito blood. FIGS. 7 and 8. Mañgyan man of Bulalacao, Mindoro.

[2] The descriptions of these photographs are taken from the catalogue of Dean C. Worcester.

PLATE VI. TRANSITIONAL MAÑGYAN EAR FORMS, IBERIAN TO PRIMITIVE

FIG. 1. Profile view of Mañgyan man of Bulalacao, Mindoro. Modified Iberian C. FIG. 2. Profile view of typical Ilongot man of Oyao, Nueva Vizcaya. Modified Iberian C. FIG. 3. Profile view of Mañgyan man of Bulalacao, Mindoro. Modified Primitive. FIG. 4. Profile view of Mañgyan woman of Bulalacao, Mindoro. Modified Primitive. FIGS. 5 and 6. Front and profile views of Mañgyan woman of the Baco River, Mindoro. Primitive. FIGS. 7 and 8. Front and profile views of Mañgyan girl of Bulalacao, Mindoro. Modified Primitive.

PLATE VII. MIXED MAÑGYANS

FIGS. 1 and 2. Front and profile views of an old Mañgyan man of the Baco River, Mindoro. Modified Primitive. FIGS. 3 and 4. Front and profile views of Mañgyan man of the Baco River, Mindoro. Modified Iberian-Alpine. FIGS. 5 and 6. Front and profile views of typical Mañgyan man, showing particularly strong evidence of Negrito blood. Modified Primitive. FIGS. 7 and 8. Front and profile views of Mañgyan man of Bulalacao, Mindoro. Modified Australoid.

PLATE VIII. NEGRITO MAÑGYANS OF LALAUIGAN, MINDORO

FIGS. 1 and 2. Front and profile view of a Mañgyan woman. Modified Iberian B. FIGS. 3 and 4. Front and profile views of Mañgyan man. This man is especially tall for a Mañgyan, and has a perceptible moustache and beard. Modified Primitive. FIGS. 5 and 6. Front and profile views of a young Mañgyan man. Modified Primitive. FIG. 7. Profile view of a Mañgyan man. Modified Primitive. FIG. 8. Profile view of a Mañgyan woman. Modified Primitive.

PLATE IX. MIXED MAÑGYANS OF BANGANAY, MINDORO

FIGS. 1 and 2. Profile and front view of Mañgyan man. Modified Primitive. FIG. 3. Front view of Mañgyan man, having every indication of Negrito blood. Note his curly hair and flat nose. Pure Negritos are not known to exist in Mindoro, but a man of this type affords ample proof that they formerly existed there. Australoid. FIG. 4. Front view of a Mañgyan man who had received a terrible wound in a fight. This is a most unusual occurrence as the Mañgyans are extremely pacific among themselves and very friendly toward outsiders. Modified Iberian B. FIGS. 5 and 6. Front and profile views of Mañgyan man of Bulalacao, Mindoro. Modified Primitive.

PLATE X. MODIFIED ALPINE AND PRIMITIVE ILONGOTS

FIGS. 1 and 2. Front and profile views of middle-aged Ilongot man. Note the remarkable features of this individual, who is of a type far superior to that of the majority of his tribe. Modified Alpine. FIGS. 3 and 4. Front and profile views of Ilongot man of Dupax, Nueva Vizcaya. Modified and Alpine-Primitive. FIGS. 5 and 6. Front and profile views of Ilongot woman of Sugat, Nueva Vizcaya. Modified Primitive. FIGS. 7 and 8. Front and profile views of Ilongot man of Delapping, Nueva Vizcaya, of the bearded type. Modified Primitive.

PLATE XI. CURLY- AND STRAIGHT-HAIRED ILONGOTS

FIGS. 1 and 2. Front and profile views of bearded type of Ilongot, of Delapping, Nueva Vizcaya, showing painly admixture of Negrito blood. FIG. 3. Front view of Ilongot man of Kauayan, Nueva Vizcaya. FIG. 4. Profile view of Ilongot man of Kauayan, Nueva Vizcaya. FIG. 5. Front view of Ilongot man of Gading, Nueva Vizcaya. FIG. 6. Profile view of Ilongot man of Sugat, Nueva Vizcaya. FIGS. 7 and 8. Front and profile views of Ilongot woman of Canadem, Nueva Vizcaya.

PLATE XII. HAIRY ILONGOTS

FIGS. 1 and 2. Front and profile views of old man of Delapping, Nueva Vizcaya. Note his gray hair and beard. He has lost most of his teeth. Modified Iberian. FIGS. 3, 4, 5, and 6. Ilongot men of Delapping, Nueva Vizcaya, of the bearded type, showing plainly the admixture of Negrito blood. Modified Iberian and modified Primitive, respectively. FIGS. 7 and 8. Front and profile views of an old Ilongot man of Dupax, Nueva Vizcaya. Modified Primitive.

PLATE XIII. MODIFIED IBERIAN ILONGOT WOMEN

FIGS. 1 and 2. Front and profile views of young Ilongot woman, of Canadem, Nueva Vizcaya. FIGS. 3, 4, 5, 6, 7, and 8. Front and profile views of Ilongot women of Delapping, Nueva Vizcaya.

PLATE XIV. MAÑGYAN MEN

FIGS. 1, 2, and 3. Mañgyans of Bulalacao, Mindoro. FIG. 4. A Mañgyan chief of Bulalacao, Mindoro. The rattan about the waist was stained a bright scarlet.

PLATE XV. ILONGOT MEN

FIG. 1. Adult Ilongot man of Oyao, Nueva Vizcaya. The typical Ilongot ornaments and hair net may be seen particularly well in this photograph. Note especially the metal band about the left arm and the shell girdle. Also the admixture of Negrito blood, evidenced by wavy hair and scanty beard. FIG. 2. Ilongot man of Canadem, Nueva Vizcaya, showing typical dress. Note the very scanty beard and earrings in the upper margins of the ears and the ornamental rattan and braided cord about the waist. FIG. 3. Ilongot man of Oyao, Nueva Vizcaya. This man shows with great plainness the admixture of Negrito blood. FIG. 4. Typical Ilongot man of Canadem, Nueva Vizcaya. Note the hair net, shell girdle, and light growth of beard.

PLATE XVI. MAÑGYANS AND ILONGOTS

FIG. 1. Mañgyan man of Bulalacao, Mindoro. FIG. 2. Young Ilongot man. FIG. 3. Typical Ilongot man. Note beard and long hair. FIG. 4. Mañgyan of Bulalacao, Mindoro.

PLATE XVII. MAÑGYANS

FIG. 1. Typical Mañgyan woman of the Baco River, Mindoro. FIG. 2. Mañgyan woman of the Baco River, Mindoro, showing typical dress. FIG. 3. Mañgyan girl of Bulalacao, Mindoro, showing typical dress. FIG. 4. Old Mañgyan woman of the Baco River, Mindoro, showing evidence of Negrito blood.

PLATE XVIII. MAÑGYANS OF BANGANAY, MINDORO. MIXED NEGRITOS OF THE AUSTRALOID TYPE

FIG. 1. Mañgyan about to throw a lance. FIG. 2. Mañgyan, full-length front view, showing relative size. This man has very evident indications of Negrito blood. FIGS. 3, 4, and 5. Full-length front view of three Mañgyan men standing.

PLATE XIX. TYPICAL ILONGOTS OF DUPAX, NUEVA VIZCAYA

FIG. 1. Ilongot man armed. FIG. 2. Ilongot man, fully armed, profile view. FIG. 3. Ilongot man, profile view. Note headdress made of the head of a hornbill (*Hydrocorax*).

PLATE XX. TYPICAL ILONGOTS

FIG. 1. Ilongot man of Gading, Nueva Vizcaya. FIG. 2. Ilongot man of San José, Province of Tayabas, Luzon.

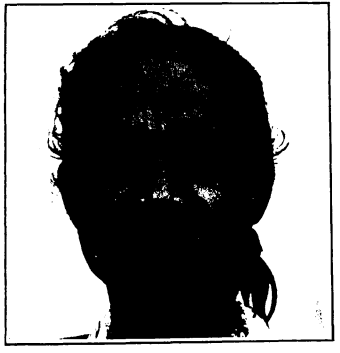

Fig. 1. Iberian A.

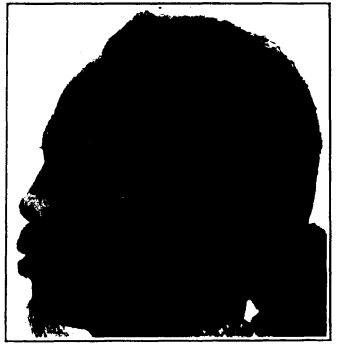

Fig. 2. Iberian A.

Fig. 3. Iberian B.

Fig. 4. Iberian B.

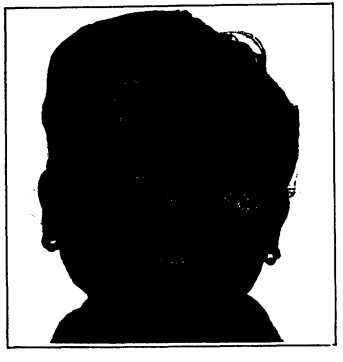

Fig. 5. Modified Alpine.

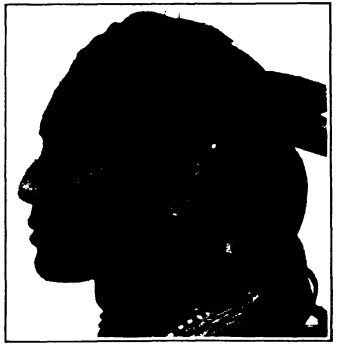

Fig. 6. Modified Alpine.

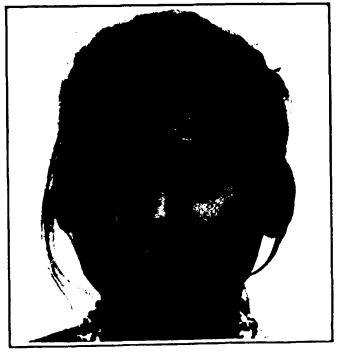

Fig. 7. Iberian A.

Fig. 8. Iberian A.

PLATE I. MANGYANS.

Fig. 1.

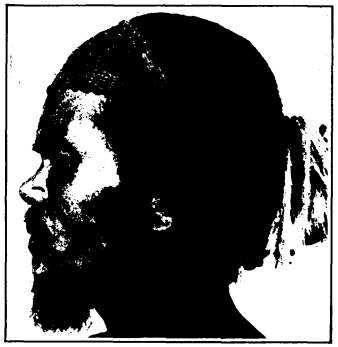

Fig. 2.

Fig. 3.

Fig. 4.

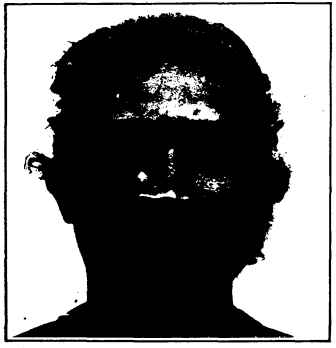

Fig. 5.

Fig. 6.

Fig. 7.

Fig. 8.

PLATE II. ILONGOTS. MODIFIED PRIMITIVE.

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

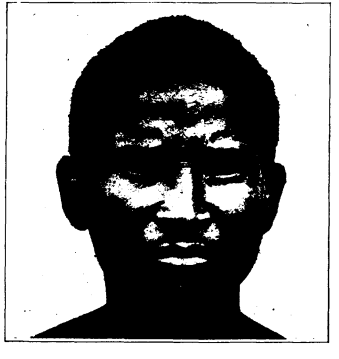

Fig. 5.

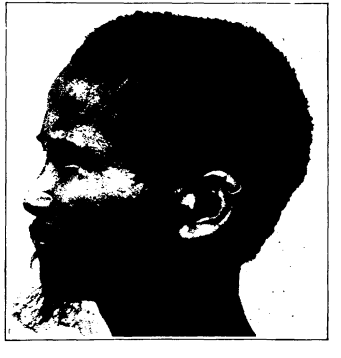

Fig. 6.

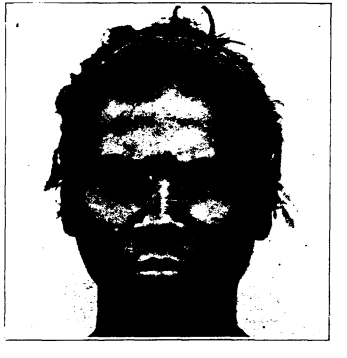

Fig. 7.

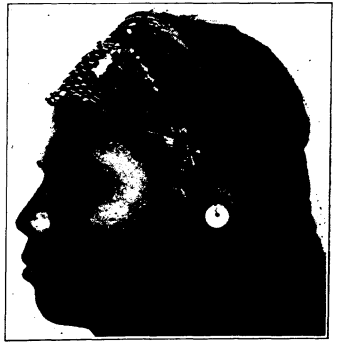

Fig. 8.

PLATE III. ILONGOTS. MUCH MODIFIED PRIMITIVE.

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

Fig. 5.

Fig. 6.

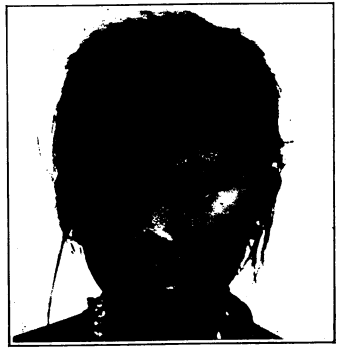

Fig. 7.

Fig. 8.

PLATE IV. ILONGOT AND MANGYAN WOMEN. PRIMITIVE.

Fig. 1. Mangyan man.

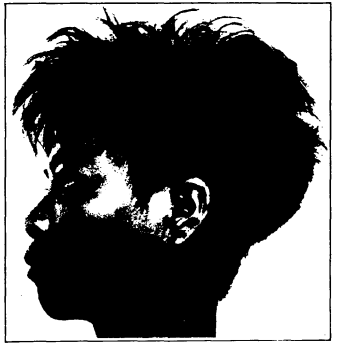

Fig. 2. Mangyan man.

Fig. 3. Ilongot woman.

Fig. 4. Ilongot woman.

Fig. 5. Ilongot man.

Fig. 6. Ilongot man.

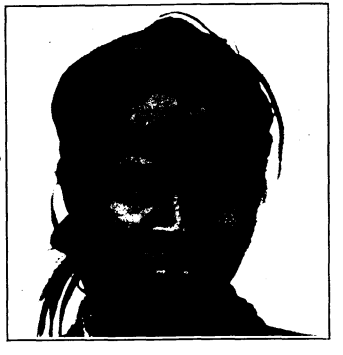

Fig. 7. Mangyan man.

Fig. 8. Mangyan man.

PLATE V. MODIFIED IBERIAN EARS, TYPE C.

Fig. 1. Modified Iberian C.

Fig. 2. Modified Iberian C.

Fig. 3. Modified Primitive.

Fig. 4. Modified Primitive.

Fig. 5. Primitive.

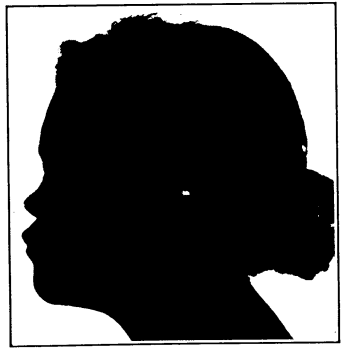

Fig. 6. Primitive.

Fig. 7. Modified Primitive.

Fig. 8. Modified Primitive.

PLATE VI. TRANSITIONAL MANGYAN EAR FORMS. IBERIAN TO PRIMITIVE.

Fig. 1. Modified Primitive.

Fig. 2. Modified Primitive.

Fig. 3. Modified Iberian Alpine.

Fig. 4. Modified Iberian Alpine.

Fig. 5. Modified Primitive.

Fig. 6. Modified Primitive.

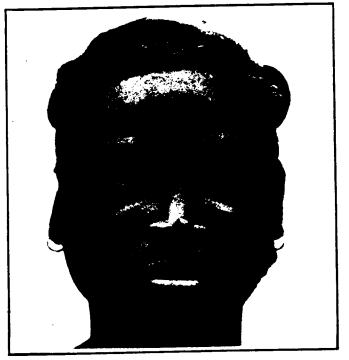

Fig. 7. Modified Australoid.

Fig. 8. Modified Australoid.

PLATE VII. MIXED MANGYANS.

Fig. 1. Modified Iberian B.

Fig. 2. Modified Iberian B.

Fig. 3. Modified Primitive.

Fig. 4. Modified Primitive.

Fig. 5. Modified Primitive.

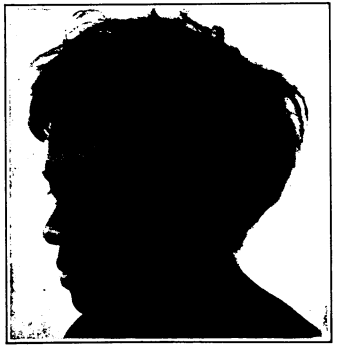

Fig. 6. Modified Primitive.

Fig. 7. Modified Iberian.

Fig. 8. Modified Primitive.

PLATE VIII. NEGRITIC MANGYANS.

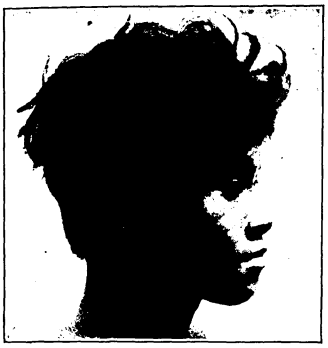

Fig. 1. Modified Primitive.

Fig. 2. Modified Primitive.

Fig. 3. Australoid.

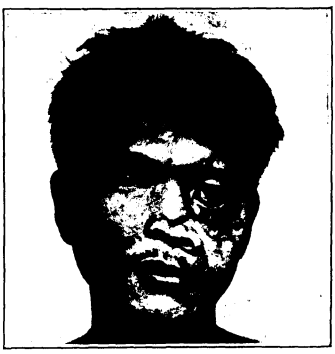

Fig. 4. Modified Iberian B.

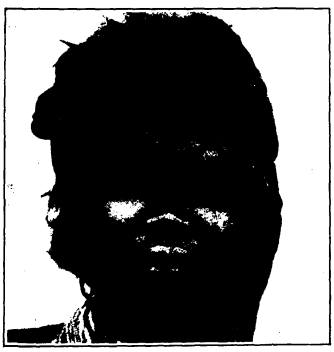

Fig. 5. Modified Primitive.

Fig. 6. Modified Primitive.

PLATE IX. MIXED MANGYANS.

Fig. 1. Modified Alpine.

Fig. 2. Modified Alpine.

Fig. 3. Modified Alpine-Primitive.

Fig. 4. Modified Alpine-Primitive.

Fig. 5. Modified Primitive.

Fig. 6. Modified Primitive.

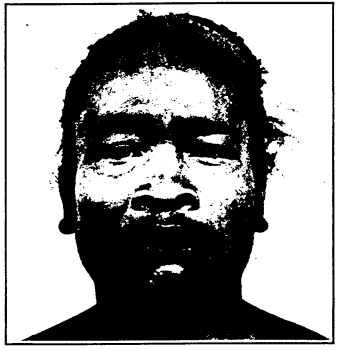

Fig. 7. Modified Primitive.

Fig. 8. Modified Primitive.

PLATE X. MODIFIED ALPINE AND PRIMITIVE ILONGOTS.

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

Fig. 5.

Fig. 6.

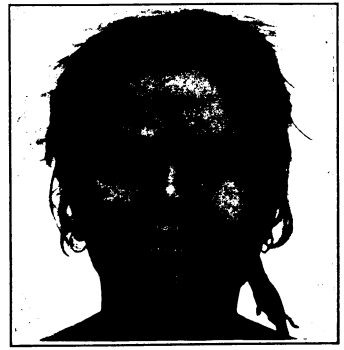

Fig. 7.

Fig. 8.

PLATE XI. CURLY- AND STRAIGHT-HAIRED ILONGOTS.

Fig. 1. Modified Iberian.

Fig. 2. Modified Iberian.

Fig. 3. Modified Iberian.

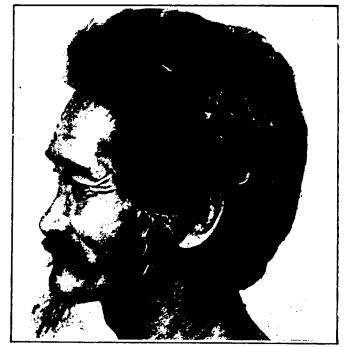

Fig. 4. Modified Iberian.

Fig. 5. Modified Primitive.

Fig. 6. Modified Primitive.

Fig. 7. Modified Primitive.

Fig. 8. Modified Primitive.

PLATE XII. HAIRY ILONGOTS.

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

Fig. 5.

Fig. 6.

Fig. 7.

Fig. 8.

PLATE XIII. MODIFIED IBERIAN ILONGOT WOMEN.

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

PLATE XIV. MANGYAN MEN. NOTE THE LONG LEGS.

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

PLATE XV. ILONGOT MEN. NOTE THE SHORT LEGS.

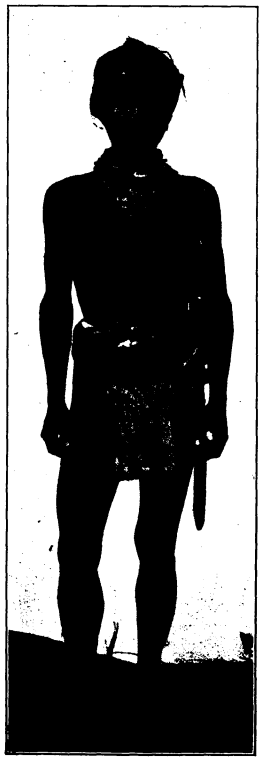

Fig. 1.

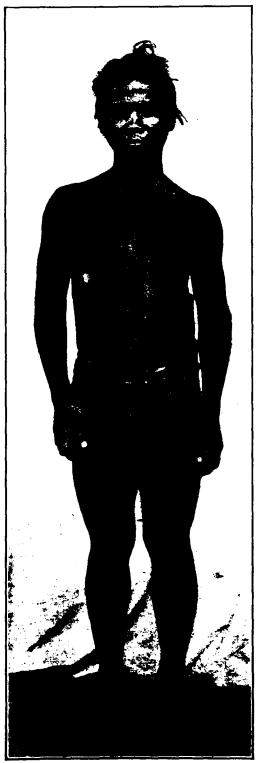

Fig. 2.

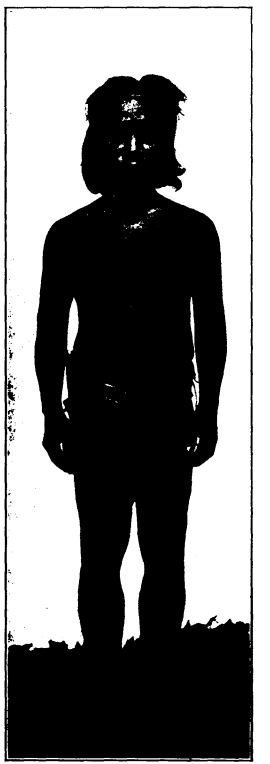

Fig. 3.

Fig. 4.

PLATE XVI. MANGYANS AND ILONGOTS.

Fig. 1.

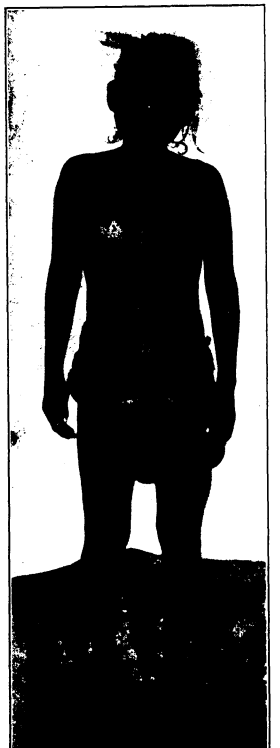

Fig. 2.

Fig. 3.

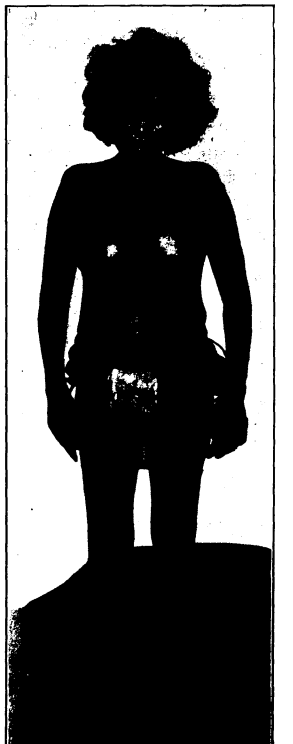

Fig. 4.

PLATE XVII. TYPICAL MANGYAN WOMEN.

Fig. 1.

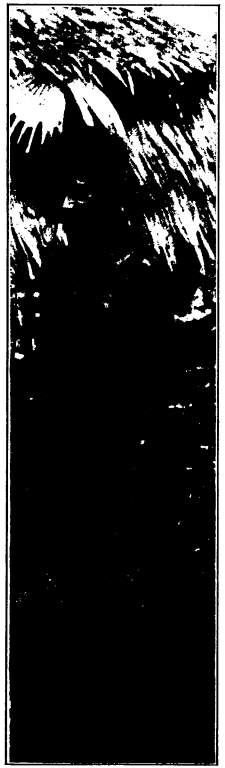

Fig. 2.

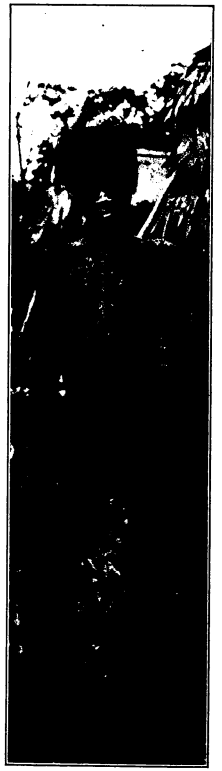

Fig. 3.

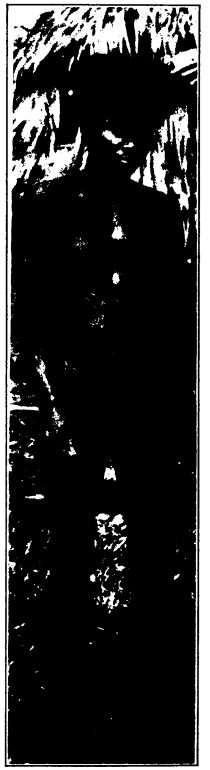

Fig. 4.

Fig. 5.

PLATE XVIII. MANGYANS OF BANGANAY. MIXED NEGRITOS OF THE AUSTRALOID TYPE.

Fig. 1.

Fig. 2.

Fig. 3.

PLATE XIX. TYPICAL ILONGOTS WITH DRESS SUITS AND DECORATIONS.

Fig. 1.

Fig. 2.

PLATE XX. TYPICAL ILONGOTS.

HIRUDO BOYNTONI, A NEW PHILIPPINE LEECH

By LAWRENCE D. WHARTON

(From the Department of Zoölogy, College of Liberal Arts, University of the Philippines)

Hirudo boyntoni sp. nov.

Individuals of this species show a wide variation in size. The following measurements are taken from a specimen slightly larger than the average: Length in extension, 14 cm.; length at rest, 7 cm.; width, 12 mm.; thickness, 6 mm. The greatest width is about the middle, and the body tapers toward both extremities, but more toward the anterior. The cephalic lobe is broad and rounded in front. The acetabulum is circular, about 9 mm. in diameter, and attached in the center.

On the dorsal surface the skin is divided into square papillæ, each annulus having from 16 to 20 of these papillæ. When the body is contracted the annuli are ridged. There are 102 distinct annuli, counting on the dorsal surface. The first 4 of these form the cephalic lobe. The 5th and 6th annuli, called by Whitman the "buccal annuli," are fused laterally as are the postbuccals, the 7th and 8th. In addition, the groove between the 6th and 7th disappears on the ventral surface so that all 4 of the annuli form a broad lip ventral to the mouth.

There are 5 pairs of ocelli borne on the 1st, 2d, 3d, 5th, and 8th annuli. In position the first pair corresponds to the median pair of sensory papillæ and the others to the inner lateral papillæ of the succeeding somites. These sensory papillæ can first be distinctly seen on the 5th annulus as small transparent spots. There are 4 pairs on the dorsal surface—a median pair, an inner lateral, an outer lateral, and a marginal pair—and 3 on the ventral surface. After the 5th annulus they are found on the 8th, 11th, and 14th, and from there on to the 94th on every 5th annulus. After this they are found on the 97th, 99th, and 101st annuli. In addition, 8 radial rows of the organs can be seen distinctly on the dorsal surface of the acetabulum.

Using these sensory papillæ as a means of determining the somites, I find the body to be composed of 26 somites made up as

follows: Somites I and II consist of 1 annulus each; III and IV of 2 annuli each; V and VI of 3 annuli each; VII of 4; VIII to XXIII of 5 annuli each; and XXIV, XXV, and XXVI of 2 annuli each; making a total of 102 annuli.

The most prominent features of the ventral surface are the genital orifices, the male opening lying between the 30th and 31st annuli of somite X and the female between the 35th and 36th annuli of somite XI. The 17 pairs of nephridial pores are also distinctly visible. The first pair is in the posterior edge of the 13th annulus, somite VII, and the last in the 93d annulus, somite XXIII. In each somite the openings are on the annulus just in front of the one bearing the sensory papillæ, which is the second annulus of the somite in every case except somite VII, in which there is only 1 annulus in front of the papillæ-bearing annulus.

The anus lies in the last, or 102d, annulus.

The structure and arrangement of the maxillæ and the internal organs is much the same as is found generally in the genus *Hirudo*.

The color and markings in this species are very constant in all the specimens which have been examined. On the dorsal surface the ground color is olive green mixed with a little yellow. Mid-dorsally there is a longitudinal line of a darker green from 2 to 4 mm. wide. Running parallel to this line on each side are 4 narrow black lines. The margins bear an orange stripe about 1 mm. wide. Lying along the dorsal edge of this marginal stripe is a row of deep-green squares, one lying on each third annulus. Ventrally the color is a uniform dark olive green with a velvety appearance. The acetabulum is the same color as the rest of the body.

The number of annuli and their somite arrangement, the number and position of the eyes and sensory papillæ, the number and position of the nephridia, the position of the genital openings, and the structure of the maxilla place this leech in the genus *Hirudo*. The peculiar papillation of the skin, the prominence of the sensory papillæ both on the body and on the acetabulum, the union of the 6th and 7th annuli on the ventral surface, and the distinctive color marking stamp it as a new species. The species is named in honor of Dr. W. H. Boynton of the Bureau of Agriculture of the Government of the Philippine Islands, who has been studying it with reference to its ability to hold the virus of rinderpest alive in ingested blood, and to whom I am indebted for first calling my attention to the species.

This leech is very common in ditches, small streams, and pools in the rice paddies of the lowlands of Luzon and of other islands. This description is based on specimens from Novaliches, Rizal Province. Specimens have been obtained from practically all of the lowland provinces of Luzon and from Negros, Iloilo, Palawan, and Cebu. I find that it is sold in some of the native drug stores of Manila in place of *H. medicinalis*. Although a paper on the leeches of the Philippines is in the course of preparation, it seems advisable to publish a diagnosis of this species at once. A more detailed description with drawings will be given at a later date.

DIE TENEBRIONIDEN DER PHILIPPINEN

Von HANS GEBIEN

(*Hamburg, Germany*)

Die Herrn Entomologen des Bureau of Science, Manila, hatten die Freundlichkeit, mich mit der Bearbeitung der Tenebrioniden aus der Entomologischen Sammlung des Bureau zu beauftragen. Ich gebe im Folgenden eine Aufzählung aller von den Philippinen gefundenen Arten. Diese stützt sich in erster Linie auf das mir gesandte Material und umfasst auch eine Anzahl Arten, die nur in meiner Sammlung vertreten sind und das gesamte Material des Kgl. Museums in Berlin.

Zweifellos stehen wir erst am Anfang unserer Kenntnis der Philippinen-Fauna. Soweit die aufgefundenen Arten bekannt waren, habe ich Notizen über die geographische Verbreitung gegeben. Ich bemerke, dass sich die Typen aller neuen Arten in meiner Sammlung befinden; war mehr als 1 Exemplar vorhanden, so befinden sich weitere Stücke in der Sammlung des Bureau of Science und des Berliner Museums.

Ethas carinatus Eschsch.

Mir lagen nur die beiden Typen (Manila, *Eschscholtz*) vom Berlin. Mus. vor.

Mesomorphus villiger Blanch.

Diese von Australien bis Afrika verbreitete Art besitzt das Berliner Museum von Luzon (*Jagor*) und Manila (*Eschscholtz*). Die verkürzten Epipleuren bringen diese neue Gattung in die Nähe der echten Opatren. Sie hat grosse Ähnlichkeit mit *Gonocephalum,* von dem sie sich durch die Bildung der Vordertibien unterscheidet. Am nächsten steht ihr die Gattung *Adavius* (*Cyptus*), die sich aber durch bewimperte Körperseiten unterscheidet.

