LIVING WORLD

Journal of the Trinidad & Tobago Field Naturalists' Club 1983 – 1984

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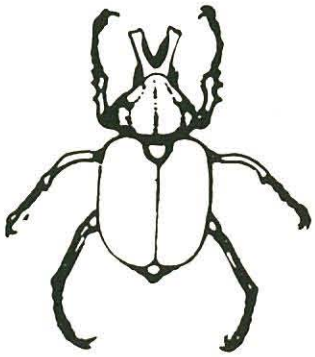

Natura Maxime Miranda in Minimis

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COVER STORY

FRONT COVER. The orchid *Cyrtopodium broadwayi* in the Aripo Savanna. See article by V.C. Quesnel *et. al.* on p. 4. (Photo by J.S. Kenny).

BACK COVER: Some tarantula spiders of Trinidad. Clockwise front top left: *Avicularia avicularia* ♀; *Psalmopoeus cambridgei* ♀; *Hapalopus incei* ♀; *Tapinauchenius plumipes* ♀. See article on p. 54 by Rick West. (Photos by Rick West).

THE TRINIDAD & TOBAGO FIELD NATURALISTS' CLUB

THE Trinidad Field Naturalists' Club was founded on the 10th July 1891. Its name was changed to the present one in 1974.

The objects of the club are to bring together persons interested in the study of natural history, the diffusion of the knowledge thereof and the conservation of nature.

At present the club has an enrolment of over four hundred members comprised of nature-lovers and professional and amateur naturalists.

Monthly lecture meetings are held at the St. Mary's College on the second Thursday of the month while field excursions are held on the last Sunday of each month, except December, when no official club activities are organized.

Membership is open to all residents of Trinidad and Tobago, of at least fifteen years of age, who subscribe to the objects of the club. The club also maintains an overseas mailing-list.

Management committee 1983: T.F. Farrell, President; Ian Lambie, Vice-President; Luisa Zuniaga, Hon-Secretary; Denise Lee, Hon. Asst. Secretary; John Hilton, Treasurer; Colin Agostini, John Seyjagat, Judith Lastique.

Editorial Committee: Victor Quesnel, Richard ffrench, Julian Duncan.

All enquiries concerning the club or its journal should be addressed to the Hon. Secretary, 1 Errol Park Rd, St. Ann's, Trinidad, W.I.

A New Snake for Trinidad

By Hans Boos, Emperor Valley Zoo Port of Spain. Trinidad, W.I.

ON September 18, 1981 Richard Joseph, a keeper at the Emperor Valley Zoo, found dead on the road near Chatham on the South West Peninsula of Trinidad a snake that was unlike any other he had ever seen. This snake was preserved and taken to the British Museum (Nat. Hist.) where it was lodged as specimen No. 1980/1167.

The head of the Herpetology Department, Andrew Stimson, identified the snake as *Thamnodynastes strigatus* (Gunther). It is a new record for Trinidad. There is a distinct possibility that it is a recent colomist or stray from the Venezuelan coast to the south, but the interesting aspect of this find is that this species has not so far been reported from nearby Venezuela but only in Sao Paulo State, Brazil and south into Paraguay and Argentina.

Further investigations are being carried out by Andrew Stimson. The description given by him of the specimen follows:

Male: snout-vent length 403mm; tail (incomplete) 105mm; dorsals smooth, with single apical pits, in 19 rows at midbody reducing to 17 posteriorly; ventrals 149; anal divided; subcaudals 50+ (an estimated 20 — 25 missing); 8 supralabials, 4th — 5th entering the eye; single preocular; two postoculars; temporals 2+2; 9 infralabials, first 4 in contact with the anterior chinshields.

The pale brown of the back separated from the darker brown of the sides by a pair of light longitudinal narrow stripes; dorsum and upper sides with irregular black spotting mostly confined to the scale edges; venter whitish with a pair of lateral, longitudinal, light-centred dark stripes; a second, central pair of light-centred longitudinal stripes is less distinct, almost grey; these two stripes merge posteriorly on the tail and anteriorly on the throat to form a single midventral stripe; head darker and more heavily black-spotted than the trunk; a black postocular streak runs from the eye to the angle of the jaw; supralabials barred with black; a black stripe runs from the eye to the nostril.

First Record of The Double-Striped Thick-Knee in Trinidad W.I.

By David Rooks, 7 Eccle Ave, Maraval

ON 24th June, 1983, I saw a Double-Striped Thick-Knee *(Burhinus bistriatus)* in the Queen s Park Savannah at 5.30 p.m. This is a first record for Trinidad; the bird is a Venezuelan species and is commonly found in savannas or open fields. It was standing in the area near the race track opposite Casuals Club.

Being on the lookout for the annual arrival of migrants in the Savannah I saw this bird and its unusual appearance excited my curiosity. From the distance of the roadway, it had the appearance of a piece of wood stuck in the ground and with that general colouration. I stopped the car and walked towards it. As I got near, it gave a trembling sort of song, trotted away for a few feet with the most amusing gait, then stopped and straightened up, pulling it's tail in towards its heels. It looked so funny, I almost burst out laughing. No matter how I approached it, it would not fly but each time repeated its trembling call and continued its strange gait for only a few feet.

I thought to myself that I must get a picture but, as it was already late in the afternoon and the bird seemed so comfortable and established in the Savannah, I was sure it would be there in the morning when I would be able to get a good picture so I went home without disturbing it and returned next morning at dawn. It was nowhere to be found. I have kept a look-out but have not seen it again. Fortunately, I had made careful detailed notes of it's appearance.

At first, I could find no reference to similar birds anywhere, but on discussing it with Richard ffrench he told me to look it up in the Birds of Venezuela which I did and there it was.

Life History of the Orchid *Cyrtopodium Broadwayi*

By V.C. Quesnel, T.F. Farrell, Ann Hilton, J. Hilton, Denise Lee and Luisa Zuniaga, P.O. Box 47, Port of Spain, Trinidad.

INTRODUCTION

THE Botany group of the Trinidad and Tobago Field Naturalists' Club was organized in 1977 for the purpose of carrying out field work on the vegetation of Trinidad. The group consists of the six persons whose names head this article together with Vilma and Judith Lastique who have not been involved with this work on *Cyrtopodium*. We decided that our first project would be a study of the terrestrial orchid *Cyrtopodium Broadwayi* which is endemic to Trinidad and thought to be in some danger of extinction. Schultes (1967) records it from the Piarco Savanna, the Caroni Savanna, the Botanic Gardens (presumably cultivated) and near Mt. Tamana, in addition to the Aripo Savanna, the locality from which most of the specimens in the National Herbarium have come. Since the Piarco Savanna is now an airport and the Caroni Savanna cultivated in sugar cane, the Aripo Savanna is now the only locality where the orchid occurrs in some abundance. Mining activity in the area is a constant threat to the site so that the danger of extinction is real. We now report on the first four years of the project.

Our first visit was made on 1st May 1977, On this visit we learned to recognize the orchid and we also made a census of the plants in two small areas of one of the large savannas. The first of these, in a small bay cut off from the main savanna by a drain, produced 53 plants. The second in a similarly sized area nearer the middle of the savanna produced 17 plants. so the first area became the study area. It had other advantages besides the seemingly greater number of plants. (1) It was clearly delimited. (2) It was reasonably easily accessible to the naturalist prepared to work there but sufficiently difficult of access to deter the casual orchid collector. (3) Its separation from the main savanna by a drain seemed to afford greater protection from fire and in the years since 1977 there has, in fact, never been a fire in this area though there have been fires on the main savanna. Its exact location is being deliverately withheld in the interest of protecting the orchids there.

After the first visit, access to the site by the route we had taken was blocked and it was only on 15th Jan. 1978 that an alternative route in was found. From then on we have visited the site about the middle of every month.

THE STUDY AREA

The Aprio Savannas lie in the triangle formed by Valencia, Cumuto and Guaico. The surrounding vegetation is palm-marsh forest; the savannas occur where white sand overlies an impermeable clay pan. As a result, plants growing there are subjected to particularly severe conditions; in the dry season from January to May they suffer from drought and in the wet season they are waterlogged. The vegetation consists mainly of grasses and sedges with some shrubs. some dicotyledonous herbs and several species of terrestrial orchid. The savannas have been studied by Beard (1946) and by Richardson (1963) and have been described in articles for the general reader by Quesnel (1979) and in the Forestry Division's Management and Development Plan 1980. The study area is approximately 1.5 ha in extent. It is divided into two more or less equal parts by a drain dug by the American Armed Forces in World War II (ca. 1941). We plan to give a more detailed account of the site in another report on the ecology of the orchid.

THE METHODS

Our methods are very simple. We first made a map of the site by means of compass and tape measure. Over a period of seven months, we located 100 plants, labelled them with plastic or aluminium labels and plotted them on the map. At each visit we counted the number of living leaves on each plant and beginning in 1979 recorded also an estimate of the size of the leaves (small, medium and large). When a leaf was more than half dry it was not counted. We recorded the appearance of flowering shoots and counted buds, open flowers, drying flowers and fruit. We also noted anything else that was affecting the plants and anything unusual. We recorded deaths and labelled additional plants to keep the number under observation at approximately 100. All observations were kept in tabular form but growth, flowering and fruiting were also displayed in graphical form (Fig. 1). On these graphs numbers of leaves over ten were recorded as ten for convenience. These graphs convey an impression of the behaviour of the plants that cannot be got from the tables.

RESULTS

Vegetative growth

We have never seen a seedling of *Cyrtopodium broadwayi* in its first year of growth and have no idea of the size attained after one year's growth. As we saw it in the field each plant was a collection of pseudobulbs of varying ages with one, two or three vegatative shoots. Typically, each year's growth begins from a bud on the pseudobulb of the preceding year. The bud increases in size puts out several leaves in a fan shape and after some weeks the stem enlarges to form another pseudobulb which provides the food store for the next season's growth.

The plotted results of growth, a sample of which is shown in Fig. 1, show clearly that most of the plants begin growing early in the year (Jan. — March), produce their maximum number of leaves by mid-year and then gradually lose leaves until only a pseudobulb remains by November or December. Some begin to grow earlier, in December, and a much smaller number begin in mid-year. Of plants beginning to grow at mid-year there were 17 in all, 3 in 1978, 4 in 1979, 3 in 1980 and 7 in 1981. These numbers do not include plants that produced mid-year shoots alongside existing shoots.

A given clump does not always behave consistently. Thus, No. 40, first seen in March 1978 dried up in August 1978, produced a plant with 6 leaves by Oct. 1978 which lasted until April 1979. A new shoot began growing in June 1979 and it dried up by November. Thereafter, this plant followed the normal pattern of producing new shoots early in the year and drying up by November. No. 96 behaved similarly. By way of contrast, No. 50 produced two vegetative shoots from April to October

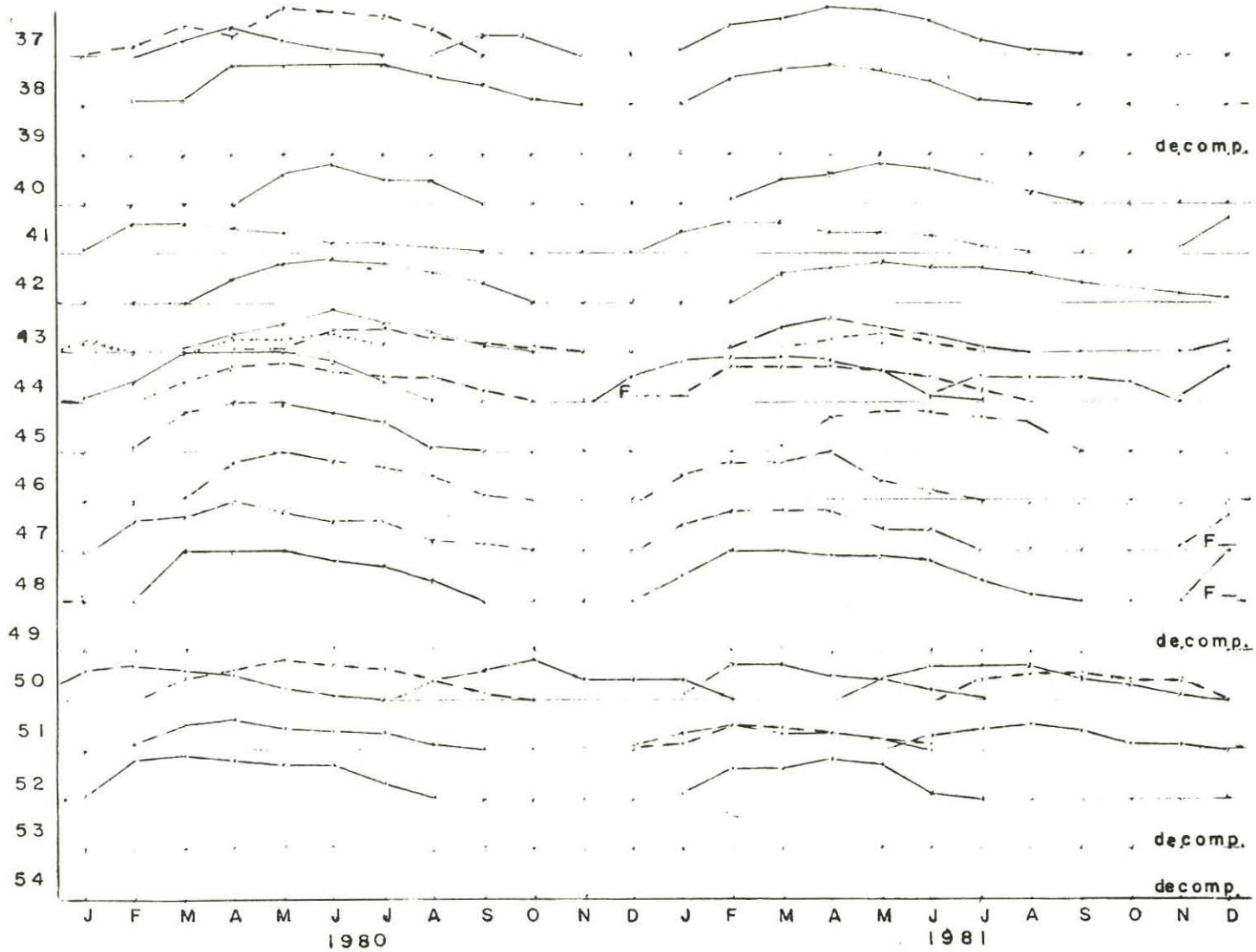

FIG. 1. A sample of the results in graphical form showing clearly the normal patterns of growth and the abnormal behaviour of No. 50. F = flowering shoot.

1978 and two more from March to September 1979, thus following the normal pattern. It then produced one from December 1978 to June 1980, one from March 1980 to September 1980, one from August 1980 to January 1981, one from January 1981 to June 1981, one from May 1981 to November 1981 and one from July 1981 to November 1981. Therefore, shoots of this plant were growing in all months from December 1979 to November 1981.

Of the 17 plants mentioned above that began to grow at mid-year, one (No. 90) produced two shoots simultaneously, giving a total of 18 shoots. Of those that grew in 1981 four were still growing in December when our study ended and their periods of growth were not determined. The mean period of growth for the remaining 14 was 6.6 mo. (shortest 5 mo;. longest 9 mo.). To obtain a comparabe figure for plants following the normal cycle where many more results were available, we used the following procedure. We ignored the data for 1978, the first year of the study, because most of the plants had been found some time after growth had begun.

Starting with the data for 1979 we took the first 18 single-shooted plants and totalled their growth periods. Taking the 1980 data we continued down the list of plants taking the next 18 single-shooted plants and added their growth periods to the previous total. We proceeded likewise with the 1981 data and then divided the grand total by 54 to get the mean period of growth which was 8.6 mo. (shortest 6 mo., longest 11 mo.). Thus on average, the plants that followed the regular cycle lasted two months longer than those that followed the abnormal cycle of growth. One plant lasted an exceptionally long time, from January 1980 to January 1981 and the new shoot produced in January 1981 lasted to the end of the study in December 1981.

Some vegetative shoots had only a few small leaves and died quickly, others had many more and larger leaves. The maximum number of leaves observed on any plant has been thirteen. We did not routinely measure the size of leaves but Schultes (1967) gives the maximum length as 45 cm and this seems about right to us. So far, we have not attempted to meausre the growth of pseudobulbs.

Reproduction

Flowering occurs mainly in the dry season (Table I). In 1978 and 1980 the peak month was March and in 1979 and 1981 the peak month was February. There has been some flowering also in December, normally a transitional month from rainy season to dry, and in 1981 one plant was in flower on 14th November. In 1979 one plant flowered in June and in 1981 No. 79 flowered in August in the middle of the rainy season. No. 79 had not behaved abnormally before but the vegetative shoot that had sprung up in December 1980 had dried up completely by the time of our visit in June 1981 and the new vegetative shoot produced in July flowered in August. Plant No. 79 was remarkable too in another respect. Normally, when a plan is going to flower it produces the flowering stalk early in the growth of the vegetative shoot and in the axil of a scale leaf but in No. 79 the

flowering stalk was terminal.

Table II summarizes the observations on flowering and fruiting. With visits only once a month it was impossible to get accurate counts of the number of flowers on each inflorescence. However, by counting buds and drying flowers as well as open flowers it was possible by adding all the figures to get an estimate but one that is undoubtedly low.

TABLE I

The numbers of inflorescences that flowered in every month of each of the four years of the study. Numbers in brackets indicate inflourescences on which buds were counted in one month but on which no flowers were seen in the following month.

	1978	1979	1980	1981
January	0	1	0	3+(1)
February	2	7+(1)	2+(2)	5+(4)
March	12+(2)	6	10+(2)	5
April	2	3	2	1
May	1	0	1	0
June	0	1	0	0
July	0	0	0	0
August	0	0	0	1
September	0	0	0	0
October	0	0	0	0
November	0	1	0	0
December	0	0	0	2
Total.	19	20	19	22

TABLE II

Summary of reproductive performance

The figure in brackets (19) in the 1981 column is the number of buds and flowers counted on the two inflorescences that flowered in December 1981 (see Table I) whose fruits, if any, would have matured outside the study period. Therefore, this figure is subtracted from the total number of flowers counted in 1981 (568) before calculating the figures for number of fruit set and matured per 100 flowers.

	1978	1979	1980	1981
1. No. plants flowering	21	22	23	23
2. No. of inflorescences	21	23	23	24
3. No. infl. on which buds & flowers counted	19	20	19	22
4. No. of flowers counted	570	546	445	568 (19)
5. Av. No. flowers per inflorescence 4/3	30.0	27.3	23.4	25.8
6. No. of fruit set	10	1	4	13
7. Av. No. of fruit/ 100 flowers	1.75	0.183	0.899	2.36
8. No. of fruit matured	6	1	4	11
9. Av. No. of matured fruit per 100 flowers	1.05	0.183	0.899	2.00

Sometimes a flowering stalk would be recorded on one visit but not on the next. When looked for, most of these stalks were found to have been eaten, possibly by grasshoppers. This accounts for the difference in Table II between the figures for the number of inflorescences produced and the number on which flowers or buds were counted. The table shows the greatest mean number of flowers per inflorescence as 30.0. A particularly handsome specimen that flowered outside the study area and which we must have encountered at the peak of its flowering had 95 flowers and buds. Although others may not normally bear so many flowers it gives some idea of the extent to which our counts may be underestimates. One of the striking features of the table is the low number of fruit set in any one year in relation to the number of flowers produced A particularly bad year was 1979 with only one fruit set. The number of fruit that mature may be even fewer than the number that set. We do not know what causes the disappearance of fruit between visits. Other ground orchids on the savanna such as *Epistephium parviflorum* and *Otostylis brachystalyx* set very many more fruit and it may be well worthwhile in the future to get comparative figures for these orchids. These facts suggest that the pollinator of *Cyrtopodium* is very much rarer than those of other orchids. We do not know what it is and, barring a stroke of luck, finding out would require an enormous investment of time. We do not know either how long flowers last and how long the stigma remains receptive. Very frequent, even perhaps daily, visits would be required to find out.

Not one of the plants that flowered did so in all four years of the study. Twenty-eight flowered once, 21 flowered twice and four flowered three times. Table III compares with respect to size those plants that flowered with those that did not. It is seen that no small plant flowered and only four in the small to medium category did so. The other 49 plants that flowered were medium sized or larger. On the other hand only one large plant (No. 100) did not flower. It was observed for only two years and died an untimely death as will be described later.

Fruit take 5.8 months to mature. This is the mean time taken for all the 19 fruit in which we observed the fruit shortly after setting and recorded its dehiscence. Of the other nine fruit observed three were first seen long after setting, two were not recorded as having dehisced (though observed for seven months) and four disappeared before dehiscing.

Since *Cyrtopodium* sometimes produces two or three shoots simultaneously the possibility exists that in time subsequent shoots may separate and the connections decompose so that two independent plants become established. We observed no instance of this during the four year period but the clumped distribution of the plants in the field suggests that many of the plants we now consider separate were not always so.

TABLE III

The numbers of plants in the different size categorises flowering and not flowering: s = small, sm = small-medium, m = medium, ml = medium-large, l = large. Small-medium plants are those sometimes assessed as small sometimes as medium. Medium-large plants are those sometimes assessed as medium sometimes as large.

	s	sm	m	ml	l	Total
Flowering	0	4	19	9	21	53
Not flowering	16	7	15	11	1	50
Total:	16	11	34	20	22	103

Hazards and Death

The environment in which *Cyrtopodium broadwayi* grows is so hostile that it may of itself be considered a hazard. In the course of the study 18 plants died and decomposed and two others, though not recorded as having decomposed, remained dried up for more than a year and are presumed to have died. Of these 20 plants six died in the first year before we started recording the size of the plant. Of the others, eight are small, three small to medium, two medium sized and one large. All but the large plant seemed to have died of inanition — a failure to maintain themselves in the harsh environment. The large one (No. 100) died after termites attacked the pseudobulbs and demolished them. On 17th May 1981 we found plant No. 71 partially dug up. A termite nest built among the old pseudobulbs had been torn open and we speculated than an anteater had been responsible. We must have visited the plant shortly after the incident for termites were still moving around within the hollow shells of old pseudobulbs. We knew that this plant too

would go the way of No. 100. It survived throughout 1981 and well into 1982 but by November 1982 had died from termite damage. Plant No. 59 was last recorded in leaf on 8th July 1979. Termites were noticed on 13th April 1980 and it was recorded as decomposed on 12th October 1980 so this plant too may have been killed by termites.

This may well be the first published report of termites devouring living orchid pseudobulbs but since none of the members of the group is an orchid enthusiast with wide knowledge of orchid literature we cannot be certain of this. However, it should also be reported that three plants (nos. 46, 47 and 50) were recorded as having been attacked by termites on 16th September 1979 but they all survived until the end of the study.

Love vine *(Cassytha americana)* parasitized two plants but both survived to the end of 1981. We have never seen any damage to leaves that may be attributed to caterpillars but flowering stalks have been cut off and leaves infrequently eaten in such a way as to suggest that grasshoppers are the culprits. Fire is a hazard on the open savanna. Shortly after we began work in 1978 there was a fire in the main savanna near the study area and we observed and marked an orchid that had been burned. The orchid later produced a new shoot so we assume that many of the orchids must survive fire. This seems clear, too, from the fact that orchids are found there at all, because recruitment to the population from seed must be very low.

In the list of hazards we should not exclude man. *Cyrtopodium broadwayi* is a beautiful orchid (see cover) and collectors could easily decimate the population. We know of no one who has succeeded in growing it for any length of time outside its native habitat even when a column of the original soil is taken with it. We advise orchid collectors, therefore, to admire it in its habitat and refrain from experimenting with it or, alternatively, to try propagating it from seed.

DISCUSSION

This study has revealed that *Cyrtopodium broadwayi* in its natural habitat grows for about nine months beginning approximately with the beginning of the dry season at year's end and ending with the "petit careme" (little dry season) in October. It flowers mainly in the dry season with a peak in the period February — March. However, a few plants begin growing at mid-year and may flower then. This explains the seemingly strange flowering behaviour recorded by Schultes (1967). Our studies have shown, too, that the flowering period is more extensive than that recorded in the Flora. But this pattern of growth and flowering presents a paradox. Either the plants respond to the same stimulus at both periods of the year when to us conditions seem so different that a similarity is hard to imagine, or they respond to different stimuli which would be a very unusual state of affairs. If we reject external stimuli and opt for an explanation based on internal ones we are faced with the question why do the plants not begin growth and flower each with its own rhythm all through the year? Obviously this is an area for further research.

But more important to us is the question with which we began. Is *Cyrtopodium broadwayi* in danger of extinction? It is true that the orchids in our study area were more numerous than expected. It is true, too, that we found them in the adjoining large savanna and in another savanna and it was good to see that the orchid can survive fire at least sometimes. On the other hand, however, the rate of fruit production seems to be much lower than in other savanna orchids and so too, we must assume, must be the rate of seedling production. In addition, hazards from termites and anteaters were revealed that were unsuspected before the study was begun. The rate of death has also been fairly high 20 out of 117 plants in four years and No. 71 is known to have died since. As recorded above, two of the 20 died from termite damage. There was no obvious cause of death for the other 18. Only one of the latter was associated with an island of taller vevegation. The remainder were either in open areas where the main vegetation was the small grass *Paspalum pulchellum* or in areas were the sedge *Lagenocarpus tremulus* was dominant. We therefore ansume that these plants died of inanition — a failure to extract sufficient nutrient from the impoverished soil to enable them to survive. All were in the small to medium categories.

One of the features of the distribution of the orchid that is not apparent at first sight is its tendency to be associated with dicotyledonous shrubs in small islands of higher vegetation and to be more common where *Lagenocarpus tremulus* is abundant. In addition, those associated with larger plants seem on average to be larger than those that are not. Whether they benefit from the larger plant or grow better simply because the soil is slightly better in the patch is an open question. In this connection it may be relevant to note that larger plants such as fat pork, *Crysobalanus icacao*, provide perches for birds whose droppings would improve the fertility of the soil in the immediate vicinity.

It seems too much to expect that a seedling from the minute seed of a *Cyrtopodium* could establish itself in the open savanna. It seems to us more likely that seeds will find their symbiotic fungus and germinate only in the more favourable areas where a greater variety of plants exists. There the seedlings will manage to establish themselves and in time grow into large plants. These will gradually over the years, or even centuries, spread out into the open by asexual reproduction but because of the poorer supply of nutrients there the pseudobulbs will in time store less food, the plants will become less vigorous and eventually die. If this view is correct the wastage will be made good by growth from more favourable areas *as long as they remain.* It would be crucial, therfore, in any plan to preserve the savannas to preserve the palm-marsh forest that surrounds them and the islands of tall vegetation within the savannas. If this is done *Cyrtopodium broadwayi* may well be safe. If it is not done, it may vanish forever.

Acknowledgements

We thank the following persons: Prof. J.S. Kenny who suggested this study, who introduced us to the orchid in its natural habitat and who commented critically on the first draft; Dr. J. Duncan who also made constructive comments on the first draft: Dr. C. Dennis Adams and Miss Y. Baksh who helped with identification of plants; the many members of the club and their friends who accompanied us on single visits and helped to find the orchids or who helped in the observations of their behaviour. These last are much too numberous to list.

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Two New Freshwater Fish Records for Trinidad and Some Comments on the Zoogeography of the Southern Peninsula

By Mary Alkins, Department of Zoology, University of the West Indies, St. Augustine, and *Gregory De Souza*, Institute of Marine Affairs, Chaguaramas.

TWO recent studies of the aquatic fauna of certain areas in the southwestern peninsula of Trinidad have yielded specimens of two species of freshwater characid fishes previously unrecorded for Trinidad. They are *Brycon siebenthalae* Eigenmann (1912) and *Triportheus elongatus* (Günther 1864), both belonging to the family Characidae, sub-family Bryconinae (Géry, 1977).

Two individuals of *B. siebenthalae* (Fig. 1) were caught by the senior author in the Quarahoon River west of the Chatham South Road and about three kilometres from the river mouth (Fig. 2(b)). They were caught with a three-millimetre-mesh push seine on 8/2/80 and 9/5/80 within the same section of the river which, at this point, is approximately three metres wide and 80 cm deep, shaded by cultivated cocoa, silk cotton (*Ceiba pentandra)* and fine leaf (*Pentaclethra macroloba)*. This section of the river is a refuge of permanent water during the dry season in an otherwise intermittent stream. Both individuals were of a large size, 174.4 and 200.9 mm standard length respectively. The first individual caught had an arc-shaped wound on its dorsal side which may have been caused by caiman which are common in the river at that point. The second specimen was subsequently identified by Dr. Stanley Weitzman of the U.S. National Museum, Washington DC, as *B. siebenthalae*; Dr. M. Boeseman of the Rijksmuseum van Natuurlijke Historie, Leiden, confirmed the identification of the first specimen as also being this species. Interestingly, *B. siebenthalae* was known only from the type specimen housed in the Chicago Museum of Natural History, originally caught in Mud Creek, Aruka River, Guyana. The two recently caught specimens are now housed in the USNM (cat. no, 235526) 200.9 mm SL, and the RMNH (cat. no. 28943), 174.4 mm SL.

Two individuals of another characid, *Triportheus elongatus* (Fig. 3), were caught with a horned cast net by the junior author in the mouth of a channel leading from the sea into Los Blanquisales Lagoon (Fig. 2(b)) on 21/9/81. A further eight specimens were collected by the junior author in a similar locality on 1/10/81. These specimens were tentatively identified by Dr. Max Sturm of the IMA as *T. elongatus*. Meanwhile, on 29/9/81, a collection made by the senior author and Prof. J.S. Kenny at the mouth and lower reaches of the Quarahoon River (about six kilometres from the Los Blanquizales site) yielded 12 more individuals. Five of these were positively identified by Dr. S. Weitzman as *Triportheus elongatus* and are now lodged at the USNM (cat. no. 229911), 56 – 108 mm SL. Dr. Weitzman also commented on the uncertain taxonomy and need for revision of this genus.

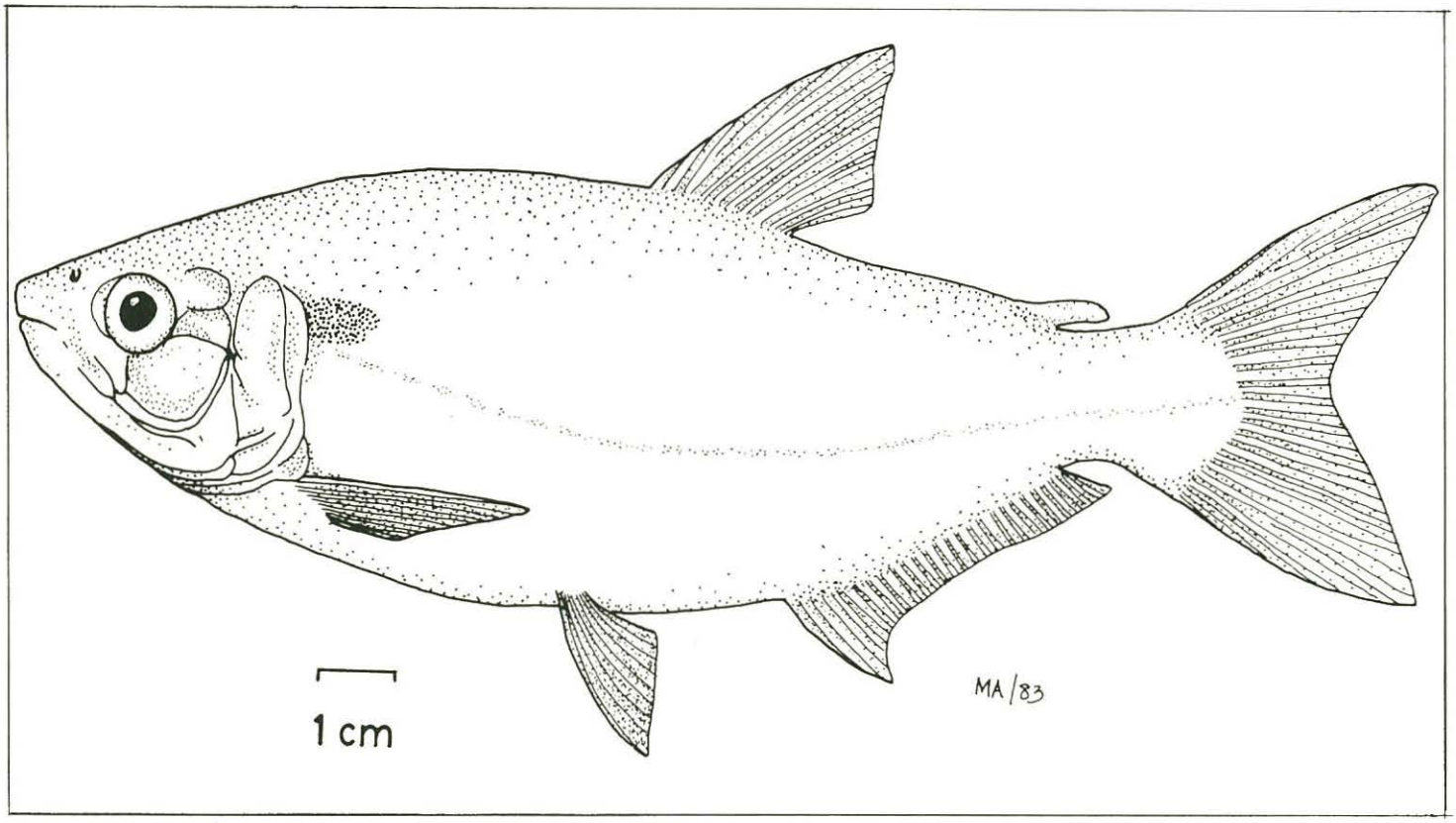
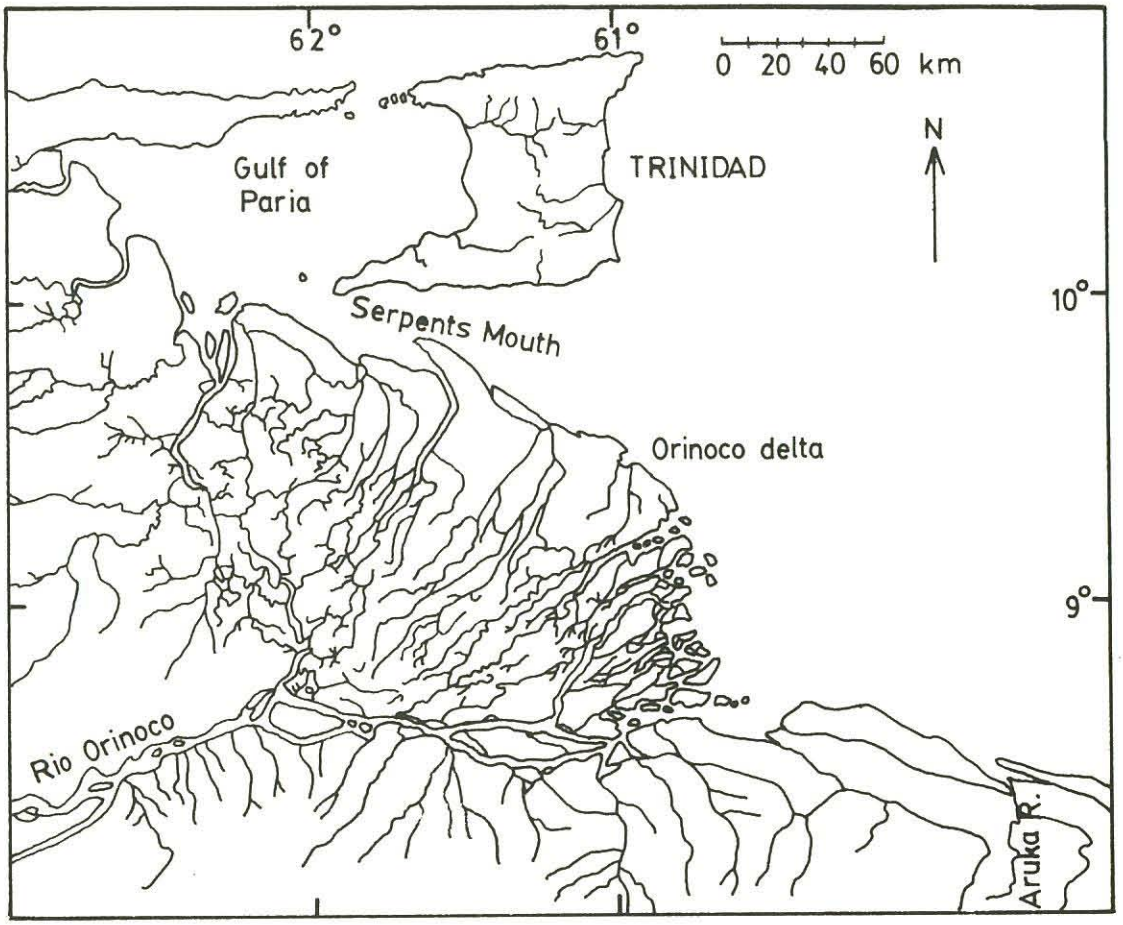
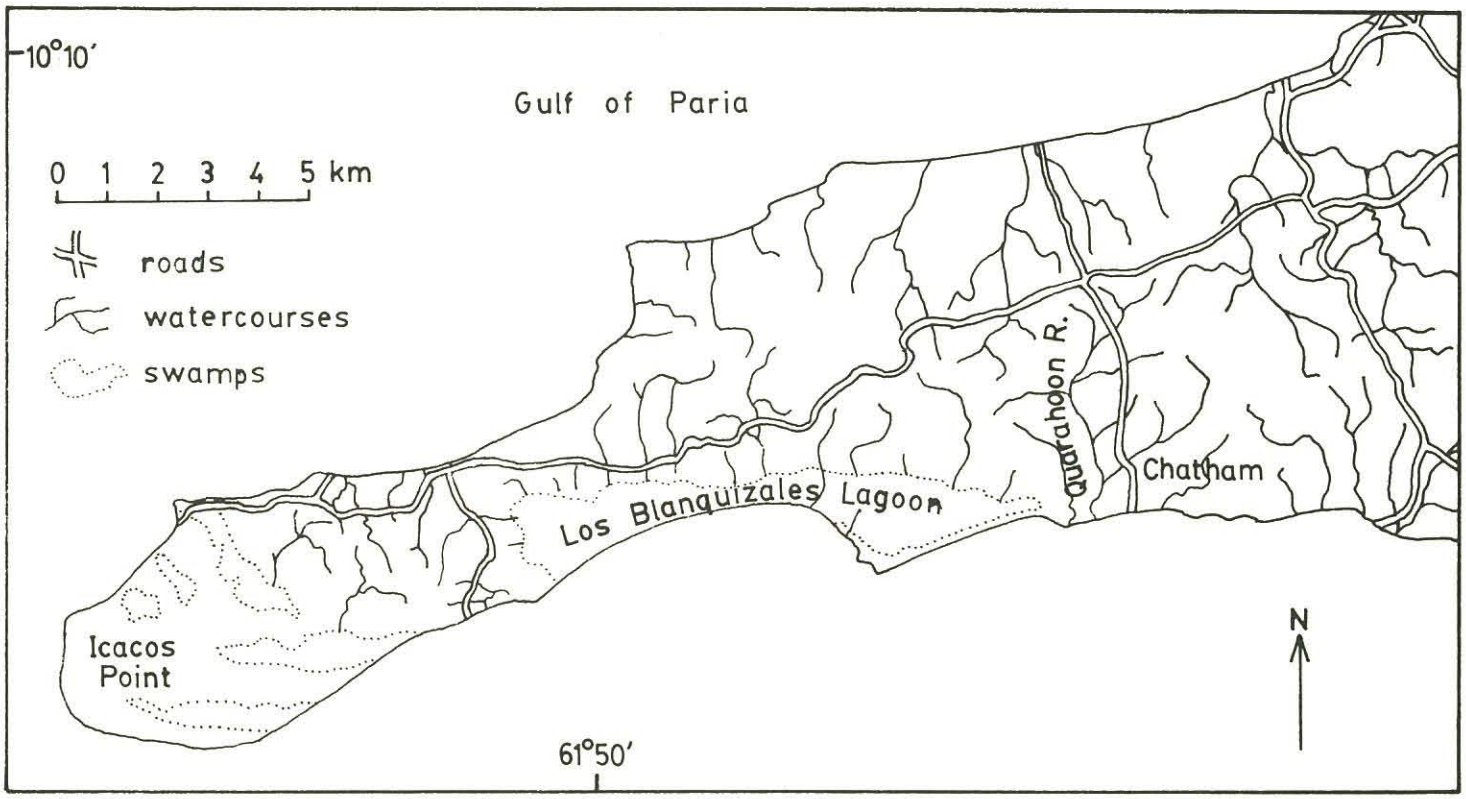


FIG. 1: Brycon seibenthalae (re-drawn from Eigenmann, 1912).