Scleron ferrugineum F. (= *denticolle* Fairm., *discicolle* Reitt., *tuberculatum* Bess.)

Vorder- und Hinterindien, Indo-China, Java, Sumatra überall sehr häufig. Von den Philippinen bisher noch nicht bekannt.

Vier Exemplare: LUZON, Manila (1748,[1] *W. Schultze;* 2972 *Charles S. Banks*), ebendaher auch im Berliner Museum (*Eschscholtz*).

Genus **CNEMODASUS** novum

(*Opatrinarum*)

Kurz elliptisch, mässig gewölbt. Ganz von dem Aussehen der *Cyptus*-Arten. Kopf breit, am Canthus viel breiter als an den Augen, da er stark winklig nach aussen tritt. Die Augen ungeteilt, aber von dem Canthus von vorn bis über die Mitte eingeschnürt, der Innenrand zu einer Falte erhaben die aber nach der Stirn hin nicht durch eine Furche abgesetzt ist; Clypeus mit dem normalen, schmalen, tiefen Ausschnitt. Das Kinn ist gehöckert, die Seiten des Submentums und zwar die Wangen zwischen Auge und Grund der Mandibeln stark gewölbt oder in der Wölbung mit langer Furche. Mandibeln sehr dick und robust, am Ende geteilt, Fühler kurz, die Mitte des Halsschildes kaum erreichend, gegen das Ende gekeult; die Keule abgeflacht, Glied 3 viel länger (circa $1\frac{2}{3}$ mal) als 4. Thorax stark quer, an den Seiten ohne längere Wimperborsten, die Basis wie bei *Adavius* (*Cyptus*) in der Mitte stark lappenartig nach hinten gezogen, höchstens seitlich gerandet. Flügeldecken kurz, Flügel vorhanden, vollständig, Seiten der Elytren ohne eigentliche Randwimpern. Oberfläche wie bei den meisten Gonocephalen fein beschuppt. Die Vorderschienen gegen das Ende mehr oder weniger lappenartig verbreitert, seitlich entweder mit deutlichen Zähnen oder nur fein gekerbt. Vorderseite der Schienen gefurcht und gekielt (Tarsalfurche!). Epipleuren vom 4. Segment ab fehlend. Der Fortsatz des 1. Abdominalsegments ist breit, abgestutzt.

Cnemodasus rectangulus sp. nov.

Kopf halb so breit wie der Halsschild, dicht und grob, aber nicht sehr tief punktiert, die beiden, durch den Ausschnitt des Clypeus gebildeten Lappen fast halbkreisförmig, innen neben den Augen ist der Rand erhaben, etwas faltenartig. Fühler glänzend, mit kurzen starren Borsten besetzt, die vorletzten Glieder stark quer, fast doppelt so breit wie lang, von der Mitte nach hinten fast garnicht, nach vorn sehr stark verengt, die Hinterecken scharf rechtwinklig, die vorderen dagegen ganz breit verrundet. Die Basis ist breit lappig vorgezogen und reicht daher viel weiter nach hinten als die Hinterwinkel,

[1] Diese Nummern beziehen sich auf die Accessionsrecorde der Entomologischen Sammlung des Bureau of Science, Manila, P. I.

jederseits der Mitte ein flacher Eindruck an der Basis. Randlinien an den Seiten der Basis fehlen. Oberfläche an den Seiten tiefer, in der Mitte flacher grob und dicht punktiert, jeder Punkt mit sehr kurzem, dicken Börstchen. Die Zwischenräume der Punkte bilden seitlich mehr oder weniger längliche Körnchen. Flügeldecken kurz, circa $1\frac{1}{4}$ mal so lang wie zusammen breit, ihre Punktstreifen fein, wenig vertieft, so dass die Zwischenräume ganz plan sind, diese Interstitien haben je circa 3 unordentliche Reihen sehr kurzer aufgerichteter, dicker Börstchen, die viel kürzer sind als ihre Entfernung von einander (von vorn nach hinten) beträgt. Die basale Randkante der Elytren ist entsprechend der Kurve des Halsschildes beim Schildchen nach hinten gezogen und lässt diese in der Mitte vor sich, so dass es nicht zwischen die Flügeldecken tritt. Die Propleuren nach vorn mit nicht sehr dichten, starken, scharfen Körnchen und mehr nach den Hüften und hinten hin groben Längsrunzeln. Das Abdomen beborstet und mit scharf reibeisenartigen Punkten besetzt. Vorderschenkel glänzend, mit sehr stumpfer Ecke an der Unterseite vor dem Ende. Die Vorderschienen gegen das Ende stark verbreitert, die Aussenecke lappenförmig, darüber an der Aussenkante 1 bis 2 grosse Zähne (aber nicht annähernd so wie bei *Melanesthes*), die untere Erweiterung etwa so breit wie die ersten 3 Fussglieder lang, die Kante an der Vorderseite sehr undeutlich, in der Oberhälfte ganz geschwunden. Prosternum über die Hüften hinaus verlängert, wenig gesenkt, am Ende zugespitzt. Der zarte Penis am Ende flach und zweispitzig.

Länge 7.5–8.5 mm., Breite 4 mm.

Zwei Exemplare.

LUZON, Batangas, Vulkan Taal (*Charles S. Banks*).

Von der vorliegenden Gattung liegen mir noch 3 neue Arten vor, von denen 2 (von Neu-Guinea and Neu-Pommern) bald beschrieben werden; die vierte von Bali[2] unterscheidet sich

[2] **Cnemodasus tenuipes sp. nov.**

Der vorigen Art ähnlich aber viel flacher, die hinteren Ecken des Halsschildes scharf rechteckig, die vorderen stumpf, schwach verrundet, die Basis jederseits der Mitte tiefer eingedrückt, eine Randlinie jederseits vorhanden, aber nicht sehr deutlich, die Propleuren sind nicht sehr deutlich gekörnt und schwach gerunzelt, das Prosternum wagerecht, am Ende breiter, flacher und stumpfwinklig vorgezogen, ohne spitze Ecke. Die Vorderschiene schmal, nur das Ende schwach lappig verbreitert, der Vorderseitenkiel ist scharf und auf der ganzen Länge vorhanden, Zähne an den Seiten fehlen.

Länge 7 mm.

INSEL BALI (*Doherty*). Meine Sammlung.

sofort durch die schmalen Vorderschienen mit vollständigem Kiel und anderes Prosternum. Die Arten vom Neu-Guinea-Gebiet haben andere Vorderschienen, gerandete Basis des Halsschildes und nicht verrundete Vorderwinkel.

Gonocephalum depressum Fabr.

Die als eigene Art oder als Varietät aufgefasste Form *Opatrum bilineatum* Wlk. lässt sich nicht scharf von ihr trennen; sie liegt mir vor aus:

LUZON, Benguet, Trinidad (8255, *Charles S. Banks*); SIBUYAN (7663, *R. C. McGregor*); Berliner Museum: Ins. Philippinae (*Cuming*).

Gonocephalum adpressum Germ.

Sechs Exemplare im Berliner Museum, von Manila und Ins. Philippinae (*Cuming*); ferner 3 Exemplare von LUZON, Batangas, Vulkan Taal (17043, *Charles S. Banks*).

Bradymerus elongatus sp. nov.

Körper langgestreckt, parallelseitig, schwarz, oder schwarzbraun, glänzend (soweit nicht der Körper mit einer Schmutzkruste bedeckt ist), Fühler und Taster rot, die ersten Fussglieder bräunlich. Kopf lang, flach, ohne deutliche Querfurche und ohne Augenfalten; Augenfurchen fein, schmal, tief, nur am Innenrande liegend; Clypeus gerade abgestutzt, der ganze Kopf sehr gedrängt, längsrissig punktiert, auch auf dem Clypeus, die Wangen vor den Augen ziemlich geradlinig verengt. Das 3. Fühlerglied $1\frac{1}{2}$ mal so lang wie das 4., die ersten 5 Glieder länger als breit, das 6. schwach quer, die folgenden immer stärker quer, die vorletzten fast doppelt so breit wie lang. Halsschild quer, kaum $1\frac{1}{2}$ mal so breit als in der Mitte lang, wesentlich schmäler als die Flügeldecken, besonders an der Basis, die Seiten vor den scharf rechteckigen Hinterwinkeln nicht oder kaum ausgeschweift, die Vorderwinkel verrundet, kaum vortretend, die Randpartie gleichmässig breit, doch ziemlich schmal abgesetzt und etwas aufgebogen, der eigentliche Rand nicht oder wenig deutlich gewellt, die Basis ganz gerandet, der Rand in der Mitte breiter als an den Seiten und mehr furchenartig. Die Oberfläche sehr dichtgedrängt, grob punktiert, die äusserst schmalen Zwischenräume der Punkte glänzend, stellenweise Längsrunzeln, stellenweise mehr feine Körnchen bildend. Das halbkreisförmige Schildchen ebenfalls dicht und ziemlich grob punktiert. Die Flügeldecken sehr gestreckt, parallelseitig, oben abgeflacht, nach gehöriger Reinigung schwarz, und ziemlich glänzend, mit

ziemlich tiefen Punktstreifen, deren Punkte meist länglich sind, die Zwischenräume sind fein lederartig punktiert gerunzelt und mit einer Reihe etwas abgeflachter, meist länglicher, ungleich dicht stehenden Körnchen versehen; diese Körnchen laufen auf den mehr erhabenen Intervallen zu einer mehr oder minder krenulierten Rippe zusammen. Der 1. Zwischenraum im letzten Achtel stark erhaben und im Spitzenwinkel mit der siebenten Rippe verbunden, der 3. Zwischenraum vorn und hinten gekielt, in der Mitte mehr abgeflacht, der 5. und 7. der ganzen Länge nach stark gerippt, der 7. bildet von oben gesehen den Rand und verdeckt, namentlich vorn, die Seitenpartie, lässt aber hinten den 8., ebenfalls schwach gerippten Zwischenraum, sichtbar. Die Pleuren des Halsschildes sind grob und dicht gedrängt, stellenweise runzlig punktiert, das Prosternum zwischen den Hüften gewölbt, undeutlich, doppelt gefurcht, am Ende niedergedrückt und mit feiner, wenig deutlicher Spitze versehen, das Mesosternum steil mit nicht sehr tiefem V-förmigen Ausschnitt. Abdomen glänzend, ziemlich fein und mässig dicht punktiert. Beine schlank, Tibien dünn, an den Hintertarsen ist das Klauenglied kürzer als die andern 3 zusammen.

Länge 9.5–10 mm.

Fünf Exemplare.

LUZON, Benguet, Pauai, 2,250 Meter (11196, *R. C. McGregor*).

Diese Art ist von allen Gattungsgenossen durch den gestreckten, flachen Körper ausgezeichnet, die Oberseite ist schwarz, der Halsschild verhältnismässig fein skulptiert, sein Rand fast glatt. Von den bekannten Arten ist keine der vorstehenden ähnlich ausser der folgenden.

Bradymerus alternicostis sp. nov.

Diese Art ist der vorigen sehr ähnlich, ebenfalls langgestreckt, oben flach, die Flügeldecken aber braun, stark glänzend. Der Halsschild ist an den Seiten deutlich krenuliert, die Basalrandung stark glänzend; in der Mitte der Basis vor dem Rand eine glatte Stelle. Die Rippenbildung der Flügeldecken ist durchaus ähnlich, doch sind die Zwischenräume sämtlich spiegelglatt, ohne Spur von Punktierung, einzelne Körnchen finden sich nur auf der hinteren Hälfte des 6. und 8. und vollständig auf dem 9. Zwischenraum, die Rippen ebenfalls glatt, nur an der Spitze etwas uneben.

Länge 9 mm.

Ein Exemplar.

LUZON, Laguna, Mt. Banajao (7206, *Charles S. Banks*).

Bradymerus impressicollis sp. nov.

Körper ebenfalls ziemlich schmal, gestreckt, oben etwas abgeflacht, braunschwarz, matt, besonders auch auf den Flügeldecken, die ersten 5 Fühlerglieder, die Taster und die Tarsen rostrot. Kopf flach, die Clypealfurche sehr fein aber deutlich, nahezu halbkreisförmig, die ganze Oberfläche fein aber scharf längsriefig, nur der Canthus vor den Augen und der Vorderrand des Clypeus mit mehr oder weniger runden Punkten, der Clypeus ganz gerade abgeschnitten mit ganz verrundeten Ecken, Augenfalten fehlen, eine schmale, kurze, scharf eingeschnittene Augenfurche befindet sich jederseits am hinteren Innenrande der Augen. Fühler ähnlich wie bei den vorigen Arten, doch sind die letzten Glieder dunkel, auch das 6. ist stark quer und fast doppelt so breit wie lang. Halsschild quer, fast doppelt so breit wie in der Mittellinie lang, die Mittelpartie des Vorderrandes nicht sehr stark vorgezogen, vorn der Quere nach stark, hinten schwach gewölbt, der Seitenrand schmal gleichmässig breit abgesetzt, die Vorderwinkel spitzwinklig, ziemlich scharf vortretend, die hinteren rechtwinklig, die grösste Breite liegt etwa in der Mitte, die Verengung nach vorn stärker als nach hinten, so dass also die Basis wesentlich breiter als die Spitze ist. Die Basis ist ganz gerandet, die Randung in der Mitte nur wenig breiter als neben den Hinterwinkeln; die Oberfläche ist durch einen mittleren, breiten, aber ziemlich flachen Längseindruck uneben, der in der Mitte mehr einem flachen Grübchen ähnelt; der Seitenrand ist fast glatt, vor den Hinterwinkeln nicht oder kaum merklich ausgeschweift. Das grob und dicht punktierte Schildchen hat eine deutliche Spitze. Die Flügeldecken sind deutlich aber nicht viel breiter als der Halsschild, die ersten Zwischenräume sind ziemlich flach, doch nach der Spitze hin konvex, die äusseren Zwischenräume mehr gewölbt, alle tragen einen sehr schmalen, feinen, geraden, vielfach unterbrochenen Längskiel, an der Spitze treten der 3., 5. und 7. Zwischenraum mehr hervor als die anderen, der 8. ist hinten scharf gerippt und läuft bis in die Spitze. Die ganze Vorderbrust mit den Pleuren ist grob und dicht punktiert aber nicht gerunzelt. Das Prosternum zwischen den Hüften ungefurcht, das Ende niedergedrückt mit feiner nach hinten gerichteter Spitze. Metasternum und Abdomen glänzend, nicht sehr dicht, aber deutlich punktiert. Mittelbrust mit niedrigem Steilabfall und geringem bogigem Ausschnitt. Beine dünn und schlank; an den Hintertarsen ist das Klauenglied so lang wie die andern zusammen.

Länge 7–7.5 mm.

Zwei Exemplare.

LUZON, Benguet, Baguio (9923, *H. M. Curran*).

Diese Art hat in der ziemlich gestreckten und flachen Gestalt, dem seitlich ungezähnten Halsschild und in der Kopfskulptur Ähnlichkeit mit *elongatus* und *alternicostis*, aber ganz andere Flügeldeckenskulptur. Von den andern bekannten braunen Arten unterscheidet sie sich durch den fein aber scharf langrissigen Kopf, durch die Bildung des Halsschildes etc.

Bradymerus æquecostatus Fairm., Notes Leyden Mus. (1893), 15, 20.

Mir liegt von dieser Art 1 Stück von Süd Palawan (meine Sammlung) vor, das ich von Exemplaren vom Kinabalu, Borneo, nicht unterscheiden kann.

Bradymerus ? crenulicollis Fairm., Notes Leyden Mus. (1882), 4, 221.

Zwei Exemplare, die mir zugesandt waren, stimmen mit einer Anzahl von Java in meiner Sammlung überein; nur ist der Halsschild am Rande fast glatt, doch finde ich Übergänge dazu unter den Javanern. Ob aber die Art richtig gedeutet ist, bleibt bei der Menge sehr ähnlicher Arten, die zum grössten Teil unbeschrieben sind, zweifelhaft.

MINDORO, Bongabon (8412, *W. Schultze*).

Bradymerus carinatus Fairm. (= *corinthius* Fairm.).

Eine durch die lebhaft metallische Färbung der Flügeldecken leicht kenntliche Art, die aber sehr variabel ist. Drei Exemplare des Berliner Museums haben grün-metallische Flügeldecken und fast schwarzen Vorderkörper, die Seiten des Halsschildes vor den Hinterecken sind fast gerade oder mehr oder weniger deutlich geschweift, auch die Rippenbildung ist sehr veränderlich.

LUZON (*Jagor*), Manila (*Eschscholtz*); CEBU, Toledo (6758, *R. C. McGregor*).

Bradymerus violaceus Pasc., Ann. & Mag. Nat. Hist. (1883), V, 11, 437.

In der auffallenden Färbung nur mit der folgenden Art und mit *B. cyaneipennis* Pasc. zu vergleichen. Von dieser letzten Art unterscheidet sie sich durch andere Färbung der Fühler, Beine und der Unterseite und das nicht längsgestrichelte Abdomen

durch die vortretenden Halsschildvorderwinkel etc. Die Unterschiede zwischen *violaceus* und der folgenden Art finden sich dort.

Drei Exemplare.

INSEL CAMIGUIN (7814, *R. C. McGregor*).

Bradymerus cæruleipennis sp. nov.

Glänzend schwarz, auch die Fühler und Beine, die Flügeldecken glänzend blau. Kopf gestreckt, Augenfurchen deutlich, tief, kurz, nach hinten aber verbreitert und nach hinten geöffnet, also nicht dem Augenrand parallel; der Canthus nicht breiter als die Augen, aber durch einen deutlichen, winkligen Ausschnitt von ihm abgesetzt, dadurch die Augen ziemlich hervortretend, die Furche, welche den Clypeus absetzt, ziemlich fein, nicht scharf, glänzend, seitlich etwas mitten zwischen Canthus und Clypeusecke ausmündend; diese ziemlich breit verrundet, der Vorderrand sanft ausgeschnitten; die Oberfläche mässig dicht und ziemlich fein punktiert, der Grund äusserst fein lederrunzlig, die Keule der Fühler nicht deutlich abgesetzt, 4-gliedrig, die vorhergehenden Glieder wenig breiter als lang. Halsschild in der Mittellinie etwa halb so lang als an der breitesten Stelle breit, der Vorderrand ganz gerade abgeschnitten, weder die Mitte noch die Vorderwinkel vorragend, diese breit verrundet, Basis und Vorderrand gleich breit, der Halsschild querüber ziemlich stark, auch an der Basis gewölbt, die Wölbung geht seitwärts fast bis zum Rande, der nur sehr schmal abgesetzt ist, der äusserste Rand ganz glatt, die grösste Breite des an den Seiten stark gerundeten Halsschildes liegt in der Mitte, die Hinterwinkel scharf, circa 100° gross, die Seiten davor kaum ausgeschweift; die Basalrandung ist an den Seiten schmäler und schärfer abgesetzt als in der Mitte, dort ist sie flach und mehr eine breite Furche. Die Oberfläche ist durch einige sehr flache undeutliche Eindrücke uneben, nicht sehr stark, und wenig dicht punktiert, an den Seiten noch sparsamer; der Grund ist äusserst fein lederrunzlig. Flügeldecken nach hinten schwach erweitert, gewölbt, hinter dem dreieckigen, glatten Schildchen mit flachem, grossem Eindruck, der Seitenrand von oben nirgends sichtbar. Oberfläche mit Reihen (auf der Scheibe) oder Streifen (seitlich) gröber, fast grübchenförmiger Punkte, die meist im Grunde ein längliches Strichelchen haben, die Interstitien auf der Scheibe flach, an den Seiten stark gewölbt, der 3., 5. und 7. an der Spitze etwas mehr erhaben als die andern. Propleuren mit einzelnen ziemlich groben Punkten, Prosternum zwischen den Hüften

gefurcht, dahinter vollständig niedergedrückt. Abdomen glänzend, ziemlich fein punktiert. Mesosternum breit V-förmig wenig tief ausgeschnitten. Beine schlank, an den Hintertarsen ist das Klauenglied so lang wie die andern zusammen.

Länge 10 mm.

Ein Exemplar.

LUZON, Benguet, Mt. Pulog, 2,250 Meter (10257, *H. M. Curran*).

Diese blaue Art ist durch den schwarzen, weitläufig punktierten ganzrandigen Halsschild, dessen Vorderwinkel nicht vortreten, und durch die Flügeldeckenskulptur gut gekennzeichnet.

Tabelle der Bradymerus-Arten der Philippinen.

1. Oberseite blau oder metallisch ..... 2.
   Oberseite schwarz oder braun ..... 4.
2. Halsschild weitläufig punktiert, Vorderrand gerade abgeschnitten, Punkte der Flügeldeckenstreifen sehr grob, seitlich grübchenartig. **cæruleipennis sp. nov.**
   Halsschild gedrängt punktiert, Vorderwinkel spitz vorragend, Punkte der Flügeldeckenstreifen sehr fein ..... 3.
3. Flügeldecken leuchtend grünlich bronze oder schwärzlich grün, Prosternum kaum gefurcht, hinter den Hüften schwach gesenkt, mit senkrechtem Absturz ..... **carinatus Fairm.**
   Oberseite lebhaft blau oder violett, Prosternum kräftig gefurcht; hinter den Hüften ganz niedergedrückt mit feiner Spitze ..... **violaceus Pasc.**
4. Beine ganz rot, Körper schwarz, gewölbt, Kopf und Halsschild granuliert (ex Fairmaire) ..... **ferruginipes Fairm.**
   Höchstens die Tarsen rot ..... 5.
5. Gedrungene, gewölbte Arten, Stirn und Halsschild gedrängt körnig punktiert ..... 6.
   Gestreckte, flache Arten, Stirn dicht und fein längsstrigos ..... 7.
6. Die alternierenden Streifen stark erhaben, rotbraune Art. **crenulicollis Fairm.**
   Alle Streifen (ausser den ersten) scharf gekielt, schwarzbraune Art. **æquecostatus Fairm.**
7. Halsschild in der Mitte mit Eindruck, Vorderwinkel ziemlich spitz vorragend, alle Streifen vorn gekielt, Fühlerkeule schwarz. **impressicollis Geb.**
   Halsschild gleichmässig gewölbt, Vorderwinkel schwach, gerundet vorragend, die abwechselnden Streifen erhabener, Fühler ganz rot .... 8.
8. Grund der dunkelbraunen Flügeldecken spiegelglatt, die Rippen auf der Scheibe fast glatt ..... **alternicostis Geb.**
   Grund der schwarzen Flügeldecken sehr fein lederrunzlig, die Rippen fein gekörnt ..... **elongatus Geb.**

Byrsax satanas sp. nov.

Form und Grösse etwa wie bei *B. gibbifer* Wesm. und *B. cœnosus* Pasc., nicht viel länger als breit, schwarzbraun, matt, Körper

jedoch ganz mit den Resten des Wirtspilzes bedeckt, welche die Skulptur zum Teil verdecken, Fühler und Taster rotbraun. Kopf flach, sein Hinterrand scharfkantig, die Stirn davor fast etwas ausgehöhlt. Vorderrand hat jederseits zwei Zähnchen, das eine ist der Canthus, das andere liegt in der Mitte zwischen Canthusecke und Clypeusecke, diese selbst ist aber ganz verrundet, der Vorderrand gerade abgeschnitten, auf dem Vorderkopf befinden sich beim gut entwickelten ♂ 2 sehr lange Hörner, die erst aufwärts und dann nach vorne gerichtet sind, ihr Vorderrand bildet einen ziemlich regelmässigen Fünftelkreisbogen (von der Seite gesehen), die Hörner divergieren (genau von vorne gesehen) mit circa 50°, der Innenrand der Augen hat keine deutliche Augenfalte. Beim ♀ ist der Kopf ganz flach mit einfachem Clypeus, der Vorderrand ohne Zähnchen, die Hörner fehlen ganz und die Stirn ist mit Körnchen von ungleicher Dichte und Feinheit bedeckt; beim zweiten ♂ sind die Hörner sehr kurz, fast gerade in die Höhe gerichtet und am Ende abgestutzt, während sie bei dem normal entwickelten, am Ende etwas flach gedrückt (aber nicht wie bei den verwandten Arten verbreitert sind), der Hinterrand ist dort mit wenigen deutlichen Kerbzähnchen versehen. An den Fühlern ist das 5. Glied so breit wie lang, die folgenden sind, allmählich breiter werdend, nach innen erweitert, das letzte ist gestreckt, länger als breit, von der Breite des vorletzten. Halsschild an der breitesten Stelle weit hinter der Mitte, circa 3 mal so breit wie in der Mitte lang, die Vorderwinkel beim ♂ scharf rechtwinklig, beim ♀ spitz und etwas ausgezogen. Die Hinterwinkel ganz kurz stumpfwinklig (z. B., die seitliche starke Verflachung des Halsschildes, die bis an den Hinterrand Zähne zeigt, hat nach innen von dem letzten Zahn eine flache Ausrandung—die bei *Byrsax cornutus* Fabr. etwa halbkreisförmig ist—und nach innen davon erst die Hinterwinkel); es sind am Seitenrand etwa 15 rechtwinklige Zähnchen vorhanden deren jedes auf der Oberseite ein Körnchen trägt, ausserdem hat die seitliche Verflachung einige wenige gröbere Tuberkeln; eine Reihe ebenso grosser steht am Vorderrand, dahinter eine unordentliche, stellenweise doppelte Querreihe; auf der Mittellinie jederseits einige noch gröbere Tuberkeln, die eine flache Mittelfurche freilassen, ferner noch auf dem übrigen Raum ein paar teilweise reihig gestellter Tuberkeln.

Die wie bei *cœnosus* hochgewölbten Flügeldecken haben einen regelmässig gesägten Seitenrand, dessen Zähnchen rechtwinklig sind, und nach hinten zu an Grösse allmählich abnehmen; aber

auch die Zähnchen des Spitzensaumes sind sehr deutlich. Der flache Seitenrand ist fein und ziemlich regelmässig quergefaltet. Jedes Zähnchen hat, etwas entfernt von der Spitze, eine feine Tuberkel, ungefähr jede 2. Falte weiter nach innen zu eine wesentlich grössere. Jederseits der Naht befindet sich ebenfalls eine Reihe feiner, aber weitläufiger Körnchen, und jederseits die 3 grossen Höcker, von denen der letzte, kleinste, am Beginn des Absturzes steht, die Höcker sind in der Anlage rund, haben aber jeder auf der Spitze einen kurzen Längskiel. Der Grund der Flügeldecken ist sehr grob, grübchenartig, nirgends reihig punktiert. Die Propleuren sind glänzend, fein aber deutlich punktiert, das Prosternum ganz heruntergebogen, das schmale Mesosternum ist nur nach vorn kielig (nicht wie bei *macleayi* scharf meisselförmig) erhöht und endet vorn mit kleiner, zahnförmiger Tuberkel. Analsegment ohne Tuberkel. Vordertibien aussen nicht abgeflacht, ungekantet.

Länge 9–9.5 mm. (ohne Hörner), Breite 6.5 mm.

Zwei ♂, 1 ♀.

LUZON, Cagayan, Aparri (10585, *H. M. Curran*).

Diese Art steht dem *gibbifer* Wesm. am nächsten. Ihre Hauptmerkmale bilden die Bewaffnung des Kopfes beim Männchen, den beim Weibchen ganz einfachen Thorax, das ganz niedergebogene Prosternum, das nur vorn erhobene Mesosternum, die grossen, nicht reihig gestellten Punkte der Flügeldecken, deren Rand auch an der Spitze scharf, wenn auch fein gesägt ist, auf den Elytren sind nur 3 grosse Höcker vorhanden, die Augenfalten fehlen etc.

Atasthalus serratus sp. nov.

Ziemlich gedrungen, parallelseitig, ganz mit graubraunem Erd- oder Schmutzüberzug bedeckt der die Skulptur einhüllt. Vorderrand des Kopfes mit zahlreichen Hörnchen oder Zacken, der Canthus spitzig vorragend, von dort ist der Seitenrand fast geradlinig nach hinten verengt, da die Augen kaum aus der Wölbung des Kopfes hervortreten. Die Mitte des Clypeus, mit 2 aufrechten dreieckigen Hörnchen, am Innenrand der Augen je eine spitze Tuberkel, 2 weitere in derselben Linie auf der Stirn, der Vorderkopf wegen des aufgeworfenen Clypealrandes ausgehöhlt, jederseits aber in der Mitte zwischen dem Clypealhorn und dem Canthus eine längliche, etwas kielförmige Erhöhung in der Richtung nach innen und hinten. Die Oberfläche ist ziemlich grob punktiert (in den tieferen Teilen) und

fein granuliert, namentlich hinten. Die Clypealfurche scharf, aber wie überhaupt die Skulptur des Kopfes unter dem Überzug nicht erkennbar. Das 1. Glied der Fühler sehr kräftig, die folgenden klein, perlig, vom 6. an quer, das 10. ist an der Spitze sanft ausgeschnitten zur Aufnahme des 11. Gliedes, das etwa so lang wie breit ist. Halsschild stark quer, seine Seiten abgeflacht, die grösste Breite in oder hinter der Mitte, der Seitenrand mit circa 6 fingerartigen, nicht zugespitzten Zähnen, der Vorderste bildet die vorgezogenen Vorderwinkel, die Hinterwinkel sind etwa rechtwinklig und ganz an den verflachten Seitenrand verlegt, nicht wie bei voriger Art, mehr nach der Mitte der Basis zu; die Basis ist in breitem, sanftem Bogen nach hinten vorgezogen und jederseits der Mitte schwach geschweift. Vom Vorderrand des Halsschildes erheben sich 2 etwas nach oben und vorn gerichtete Hörner, die aber (von hinten gesehen) nach aussen gekrümmt sind. Die Hörner sind am Grunde so dick, dass ihr Hinterrand etwa die Mitte der Scheibe erreicht, sie tragen an der Spitze einen Haarpinsel, beim bestentwickelten Männchen sind die Hörner länger als Kopf und Halsschild zusammen. Oberfläche des Halsschildes und die Hörner sind mit ziemlich grossen Körnchen weitläufig besetzt, hinter den Hörnern befindet sich jederseits eine Gruppe etwas grösserer Körner welche die Mitte grubig oder längsfurchig freilassen. Flügeldecken so breit wie der Halsschild an der breitesten Stelle, ihr Seitenrand mit circa 15 groben fingerartigen Zähnen, die nach hinten viel feiner werden und am Hinterrand fein kerbzähnig sind; jederseits der Naht in etwa $\frac{1}{3}$ der Scheibenbreite stehen 3 grosse Höcker von denen der hintere, am Rande des Absturzes stehende, der grösste ist; durch die Bildung dieser Höcker erscheinen die Flügeldecken aus einiger Entfernung oben abgeflacht mit fast senkrechtem Absturz, an den Seiten noch einige spitze grobe Tuberkeln die ebenfalls nach hinten grösser werden, und dort von oben gesehen den Seitenrand überragen, jederseits der Naht und an der Spitze steht eine Anzahl kleinerer Körner. Der Grund der Flügeldecken mit ziemlich grossen, dichten, aber nirgends reihig gestellten Punkten. Das Endglied der Labialpalpen mit Haarpinsel; das Mentum höckerartig gewölbt, die Mundteile durch einen glatten Rahmen seitlich eingefasst, der scharfkantig, seitlich senkrecht nach den Augen zu abfällt. Das Prosternum in der Längsrichtung scharf rechtwinklig, nach vorn und hinten gleichmässig gerade abfallend, zwischen den Hüften am höchsten. Mittelbrust zwischen den Hüften erhaben,

kielförmig, mit scharfem Winkel ganz schräg nach vorn abfallend. Abdomen ziemlich grob und dicht punktiert. Schienen an der Innenseite ungekantet.

Länge 6.5–7.5 mm.

Drei (♂) Exemplare.

Negros Occidental, Maao (1113, 2851, *Charles S. Banks*).

Diese ausgezeichnete Art ist sofort an der Gestalt der am Ende beschopften Hörner und an den groben fingerartigen Zähnen am Seitenrand der Flügeldecken zu erkennen. Ich kenne keine näher verwandte Art.

Ceropria induta Wied.

Eine im ganzen Indo-Malayischen Archipel verbreitete gemeine Art findet sich auch auf den Philippinen.

Sechs Exemplare.

LUZON, Rizal, Montalban Schlucht (5468, *Charles S. Banks*); Bataan, Lamao (9860, *H. M. Curran*).

Ceropria dolorosa Fairm.

Fairmaire hat diese Art von der Insel Saleyer südlich von Celebes beschrieben. Vier Exemplare meiner Sammlung stammen von Mindoro. Ich habe allerdings die Typen nicht gesehen, aber die Beschreibung passt vollkommen.

Hemicera bivittata sp. nov.