(a)



(b)

FIG. 2: (a) Trinidad in relation to the Orinoco delta and Aruka River, Guyana (adapted from van Andel and Postma, (1954). (b) The southwestern peninsula of Trinidad showing collecting areas and general hydrography.

Brycon siebenthalae was previously considered 'peculiar to the Guianas' being known from only one specimen caught in the Aruka River drainage, western Guyana (Eigenmann, 1912)[1]. However, Mago-Leccia reports that although there are no publications on it other than the type description, he has found it common in the middle and lower parts of the Orinoco drainage (Mago-Leccia, pers. comm. to S. Weitzman). Further, there is a possibility of this species having an even wider range than previously recorded because the South American faunas are so poorly known. *Triportheus elongatus*. on the other hand, seems to have a fairly well documented wide range, being common in the Upper Amazon (Géry, 1977) and also occurring down to the mouth of the Amazon (Garman, 1890, cited in Eigenmann, 1912), the Orinoco near Ciudad Bolivar (Steindachner, 1879, cited in Eigenmann, 1912) and north-western Guyana (Eigenmann, 1912). However, given the need for revision of this genus, the seemingly wide distribution of this species can only be regarded as tentative.

Locally, neither of these two species has been recorded from previous collecltions (most recently Price, 1955; Boeseman, 1960, 1964, and Kenny, in prep.) which have all included coverage of the southwestern peninsula and, in particular, the same drainages where these two species were found. This strongly suggests that the presence of *B. siebenthalae* and *T. elongatus* is as a result of dispersal from the South American mainland and not as a result of inadequate sampling in previous collections. If this is the case, these new records raise cdrtain questions about the degree to which the salt water crossing between Trinidad and the mainland acts as a barrier to freshwater fish movements.

Characins have generally been considered primary freshwater fishes, that is, they are strictly confined to freshwaters with little or no tolerance for salt or brackish water (Myers, 1938; Darlington, 1957; Roberts, 1973, Géry, 1977; and others). Although Myers (1938) points out that some characins do enter brackish water in estuaries, he stresses that these and other primary division freshwater fishes would not survive in the sea for more than a few hours and none would breed there. He further generalises that there is a tendency for all or nearly all the species of one family to show a similar tolerance for salt water. Darlington (1957) questions the validity of this assumption since the salt tolerances of many freshwater fishes are generally unknown and he cites several examples of fish belonging to primary division families which enter the sea, for example, a Japanese carp (cyprinid), *Acahara hakonensis*, widely distributed in rivers and frequently taken in the sea (Myers, 1938; Jordan, 1905 and Okada, 1955, cited in Darlington, 1957). The specimens of *T. elongatus* collected by the junior author were caught in water of salinity 12°/oo (Sturm and de Souza, in press), while those caught by the senior author were found in greater numbers at the mouth of the Quarahoon River (salinity estimated by taste to be about 5 — 10°/oo) than further upstream in less saline conditions. These fish at the river mouth showed no obvious stress and there is a possibility that the difference in relative abundance observed when moving upstream might indicate a salinity preference as a result of acclimation. Further, three of the specimens caught at the mouth of the Quarahoon River on 29/9/81 are still alive at the time of writing (January, 1983) in the Zoology Department, having been kept in unfiltered, unaerated water of slainity 5°/oo and have grown substantially during this time. This indicates a certain degree of hardiness and salinity tolerance for extended periods for these individuals.

The south coast of Trinidad is separated from the mainland by a shallow channel about 10 kilometres wide, and from the delta of the Orinoco by a distance of 20 to 25 kilometres (Fig. 2(a)). Surface salinities range here from 30°/oo at the mouth of the Orinoco to 34°/oo at the south coast of Trinidad in the dry season, and 5°/oo to 15°/oo respectively in the wet seaosn (van Andel and Postma, 1954; Fukuoka, 1964). This decrease in wet season salinities is caused largely by the increased discharges from the South Ameircan rivers, for example, the Orinoco, Essequibo and others. These salinity readings were taken only during the 'early rainy season' (van Andel and Postma, 1954), and during the months of Augus' 1960 and April 1961 (Fukuoka. 1964) and therefore are not seasonal averages, nor are they indicative of extreme conditions which might ensue at certain times of the year. It can therefore be expected that during times of intense flood of the larger mainland rivers, surface salinities may be even lower than those recorded, or be consistently low from the mainland to the Trinidad south coast.

Under these conditions, it is conceivable that characins such as *Triportheus elongatus* which seem to have some degree of salt tolerance may be able to accomplish such a crossing. This event is not totally unlikely since a similar situation exists on the west coast of British Columbia. The freshwater peamouth chub, *Mylocheilus caurinus*, has been shown to be able to successfully accomplish an experimentally simulated crossing of the 48 kilometre Strait of Georgia separating the Fraser River on the mainland and the Nanaimo River on offshore Vancouver Island where it occurs (Clark and McInerney, 1974). This salt intolerant fish seems to be assisted by low salinities across the Strait, ranging from 2°/oo at the mouth of the Fraser River to 15°/oo near Vancouver Island, which are caused by rapid snow melt and consequent large discharge of the Fraser River on rare occasions. Such 'low salinity corridors' may well exist between the South American mainland and Trinidad during the wet season.

Another way in which freshwater animals may cross salt water barriers is by being carried along with the flood of large rivers within rafts of vegetation. Gorman (1979) reports that during a hurricane in the Pacific in 1971, rafts of vegetation up to 10 metres across were swept out of the Rewa River, Fiji, into the Pacific Ocean and on these were collected three species of freshwater molluscs and six species of arthropods. A similar situation very likely exists locally since the south coast beaches are often littered during the rainy season with tangled mats of *Eichornia* sp. which during life, serve as a habitat for many terrestrial arthropods and small aquatic organisms (Dasmann *et al*, 1973; National Academy of Sciences, 1976; Mitchell, 1978). Similar mats of *Eichornia* have been observed by the senior author at the mouth of large rivers in Surinam even in May, and also living mats have been seen at the mouth of the Quarahoon River in the rainy season.

The possibility of dispersal from the mainland to the south coast of Trinidad also exists for other mainland species. Kenny (1977) records the frog *Leptodactylus macrosternum* from a swamp on the southwestern peninsula and suggests that it is a new arrival from the mainland. Tapir, *Tapirus terrestris*, and capybara, *Hydrochoerus hydrochaeris*, have in the past, appeared in the forests of the southern part of the island but no breeding populations of either exist in Trinidad. Also, in mid- 1981, a specimen of the mata mata, *Chelys fimbriata*, was caught by villagers on the beach near the Chatham area on the south coast. This species is said to be a rare inhabitant of Trinidad (Underwood, 1962) but the presence of barnacle shells on the carapace of this specimen is evidence for prolonged exposure to estuarine or marine conditions and there is a possibility of it having crossed from the mainland to the south coast of Trinidad. This specimen is currently on display at the Emperor Valley Zoo, Port of Spain.

1. There is some discrepancy in Eigenmann (1912) with respect to *Brycon siebenthalae*. Firstly, the specific name is spelt in two different ways, being *B. siebenthali* in the species lists of the locality tables, and *B. siebenthalae* in the type description and elsewhere. Secondly, in a table comparing the species composition of different regions from the Orinoco to French Guiana, *B. siebenthalae* is recorded as being from 'the Essequibo below Warraputa' while in a second table showing the distribution of species obtained in the areas examined during Eigenmann's expedition, the one individual caught is recorded as being from 'coastal streams, northwest coast'. The latter locality is supported by the locality data in the type description, Mud Creek, Aruka River, which is shown in the plates to be quite distinct from the Essequibo River. It seems, from the report of the expedition, that Eigenmann himself did not collect this specimen since a colleague, Mr. S.E. Shideler who accompanied him on this expedition to Guyana, made collections in the northwest coastal region while Eigenmann worked slowly along the Potaro and back down the Essequibo River. This may be a reason for the discrepancy in allocation of a locality.

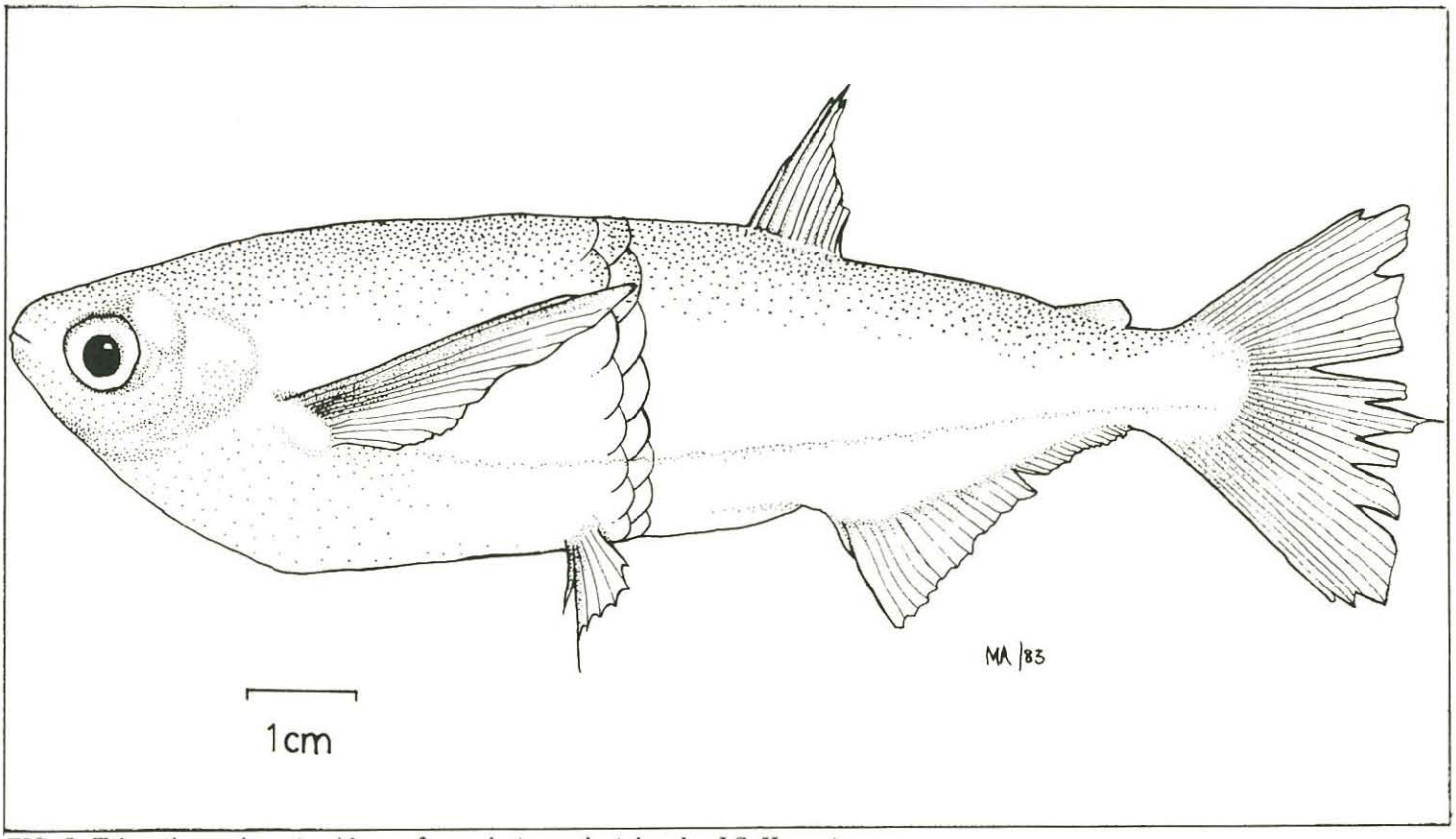


FIG. 3: Triportheus elongatus (drawn from photographs taken by J.S. Kenny).

Dispersal, however, does not necessarily imply successful colonisation, since this depends on the establishment of breeding populations. In the case of *B. siebenthalae*, establishment does not seem to have occurred in the Quarahoon River since intensive fishing of the same stream has been carried out every month up to July 1982, and no further adults or juveniles have been obtained. It has not been ascertained whether *T. elongatus* is still present and, if so, breeding in the area.

Acknowledgements to Drs S. Weitzman and M. Boeseman for identifying the specimens of *Brycon siebenthalae* and *Triportheus elongatus*; Prof. J.S. Kenny and Dr. R.W. Bruce for reading and making valuables comments on the manuscript; technicians of the Department of Zoology and the Institute of Marine Affairs for valuable assistance in the field.

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Reptiles of Soldado Rock, Trinidad

By Hans E.A. Boos, Emperor Valley Zoo, Port of Spain

SOLDADO ROCK lies approximately 5 km due west of the south-western peninsula of Trinidad. Visits to this rock over the years by the Trinidad and Tobago Field Naturalists' Club have been made, and the flora and fauna noted.

The first mention of a reptile on Soldado rock was by Richard ffrench when he lectured to the Club on September, 19 1969. This reptile was the Common Iguana, *Iguana iguana iguana*. Though the iguana is recognised as a vegetarian, ffrench (1969) noted that it eats the eggs of the Sooty Tern, *Sterna fuscata fuscata*, and the Noddy Tern, *Anous stolidus*, which nest on Soldado Rock from March to June. He also noted the four species of plant found there.* These are the only land based plant food available to the resident iguanas. ffrench queried the food and survival of the iguanas during the months when there were no eggs available. However beside the four plants some of which may be unpalatable to iguanas, from July to December great rafts of floating vegetation are swept out of the Orinoco River Delta and many of these rafts must make land-fall on Soldado Rock, which stands in the middle of the Serpents Mount passage, through which strong currents sweep (Field 1975) and the prevailing winds for these months funnel. Though these rafts consist mainly of the Water Hyacinth *Eichhornia crassipes* and Water Lettuce *Pistia stratiotes*, they most likely provide sufficient other vegetation as well, on which the Iguanas can feed. Iguanas are more than likely carried to Soldado Rock on these floating food-stores.

The expedition to Soldado Rock by the Trinidad and Tobago Field Naturalists' Club on March, 28 1982, revealed that not only were the iguanas still present and surviving, for one specimen was caught, examined, photographed and released, but that another reptile had managed to reach this barren rock, most likely as a passenger too, on the rafts of north-westerly drifting plants and debris.

A small gecko, a female of the species *Sphaerodactylus molei* was collected (V. Quesnel 1982) under loose rocks on the eastern slope of the rock. Searches failed to turn up any more. This specimen was photographed and preserved.

Thus the list of repitiles of Soldado Rock is as follows:

Family: Iguanidae
Iguana iguana iguana (Linneaus) — Iguana

Family: Gekkonidae
Sphaerodactylus molei Boettger — Mole's Gecko

Isolation on such a small rock with a restricted, chancy and seasonal food supply must put great pressure on the population of iguanas there and must prompt them to utilize their swimming prowess to secure food at times from the sea. Rafts of vegetation sweeping past or washed up near the island on the many exposed reefs must tempt the iguanas to secure this food by swimming to get it.

Evidence of this was the young iguana found in the stomach of a grouper caught by my father fishing on the reefs off Soldado Rock in the 1950s.

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* On the club's visit on 28 March 1982 five species of plant were found: *Eleusine indica, Plumbago seandens, Paspalum vaginatum, Mariscus ligularis* and *Portulacca oleracea*. Ed.

Panstrongylus rufotuberculatus, a New Reduviid Bug Record for Trinidad

By I. Omah-Maharaj. Department of Zoology, The University of the West Indies, St. Augustine, Trinidad.

A REDUVIID bug belonging to the sub-family Triatominae, was collected by M.J.W. Cock at the Textel Station, Morne Bleu, Blanchisseuse in February 1981. The specimen was subsequently identified by the author as a male *Panstrogylus rufotuberculatus.* This is the first record of this species in the island.

The importance of this record is due to the fact that all triatomid bugs are blood feeders and, because of this habit, some members of the sub-family are vectors of the protozoan parasite *Trypanosoma cruzi.* This parasite is the aetiological agent of Chagas's disease, a human disease of widespread occurrence in South America.

P. rufotuberculatus has been recorded as naturally infected with *T. cruzi* in South America. To date, only the one specimen of *P. rufotuberculatus* has been collected in Trinidad, and this unfortunately, could not be examined for *T. cruzi.* Another member of the genus, *P. geniculatus*, occurs in Trinidad and specimens collected from various areas of the island have been found to be naturally infected with *T. cruzi* (unpublished data).

Information on the general biology, external structure, systematics and geographical distribution of these two species of triatomid buds, is given by Lent and Wygodzinsky (1979).

Since the presence of *T. cruzi* in the island has been clearly established, it is obvious that further collections of *P. rufotuberculatus* are essential in order to determine whether this species is a natural vector of the parasite in Trinidad.

My thanks to Dr. M.J.W. Cock for his interest in my research work, which resulted in the collection of this specimen and to Dr. Pedro Wygodzinsky of the American Museum of Natural History, for confirming the identification of the specimen.

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Panstrongylus rufotuberculatus *(male)*

The Terrestrial Reptiles of Monos Island

By Hans E.A. Boos Emperor Valley Zoo, Port of Spain, Trinidad

PHYSICAL FEATURES

MONOS Island is the first island to the west of the north-western peninsula of Trinidad, W.I. It is separated from Trinidad by a trench 22 fathoms (40 metres) deep (Underwood, 1962) called the First Boca, Boca de Monos, or the Apes Mouth, which is approximately 800 metres wide at its narrowest point, between the area of Blanchette Point on the east of Monos Island, and Anse Paoua on the West of Scotland Bay on Trinidad.

On the west, Monos Island is separated from the next island, Huevos, by the Second Boca, Boca de Huevos, or Egg's Mouth by a trench 40 fathoms (74 metres) deep (Underwood, 1962) which is approximately 1300 metres wide at its narrowest point between Point Braba on the East of Huevos Island and Point Courant (Cape Cola) on the west of Monos Island.