Von der Gestalt und Grösse der *H. splendens*. Kopf und Halsschild dunkel golden kupfrig, Flügeldecken mehr braun kupfrig, die Naht und ein langer Längsstreifen auf jeder Decke grün. Die Epipleuren lebhaft braun metallisch oder grün glänzend. Unterseite metallisch, die ersten Fühlerglieder braun. Kopf dem von *H. splendens* durchaus ähnlich gebildet, zwischen den Augen flach gleichmässig gewölbt, am Innenrand der Augen nach hinten zu eine scharfe, schmale, nicht sehr lange Furche. Die Querfurche deutlich. Der Vorderkopf sehr schmal, von den Augen fast um ein Drittel so breit wie der Durchmesser der Augen, der Clypeus gerade abgeschnitten, Oberfläche des ganzen Kopfes mit feinen, gleichmässigen ziemlich weitläufigen Punkten, der Grund bei sehr starker Vergrösserung (65-fach) äusserst fein lederrunzlig erscheinend. Die ersten 5 Glieder der Fühler braun, glänzend, schlank, Glied 3 doppelt so lang wie 2, die letzten sechs plötzlich breiter und grösser, matt, schwarz, grob punktiert, nach innen stärker als nach aussen erweitert, 6 und 7 etwa so lang wie breit, die folgenden allmählich mehr

quer, das letzte kreisrund. Das Mentum schwach gewölbt, einzeln behaart, das letzte Glied der Maxillartaster ganz schräg abgeschnitten, so dass die Aussenkante etwa doppel so lang ist wie die Innenkante, aber viel schmäler als bei *splendens*. Mandibeln an der Spitze schwach ausgeschnitten. Halsschild von der Gestalt wie bei *splendens*, über doppelt so breit wie lang, an den Hinterwinkeln am breitesten, gleichmässig nach vorn verengt, vor den Ecken nicht ausgeschweift, die Vorderwinkel ganz verrundet, der Vorderrand also nicht ausgeschnitten. Die Vorderrandlinie seitlich breit, in der Mitte schmal unterbrochen; die Seiten breit und scharf gerandet, die Basis ungerandet, die Mitte nach hinten lappig vorgezogen, der Lappen gerade abgestutzt, die Scheibe vor der Basis querüber eingedrückt, Hinterwinkel rechteckig. Die Oberfläche wie die des Kopfes sehr fein, wenig eng, gleichmässig punktiert. Scutellum etwas länger als breit, lackglänzend, äusserst fein lederrunzlig und mit wenigen gröberen Punkten, die Spitze scharf. Die Flügeldecken mit sehr feinen Punktlinien. Der Nahtstreifen grünlich, die Naht selbst sehr schmal grünlich, ein grüner, bei einem Individuum rotkupfriger, fein grün gerandeter Streifen nimmt den fünften Zwischenraum ein; er reicht von vorn, hinter der Schulterbeule, wo er stark verbreitert ist, bis dicht vor die Spitze, dort ebenfalls über die Punktstreifen hinausgehend; meist ist auch der abgesetzte Seitenrand schmal grün. Die 4. und 5. Linie sind vorn an der Basis vertieft und ihr Zwischenraum etwas gewölbt, die 7. ist an der Spitze tiefer eingeschnitten und verbindet sich dort mit der 2. Linie. Die Zwischenräume sind vollkommen flach und äusserst fein punktuliert. Prosternum hoch erhaben, vorn gekielt, von der Seite gesehen vollkommen wagerecht, nach vorn zugespitzt mit etwas abgesetzter Spitze, nach hinten mit verrundetem Ende hinter den Hüften aber senkrechtem hohem Abfall, die Platte und das Ende fein rings gerandet. Mesosternum gerundet steil abfallend. Abdomen sehr fein punktiert. Schenkel schwarzbraun glänzend, Vorder- und Mitteltarsen der Männchen deutlich verbreitert, Glied 1 der Hintertarsen ist gleich dem vierten. Analsegment ganz einfach verrundet, an der Spitze ungerandet. Die äusseren Anhänge der weiblichen Geschlechtsorgane gabelförmig in 2 sehr feine scharfe Spitzen ausgezogen.

Länge 7–8 mm.

Einige Exemplare beider Geschlechter von Nord-Luzon (*Whitehead*) und der Insel Negros (*Whitehead*) in meiner Sammlung.

Die Art ist von den Verwandten durch die gleichmässig metallische Farbe von Kopf und Halsschild und durch die beiden grünen Streifen der Flügeldecken ausgezeichnet, sie ist viel weniger bunt als die anderen Arten, hat aber stark glänzende Oberseite.

Hemicera caudata sp. nov.

Viel schmäler und gestreckter als irgend eine andere Art, nach hinten nur sehr schwach erweitert. Oberfläche glänzend braun metallisch, der Kopf und die Ränder des Halsschildes besonders breit, die Basis und die schmale Mittelline kupferrot, auf den Flügeldecken sind Naht und der 5. Streifen grün und kupfrig, auch die Unterseite, besonders das Abdomen, ist schön metallisch, die Segmente querüber bläulich und grün, seitlich goldig und kupfrig, Beine und die ersten Glieder der Fühler braunrot. Kopf gleichmässig fein und nicht sehr dicht punktiert, die Clypealfurche deutlich, oberhalb dieser 2 Grübchen. Augenfurche fein aber scharf, Clypeus gerade abgeschnitten. Die ersten 5 Glieder der Fühler rötlich, das 3. kaum $1\frac{1}{2}$ mal so lang wie das 2., die 6-gliedrige Keule wie bei der vorigen Art. Das Mentum flach gewölbt, Seitenränder gerade; letztes Glied der Maxillarpalpen auf beiden Seiten gleichmässig, nach dem Ende zu spitz. Halsschild etwa doppelt so breit wie lang, Seiten fast gerade nach vorn verengt, die Spitze gerade oder fast etwas nach vorn gezogen, Vorderwinkel breit verrundet, Hinterecken scharf, etwas stumpfeckig, Randung vorn in der Mitte unterbrochen. Seitenrandung wie gewöhnlich breit und stark, die ungerandete Basis mit vorgezogenem, gerade abgeschnittenem Mittellappen. Oberfläche fein und mässig dicht punktiert, die Partie vor der Basis querüber seicht niedergedrückt. Schildchen so lang wie breit, seine Spitze verrundet, mit einzelnen Punkten und im Grunde äusserst fein lederrunzlig. Flügeldecken an der Basis um ein geringes breiter als der Hinterrand des Halsschildes; mit sehr feinen Punktlinien, deren Punkte fein, nicht gedrängt stehen, der 5. ist neben der Schulter deutlich vertieft, auch an der Spitze sind die äussersten und innersten Streifen fein eingeschnitten. Die Naht und der 5. Streifen grünlich. Das Prosternum ist vorn nicht dachförmig, sondern von vorn nach hinten plattenförmig, ganz wagerecht, zwischen den Hüften bis zur Spitze, die verrundet ist, vollständig gerandet, Mesosternum steil abfallend. Abdomen im Grunde äusserst fein lederrunzlig und wenig dicht, fein punktiert; das Analsegment in einer kurzen,

parallelen, am Ende kurz verrundeten Fortsatz ausgezogen. An den Hintertarsen ist das Klauenglied länger als das erste Glied.

Länge 7.5 mm.

Ein Exemplar von Nord-Luzon (*Whitehead*) in meiner Sammlung.

Die Art ist an dem gestreckten Körperbau, der Bildung des Prosternums und an dem in einen Fortsatz ausgezogenen Analsegment—eine Bildung wie sie bei keiner mir bekannten Tenebrionidæ vorkommt—sofort zu erkennen.

Die Gattung *Hemicera* steht bis jetzt bei den Diaperiden. Sie ist aber eine Cuodalonide und aufs nächste mit *Eucyrtus* verwandt, einige Arten dieser Gattung gehören entschieden zu *Hemicera*. Ihre Merkmale sind in erster Linie die folgenden: der sehr kurze Vorderkopf, der gerade abgeschnittene Clypeus, die 6 grossen Endglieder der Fühler, die ungerandete Halsschildbasis, deren Mittellappen gerade abgeschnitten ist, die stark erhabene, vollkommen wagerechte Vorderbrust, die nicht ausgelappten Tarsenglieder und die beim ♂ erweiterten Glieder der Vordertarsen.

Genus **TAGALUS** novum

(*Ulomidarum*)

Körper klein, ziemlich cylindrisch, nur etwas flachgedrückt, kurz. Kopf halb so breit wie der Halsschild. Augen frei, weit vom Vorderrand des Thorax entfernt, klein, rund, vorn durchaus nicht vom Canthus eingeschnitten, Augenfurchen fehlen. Canthus sehr gross, aber seitlich nicht über die Augen hinausgehend. Vorderrand des Kopfes sehr breit, da er vom Canthus an querüber abgeschnitten ist, fast gerade, der Clypeus also nur sehr schmal und schwach weiter vorgezogen als der Canthus. Oberlippe schmal, etwa so lang wie breit, frei. Mandibeln frei, vorragend, aber klein, ihr Innenrand von der Oberlippe verdeckt, Aussenkante ziemlich scharf stumpfwinklig geknickt, das Ende scharf 2-spitzig, Spitzen ungleich. Mentum trapezisch, Seiten gerade, die Mitte schmal dreieckig (die Basis dieses Dreiecks ist die Basis des Mentums) sehr stark erhöht. Unterlippe von der Breite des Mentums, ihr Vorderrand ganz gerade, letztes Glied der Labialpalpen cylindrisch, ebenzo wie auch das letzte Glied der Maxillartaster, die sehr gestreckt sind. Fühler kurz, das erste Glied dick, die folgenden klein, perlig glänzend, die beiden letzten bilden eine stark abgesetzte Keule. Halsschild quer, rings gerandet, Vorderrand fast gerade, Vorderwinkel nicht vorragend. Schildchen deutlich, länger als breit. Flügeldecken mit starken Punktstreifen, ohne Scutellarstreif, der innere Punktstreifen wie

bei den Phrenapatinen beim Scutellum nicht ausweichend, der Seitenrand ist von oben gerade noch sichtbar. Prosternum steil abfallend, über die Hüften hinaus verlängert. Abdominalfortsatz spitz. Epipleuren nach hinten stark verbreitert, am vorletzten Segment am breitesten, dann schnell verengt und an den Spitzen geschwunden. Schenkel sehr kurz und dick, ihre Unterseite der Länge nach ausgehöhlt, diese Aushöhlung mit sehr scharfen Kanten. Tibien mit grossen Enddornen, die vorderen und mittleren an der Aussenkante mit kräftiger Zähnung, die hinteren glatt. Klauen zart, Onychium deutlich.

Diese Gattung ist besonders durch die 2-gliedrige Keule der Fühler von allen Gattungen der alten Welt geschieden, auch die freien Augen und die Bildung des Mentums und der Ligula sind sehr charakteristisch. Zwei-gliedrige Fühlerkeule findet sich bei den amerikanischen Gattungen *Arrhabæus* und *Dioedus*, die aber eine andere Kopfbildung haben.

Es dürfte sich sehr empfehlen, eine ganze Anzahl Gattungen der bisherigen Ulomiden zu den Phrenapatiden zu stellen und zwar alle, die hervorragende Mandibeln, vortretende Oberlippe, runde Augen, gerade Flügeldeckenstreifen (die beim Schildchen nicht ausliegen), grosse Enddornen der Schienen und meist stark vergrösserte Endglieder der Fühler haben. Zu den bisherigen Gattungen der Phrenapatinæ gehören dann also ausser der vorliegenden Gattung noch *Arrhabæus, Dioedus, Platycilibe, Brachycilibe, Phthora* (*Clamoris*), *Daochus* und vielleicht noch die eine oder andere mir gegenwärtig unbekannte Gattung.

Tagalus impressicollis sp. nov.

Glänzend schwarzbraun, Fühler und Beine etwas heller, Körper kurz, fast cylindrisch, aber etwas flacher, Kopf von den Augen nach vorn schwach, und gleichmässig verengt, der Canthus sehr dick, schmäler als die Augenpartie, zwischen den Augen flach eingedrückt, der Eindruck bis zum Clypeus, die Clypealfurche, oder überhaupt ein Quereindruck fehlt. Die Oberfläche ist ziemlich grob, flach, vorn feiner, nicht sehr dicht punktiert. Das erste Glied der Fühler dick und gross aber nicht schaftartig, das dritte nur wenig länger als das 2. und 4., die folgenden etwas mehr quer, aber nicht länger, mit einzelnen, ziemlich langen steifen Borsten besetzt, die letzten zwei stark vergrössert, matt. Halsschild etwa um $\frac{1}{3}$ breiter als lang, seitlich (von oben gesehen), ziemlich parallel, alle Ecken verrundet, die vorderen kaum vortretend, die hinteren in der Anlage ganz stumpfwinklig, die Seitenrandlinie ist von der Seite gesehen nur in schwachem Bogen nach unten gezogen; alle Kanten gerandet, die Vor-

derrandkante in der Mitte verbreitert und verflacht, die Basis jederseits dem 2. Zwischenraum gegenüber sehr flach und kurz ausgebuchtet. Die Vorderpartie querüber fast der ganzen Breite nach eingedrückt, der Eindruck nicht sehr tief, schlecht begrenzt. Oberfläche ziemlich weitläufig und fein (feiner als der Kopf) punktiert. Schildchen glatt, die Spitze verrundet, etwas länger als breit. Flügeldecken mit kräftigen Punktstreifen, die an der Spitze feiner werden, ja zu Punktreihen, die stark gewölbten Zwischenräume mit vereinzelten äusserst feinen Zwischenräumen, der erste Streifen, wie überhaupt bei den Phrenapatinen, beim Schildchen gerade. Vorderschienen gegen das Ende verbreitert, ihr Aussenrand mit circa 6, nach der Spitze zu gröber werdenden Zähnen, die Innenseite nach der Spitze zu gelb behaart, auch die Mittelschienen mit einigen etwas feineren Sägezähnen, die Hinterschienen glatt, innen am Ende mit einzelnen Haaren, das erste Glied der Hintertarsen so lang wie 2 und 3 zusammen, das Klauenglied etwas kürzer als die drei ersten zusammen genommen. Unterseite, nähmlich Hinterbrust und Abdomen, seitlich grob und dicht, in der Mitte viel feiner punktiert. Prosternum fein, vollständig gerandet, das Ende verrundet, die Vorderbrust in der Mitte dichter, an den Seiten weitläufiger punktiert.

Länge 6 mm.

Ein Exemplar.

LUZON, Laguna, Mt. Banajao (7207, *Charles S. Banks*).

Tagalus schultzei sp. nov.

Diese Art ist von der vorigen gut geschieden. Die Farbe ist ein glänzendes Braun, wie bei den meisten Ulomiden, die Grösse eine viel geringere, der Halsschild ist vorn nicht eingedrückt, sondern gleichmässig gewölbt, vorn in der Mitte breit ungerandet, die Hinterecken viel kürzer verrundet, Glied 3 der Fühler $1\frac{1}{2}$ mal so lang wie das vierte, die Punkte der Flügeldeckenstreifen an der Spitze kaum feiner, die Vorderschienen sind nur ziemlich fein gesägt, Prosternum ungerandet, aber in der Mitte vertieft.

Länge 4 mm.

Ein Exemplar.

LUZON, Benguet, Mt. Pulog (10400, *H. M. Curran*).

Genus **BOLITRIUM** novum

(Aff. *Tribolium*)

Etwa von der Gestalt des *Tribolium* mit dem die Gattung weitläufig verwandt ist. Kopf vor den Augen schmal, der Canthus nicht vorspringend, sondern ganz zurücktretend, die Augen

vollständig, rund, grob wie bei *Tribolium* facettiert, Fühler mit 4-gliedriger Keule. Zwischen Oberlippe und Clypeus ist keine Gelenkhaut sichtbar, die Verengung des Vorderkopfes von den Augen an sehr stark, der Vorderrand daher kaum breiter als die Oberlippe. Mandibeln am Ende gefurcht; das Endglied der Maxillarpalpen dreieckig. Halsschild etwas quer, vorn und hinten gerade abgestutzt, Vorderrand ungerandet, die Seitenränder krenuliert. Schildchen halbkreisförmig. Flügeldecken verworren punktiert, der Seitenrand von oben sichtbar, die Epipleuren vollständig, vom ersten Abdominalsegment an gleich breit, Pygidium ganz bedeckt. Schenkel kurz und dick, Vorderbein schmal, Enddornen kaum erkennbar, die Gelenkhöhlen der Mitteltibien seitlich geschlossen. Die Tarsen sind kurz, das vorletzte Glied aller Füsse ist lamellenförmig unter das letzte gezogen, das Klauenglied also nicht am Ende, sondern oben auf dem vorletzten Glied eingelenkt.

Diese Gattung ist in mehrfacher Beziehung eigentümlich. Sie gehört zu den Ulomiden. Die Gestalt, der gerade Hinterrand des Halsschildes, die vollständigen Epipleuren hat die Gattung mit den Triboliinæ gemein, die Bildung der Tarsen erinnert an die Alegoriiden, die nicht gestreiften Flügeldecken und die Kopfbildung sind aber ganz abweichend. Es ist nicht möglich diese Gattung in eine der Abteilungen der Ulomiden einzureihen wenn man nicht der natürlichen Systematik grossen Zwang antun will; es muss viel mehr eine besondere Abteilung: Bolitriini errichtet werden, deren Merkmale die folgenden sind: Augen rund, nicht geteilt, Vorderkopf stark verschmälert, Canthus viel schmäler als die Augen, Basis der Thorax gerade, Elytren verworren punktiert, Pygidium bedeckt, Epipleuren vollständig, das Klauenglied auf dem vorletzten Gliede eingelenkt.

Bolitrium crenulicolle sp. nov.

Schmal, glänzend rotbraun. Kopf vorn mit seichtem, jederseits etwas vertieften Quereindruck, Canthus sehr klein, Punktierung nicht sehr dicht, tief, sehr deutlich. Fühler die Mitte des Halsschildes überragend, Glied 1 dick, kugelig, 2 den mittleren Gliedern an Länge gleich, 3 über $1\frac{1}{2}$ mal so lang als 4, die letzten 4 Glieder bilden eine gut abgesetzte Keule, 8–10 gleich lang, etwas länger als 7, aber quer, das letzte etwas kugelig. Der Halsschild etwa $1\frac{1}{3}$ mal so breit als lang, die grösste Breite in der Mitte, zur Basis etwas mehr als zur Spitze verengt, der Vorderrand und die Basis ganz gerade abgeschnitten. Seiten vor den Hinterecken etwas ausgeschweift, diese daher scharf rechtwinklig, die Vorderecken scharf stumpf,

der Seitenrand krenuliert, die Wölbung reicht seitlich bis an den Rand, Oberfläche punktiert wie der Kopf. Flügeldecken oben mässig flach, von den Schultern nach hinten schwach divergierend, der Seitenrand von oben überall sichtbar, die Basis ist viel breiter als die des Halsschildes, die grösste Breite ist fast 1½ mal diejenige des Halsschildes. Die Punktierung steht nirgends in Reihen, sie ist regelmässig, ziemlich tief, etwas gröber als die des Halsschildes, die Entfernung der Punkte von einander ist viel grösser als die Punkte selbst. Die Propleuren wie der Halsschild punktiert, ebenso die Seiten der übrigen Unterseite, die Epipleuren mit einer einfachen, vorn doppelten Reihe von Punkten, Prosternum schwach erhaben, grob punktiert, ungefurcht, der Fortsatz schwach gesenkt, am Ende gerade abgestutzt, nicht vorragend, Schenkel fein punktiert, das Klauenglied der Hinterfüsse ist so lang wie das erste, aber viel dünner, und so lang wie 2 und 3 in ihrer ganzen Länge zusammen.

Länge 2.75–3 mm.

Vier Exemplare.

Negros Occidental, Bago (1599, *Charles S. Banks*).

Tribolium ferrugineum F.

LUZON, Manila (1821, *W. Schultze*).

Uloma orientalis Cast.

Uloma orientalis CAST. 1840.
Uloma denticornis FAIRM. 1882.
Uloma retusa F., Syst. El. (1801), 1, 150 (nec. *U. retusa* F., loc. cit. 149.)

Die Beschreibung Castelnau's passt auf eine ganze Anzahl Arten. Wollen wir seine Art anerkennen, so müssen wir sie zu deuten suchen, da die Type, so viel ich weiss, verloren gegangen ist. Die Angaben passen am besten auf *U. denticornis* Fairm. die auf Java sehr häufig ist. Bates hat[3] durch eine beiläufige Bemerkung über die Fühler die Castelnau'sche Art genau gekennzeichnet (d. h. falls er die richtige vor sich hatte). Seiner Auffassung habe ich mich anzuschliessen, da nichts dagegen einzuwenden ist. Fairmaire's Art ist also synonym. Noch älter als beide Namen ist der von Fabricius gegebene *U. retusa* F.[4] der aber ebenfalls verschwinden muss, weil dieser Autor noch eine andere *Uloma*-Art (die bekannte südamerikanische) *U. retusa* nannte.

Vier Exemplare.

[3] *Ent. Mon. Mag.* (1873), **9**, 183.
[4] Gebien, *Deutsche Ent. Zeitschr.* (1906), 220.

MINDORO, Bongabon (8410, 8605, *W. Schultze*); Negros Occidental, Pulupandan (10604, *Charles S. Banks*).

Uloma fracticollis sp. nov.

Glänzend rotbraun, parallelseitig, schlank, Beine und Fühler gelbrot. Clypeus gerade abgestutzt, flach, nicht aufgeworfen, seine Ecken verrundet, die vordere Furche halbkreisförmig, in der Mitte stark vertieft, die hintere (hinter den Augen) gerade, auf der Stirn verflacht, die erste ist auch an den beiden Enden sehr deutlich, die Punktierung vorn sehr fein, in den Vertiefungen und am Hinterkopf wesentlich gröber, der Canthus schmäler als das Auge hinter ihm, aber ganz verrundet. Fühler kurz und dick, die Mitte des Halsschildes kaum erreichend, das 3. glied etwas länger als das 4., 5–10 stark quer, aber normal, nicht in Zähne ausgezogen. Das Mentum hexagonal, die Vorderecken etwas abgerundet, die Mitte stark der Länge nach erhöht, die Erhöhung seitlich scharfkantig, an jeder Seite eine tiefe, längliche Grube, die Ligula vorn nicht sehr stark (viel schwächer als bei *orientalis*) ausgeschnitten; der erhöhte Mittelteil seitlich nach den Palpen zu scharfkantig begrenzt. Halsschild von der gewöhnlichen Form, quer, Vorderecken breit und vollständig verrundet, die Hinterecken stumpf, sehr kurz verrundet. Die Oberfläche fein und wenig dicht, an den Seiten etwas deutlicher und im Eindruck noch gröber punktiert. Basis ungerandet, die Vorderrandlinie vollständig, aber äusserst fein, die Seiten wie gewöhnlich stark gerandet, flach gerundet. Der Eindruck beim Männchen ist ganz flach, wie abgebrochen, ähnlich wie bei *picicornis* und *westringi*, er nimmt etwa $\frac{2}{3}$ der Breite ein, ist ungefähr bohnenförmig, hinten nicht deutlich begrenzt, ohne die gewöhnliche feine doppelte Tuberkel. Flügeldecken parallelseitig, so breit wie der Thorax, stark punktiert, gestreift, die Streifen hinten nicht flacher werdend, Zwischenräume konvex, im Grunde äusserst fein (65 × vergrössert) lederrunzlig, und mit äusserst feinen, weitläufigen Pünktchen bedeckt. Die Punkte der Streifen rund, ziemlich tief und grob, die eingeschnittene Streifenlinie geht durch sie hindurch. Prosternum jederseits fein aber scharf gefurcht, am Ende gerundet niedergedrückt. Propleuren ziemlich grob punktiert. Die Abdominalsegmente ziemlich stark längsrunzlig und punktiert. Vorderschienen robust, seitlich mit circa 8 grossen Zähnen, auf der Vorderseite ist der Kiel sehr kurz und undeutlich, auf der Rückseite befinden sich circa 4 grössere Zähne.

Länge 9.5 mm.

Ein Exemplar (♂).

LUZON, Benguet, Mt. Pulog (10274, *H. M. Curran*).

Verglichen mit der gemeinen und in allen Sammlungen verbreiteten indo-malayischen Art *U. orientalis* ergeben sich folgende Unterschiede:

Die Grösse ist geringer, der Clypeus nicht aufgeworfen und zweizähnig, die Clypealfurche scharf, die Fühler der ♂ ohne Zähne am 5. und 7. Glied, das Kinn ist ganz anders, der Eindruck des Halsschildes von ganz anderer Gestalt. *Uloma picicornis* ist vielleicht die nächst verwandte Art, ist aber kleiner, stark glänzend schwarzbraun, schmäler, und das Mentum des Männchens ist ganz anders, flachgewölbt, ohne seitliche Gruben und gekantete mittlere Erhebung.

Uloma contracta Fairm.

Vier Exemplare im Berliner Museum. Davon eines von Chamisso auf Kotzebue's Reise um die Welt gesammelt (Manila), 3 von Luzon (*Jagor*). Sonst von Sumatra und von Borneo. (Zahlreiche Exemplare in meiner Sammlung.)

Alphitobius diaperinus Panz.

Ein Exemplar von Manila in meiner Sammlung (Kosmopolit).

Alphitobius piceus Ol.

Ebenfalls über die ganze Erde verbreitet.
Ein Exemplar.
LUZON, Manila (11428, *W. Schultze*).

Alphitobius (Diaclina) quadrimaculatus sp. nov.

Lang-oval, flach, von der Gestalt unseres europäischen *A. testudineus*, aber schmäler. Oberseite glänzend schwarz, 4 Flecken auf den Flügeldecken blutrot. Fühler und Beine braunrot, Unterseite schwarzbraun. Kopf lang, flach, sanft gewölbt, der Canthus schmäler als die Augen, Clypeus nicht aufgeworfen gerade abgestutzt. Oberfläche sehr fein und dicht aber nicht gedrängt punktiert. Mentum buckelig gewölbt, aber nicht gekielt. Die Fühler kurz und dick, die letzten 6 Glieder bilden eine Keule, sie sind über doppelt so breit wie lang, das letzte etwa kreisförmig. Halsschild von der Basis an nach vorn verengt, die Basis fast doppelt so breit als die Mittellinie lang, doppelt, ziemlich stark gebuchtet, die Stelle der tiefsten Einbuchtung sanft eingedrückt, die Vorderwinkel sehr kurz ver-

rundet rechtwinklig, die hinteren scharf, etwa 80° gross, die Vorderecken heruntergedrückt. Die Oberfläche ist querüber bis an den Rand flach gewölbt (an den Seiten stärker), sie ist äusserst fein und weitläufig punktiert, die Basis mit äusserst feiner Randlinie, die Spitze ungerandet. Die Basis der Elytren ist dem Hinterrand des Halsschildes entsprechend 2 mal vorgezogen, der Seitenrand ist wie bei unserer europäischen Art schmal abgesetzt. Die Oberfläche mit feinen Reihen dicht gedrängter Punkte, die nach den Seiten zu schwächer werden, die ersten beiden zuweilen fast etwas streifenartig, alle Streifen an der Spitze geschwunden. Die Zwischenräume flach, kaum sichtbar punktuliert. Schulterecken scharf, stumpfwinklig. Die Flecken nicht sehr deutlich, blutrot, dunkel, die vorderen rund, hinter der Basis, die hinteren die Spitze einnehmend. Prosternum wagerecht, lanzettförmig, das Ende aber verrundet, mit senkrechtem Absturz. Das Mesosternum U-förmig ausgeschnitten, steil abfallend, die Kanten des Absturzes scharf. Abdomen fein und ziemlich dicht punktiert. Alle Schenkel dick, ihre Unterkante gerade, die Oberkante stark gerundet. Die Hintertibien der Männchen etwas gekrümmt, an der Basis dünn, von der Mitte an verbreitert.

Länge 5–5.5 mm.; Breite 2.75 mm.

Diese Art steht unseren europäischen sehr nahe, sie unterscheidet sich durch andere Färbung und Zeichnung, schmäleren Körper, durch die Bildung der Hinterschienen des Männchens, bedeutendere Grösse, etc.

Alphitobius rufotinctus Fairm. ist ebenfalls mit unserer Art verwandt, aber viel kleiner, stärker gewölbt, ganz anders gefärbt, die Fühlerglieder innen scharf gewinkelt. Ausserordentlich ähnlich ist eine neue Art aus Java, die aber etwas andere Färbung und einen spitzen Prosternalfortsatz hat.

Sieben Exemplare in meiner Sammlung.

Insulae Philippinae: NEGROS (*Whitehead*) und SÜD PALAWAN. Die ersteren von H. Rolle, Berlin, die letzten von Staudinger und Bang-Haas erworben.

Hypophlœus analis sp. nov.

Rotbraun, glänzend, gestreckt, Beine und Fühler gelbrot. Kopf fein und nicht sehr dicht punktiert. Clypealfurche deutlich aber fein, die Scheitelquerfurche breit, einer Einschnürung gleichend. Augen gross. Fühler dick, etwa bis zum ersten

Viertel des Halsschildes reichend, Glied 5 doppelt so breit wie lang, die folgenden noch stärker quer, die vorletzten etwa 3 mal so breit wie lang, das letzte ungefähr kreisförmig. Mentum stark quer, flach, fast doppelt so breit wie lang, grob und dicht punktiert. Halsschild circa 1½ mal so lang wie breit, die Mitte vorn breit vorgezogen, die Vorderwinkel scharf rechtwinklig, deutlich vorragend, die Seiten in der Mitte auf kurze Strecke parallel, nach vorn und hinten gleichmässig verengt. Hinterwinkel scharf stumpfwinklig. Oberfläche sehr fein und weitläufig punktiert. Die Seitenrandkanten der Flügeldecken in den ersten Zweidritteln gerade noch übersehber. Oberfläche mit Linien feiner Punkte, die nirgends zu Streifen werden. Zwischenräume mit einer unregelmässigen Reihe ebenso grosser, aber viel weitläufigerer Punkte. Prosternalplatte wagerecht, hinter den Hüften verbreitert, durch einen kleinen mittleren Ausschnitt zweizipflig. Hinterbrust mit fast vollständiger Längsfurche. Abdomen sehr fein punktiert, Analsegment gröber, mit etwas querer ziemlich tiefer Grube.

Länge 3.5–4.66 mm.

Fünfzehn Exemplare in meiner Sammlung.

Philippinen: NEGROS (*Whitehead*); FORMOSA: Kosempo (*Sauter*); MENTAWEI, Si-Oban (*Modigliani*).

Von den asiatischen Arten der Gattung *Hypophlœus* gehören *H. floricola* und *exilis* Mars. zur Gattung *Palorus.*, *H. colydioides* Lew. ist grösser und ganz schwarz, *H. gentilis* Lew. ist kleiner, der Thorax so breit wie lang, bei unserer Art, länger als breit. *H. filum* Fairm. ist noch kleiner, das letzte Fühlerglied ist stumpf kegelförmig oval, die Fühler sind kürzer. Die für unsere Art charakteristische Analgrube wird von keinem der Autoren erwähnt.

Cossyphus striatus Wiedem.

Drei Exemplare. Bisher nur von Java bekannt.

LUZON, Manila (2853, *W. Schultze, C. S. Banks*).

Toxicum quadricorne F.

Eine in Indien und dem Indo-Malayischen Archipel sehr gemeine Art.

Sieben Exemplare.

LUZON, Benguet, Irisan (1578, *R. C. McGregor*); Bataan, Lamao (6547, *H. M. Curran*); Negros Occidental, Mt. Canlaon (6854, *Charles S. Banks*).

Toxicum flavofemoratum Redtenb.

Wie das mir vorliegende Material beweist, gibt es drei sehr ähnliche Arten von *Toxicum* auf den Philippinen. Aus dem Berliner Museum liegt mir eine Art vor (2 ♂ 1 ♀) und vom Bureau of Science die andere (2 ♂). Auf das eine Weibchen passt die Beschreibung Redtenbacher's sehr gut, daher beziehe ich die Art vorläufig auf die Berliner Exemplare. Die dritte Art scheidet wegen der bedeutenderen Grösse aus. Redtenbacher beschreibt nur das ♀. Leider sind die Weibchen sehr ähnlich, so dass man sie nach den Beschreibungen nicht sicher identifizieren kann. Alle wesentlichen Artkriterien zeigen sich beim Männchen.

♂, Kopf mit 4 Hörnern, Hörner sehr zart, die vorderen auf dem Vorderrand des Clypeus flach, am Grunde verwachsen, also auf dem verbreiterten, aufgeworfenen Vorderrand des Clypeus stehend, sie divergieren stark und stehen fast in einem verrundeten rechten Winkel gegeneinander. Die hinteren Hörner sind seitlich schwach kompress, gehen von vorn oder hinten gesehen vom Grunde aus schwach nach aussen und sind dann stark gegeneinander geneigt; die obere Hälfte ist vorn und aussen mit ziemlich starker Bürste versehen. Der Kopf ist stark eingedrückt, der Eindruck hinten halbkreisförmig, scharfkantig begrenzt, grob punktiert, der Vorderkopf nahezu glatt. Der Halsschild ist seitlich stark gerandet, am stärksten bei den kräftig vorgezogenen Vorderecken. Das Prosternum ist hinter den Hüften schwach gesenkt, doppelt gefurcht, die Spitze (sehr schwach aufgebogen) tritt von der Seite gesehen ziemlich weit über den senkrechten Absturz hinaus.

Zwei ♂, 1 ♀ von Manila (*Cuming*) im Berliner Museum.

Toxicum ramiferum sp. nov.