Very strong currents called 'remous' (Vincent, 1910) sweep through these narrow passages every day with the rise and fall of the tides.

Monos Island is rugged and mountainous with deeply indented bays on the south and east and with steep cliffs on the west and north. It measures 2.4 x 4.0 kilometres (1.5 x 2.5 miles) (Underwood, 1962) and the highest point is 268.8 metres (942ft) (Latham, 1927). (See Map. Figure 1).

HISTORY AND DEVELOPMENT

The island has been inhabited for almost two centuries. It was decided by the Spanish Governor of Trinidad, Joseph Maria Chacon, in 1791 that the islands of Patos, Huevos and Monos be granted to the illustrious Cabildo to be leased out, the revenues created thereby to be used to increase the town (Port of Spain) funds (HSP 534).

The leases granted for Monos Island must have been for agriculture and fishing from the island. Some whaling in the Gulf of Paria was done from the point still known today as Copperhole Bay.

Today, very little of the original vegetation remains as a result of years of slash and burn agriculture which to a small extent is still practised on the island. Dense bush and vegetation remains only in the deep ravines between grass-covered ridges. The only valley that supports running water, and which at one time was extensively cultivated is the one which runs inland from Grand Fond Bay.

Here, there are remnants of an old cocoa and coconut plantation. There are also the odd avocado, mango, and other fruit trees. Tenacious, decorative hibiscus and other shrubs still exist.

In nearly every suitable site along the south and east coast, there are holiday homes and a few permanent residences.

GRAND FOND BAY

In Grand Fond Bay there is a small brick and wood structure that is called the Villafana house which stands on flat, low-lying land behind a stone break-water. This land is traversed by the only flowing water of a semi-permanent nature on the island.

The stream which runs down between the mountain ridges that enclose Grand Fond Bay has cut a well-defined channel in the valley in which there are many small pools that collect water in the wet season (June to December) and which retain some moisture even in the dry season (January to May), being refilled by occasional unseasonal showers.

Efforts to channel this run-off water had been made in the past as the remains of concrete culverts are still to be found up in the bush behind the Villafana House. This attempt at drainage, and the building of the stone break-water were probably an attempt to reclaim the foreshore area where the stream had broken up into many small distributaries and seepages, creating a swampy mangrove-like environment.

Today this area supports thriving colonies of fiddler crabs (*Uca sp.)* and "Blue" crabs (*Cardisoma guanhumi)* and is affected by the tides, becoming flooded to some extent at high tide.

During the Second World War (1939 — 1945) a road was cut into the valley and up to the highest point on the island to a gun emplacement. The remains of a landing area and pier can still be seen, but the road between the pier and the gun emplacement has almost completely disappeared under the secondary scrub-growth and cactus.

CLIMATE

Monos is a dry island. The climate and vegetation of the Grand Fond Bay area were surveyed in 1964 (Chalmers, 1965) and it was on this same expedition that the first listing of Reptiles on Monos Island was made and published (Manuel, 1965).

REPTILES OF MONOS

The first reptile reported from Monos was by R.R. Mole (1926b) who related that he had been told that "Cribos" were known from the island. Mole's "Cribo" was what is now called the "Yellow-tailed Cribo," *Drymarchon corais corais.*

If this snake survives on Monos island it was not collected by Raymond Manuel when he visited the island wth the Trinidad Field Naturalist's Club on the 16th — 18th May 1964, nor by Richard ffrench and G. La Forest on 1st — 3rd August of the same year (Manuel, 1965).

The following reptiles were recorded as a result of these two trips:

SNAKES

Boa constrictor	*Macajuel*
Drymobius boddaerti	*Machette couesse*

LIZARDS

Ameiva ameiva	*Common Garden Lizard*
Gonatodes vittatus	*Streak Lizard*
Iguana iguana	*Iguana*
Mabuya mabouya aenea	*Skink*
Plica plica	—
Thecadactylus rapicaudus	*Woodslave*

During another Trinidad Field Naturalist's Club week-end

field-trip/camp in the same area in 1966, one of the Club's members, John Correia, while on a hike to the top of the peak, collected a turtle. He unfortunately lost the specimen when he got lost trying to return to the camp site in the falling darkness. The identity of this turtle remains a mystery.

In 1974 I visited the Grand Fond Bay area, and I collected the small Mole's Gecko (*Sphaerodactylus molei)* from the spaces between the leaf-stems and trunks of the young coconut trees growing on the swampy land around the Villafana House.

In 1979 I was again collecting lizards in this area with Raymond Mendez of New York, when he saw and we collected a species of gecko that was unfamiliar to me. I have since sent another specimen of this lizard to the Museum of Comparative Zoology in Cambridge, Massachusettes for a positive identification. This gecko was quite similar to the common house dwelling gecko, *Hemidactylus mabouia*, but different enough for me to provisionally identify it as *H. palaichthus* (Boos, 1981). The M.C.Z. has given this specimen the number 159776 and confirmed my identification.

Up to this time no amphibians had ever been recorded from Monos Island. I did not recall ever seeing even one specimen of the hardy and common Marine Toad, *Bufo marinus*, on Monos Island during the years when, as a boy, I spent many holidays at several of the island houses on the South Coast.

THE 1979 FIELD NATURALISTS' TRIP

When the Trinidad & Tobago Field Naturalists' Club of decided to camp in Grand Fond Bay once again in 1979, it was agreed that the theme of activity for this field-trip was to be an investigation into the possible presence of amphibian life on the island. It was reasoned that, since the Grand Fond Bay area and the valley behind it were the wettest part of the otherwise dry and scrub-covered island, it was to be expected that we should find any amphibians here, if at all.

The long week-end chosen for the trip was at the height of the wet season, the 3 days and 2 night between August 31st and September, 2nd.

The river was flowing steadily, and there were many well established pools. The swampy delta area, near the sea, was extremely marshy and spongy. Seepages and irregular meanderings, of the river were common, and this made collecting or observations in this area unpleasant and difficult.

We had hoped too, to listen for the calls of frogs of the genus *Eleutherodactylus* as they were not dependant on flowing or standing water (in Bromeliads) for their metamorphosis. Their small froglets hatch directly from the spongy mass of jelly-like eggs which are deposited in any consistantly damp place (Cochran, 1961). Such locations were abundant in the valley, especially under and within the piles of semi-rotting coconut husks.

In similar situations on the island of St. Lucia, I had collected in such piles many *E. johnstonei.* We hoped to find similar populations of *E. urichi* in these coconut piles on Monos Island.

RESULTS

Though we made many forays into the bush, and up into the valley, both during the day and the night, though we listened diligently for *any* frogcalls especially the distinctive 'tink' of *E. urichi*, we neither saw, nor collected, nor heard anything that would indicate that there is an amphibian population in the Grand Fond Bay area on Monos Island.

However, an impressive collection of reptiles was made which includes several new records for Monos Island. This list follows with additional notes and includes previous records that have appeared in the literature. The scientific names have been updated.

Many of these new records are due to the sharp eyes and enthusiasm of the Club's members, especially John Seyjagat, and I am grateful to all of them for the help given in this survey.

THE REPTILE LIST FOR MONOS ISLAND:

Order: Squamata
Sub order: Lacertilia (Lizards)

Family: Iguanidae

1. *Iguana iguana iguana* (Linnaeus) *Iguana*
This lizard is well known from Monos Island, and though not seen on the 1979 trip, had been on previous visits. On fishing trips around the island Iguanas are a fairly common sight basking on rocks and cliffs and on trees overhanging the sea. There used to be a group of these lizards that became tame and were hand-fed for years in Guppy's Bay (Boos, 1977a). Recorded by Manuel (1965).

2. *Plica plica* (Linnaeus) *Plica*
This is a fairly common lizard in the Grand Fond Bay area on the tree trunks near the sea, as well as up in the dense jungle in the valley.

Family: Teiidae

3. *Ameiva ameiva atrigularis* Garman (Tuck & Hardy, 1973) *Zandolie.*
The 'zandolie is fairly common around the Villafana House, and several were seen, though none was collected.

4. *Bachia heteropa* (Lichtenstein) *Burrowing Lizard*
Two small immature specimens of this strange lizard were collected and have been sent to Jerry D. Hardy Jr. in the United States of America to have their subspecific taxonomic status verified. At the time of their capture I did not have a copy of Dixon (1973) on the systematic review of the genus, but with it now at hand it will be interesting to collect adults of this lizard and have them positively identified. On the immature specimens collected it was difficult to see the scalation features on their heads whereby a correct identification can be made.
It is most likely however that these lizards will turn out to be the same as the mainland form — *B.h. trinitatis* (Barbour).
This is a new record for the Island.

5. *Gymnophthalumus underwoodi* Grant *Shiny Lizard*
I saw a lizard disappear into deep leaf-litter and it looked like *G. underwoodi.* I shall have to collect one to confirm this sighting. This will be a new record for the island if verified.

Family: Scincidae

6. *Mabuya mabouya mabouya* Lacepede *Bronze Skink*
This skink is fairly common in the Grand Fond Bay area and I have collected it on several occasions.

Family: Gekkonidae

7. *Gonatodes ceciliae* Donoso — Barros *Variegated Gecko*
Three males were collected on damp rock faces, which is typical *G. ceciliae* habitat, far up in the valley. This is a first record for the island.

8. *Gonatodes humeralis* (Guichenot) *Spot-nosed Gecko*
This gecko was collected both up in the valley and on the tree trunks in the swampy area. This is a first record for the island.

9. *Gonatodes vittatus vittatus* (Lichtenstein) *Streak Lizard*
The streak lizard is common around the Villafana house, and on the tree trunks up in the valley it has been collected also under piles of loose stones, and lumber and in leaf litter.

10. *Sphaerodactylus molei* Boettger *Mole's Gecko*
I have collected this lizard on several occasions in the spaces between the leaf bases and tree trunks of the young coconut palms near the Villafana house. This is a first record for the Island.

11. *Hemidactylus palaichthus* Kluge *Spiny Gecko*

This lizard was collected by Raymond Mendez and myself in early 1977, again in August/September 1979, and another specimen in 1980. They were caught both during the day and at night as they were hunting for insects attracted to the lights on the outside of the Villafana house. A specimen sent to the M.C.Z. has been identified as *Hemidactylus palaichtus.* Given Specimen No. 159776 it verifies a provisional diagnosis (Boos, 1981). It is similar in general shape and appearance to the well known and widely distributed *H. mabouia* from Trinidad and Chacachacare Island (Underwood, 1962). Besides this common species Underwood (1962) lists another species, *H. brooki*, from Trinidad and Chacachacare Island.

H. brooki has been re-assigned to the taxon *H. palaichthus* by Kluge (1969). It has also recently been recorded from Tobago as well (Tuck, 1972; Hardy, 1982).

To date I have collected only the common species *H. mabouia* on Trinidad and Chacachacare Island (Boos, 1983) but it will be interesting to survey Chacachacare Island more thoorughly, and at night, to try to collect both these related species which were found by Underwood (1962) on coconut palm-trees growing side by side in La Tinta Bay. These two trees no longer exist. Similar checks on the island houses on Monos Island, at night, for *H. mabouia* should also prove very interesting. This is a new record for the island.

12. *Thecadactylus rapicaudus* (Houttuyn) *Turnip-tailed Gecko*

This large gecko was common in the area and its rattling call could be heard when we were settling down to sleep at night at our camp site. R.R. Mole (1926a) mentions hearing Gecko calls on Monos through he does not identify which lizard gave them.

Sub Order: Serpentes (Snakes)
Family: Boidae

1. *Boa constrictor constrictor* (Linnaeus) *Macajuel*

Three specimens were collected in 1979. One was taken in the shallow water of one of the channels of the river in the swampy area, and a party, hiking up the valley, caught two more. All three were females, about 1 metre long, and there were numerous ticks embedded in scar tissue in the neck area of the snakes. This snake was reported by Manuel as well (1965).

Family: Colubridae

2. *Drymachon corais corais (*Boie) *Yellow-tailed Cribo*

This snake was reported by Mole (1926b) to be on Monos Island. He was told by the locals living there that it used to prey on young chickens. In recent years no reports of this distinctive snake have been received, nor has it been collected and may well be extinct there. Even on Trinidad it is uncommon (Boos, 1975)

3. *Mastigodryas boddaerti boddaerti* (Sentzen) *Machete couesse*

This snake, collected and recorded by Manuel (1965) has also been collected on nearby islands (Boos, 1967; 1983). It was formerly called *Drymobius b. boddaerti.*

Order: Crocodilia
Family: Crocodylidae

1. *Caiman crocodilus crocodilus* (Linnaeus) *Alligator*

Though this reptile has not been recently seen or collected on Monos Island, Medem (1970's?) records it from "Gran Fonde Bay, Monos Island" (sic) "up to about 20 years ago, but are now reportedly absent." Owing to the lack of adequate water on Monos Island, it is unlikely that there was ever a breeding colony there. They were more than likely strays from the swampy area of Tucker Valley, where there are still small numbers, or from the Caroni River and Swamp.

DISCUSSION

The reptile fauna, especially the lizards, of Monos Island is a rich one when compared with that of Trinidad and the other nearby islands of Huevos (Boos, 1967, 1983) and Chacachacare (Boos, 1983). It suggests a more recent separation of the island from Trinidad than the 10,000 years usually suggested by other authors (Underwood 1962, Emsley, 1977). To date, two of the four Iguanids, six of the seven Gekkonids, three of the seven Teiids, and the one Scincid found on Trinidad have been recorded there.

It is surprising that the Iguanids, *Polychrus marmoratus*, and *Anolis chrysoleps planiceps* have not been collected there, for they have both been taken nearby on Chacachacare Island (Boos, 1983), the second on Huevos Island (Boos, 1967), the first on Gaspar Grande Island (Boos, 1983 and both on the mainland of Trinidad opposite (Boos, 1977a and b, Johnson, 1946) I believe it is only a matter of time before these two lizards are collected on Monos Island.

It would be no surprise to find that the Iguanid *Anolis aeneus*, introduced to Trinidad from Grenada (Gorman & Dessaur, 1965) has established itself here too, having been brought over to Monos Island on vegetation and houseplants over the years, for it is common on other off-shore islands such as Gaspar Grande and some of the Cotorras or Five Islands (Boos, 1983).

Though seriously dwindling on the mainland (Gorman & Boos 1972) perhaps isolated colonies of *Anolis trintatis* may exist on Monos Island as it has been suggested (Donoso-Barros, 1968) that this species introduced to Trinidad from St. Vincent (Gorman & Dessaur, 1966) may be found on the Paria Peninsula of Venezuela to the west of Monos Island.

The gecko *Hemidactylus mabouia* will also probably be collected when a more thorough search is made at night in the many buildings of the houses on Monos Island.

The paucity of snakes, when compared to the rich list from Trinidad, is difficult to explain if we accept the concept, suggested above, of a more recent separation of Monos Island than the other islands to the west, Huevos and Chacachacare.

Unlike lizards, snakes are not generally gregarious. They are more widely territorial and the newly separated island would have had only the sparcely spread snakes that were occupying their respective territories at the time.

The macajuel, *Boa c. constrictor*, is a large, easily identified snake, and may have, in those more enlightened rural surroundings and times, been recognised for its rat-killing usefulness, and more often than not, left alone. Being a live-bearer with large litters of young, it has been able to hold its own against the pressures of increasing slaughter and habitat destruction.

Its natural food has been supplemented by the advent and spread of human habitation on Monos Island owing to the introduction of domestic fowls and the usual human habitation-following rats and dogs.

There is also the possibility of re-population of the island by rafting during the wet season on the floods down the Caroni and Cuesa Rivers, flowing out of the Caroni plain and Tucker Valley, before these areas were affected by modern human population.

The plight of the other less often collected or sighted snakes is indicated by Mole's report (1926) that the once abundant Cribo, *Drymanchon c. corais*, well known then on Monos Island, is no longer seen, and perhaps is no longer there.

The destruction of the natural vegetation on Monos Island is on a major scale owing to slash and burn roving agriculture over the centuries.

The subsequent yearly fires on the resulting grasslands that have covered a great portion of the hillsides, have also taken their toll. This destruction of habitat has undoubtedly been disastrous to the smaller species of snakes and their foods which may at one time have existed there in some natural abundance.

The remaining untouched and undestroyed habitats which may have protected the surviving species, were not safe either, for these were usually the sites chosen for clearing and the building of holiday homes. In these areas any snake encountered by the people working or building on the land would have invariably been killed owing to city-bred ignorance and fear.

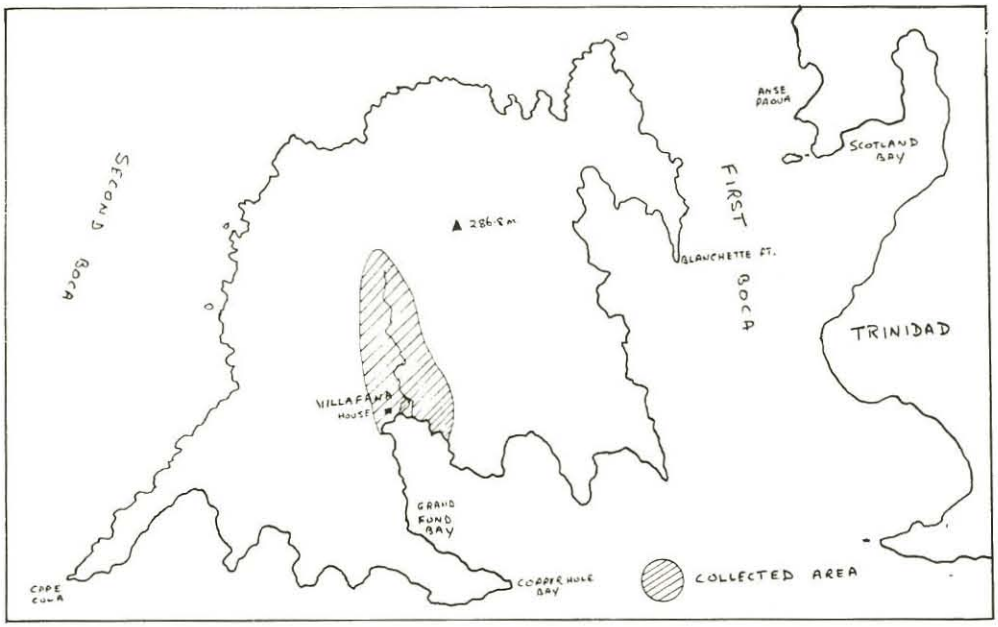

FIG. 1: Monos Island.

The Grand Fond Bay area has been a haven for some time since the turn of the century and since World War II, and all the collecting done so far, except for odd sightings, has been there, and up on the ridges overlooking the bay.

The machete couesse, *Mastigodryas b. boddaerti* has only so far been collected there. It is a shy, swift, and basically highly adaptable survivor at home both in dry scrub-covered hillsides or in wet river valleys. It survives on nearly all the off-shore islands of the Bocas (Manuel, 1965; Boos 1967, 1983. Lancini 1963). On Monos Island it is not known how widespread it is, but it possibly does well wherever the original forest cover has survived, on the steep slopes and cliffs of the North and West coasts of the island and in any other areas that are unsuitable for agriculture or houses.

It is surprising that more of the secretive smaller species of snakes, common in Trinidad, that one would expect to collect in the one remaining suitable habitat (Grand Fond Bay area) have not been found. They may yet be in the future.