Der vorigen Art in Grösse und Gestalt vollständig gleichend. Schwarz, matt, mit schwachem Seidenglanz, Unterseite glänzend, Schenkel bis auf die schwarze Basis korallenrot. Kopf des Männchens mit 4 Hörnern, die beiden vorderen, unbehaarten vom Clypeusrand nach vorn ragend, fast parallel, am Grunde kaum dicker als an der Spitze, nicht flachgedrückt. Die hinteren Hörner senkrecht, sie bilden von der Seite gesehen mit den vorderen Hörnern einen Winkel von ungefähr 60°; sie sind seitlich zusammengedrückt, und haben nach vorn einen kurzen, winkligen Fortsatz eben unter der Mitte; das eigentliche Horn ist von

diesem Fortsatz bis zur Spitze an der Aussen- und Vorderkante behaart. Von hinten gesehen erscheinen die Hörner viel schlanker und sind vom Grunde ab gegeneinander geneigt.

Das zweite Männchen ist viel schwächer entwickelt, die vorderen Hörner auf 2 kräftige Tuberkeln reduciert, die hinteren sehr kurz, seitlich stark zusammen gedrückt, breit und ohne den Fortsatz, Behaarung aber ebenfalls deutlich. Der Canthus ist so breit oder breiter als die Augen, flach, der Hinterkopf mit dem bekannten tiefen halbkreisförmigen Eindruck, der hochkantig begrenzt ist. Die 4-gliedrige Fühlerkeule schlecht abgesetzt, da schon das 7. Glied so breit wie lang ist, das 8. 1½ mal so breit wie lang, das 10. doppelt so breit wie lang. Halsschild quer, ziemlich stark bis zum herabgezogenen Seitenrand gewölbt, die Vorderwinkel treten schwach vor, an der Basis in der Mitte ein schwacher rundlicher Eindruck, grösste Breite etwas vor der Mitte, Hinterwinkel scharf rechteckig, Basis stark doppelbuchtig, ungerandet. Oberfläche wie bei *quadricorne* mit wenig starken, tief eingedrückten, nirgends gedrängten, etwas ungleich gestellten Punkten bedeckt. Flügeldecken mit Reihen feiner, nach der Naht zu etwas unordentlich gestellter Punkte, Zwischenräume ganz flach, unpunktiert. Mentum hexagonal, die Basis am kürzesten, der gerundet winklig ausgeschnittene Vorderrand am breitesten; die Mitte der Länge nach erhöht, jederseits eine längliche Grube; Oberfläche ziemlich grob punktiert. Prosternum wagerecht, sein Absturz senkrecht, es tritt, von der Seite gesehen, nicht über die Hüften nach hinten; es ist jederseits gefurcht, seine Spitze etwas aufgebogen. Die Propleuren neben den Hüften grob gerunzelt und punktiert, nach den Seiten zu allmählich viel feiner werdend. Das erste und zweite Abdominalsegment (♂ !) mit feinem, goldgelben Flaum.

Länge 12.5–13.5 mm.

Zwei (♂) Exemplare.

LUZON, Pampanga, Mt. Arayat (2982, *W. Williamson*).

Diese Art ist von den rotschenkligen Gattungsgenossen sofort durch die charakteristische Hornbildung geschieden. Das kurze Prosternum ist ebenfalls bemerkenswert.

Toxicum planicolle sp. nov.

Schwarz, ziemlich glänzend, verhältnismässig flach, Schenkel bis über die Mitte blutrot, Knie schwarz, Unterseite glänzend. Kopf (♀): Canthus schmäler als die Augen. Hörner fehlen, statt der hinteren am Innenrande der Augen eine flache Längsfalte, die nach aussen zwischen sich und dem Hinterrand

der Augen eine kurze Furche hat. Der Clypeus in der Mitte schwach gewölbt, die Querfurche dahinter breit und ziemlich tief. Die Oberfläche ziemlich grob und dichter als der Thorax punktiert. (♂) Canthus so breit wie die Augen, die Oberfläche blank und nur nach den Seiten und hinten hin punktiert; der Clypeus lamellenartig aufgebogen und 2 stark divergierende, in gerundetem Winkel zusammenstossende, etwas breitgedrückte nackte Hörner tragend. Die hinteren Hörner sehr schlank, rund, am Grunde weit getrennt, kräftig nach aussen gebogen, die Spitze stark genähert; von der Seite gesehen sind die Hörner schwach S-förmig, die äusserste Spitze etwas nach hinten gebogen, die Haarbekleidung ist auf ein winziges Büschelchen auf der äussersten Spitze beschränkt. Die Partie zwischen den Hörnern ist stark vertieft, aber flach im Grunde, die Grube nach hinten halbkreisförmig, hoch- und scharfkantig abgeschlossen. Die 4-gliedrige Keule der Fühler gut abgesetzt, die vorletzten Glieder 1½ mal so breit wie lang. Das Mentum grob punktiert, fast flach, ohne seitliche Gruben, Vorderrand ausgeschnitten, aber nicht deutlich winklig, auch die Seiten nicht deutlich gewinkelt. Halsschild flach, die Vorderecken auch beim ♂ wenig vorgezogen, kurz verundet rechteckig, heruntergebogen, die Hinterecken scharf rechteckig, neben dem Seitenrand eine flache Grube, ebenso jederseits und vor der Mitte der Basis, auch die Mittellinie schwach angedeutet. Punkte des Halsschildes ziemlich tief eingestochen, wenig eng, auch nicht an den Seiten. Flügeldecken mit Reihen ziemlich tiefer aber feiner Punkte, die nur hin und wieder etwas unordentlich gestellt sind. Zwischenräume unpunktiert, ganz flach. Schulterbeule durch einen flachen Eindruck nach innen deutlich abgesetzt. Propleuren neben den Hüften grob punktiert und gerunzelt, nach den Seiten zu sehr fein punktiert. Prosternum fast wagerecht, wesentlich über die Hüften hinausragend, Spitze kurz verrundet, nicht aufgebogen, Absturz senkrecht, die beiden Furchen deutlich, das Abdomen sehr fein punktiert, blank, beim ♂ ohne Haarbesatz an den ersten Segmenten.

Länge 16–17 mm.

Zwei ♂, 3 ♀.

LUZON, Benguet, Mt. Pulog (10251, *H. M. Curran*).

Diese rotbeinige Art ist grösser als ihre Gattungsgenossen, vor allem durch den flachen Halsschild, die Bewaffnung des Kopfes beim ♂ und das in diesem Geschlecht *unbehaarten* Abdomen ausgezeichnet.

Tabelle der 4 Toxicum-Arten von den Philippinen.

(Bei allen haben die Männchen 4 Hörner.)

1. Beine ganz schwarz, die vorderen Hörner der Männchen parallel, dem Clypeus aufgesetzt, die hinteren mit den Spitzen divergierend. **quadricorne F.**
   Schenkel zum grössten Teil rot, die hinteren Hörner der ♂ mit den Spitzen gegeneinander geneigt ..... 2.
2. Grosse Art (16–17 mm. lang) ziemlich glänzend, Halsschild sehr flach. Die hinteren Hörner der Männchen nur auf der Spitze mit feinem Haarbüschel ..... **planicolle sp. nov.**
   Kleinere Arten (12–13 mm. lang) matt, Halsschild bis zum Seitenrand stark gewölbt, die hinteren Hörner in der oberen Hälfte behaart ..... 3.
3. Die vorderen Hörner parallel, die hinteren breit, mit kurzem Ast. Prosternum bei den Hüften abschneidend ..... **ramiferum sp. nov.**
   Die vorderen Hörner divergierend, die hinteren dünn, einfach. Prosternum hinten über die Hüften hinaustretend (d. h. nicht nur die Spitze) ..... **flavofemoratum Redtenb.**

(Schluss folgt.)

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DIE TENEBRIONIDEN DER PHILIPPINEN

Von HANS GEBIEN
(*Hamburg, Germany*)

(*Schluss*)

Anthracias elongatus Schauf.

Diese Art gehört, wie ich im Oktober, 1912, in Berlin feststellen konnte, nicht in die Gattung *Toxicum*.

Drei Exemplare (♂).

TICAO (9610, *R. C. McGregor*).

Pediris sulcigera Boisd.

Diese grosse, durch die ausgezeichnete Beinbildung sehr leicht kenntliche Art, scheint in ihrem Verbreitungsbezirk überall häufig zu sein.

Sechs Exemplare.

TICAO (1469); CEBU, Toledo (6755, *R. C. McGregor*).

Ferner eine Anzahl Tiere in meiner Sammlung mit den Fundorten: Philippinen, Luzon, Manila, Mindanao und Süd-Palawan. Sechs Exemplare von Manila auch im Berliner Museum.

Ausserdem liegt mir Material in meiner Sammlung vor von New-Guinea, New-Lauenburg, den Aru-Inseln.

Die Art ist von den verwandten durch die meist sehr stark entwickelten Längsfurchen jederseits der Halsschildmitte und besonders durch den kantigen Knoten eben hinter der Basis an der Innenseite der Hinterschienen beim Männchen geschieden.

Pediris longipes Motsch.

Waterhouse deutet diese Art auf die vorige. Aber *P. sulcigera* kommt auf Sumatra meines Wissens nicht vor, auch Motschulsky's Angabe, „capite antice transversim impresso," passt nicht. Mir liegt 1 ♂ von Mindanao in meiner Sammlung vor.

Setenis manillarum Fairm.

Hierher gehört meiner Meinung nach sicher *S. brevicornis* Schauf. (nec. Westwood) = *S. penicilligera* Geb. nom. nov. in Cat. Col. Schaufuss nennt das Analsegment gerandet, es fehlt aber die Randlinie, die für eine ganze Artengruppe charakteristisch ist, der Rand selbst ist nur aufgeworfen. Die Tiere von Manila haben nur ein einfaches Analsegment, das ist aber der einzige geringfügige Unterschied den ich finden kann, der Unterschied verwischt sich aber bei Exemplaren von Borneo so sehr, dass sich die *S. brevicornis* nicht einmal als Varietät halten lässt. Wahrscheinlich gehört *S. puncticollis* Motsch. hierher. Wollen wir sie nicht auf diese Art deuten, so verschwindet sie am besten ganz aus den Katalogen, denn mit der Beschreibung ist nichts anzufangen.

Zwei Exemplare.

TICAO (1468, *R. C. McGregor*).

Drei Exemplare von Manila (*Cuming*) im Berliner Museum. In meiner Sammlung 28 Exemplare von Mindanao, Süd-Palawan, Borneo (Kina Balu), Sumatra, Java (Malang), Singapur.

Setenis aequatorialis Blanch.

Nyctobates podagra FAIRM.

Blanchard's ausreichende Beschreibung und Abbildung beweisen, dass seine Art identisch ist mit *Nyctobates podagra* Fairm. Fairmaire hat sich hier wie in andern Fällen um Blanchard's Arbeit nicht gekümmert.

Die Art ist ganz ungemein variabel. Die 11 mir vom Bureau of Science übersandten Exemplare könnte man ganz gut auf 3 Arten verteilen, wenn nicht das Material meiner Sammlung (circa 40 Exemplare von den verschiedensten Fundorten) beweisen würden, dass alle Merkmale schwanken. Auch der Forceps ist übereinstimmend gebaut, obgleich sich innerhalb der Gattung dieses Organ sehr wohl zur genaueren Unterscheidung der Arten brauchen lässt.

Die Variationsfähigkeit erstreckt sich auf folgende Merkmale: Grösse von 10–21 mm., Skulptur der Flügeldecken, Exemplare mit feinen Punktlinien bis zu solchen mit tief gestreiften Flügeldecken; Halsschild seitlich meist deutlich gewinkelt und dahinter

krenuliert, zuweilen, gleichmässig gerundet. Farbe schwarz bis rotbraun mit dunkler Naht (2 Exemplare von den Philippinen). Der Clypeus ist entweder gerade abgestutzt oder mehr oder weniger sanft ausgebuchtet.

Wichtige Merkmale sind: Die Bildung der Vorderschienen des ♂. Sie sind im letzten Drittel plötzlich, fast winklig nach innen gekrümmt, innen ungezähnt, die Spitze innen schwach bebürstet. Von der Seite gesehen haben sie gegen das Ende einen langbogigen Ausschnitt, der am unteren, aber nicht am oberen, Ende begrenzt ist, das eigentliche Ende (etwa das letzte Achtel) ist plötzlich verbreitert. Die andern Schienen und die Schenkel ohne Auszeichnung. Halsschild quer, flach, mit deutlicher Mittellinie, die Hinterecken scharf recht- oder etwas spitzwinklig, Vorderrandlinie in der Mitte breit unterbrochen. Analsegment ungerandet. Hinterbrust querrunzlig. Forceps sehr zart, zweispitzig, oben durch eine lange, tiefe Furche getrennt.

Fairmaire hat eine Art *Nyctobates sanguinicrus* auf sehr glattflügelige, rotschenklige Exemplare beschrieben. Tatsächlich ist die typische Form glatter als die entsprechenden Formen von *aequatorialis*, aber es finden sich auch Exemplare, die in der Skulptur nicht von der Stammform abweichen. Diese „Art" ist höchstens als Farbenabweichung haltbar. Mir liegt sie vor von Java, Sumatra und Borneo.

Das Material des Bureau of Science hat die Stammform von: LUZON, Benguet, Irisan River (1645, *R. C. McGregor*); Nueva Vizcaya, Bayombong (9899, *H. M. Curran*); Negros Occidental, Mt. Canlaon (6852, *C. S. Banks*).

Derosphaerus rotundicollis Cast.

Fairmaire fat diese Art noch einmal unter den Namen *D. simillimus* beschrieben.

Zwei Exemplare in meiner Sammlung mit den Fundorten: Philippinen und Manila.

MINDORO, Magaran (10764, *W. Schultze*).

Drei Exemplare im Berliner Museum: Manila (*Eschscholtz*), (*Cuming*).

Eucyalesthus nitidipennis Fairm.

Von dieser Art liegen mir 4 Exemplare von Mindanao, Davao, in meiner Sammlung vor; ferner 3 Exemplare von den Philippinen (*Cuming*) im Berliner Museum und 1 Exemplar vom Bureau of Science.

LUZON, Benguet, Irisan River (1268, *R. C. McGregor*).

Die Art ist in der Färbung recht variabel. Die Exemplare von Mindanao (woher auch die Originalexemplare stammen) haben kupfrig metallische Flügeldecken, blauen Halsschild und blaue Beine. Ein Exemplar des Berliner Museums ist ganz stahlblau und wird dadurch dem *E. coerulescens* Guér. sehr ähnlich. Das Exemplar vom Bureau of Science ist oben einfarbig metallisch bronzefarben und hat fast schwarze Beine. Diese Farbenabänderungen zu benennen scheint mir wertlos.

Eucyalesthus striatus sp. nov.

Glänzend schwarz, auch die Beine und Fühler, das Abdomen zuweilen etwas bräunlich. Flügeldecken mit blossem Auge gesehen bräunlich metallisch, bei Betrachtung durch die Lupe sind die Streifen golden oder kupfrig, die Zwischenräume stahlblau, die Basis schmalgolden, die Epipleuren stark metallisch. Kopf nahezu glatt, nur äusserst fein punktiert, der Clypeus breit und schwach ausgebuchtet, die Augenfurchen schmal und tief, hinten dicht hinter dem Hinterrande der Augen aufhörend, Stirn fast flach, Clypealfurche sehr fein und wenig deutlich, zuweilen fast verwischt. Fühler bis zur Mitte des Thorax reichend, die letzten 6 Glieder bilden eine schwache Keule, ihre Glieder nicht doppelt so breit wie lang. Mentum ziemlich flach mit mittlerem Längskiel. Halsschild etwa $1\frac{1}{2}$ mal so breit wie lang, seitlich stark gerundet, in der Mitte am breitesten, Randlinie von oben nicht sichtbar, Oberfläche sehr fein und wenig dicht punktiert, Punktierung an den Seiten erloschen, die Basis dick gerandet, die Randlinie selbst fast gerade, so dass die Basismitte wesentlich breiter als an den Seiten ist, die Hinterecken schwach stumpfwinklig, die Vorderrandlinie in der Mitte breit unterbrochen. Flügeldecken tief punktiert gestreift, die Zwischenräume, besonders nach der Spitze hin, stark konvex, nur bei einem Exemplare sind die Interstitien auf der Scheibe fast plan, ihre Punktierung ist äusserst fein. Prosternum zwischen den Hüften wenig hoch, dahinter sanft, aber ganz niedergebogen, das Ende nicht immer deutlich gerandet, breit, zwischen den Hüften 2 gerade, scharfe Längsfurchen, Mesosternum viel flacher als bei *E. aeruginosus* F. Propleuren ohne Punkte und Runzeln, Abdomen mässig fein längsrunzlig punktiert. Schenkel kräftig gekeult, die dünnen Hinterschienen des Männchens innen mit feinem Saum gelber Haare in der unteren Hälfte, im übrigen die Beine ohne Auszeichnung. Forceps sehr fein, einfach zugespitzt.

Länge 13.33–14 mm.

Drei Exemplare.

Negros Occidental, Mt. Canlaon (6853, *Charles S. Banks*). Ein Exemplar im Berliner Museum: Ins. Philippinae (*Cuming*).

Die Art ist der vorigen sehr ähnlich, aber kleiner, der Halsschild sehr fein punktiert, die Basallinie gerade, die Scheibe ohne seitliche Eindrücke, die Flügeldecken mit farbigen Streifen, das ♂ mit den ausgezeichneten Hinterschienen, die Glieder der Fühlerkeule weniger in die Breite gezogen, das Prosternum ganz anders, etc.

Catapiestus mediocris Guér.

Mir liegt in meiner Sammlung 1 Tier aus Borneo vor, auf das die Beschreibung gut passt. Charakteristisch ist die sehr schwache Krenulierung des Halsschildseitenrandes und besonders die Bildung der Vorderschenkel. Guérin sagt in seiner Beschreibung, dass ausser dem Mittelzahn zwei kleine nach aussen liegende Zähnchen vorhanden sind. Nach dem mir vorliegenden Stück würde ich lieber sagen: zwischen dem Mittelzahn und der Spitze liegt ein winziger halbkreisförmiger Ausschnitt mit scharfen Ecken. Mittel- und Hinterschenkel sind ungezähnt. Der Zahn hinter den Augen sehr schmal, aber spitz. Das Tier von den Philippinen ist grösser (12.5 mm. lang) und braun gefärbt, stimmt aber sonst mit dem Borneo Exemplar überein.

Ein Exemplar.

LUZON, Benguet, Irisan River (1577, *R. C. McGregor*).

Lyprops luzonicus sp. nov.

Klein, ziemlich schlank, braun, glänzend, Beine dunkel, Fühler schwarz. Kopf grob; aber nicht zusammenfliessend punktiert, Clypeus dick, Querfurche sehr deutlich, Fühler dick, die Basis des Halsschildes erreichend, Glied drei 1½ mal so lang als 4, die folgenden allmählich an Länge und Breite zunehmend, viel breiter als lang, das letzte fast doppelt so lang wie das vorletzte. Halsschild wenig quer, grob aber nicht gedrängt punktiert, die Seiten in der Mitte fast gerade, sehr schwach nach hinten verengt, dann plötzlich, fast winklig, und etwas eingezogen verengt, die Vorderwinkel ganz verrundet, der Vorderrand ungerandet, die Basis vollständig fein gerandet, in der Mitte schwach eingezogen, die Hinterwinkel fehlen. Flügeldecken ziemlich parallel, nach hinten erweitert, ganz verworren punktiert, die Punkte grob, aber nicht gedrängt, ihre Zwischenräume

so gross wie sie selbst, alle genabelt, und je ein aufgerichtetes aber nach hinten gekrümmtes Haar tragend. Beine ohne Auszeichnung. Forceps ziemlich breit, einfach zugespitzt, Abdomen in der Mitte fein, seitlich grob punktiert.

Länge 6.5 mm.

Zwei Exemplare.

PALAWAN, Bacuit (12361, *C. M. Weber*).

Diese kleine Art von der Gestalt des *L. sinensis* Mars. unterscheidet sich von dieser Art sofort durch die viel geringere Grösse. Sehr ähnlich ist *L. piceus* Fairm. aber viel breiter, mit stark querem Thorax. Die charakteristische Gestalt des Halsschildes unterscheidet sie von allen mir bekannten Arten.

Oedemutes purpuratus Pasc.

Auf diese Art beziehe ich 4 Exemplare in meiner Sammlung: Manila und Nord-Luzon (*Whitehead*) und 1 Exemplar des Berliner Museums: Philippinen (*Cuming*).

Oedemutes physopterus sp. nov.

Kurz und gedrungen, Flügeldecken blasig aufgetrieben. Schwarzblau, fast schwarz, Flügeldecken mit sehr schwachen, grünlichen und kupfrigen Reflexen. Kopf lang, mit kurzen, tiefen, geraden Augenfalten, in der Mitte mit undeutlicher Längsfurche, der sanft ausgeschnittene Clypeus sehr fein, die Stirn grob punktiert. Die kurzen Fühler mit der gewöhnlichen 5-gliedrigen Keule, das letzte Glied nicht gleichmässig gerundet, sondern an der Innenseite deutlich länger. Halsschild kaum $1\frac{1}{2}$ mal so breit wie lang, oben ziemlich flach, an den Seiten stärker gewölbt als bei den andern Arten, mit 4 im Rechteck stehenden Eindrücken, von denen die vorderen viel schwächer sind, ausserdem aber am Rande eben hinten der Mitte mit 2 kleinen Quereindrücken, welche aber den Rand nicht einziehen; die Scheibe ziemlich fein und weitläufig, die Basis noch feiner, die Seiten ganz erloschen punktiert, die Seiten vor der Basis sehr kurz eingezogen, daher die Hinterwinkel scharf rechtwinklig. Flügeldecken sehr kurz oval, hinter der Basis kurz niedergedrückt, dann blasenartig aufgetrieben, von der Seite gesehen bildet die mittlere Längslinie des Körpers beim Schildchen einen stumpfen Winkel, höchste Höhe etwas vor der Mitte der Flügeldecken, die Grübchen grob, rundlich, nur einzelne etwas länglich, die Zwischenräume etwa von dem Durchmesser der Grübchen. Unterseite schwärzlich, die Seiten der Vorderbrust und des Abdomens kupfrig, die Beine ebenfalls mit schwachen

metallischen Reflexen. Die Vorderschenkel mit dem gewöhnlichen kräftigen Zahn, die Hinterschienen der Männchen an der inneren Vorderkante in ganz flachem Bogen unter der Mitte ausgeschnitten und kurz tomentiert. Die Propleuren kaum gerunzelt, das Prosternum der Länge nach eingedrückt, wagerecht.

Länge 11 mm. Höhe 6 mm.

Ein Exemplar.

LUZON, Ambos Camarines (9093, *H. M. Curran*).

Diese Art ist mit der vorherigen nahe verwandt, hat aber schwarze Beine, fein punktierten Halsschild, und ganz andere Bildung der Flügeldecken. Sie erinnert sehr an *Sphaerotus*.

Oedemutes viridulus Kraatz.

Die am prächtigsten gefärbte Art der Gattung liegt mir in 1 Exemplar aus dem Berliner Museum vor: Ins. Philippinae (*Semper*).

Oedemutes pretiosus Pasc.

Auf diese Art beziehe ich 1 Exemplar meiner Sammlung von den Philippinen (ex. coll. *Waagen*) und 2 Tiere des Bureau of Science.

CALAYAN INSEL (646, *R. C. McGregor*).

Oedemutes varicolor sp. nov.

Verhältnismässig schlank, stark gewölbt, aber in den Flügeldecken nicht buckelig. Die Färbung sehr variabel. Drei Exemplare leuchtend stahlblau mit rotkupfrigen oder purpurnen Flügeldecken, bei einem andern sind die Beine und der Vorderkörper blaugrün, bei einem fünften violett mit purpurnen Reflexen und die Flügeldecken messingfarben und nach den Seiten hin mehr grün leuchtend, bei einem sechsten Vorderkörper und Beine leuchtend grün und die Mitte von Kopf und Halsschild goldig, die Flügeldecken schwärzlich grünblau, das letzte ist oben ganz grünblau, die Ränder der Flügeldecken und Seiten des Kopfes herrlich cyanblau, die Beine purpurn violett metallisch.

Kopf breit, nicht sehr grob und wenig dicht punktiert, auf der Stirn mit 3 mehr oder weniger deutlichen Längsgrübchen, die Augenfurchen kurz, gerade, deutlich, Clypeus fast gerade abgestutzt, Canthus von Augenbreite oder etwas breiter, der Quereindruck gerade, schmal, nicht sehr stark, an den Seiten etwas eingestochen. Fühler mit der normalen 5-gliedrigen Keule, das letzte Glied so breit wie lang oder schwach quer,

gleichmässig gerundet. Halsschild breit, fast doppelt so breit wie lang, gleichmässig flach gewölbt, die Eindrücke schwach oder fehlend, die seitlichen Eindrücke sind ganz schwach oder fehlen, so dass die Seitenrandlinie kontinuierlich gewölbt ist. Hinterwinkel scharf rechteckig, die Vorderwinkel verrundet, die Basis ganz gerandet. Oberfläche auf der Scheibe ungleich, ziemlich weitläufig und mässig grob oder ziemlich fein punktiert, die Seiten kaum sichtbar punktiert. Flügeldecken etwas breiter als der Halsschild, gleichmässig gewölbt, so dass die mittlere Längslinie des Körpers eine ziemlich regelmässige Kurve bildet, die nicht sehr groben Grübchen der Flügeldecken länglich viel schmäler als die Zwischenräume. Prosternum wagerecht, der Länge nach gefurcht, lang zugespitzt, Propleuren mit vereinzelten Längsrunzeln. Vorderschenkel mit dem normalen Zahn, Hinterschienen der Männchen im sehr schwachen Ausschnitt, innen eben unter der Mitte mit feinem Haartoment.

Länge 11.5–14.33 mm.

Sieben Exemplare.

ROMBLON (1983); SIBUYAN (7670, *R. C. McGregor*); SIQUIJOR (8960, *A. Celestino*).

Ein Exemplar im Berliner Museum von Semper auf den Philippinen gesammelt.

Diese Art ist durch die Gestalt der mit länglichen, schmalen Grübchen bedeckten Flügeldecken ausgezeichnet.

Pseudeumolpus superbus Kraatz.

Nach Kraatz von Manila und Pulo-Penang. Mir unbekannt geblieben.

Pseudeumolpus iridipennis sp. nov.

Sehr robust, stark gewölbt. Oberseite, besonders die Flügeldecken, in allen Regenbogenfarben glänzend, die Beine blaugrün, die Unterseite grün, die Seiten des Abdomens golden. Kopf mit kräftigen Augenfalten, die innen etwa in der Mitte der Augen beginnen und schräg nach aussen laufen und die Seitenäste der Clypeallinie fortsetzen. Der Canthus mit einem kleinen Grübchen, die Oberfläche sehr fein, an den Seiten etwas stärker punktiert, Vorder- und Hinterkopf grün, die Seiten blaugrün, die Mitte herrlich purpurn. Die Augenfurchen scharf aber fein, die hintere Partie plötzlich in einen Hals verengt, so dass die Schläfen hinter den Augen diesen etwa blattartig aufgesetzt sind, Clypeus dick, gerade abgestutzt; Fühler schwarz, mit 5-gliedriger Keule, das letzte Glied etwas breiter als lang.

Halsschild doppelt so breit wie lang, fast so breit wie die Flügeldecken, jederseits, ein grosser, purpurner, goldig umgebener Fleck, Vorder- und Hinterrand grün oder blaugrün, Punktierung sehr fein und weitläufig. Die Seiten nach hinten kaum verengt, Hinterwinkel scharf rechteckig, Basis fein, vollständig gerandet, Vorderwinkel verrundet. Die herrliche Färbung der Flügeldecken schwer zu beschreiben: es befindet sich an den Schultern und vor der Spitze je ein dunkel erzfarbiger Fleck, der in verwaschenen Zickzacklinien von purpurn, dann golden, blau, grün, violett umgeben ist, so entsteht eine violette Querbinde, die am Seitenrand und nach der Naht zu verbreitert und rotgolden wird. Die Oberfläche mit Linien feiner engstehender Punkte, Zwischenräume ganz flach, äusserst fein punktiert. Prosternum hinter den Hüften etwas gesenkt, der Länge nach gefurcht. Abdomen fein punktiert und sehr fein längsrunzlig. Vorderschenkel mit kräftigem, spitzem, nach aussen gerichtetem Zahn. Schienen einfach, gerade.

Länge 13 mm.

Ein Exemplar.

MINDANAO, Zamboanga, Port Banga (8713, *W. J. Hutchinson*).

Diese wundervolle Art ist unter anderem durch die Färbung von allen Gattungsgenossen verschieden.

Pseudeumolpus polychromus sp. nov.

Ziemlich schlank, in der Längsrichtung nicht sehr konvex. Beine und Fühler glänzend schwarz, Kopf und Halsschild bunt, die Farben der Flügeldecken in der Längsrichtung angeordnet. Augenfalten breit und flach, schräg nach aussen gerichtet; die Grübchen auf dem Canthus punktförmig, Clypeus dick, die Seitenäste der Clypealfurche eingedrückt aber nicht eingeschnitten. Die Augenfurchen fein, aber scharf, Punktierung fein, auf der Stirn, die ein undeutliches Längsgrübchen hat, deutlicher, der Hals ziemlich dünn, daher die Schläfen hinter den Augen wie bei voriger Art. Vorderkopf dunkelblau und grün, die Stirn purpurn und golden. Halsschild circa $1\frac{2}{3}$ mal so breit wie lang, fein und weitläufig punktiert. Punktierung an den Seiten fast erloschen, die Seiten in den letzten Zweidrittel fast parallel, die Vorderecken ziemlich scharf stumpfwinklig, die Hinterwinkel scharf rechteckig, und schwach nach hinten gezogen, die Basis vollständig gerandet, die Färbung an jeder Seite breit goldig und purpurn, die Mitte blau und seitlich schmal grün. Flügeldecken leuchtend rotgolden, über jeder ein schräger

grüner Längsstreif von der Schulterbeule bis zur Spitze, der Streif gerade, von der ungefähren Breite zweier Interstitien, auch die Naht grün gefärbt. Punktlinien fein, nach der Spitze hin noch feiner werdend, Zwischenräume ganz flach. Prosternum wagerecht, zugespitzt, tief gefurcht, Unterseite dunkel blaugrün. Beine schwarz; Vorderschenkel mit normal grossem, spitzem, in der Anlage rechtwinkligem Zahn. Vorderschienen gekrümmt, unmittelbar unter der Basis innen mit kleinem Winkel, die Hinterkante oben sanft ausgeschnitten.

Länge 13.33 mm.

Ein Exemplar.

MINDANAO, Camp Keithley (7305, *Frau M. S. Clemens*).

Die Art is sofort durch die Farbenverteilung und durch die Bildung der Vorderschienen gekennzeichnet.

Pseudabax formosus Kraatz.

Von dieser Art liegen mir 2 Exemplare vor, eines ohne Fundort in meiner Sammlung, ein anderes aus dem Berliner Museum: Ins. Philippinae.

Pseudabax purpureomicans sp. nov.

Auf den ersten Blick der vorigen Art ähnlich aber viel gewölbter, namentlich in den Flügeldecken, die Färbung ganz ähnlich. Der Kopf zwischen den Augen nicht gerunzelt, der Clypeus in kräftigem (circa $\frac{1}{4}$) Kreisbogen ausgeschnitten, die Clypealfurche fein, gebogen, in der Mitte nicht gerade, Oberfläche fein punktiert, Vorder- und Hinterkopf purpurn. Stirn und Canthus mehr oder weniger blaugrün, Fühler am Grunde braun, die Keule 6-gliedrig, die vorletzten Glieder doppelt so breit wie lang, das letzte so breit wie lang. Augenfurchen sehr fein und wenig deutlich. Halsschild beim ♂ flacher, beim ♀ viel gewölbter, $1\frac{1}{2}$ mal so breit wie in der Mittellinie lang, beim ♂ nach hinten fast parallel, beim ♀ seitlich mehr gerundet, die Vorderecken stehen vor, aber viel weniger als bei voriger Art, die Hinterecken spitz rechtwinklig, die Randung an den Seiten dicht und aufgeworfen, an der Basis jederseits scharf eingeschnitten, die Mitte selbst ungerandet und nur etwas aufgeworfen. Die Punktierung der Oberfläche ist äusserst fein und wenig dicht, in der Seitenrandkeule nicht deutlich grob punktiert. Die Scheibe jederseits vor der Mitte blau, und rund herum breit purpurn, die schmale Mittellinie, die Spitze und Basis blau und grün. Flügeldecken ziemlich gewölbt, mit Punktstreifen, deren Zwischenräume auch auf der Scheibe ge-

wölbt sind. Die Punkte der Streifen wenig gross eng stehend, die Interstitien glatt, die abwechselnden an der Spitze wesentlich erhöht, aber nicht tropfenförmig. Beim ♂ sind die Streifen auf der Scheibe nicht purpurn, sondern die abwechselnden, nicht erhabenen Zwischenräume an der Spitze. Beim ♀ sind die Punktstreifen selbst schmal purpurn, die Zwischenräume selbst dunkel metallisch, Basis, Nahtstreifen und Seiten mehr oder weniger purpurn in beiden Geschlechtern. Ich nehme aber an, dass die Färbung nicht nach den Geschlechtern, sondern individuell verschieden ist. Prosternum vorn tomentiert, beim ♂, Abdomen in beiden Geschlechtern unbehaart, stark glänzend. Der Prosternalfortsatz sehr lang, geradlinig, stark zugespitzt, wagerecht, stark gefurcht, die Furche von der Form des Fortsatzes. Das Abdomen stark grün und purpurn metallisch, die ersten Segmente kräftig punktiert. Die Vorderschienen des ♂ innen schwach S-förmig gebogen und in der Endhälfte sehr fein tomentiert. Die ganzen Beine mit den Metallfarben des Körpers.

Länge 15–16 mm.

Ein Exemplar (♀).

CEBU, Toledo (6778, *R. C. McGregor*). Ein ♂ aus dem Berliner Museum: Ins. Philippinae (*Cuming*).

Dem *P. formosus* Kraatz sehr ähnlich, aber kleiner, gewölbter, mit gewölbten Flügeldeckenzwischenräumen, viel weniger vorstehenden Vorderecken des Halsschildes, in beiden Geschlechtern nacktem Abdomen.

Pseudabax nigricollis sp. nov.

Kleinere Art, flach gewölbt, ziemlich parallelseitig, glänzend schwarz.

Flügeldecken dunkel kupferrot mit schmalen grünen Streifen. Kopf sehr tief in den Thorax eingelassen, so dass die Vorderwinkel die Mitte des Auges überragen. Der Ausschnitt des Clypeus stumpfwinklig, die Stirn grob, zusammenfliessend punktiert, die Clypealfurche bildet einen regelmässigen Kreisbogen, sie ist sehr fein, der Vorderkopf davor sehr fein punktiert, Augenfurchen tief, nach hinten verbreitert; Fühler rotbraun, die letzten 6 Glieder bilden eine lose Keule. Halsschild 1½ mal so breit wie lang, die Seiten in den letzten Zweidrittel parallel, sehr dick wulstig gerandet, die Hinterecken scharf rechtwinklig, die Vorderecken verrundet spitzwinklig, stark niedergedrückt, die starke basale Randung in der Mitte unterbrochen, die Punktierung auf der Scheibe deutlich, weitläufig,

an der Basis viel gröber, an den Seiten fast erloschen. Die Flügeldecken an der Basis kaum breiter als der Halsschild, die Epipleuren an den Schultern deutlich abgesetzt und etwas winklig nach vorn springend, Oberfläche mit kräftigen Punktstreifen, deren Punkte viel gröber als bei andern Arten, Zwischenräume glatt, auf der Scheibe wenig, an den Seiten und an der Spitze stark gewölbt, vor der Spitze sind der 3., 5. und 7. (dieser zweimal) verbreitert und etwas tropfenartig verdickt. Unterseite ganz schwarz, die Propleuren sind punktiert und längsrunzlig, das Prosternum vorn tomentiert, der Fortsatz spitz, aber nicht sehr schmal; hinter den Hüften schwach gesenkt, zwischen ihnen stark gefurcht. Das Abdomen auf den ersten Segmenten mässig fein punktiert, ohne Haartoment, die Epipleuren vor der Spitze mit zwei bogigen, tiefen Eindrücken. Die Vorderschienen innen in der Endhälfte fein behaart, alle Schienen einfach gerade.

Länge 12 mm.

Ein Exemplar von Luzon in meiner Sammlung.

Diese kleine Art ist an der Färbung leicht kenntlich und nur mit der folgenden zu verwechseln.

Pseudabax frater sp. nov.

Der vorigen Art in Gestalt und Grösse sehr ähnlich, von ähnlicher Färbung. Kopf, Halsschild und Unterseite dunkel metallisch, der erste ziemlich lebhaft gefärbt, Fühler rotbraun, Beine schwarz, Flügeldecken kupfrig violett mit grünen Streifen. Kopf vorn sehr fein, auf der Stirn viel gröber, aber nicht runzlig punktiert, der Ausschnitt wenig stark, in der Mitte fast winklig. Augenfurchen kurz und tief, die letzten 6 Fühlerglieder bilden eine lose Keule, die feine Clypeallinie etwa halbkreisförmig. Der Kopf ist viel weniger tief in den Thorax eingelassen wie bei voriger Art, die Vorderecken reichen kaum über den Hinterrand der Augen. Halsschild ganz wie bei voriger Art und nur durch die düster metallische Färbung unterschieden, ebenso findet sich in der Bildung der Elytren kaum ein Unterschied. Prosternum hinter den Hüften ganz gerade mit der tiefen Furche wie bei voriger Art. Abdomen ohne Haartoment.

Länge 12 mm.

Ein Exemplar.

LUZON, Laguna, Santa Maria (8632, *H. M. Curran*).

Es ist denkbar, dass dieses Tier nur das andere Geschlecht der vorigen Art ist, doch scheinen mir die angegebenen Unterschiede doch specifische zu sein.

Pseudabax chalceus sp. nov.

Oben und unten gleichmässig bräunlich oder etwas grünlich erzfarben, die Ränder und Beine mehr rötlich. Kopf beim ♂ sehr fein und weitläufig, auf der Stirn nicht gröber, beim ♀ dort etwas deutlicher und weniger fein, der Clypeus fast gerade abgestutzt, die Clypealfurche sehr fein, nicht halbkreisförmig, sondern seitlich schwach gewinkelt, Augenfurchen schmal und wenig tief. Fühler mit 6-gliedriger Keule. Mentum der Länge nach gekielt. Halsschild beim ♂ mit stark und spitz vortretenden Vorderecken, beim ♀ mit weniger vortretenden in der Anlage rechtwinkligen Vorderwinkeln, die Hinterecken scharf spitzwinklig, die grösste Breite an der Basis, die letzten Zweidrittel ziemlich parallel, die Seiten schmal aufgeworfen, ebenso die Basis, diese auch in der Mitte, doch entfernt sich hier die Randlinie von der Basalkante, der Thorax ist an der Basis $1\frac{1}{8}$ mal so breit wie in der Mitte lang, Oberfläche beim ♂ fast spiegelblank, beim ♀ äusserst fein punktiert. Die Flügeldecken haben eine an den Schultern vorn etwas vortretende Epipleuralkante, sie sind vollkommen eben, mit feinen Punktlinien; an der Spitze treten die Zwischenräume, ohne vorher konvex zu sein, etwas tropfenartig heraus, es sind verdickt: der 2. Zwischenraum ganz an der Spitze und zwar schräg nach dem Nahtwinkel hin, der 3. vor der Spitze, 4. und 6. in ihrer Vereinigung, der 5. unmittelbar davor, der 7. ist ziemlich lang erhaben und läuft etwas kielförmig neben dem Seitenrande hin. Die Propleuren sind neben den Hüften wenig stark längsrunzlig, beim ♂ unpunktiert, beim ♀ mit einigen kräftigen Punkten. Prosternum ganz wagerecht, nur zwischen den Hüften mit 2 wenig tiefen Furchen, die Spitze selbst ungefurcht. Abdomen beim ♀ glatt, beim ♂ auf den beiden ersten Segmenten mit feinem gelbem Haartoment.

Länge 16.5–18 mm.

Zwei Exemplare.

LUZON, Benguet, Irisan River (1486, *R. C. McGregor*); MINDORO, Mt. Halcon (6693, *E. D. Merrill*).

Ich halte die beiden mir vorliegenden Tiere für die Geschlechter einer Art, obgleich die Unterschiede in der Skulptur, der Bildung der Vorderecken des Halsschildes, der Punktierung des Kopfes ziemlich beträchtlich sind.

Die Art ist an dem einfarbig metallisch glänzenden Körper, den stark vortretenden Vorderecken des Halsschildes, dem fast

gerade abgestutzten Clypeus, und den ganz flachen Interstitien der Flügeldecken leicht kenntlich. *Pseudabax opacus* Kraatz ist mir unbekannt geblieben. Die Art ist nach einem Exemplar von Luzon aus der Coll. *Haag* beschrieben.

Die Arten der Gattung *Pseudabax*, die auf die Philippinen beschränkt zu sein scheint, haben alle die sonderbaren Verdickungen in den Flügeldeckenzwischenräumen vor der Spitze. Diese fehlen nur bei *P. viridipennis* der wahrscheinlich nicht zur Gattung gehört. Sein Vaterland ist unbekannt. Die andern Arten lassen sich wie folgt unterscheiden:

1. Clypeus gerade abgestutzt, Zwischenräume der Flügeldecken absolut flach. Oberseite einfach, glänzend metallisch..... chalceus sp. nov.
   Clypeus ausgerandet, Zwischenräume meist gewölbt, wenigstens seitlich, Oberseite matt pechschwarz oder mehrfarbig..... 2.
2. Körper einfarbig pechschwarz, matt, Kopf auf der Stirn rauh punktiert (ex. Kraatz) ..... opacus Kraatz.
   Körper stark glänzend, mehrfarbig..... 3.
3. Grosse Arten (16 mm. und darüber), Kopf und Halsschild stark irisierend, Vorderwinkel des Halsschildes schwach niedergebogen.... 4.
   Kleinere Arten (12 mm.), Kopf und Halsschild schwarz oder sehr schwach metallisch. Vorderwinkel des Halsschildes stark heruntergezogen ..... 5.
4. Abdomen auf den ersten Segmenten mit gelbem Haartoment, Interstitien auf der Scheibe flach..... formosus Kraatz.
   Abdomen nackt, Interstitien gewölbt..... purpureomicans sp. nov.
5. Körper (bis auf die Flügeldecken) glänzend schwarz, Stirn runzlig punktiert..... nigricollis sp. nov.
   Körper deutlich metallisch, besonders der Kopf. Stirn einfach punktiert..... frater sp. nov.

Scotaeus seriatopunctatus Heller.

Zwei Exemplare.

LUZON, Benguet, Irisan River (1272, 1483, *R. C. McGregor*).

Platycrepis violaceus Kraatz.

Ein Exemplar vom Berliner Museum. Manila (*Eschscholtz*). Zwei Exemplare in meiner Sammlung: Süd-Palawan; ferner 3 Exemplare von Java.

Eucyrtus nigripes Kraatz.

Ein Exemplar (♀) von den Philippinen in meiner Sammlung.

Eucyrtus gloriosus Kraatz.

Drei Exemplare, nach dem Autor auch auf Borneo. Noch Exemplare des Bureau of Science: PALAWAN, Iwahig (10746, *W. Schultze*).

Eucyrtus lisae Kraatz.

Wird vom Autor als von den Philippinen (Manila!) stammend angegeben. Mein Exemplar stammt von Tamiang (wahrscheinlich der Fluss auf Sumatra).

Eucyrtus clypealis sp. nov.

Schlank, parallelseitig, Oberseite grünlich metallisch, Unterseite mehr schwärzlich, Beine grün. Kopf flach, ziemlich grob, vorn viel feiner punktiert, der Clypeus im Bogen ausgeschnitten, die Clypealfurche sehr fein, nicht eingeschnitten, in der Mitte gerade, die Seitenäste in stumpfen Winkel angesetzt, Augenfurchen sehr deutlich, nach hinten schräg nach aussen verlaufend, Augenfalten fehlen. Der Kopf ist lang, vor den Augen noch so lang wie der Zwischenraum zwischen ihnen, die Fühler mit 6-gliedriger Keule, deren Glieder stark quer sind. Halsschild $1\frac{1}{2}$ mal so breit wie lang, die hinteren Zweidrittel parallel, die Vorderwinkel kaum vortretend, gerundet stumpfwinklig, die Hinterecken scharf rechtwinklig, die Basis jederseits fein gerandet, die Mitte ungerandet, aber quer niedergedrückt, die Oberfläche fein und ziemlich dicht, die Basis im Eindruck weitläufiger und gröber punktiert. Flügeldecken mit ziemlich feinen Punktreihen, deren Zwischenräume ganz eben, nur seitlich und an der Spitze deutlich konvex; sie sind fein, aber deutlich und ziemlich dicht punktiert. Prosternum hinter den Hüften schräg niedergedrückt, doppelt gefurcht, die Spitze selbst umrandet, das Mesosternum breit U-förmig eingedrückt, mit wenig vortretenden Ecken. Das Abdomen dicht und deutlich punktiert, das Analsegment sehr fein und gedrängt, das erste viel gröber und weitläufiger und ausserdem deutlich gerunzelt. Propleuren längsrunzlig und weitläufig, nicht sehr tief punktiert. Beine einfach; Schienen gerade, Tarsen kurz, an den hinteren ist Glied 4=1+2; 2=3; 1=2+3.

Länge 12.5–14 mm.

Zwei Exemplare.

Negros Occidental, Bago (1390, 1608, *Charles S. Banks*).

Diese Art gehört mit den folgenden und einer ganzen Anzahl von Fairmaire beschriebenen in eine Gruppe, welche durch den langen Vorderkopf und die schmale Gestalt ausgezeichnet ist; die Gruppe ist gut begrenzt. Es ist nötig darauf eine neue Gattung zu gründen, doch verzichte ich darauf, da mir eine Menge der Fairmaire'schen Arten nicht genau genug bekannt sind.

Die vorliegende Art zeichnet sich innerhalb dieser Gruppe durch bedeutende Grösse (alle Arten sind klein oder sehr klein), und durch eine einfache metallische, unansehnliche Farbe aus.

Eucyrtus subcostatus Fairm.

Ein Exemplar, vom Bureau of Science.

Negros Occidental, Bago (1610, *Charles S. Banks*).

Das vorliegende Exemplar unterscheidet sich durch dunkle Beine von meinen Stücken aus Nord Borneo und Java.

Eucyrtus acutangulus sp. nov.

Klein, ziemlich parallel, glänzend schwarz, Flügeldecken glänzend blaugrün. Kopf lang, Clypeus gerade abgestutzt, breit, die Clypealnaht fehlt, es ist nur ein ganz schwacher Quereindruck vorhanden, der ganze Kopf ist gleichmässig dicht und nicht sehr fein punktiert. Augenfurchen schmal, fein und kurz. Fühler schlank, dünn, die ersten Glieder rotbraun, die 5-gliedrige Keule lose gegliedert, die Glieder nur etwas breiter als lang. Halsschild kaum $1\frac{1}{2}$ mal so breit wie lang, die Seiten ganz gerade, unmerklich nach vorn verengt, nur an der äussersten Spitze nach innen gebogen, die Vorderecken stark nach vorn vorgezogen, spitzwinklig, aber nicht scharf, die Hinterwinkel scharf rechtwinklig, die Basis ganz ungerandet, die Seiten fein gerandet, die Oberfläche kräftig und ziemlich gleichmässig punktiert, die Pleuren des Thorax spiegelglatt. Flügeldecken parallelseitig, ihre Seitenrandkante von oben gerade noch übersehbar, Oberfläche mit Reihen ziemlich grober Punkte, die Zwischenräume ganz flach, auch an der Spitze dicht und deutlich punktiert. Das Prosternum wagerecht, hoch, am Ende nicht sehr spitz, der Länge nach mit starker einfacher Furche, Mesosternum scharfkantig, breit, V-förmig angeschnitten, Abdomen ziemlich fein punktiert. Beine einfach, Vorder- und Mittelschienen schwach gekrümmt, an den Hintertarsen ist das erste Glied etwas kürzer als das Klauenglied.

Länge 8 mm.

LUZON, Benguet, Mt. Pulog (10272, *H. M. Curran*).

Ein Exemplar dieser durch Färbung und durch Gestalt des Halsschildes ausgezeichneten Art.

Eucyrtus ovipennis sp. nov.

Schwarz, Fühler und Beine korallenrot, Flügeldecken schwarz, oder schwärzlich violett oder schwarzblau, fast matt mit etwas Fettglanz, Unterseite schwarzbraun. Der Kopf ist flach, sein Vorderrand nahezu gerade, die Clypealnaht ist eine sehr feine

gerade Linie, deren Seitenäste sich verlieren, Oberfläche äusserst fein, kaum sichtbar punktuliert, Augenfurche kaum angedeutet. Fühler schlank und dünn, ohne eigentliche Keule, die letzten 6 Glieder vergrössert, so lang wie breit, dreieckig, das letzte etwa von kreisförmigem Umriss, sie überragen die Mitte des Halsschildes. Dieser ist gross, seine Länge verhält sich der der Flügeldecken wie 1: 2⅓, bei den andern Arten mindestens wie 1: 3; er ist an der Basis nur um ¼ breiter als in der Mittellinie lang, die Seiten ziemlich stark gerundet, grösste Breite etwas vor der Mitte, dahinter schwach eingezogen, dadurch die Hinterecken recktwinklig, der Vorderrand ganz gerade abgeschnitten, die Vorderecken kurz verrundet, die Seitenrandlinie ist sehr fein, sie reicht vorn und hinten nur bis in die Ecken, so dass Basis und Spitze ganz ungerandet sind, dafür ist aber die ganze Basis sehr schmal, in der Mitte nur wenig breiter, aufgeworfen, Oberfläche äusserst fein, zuweilen fast erloschen, an der Basis etwas deutlicher punktiert. Flügeldecken eiförmig, kräftig, der Länge und Quere nach gewölbt, die Seitenrandkante in der Mitte breit überwölbt, die Schultern mit schmal vortretender Pleuralkante. Oberfläche mit sehr feiner Punktlinien die an der Spitze und an den Seiten ganz oder fast erloschen sind, die vollkommen flachen Zwischenräume sind äusserst fein punktiert. Die grösste Breite der Flügeldecken liegt in der Mitte, ebenso die grösste Höhe. Mentum verrundet sechseckig mit erhöhter Mitte und jederseits mit länglichen Grübchen. Die Propleuren unpunktiert mit einigen schwachen Runzeln neben den Hüften, Prosternum hinter den Hüften niedergedrückt, runzlig, jederseits fein gefurcht, unten mit etwas vortretender Spitze, die Hinterkante des Prosternums ziemlich dick gerandet. Beine einfach, Schienen gerade, an den Hintertarsen ist Glied 1=4, aber wesentlich dicker.

Länge 9.33–11 mm.

Drei Exemplare.

LUZON, Benguet, Mt. Pulog (10256, *H. M. Curran*).

Diese Art mit korallenroten Beinen ist an dem Verhältnismässig langen, vorn ganz gerade abgestutzten Thorax und den eiförmigen Flügeldecken leicht kenntlich.

Eucyrtus excellens sp. nov.

Die beiden mir vorliegenden Stücke sind in der Färbung total verschieden, da aber kaum nennenswerte, höchstens als individuell zu bezeichnende Strukturverschiedenheiten vorhanden sind, betrachte ich sie vorläufig als eine Art.

Kopf und Halsschild leuchtend grün metallisch, die Basalhälfte der Flügeldecken prachtvoll purpurn und rotkupfrig, goldig umflossen, die Spitze breit golden, eine Querbinde blaugrün, Beine dunkelgrün, Unterseite schwärzlich metallisch. Das 2. Exemplar leuchtend violett, die Unterseite dunkler, eine Querbinde auf den Flügeldecken purpurn.

Kopf vor den Augen lang, der Clypeus sehr schwach ausgeschnitten, die Clypealnaht bildet einen ziemlich regelmässigen Kreisbogen, sie ist fein, aber sehr deutlich, Augenfurchen fein, aber tief, um das Auge herumgehend, Oberfläche vorn fein, hinten gröber und dicht punktiert. Fühler mit 6-gliedriger Keule, deren Glieder gedrängt, stark quer, das vorletzte über doppelt so breit wie lang, die ersten Glieder rotbraun. Halsschild $1\frac{1}{2}$ mal so breit wie lang, in der Mitte am breitesten, zur Spitze nur wenig mehr als zur Basis verengt, der Seitenrand mit Andeutung von Wellen, Vorderecken sehr schwach vorgezogen, verrundet, die Hinterecken scharf recht- oder stumpfwinklig, die Basis an den Seiten deutlich gerandet, in der Mitte abgesetzt, Oberfläche wenig dicht und feiner als die Stirn punktiert. Flügeldecken lang, parallelseitig, von der Breite des Halsschildes und 3 mal so lang als dieser; Oberfläche mit Punktlinien, deren Punkte nicht ganz gleichmässig dicht stehen und nicht ganz von derselben Grösse sind, die erste ist nach der Spitze hin kräftig vertieft. Zwischenräume ganz flach, sehr fein und weitläufig punktiert. Prosternum zwischen den Hüften undeutlich gefurcht, dahinter ganz niedergebogen und ganz am Grunde mit feiner, aufstehender Spitze, die Pleuren sind schwach längsrunzlig, grob, aber nicht dicht punktiert, Mesosternum wenig hoch, die Ecken nicht scharf, Ausschnitt etwas halbkreisförmig, Abdomen auf den ersten 3 Segmenten ziemlich grob, auf den letzten beiden viel feiner punktiert. Beine sehr kurz, die Vorderschienen innen schwach geschwungen. An den Hinterfüssen ist das Klauenglied so lang wie die 3 andern zusammen.

Länge 9.5–10 mm.

LUZON, Bataan, Lamao (6211, *H. M. Curran*); Manila (8813, *W. Schultze*).

Zwei Exemplare, die untereinander in Färbung ganz verschieden sind.

ÜBERSICHT ÜBER DIE PHILIPPINISCHEN ARTEN VON EUCYRTUS

Diese Übersicht hat nur problematischen Wert, da die Gattung aufgelöst werden muss. Das aber nach dem Material einer Lokalfauna zu tun, scheint mir gewagt.

1. Kopf kurz, dicht vor den Augen abgeschnitten, Seiten des Thorax dick gerandet ..... 2.
   Kopf lang, normal, Seiten des Halsschildes fein gerandet ..... 4.
2. Epistom breit und flach ausgeschnitten, Basis des Halsschildes vollständig gerandet ..... 3.
   Epistom gerade abgestutzt, Basis in der Mitte ungerandet.. **lisae Kraatz.**
3. Flügeldecken mit feinen, seitlich fast erloschenen Punktreihen, Halsschild hinter der Mitte eingezogen, Basis wenig breiter als die Spitze ..... **nigripes Kraatz.**
   Flügeldecken mit feinen, eingeschnittenen Linien, Halsschild hinten nicht deutlich eingezogen, Basis viel breiter als die Spitze. **gloriosus Kraatz.**
4. Hinterkörper oval, Beine korallenrot ..... **ovipennis sp. nov.**
   Hinterkörper parallelseitig, Beine schwarz ..... 5.
5. Vorderwinkel des Halsschildes lang vorragend, Kopf und Halsschild glänzend schwarz ..... **acutangulus sp. nov.**
   Vorderwinkel des Halsschildes nicht oder kaum vorragend, Vorderkörper blau oder metallisch ..... 6.
6. Die mittleren Zwischenräume nach aussen gerippt, im Querschnitt schief ..... **subcostatus Fairm.**
   Alle Zwischenräume flach oder gleichmässig schwach gewölbt ..... 7.
7. Basis des Halsschildes ungerandet, Clypeus mit deutlichem Ausschnitt; grössere Art, einfarbig metallisch, über 12 mm. lang.. **clypealis sp. nov.**
   Basis des Halsschildes seitlich gerandet, Clypeus kaum ausgeschnitten, kleinere Art (höchstens 10 mm. lang), bunt gefärbt.. **excellens sp. nov.**

Artactes latreillei Cast.

Zwei Exemplare im Berliner Museum.
LUZON (*Jagor*).

Amarygmus callichromus Fairm.

Vier Exemplare von Mindanao, Davao, in meiner Sammlung. Ein Exemplar von Luzon und 3 von Manila (*Eschscholtz*) in der Sammlung des Königl. Museums, Berlin, und 2 Exemplare vom Bureau of Science:
LUZON, Laguna, Magdalena (1756, *W. Schultze*).

Amarygmus angustus sp. nov.

Sehr lang oval, braun metallisch, Oberseite irisierend, Fühler rotbraun, wie die Tarsen, Unterseite schwarz, Schenkel und Schienen schwarzbraun. Kopf sehr flach, ohne Spur von Augenfurchen; der Canthus nicht aufgebogen, sondern ganz anliegend, die Entfernung der Augen grösser als die Länge des 3. Fühlergliedes, die Querfurche schwach, gerade, nur in der Mitte deutlich. Fühler dünn, lang, fast die Hälfte des Körpers erreichend, Glied 3 doppelt so lang wie 2, etwas länger als 4, die folgenden linear, rund, an Länge allmählich zunehmend, 8–10 etwa $2\frac{1}{2}$ mal so lang wie breit. Mandibeln gefurcht. Farbe zwischen den Augen kupfrig, davor grünlich. Halsschild nach vorn stark

im Bogen verengt, Basis zur Spitze wie 5: 3, der Vorderrand mit feiner, vollständiger Randlinie, die Basis ganz ungerandet, die Vorderwinkel ganz kurz verrundet, rechtwinklig, die hinteren stumpf, Punktierung wie die des Kopfes fein und dicht. Die Scheibe jederseits mit blaugrünem Querfleck, der kupferrot umflossen ist, die Ränder mehr goldig. Basis der Flügeldecken breit kupfrig, ein schräger Längsstreifen, der sich hinten mehr der Naht nähert, blau und blaugrün, Naht und äussere Streifen kupferrot, in der Mitte des Seitenrandes ein blaugrüner Längsfleck. Die ersten Streifen vertieft, die folgenden bilden Reihen nicht sehr dicht stehender, ziemlich grober Punkte, die beiden äussersten Streifen in der Mitte furchig vertieft mit gewölbtem Zwischenraum. Die Punktierung der Interstitien nicht sehr dicht und wenig feiner als die des Halsschildes. Prosternum nach hinten wenig geneigt, schmal, nach hinten doppelfurchig, mit vortretender, etwas gekielter mittlerer Partie, Mesosternum schmal, jederseits gekantet, die Platte etwas länger als breit, vorn nicht sehr stark ausgeschnitten, Absturz fast senkrecht. Abdomen fein punktiert und schwach längsstrigos. Vorderschenkel ungezähnt, Tarsen einfach, dünn, an den hinteren ist Glied 1 so lang wie die folgenden zusammen.

Länge 8.5 mm.

Ein Exemplar in meiner Sammlung.

Nord-Luzon, Cap Engaño (*Whitehead*).

Die schmale Gestalt, die Färbung und der ganz angedrückte Canthus machen diese Art leicht kenntlich.

Genus **PLATOLENES** novum

(Aff. *Amarygmus*)

Oval, unbehaart. Augen weit voneinander entfernt. Canthus ganz flach, kaum merklich aufgebogen. Oberfläche ohne eingeschnittene Linien. Fühler schlank, fadenförmig. Mandibeln kurz, am Ende gefurcht und daher 2-teilig, Mahlzahn flach gewölbt, ohne deutliche Skulptur. Mentum in der Mitte erhöht, mit vorrangenden Vorderecken, trapezförmig, Ligula etwa von der Breite des Mentums, vorn nicht ausgeschnitten, Seitenteile häutig, Innenlade der Maxillen unbewehrt, nur beborstet. Halsschild quer, stark nach vorn verengt, alle Ecken deutlich. Epipleuren unmittelbar vor der Spitze geschwunden. Prosternum vorn und hinten senkrecht abfallend. Mesosternalplatte seitlich nicht gekantet, so lang wie breit, vorn mit feinem Ausschnitt. Schenkel kräftig ungezähnt, Schienen

auf der Hinterkante nicht gefurcht. Vordertarsen mit den ersten 3 Gliedern kräftig verbreitert, das 4. wenig klein und kaum sichtbar, Mitteltarsen schwach erweitert.

Diese Gattung steht *Amarygmus* sehr nahe, unterscheidet sich aber sofort durch die erweiterten Vordertarsen. Doch kommt dieses Merkmal wie bei Helopinen, Pedininen, etc. wahrscheinlich nur den Männchen zu. Ausser der nachstehenden Art gibt es noch einige andere, die, wie es scheint, sämtlich neu sind.

Platolenes rufipes sp. nov.

Dunkel grünblau, bei ganz schräg fallendem Licht purpurrot. Beine und Fühler leuchtend rot, Unterseite glänzend schwarz. Kopf vorn sehr flach gewölbt, sehr fein punktiert, Augenfurchen fehlen, Entfernung der Augen über doppelt so gross wie das 3. Fühlerglied lang. Clypealfurche fein, fast gerade. Fühler lang, die Mitte des Körpers erreichend, Glied 3 etwas länger als 4, die folgenden an Länge etwa gleich, cylindro-konisch, etwa $2\frac{1}{2}$ mal so lang wie an der Spitze breit. Das Mentum seitlich gerade, nach hinten verengt, die Seiten abgesetzt. Halsschild an der Basis ziemlich flach, die Seitenränder von oben ganz übersehbar, nicht heruntergedrückt, der Vorderrand ist etwa $\frac{8}{5}$ so lang wie die Basis, die Hinterecken stumpf, circa 100° gross, die Vorderecken ganz kurz verrundet rechtwinklig, die Seiten in kräftigem Bogen nach vorn verengt. Flügeldecken mit Reihen sehr weitläufiger, ziemlich feiner, in flachen undeutlichen Grübchen stehender Punkte, die Reihen hinten undeutlich, Zwischenräume wie der Halsschild punktiert; die Seitenrandkante ist auch vorn von der Kontur der Flügeldecken überdeckt. Prosternum hinter den Hüften schwach gesenkt, mit undeutlichen Furchen, senkrecht abfallend, Propleuren spiegelglatt. Abdomen fein längsstrigos, Analsegment am Ende gerade abgeschnitten und sanft niedergedrückt ungerandet. An den Vordertarsen ist das erste Glied das breiteste und längste, die folgenden nehmen an Grösse ab, das letzte ist schmal, so lang wie 1+2 zusammen. Die Mitteltarsen so lang wie ihre Schienen, die Längenverhältnisse ihrer Glieder wie bei den Vordertarsen. Hintertarsen länger als ihre Schienen, Glied 1 ist $1\frac{1}{2}$ mal so lang wie 2+3, das letzte viel kürzer als das erste.

Länge 8.60 mm., Breite 4.33 mm.

Ein Exemplar.

LUZON, Benguet, Bued Fluss (9882, *H. M. Curran*).

Dietysus luzonicus Fairm.

Drei Exemplare.

LUZON, Nueva Vizcaya, Bayombong (9900, *H. M. Curran*); PALAWAN, Iwahig (10898, *W. Schultze*).

Zwei Exemplare von Nord-Luzon, Cap Engaño (*Whitehead*), in meiner Sammlung.

Drei Exemplare im Berliner Museum: Ins. Philippinae (*Cuming*).

Dietysus amplicollis Fairm.

Auf diese Art deute ich sehr zweifelhaft eine Anzahl Tiere aus meiner Sammlung von Manila, aus dem Berliner Museum (*Amarygmus aereus* Eschsch. i. l.) ebenfalls von Manila, sowie aus der Sammlung des Bureau of Science von MINDORO, Magaran (10763); PALAWAN, Iwahig (10774, 10899, *W. Schultze*).

Pseudostrongylium semperi Kraatz.

Nach Kraatz von Luzon; mir unbekannt.

Pseudostrongylium opacum sp. nov.

Oberseite mattgrün bronzefarben, Thorax mehr grünlich, sein Vorder- und Hinterrand oft bläulich, Beine violett, Mitte der Schenkel und Schienen rötlich violett. Kopf zwischen den Augen mit flachem Grübchen, das meist die Form eines doppelten Längseindrucks hat, Augenfurchen sehr schmal, nach hinten um die Augen herumgehend, Clypealfurche scharf, einen regelmässigen Kreisbogen bildend, davor meist ein kleiner Quereindruck, der Clypeus seitlich scharfwinklig, vom stark entwickelten Canthus abgesetzt, nach vorn etwas trapezisch verbreitert, gerade abgestutzt. Der Abstand der Augen voneinander (alle 4 Exemplare sind ♀) reichlich so gross wie das erste Fühlerglied lang. Punktierung unregelmässig, hinten grob, zusammenfliessend, vorn fein und dicht. Fühler lang, fadenförmig, Glied 3 etwas länger als 4, die folgenden an Länge abnehmend, cylindrisch, die letzten nicht grösser, nicht flachgedrückt. Mentum sehr kurz, einfach gewölbt, in der vorderen Hälfte häutig. Halsschild $1\frac{1}{2}$ mal so breit wie lang, die Seiten sanft gerundet, der Vorderrand fast gerade abgestutzt, die Vorderrandlinie vollständig, in der Mitte nicht unterbrochen und kaum breiter, die Basis schmal wulstig gerandet, auch hier der Rand in der Mitte kaum breiter, die Mitte hinten mit scharfem Längseindruck, der nicht bis in die Mitte der Scheibe reicht, und einen scharfen, schmalen Längskiel hat. Oberfläche ziemlich grob und dicht, an den Seiten

runzlig punktiert. Scutellum mit deutlichen Punkten. Flügeldecken mit Linien scharf eingestochener Punkte, die an der Naht sehr fein sind, nach den Seiten hin gröber werden, die Punkte durch eine feine, nicht eingedrückte Linie verbunden. Zwischenräume vollkommen plan, ohne Skulptur. Schulterbeule kräftig entwickelt, Basis fein aufgeworfen. Prosternum zwischen den Hüften eingedrückt, wagerecht, ungerandet. Propleuren mit ziemlich groben, nicht sehr dichten Punkten und vereinzelten Längsrunzeln. Unterseite blank, Mittelbrust und Hinterbrust nebst ihren Anhängen deutlich punktiert, Abdomen auf den ersten Segmenten flach längsstrigos. An den Vordertarsen ist Glied 5 so lang wie die ersten 4 zusammen, an den hinteren ist das erste Glied wesentlich kürzer als das letzte.