There are many mysteries yet to be unravelled on Monos Island. The identity of the turtle collected and lost in 1966 by John Correia remains unknown. There are also reports of turtles or "morocoys," a local name that has come to mean many species, being caught for eating by the weekend inhabitants of the Villafana house in Grand Fond Bay. What these testudines are or were, may never be verified as they may be extinct there now.

Of all the Boca Islands, Monos is unique. There is further evidence to support my contention that geologically speaking Monos Island was still a part of the Trinidadian mainland until farily recently and which would account for the richness of its lizard fauna. This evidence is the presence of mammals. Its name, Monos, tells us that within human memory, monkeys were perhaps known from there. Columbus saw it in 1498 as he sailed out of the Dragon's Mouth — the collective name for all the Bocas.

Charles William Day (1852) suggested authoritatively that "Monos or Ape Isle, a large inhabited territory is named from the circumstances of its first inhabitants on its eastern side having heard the chattering of the monkeys in Scotland Bay on the main land of Trinidad."

Though Day may have been told this by the local inhabitants while he was spending his "Five Years Residence in the West Indies," he tended to beleive whatever he was told, and reported these stories as fact. He reports as well that "the fact of the crapeau blinding animals, by ejecting a corrosive liquid is thoroughly established throughout the country." Stories of this sort formed part of the folklore then as they often still do today.

Sir Claud Hollis (1941) further confuses matters in quoting Wise (1934) who suggested that Chacachacare Island was an onomatopoeic rendition of, once again, the "Chatter of the vivacious troops of monkeys that formerly lived *there*" (my emphasis). Not on Monos!

By no stretch of the imagination can the incredible morning chorus of the Red Howler *(Alouatta seniculus)*, which can still be heard in the forests of the north western peninsular of Trinidad, be described as "chatter." That the monkeys may have been capuchins *(Cebus albifrons)*, the second species found on Trinidad, is unlikely, as these monkeys are not as easily seen, nor are they likely to make enough noise to have been heard and noted from a distance to give an island a name.

There is another strange fragment of information which adds to the general confusion. Morrison (1955) says that Columbus on the night of August 12, 1498 having sailed east from his anchorage south of the Paria Peninsular of Venezuela, anchored in a harbour on Chacachacare Island which, Morrison says, Columbus called "Puerto de Gatos" and the translation is given as "Monkey Harbour". "Puertos de Gatos" means "Cat Harbour" — not "Monkey Harbour." If Cat Harbour is right — what cats on Chacachacare Island and why? If Morrison meant to write "Puerto de Monos" was the anchorage near Chacachacare Island, or Monos Island? The mind boggles.

No! Red Howlers are gregarious, noisy and easily seen and their presence on the island must have given Monos its name. Charles Kingsley (1871) says, "Monos as the old Spaniards named it, from Monkeys long since extinct." On the earliest maps the island is labelled Mono, (Columbine, 1803-16), Ape I (Thompson, 1816) and Isle de Monos (Mallet, 1802), and I can think of no greater evidence than that which I have presented here for the presence at one time of monkeys on Monos Island.

There, they were more than likely hunted for sport and for food. They are no longer there. They are all gone.

We found one more piece of evidence that supports my suggestion that Monos Island was the last island to be shaken off from Trinidad by the earth movements that have split and folded the mountains of the Northern Range. Walking with John Seyjagat through the dripping forest of Grand Fond Bay we came across the scattered quills of the South American Porcupine *Coendu prehensilis* on the jungle floor. Unlike the gregarious, loud Howler Monkeys, after which Monos Island was named, and whose morning and evening cries must have attracted

and aimed the hunters guns, the porcupine still plods its quiet, secret way, surviving on his island home. We saw squirrels up in the whispering bamboos as well. What other small mammals survive there?

The field is open. The years ahead will surely tell us much more about the reptilian fauna of Monos Island and many of the gaps will be filled, as new records are established and new species are collected.

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A Consideration of the Terrestrial Reptile Fauna on Some Offshore Islands North West of Trinidad

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THE northwestern peninsula of the island of Trinidad is separated from the Paria Peninsula of Venezuela by a passage known as the Dragon's Mouth. This passage is divided into four 'Bocas' or 'Mouths' by three large islands named Monos, Huevos and Chacachacare. These form part of the territory of Trinidad and Tobago.

To the southwest of these islands, tucked under the Paria Peninsula, is Patos Island, handed back to Venezuela in 1942. Up until that year this island had belonged to Trinidad and Tobago.

To the south of the northwestern peninsula of Trinidad there are several smaller islands of various sizes. Three larger ones are, Gaspar Grande (Gasparee), Cronstadt, and Carrera, and there are eight others, Centipede Island (Gasparillo), Little Centipede Island, and the Five Islands or Cotorras (really six), Pelican, Rock, Nelson, Lenagan, Caledonia and Craig. Pelican Island and Little Centipede Island are little more than rocks, yet have had houses built on them in the past.

These islands are utilized as follows: —

Patos	Fishing and weather station.
Chacachacare	Leprosarium, Light House and Coast Guard Station.
Huevos	Private House
Monos	Private houses and estates
Gaspar Grande	Private houses and hotel resort
Centipede	Not used
Little Centipede	Not used. Ruins exist
Cronstadt	Holiday house and mining company
Carrera	Security Prison
Pelican	Not used. Ruins exist
Caledonia	Not used. Ruins exist.
Craig	Not used. Ruins exist. Joined to Caledonia
Lenagan	Not used. Ruins exist.
Nelson	Outpost Army and Coast Guard. Detention and research centre.
Rock	Not used.

(See figure 1 Map)

Climate

All these islands are quite dry, receiving sporadic rains in the wet season from June to December. The vegetation is usually dry scrub, interspersed with cacti, thorn-bushes and ground Bromiliads. Only on Monos and Chacachacare are there any damp valleys supporting seasonal streams. Inhabitants on these islands depend on collected rain water or imported water for their supply.

Reptiles on the Islands

Collections of reptiles have been made on nearly all of these islands and in some cases the collections or sightings have been recorded and published. A history of these collections and observations is given below.

PATOS ISLAND

This island, lying south and about three miles from the Paria Peninsula of Venezuela, was, until 1942, part of the territory of Trinidad and Tobago. It has been visited many times by naturalists and collectors who made observations of its reptilian fauna. Though the visits and collections began early in this centiry the first written record of a reptile from Patos Island that I have been able to locate was by the naturalist R.R. Mole (1924), who recorded *Drymobius boddaerti* being observed there, and that his friend and oft-times co-author, F.W. Urich had collected three specimens of *Oxybelis fulgidus* there (Mole, 1926).

At present there are three specimens of *O. fulgidus*, labelled from Patos in the collection of the Universtiy of the West Indies, St. Augustine, that may be the ones collected by Urich.

Burt and Burt (1931) recorded the lizard *Cnemidophorus lemniscatus lemiscatus* from the island (though they mispelled it "Patas" B.W.I.) based on a specimen No. 8362 in the American Museum of Natural History received from the New York Zoological Society in 1916.

Parker (1935) described the gecko *Phyllodactylus mulleri* as a new species. It had been collected on Patos Island by Dr. Vesey Fitzgerald some time earlier and lodged in the British Museum as specimen No. 1934. 7.5.1. Parker noted the misspelling of Patos by Burt & Burt.

Stuart (1941), in his review of the snakes of the genus *Dryadophis*, listed *D. boddaerti boddaerti* from Patas Island, based on a specimen No. 8724 in the American Museum of Natural History, which was also received from the New York Zoological Society in 1916. Stuart, too, misspelled the name of the island.

Dixon (1962) synonymised *Phyllodactylus mulleri* with *P. ventralis*. This fact seems to have been unknown to Lancini when he published his paper on the reptiles of Patos Island (1963).

Underwood (1962) seems to have been ignorant of the record of *Phyllodactylus* on Patos, though he predicted the presence of this genus on "the islands of the Dragon's Mouth."

Having collected there in 1961 and 1962, Lancini (1963) added the following taxa to the reptiles from Patos.

Iguana iguana iguana
Hemidactylus mabouia
Thecadactylus rapicaudus
Gonatodes vittatus vittatus
Mabuya sp. (observed only).

Peters & Donoso-Barros (1970) list from Pato (sic) *Mabuya mabouya mabouya*, giving the species and subspecies unknown to Lancini. *Phyllodactylus ventralis* they accept instead of *P. mulleri* from Patos Island, and they list *Cnemidophorus lemniscatus lemniscatus* from Pato (sic.)

The genus *Mastigodryas* replaced *Dryadophis* according to Peters and Orejas-Miranda (1970). This snake had been known as *Drymobius boddaerti* both on Patos Island and mainland

Trinidad (Mole 1924) based on the original listing in Boulenger (1893) and this taxon was used up to recent times by many workers who were unaware of, or who ignored Stuart's (1942) revision of the genus *Dryadophis*, wherein he assigned the snakes found on Trinidad and Patas (sic) to the taxon *Dryadophis boddaerti boddaerti.*

Emsley (1977) listed *Leptotyphlops goudotii* as being known from Patos Island but does not give his source. It is unlikely that he collected there as the Venezuelan authorities have been extremely reluctant to allow anyone, except Venezuelans, to visit this island for almost twenty years. Emsley, (pers. comm. 1982) says that there may be specimens in the University of the West Indies collection, but so far I have been unable to find any support for this record.

Thus, the list of reptiles from Patos Island with the scientific names updated is as follows:

Lizards

Iguana iguana iguana (Linnaeus).
Mabuya mabouya mabouya (Lacépède).
Cnemidophorus lemniscatus lemniscatus (Linnaeus).
Phyllodactylus ventralis O'Shaughnessy.
Hemidactylus mabouia (Moreau de Jonnes).
Thecadactylus rapicaudus (Houttuyn).
Gonatodes vittatus vittatus (Lichtenstein).

Snakes

Leptotyphlops goudotii goudotii (Duméril, Bibron & Duméril).
Mastigodryas boddaerti boddaerti (Sentzen).
Oxybelis fulgidus (Daudin).

CHACACHACARE ISLAND

Chacachacare Island is the westernmost island belonging to Trinidad and Tobago and is separated from Venezuela to the west by the Grand Boca and from Huevos Island to the east by the Third Boca or Ship's Mouth. No complete recent reptile list has ever been compiled for Chacachacare Island.

The first mention of a reptile on Chacachacare is by R.R. Mole (1924) when he listed the snake *Drymobius boddaerti* from there. (See Patos Island for comment on this genus.)

Underwood (1962) listed the following reptiles, having collected there when he was head of the Zoology Department at the University of the West Indies in St. Augustine in the 1960s.

Lizards

Gonatodes vittatus
Hemidactylus mabouia
Hemidactylus brooki
Iguana iguana
Ameiva ameiva tobagana
Cnemidophorus lemniscatus lemniscatus
Gymnophthalmus underwoodi
Scolecosaurus trinitatis

In listing *Scolecosaurus*, Underwood was unaware that Vanzolini (1961b) had argued that this genus should be a synonym of *Bachia.* This concept was accepted by Thomas (1965) when he relegated the specimens from Trinidad to subspecific status of *Bachia alleni*, making them *B.a. trinitatis*, although Vanzolini (1961a) had redescribed a specimen from Trinidad as *Bachia trinitatis.* Kluge (1969) described a new species, *Hemidactylus palaichthus* and reassigned the lizards, formerly called *H. brooki* on Trinidad and Chacachacare Island, to this taxon.

Medem (1970s) recorded that "Bobby, a fisherman resident of Staubles Bay had seen a dead specimen" of *Crocodylus intermedius* "floating out of Boca Grande, north west coast, Chacachacare island in 1962-1964". This was certainly a stray from the Orinoco River in Venezuela.

Dixon (1973) relegated Vanzolini's *Bachia trinitatis* to synonymy of *Bachia heteropa trinitatis*, which form was found in Trinidad, Chacachacare Island and the adjacent Venezuelan mainland.

Tuck & Hardy (1973) showed that the correct mane for lizards in the genus *Ameiva* on Trinidad and Chacachacare was *Ameiva ameiva atrigularis.*

The following is an updated list of the reptiles recorded from Chacachacare Island. New records are marked with an asterisk. (*)

Lizards

Iguana iguana iguana (Linnaeus).
Anolis chrysolepis planiceps Troschel *1981 Personal collection specimen.
Polychrus marmoratus (Linnaeus). *1982 Matt. Cock coll. CIBC.
Ameiva ameiva atrigularis Garman.
Bachia hetropa trinitatis (Barbour).
Cnemidophorus lemniscatus lemniscatus (Linnaeus).
Gymnaphthalmus speciosus speciosus (Hallowell). *Pers. comm. J. Cole (1981) AMNH Coll. R. Mendez.
Gymnophthalmus underwoodi Grant.
Hemidactylus mabouia (Moreau de Jonnes).
Hemidactylus palaichthus Kluge.
Thecadactylus rapicaudus (Houttuyn). *Pers coll. 1981.
Gonatodes vittatus vittatus (Lichtenstein).
Gonatodes ceciliae Donoso-Barros. *Pers. coll. 1981 Photos

Snakes

Mastigodryas boddaerti boddaerti (Sentzen).

Crocodiles

Crocodylus intermedius Graves.*

HUEVOS ISLAND

Huevos Island lies between Chacachacare Island on its west and Monos Island on its east and is separated from them by the Third Boca or Ship's Mouth and the Second Boca or Egg's Mouth respectively.

The first list of reptiles for Huevos Island was made as a result of a visit to the island by the Field Naturalists' Club in 1965. The following reptiles were noted. (Boos, 1967).

Lizards

Plica plica
Anolis chrysolepis
Iguana iguana
Cnemidophorus l. lemniscatus
Mabuya aeneus
Gonatodes vittatus

Snakes

Drymobius boddaerti (See comment on Patos Island)

Six pairs of anoles from Barbados, *Anolis roquet cinereus* were released on the island (Boos, 1967) as an experiment in survival. In 1976 the survival of this lizard was checked and confirmed by two sightings (Boos, 1977-1978), and the correct taxon was used *Anolis extremus* (Schwartz & Thomas, 1975).

Emsley (1977) noted several snakes for Huevos Island, but does not say whether he collected them himself. That he did so is unlikely, as Huevos Island has been privately leased by the present lessees since 1927, and exploration and expeditions to the one area likely to supply specimens around the private house and buildings — have been severely curtailed. Personal communication with Mike Emsley (1982) has not clarified these

records, as his notes are lost, and he did not specify where his specimens might be lodged. He did not say if he made the trips to the island himself, with or without the permission of the lessees. In one fell swoop his listing increases the snake fauna of Huevos Island from one to six species.

An updated and corrected list of the reptiles on Huevos Island follows:

Lizards

Iguana iguana iguana (Linnaeus)
Anolis chrysolepis planiceps Trochel.
Anolis extremus Garman.
Plica plica (Linnaeus)
Cnemidophorus lemniscatus lemniscatus (Linnaeus).
Mabuya mabouya mabouya Lacepede).
Gonatodes vittatus vittatus (Lichtenstein).

Snakes

Atractus trilineatus Wagler*
Leptodeira annulata ashmeadi (Hallowell)*
Mastigodryas boddaerti boddaerti (Sentzen)
Oxybelis aeneus Wagler*
Sibon nebulata nebulata (Linnaeus)*
Tantilla melanocephala melanocephala (Linnaeus)*

*Recorded by Emsley (1977). The snakes marked with an asterisk (*) should be considered suspect until recollected and recorded.

It is interesting to note that when I collected the *Anolis chrysolepis planiceps* in 1976, I housed it temporarily with a female *Cnemidophorus lemniscatus lemniscatus* taken on the same trip. The *Anolis* came to grief, being eaten by the *Cnemidophorus*, which also died owing to over-gorging.

MONOS ISLAND

Monos Island is separated from Huevos Island on its west and the mainland on its east by the Second Boca or Egg's Mouth and the First Boca or Mono's Mouth respectively.

The reptile fauna has been surveyed by Boos (1983) and the following is a list of the reptiles of Monos Island.

Lizards

Iguana iguana iguana (Linnaeus).
Plica plica (Linnaeus).
Ameiva ameiva atrigularis (Garman)
Bachia heteropa trinitatis (Barbour)
Gymnophthalmus underwoodi Grant. Sighting only.
Mabuya mabouya mabouya (Lacépède).
Gonotodes ceciliae Donoso-Barros. Photos taken.
Gonatodes humeralis (Guichenot).
Gonatodes vittatus vittatus (Lichtenstein).
Sphaerodactylus molei Boettger.
Hemidactylus palaichthus Kluge. M.C.Z. Spec. No. 159776.
Thecadactylus rapicaudus (Houttuyn).

Snakes

Boa costrictor constrictor (Linnaeus).
Drymarchon corais corais (Boie). Probably extinct on Monos Island.
Mastigodryas boddaerti boddaerti (Sentzen).

Crocodiles

Caiman crocodilus crocodilus (Linnaeus).

GASPAR GRANDE ISLAND (GASPAREE)

This limestone island lying to the south of the north-western peninsula of Trinidad is extremely dry and scrub-covered.

Many holiday houses are built on the northern coast line. The first mention of a reptile on this island is by R.R. Mole (1926). He listed the snake *Drymobius boddaerti*, having collected it there himself. Medem (1970s) reports *Caiman crocodilus crocodilus* from Gaspar Grande Island. I had a specimen brought to me, caught on a home-owners jetty on the north coast of the island in 1979. These animals are no doubt strays from the swampy area of Tucker Valley on the mainland of Trinidad where they are also found. Over the years between 1966 and 1981 I have collected and observed reptiles on this island. Specimens and reports have also been brought in to me and a list is given below, with notes where necessary.

Lizards

Iguana iguana iguana (Linnaeus). Hatchlings in Nov. 1967.
Anolis aeneus Gray.
Polychrus marmoratus (Linnaeus). Coll. at Pt. Baleine 1967
Thecadactylus rapicaudus (Houttuyn).
Amphisbaena fuliginosa fuliginosa (Linnaeus). Regurgitated by *Micrurus*.

Snakes

Boa constrictor constrictor (Linnaeus). Caught on construction site, Bombshell Bay Develop. (Pers. comm. D. Chalmers, 1979).
Mastigodryas boddaerti boddaerti (Sentzen).
Pseudoboa neuwiedii (Duméril, Bibron & Duméril). Spec pers. Coll. Coll. J. Correia.
Micrurus psyches circinalis (Duméril, Bibron & Duméril).

Crocodiles

Caiman crocodilus crocodilus (Linnaeus).

GASPARILLO (CENTIPEDE) ISLAND AND LITTLE CENTIPEDE ISLAND

These two islands, Little Centipede being little more than a rock, lie between Gaspar Grande and the mainland of Trinidad. They are both covered with dry shrub vegetation. Because of the roughness of the terrain and the difficulty of landing on these two islands, little collecting has been done there. There are ruins of a small building on Little Centipede Island. Iguanas are probably found there, though the only reported reptile is listed below.

Lizards

Anolis aeneus Gray.

CRONSTADT ISLAND

Though this island is declared a Wild Life Sanctuary, one half of it is mined for its limestone. The fauna is therefore depleted. I have only recorded the following.

Lizards

Iguana iguana iguana (Linnaeus)

CARRERRA ISLAND

This island is almost totally taken up with the buildings of the prison. There are some areas that are still covered with secondary bush and some gardening is in evidence. There is a small plantation of coconut palms.

I visited Carrera Island with the permission of the Prison Authorities and recorded the following.

Lizards

Iguana iguana iguana (Linnaeus)
Anolis aeneus Gray.

Hemidactylus mabouia (Moreau de Jonnes).

There were numerous domestic cats all over the island, living in a semi-feral. state. These were possibly responsible for the absence of the lizard *Ameiva ameiva atrigularis*, which I had expected to find there.