Länge 15–16.5 mm.

Vier Exemplare (♀) von Nord-Luzon, Cap Engaño (*Whitehead*), in meiner Sammlung.

Die Art steht dem *P. semperi* durch die dichte und ziemlich grobe Punktur des Halsschildes am nächsten, unterscheidet sich aber durch ganz andere Färbung, die schmal abgesetzte Halsschildbasis, etc. und von allen Arten durch die ganz matte Oberseite.

Pseudostrongylium viride Kraatz.

Ein Exemplar von Luzon (*Jagor*) in der Sammlung des Berliner Museum, 2 weitere Tiere in meiner Sammlung von Ceram, Piroe, und von Sumatra.

Pseudostrongylium banksi sp. nov.

Stark glänzend, dunkel erzfarben, mit schwach grünlichem Schimmer, Beine, Ränder des Halsschildes, Basis der Flügeldecken mehr oder weniger kupfrig. Körper sehr schlank. Der Abstand der Augen ist beim ♂ wesentlich geringer als das erste Fühlerglied lang ist, beim ♀ dagegen etwa ebenso gross. Kopf sehr fein und wenig dicht punktiert, glatt, Augenfurchen sehr schmal aber deutlich, die Clypealfurche scharf kreisbogig, davor ein feiner Eindruck, das Stirngrübchen rundlich, tief, im übrigen ist der Kopf wie bei voriger Art. Halsschild seitlich fast parallel, nach vorn plötzlich, wenn auch nicht scharf abgeschnitten, verengt, die Seitenrandkante von der Seite gesehen im letzten Fünftel wagerecht, so dass die Hinterecken rechtwinklig sind, die Vorderrandlinie in der Mitte undeutlich, die Basis wulstig gerandet, die Randlinie in der Mitte aber nicht wesentlich weiter vom Rande entfernt, die basale Längslinie scharf eingedrückt,

mit deutlichem Kiel. Oberfläche bei 10-facher Vergrösserung noch ganz platt erscheinend. Flügeldecken mit kräftigen Schulterbeulen und etwas aufgeworfener Basis, die Punkte der Linien rund, an den Seiten kaum stärker, Zwischenräume schwach gewölbt, glatt, Naht hinten kupfrig. Prosternum wagerecht, zwischen den Hüften eingedrückt, Spitze nicht sehr scharf, querüber gewölbt, Propleuren glatt oder mit einigen angedeuteten Punkten. Seiten der Brust deutlich punktiert, Abdomen fein längsstrigos. Vorderschienen beim ♂ innen sehr schwach S-förmig gekrümmt, die Füsse wie bei *opacus*.

Länge 14 mm.

Zwei Exemplare (♂ und ♀) von Nord-Luzon, Cap Engaño (*Whitehead*), in meiner Sammlung. Der vorigen Art sehr nahe stehend, aber mit glattem Thorax und viel schmälerem Körper.

Pseudostrongylium aberrans Kraatz.

Diese charakteristische Art ist mir fremd geblieben. Nach Kraatz von Luzon.

Pseudostrongylium cyanipes sp. nov.

Kurz und gewölbt, auch in der Längsrichtung, etwas von der Gestalt des *S. vollenhoveni, gravidum*, etc. Vorderkörper leuchtend grüngoldig, Flügeldecken braun-metallisch, Unterseite dunkelgrün-metallisch, Beine stahlblau, die Mitte der Schenkel mehr rötlich. Kopf dicht und deutlich, aber fein punktiert, der Clypeus noch feiner, die Clypealfurche kreisbogig, scharf eingeschnitten, davor ein Quereindruck, zwischen den Augen eine runde, tiefe Grube, der Clypeus seitlich fast gerade, vorn gerade abgestutzt, Augenfurche kaum erkennbar. Halsschild $1\frac{1}{2}$ mal so breit wie lang, seitlich sehr schwach gebogen, dann plötzlich nach vorn bogig verengt, die Seitenrandkante, von der Seite gesehen, als schwacher, gleichmässiger Bogen nach unten gezogen, im letzten Teil nicht wagerecht abgesetzt. Oberfläche fein, aber deutlich punktiert, die Basis fein gewulstet, die Spitze vollständig gerandet, in der Mitte vorn geht ein kleines Kielchen ab in der Längsrichtung ähnlich dem an der Basis nur viel kleiner, die basale Längsfurche wie gewöhnlich mit scharfem Längskiel. Schildchen blaugrün, mit kräftigem Quereindruck. Flügeldecken kurz, die Basis durch die vorn stark vertieften Punktstreifen aufgeworfen, Schulterbeulen kräftig. Die Punktstreifen kräftig, ihre Punkte in den seitlichen Streifen etwas gröber, die Zwischenräume stark gewölbt, glatt. Prosternum zwischen den Hüften eingedrückt, wagerecht, der Fortsatz gewölbt, wenig spitz, Propleuren deutlich punktiert und schwach längsgerunzelt.

Seiten der Brust und ihre Anhänge deutlich punktiert, Abdomen fein längsstrigos. Vordertarsen kurz, an den Hintertarsen ist Glied 1=4.

Länge 12.5 mm.

Ein Exemplar.

CAMIGUIN INSEL (7813, *R. C. Mcgregor*).

Diese Art hat eine flüchtige Ähnlichkeit mit *P. banksi*, hat aber einen viel gedrungeneren, in der Längsrichtung stark gewölbten Körperbau, ganz andere Färbung, stark gewölbte Flügeldeckenzwischenräume und deutlich punktierten Halsschild. *P. aeneum* Kraatz steht ihr noch näher, ist aber anders gefärbt (z. B., Beine und Unterseite schwarz), der Halsschild ist viel stärker gewölbt, sein Vorderrand unvollständig gerandet, das Prosternum im Grunde fein gekielt, etc. *Lophocnemis amabilis* Maekl. ist mir unbekannt geblieben von den Philippinen.

Strongylium erythrocephalum F.

Diese Art ist im indischen Gebiet sehr weit verbreitet: China, Saigon, Rangoon, Calcutta, Birmah, Hongkong, Sumatra, Java, Siam. Ein Exemplar meiner Sammlung aus Manila, 2 weitere aus der Sammlung des Bureau of Science.

LUZON, Manila (3196, *G. M. Nell;* 3346, *Charles S. Banks*).

Strongylium foveolatum Maekl.

Von dieser Art liegt mir nur 1 von Maeklin selbst bestimmtes Tier aus dem Berliner Museum vor: Ins. Philippinae (*Cuming*).

Strongylium ambiguum Maekl.

Nach dem Autor von Java, in meiner Sammlung von Java und Palawan.

Strongylium foveostriatum sp. nov.

Eine ansehnliche, ziemlich robuste Art. Ganz braunbronzefarben, Oberseite nackt, Unterseite anliegend behaart. Kopf grob und dicht, etwas unregelmässig, aber feiner als der Halsschild punktiert, die Entfernung der Augen beim ♀ (mir liegen nur 2 Weibchen vor) so gross wie das erste Fühlerglied lang, zwischen den Augen ein etwas furchiger Längseindruck, vor ihnen die schmale, seitlich verwischte, gebogene Clypealfurche; der Clypeus seitlich stumpfwinklig eingezogen, vorn in sehr schwachem Bogen vorgezogen; er ist ziemlich dick. Fühler lang, sie reichen mit den letzten 4–5 Gliedern über den Hinterrand des Thorax hinaus, ihre Glieder cylindrisch oder schwach cylindro-konisch, das 5. fast 3 mal so lang wie breit, die vorletzten noch doppelt so breit wie lang, die ersten Glieder schwach

metallisch, die andern schwarz. Halsschild kaum um ¼ breiter als lang, mit vollständiger Pleuralkante. Mittere Längsfurche deutlich und ziemlich tief, jederseits hinter der Mitte eine rundliche Grube, ein weiterer Eindruck noch weiter nach aussen an der Basis; Punktierung grob, auf der Scheibe undicht und blanke Stellen frei lassend, an den Seiten gedrängt. Vorder- und Hinterrandlinie vollständig, in der Mitte etwas breiter, die basale Randung etwas aufgeworfen; die Seiten wenig stark gebogen, die Vorderwinkel breit verrundet, die Hinterecken ziemlich deutlich stumpfwinklig. Flügeldecken dicht hinter der Basis buckelig erhöht, aber nicht 2-höckrig, dahinter sanft und gleichmässig abfallend, Schulterbeule deutlich, Oberfläche mit Reihen sehr grober, länglicher an der Spitze kaum feinerer Gruben, auf der vorderen Hälfte sind sie mehr rundlich, an der Spitze sehr lang gestreckt, am Grunde jeder Grube befindet sich ein länglicher Einschnitt, die Teile der Punktstreifen. Prosternum zwischen den Hüften wenig vertieft, in der Vertiefung mit einer Längserhebung, der Fortsatz wagerecht, fast von der Höhe der Hüften, ziemlich zugespitzt, der Absturz sehr steil. Mesosternum tief ausgehöhlt, jederseits dick knotig aufgetrieben zur Aufnahme des Prosternalfortsatzes. Propleuren grob und dicht wie das Pronotum punktiert. Hinterbrust und Abdomen glatt, anliegend behaart, Analsegment am Ende gerade abgestutzt. Schenkel und Schienen dicht und mässig grob punktiert, Schienen gerade, an den Vordertarsen ist das Klauenglied grösser als die andern zusammen, an den Mittel- und Hintertarsen ist Glied 1=2+3, an den hinteren das Klauenglied etwa von der Länge des ersten Gliedes.

Länge 20 mm.

Zwei Exemplare (♀).

PALAWAN, Iwahig (10745, *W. Schultze*).

Diese auffallende Art ist an den vorn gebuckelten charakteristisch skulptierten Flügeldecken, an der Bildung des Halsschildes und dem hohen Prosternalfortsatz leicht kenntlich. Wahrscheinlich haben die Männchen an den Schienen und am Analsegment Geschlechtsmerkmale.

Strongylium gravidum Maekl.

Weit verbreitet, nach Maeklin von Borneo, Amboina, Ceram und den Philippinen. In meiner Sammlung u. a. von Nord-Luzon (*Whitehead*) und der Insel Samar, 150 meter (*Whitehead*).

Ein Exemplar im Bureau of Science.

TICAO (6538, *R. C. McGregor*).

Strongylium elegantissimum sp. nov.

Kurz und gedrungen, aber schlanker als *S. gravidum.* Kopf und Halsschild glänzend grün, an den Rändern bläulich, Flügeldecken stark glänzend goldig, an den Seiten mehr kupfrig und am Rande leuchtend violett, dieser Rand nach hinten hin etwas breiter, Unterseite in der Mitte violett, Beine blaugrün. Kopf mit sehr grossen Augen, die auf der Stirn fast zusammenstossen, zwischen den Augen hinten ein Grübchen, der Canthus kürzer als das Auge hinter ihm, der Clypeus nach vorn etwas trapezisch verbreitert, gerade abgestutzt Clypealfurche eingeschnitten, unmittelbar vor den Augen liegend, davor ein leichter Quereindruck, Punktierung dicht und mässig fein. Fühler schlank, die ersten Glieder sehr dünn, cylindrisch, das dritte $1\frac{1}{2}$ mal so lang als das vierte, das 6. schwach, die folgenden stärker konisch, die vorletzten Glieder nicht doppelt so lang wie breit. Halsschild etwa $1\frac{1}{3}$ mal so breit wie lang, nach vorn etwas mehr als nach hinten verengt, die Propleuren fast senkrecht, von oben gesehen treten die Hüftbeulen etwas über die Seitenrandkante hinaus, die Seitenrandkante ist deutlich, nicht sehr scharf aber vollständig, Vorderrand und Basis gerandet, die Randung in der Mitte breiter und sehr dick, die Mittellinie ist der Länge nach furchig eingedrückt, jederseits auf der Scheibe 2 nicht sehr deutliche Quereindrücke; Oberfläche nicht sehr dick aber kräftig, an den Seiten nicht gröber punktiert. Schildchen blau. Flügeldecken mit stark abgesetzten Schulterbeulen und je einer rundlichen, etwa 3 Interstitien einnehmenden Tuberkel hinter dem Schildchen, die noch deutlicher als bei *gravidum* ist, dahinter ein Quereindruck. Die Punktstreifen neben der Naht sehr fein, nach der Seite (vom 4. an) viel gröber, ihre Punkte ganz nach dem Rande hin sehr tief und etwas grübchenartig, nach der Spitze zu werden alle viel feiner, die Zwischenräume dort stark, vorn viel schwächer gewölbt, die seitlichen Streifen nach aussen wenig überhängend, die Interstitien glatt, die beiden Spitzen einzeln kurz verrundet. Prosternum zwischen den Hüften tief eingesenkt, der Fortsatz ziemlich flach, wagerecht, die Propleuren wie der Halsschild punktiert, die Beulen des Mesosternums ziemlich stark, Abdomen fein punktiert, die ersten Segmente fein längsstrigos, das Analsegment stark eingedrückt, der Eindruck fast die ganze Länge des Segmentes einnehmend, viel länger als breit, seine Seiten gekantet, das Ende schwach ausgeschnitten. Die Vorderschienen in der Endhälfte kräftig nach innen gekrümmt, die Hintertibien um die

Längsachse gedreht, innen abgeflacht; an den Hintertarsen ist Glied 1 sehr lang, nur etwas kürzer als die übrigen 3 zusammen.

Länge 17 mm.

Ein ♂ im Berliner Museum: Ins. Philippinae (*Semper*).

Diese herrliche Art aus der Gruppe *gravidum, binodosum,* etc. ist durch Farbe und Skulptur sehr ausgezeichnet.

Strongylium cupreolineatum sp. nov.

Ziemlich gedrungen, Flügeldecken nicht cylindrisch; sondern seitlich etwas nach aussen gebogen, in der Längsrichtung ziemlich gewölbt. Oberseite glänzend braunbronze, Propleuren und Hinterbrust weniger metallisch, die übrige Unterseite schwarzbraun, Fühler (bis auf die gelbbraun gefärbte Spitze des letzten Gliedes) und Beine schwarz, die abwechselnden Zwischenräume der Flügeldecken kupferfarben. Kopf mit grossen Augen, deren Entfernung so gross ist wie das 2. Fühlerglied lang, zwischen ihnen nach hinten ein seichter Eindruck, die Clypealfurche gebogen, scharf, unmittelbar vor den Augen, davor ein leichter Quereindruck, der Clypeus seitlich nach vorn erweitert, ziemlich flach. Punktierung fein und dicht, besonders vorn. Fühler mässig lang, die Glieder genau cylindrisch, Glied 3 etwas grösser als 4, die folgenden mit diesem an Länge gleich. Halsschild kaum $1\frac{1}{2}$ mal so breite wie lang, auf der Basis viel flacher als vorn, mit vollständiger Seitenrandkante, diese ist jedoch heruntergezogen, so dass sie von oben nicht zu sehen ist, die Seiten vor den (scheinbaren!) Hinterecken deutlich ausgebuchtet: oberhalb der eigentlichen, durch die Randkanten gebildeten Hinterwinkel befindet sich eine kurze, scharfe Falte, die von oben allein zu sehen ist und so die Ecken vertäuscht, der Raum zwischen Falte und Hinterwinkel mit Eindruck, der ein scharfes Längsfältchen trägt. Der Vorderrand in der Mitte mit undeutlichem nicht verbreitertem Rande, die Basalrandung stark, wulstig, aber nicht besonders breit, Oberfläche mit angedeuteter, glatter Mittellinie, Punktierung mässig stark, gleichmässig, nicht sehr dicht. Flügeldecken mit sehr schwachem Quereindruck hinter dem Schildchen, die Punktstreifen fein, ihre Punkte gedrängt, an den Seiten kaum grösser, die Zwischenräume plan, nur an der Spitze schwach konvex, der 2., 4. und 6. sind rotkupfrig, alle glatt, unpunktiert. Prosternum zwischen den Hüften stark furchig eingedrückt, der Fortsatz hinter den Hüften ganz niedergedrückt, Propleuren seitlich punktiert und etwas gerunzelt. Mesosternum stark längsvertieft, mit mässig starken Schwielen. Abdomen äusserst fein punktiert und

sehr schwach längsrunzlig. An den Hinterfüssen ist das erste Glied etwas länger als das Klauenglied.

Länge 10.5 mm.

Ein Exemplar.

MINDORO, Baco Fluss (3160, *R. C. McGregor*).

Diese kleine Art ist durch die Färbung der Flügeldecken besonders aber durch die sonderbare Bildung der Hinterecken des Halsschildes sehr gut gekennzeichnet.

Strongylium insolitum sp. nov.

Eine kleine ziemlich unansehnliche mässig schlanke, oben etwas flachgedrückte Art. Kopf blau, Halsschild bis auf den Hinterrand kupfrig, Flügeldecken kupfrig, die Naht, ein mittlerer Längsstreif und der Seitenrand blaugrün. Kopf fein punktiert, zwischen den Augen mit einem angedeuteten Grübchen. Augen sehr stark vorquellend, auf der Stirn fast zusammenstossend, Clypeus flach, seitlich nicht nach vorn erweitert, die Furche kreisbogig tief eingeschnitten, der Canthus kaum halb so breit als das Auge hinter ihm, Fühler schlank, die ersten 5 Glieder schwarzbraun, die andern schwarz. Glied 3 ist $1\frac{1}{3}$ mal so lang als 4, dieses $1\frac{1}{3}$ mal so lang als 5, die folgenden gleich, cylindrisch, nicht ganz doppelt so lang wie breit. Halsschild $1\frac{1}{2}$ mal so breit wie lang, flach, namentlich an der Basis, seitlich vollständig gerandet, die Randkante bildet in der Mitte einen deutlichen Winkel, von oben gesehen tritt die Partie dahinter geradlinig sich verengend etwas zurück; der Vorderrand in der Mitte ziemlich fein, aber tief gerandet, die Partie in der Mitte und die Basis schmal wulstig aufgeworfen. Eine Längsfurche fehlt, jederseits an der Basis ein undeutliches Grübchen, Oberfläche mässig dicht und ziemlich grob, etwas unregelmässig weit punktiert. Punkte sich nirgend berührend. Flügeldecken mit sehr seichtem Eindruck hinter dem Scutellum, Schulterbeulen kräftig entwickelt, die Farben nicht sehr scharf ausgesprochen, der mittlere grüne Längsstreif nimmt etwa 2 Streifen ein. Oberfläche mit Punktstreifen, deren Punkte dicht, etwa so fein wie die des Halsschildes, an der Spitze kaum feiner, nach den Seiten etwas gröber werdend, die Zwischenräume auf der Scheibe und an der Spitze weniger, seitlich sehr stark gewölbt, glatt. Prosternum zwischen den Hüften eingedrückt, nach hinten schräg abfallend, nicht angedrückt, das Ende wenig vortretend, die Mittelbrust deutlich und ziemlich kräftig eingedrückt, Abdomen auf den ersten Segmenten sehr fein längsstrigos, Analsegment nicht ausgezeichnet, die ganze Unterseite und die Beine blau. Vorder-

tarsen sehr kurz, 4-gliedrig, sie sind kaum $\frac{2}{3}$ mal so lang wie die Schienen, Mitteltarsen sehr lang 5-gliedrig, fast von der Länge der Schienen, an den Hintertarsen ist Glied 1 wesentlich länger als 2+3 und etwas länger als das Klauenglied. Die Schienen gerade, ohne Auszeichnung.

Länge 9.66 mm.

Ein Exemplar.

Negros Occidental, Bago (1688, *Charles S. Banks*).

Diese kleine Art ist durch die Färbung und den flachen Halsschild ausgezeichnet, besonders auffallend aber sind die nur 4-gliedrigen Vordertarsen. Dieses Merkmal weicht von dem Heteromerentyp ab. Es gibt nur ganz vereinzelte Ausnahmen bei den Tenebrioniden, z. B., *Sepidiosternus pradieri* ♂, *Mophon tinctipennis* ♂. Aber möglicherweise ist dieses Merkmal nur ein sexuelles und findet sich nur bei dem ♂ dieser Art, die ♀ ♀ sind unbekannt, und ausserdem ist vorliegende Art in allen andern Eigenschaften ein echtes *Strongylium*. Diese Gattung mit einem ungeheuren Artenreichtum (die Gattung, wie sie jetzt aufgefasst wird, dürfte mindestens 1000 Arten umfassen, von denen allerdings erst circa 430 beschrieben sind) muss doch bald in eine ganze Anzahl Genera gespalten werden, und es erscheint mir vorläufig noch nicht geboten, für die vorliegende Art eine neue Gattung zu errichten.

Strongylium mindorense sp. nov.

Etwas grünlich erzfarben, besonders an den Seiten, in den Streifen, sonst mehr rein metallisch, die Beine blaugrün. Fühler und Tarsen schwarzblau, das letzte Glied der Antennen an der Spitze bräunlich, Unterseite metallisch grün. Epipleuren blau. Kopf mit grossen Augen (♂), die stark genähert sind, ihr Abstand nicht ganz so gross wie das 2. Fühlerglied lang, ein Frontaleindruck fehlt, ebenso Augenfurchen, die Clypealfurche wie gewöhnlich unmittelbar vor dem Canthus, scharf eingeschnitten, der kleine Quereindruck fehlt. Der Clypeus seitlich fast gerade, er ist fein und einzeln, der Hinterkopf gröber und gedrängt punktiert. Fühler schlank, Glied 3=4; dieses $1\frac{1}{2}$ mal so lang als 5, die folgenden allmählich etwas kürzer werdend, deutlich konisch, die vorletzten nicht ganz doppelt so lang wie an der Spitze breit. Halsschild $1\frac{1}{2}$ mal so breit wie lang, kräftig, nur wenig schmäler als die Flügeldecken, seitlich vollständig gerandet, mit starker Mittelfurche, einem schwachen Grübchen jederseits eben hinter der Mitte und einem deutlicheren Eindruck nahe den Hinterecken an der Basis, diese und der Vorderrand

scharf, in der Mitte etwas breiter gerandet, Oberfläche dicht und grob, stellenweise gedrängt punktiert, die Hinterecken rechtwinklig, die vorderen breit verrundet. Flügeldecken an der Basis neben dem Schildchen aufgeworfen, mit 4, nicht sehr starken Quereindrücken an der Naht, Oberfläche mit Punktstreifen, die Punkte länglich, auf der Scheibe viel feiner als seitlich, alle scharf eingestochen, die Zwischenräume an der Spitze stark gewölbt, vorn mehr plan, sehr fein und ziemlich dicht punktiert, etwas mattglänzend, die Spitzen kurz, einzeln abgerundet. Die Beine einfach, ohne Geschlechtsmerkmale, an den Hintertarsen ist Glied 4=2+3, Glied 1 viel länger als 4, Prosternum zwischen den Hüften eingedrückt, dahinter ganz niedergebogen, am Ende flach, verrundet, Mittelbrust kräftig ausgehöhlt, das Analsegment des Männchens am Ende breit ausgeschnitten, auf der Platte breit, nicht sehr tief ausgehöhlt, der Eindruck seitlich nicht kantig begrenzt, aber die Spitzen gut markiert. Der Forceps stark gekniet, sehr lang und dünn, mit einfacher Spitze.

Länge 15.5 mm.

Ein Exemplar.

MINDORO, Baco Fluss (3159, *R. C. McGregor*).

Diese Art gehört in die Gruppe *gratum* Maekl., *sobrinum* Dohrn, etc. Sie wird besonders charakterisiert durch die für die Gruppe sehr plumpe Gestalt, breiten Halsschild, die Färbung und die länglichen, scharf eingeschnittenen Punkte der Streifen.

Übersicht über die philippinische Arten von Strongylium.

1. Vordertarsen (wenigstens beim ♂) 4-gliedrig, kleine Art, Halsschild hinten flach, Flügeldecken mehrfarbig längsgestreift.. **insolitum sp. nov.**
   Vordertarsen normal ..... 2.
2. Sehr gedrungene Arten, jede Flügeldecke hinter der Basis mit einer runden Beule, Vorderschienen der ♂ winklig gekrümmt ..... 3.
   Gestreckte Arten, Flügeldecken ohne runde Beulen, Vorderschienen nicht gekrümmt ..... 4.
3. Oberseite 2-farbig, Flügeldecken golden (seitlich violett), Vorderkörper blaugrün. Grössere Art, 17 mm ..... **elegantissinum sp. nov.**
   Oberseite einfarbig blau, oder kupfrig, etc. Kleinere Art, **circa 10–12** mm. lang ..... **gravidum Maekl.**
4. Basis des Halsschildes innerhalb der Ecken gekielt und daneben nach aussen gefaltet, Flügeldecken mit alternierenden kupferfarbenen Interstitien ..... **cupreolineatum sp. nov.**
   Hinterecken des Halsschildes einfach, Flügeldecken einfarbig blau oder metallisch ..... 5.
5. Halsschild grob und dicht punktiert ..... 6.
   Halsschild sehr fein und weitläufig punktiert, Körper blau, Beine rot. **erythrocephalum F.**

6. Flügeldecken mit 4 Quereindrücken an der Naht..... **mindorense sp. nov.**
   Flügeldecken ohne Eindrücke..... 7.
7. Flügeldecken hinter der Basis buckelig erhaben, mit grossen Gruben bis zur Spitze, Halsschild gefurcht. Grosse Art von circa 20 mm.
   foveostriatum sp. nov.
   Flügeldecken nicht gebuckelt, die Streifen hinten sehr fein punktiert, Halsschild ungefurcht. Kleinere Arten..... 8.
8. Bronzefarben, die vorletzten Glieder der Fühler breiter als lang.
   ambiguum Maekl.
   Bläulich, die vorletzten Glieder doppelt so lang wie breit.
   faveolatum Maekl.

INDEX

Neue Namen sind fett gedruckt. Numern in Cursivschrift beziehen sich auf Synonyme oder auf Referate von minderer Wert.

NOTES ON PHILIPPINE ALCYONARIA

PART I: THE PHILIPPINE SPECIES OF THE GENUS CAPNELLA

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Three plates

Capnella capitulifera (Wright and Studer).

Paranephthya capitulifera WRIGHT and STUDER, Rep. Sci. Res. Challenger, Zool (1889), **31**, 227, Plate 36A, figs. 1a and 1b, Plate 42, fig. 8; STUDER, Alcyonarien aus der Sammlung des Naturhist. Mus. in Lübeck (1894), 127.

Paraspongodes capitulifera MAY, Jena. Zeit. Naturw. (1899), **33**, 154, 155.

Capnella capitulifera KÜKENTHAL, Zool. Jahrb. Syst. (1904), **19**, 128, 129.

The tree-like colony has a thick rigid stem, decreasing in size distally, from which the irregularly placed branches are given off, themselves broken up into short twigs. The polyps are placed at the ends of the twigs in more or less clearly defined, rounded lobes, 4 mm. in diameter. The polyps are arranged very closely on the lobes, and as they are bent inward they overlap one another like tiles. Their length reaches 2 mm. and their greatest breadth 1 mm. The short tentacles are folded in over the mouth opening. The polyp armature consists of a thick coat of small, toothed, foliaceous clubs. On the upper surface of the outer ends of these spicules are broad, toothed plates which are supported by strong ribs. The inner end of the spicule consists of wart-like projections. The average length of these spicules is about 0.1 mm. and their breadth 0.068 mm. The stem cortex contains spicules similar to those of the polyp and compact 4-rayed stars, 0.19 mm. in diameter, set with numerous thorns. The walls of the extremely numerous and narrow canals contain many foliaceous clubs, 0.17 mm. in length, which are usually extended at one end to form a long pointed thorn.

Color of the stem, brown; of the polyps, lighter brown.

Locality: Sulu Sea and Zamboanga.

This description is based on Kükenthal's description in his revision of the Nephthyidae as I have no example.

The species was named by Wright and Studer (1889) from a specimen in the Challenger collection from Zamboanga. Studer has also reported it from the Sulu Sea (1894). It is not represented in the alcyonarian collection of the zoölogical museum of the University of the Philippines, which is not surprising as there are no specimens in the collection from Mindanao or the southern part of the Sulu Sea.

Capnella philippinensis sp. nov. Plate I, figs. 1 and 2; Plate II, fig. 4; Plate III, figs. 1a, 1b, 1c, 1d, 1e, 1f, 1g, and 1h.

The compact colony has a short, thick, rigid stem which expands distally and gives off the polyp-bearing lobes directly or the branches which bear them. The branches are short, and divide almost immediately into the conical, distally directed lobes which are from 6 to 11 mm. long and from 4 to 8 mm. thick at the base. The polyps are turned inward and closely packed on the lobes, and are from 1.8 to 2.2 mm. in length and from 0.8 to 1.5 mm. in breadth. The tentacles, while they can be folded in over the mouth, often protrude in preserved specimens, and are short and blunt with about 12 pairs of short, blunt, closely packed pinnules. In life, however, the tentacles are long, slender, and pointed, giving a lacy appearance to the expanded colony. The ectoderm of the tentacles is filled, especially in the pinnules, with large unicellular algæ, probably zoöchlorellæ, which give to the tentacles their characteristic greenish or brown color.

The polyp armature consists of a coat, one spicule deep, of capstan-like spicules graduating into foliaceous clubs at the distal end of the polyp. The capstans average 0.1 mm. in length and 0.075 mm. in greatest breadth. The outer end, which is the larger and broader, is usually more or less spherical in general outline, consisting of a central column from which are given off toothed foliaceous expansions, usually in 4 planes. Between this and the basal portion, which consists of 3 or 4 knobbed or bluntly spined root-like processes, is a slender, smooth, cylindrical zone. Viewed from above these spicules appear to be 4-rayed stars, the rays often appearing bifurcated due to the bifurcation of the outer end of the main foliaceous expansion in each plane. Toward the distal end of the polyp the basal portion of these spicules becomes one-sided, one of the root-like processes developing laterally as a long thick spiny

thorn making an obtuse angle with the upper portion of the spicule. The spicule coat runs out into 8 points corresponding to the tentacles. In these projecting points and in that portion of the polyp immediately proximal to them, the spicules undergo a still further modification to form typical foliaceous clubs. These spicules make a characteristic figure in the tentacle points with their flattened, ribbed, and spined foliaceous portions turned outward and projecting slightly, and their thorns pointing inward and downward. The spicules of the stem cortex are capstan-like forms similar to those of the lower portion of the polyp. They form a single closely packed layer with their longer foliated ends outward. The inner stem cortex contains very few spicules, those which are present being 4-rayed forms somewhat similar to those of the canal walls, but smoother and smaller, and found usually at the points of junction of the inner stem cortex and the walls of the outermost canals. The spicules of the canal walls are thick spindles covered with large low warts, which bear on their outer surface irregularly spined tubercles. They are sometimes constricted in the middle and graduate into cross-shaped and 4-rayed forms with X-shaped markings on their broader surfaces. The latter are often the more numerous spicules of the canal walls. Scattered among the other spicules of the canal walls are a few small, smooth, 4-rayed stars and irregular spiny forms. The large spindles are of about the same diameter as the canal walls, averaging 0.23 mm. in length and 0.15 mm. in diameter; the cross-shaped forms average 0.2 mm. in length and 0.15 mm. in breadth, and the 4-rayed forms average 0.19 mm. in greatest diameter. The spicules of the base are similar to those of the canal walls but are more irregular and have larger tubercles on the warts, the tubercles bearing more and finer spines. There also are usually present in the base a few very large thick spindles averaging 0.3 mm. in length and 0.2 mm. in diameter.

The following types of spicules have been noted, and the measurements [1] are those of typical examples and were chosen from a large number of measurements made on spicules from the different colonies belonging to this species.

(*a*) Polyp spicules:

(1) Capstan-like spicules: 0.118 by 0.087; 0.1 by 0.087; 0.097 by 0.06; 0.083 by 0.064; 0.076 by 0.064; 0.076 by 0.09.

(2) Foliaceous clubs: 0.17 by 0.07; 0.16 by 0.068; 0.144 by 0.044; 0.133 by 0.057; 0.129 by 0.07.

[1] All spicule measurements are in millimeters.

(*b*) Spicules of the stem cortex:
  (1) Capstans: 0.11 by 0.08; 0.1 by 0.09; 0.098 by 0.076; 0.08 by 0.07.
  (2) 4-rayed spicules: 0.21 by 0.19; 0.196 by 0.167; 0.16 by 0.133; 0.12 by 0.114.

(*c*) Canal-wall spicules:
  (1) Spindles: 0.285 by 0.19; 0.228 by 0.133; 0.21 by 0.12; 0.19 by 0.125.
  (2) Large cross-shaped forms: 0.266 by 0.16; 0.021 by 0.098; 0.19 by 0.16; 0.178 by 0.152; 0.152 by 0.1.
  (3) 4-rayed forms: 0.22 by 0.17; 0.2 by 0.186; 0.18 by 0.133; 0.16 by 0.144.
  (4) Small, smooth, 4-rayed forms: 0.144 by 0.133; 0.133 by 0.08; 0.11 by 0.08; 0.1 by 0.076; 0.098 by 0.076.
  (5) Irregular and double-headed spicules (very few): 0.19 by 0.11; 0.174 by 0.129; 0.16 by 0.155.

(*d*) Base spicules:
  (1) Spindles: 0.31 by 0.2; 0.266 by 0.17; 0.24 by 0.14; 0.228 by 0.155; 0.21 by 0.152.
  (2) Cross-shaped forms: 0.235 by 0.148; 0.228 by 0.19; 0.21 by 0.21; 0.21 by 0.159.
  (3) Large 4-rayed forms: 0.254 by 0.216; 0.21 by 0.17; 0.19 by 0.14; 0.178 by 0.148; 0.152 by 0.12.
  (4) Small, smooth, 4-rayed stars: 0.09 by 0.07; 0.08 by 0.08; 0.08 by 0.064; 0.064 by 0.03.

The canals are numerous and fairly large, their diameter being several times the thickness of the canal walls and their walls contain numerous spicules. In the center of the stem of some colonies there has been observed a thickening of the canal walls at the expense of the canal spaces and a decrease in the number of canals resulting in the formation of a thickened region approaching the irregular axis found in *C. ramosa* sp. nov. (see p. 450).

The color of the colony in specimens preserved in formalin is characteristically a light green shading into gray or brown. In life the colonies are greenish brown.

Localities: Bantayan Islands; Port Galera Bay, Mindoro; Silanga Channel, Taytay Bay, and the Pabellones Islands, Palawan.

Type specimen, No. C. 2300 in the zoölogical museum of the University of the Philippines.

The alcyonarian collection of the zoölogical museum of the University is very rich in colonies of this species of *Capnella*. There are 50 specimens in all, including specimens from each of the regions of the Philippines where systematic collections have been made; that is, from the northern end of Mindoro (Port Galera Bay and Sabong Cove), from the Bantayan Islands (Doong Island), and from the northeastern coast of Palawan (Taytay,

Silanga Channel between Taytay and Shark's Fin Bays, and the Pabellones Islands). Because of its wide distribution in the Islands and because it is so characteristic of the alcyonarian fauna of the reefs of the Archipelago, I have given it the specific name *philippinensis.*

It is found growing on coral clumps and débris and on sand and small stones on the reefs not ordinarily in such abundance as certain species of the genus *Nephthya,* but forming a characteristic part of the reef fauna, at a depth of from 1 to 3 meters. On the reefs in the Silanga Channel it is the predominant Nephthyid form. These reefs, which are very shallow and composed of but few species of coral of such genera as *Euphyllia, Goniopora,* and *Astraeopora,* seemed to be gradually dying, and on the dead coral bases great numbers of colonies of this species were found growing. It seemed to take the place of the reef *Nephthya* which, so common on growing reefs, was practically absent here. When expanded it has the appearance of some of the species of *Nephthya,* but the larger polyps and, the longer, more slender, and more pointed tentacles give it a more open and delicate appearance than that of the ordinary reef *Nephthya.* On being disturbed a remarkable contraction of the entire colony takes place, the colony contracting to one-third or one-fourth its size when expanded. One who has seen only the contracted, preserved specimens with their hard rigid appearance can have but little idea of how delicate and graceful the expanded colony is. Length, breadth, and the relative proportions of the parts of the colony are very uncertain quantities in this species as they differ greatly with the degree of contraction.

There is so much variation in the form of the colony, the branching, and the position and arrangement of the polyps that I have found it necessary to distinguish three varieties of this species. Typical specimens of these varieties are quite distinct in general appearance and in certain characters; but the fact that they are very similar in their spiculation, which seems to be the most basic diagnostic character in this genus and the fact that there are some specimens which seem to be connecting links with the typical forms make it inadvisable to consider them of specific rank. On the other hand, it would be very inconvenient and confusing to place them all in a single undivided species. This division into varieties is tentative, as I expect in the near future to undertake a study of the anatomy of the species and varieties described in this paper with a view to finding some additional diagnostic characters which

will make it possible to determine with greater security their exact systematic position, and which will be of aid in the diagnosis of the other new species of this genus, which I have no doubt further and more widespread collecting will discover in the Philippines and in other localities.

The 50 specimens might be superficially divided into two groups on the basis of the consistency of the colony, the first group containing those colonies which have a stiff rigid consistency and in which the canal walls are thick and the spicules of the canal walls and stem cortex closely approximated; the second containing those specimens in which the colony is soft and flabby and the spicules of the thin canal walls and of the stem cortex are not closely approximated. This would, however, be simply separating those colonies which were killed contracted from those killed expanded, as all the soft flabby specimens are colonies which I allowed to expand in an aquarium and anæsthetized with magnesium sulphate before killing.

Much more real criteria on which to base a division are the length and diameter of the stem and its proportion to the polyp-bearing portion, the method of branching, and the position and arrangement of the polyps. Using these characters the specimens fall into 4 distinct groups as follows:

(1) *Capnella philippinensis* forma typica.
Those colonies in which the barren stem portion is short and thick, expanding distally to give off the short thick branches and polyp-bearing lobes.

(2) *Capnella philippinensis* var. *mindorensis* var. nov.
Those colonies in which the stem portion is long and slender, and the polyp-bearing portion is small and composed of short thick branches and polyp-bearing lobes.

(3) *Capnella philippinensis* var. *arborea* var nov.
Those specimens in which the colony has a distinctly tree-like form with branches several times divided, in which the lobes are the terminal twigs or their lateral branches and in which the polyps are not scattered on the main stem and branches.

(4) *Capnella philippinensis* var. *albida* var. nov.
Those specimens in which the colony is tree-like in form but in which the polyps are scattered on the surface of the main stem and branches and on the slender terminal twigs which are not lobe-like in form.

Capnella philippinensis var. mindorensis var. nov. Plate I, figs. 3 and 4.

The stem is long and slender, in contracted specimens hard and rigid, in expanded specimens soft and flabby, and divides distally to form a polypary of a few short, thick, irregularly placed

branches which in turn bear the short, thick, conical, polyp-bearing lobes. The polyps, usually somewhat smaller than in the colonies of *C. philippinensis* forma typica, are crowded on the lobes. The spiculation is the same as that of the other varieties of the species. The canal walls are very thin, and there is no hint of a central axis.

The color in formalin is greenish gray in contracted specimens and light yellow with a brownish tinge in expanded specimens.

Locality: Sabong Cove and Port Galera Bay, Mindoro.

Type specimen No. C. 317 in the zoölogical museum of the University of the Philippines.

There are 3 specimens from Sabong Cove collected by Griffin, and 11 expanded colonies which I collected at Port Galera, Mindoro. The great difference in appearance and consistency between colonies allowed to expand in an aquarium and anæsthetized by slowly adding magnesium sulphate to the water and colonies thrown directly into the preserving fluid whether it be alcohol or formalin is worthy of notice. The worker in such contractile forms as the Alcyonacea must use characters of general form and consistency with great caution, and it would seem that only rarely, if at all, are they of sufficient diagnostic value, when taken alone, to warrant the naming of new species. These specimens were, like all the others in the collection, found growing on the shallow coral reefs in water from 0.5 to 2 meters deep at low tide.

The 3 from Sabong Cove measure, respectively, 47 mm., 53 mm., and 57 mm. in height; 20 mm., 25 mm., and 12 mm. in breadth of polpary; and 11 mm., 12 mm., and 8 mm. in diameter of stem. Two of these colonies have a common, irregular, encrusting base. The 11 from Port Galera were killed expanded, and so have a different general appearance. The largest of these colonies measures 75 mm. in height, 25 mm. in breadth of polypary, and 20 mm. in diameter of stem. The smallest measures 30 mm. by 10 mm. by 8 mm., the others varying between these limits. Owing to the relaxation of these colonies, they have a swollen, fleshy appearance. The lines which mark the insertion of the canal walls can be seen as fine longitudinal striations. The canal walls are very thin and delicate, the spicules being much thicker than the walls in which they cause distinct swellings.

Capnella philippinesis var. arborea var. nov. Plate I, fig. 7.

The large colony is distinctly tree-like, the moderately thick stem giving off along its distal portion irregularly placed, stout

branches. These in turn bear numerous secondary branches which again divide to form other branches or the terminal twigs which bear the small conical lobes densely packed with rather small, club-shaped polyps, averaging 1.3 mm. in length by 0.8 mm. in diameter. There are no scattered polyps on the stem or branches. The spiculation agrees with that of *C. philippinensis* forma typica, except that there are an unusually large number of the small, smooth, 4-rayed stars present both in the canal walls and in the base. The following measurements in millimeters were taken:

(*a*) Small, 4-rayed stars of the canal walls: 0.133 by 0.08; 0.11 by 0.08; 0.1 by 0.076; 0.098 by 0.076.

(*b*) Small, smooth, 4-rayed stars of the base: 0.11 by 0.08; 0.083 by 0.08; 0.083 by 0.064; 0.08 by 0.083.

The canal walls are thick. A large irregular axis is present in the stem.

Color, grayish green in formalin.

Locality: Sabong Cove, near Port Galera, Mindoro.

Type specimen No. C. 282 in the zoölogical museum of the University of the Philippines.

There is a single colony collected by Griffin at Sabong Cove,[2] on the shallow reef, which is wonderfully rich in Alcyonaria. This is the largest specimen of the species, and measures 80 mm. in height and 50 mm. in breadth. The stem is somewhat bilaterally compressed, measuring 20 mm. by 15 mm. in diameter. At a point 35 mm. above the base the first branch is given off on one side, the other side of the stem being barren to a height of 50 mm. The stem gives off in all 8 branches including the 2 terminal ones. The first branch, which is characteristic, breaks up at a point 1 cm. from its origin into 3 secondary branches. These in turn divide into 5, 3, and 3 branches, respectively, which in turn divide into terminal twigs bearing one or more lateral lobes about 3 mm. long and 2 mm. thick and a terminal lobe about 7 mm. long and from 4 to 5 mm. thick at the base, or form only a single terminal lobe. The club-shaped polyps—slender at the base and enlarged at the tentacles zone, about 50 to a terminal lobe and 20 to a lateral lobe—are closely packed, covering the entire surface of the lobes. The tentacles and tentacle points are folded over the outer edge of the oral surface making a regular 8-pointed figure, the central area being uncovered.

[2] Sabong Cove is the second small cove to the left of the eastern channel of Port Galera Bay, Mindoro.

A study of the anatomy of this colony may show it to be specifically distinct, but it would be premature in the present state of our knowledge of the anatomy of the genus and on the present basis of specific diagnosis to so consider it.

Capnella philippinensis var. albida var. nov. Plate I, figs. 5 and 6.

The colony is tree-like, and the secondary and tertiary branches and twigs are slender. The rather long, narrow, distinctly club-shaped polyps average in contracted specimens 2.1 mm. in length, 1 mm. in diameter at the tentacle zone, and 0.35 mm. in diameter at the base, and are scattered irregularly over the surface of the main, secondary, and tertiary branches and the slender terminal twigs. They are more numerous on the twigs, but here they are much more scattered than in the typical form of the species. The canals are narrow in both expanded and contracted specimens with thick canal walls. They are practically absent in the center of the stem, the thickened canal walls forming a large irregular central axis containing many large spicules. The spiculation is in general similar to that of *C. philipinensis* forma typica, but the polyp capstans are consistently smaller, and the spindles of the canal walls and base are the predominating forms and larger than in the forma typica.

The following measurements in millimeters have been noted:

(*a*) Polyp capstans: 0.95 by 0.08; 0.087 by 0.08; 0.064 by 0.047; 0.06 by 0.45.

(*b*) Base spindles: 0.357 by 0.228; 0.3 by 0.19; 0.247 by 0.15; 0.247 by 0.136.

Color in formalin, whitish to light yellow.

Locality: Port Galera Bay, Mindoro.

Type specimen No. C. 260 in the zoölogical museum of the University of the Philippines.

This well-defined variety may very well prove to be specifically distinct. I have 4 specimens collected on the reefs in the inclosed bay at Port Galera, Mindoro. All of them were growing on small rocks and coral fragments in from 0.5 to 2 meters of water. Two of them were anæsthetized and killed expanded, and are soft and flabbly with the polyps opened and tubular in shape, the narrowing at the base which is probably due to contraction being absent in most of the polyps of these two colonies. Two of the colonies are imperfect, lacking the base, but are of about the same proportions as the other two. The two complete colonies (one of which is expanded) measure, respectively, 50 mm. and 45 mm. in height and 37.5 mm. and 30 mm. in breadth.

Capnella philippinensis is most closely related to *Capnella capitulifera* (Wr. and St.) and *C. imbricata* (Q. and G.). It seems to be especially close to *C. capitulifera,* a description of which, since it is a Philippine species, is given at the beginning of the paper. Of the 50 colonies that I have examined, only 3, belonging to the varieties *arborea* and *albida,* approach the tree-like form of *C. capitulifera,* and only 1, variety *arborea,* agrees with it closely. The principal distinction between the two species, however, is the difference in the form of the spicules of the canal walls. In the original description, Wright and Studer (1889) do not state that the canal walls contain foliaceous clubs, but they make the statement that the spicules of the species are foliaceous clubs and in their spicule drawings show spicules of no other type except some spicules resembling the capstan-like forms found in the polyp armature and stem cortex of *C. philippinensis.* Kükenthal (1903), in his revision of the genus, following Studer's description (1894), says: "Die äusserst zahlreichen und engen Canäle enthalten in ihren Wänden zahlreiche Blatt-keulen von 0.17 mm. Länge, die an einem Ende meist in einem langen spitzen Dorn zulaufen." *Capnella philippinensis* has no foliaceous clubs in the canal walls, and indeed this type of spicule is found only in the distal portion of the polyp and in the tentacle points, the spicules of the canal walls being cross-shaped, 4-rayed, and spindle-shaped forms. The spicules of the polyp and stem cortex are also somewhat different in that the central portion of the foliated distal end of these spicules is cylindrical rather than flattened as in *C. capitulifera.* Kükenthal also says in his diagnosis: "In der Stammrinde liegen compacte vierstrahlige Sterne * * *." Although he mentions no other spicules of the stem cortex, it is probable that he here refers to the spicules of the inner stem cortex, for Wright and Studer (1889) say in their original description: "The spicules are small, closely placed, foliaceous and spiny clubs. The broader portion of the spicule, which, in the polyp, projects above the surface * * *," evidently including in this statement the spicules of the outer stem cortex as well as those of the polyp. This is made more certain by the fact that in *C. philippinensis,* a closely related form, we find capstan-like spicules in the outer stem cortex somewhat similar to the foliaceous clubs described and figured by Wright and Studer for *C. capitulifera* and 4-rayed forms in the inner stem cortex similar to those spoken of by Studer and Kükenthal as occurring in the stem cortex of *C. capitulifera.* Furthermore, it is generally characteristic of

the species of this genus that the spicules of the polyps are similar, in general form at least, to those of the stem cortex.

Capnella philippinensis differs from *C. imbricata* in the structure of the spicules of the stem cortex and polyp, *C. philippinensis* having capstan-like spicules and *C. imbricata* foliaceous clubs with the distal end flattened in one plane and ribbed. It differs also in the size of the spicules of the stem cortex and their proportion to the size of the spicules of the canal walls, those of the inner stem cortex of *C. philippinensis* being about 0.18 mm. in diameter, if anything smaller than those of the canal walls, while in *C. imbricata* they are 0.34 mm. in diameter; that is, twice the length of those of the canal walls.

Capnella philippinensis forma typica resembles *C. fungiformis* Kükenthal in the massive form of its colony, but differs decidedly in spiculation.

Of the 31 specimens belonging to *C. philippinensis* forma typica, one was collected at Sabong Cove by Griffin. It measures 30 mm. in height, 30 mm. across the polypary, and has a stem 15 mm. in length and the same in diameter. The polyps are moderately large, reaching a length of 25 mm. and a breadth of 1.5 mm.

One colony was collected at Doong Island, Bantayan Islands, by Griffin and Wharton. The colony is very symmetrical, 45 mm. high, 45 mm. broad, with a stem 20 mm. in diameter (Plate I, fig. 2). In this specimen the lobes are longer and more slender than in the more typical colonies and the spicules are somewhat smaller throughout, but as there is only a single colony and its form is in general similar to that of *C. philippinensis* forma typica I have not considered it necessary to describe it as a new variety.

There are 10 specimens from the reefs near Taytay, Palawan. These are all small colonies from 20 to 40 mm. high and from 15 to 40 mm. broad and with stems from 10 to 20 mm. in diameter. They are low and thick with little if any branching of the capitulum, the polyp-bearing lobes being direct outgrowths of the expanded distal surface of the colony or of very short, thick, conical branches. These colonies were growing on the dead coral and débris of the reefs in water from 0.5 to 2 meters deep at low tide.

There are 18 colonies from Silanga Channel between the Island of Matiguit and the mainland of Palawan, connecting Taytay and Shark's Fin Bays. These are all low thick colonies with broad, more or less flat, capitula. They are from 30 to

70 mm. broad and with stems from 18 to 55 mm. in diameter and from 20 to 60 mm. in length.

The one colony from the Pabellones Islands (Plate II, fig. 4) is attached to the coralline alga which has overgrown a thick stalk of dead *Porites*. The base is somewhat expanded and encrusting, the stem is almost lacking, the indistinct branches or the lobes arising practically from the base. The surface of the polypary is level, symmetrical, and nearly circular. The contrast between such a form with its very short and broad, flat capitulum and general rigidity and forms such as *C. philippinensis* var. *arborea* and var. *mindorensis* gives a good idea of the great range of variation in the form of the colony to be found in this species.

Capnella parva sp. nov. Plate I, fig. 8; Plate III, figs. 3a, 3b, 3c, 3e.

The small rigid colony is slender and tree-like, with a wrinkled stem, which is long in proportion to the size of the colony, and a distal portion which gives off the simple or compound polyp-bearing lobes or catkins. The distal portion of the stem may divide to form a number of main branches, giving the colony a bushy appearance. The polyps are closely crowded on the lobes, and appear singly or in small groups on the main stem. The lobes are cylindrical with rounded ends, reaching a length in the simple forms of 4 mm. and a diameter of 2.5 mm. and a length of 10 mm. in the compound forms. The colony appears smooth to the naked eye, but with a slight magnification shows a general granular appearance over the entire colony. In contracted specimens the knob-like polyps are turned inward and closely appressed to the surface of the catkins. They measure from 0.8 mm. to 1.6 mm. in length and from 0.4 mm. to 1 mm. in diameter. The polyp armament consists of a continuous coat of rather large spinose and knobbed spindles and clubs. The following types and measurements have been noted:

(*a*) Clubs:

(1) Clubs with the spines of one end much enlarged, numerous, and sometimes foliated: 0.27 by 0.06; 0.19 by 0.06; 0.3 by 0.08; 0.28 by 0.04; 0.22 by 0.03.

(2) Smaller, smooth, slender clubs: 0.15 by 0.03; 0.14 by 0.04.

(*b*) Spindles:

(1) Curved spindles with thickened central portions bearing spiny or foliaceous processes on their convex surfaces; ends slender and fairly smooth: 0.26 by 0.068; 0.296 by 0.045; 0.266 by 0.057.

(2) Thicker spindles with central enlargement and thicker ends covered with spines: 0.27 by 0.08.

(*a*) Spindles—Continued.
(3) Slender, curved, spindles without central enlargement: 0.266 by 0.036; 0.21 by 0.03.
(4) Thicker more heavily spined spindles without central enlargement: 0.277 by 0.06; 0.28 by 0.06.
(*c*) Irregular forms: 0.095 by 0.057; 0.17 by 0.095.

The stem cortex contains many short thick spindles, usually constricted in the middle, with rather high narrow warts. The following measurements have been taken: 0.155 by 0.055; 0.137 by 0.074; 0.133 by 0.08; 0.127 by 0.066; 0.11 by 0.06; 0.11 by 0.064. Besides these there are scattered, irregular, club-like bodies of which the following measurements have been taken: 0.125 by 0.076; 0.1 by 0.08; 0.087 by 0.045; 0.08 by 0.068.

The spicules of the canal walls are thick, heavily warted spindles somewhat similar to those of the stem cortex and a few thick, irregularly knobbed and warted club-like bodies. The following types and measurements have been noted:

(*a*) Short thick spindles with a central constriction and 2 zones of warts: 0.16 by 0.09; 0.155 by 0.1; 0.133 by 0.095.
(*b*) Long irregularly warted spindles: 0.2 by 0.1; 0.18 by 0.098.
(*c*) Irregular knobbed club-like forms: 0.133 by 0.107; 0.12 by 0.079; 0.095 by 0.08.

The thickness of the canal walls is several times the diameter of the canal, but there is no central axis.

Color of colony in formalin, brown with a grayish tinge on the polyps.

Locality: Tide channels in the reef at Doong Island, Bantayan Islands.

Type specimen No. C. 269 in the zoölogical museum of the University of the Philippines.

I have named this new species from two small but perfect colonies collected by Griffin and Wharton at Bantayan in 1909. The largest of these (Plate I, fig. 8) is 32 mm. in length, and consists of a rigid stem portion 5 mm. in diameter which passes into the polyp-bearing portion of the colony at a point 20 mm. from the base, giving off 4 short branches in a sort of whorl. These measure, respectively, 8, 4, 3.5, and 2.5 mm. in length, the first two bearing 4 lobes each, the other two bearing each a single terminal lobe. The main stem beyond this whorl gives off 4 catkin-like branches, and ends in a compound catkin. In this colony, as in *C. ramosa* and *C. philippinensis* var. *albida*, there are scattered polyps on the main stem and branches.

The thick canal walls containing numerous spicules make the colony very stiff and rigid. The canals are regularly distributed

in the stem, and there is no suggestion other than the very thick canal walls of a central axis as found in *C. ramosa* and in some colonies of *C. philippinensis*.

The other colony is smaller with a somewhat different method of branching. The entire colony is 15 mm. in height, the stem dividing at a height of 18 mm. into 3 main branches about 6 mm. in length, covered with polyps and each having a smaller branch or two, each branch with its branchlets making up a sort of compound catkin.

This species differs from any of the described species of the genus not only in the small size of the colony but in its spiculation. While it agrees with some of the named species in certain characters, it does not agree with any of them in its total characters. In spiculation it approaches *C. ramosa*, but the form and size of the colony and the arrangement of the polyps is radically different in the two species. It differs from *C. philippinensis* in the form of its colony and in the spicules of the polyp and stem cortex which in *C. philippinensis* are capstans and foliated clubs, while in *C. parva* they are spindles and clubs, the latter showing little if any foliation. From *C. capitulifera* and *C. imbricata* it differs among other things in the form of its polyp spicules. In its spiculation it suggests *C. spicata* (May), but the larger size of the clubs of the polyp, the presence besides the clubs of many spindles in the polyp armature, the larger size of the spicules of the stem cortex, as well as the difference in size and form of the colony make it impossible to consider it as belonging to *C. spicata*. *Capnella fungiformis*, although resembling *C. parva* somewhat in its spiculation, differs radically from it in the form of its colony and the method of branching. From the other known species of *Capnella* it differs even more widely than from those mentioned.

I have selected the specific name *parva*, because of the small size of the perfect and apparently mature specimens.

Capnella ramosa sp. nov. Plate II, figs. 1–3; Plate III, figs. 2a–2g.

The tree-like colony is profusely branched. The rigid stem is short and cylindrical, measuring in the single specimen 35 mm. long by 18 mm. in diameter, and is covered with fine longitudinal ridges which extend out on to the main branches. The entire colony is about 130 mm. in height and 100 mm. in greatest breadth, the stem breaking up at a height of 35 mm. into the 5 main branches which extend somewhat laterally and are profusely branched, giving the colony a bushy appearance. The secondary and tertiary branches bear the long slender twigs.

The polyps are scattered singly or in groups of 2 or 3 over the surface of the main and secondary branches and more thickly and regularly over the surface of the terminal twigs, which reach a length of 30 mm. and average 4 mm. in diameter. The club-shaped polyps are not closely packed, but are usually separated by a space at least equal to the diameter of a polyp. They reach a length of 2 mm. and a diameter at the tentacle zone of 1.2 mm., being smallest near the base and largest at the tentacle zone. The upper portion is turned in when at rest or in a state of contraction, but the basal portion always makes an angle of from 75° to 90° with its support. The tentacles in the preserved specimens are thick, with plump, closely packed pinnules, and were probably long in life.

The polyp armature consists of small, slender, bluntly spined and foliaceous clubs and straight or slightly curved bluntly spined spindles. These run out into the tentacles as similar but smaller spicules. The clubs consist of a long bluntly spined thorn with the large end set on one side with long, sometimes branched spines, and in many cases a toothed or spined foliaceous expansion. The clubs lie with the large end toward the distal end of the polyp and with the spines of that end toward the outside and often projecting. Many of the curved spindles have a group of spines on the center of the convex surface which also project. The spicules of the stem cortex are straight or curved spindles and toothed and foliated clubs. There are two types of spindles, a thick type with more or less regular zones of blunt projections bearing many short tooth-like spines at their outer ends, and a more slender type in which the projections are fewer and more spine-like. The clubs have one end much enlarged and irregularly foliated, spined, and toothed; the other end consisting of a longer or shorter thorn, bearing blunt projections similar to those of the slender spindles. The canal walls and base contain many very thick spindles, a few smaller double-headed spicules, and a few cross-shaped spicules.

Spicule measurements.

(*a*) Polyp spicules:
  (1) Spindles: 0.218 by 0.028; 0.254 by 0.016; 0.24 by 0.016.
  (2) Clubs: 0.235 by 0.057; 0.19 by 0.05; 0.231 by 0.05; 0.21 by 0.06.

(*b*) Stem-cortex spicules:
  (1) Spindles: 0.2 by 0.05; 0.23 by 0.06; 0.22 by 0.06; 0.16 by 0.056; 0.174 by 0.114; 0.167 by 0.076; 0.136 by 0.078.
  (2) Clubs: 0.21 by 0.08; 0.167 by 0.068; 0.163 by 0.085; 0.144 by 0.068; 0.144 by 0.08.
  (3) Irregular forms: 0.08 by 0.057; 0.05 by 0.045.

(*c*) Canal-wall spicules:

(1) Spindles: 0.2 by 0.098; 0.18 by 0.087; 0.171 by 0.114; 0.133 by 0.095; 0.144 by 0.095.

(2) Double headed forms: 0.087 by 0.064; 0.1 by 0.06; 0.08 by 0.06.

(*d*) Base spicules:

(1) Spindles: 0.19 by 0.098; 0.19 by 0.08 0.17 by 0.133; 0.16 by 0.072; 0.16 by 0.095.

The canals of the stem and main branches are very small with thick walls. The center of the stem contains a large irregular axis containing many spicules which is pierced by a few very small canals.

Color, uniform olive-green with a grayish tinge.

Type specimen No. C. 297 in the zoölogical museum of the University of the Philippines.

I have only a single specimen of this very distinct species collected by Griffin at Sabong Cove, Mindoro. It is much the largest specimen of the genus in the collection and in fact the largest yet reported. While its general appearance, the shape of its polyps, and its spiculation make it impossible to consider it as other than a species of *Capnella,* yet the fact that the polyps are scattered singly on the branches and twigs and the presence of a large and very distinct central axis in the stem and main branches are characters which do not agree exactly with the system of classification given by Kükenthal (1903) in his revision of the family Nephthyidæ [3] and would seem to necessitate a revision of the generic diagnosis.

In having a central axis it approaches in common with many of the colonies of *Capnella philippinensis* and particularly those of *C. p.* var. *albida,* the genus *Scleronephthya* Wr. and St. It differs very decidedly from this genus, however, in its spiculation and in that the polyps are scattered singly over the branches and twigs and not typically arranged in little groups as in *Scleronephthya.*

Because of these characters I propose the following diagnosis of the genus *Capnella*:

The colony is upright, tree-like or bushy; the nonretractile polyps, without a "Stützbündel," are grouped on lobes or scattered singly on branches and twigs, and are thickly covered with a coat, usually one spicule deep, of minute foliaceous clubs or clubs

[3] This helpful and basic work has greatly facilitated my research in the family Nephthyidæ, and every worker in this group must feel grateful for the order which Doctor Kükenthal has brought from the chaos of poorly defined and incorrectly named genera and species.

and spindles which is continued with some changes in the form of the spicules on to the stem cortex. The canal walls contain numerous spindles, clubs or cross-shaped spicules. The canals are numerous and small with fairly thick walls. Their cavities are sometimes very small or lacking in the center of the stem, resulting in the formation of an irregular central axis.

Kükenthal in his revision of the genus (1903) recognized 5 species; namely, *C. capitulifera* (Wr. and St.), *C. imbricata* (Q. and G.), *C. rugosa* (Kükth.), *C. spicata* (May), and *C. fungiformis* Kükenthal. Since Kükenthal's work 2 new species have been added to the genus; namely, *Capnella morula* Thomson and Mackinnon (1910) and *C. gilchristi* Thomson (1911). *Capnella manaarensis* Thomson and Henderson (1905), as Kükenthal says, cannot be placed in the genus *Capnella,* and Thomson and Mackinnon (1910) have erected a new genus, *Sclerella,* for *Paranephthya pratti* Thomson and Henderson (1905).

With the 3 species and 3 varieties added in this paper, we have now 10 species and 3 varieties in the genus *Capnella* reported from the following localities:

(1) *Capnella capitulifera* (Wr. and St.). Zamboanga (*Wr. and St.*), Sulu Sea (*Studer*).
(2) *Capnella imbricata* (Q. and G.). Duke of York (*Q. and G.*), New Ireland (*Studer, Kükth.*).
(3) *Capnella rugosa* (Kükth.). Indian Ocean (South African coast) (*Kükth.*), Pacific Ocean (*Kükth.*).
(4) *Capnella spicata* (May). Zanzibar (*May*), Aru Islands (*Kükth.*).
(5) *Capnella fungiformis* Kükth. Indian Ocean (coast of Dar es Salaam) (*Kükth.*), Coetivy (*Thomson and Mackinnon*).
(6) *Capnella morula* Thomson and Mackinnon. Southwest Indian Ocean (*Thomson and Mackinnon*).
(7) *Capnella gilchristi* Thomson. Cape of Good Hope (*Thomson*).
(8) *Capnella philippinensis* Light. Sabong Cove and Port Galera Bay, Mindoro; Doong Is., Bantayan Islands; Taytay, Silanga and the Pabellones Islands, Palawan (*Light*).
Capnella philippinensis var. *mindorensis* Light. Sabong Cove and Port Galera Bay, Mindoro (*Light*).
Capnella philippinensis var. *arborea* Light. Sabong Cove, Mindoro (*Light*).
Capnella philippinensis var. *albida* Light. Port Galera Bay, Mindoro.
(9) *Capnella ramosa* Light. Sabong Cove, Mindoro (*Light*).
(10) *Capnella parva* Light. Doong Is., Bantayan Islands (*Light*).

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ILLUSTRATIONS

PLATE I

(Photographs by Light)

FIG. 1. *Capnella philippinensis* sp. nov. forma typica. ⅝ natural size.
2. *Capnella philippinensis* forma typica. A rather divergent colony from Bantayan (p. 445). ⅝ natural size.
3. *Capnella philippinensis* var. *mindorensis* var. nov. A colony killed after being anæsthetized. ⅝ natural size.
4. *Capnella philippinensis* var. *mindorensis*. A contracted colony. ⅝ natural size.

FIGS. 5 and 6. *Capnella philippinensis* var. *albida* var. nov. ⅝ natural size.

FIG. 7. *Capnella philippinensis* var. *arborea* var. nov. ⅘ natural size.
8. *Capnella parva* sp. nov. ⅞ natural size.

PLATE II

(Photographs by Light)

FIG. 1. *Capnella ramosa* sp. nov. 9/10 natural size.
2. Part of a branch of *Capnella ramosa*. ½ natural size.
3. Section of the stem of *Capnella ramosa*, showing the arrangement of the canals and the irregular central axis. ½ natural size.
4. *Capnella philippinensis* forma typica. A colony from the Pabellones Islands, Palawan, showing extreme shortening of the stem and flattening of the polypary. ⅞ natural size.

PLATE III

(Drawings by J. Santos from camera lucida outlines)

FIG. 1*a*. A "capstan" spicule from the stem cortex of *Capnella philippinensis*. × 250.
1*b*. A small 4-rayed spicule from the inner stem cortex of *Capnella philippinensis*. ×75.
1*c*, *d*, and *e*. Spicules from the canal walls and base of *Capnella philippinensis*. × 75.
1*f*, *g*, and *h*. Spicules from the distal portion of the polyp of *Capnella philippinensis*. × 75.
2*a* and *b*. Spicules of the outer stem cortex of *Capnella ramosa*. × 75.
2*c*, *d*, and *e*. Spicules from the polyp armament of *Capnella ramosa*. × 75.
2*f* and *g*. Spicules of the canal walls of *Capnella ramosa*.
3*a*, *b*, and *c*. Spicules of the polyp of *Capnella parva*. × 75.
3*e*. A spicule from the stem cortex of *Capnella parva*. × 75.