THE COTORRAS (FIVE ISLANDS)

Visits were made to four of the six "Five Islands" or Cotorras, and the following reptiles recorded.

PELICAN ISLAND

This island is little more than a rock where, however, there are the remains of a pier, water cistern and two houses. No reptiles were recorded.

CALEDONIA ISLAND

One of the largest islands of the Cotorras, it is joined by a stone man-made causeway to nearby Craig Island. The vegetation on Caledonia Island is thick and overgrown. There are ruins of several buildings, water cisterns and piers, and the whole of Craig Island is occupied by the ruins of a building. The following reptiles were recorded from Caledonia Island.

Lizards

Anolis aeneus Gray.
Ameiva ameiva atrigularis Garman.
Thecadactylus rapicaudus (Houttuyn).

The remains of *Anolis* and *Thecadactylus* were found floating in a large half-filled water cistern. Shell fragments of eggs similar to those laid by *Gonatodes* or *Hemidactylus* were found in a fissure in the limestone rocks of Caledonia Island.

CRAIG ISLAND

No reptiles were recorded.

LENAGAN ISLAND

There were two large ruined buildings on Lenagan Island and the pier on the eastern point seems to be still used by fishermen. The island is densely covered with scrub forest. The following reptiles were recorded.

Lizards

Anolis aeneus Gray.
Gymnophthalmus underwoodi Grant. (J. Kenny, UWI Report. pers comm. verbal).

NELSON ISLAND

I have not visited this island. It is occupied by the Protective Forces. The buildings are sometimes used by the Natural Science Faculty of the University of the West Indies for field-trips, and Prof. J. Kenny recorded the following reptiles there (pers. comm. verbal).

Lizards

Hemidactylus mabouia (Moreau de Jonnes).
Thecadactylus rapicaudus (Houttuyn).

ROCK ISLAND

Not visited.

Prof. J. Kenny reports that iguanas, *Iguana iguana iguana*, have been seen on all the Cotorras, and they probably swim easily between the islands. Table I gives the listing for the offshore islands for easy comparison.

DISCUSSION

The reptile fauna of Trinidad is an impoverished South American one, consisting of relict and recently immigrant populations. In their turn, on a smaller scale, the offshore islands support an impoverished reptile fauna of Trinidad on the east and Venezuela on the west.

It is difficult to tell which reptiles are relicts and which are recent immigrants. There are some clues, however, that give us some guidelines to this problem. Relict or long-established colonists usually occupy every suitable habitat.

Recent colonists are usually restricted to suitable habitats close to their point of entry. Other suitable habitats nearby or that exist elsewhere have usually not been colonized. The spread of a species can often be traced and noted. Worth (1967) noted the appearance of *Cnemidophorus* in a man-altered suitable habitat, and the presence of this lizard on the man-made savannah-like conditions of the Wallter Field air strips constructed in 1944 has been noted (Everard & Boos, 1975).

The distribution and spread of *Cnemidophorus* on Trinidad is a good example of colonization in action, and this example is sharply focused when their presence on the offshore islands is considered.

These islands which separate the Dragon's Mouth into four passages or Bocas, seem to be the tops of a sunken or drowned mountain range which runs eastward out of the Paria Peninsula of Venezuela through these islands and continues on Trinidad as the Northern Range.

The Bocas have been gouged and scoured deeper by the incoming and outgoing tides over the centuries. Whatever reptile fauna was stranded on the islands when the Bocas were formed, and survives there today, varies very little from the mainland species from Venezuela in the west and Trinidad in the east.

Some species, especially the snakes, must have been unable to survive owing to the changes in climate and the curtailed size of their accustomed range. This is evident when one considers the richness in the quantity and diversity of genera and species on the mainlands nearby. However the process of migration and colonization has continued, and not only has Trinidad been affected. The stage at which one such dramatic colonization has reached is well illustrated when one critically observes the reptile fauna of the offshore islands. The method by which such colonizations are made should be considered here. That it does happen should be in little doubt. (Mole, 1926. Kenny, 1977, 1978-1979, Medem, 1970s).

Animals are rafted from the South American continent on materials carried by the floods from the vast outpourings of the Amazon and Orinoca River systems to the south and west of Trinidad. Some end up on Trinidad, Tobago and sometimes far beyond.

I have recently had a young anaconda, *Eunectes murinus gigas*, brought to me from Pt. Galeota. It was caught in the large mats of vegetation floating in the sea. Richard Joseph has caught the water snake, *Helicops angulatus*, on the beach at Erin and more recently a large fresh-water turtle, *Chelus fimbriatus* was taken by Mary Alkins from Chatham Beach on the south coast of Trinidad.

All these waifs undoubtedly came from Venezuela, rafted on vegetation or swimming across the narrows to Trinidad. How else can we explain the presence of the very tiny, delicate Mole's Gecko, *Sphaerodactylus molei*, collected on the almost barren terrain of Soldado Rock, three miles west of Icacos Point (Boos, 1983b)?

By considering the reptile fauna of the islands off the north-western peninsula of Trinidad, the stage at which such recent colonization has arrived can be illustrated. Physical factors affecting these islands have played an important part in determining which immigrant species, and how far each immigrant

TABLE 1: Distribution of reptiles on the islands off the north-west peninsula of Trinidad, W.I.

X = recorded O = probable

LIZARDS	Patos	Chacachacare	Huevos	Monos	Gaspar Grande	Gasparillo & L.C.	Cronstadt	Carrera	Pelican	Caledonia	Craig	Lenagan	Nelson	Rock
Iguana iguana iguana	X	X	X	X	X	O	X	X	O	O		O	O	O
Mabuya mabouya mabouya	X	O	X	X	O									
Cnemidophorus l. lemniscatus	X	X	X											
Phyllodactylus ventralis	X													
Hemidactylus mabouia	X	X	O	O	O		O	X		O		O	X	
Hemidactylus palaichthus		X	O	X										
Thecadactylus rapicaudus	X	X	O	X	X	O				X			X	
Gonatodes v. vittatus	X	X	X	X	O		O	O		O		O	O	
Gonatodes humeralis		O	O	X	O									
Gonatodes ceciliae		X	O	X										
Polychrus marmoratus		X	O	O	X									
Anolis chrysolepis planiceps		X	X	O	O									
Anolis aeneus					X	X		X		X		X		
Anolis extremus			X											
Plica plica		O	X	X	O									
Gymnophthalmus underwoodi		X	O	X	O		O	O		O		X		
Gymnophthalmus s. speciosus		X												
Bachia heteropa trinitatis		X	O	X	O									
Ameiva ameiva atrigularis		X		X						X				
Sphaerodactylus molei		O	O	X	O									
Amphisbaena f. fuliginosa					X									
SNAKES														
Mastigodryas b. boddaerti	X	X	X	X	X									
Oxybelis fulgidus	X													
Oxybelis aeneus			X											
Sibon n. nebulata			X											
Leptodeira annulata ashmeadi			X											
Tantilla m. melanocephala			X											
Atractus trilineatus			X											
Drymarchon c. corais				X										
Pseudoboa neuwiedii					X									
Leptotyphlops g. goudotii	X													
Boa c. constrictor				X	X									
Micrurus psyches circinalis					X									
CROCODILES														
Crocodylus intermedius		X												
Caiman c. crocodilus				X	X									

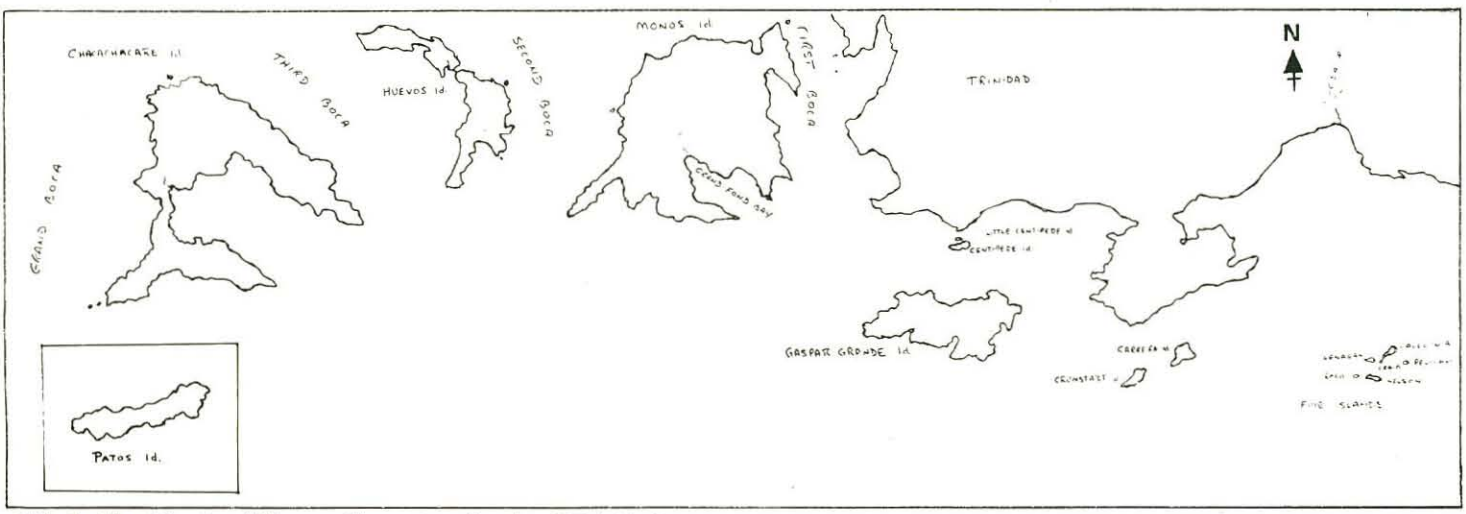

FIG. 1: The islands off the north-west peninsula of Trinidad.

species has reached. We can also speculate on which species are relict populations, judging by their presence or absence on the islands.

In some cases, where the species has not been collected or recorded on a specific island, it is perhaps only a matter of time and more diligent collecting before it turns up. This is indicated by the common presence of the species on both the Venezuelan and Trinidadian mainlands as well as on nearby islands. (Boos, 1983).

Where mainland climatic conditions, especially humidity, are found on these islands, some reptiles, at present not recorded on individual islands, should be reasonably expected to be found in the future. These reptiles which are found at present on both the Venezuelan and Trinidadian mainlands as well as on some of the islands, are more than likely relict populations or older colonizations. These expected populations are represented by a circle symbol on Table I.

The routes of recent colonization of Trinidad primarily and the islands secondarily, seem to be from two different directions or arcs, with certain species establishing themselves wherever they have encountered suitable habitats. Where there are suitable habitats available and no colonists, we must assume that the immigrants have not yet arrived. The two colonization arcs are as follows.

Both arcs begin as one column south and east of Trinidad, originating in South America and are given impetus by the flood-waters of the Amazon and Orinoco Rivers. Carried north-westerly by the mid-Atlantic current, travellers on this highway of colonization reach Trinidad at its south eastern corner. Here the column is split into the two arcs. The first (Arc A), is pushed west, and passing along between the south coast of Trinidad and the north coast of Venezuela, it deposits its waifs wherever they can make landfall. More of these waifs would seem to reach Trinidad than are swept back to the Venezuelan side, for the westward flowing current is further swollen, kept away from Venezuela and pushed toward Trinidad, by the outpourings of the distributaries of the Orinoco delta flowing into the area. (Field, 1975).

The winds, too, in the rainy season from June to December when the raft-carrying floods are the heaviest are from the south east and assist in pushing the floating debris to Trinidad. This arc empties into the Gulf of Paria and sweeps out between the islands that divide the Dragon's Mouth. The waters of the Gulf of Paria are further enriched by any faund that may be carried down the rivers flowing out of the Perdenales Area of Venezuela.

The second Arc, (Arc B), splits off at Pt. Galeota, the south-easternmost point of Trinidad, and flows north along the east coast, is forced further east briefly by Pt. Galera, and eventually reaches Tobago and beyond.

That these two arcs are a major highway in the colonization process is vividly demonstrated by the presence or absence of the lizard *Cnemidophorus lemniscatus lemniscatus* in the suitable and available habitats on Trinidad and the off-shore islands.

Wherever the currents that constitute arc A or B, have passed or touched, and there is a suitable habitat available, this lizard is found. On all the beaches along the south and east coast of Trinidad and on the southwestern tip of Tobago colonies have established themselves.

The lizard *Cnemidophorus lemniscatus lemniscatus* is a hardy, habitat-specialist opportunistic, widespread colonizer (Worth, 1967). Where established, it thrives around human habitation (Hoogmoed, 1973). It is found over a large area of tropical south and central America. On Trinidad it is found along the beaches of the south coast following the direction of Arc A, and though it is not known to this author if it is found on beaches of the eastern shores of the Gulf of Paria, or the southern and northern beaches of the Paria Peninsula, it is found on Patos Island, Chacachacare Island, and Huevos Island.

Here, on Huevos Island, the northward and eastward curve of colonization of Arc A seems to end. It has not crossed to Monos Island. It is also found up along the east coast beaches of Trinidad as far north as Matura Bay. This seems to be as far north as it has colonized in the east of Trinidad. Small colonies have reached inland to Bush Bush Island in the Nariva Swamp (Worth, 1967) and Waller Field (Everard & Boos, 1975). I have not collected it or observed it as far north as Toco Point (Pt. Galera), or on any of the suitable beaches on the north coast. Arc B is shunted out to sea by the north east peninsula of Trinidad, and Tobago is the next stop, where *Cnemidophorus* is also found in abundance at first landfall there – Crown Point.

So far the pincers of Arc A and Arc B have not closed. *Cnemidophorus* has not crossed the mainland mass of Trinidad in a westward direction from the small colonies in Bush Bush and Waller Field. It does not occupy suitable niches on beaches of the north coast, having not had any currents to ride around Pt. Galera and further west. Instead it has ended up in Tobago.

So far it has not been collected or observed on Monos Island where there are suitable hahitats for it to colonize, nor has it been seen on any of the smaller offshore islands listed above, or on the beaches facing west and south on the northwestern peninsula of Trinidad.

It has got to Huevos where it occupies the one small suitable habitat - a stretch of sand not more than 200 metres long, and the hot scrub-covered hillside around the single human habitation.

On Patos Island, there are two species of reptile, a lizard, *Phyllodactylus ventralis*, and a snake, *Oxybelis fulgidus*, that are found on the Venezuelan mainland (Donoso-Barros, 1968; Roze, 1966), but not on Trinidad.

Though it is possible that these two species of reptile are relict on Patos Island, when the following information is considered, that they are immigrants appears to be more likely.

Firstly, if they are relict on Patos Island, being stranded there when the island was separated from the continent by the rising of the oceans, why are they not found on Trinidad and the offshore islands which were cut off at the same time? Had they been there then they would, more than likely, exist there now as relict populations.

Secondly, on the distribution map for *O. fulgidus* (Roze, 1966, p 192). (See Fig. 2 adapted from Roze), the species is present in the entire east of Venezuela, including territory south of the Orinoco River, but is excluded from the vast distributary system of the Orinoco River where the majority of immigrants to Trinidad are likely to originate. The area where it is found also includes the Paria Peninsula, and the drainage of the San Juan, Guanipa, and Manamo Rivers, which flow through the lowlands south of the Paria Peninsula, and north of the exclusion zone of the Orinoco distributaries.

The San Juan, Guanipa and Manamo Rivers empty into the Gulf of Paria, and any colonists being carried by the flood-waters of this river-system are unlikely to make landfall on Trinidad as the ocean and wind currents are unfavourable for this to happen. They have no choice but to be pushed north by the prevailing winds and currents, and then east along the south coast of the Paria Peninsula, and out the channels between the islands of the Dragon's Mouth.

However rafting colonists have a good chance of reaching Patos Island which stands in the direct path of vegetation rafts exiting the Gulf of Paria, and is a natural landfall for these colonists.

To speculate that the Patos specimens of *O. fulgidus* came from the area on the south bank of Orinoco River, one would have to ask why Trinidad had not been colonized from this source as well. This would seem to be a much more natural course of events with a greater chance of success than for all the waifs originating from this area to bypass Trinidad completely and to be swept up on Patos Island.

Though *O. fulgidus* has been recorded from Trinidad in the literature several times (Beebe, 1952. Wehekind, 1955, 1960: Underwood, 1962.) these records have been incorrect. (Emsley, 1977.)

To recapitulate: If *O fulgidus* is relict on Patos Island it should be relict as well on Trinidad and the northwestern offshore islands. If a colonist from any other source but the river system of the San Juan, Guanipa and Manamo Rivers it would

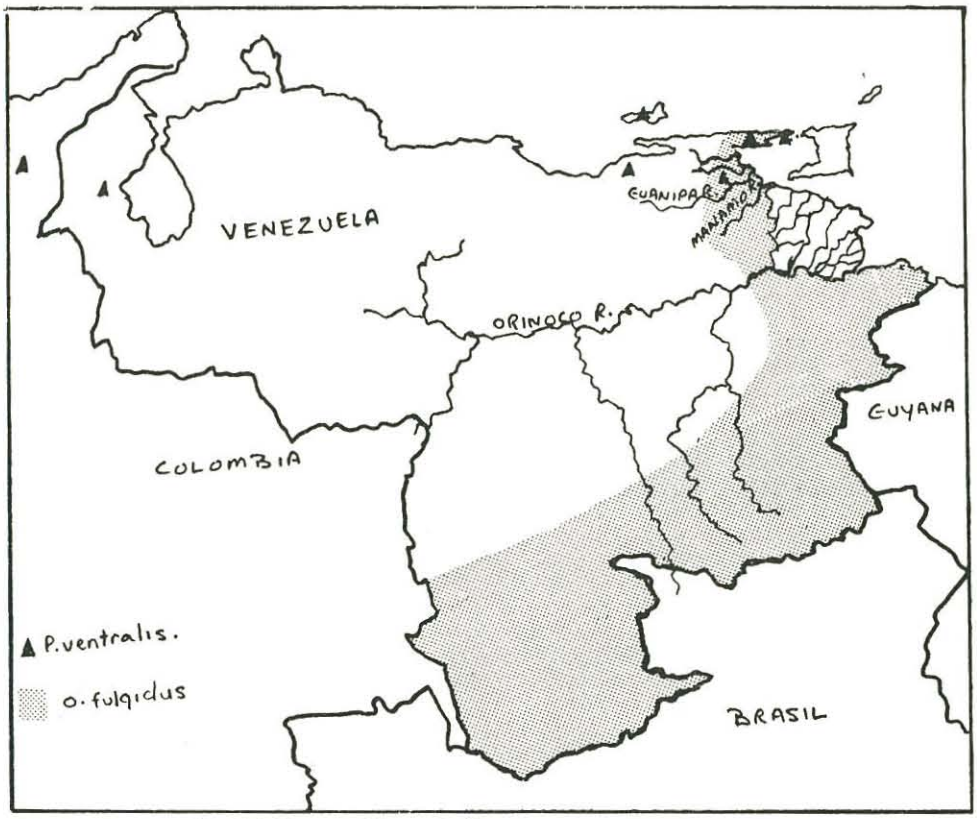

FIG. 2: Range of O. fulgidus *and* P. ventralis.

be on Trinidad as well.

Thus it must be an immigrant species on Patos Island, originating from an area that is unlikely to affect Trinidad.

A similar situation refers to the lizard *Phylladactylus ventralis*. It prefers a dry habitat and is found along the northern coast of South America, the Paria Peninsula, Margarita Island and Patos Island (Donoso-Barros, 1968). If it is relict on Patos Island it should be relict as well on the indentical dry shrub habitat on Chacachacare Island, Huevos Island, and perhaps as well on Monos Island and the northwestern peninsula of Trinidad for the same reasons as outlined above for *O. fulgidus*. But to date it has not been collected in these areas.

So it is fairly reasonable to surmise that it has managed to reach and colonize Patos Island by being rafted down rivers that pass through its range south of the Paria Peninsula. It has not reached any other islands further west across the channels of the Dragon's Mouth of Trinidad.

Thus it is my contention that these two reptiles are recent colonists of Patos Island, but colonists poured into Arc A rather late in its course, affecting Patos Island, but perhaps too late to affect the other islands or Trinidad.

Another piece of evidence that pinpoints the origin of the reptiles on Trinidad and especially the offshore islands is the presence and colour pattern of the one snake found so far on five of these islands.

Mastigodryas boddaerti boddaerti is found on Patos, Chacachacare, Huevos, Monos, Gaspar Grande and the mainland of Trinidad.

The colour variety of this snake that is found on Trinidad is the same as the one on Gaspar Grange and distinctly different from that found on the other islands (except Monos).

This snake is relict on Trinidad and possibly relict on Gaspar Grande, though there could be a constant repopulation of this island from the mainland. Snakes are good swimmers and the distance between Gaspar Grande and the mainland is not too great or affected by any great climatic or physical barriers to hamper constant immigration from Trinidad on the floodwaters of the Caroni and Cuesa Rivers.

The ones found on Patos, Chacachacare and Huevos Islands are all similarily patterned and are distinct from those from Trinidad. Though listed to date as *M. b. boddaerti* it is possible they are a different species. The exact taxonomic designation of these snakes that occur on these islands is open for revision. They should be similar to, or the same as, those found in the dry scrub land of the Paria Peninsula and are more than likely relict on Patos, Chacachacare, and Huevos Island.

The ones found on Monos Island, which geographically are between the two other populations seem to lean both ways. Not many specimens have been taken on Monos Island and there is the added difficulty in that this snake has a juvenile form radically different in colour pattern from the adult. The reptile fauna of Monos is more than likely derived mainly from Trinidad than elsewhere (Boos, 1983) though there might have been and still be imput from the Venezuelan mainland along both Arc A and B (via Trinidad) creating an unique situation on Monos where species or colour intergrades are to be found.

By charting the distribution, observing the habitat preference, studying the geographical factors of wind, currents, climate and topography affecting it, and by concentrating on one lizard, *Cnemidophorus lemniscatus lemniscatus* the process of colonization in action can be demonstrated.

The islands off the north west peninsula of Trinidad are a living theatre of change where not only recent colonization can be demonstrated, but with more research and collection more information can be gathered about what went on in the past.

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Galeota Point: Habitat and Birds: an Area for Study

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SITUATED in the extreme south-east corner of Trinidad, Galeota Point is a one mile (2 km) long peninsula extending south from the eastern coastline and providing ideal shelter from the prevailing easterly winds for Guayaguayare Bay to the west (see Figure 1).

The southern half of the peninsula is the home of AMOCO (Trinidad) Oil Company (ATOC) and is their onshore tank storage facility for the offshore oil wells to the east of the point. As such, this area is fenced off with a security fence and access can only be gained with ATOC's permission and requires a security pass card. There is a smaller tank 'farm' for oil storage, and a small heliport facility, further to the north, which both belong to TESORO Petroleum Company which also has offshore oil wells to the east. Most of the peninsula is however easily accessible by car, and on foot from the road.

The most sourtherly tip of the point is a rocky promontory about 90 m high, showing all the typical signs of erosion as demonstrated by all the southern cliffs of the island's south coast. There are trees at the top of the cliffs, including a few palms, and then the land slopes gently to the north down through the ATOC industrial complex. The rest of the peninsula is mainly mangrove swamp and woodland, lowlying to the west, and with low cliffs backing the exposed eastern beach. Nearly every conceivable bird habitat exists and the peninsula and its shores can be easily subdivided into relevant habitat areas for study. My sketch map attempts to show this.

Galeota Point has an added bonus for bird-watchers. Like all distinctive headlands throughout the world, Galeota is a focal point for migration navigation, and at the appropriate times each year a myriad unusual species can be seen moving north or south through the area.

Using the limited time at my disposal, I have been able, over the past two years, (1981 - 1982) to make a casual study of the peninsula's bird life. The following is a rough guide to what I have seen.

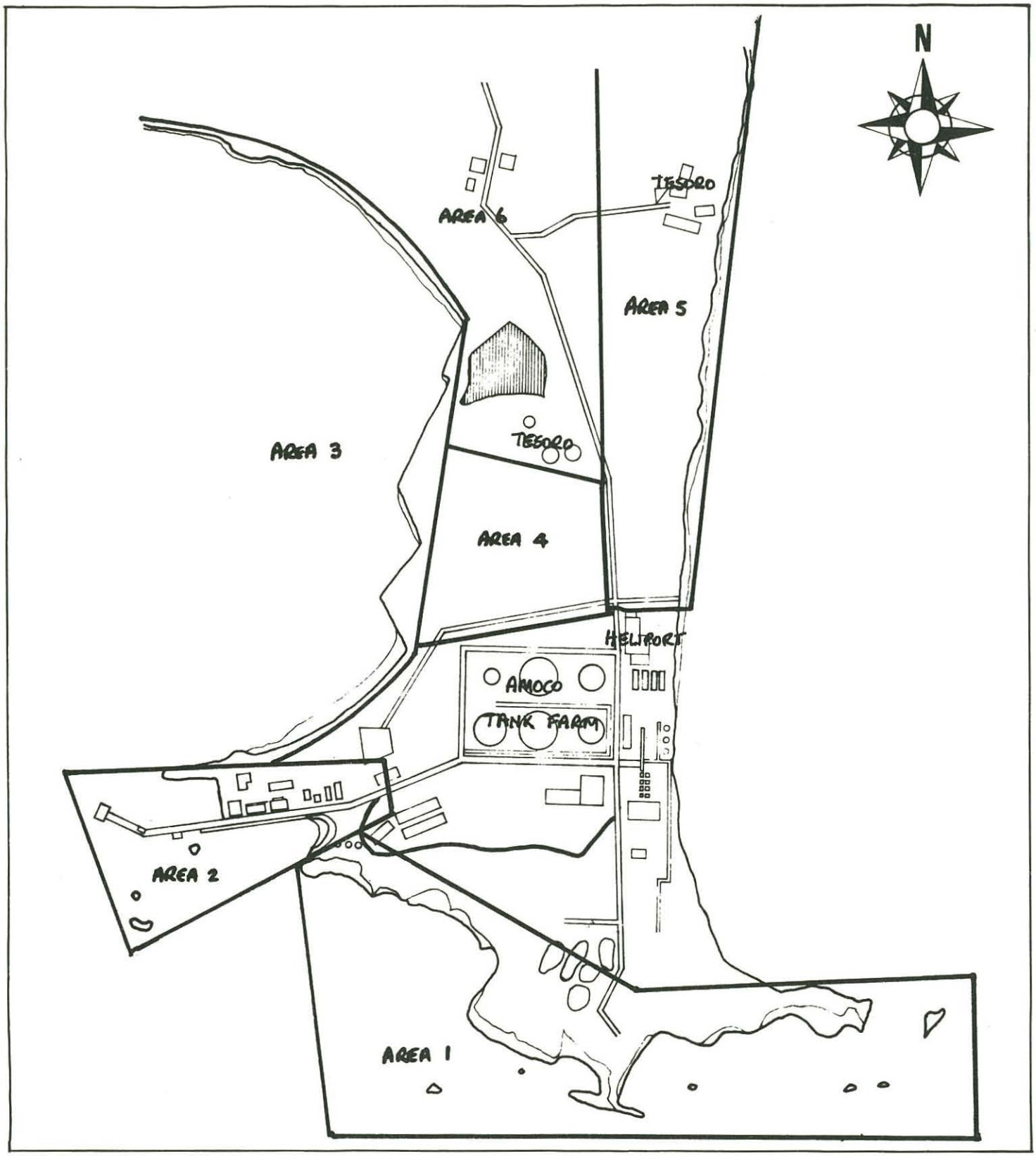
AREA 1. This is the most southerly extremity of the peninsula. It consists of the rocks and cliffs and cliff-top vegetation. Here are seen the sea-birds and hawks. Terns predominate, sooties, noddies and common are all present. There are always pelicans and frigate birds (*Fregata magnificens)* about and I have seen an occasional solitary Red-billed Tropicbird, and once, a pair of them. Here also can be seen a resident pair of hawks (sp?), and very often other birds-of-prey, both large and small.

AREA 2. Just west and a little north of the headland itself is the harbour area used by the offshore platform support vessels. There is one particular large rock, just off the main jetty, where about 30 or 40 frigate birds often perch. This small group can be watched leisurely from the jetty. Sharing the rock are a large number of noddy terns, and a few sooties. There are usually a few pelicans to be seen as well, and occasionally a brown booby. Around about the harbour itself there can always be seen a few scavenging waders and passerines, and quite often there are groups of gulls. The harbour however, is not used by fishing boats, and so the usual attractions for birds are not present.

AREA 3: For me, this is the most interesting area. Sheltered tidal water with sandy beaches expanding at low tide states, with large mud-flats and sand-bars plus coastal mangroves and a small area of sand-dunes. This is wader country and nearly all the locally recorded Trinidad species occur, sometimes in large numbers. The area also attracts common terns and I have seen wintering flocks in excess of 2000 birds.
Roseate terns are often recorded in company with their common cousins, but here I have not been able to positively identify a single roseate. Egrets can always be seen in the area. There is at least one great blue heron, and I have seen as many as 5 at one time. There are often black vultures about. But the stars of the show, for me anyway, are the skimmers. When I first arrived in mid-1980, there was a colony of about 50 birds, and I watched them performing throughout that year and all through '81 until about September when they vanished. To my delight, I spotted 5 birds again on April 13 '82, and from that day on I have attempted to keep a record of their numbers, whenever I can. Also seen regularly in this area is an anhinga or 'snake-bird,' but it is very shy and I have not been able to get close to it. It is a great flyer, a fact which has always puzzled me, for a bird so obviously adapted for underwater work. But this one, anyway, really seems to enjoy its time in the air and I often see it soaring gracefully on the cliff up-currents where it puts the clumsy corbeaux to shame. Ospreys are also common visitors to this area. A group of 4 once spent several days here, and there are seldom days when one is not about.

This bay, particularly its eastern, sheltered end, is a splendid attraction for birds, but it is also frequently the scene of severe surface oil pollution. Polluted river water runs into the bay at its north-west end after every fall of rain, also from drain outlets from the ATOC site, usually associated with rainfall, but by no means alwlays. The harbour is another source of oily effluents, and the prevailing currents always seem to conspire to wash all the waters straight on to the beach areas. Skimmers, feeding the way they do, would be especially prone to suffer from surface pollution. Consequently I have watched very closely for any signs that the birds here have fallen casualty to this curse, but as yet I have not one single scrap of evidence that the birds have suffered at all. The pollution of this lovely bay, and its effects on the environment, needs to be subject to surveys other than mine.

AREA 4: This is a small area of grassed dunes and low-lying mangrove (white mangle). It is the haunt mainly of passerines and herons. I have seen a pair of green kingfishers here once. On August 21, '82 a single adult scarlet ibis appeared, much to my excitement, and was still around the next morning, when I saw it feeding on crabs among the mangrove roots. Sadly, it had gone by the afternoon. This area



MAP showing Galeota Point

is particularly accessible, and is outside the ATOC fence, it has always struck me as being eminently suitable for more exhaustive study.

AREA 5: The east coast strip. This is the home of a resident black hawk, *B. anthracinus*. This bird has only been seen on its own, usually near the ATOC heliport. The area is mainly wooded and is the home of passerines and other woodland species. It is also a popular roost for herons and egrets.

AREA 6: Another mainly wooded area; dry woodland and mangroves to the west. Here, though, the mangroves are the taller red and black varieties, and here also is 'Tesoro's Shame.' This is a small lake which is so blackened and polluted by oil spillage that all life has forsaken it. This area is, hwoever, accessible for study and is largely unspoiled. It is the habitat for a large number of woodland and coastal species. I confess that I have neglected it, and I have no specific records here.

Notes on Some Birds of Trinidad Wetlands

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LITTLE attention has been paid to the ornithology of swamplands in Trinidad during the last fifty years, apart from the collections of Plowden-Wardlaw in 1950-51 and the fieldwork of ffrench on the Scarlet Ibis, mostly in 1963-66 (ffrench & Haverschmidt 1970), both in the Caroni Swamp. The following observations update the status of twenty-two species of birds frequenting the wetlands of Trinidad, especially the Caroni, Nariva and south Oropouche swamps. One species is recorded for the first time in Trinidad, while another is recorded breeding in Trinidad for the first time.

One of us (R. ff) was engaged from June 1981 to June 1982 in fieldwork on the wetlands avifauna of Trinidad (Ramcharan, de Souza & ffrench, 1982), under the auspicies of the Institute of Marine Affairs, Chaguaramas, who provided valuable logistic support. The other (T.M.) was carrying out a research project for the University of Colorado concerning the host relationships of the Shiny Cowbird *Molothrus bonariensis*, mostly during the rainy seasons of 1979 and 1980.

Since some of these status changes may have occurred as a result of recent ecological development, it may be worthwhile mentioning here the broad outlines of some of this development.

In the Caroni Swamp, following the initiation of the Cipriani Reclamation Scheme about 60 years ago, tidal water from the Gulf of Paria was largely excluded from the savannahs and marsh land east of the North-South Drain and bank, which were constructed between the Blue River and the Madame Espagnole River (Bacon 1970). Gradually the vegetation changed as the brackish conditions gave way to a freshwater environment, with sedges and grasses becoming dominant. However, the bank was allowed to deteriorate so much by 1968 that in numerous places salt water was flooding through and conditions have been returning once again to something akin to those of the early twentieth century. At the time of writing the extensive marsh immediately south of the No. 9 Drain (where excursions by boat leave the Princess Margaret Highway) has been almost completely changed by the salt water, with mangroves once again predominating.

Certain changes have taken place too in the south Oropouche Lagoon, affecting the freshwater marshes and environs. In spite of, or possibly because of, attempts by the authorities to provide some sort of irrigation works to drain the lagoon, with its recurrent flooding problems, the situation has not improved and salt water contamination continues. However, it has not occurred on the scale of the Caroni experience, and large areas of reed and sedge still extend southwest of the main mangrove belt which borders the coast. Eventually there is still a plentiful supply of fresh water to support this vegetation. All the same, farmers' complaints support our own observation that the entire area is more waterlogged that it was twenty-five years ago.

THE SPECIES LIST

Glossy Ibis *Plegadis falcinellus*. Though the species was seen in some numbers during the 1960s (ffrench 1980), the only recent records appear to be a few birds seen in Nariva during February 1979 (Bacon et al. 1980), and a single bird seen by Graham White near Cacandee in June 1982.

Tree-Ducks *Dendrocygna* spp. There has been a dramatic increase in the numbers of these ducks in Trinidad. T.M. found only one pair of Fulvous Tree-Ducks *D. bicolor* in the Caroni marshes during 1979, but in mid 1980, 1981 and 1982 both this species and the Black-bellied *D. autumnalis* were seen in some numbers, with flocks up to 25 birds. In the south Oropouche Lagoon Fulvous numbers in 1981 and 1982 reached perhaps 400 birds, with a few Black-bellied. In Nariva a flock of about 200 Black-belied was reported in February 1982, and a few of this species was also seen in the Icacos swamp. Clearly conditions have improved for these ducks, for breeding has also been recorded recently in the Oropouche Lagoon. It is just possible that the improvement has stemmed from the captive breeding programme at the Pointe-à-Pierre Wildfowl Trust which released nearly 350 young birds during the years 1967 to 1981.

White tailed Kite *Elanus leucurus*. Following the 1976 breeding in the northern Nariva Swamp (ffrench 1980), birds have been recorded during 1981 and 1982 in circumstances suggesting breeding at Oropouche Lagoon and the southern Nariva Swamp. Then in April 1982 a pair of kites were seen at a nest in a mango tree in the Caroni marshes; subsequently the nest was deserted, and it is presumed that these very conspicuous birds suffered from human disturbance.

White tailed Hawk *Buteo albicaudatus*. There are very few records of this savannah species in Trinidad. One individual was seen on two occasions near Bush-Bush island, Nariva in early 1982.

Black-collared Hawk *Busarellus nigricollis*. The species has been seen several times in the Bush-Bush area of Nariva since the first record in 1963. R. ff along with Mr. and Mrs. Bob Kennedy had a good view of an adult in Bush-Bush on 13 June 1982. It was sitting, fairly low down, on a moriche palm leaf, eating a fish. Several times it uttered low-pitched calls resembling a snarling rattle.

Rufous Crab-Hawk *Buteogallus aequinoctialis*. Only one record of this extremely sedentary species has been made before in Trinidad (ffrench 1977), so it is very interesting that another bird has recently been observed in the mangrove belt east of Bush-Bush island. First seen by Jogie Ramlal, the Nature Centre guide, it was confimed on 27 February 1982 by C. Petrow and K. Rees of U.K. The bird appeared remarkably tame and allowed a close approach.

Long-winged Harrier *Circus buffoni*. Though considered earlier "a rather rare breeding species" (ffrench 1980), these birds have been seen quite commonly in the marshes bordering the Caroni Swamp and at Oropouche Lagoon. Up to four birds have been seen together, and on some occasions birds have been observed crossing the Princess Margaret Highway at no great height. A recent study on harriers (Rice 1982) showed that much of their prey, in the form of small, concealed rodents, is located acoustically, a technique for which their owl-like facial ruff is a clear adaptation.

Aplomado Falcon *Falco femoralis*. This rare falcon was

seen for only the fourth time in Trinidad over the last 50 years when T.M. saw an adult on 17 Jult 1980, catching a small bird over the Caroni marshes.

Limpkin *Aramus guarauna*. This species has hitherto been found most frequently in the Nariva Swamp, and this is still its most favoured habitat. But it has also been found recently to be not uncommon in the Caroni marshes, up to four being seen in a morning. A few individuals have also been seen at Oropouche Lagoon, and on isolated occasions near the Carapo River, and at Pointe-à-Pierre.

Spotted Rail *Rallus maculatus*. This "rare and local resident" (ffrench 1980) was observed in the Caroni marshes on four occasions between 23 June and 4 August 1980, also once at Oropouche on 11 October 1981. It is probably a fairly common species, but difficult to see owing to its skulking habits.

Yellow-breasted Crake *Prozana albiventer*. This is another rail that is extremely hard to see, there being very few records, all hitherto confined to Caroni marshaes (ffrench 1980). During our recent fieldwork the call-note was eventually identified as a high-pitched double note, accented on the first syllable, *tee*-di, somewhat resembling the vocalisation of a frog. Once this call was effectively recognised, we found this species to be well distributed in freshwater areas of Oropouche Lagoon. But being a tiny bird and like many rails not venturing into the open, it is hardly ever seen.

Gray-breasted Crake *Laterallus exilis*. T.M. had a similar experience to the above with this species, also hitherto considered rather uncommon. Its call was finally isolated in July 1980 as a rapid high pitched piping series of five or six notes, the last pitched a little lower, pee-pee-pee-pee-pee-pi. Thenceforth it was found to be quite common in the Caroni marshes east of the highway, and to occur in patchy distribution at Nariva, Oropouche Lagoon, and in a sedge marsh at Icacos. The species seems to prefer marshes dominated by dense *Eleocharis mutata* or *E. interstincta*.