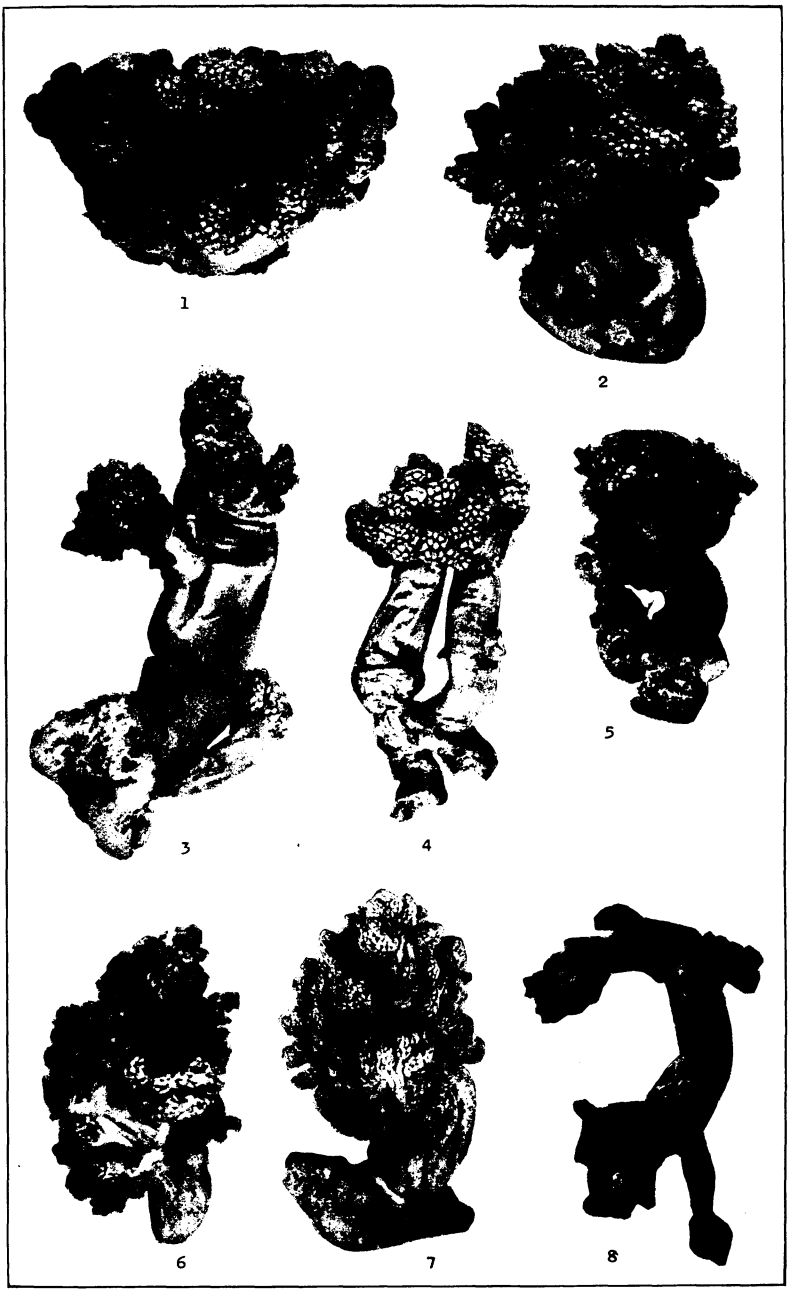

PLATE I. SOME SPECIES OF CAPNELLA.

PLATE II. CAPNELLA RAMOSA AND C. PHILIPPINENSIS.

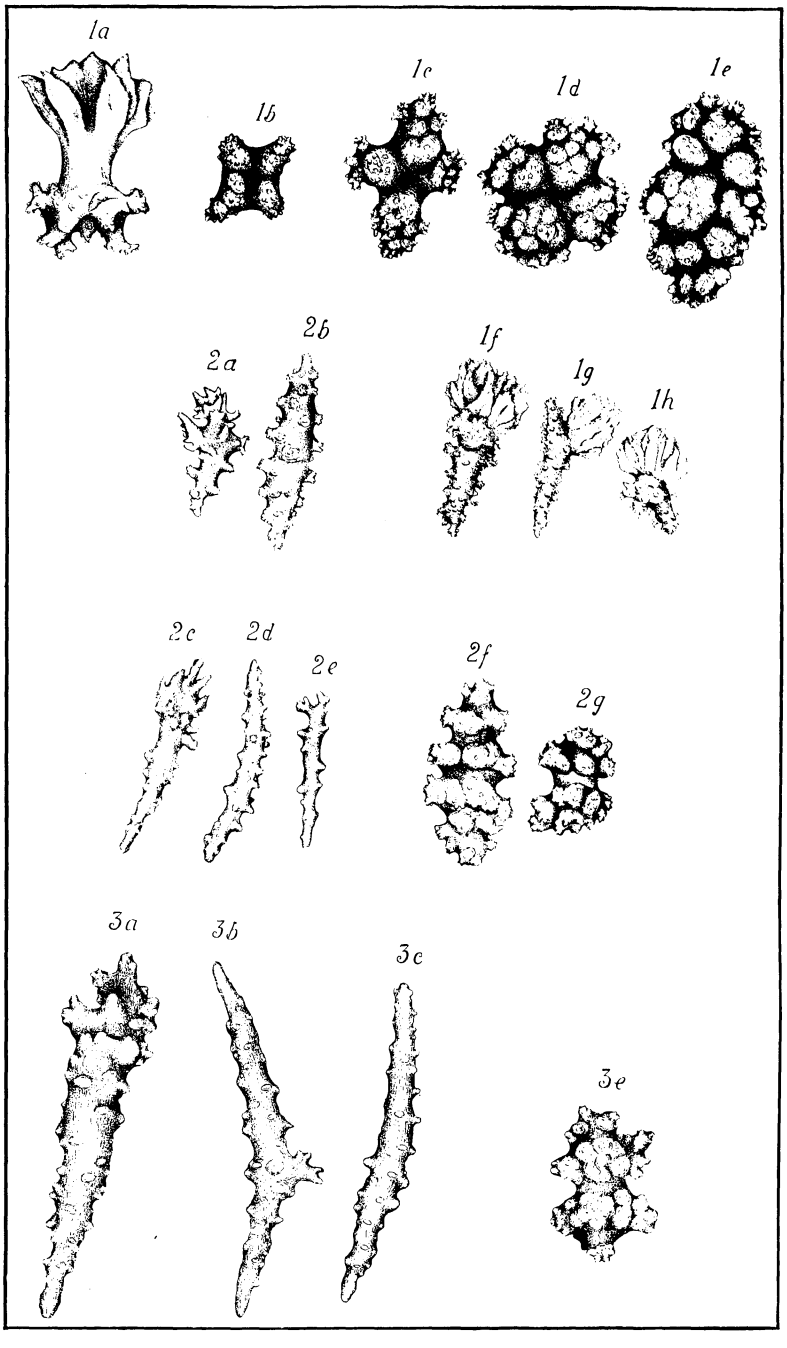

PLATE III. SPICULES FROM CAPNELLA PHILIPPINENSIS, C. RAMOSA, AND C. PARVA.

TYPES AMONG THE INLAND TRIBES OF LUZON AND MINDANAO

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Nine plates and 1 map

Luzon and Mindanao are the largest of the Philippine Islands. Therefore, one would suppose that the tribes in the interior of the two islands have been influenced less than those on the coast by recent mixtures with the Malay and European, and the types among those tribes would represent the primary elements of the Filipinos. Having this supposition in mind, I have attempted to select representative individuals from the best known groups of the interior of the two islands to serve as a basis for a fuller study of the inland tribes, which is to be undertaken subsequently.

The tribes selected for this study are the most numerous of all in the Islands and include the Bontoc Igorots, Benguet Igorots, Ifugaos, and Kalingas of Luzon; and the Moros, Bagobos, and Subanuns of Mindanao. The photographs were selected from the collections of Mr. Dean C. Worcester and of the Bureau of Science.

THE BONTOC IGOROTS

The Bontoc Igorots are so well known and have been so fully treated by others that it is not necessary to do more than mention them, but it is of interest to note the presence of the Iberian and Primitive types here as elsewhere among the inland tribes. In Plate I, figs. 1, 2, and 5, may be seen two Iberian men of Bontoc. The evident Iberian characteristics are the long narrow face, the long narrow nose, the pointed chin, and the Iberian ear type A—recognized by absence of lobule, eversion of concha, and rolling out of helix at the lower part. These men have long narrow heads which cannot be determined exactly from the photographs because of the hair. The Primitive type of Bontoc Igorot is represented in Plate I, figs. 3, 6, and 7. The young woman has the broad flat face, short broad nose with depressed bridge and flaring nostrils that open somewhat downward, and the bowl-shaped ear with much rolled-in helix; the man

has a somewhat longer face, straight nose with nostrils opening downward, and modified Alpine ear that has qualities of the Iberian type A in the absence of lobule and somewhat everted concha, and of the Primitive in the rolled-in helix, denoting a mixed type. In a former study of the Benguet, Lepanto, and Bontoc Igorots three types were selected and entitled M, A, and N, which may now be designated as the Iberian, Australoid, and Primitive, respectively. The three types may also be segregated by the examination of photographs using descriptions as an aid in their interpretation as in the previous study.

THE BENGUET IGOROTS

Two characteristics of the Benguet Igorots are the prettiness of the women and the ugliness of the men. Three pretty girls may be seen, one in Plate I, fig. 8, the others in Plate III, figs. 1 and 2. Benguet men are shown in Plate II, figs 1, 2, 3, 4, 5, and 6. The men of figs. 1, 2, 3, and 4 are modified Primitive in type as may be seen by their ears and physiognomy. The Iberian type is present in Benguet, modified in form, but distinctly European in physiognomy, as illustrated by fig. 6. The high head and long face, the moderately high nose—not broad and flat—the nostrils opening downward, and the ears without lobule and with everted concha and somewhat rolled-out helix stamp this man with Iberian characteristics. The accompanying fig. 5 of a younger man is distinctly modified Primitive in type, with broader head, shorter face, wider nose, and bowl-shaped ears. Evidence favors the view that the Benguet Igorots are more Primitive than those of Bontoc, which points to an infiltration into Benguet from the lowlands; Bontoc, being more inaccessible, has retained to a greater extent the earlier elements of the Iberian type that came from Europe, probably through India, in prehistoric times; or else there has been a migration into Bontoc of Iberians who did not reach Benguet. Evidence of the Indian Iberian is not lacking throughout the Philippines, a large part of the Iberian element having come in the early settling of the Philippines by Hindu Malays. The Iberian and the Primitive occur among all the Filipinos.

THE TINGIANS

Adjoining the Igorots on the west, and separating them from the Ilocanos of the coast, are the Tingians who are modified Iberian to some extent, as may be seen in Plate III, fig. 3, and

Plate IV, figs. 1, 2, 3, and 4. The women are pleasing in appearance, and the Tingian men are not unattractive. Their physiognomy is distinctive and different from that of the Iberians of Bontoc and Benguet. The Bontoc Iberians are purer in type, the Benguet Iberians are the least pure, and the Tingians are intermediate, each having a characteristic form that appears to have become somewhat stable and fixed as a type that can be differentiated. Endogomy and differences in the relative proportion of the type to start with have been largely influential in producing the differences, but habits and conditions have also played a part in molding the three groups in different directions.

THE KALINGAS

Turning next to the Kalingas, who live to the north of the three groups, another distinct modified Iberian type is encountered, different from, and purer than, any of the preceding. The man of Plate II, figs. 7 and 8, and the man of Plate V, fig. 1, represent them well, and the man of Plate V, fig. 2, is another representative member of the tribe although somewhat mixed in type. They have the wide open eyes of the East Indian, not shown well except in Plate V, fig. 1, and this, coupled with the relative purity of the Iberian type, indicates that they represent at least in part a remnant of that early East Indian element that must have entered the Philippines, and the type is purer here than elsewhere.

THE IFUGAOS

The Ifugaos who are south of the Kalingas and east of the other Igorots also have some of this Iberian element, as indicated by the woman of Plate IV, figs. 5 and 6, who is placed beside the Primitive Australoid Mañgyan woman (figs. 7 and 8) for comparison and contrast. The Mañgyans are largely of the Iberian types and probably of East Indian origin, as demonstrated in a previous study, but there is also the Negrito element in the interior, and the Primitive is present as well. Throughout the Archipelago these three types are fundamental—the Primitive, the Australoid, and the Iberian—with the Iberian predominant in local areas.

MINDANAO

Passing from Mindoro we may go to Mindanao, and in doing so we cross the Visayan Islands, the middle group of the Archipelago, between the two large islands, Luzon in the north, and

Mindanao in the south; and in the Visayas a modified Primitive type similar to the one shown in Plate V, figs. 3 and 4, may be seen.

The people of Mindanao are largely of four groups: the Moros of the south, the Subanuns of the north, the Bagobos of the Gulf of Davao, and the Bukidnons in the interior. A few Negritos are said to exist in the northeastern part of the island. Photographs of the last two groups are not available, therefore they are omitted necessarily.

The Subanuns are distinctly Iberian in character as may be seen in Plate V, figs. 5, 6, 7, and 8, and Plate VI, figs. 1 and 2, although mixed and modified Primitive and Australoid types are not altogether absent. The Iberians are unlike those of Luzon, and resemble the Moros from whom they were probably derived in large measure. Therefore, they are of more mixed Iberian type, having come through Arabia and being more recent in origin than the Indian Iberians. However, types similar to those of central Luzon may be seen, and the man of Plate V, fig. 6, is an example. This man resembles an Ilongot of a previous publication, and the two represent an early European migration that came directly through the intervening territory without great mixture on the way. They are not unlike European types that may be seen in the United States. Subanuns, as in Plate VI, figs. 5 and 6, are similar to the Bontoc Igorots of Plate I, figs. 6 and 7, although somewhat more Primitive. Types similar to this are found in Benguet, as the men in Plate II, figs. 3 and 4 show; also among the Bagobos, as is shown in Plate VIII, figs. 1 and 2. The ears of these people are mixed Primitive and might be termed the Australoid although simulating the Alpine. This modified Primitive form is a fundamental type of the Islands. The other Bagobo is also a fundamental type of the Islands, and resembles the Benguet Igorot of Plate II, figs. 1 and 2, the Bagobo of Plate VIII, figs. 3 and 4, and similar types elsewhere. The Igorot is more Primitive than the Bagobo, who is almost typical B. B. B. The square face, head, and ear are unmistakable.

The Moros are almost all modified Iberian types as may be seen in Plate VII, which portrays only high-class Moros—sultans and datos. The sharp nose with high bridge, the long face with pointed chin, and the ear of Iberian types, although somewhat modified and resembling the Alpine in Plate VII, figs. 3, 4, and 8, signify a derivative origin from Europe. The Moro

Iberians are different from the Iberians of Luzon, but similar to the Subanun Iberians. Arabian blood in the Moros may account for the difference. Three individuals of Mindanao in Plate IX represent the Bagobo, Subanun, and Moro, respectively, and the three persons are very much alike in physical characteristics, which is to be expected of the inhabitants of a single island.

This glimpse of inland Filipino types serves to impress one with the prevalence of the Iberians, especially among the leading men of the tribes, for it is true that such men are as a rule the ones whose photographs have been taken. The uniformity of distribution of the Iberian is exceeded only by the diversity of type, each group or tribe having an Iberian form different from the other groups. Thus the Iberian Kalingas and Bontoc Igorots are similar to the Hindu Iberians, the Moros and Subanuns are similar to the Moors or Arabs, and in the heart of Luzon and Mindanao are types similar to existing European types in America.

In addition to the Iberian types there are Primitive, modified Primitive, and Australoid types among the inland tribes, as well as those with modified Alpine and modified B. B. B. affinities, which represent forms of the Orient that are not of European origin, but have been modified by European types.

Therefore, it seems to me, from this and previous studies, that the fundamental types, Iberian, Primitive, and Australoid, have entered into the population of the Philippines throughout the Archipelago, and for that reason all the people of the Philippines are similar in type. The different islands, and different localities in any one island, have received varying proportions of the three fundamental types—sometimes pure, sometimes mixed with each other—coming from different places, where fusion had already fashioned a modified type; local conditions, endogamy or exogamy, inbreeding or breeding out, and differences of soil, climate, food, and water have affected the groups in many ways with the result that one tribe differs from another at present, although individual members of the different tribes resemble each other. Other European types such as the Alpine and B. B. B. may have entered the Islands from time to time or the modified Alpine and B. B. B. types may be the result of combinations in various ways of the Iberian, Australoid, and Primitive.

Three distinct migrations from Europe are evident from the three modified Iberian forms; one from Europe direct, without mingling with intervening peoples, as represented by the almost pure European types in the heart of Luzon and Mindanao; one by way of India in which the types are the Indian and the so-called Malay; and one from Arabia and north Africa, the Mohammedan of history. There is also evidence among the Ilongots of another European element migrating through Siberia, possibly through China, and also from Japan. The Australoid type may antedate the Negritos, it may have resulted from them by crossing with other types, or it may have been brought in with the other types in the mingling migrations of the Europeans. The Primitive type is probably oriental in origin, although I have seen modified Primitive Europeans.

There have been waves and waves of migration, which have apparently come largely from the south, and each succeeding wave finds the drift of the preceding one and in receding leaves its own, sometimes penetrating farther than its predecessor, sometimes falling short and retiring before having reached the remaining portions of previous waves. A crescent would represent the form of the wave, the center advancing farther than the sides. Three crescents might be placed across the Archipelago to represent the three European migrations: The first would center in northern Luzon about the Ilongots, representing the purest European types, the crest of the wave having crossed central Mindanao, leaving traces among the Subanuns; the second crescent would cross the Island of Mindoro, but would have an eddy or advance point among the Kalingas and Bontoc Igorots; the third has its center in Sulu. The Mohammedan crescent advanced farther northward, but receded to Sulu when the Spaniards came.

The fields of greatest hopefulness for results in research, now as heretofore, are the interior of Luzon and the interior of Mindanao.

I have touched only the outskirts of the problem that confronts the racial anatomist in the Philippines, and whatever I have done is suggestive rather than conclusive.

ILLUSTRATIONS

Plate II, fig. 5, is from a photograph by Worcester; Plate V, figs. 3 and 4, and Plate VII, figs. 1, 2, and 7, are from photographs by Miller; Plate IX, fig. 8, is from a photograph by Ball; the photographer of Plate VII, figs. 5, 6, and 8, is unknown; the remaining cuts are from photographs by Martin.

PLATE I

FIGS. 1 and 2. A Bontoc man. This man has a notoriously bad character.
3 and 4. Front and side half-length pictures of Bontoc woman, showing typical ornaments, dress, and in some instances tattoo. The women as a rule tattoo the arms only.
FIG. 5. A Bontoc man.
6. A Bontoc man. Note this tremendously powerful neck.
7. The Bontoc man of fig. 6, side view.
8. Gabi, the youngest sister of Loyan and the prettiest girl of Pico. Taken in 1904.

PLATE II

FIGS. 1 and 2. Igorot men of Benguet.
3 and 4. Igorot men of Ambuklao and Kayapo (showing typical dress).
FIG. 5. Igorot man of Irisan, showing method of wearing blanket.
6. Acop, one of the wealthiest Igorots in the subprovince of Benguet.
7. A young Kalinga man, showing the peculiar form of the Kalinga eyes to special advantage.
8. Side view of young Kalinga man.

PLATE III

FIG. 1. Gabi, a girl of Trinidad, Benguet. Taken in 1901.
2. Two girls of Kalayan school. The taller one was teaching at Daklan at the time the picture was taken.
3. Full-length view of a young Tingian girl of Abra.

PLATE IV

FIGS. 1 and 2. Typical Tingians.
3 and 4. Tingian men, showing typical dress.
5 and 6. Ifugao women, showing typical dress and ornaments.
7 and 8. Young Mañgyan women, showing scaly skin disease which is common among the wild tribes of the Philippines and is particularly common among the Mañgyans inhabiting the lowlands of Mindoro.

PLATE V

FIG. 1. Man of Lubuagan, showing feather headdress.
2. The *presidente* of Nanong, perhaps the most influential man in the subprovince of Kalinga.
FIGS. 3 and 4. Views of a young Bukidnon man.

FIG. 5. A Subanun man of the District of Zamboanga. Note style of tying turban.

6. An old Subanun man of the District of Zamboanga. Note straggling gray beard and mustache. The occurrence of a beard among these people is unusual.

FIGS. 7 and 8. An old Subanun man of the District of Zamboanga. He has a relatively thick mustache and beard which is probably accounted for by the presence of some Arab blood.

PLATE VI

FIGS. 1 and 2. Subanun men with long hair.

3 and 4. Front and side views of typical Subanun man.

5 and 6. Subanun man who has his hair cut short and has light hair and mustache. His features are quite different from most of the Subanuns.

7 and 8. Front and side view of Subanun women of the Peyo River, near Sindangan Bay, Mindanao, showing physical characteristics, typical dress, and ornament. Note especially the load of necklaces worn by them.

PLATE VII

FIGS. 1 and 2. Typical Bilau men of Davao, Mindanao, showing dress and ornaments.

3 and 4. Front and side view of a Moro dato.

FIG. 5. Dato Mastura.

6. Judge Kali Punga.

7. Dato Dacula, at Zamboanga, Mindanao.

8. Moro youth, Samul Suwaan type.

PLATE VIII

FIGS. 1 and 2. Bagobo men, showing typical dress and ornaments. Note the spotted headdress, indicating that the warriors have killed enemies.

3 and 4. An old Bagobo man. The light spots with dark centers on the handkerchief wrapped about the head show that he has killed enemies. Note particularly the headpiece and embroidery. In side view, note the large opening in the lobe of the left ear, which evidently was at one time large enough to admit one of the ivory ear ornaments, but has now closed up somewhat.

PLATE IX

FIG. 1. A Bagobo, showing typical dress and ornaments. Note bead work on carrying bag.

2. View of a well-to-do Subanun woman, showing characteristic dress and ornaments. Note the numerous necklaces, the ear ornaments, embroidered upper garments, and the anklets.

3. Side view of young Yacan Moro.

MAP

Map of the Philippine Islands, showing distribution of inland tribes considered in this paper.

Vol VIII, Sec. D, No. 5, of this Journal was issued February 25, 1914.

Fig. 1. Iberian.

Fig. 2. Iberian.

Fig. 3. Primitive.

Fig. 4. Primitive.

Fig. 5. Iberian.

Fig. 6. Mixed.

Fig. 7. Mixed.

Fig. 8. Iberian.

PLATE I. IGOROTS AND A BENGUET GIRL.

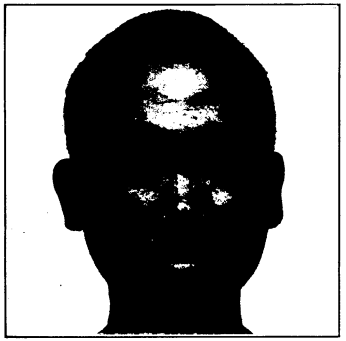


Fig. 1. Mixed B. B. B. ear.

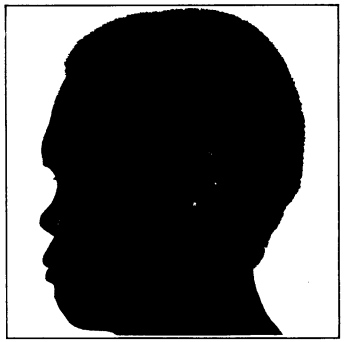


Fig. 2. Mixed B. B. B. ear.

Fig. 3. Mixed Primitive ear.

Fig. 4. Mixed Primitive ear.

Fig. 5. Primitive ear.

Fig. 6. Iberian ear.

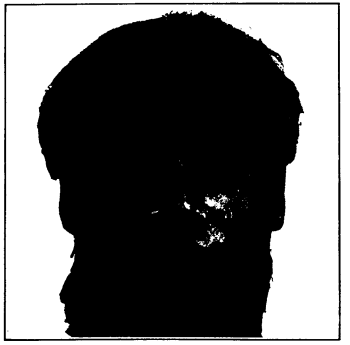


Fig. 7. Iberian ear.

Fig. 8. Iberian ear.

PLATE II. BENGUET IGOROTS AND A KALINGA.

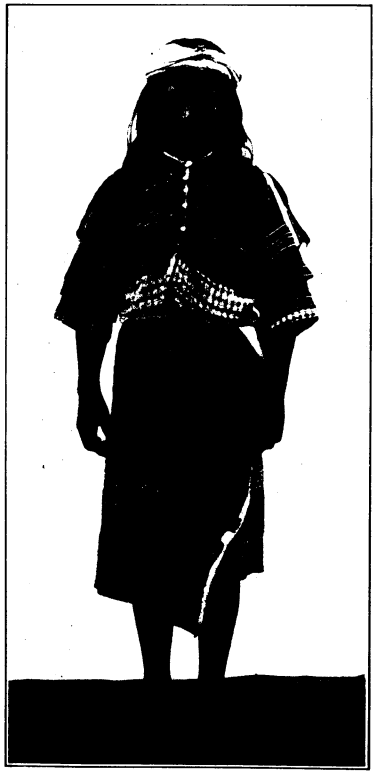


Fig. 1. A girl of Trinidad, Benguet.

Fig. 2. Girls of Kayapao, Benguet.

Fig. 3. A Tingian girl of Abra.

PLATE III. TYPES OF LUZON.

Fig. 1. Iberian.

Fig. 2. Iberian.

Fig. 3. Iberian.

Fig. 4. Iberian.

Fig. 5. Iberian.

Fig. 6. Iberian.

Fig. 7. Primitive.

Fig. 8. Primitive.

PLATE IV. TINGIANS, AN IFUGAO WOMAN, AND A MANGYAN GIRL.

Fig. 1. Iberian ears.

Fig. 2. Mixed ears.

Fig. 3. Primitive ears.

Fig. 4. Primitive ears.

Fig. 5. Iberian ears.

Fig. 6. Iberian ears.

Fig. 7. Iberian ears.

Fig. 8. Iberian ears.

PLATE V. KALINGAS, A VISAYAN, AND SUBANANS.

Fig. 1. Iberian ear.

Fig. 2. Iberian ear.

Fig. 3. Mixed ear.

Fig. 4. Mixed ear.

Fig. 5. Alpine-Primitive ear.

Fig. 6. Alpine-Primitive ear.

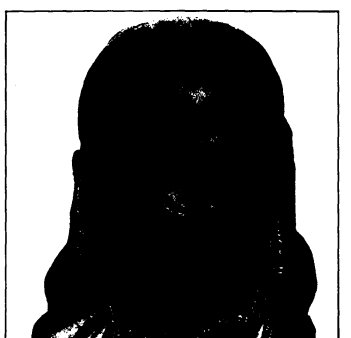


Fig. 7. Mixed-Primitive ear.

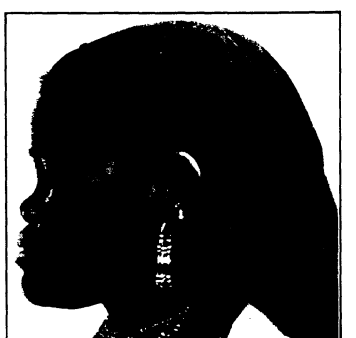


Fig. 8. Mixed-Primitive ear.

PLATE VI. SUBANANS.

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

Fig. 5.

Fig. 6.

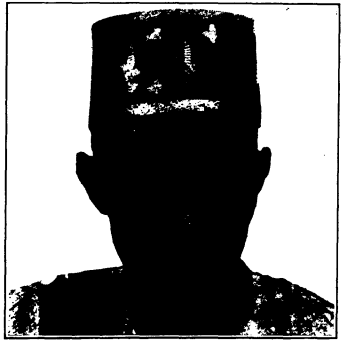


Fig. 7.

Fig. 8.

PLATE VII. MOROS. IBERIAN AND MODIFIED IBERIAN EARS.

Fig. 1. Mixed Primitive ears. Alpine.

Fig. 2. Mixed Primitive ears. Alpine.

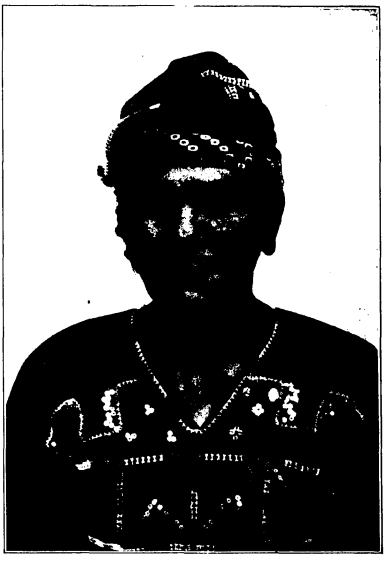


Fig. 3. Mixed B. B. B. ears.

Fig. 4. Mixed B. B. B. ears.

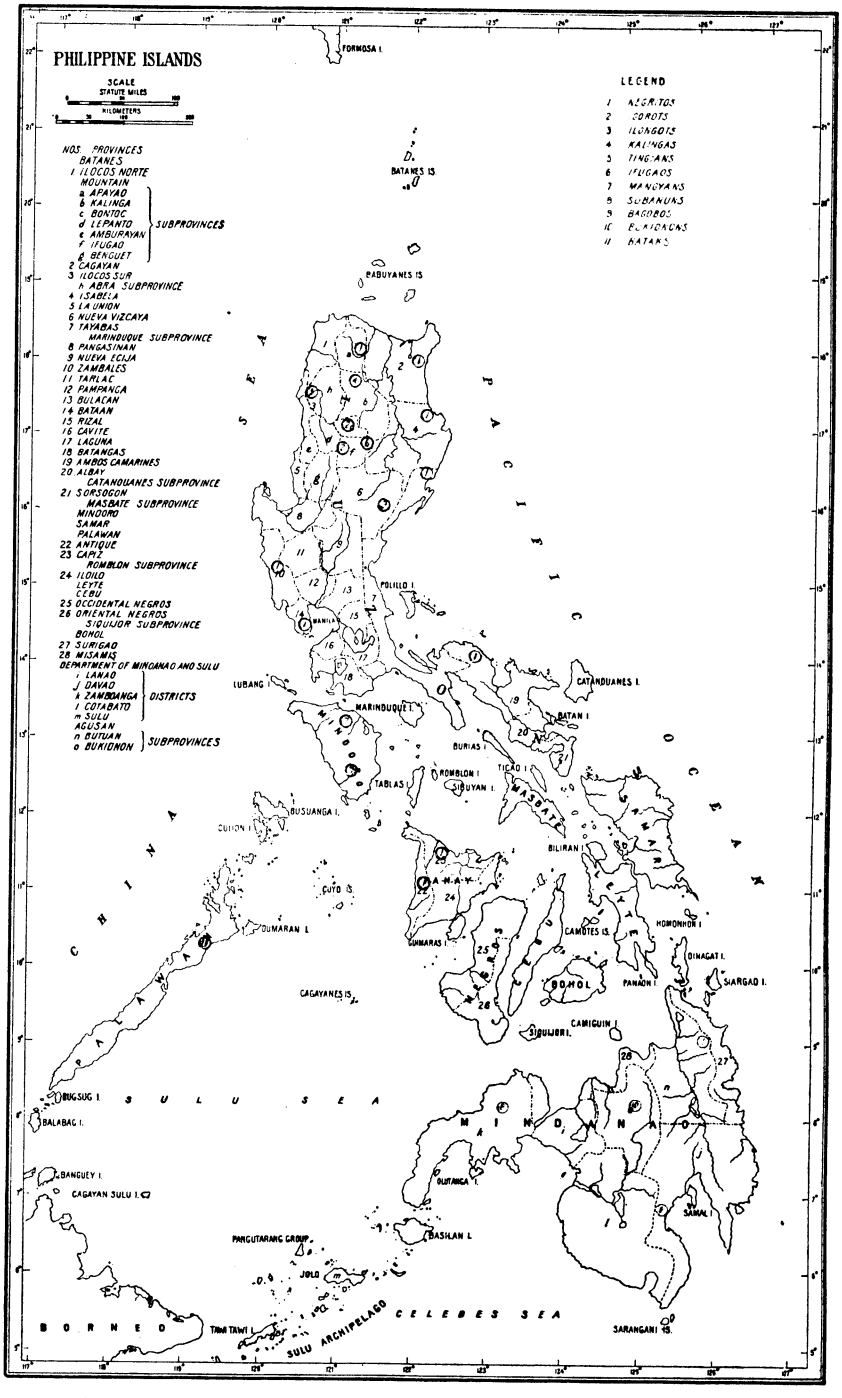
PLATE VIII. BAGOBOS.

Fig. 1. A Bagobo.

Fig. 2. A Subanun.

Fig. 3. A Moro.

PLATE IX. TYPES FROM MINDANAO.



MAP OF THE PHILIPPINE ISLANDS, SHOWING DISTRIBUTION OF INLAND TRIBES.

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(New names are printed in **heavy-faced** type; numbers in *italics* indicate synonyms or references of minor importance.)

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