Azure Gallinule *Porphyrula flavirostris*. Following the first record of this species for Trinidad in 1978, referred to in the last issue of this journal (ffrench 1981), several more observations have been made in the Bush-Bush and neighbouring areas of the Nariva Swamp. Decidedly smaller than the congeneric Purple Gallinule, the adult has a pale blue breast and neck, quite different from the striking dark violet blue of the larger bird. The frontal shield is yellow, not blue, a feature also noted in the brown immature plumage. On the early morning of 13 June 1982 four of these birds were seen in the marshy area east of Bush-Bush, perched on the tops of grass tufts and occasionally flying short distances. It is quite possible that this rather conspicuous species is truly a new arrival into Trinidad from neighbouring Venezuela. If so, one might also expect to see it in the Icacos and Los Blanquizales swamps.

Ruff *Philomachus pugnax*. This Old World sandpiper has only twice been recorded before in Trinidad (ffrench 1980). Another bird was seen in off-season plumage, very brownish with upperparts and breast mottled black, in the Caroni marshes near No. 9 Drain early on 1 May 1982. It is of interest that the first record, in 1965, was also in early May.

Black Swift *Cypseloides niger*. This species is notoriously difficult to identify in the field, and in fact has never been recorded with absolute certainty in Trinidad (ffrench 1980). However, on 13 June 1982 a flock of twelve black swifts, which were certainly not *C. rutilus* and seemingly too large for any *Chaetura* species, was seen at close range by R. ff and Mr. and Mrs. Bob Kennedy over the marshes east of Bush-Bush. They were feeding over the area and gradually drifted to the south. Tentatively they were identified as this species, which migrates from the Lesser Antilles to South America at about this time.

Fork-tailed Palm-Swift *Reinarda squamata*. Recorded earlier as a "rare and local resident" mainly of eastern Trinidad, and always in the vicinity of moriche palms, birds of this species have also seen in small flocks near Icacos feeding over cat-tail marshes amidst coconut palms. No moriche palms could be found, so it could be that other palms are also used for nesting or roosting.

Silvered Antbird *Sclateria naevia*. This speices has always been found commonly in swamp forest bordering Nariva Swamp, also alongside streams in parts of the Northern Range. It has now also been found to frequent Los Blanquizales lagoon. Clearly the somewhat patchy distribution of this antbird warrants further study.

Spotted Tody-Flycatcher *Todirostrum maculatum*. Herklots (1961) recorded the discovery of this small flycatcher in a Cedros swamp in mid 1957. Specimens were taken but apparently not preserved. Since that time R. ff has occasionally looked for the species in that area, but in vain. So it was with great interest that investigations were re-opened when Bob Richardson found the species in the Icacos mangroves in September 1981. Since that time several birds have been located in the area, also at Los Blanquizales lagoon. The bird is quite confiding and in addition the call-note, a suprisingly loud and piercing note, single or double, *chee* or *ti-dee*, cannot be mistaken, once learnt. Further success was achieved when R. and M. ffrench found an occupied nest of the species, with both adults present, near Icacos on 23 May 1982. It was an elliptical pouch, made of dry grasses, leaves and down, and was slung from a thin mangrove branch about 2½ metres above ground. This is the first breeding record for Trinidad.

Carib Grackle *Quiscalus lugubris*. This well known species has recently established a very large roosting site just south of No. 9 Drain in the Caroni marshes. It is located in the young mangroves which have grown up as a result of the infiltration of salt water into the previously fresh water marsh and reed beds. The roost is shared with Yellow-hooded Blackbirds *Agelaius* and Shiny Cowbirds *Molothrus*. Many thousands of grackles commute daily to this roost, moving in groups of 30 to 50 birds from the surrounding countryside to north, east and south. As a daily migration, it rivals in scope even the more spectacular movements of the Cattle Egret *Bubulcus*.

Red-winged Blackbird *Agelaius phoeniceus*. A male of this northern species was found by T.M. in an area of freshwater marsh and rice-fields near Caroni Swamp on 26 June 1980. It was singing and apparently holding a territory; it was still present on 1 September, but disappeared soon afterwards. However, the following year it turned up again in the same place during the middle months of the year. Though associating with its congener *A. icterocephalus*, it again sang repeatedly in an established territory. This is the first record for Trinidad, and probably for the South American region. The bird was seen by various observers, and allowed a fairly close approach, but was clearly not an escaped cagebird. It may, however, have been brought here by a ship (J. Bond, pers. comm.). The nearest population of this species is on Cuba, but the large size of this bird and the extent of the yellow borders of the red epaulets indicate that it probably came from a more northern, migratory population. The nominate race winters south to Texas and California, while another race is known as far south as northwestern Costa Rica. At all events this record is most extraordinary.

Moriche Oriole *Icterus chrysocephalus*. Records of this beautiful icterid have become increasingly rare, probably due to the continued trapping of the species. However, two pairs were seen at Bush-Bush, Nariva on 12 April 1982 by R. ff and Dr. and Mrs. Geoff Gibbs. The circumstances suggested possible nesting.

Dickcissel *Spiza americana*. One of the most extraordinary phenomena among the avifauna of Trinidad is the status of this species. Apparently absent for many years early in this century it occurred in vast numbers, mainly in the Oropouche Lagoon, during the late 1950s and 1960s (ffrench 1967). During the majority of the 1970s it seems to have been almost entirely absent. However, on 17 January 1982 a flock of about 50 birds was seen south of Bush Bush, Nariva, in marshland. But no other record has been reported.

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Further Notes on the Avifauna of Trinidad & Tobago

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THERE is no sign yet of any slowing down in the rate of reports of interesting bird records. Although this is the fifth consecutive issue of this journal in which I have collated such reports, the list of species treated is as long as ever. In addition, more reports are coming in from local naturalists, which is a promising sign for the future.

The value of sight records of birds is disputed by some ornithologists (e.g. Bond, 1962) on the grounds that mistakes can be (and frequently are) made, and that such ambiguities have no place in a scientific publication. It is argued that doubts about the occurrence of rare species can only be dispelled by the collection of specimens or possibly adequate photographic evidence. To a certain extent I concur with this, but it is clear that some sight records, for example of a conspicuous species seen under good conditions by several competent observers, are practically indusputable, so should not be discounted.

I think that the important thing is to ensure that sight-records are evaluated by rigorous standards at all times. The ideal sight record should follow careful field-notes made at the time of observation, giving full details of plumage, size, shape, soft parts, flight pattern, call note, behaviour and environment. Details of light conditions and distance from observer should be recorded, and ideally the observer should be familiar with the species and other similar species. Wherever possible, corroboration by other competent observers should be obtained. If all the above conditions can be met, I see no reason to discount sight-records. But of course they will always remain just sight-records — with the element of doubt present — and must be treated as such. In addition, there are some species of birds which resemble others so closely that they can only be adequately identified under perfect conditions, preferably in the hand.

The following list of twenty-nine species includes three new records for Trinidad, seven new for Tobago, and two possible new breeding records, one for each island.

THE SPECIES LIST

GREAT SHEARWATER *Puffinus gravis*

Varying numbers of this species have been recorded dead or dying on east coast beaches during June in most years since 1971 (ffrench 1977, 1980). In 1982 Dick Raby kept a careful watch on seabirds at the "Blue Waters' drilling rig about fifteen miles off Point Galeota during the middle of June. Small numbers of these shearwaters were seen each day from June 14 to 17, but not before or after. It seems that the northward passage of this austral breeder past Trinidad may be confined to just a few days.

LEACH'S STORM-PETREL - *Oceanodroma leucorhoa*

During 1982 individuals were seen in offshore Trinidad waters on several occasions between February 7 and June 20. A fair number were found dead or dying on Cocal beach on April 22. One of these was collected by Wendy Wood, it had been banded on October 25 1981 in Nova Scotia, when less than one year old. This is the first banding recovery of the species in Trinidad.

KING VULTURE - *Sarcoramphus papa*

There are very few records of this rare visitor to Trinidad. On May 23, 1982 Bob Kennedy and others on a Club excursion saw one high over forest north of Brasso Seco.

PEARL KITE *Gampsonyx swainsoni*

David Rooks found a bird building a nest in an immortelle tree beside the Princess Margaret Highway near Chaguanas in early March 1982. By March 20 the birds were incubating, and two large young were seen there on May 15. All other nests of this species in Trinidad have been found at Pointe-a-Pierre (ffrench 1982), where an immature bird was found dying of apparent starvation on June 21, 1982. The specimen has been lodged at the Carec collection (formerly Virus Lab.) at Federation Park, Port of Spain.

GRAY-HEADED KITE *Leptodon cayanensis*

Two individuals were occasionally seen in lowland swamp and riparian forest near Carapo during July and August 1980.

Two adults have been seen also by B. Mohan of the Forestry Division in the Central Range Wildlife Sanctuary from time to time. The species may be more widespread than was hitherto thought (ffrench 1980).

PLUMBEOUS KITE — *Ictinia plumbea*

On April 2, 1982 Geoff Gibbs saw a bird of this species near Ravin Anglais. There are very few records from the Northern Range, though the species is common over southern forests.

GREAT BLACK HAWK — *Buteogallus urubitinga*

There is some doubt as to whether this species, easily confused in the field with the commoner *B. anthracinus*, has ever bred locally. So it was with interest that on March 30, 1981, in company with George Reid, I saw an adult carrying nesting material at Bloody Bay River, Tobago. The nest, however, was not found, so successful breeding remains to be proved.

ORNATE HAWK-EAGLE - *Spizaetus ornatus*

The breeding of this beautiful raptor in Trinidad has also not been confirmed, though suspected (ffrench 1980). However, Allan Rodriguez found a bird at what appeared to be a nest high in a forest tree near Platanal in May 1982. Further confirmation is still needed.

RUFF — *Philomachus pugnax*

Two brids seen at Buccoo from December 1 — 10, 1981 by J.M. Wunderle constitute only the second record for Tobago (cf. ffrench 1977).

SOUTH POLAR SKUA - *Catharacta maccormicki*

On July 13, 1980 this large seabird was seen by Tim Manolis and Shahid Mohammed at Icacos Point under excellent conditions. The diagnostic field characters were generally sooty brown plumage with striking white patches at the base of the primaries, and offwhite head and neck. This is the first record for Trinidad and the south Caribbean of this Antarctic breeder, which however is known to wander regularly as far north as

U.S.A. in the austral winter.

POMARINE JAEGER - *Stercorarius pomarinus*

Several birds were seen by Dick Raby off Galeota Point in early March 1982. The species is distinctly larger and heavier than its congener, *S. parasiticus*, four of which were well seen by the Club party returning from Soldado Rock on March 28, 1982; *pomarinus* has rarely been identified before off Trinidad.

HERRING GULL - *Larus argentatus*

A second-year bird seen at Pointe-a-Pierre foreshore, in company with hundreds of Laughing Gulls *L. atricilla*, on February 19, 1982, is only the third record for Trinidad.

RING-BILLED GULL *Larus delawarensis*

A second winter immature bird was well seen at close range by Bob Richardson off Pigeon Point, Tobago on December 27, 1981. Though recorded on several occasions at Pointe-a-Pierre (ffrench 1980), this is the first record for Tobago.

LESSER BLACK-BACKED GULL — *Larus fuscus*

Following observations of three birds during 1978 and 1979, reported in the last issue of this journal (ffrench 1981), another bird in adult plumage was found at Pointe-a-Pierre on October 11, 1981. Sightings of this Old World species in the region have been occurring with some frequency during the last four years, the most recent being at Panama.

SABINE'S GULL — *Xema sabini*

An immature bird of this species was seen on many occasions by Dick Raby at the "Blue Waters" rig off Galeota Point between March 2 and March 21, 1982. Careful descriptions were recorded and the bird was photographed in flight. Diagnostic features of this small gull included conspicuously contrasting black and white plumage of upperparts and wings, and black bill wih pale tip. This is the first record for Trinidad and the entire region of this Arctic breeder which migrates south mainly in the Pacific. Atlantic records are rare, and the nearest previous record appears to be of a bird off Cuba in December 1954.

SCARLET-SHOULDERED PARROTLET — *Touit huetii*

A flock of up to 40 of these birds was seen on March 18, 1980 by Tim Manolis and his wife near Carapo. Diagnostic features included the vivid green of the back and upper tail coverts, and the soft "wick, wick" call-notes, occasionally uttered; very different from the harsh screaming of the congener *T. batavica*. Apart from two sightings of flocks by R.G. Gibbs, this constitutes the only record of this parrotlet in recent years. But of course similarity to *batavica* might well have led to confusion in identification in the past.

MANGROVE CUCKOO — *Coccyzus minor*

J.M. Wunderle, who is well acquainted with the species, had an excellent view of a bird at a distance of seven metres in mangroves west of Buccoo, Tobago on December 2, 1981. There is only one other record of the species from Tobago, by C.F. Belcher at Lowlands on September 20, 1934, which I have hitherto held as suspect. Wunderle points out that on the Antillean islands the species rarely inhabits mangrove, which, however, is its preferred habitat on Trinidad.

BLACK SWIFT — *Cypseloides niger*

On August 15, 1980 at Terry Hill near Hillsborough Dam, Tobago, Tim and Annette Manolis saw a swift larger than *Chaetura brachyura* with which it was associating; from above it appeared all dark, and certainly did not seem large enough for *C. zonaris*. Although swifts are notoriously difficult to identify in the field, it seems most probable that this bird was in fact a Black Swift in the course of migration southwards. If authentic, this record would be a first for Tobago.

RUFOUS SHAFTED WOODSTAR — *Chaetocercus jourdanii*

Previous sight-records of this tiny hummingbird have frequently been unsatisfactory or uncorroborated. However, an immature bird, apparently of this species, has been seen by many people at the Asa Wright Nature Centre during the early months of 1982 (fide Ian Lambie and David Rooks). I personally have yet to identify this species.

VARIEGATED FLYCATCHER - *Empidonomus varius*

Recent reports from the Nature Centre indicate that several birds of this species were present at Springhill during June and July 1982. It is significant that the only previous authentic records are of *collected* specimens (ffrench 1980). The species is in fact rather similar to the much commoner Piratic Flycatcher. Here is a typical case where full field-notes are essential, in order to minimise the risk of error.

PIRATIC FLYCATCHER — *Legatus leucophaius*

In our last journal (ffrench 1981) I reported the near certainty of Tobago records of this species. Thereafter, in company with George Reid, on March 30, 1981 I located several individuals at Bloody Bay River. The characteristic song was being uttered, and unmistakable views were obtained at close quarters. This confirms its status in Tobago.

STREAKED FLYCATCHER — *Myiodynastes maculatus*

In early June 1982 Dick Raby found a bird of this species resting on the "Blue Waters" rig about fifteen miles east of Galeota Point. It seems more than likely that it was of the race *solitarius*, a migrant from Argentina, similar to the record F. Haverschmidt obtained of this race at sea in mid-April (ffrench 1980).

VEERY — *Catharus fuscescens*

The single previous record of this northern migrant in Trinidad (ffrench 1980) was augmented by another bird found at the Nature Centre on October 15, 1982 by Bob Behrstock, who has wide experience of the species in U.S.A.

NORTHERN ORIOLE — *Icterus galbula*

A third record for Trinidad was obtained on March 13, 1981 by Mr. and Mrs. H.S. Archer, who saw a male at Maraval. It was still present on March 31.

BOBOLINK - *Dolichonyx oryzivorus*

On October 31 1982 a bird in female plumage was seen at Pigeon Point, Tobago by R. and M. ffrench at very close quarters. It may well have been in the course of migration, as a passage of Blackpoll Warblers was observed in the same place on that day. This is only the second record for Tobago of this northern migrant.

BLACKBURNIAN WARBLER — *Dendroica fusca*

While trapping birds for a lecture demonstration near Andrews Trace on the Blanchisseuse Road on April 24, 1982 Bob Kennedy, Graham White and I found a female of this species in low trees beside the road. We just missed trapping her. This is only the third record for Trinidad, and quite late in the season for a northern migrant.

PALM TANAGER — *Thraupis palmarum*

This extremely well-known species from Trinidad has recently (1982) been found at several locations in Tobago by David Rooks in company with others. These are the first records for Tobago. I confess that it seems to me almost incredible that such a common species should have escaped notice before. Possibly it is a genuine new arrival, or perhaps more likely, the present birds are representatives or descendants of birds that have been artificially imported by man from Trinidad, as has happened in the case of the Kiskadee. If the latter, it is a great shame, for it is impossible to foresee the ecological developments — whether for competing native species, which may succumb, or for farmers, if the birds should attack crops.

At all events, as naturalists we must deplore attempts, however well-meaning, to interfere with the natural balance of species.

GRAYISH SALTATOR — *Saltator coerulescens*

A reprot made at the Nature Centre states that on August 14 1980 a bird of this species was seen at Grafton, Tobago. If correct, this would be the first record for the island; but the report requires corroboration.

ROSE-BREASTED GROSBEAK — *Pheucticus ludovicianus*

This northern migrant was found at Crown Point, Tobago on December 5, 1981 by J.M. Wunderle, who knows the species well in U.S.A., and another was seen on April 20, 1982 at the Nature Centre by S. Higginbotham of Massachusetts, in company with twelve other observers. These are the first records for Tobago and Trinidad respectively. Wunderle comments that he is surprised to find no previous records here, since the species migrates regularly to northern Venezuela and Curacao. I know also of records from Barbados.

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Lepidoptera Notes 1 – 6

By *M.J.W. Cock*, Commonwealth Institute of Biological Control, Silwood Park, Ascot, Berkshire, England.

I. On the larval foodplant of Ascia menciae janeta Dixey (Pieridae)..

I HAVE recorded *Ascia menciae janeta* Dixey as a common butterfly on Chacachacare Island, since on Jan. 15, 1980 several specimens were seen near the doctor's house on Rust's Bay and 20 or more along the road to the lighthouse (Cock 1981b). On Jan. 9, 1981 I accompanied the UWI Department of Zoology marine biology field course to the salt pond area on the south coast of Chacachacare and saw several specimens of *A. menciae*. I saw oviposition on a tree which Dr. C.D. Adams subsequently identified as *Capparis odoratissima* Jacq. (Capparidaceae). In Trinidad this plant is recorded only from Chacachacare, but in view of F.C. Urich's captures of *A. menciae* on Gaspar Grande (Urich 1977), it may well occur there too. In the flora of Trinidad and Tobago, Williams (1928) gives the distribution of *C. odoratissima* as St. Lucia, St. Vincent, Panama, Grenada, Venezuela and Colombia. This includes Venezuela, where *A. menciae janeta* occurs on the north coast. Although the subspecies *janeta* is not known from anywhere else, the nominate subspecies *menciae* Ramsden is from Cuba where *C. odoratissima* does not occur, and probably the foodplant of *A. m. menciae* is some other species of *Capparis*.

II. On the foodplants of Catonephile *spp. (Nymphalidae).*

Both J.O. Boos and F.C. Urich have shown me the foodplant of the Grecian Shoemaker, *Catonephile numilia* Cram., and I have found larvae on several occasions on plants growing on th ridgetops of the Northern Range. Dr. Adams has identified this plant as *Alchornea triplinervia* (Spr.) (Euphorbiaceae), the only Trinidad species of this genus, and known from the Guyanas and Amazonia (Philcox 1979). Barcant (1970) gives the foodplant of *C. numilia* as fiddlewood, *Citharexylum fruticosum* (L.) (Verbenaceae) which is probably a mis-identication. Other foodplant records include *A. cordata*, *A. iricurana* and *Nectandra venulosa* (Lauraceae) in Brasil (Silva *et al.* 1968). I conclude that *C. fruticosum* is not a normal foodplant for *C. numilia*, which in Trinidad is probably restricted to *A. triplinervia*.

The Orange Banded Shoemaker, *C. acontius* L. which is recorded from the same foodplants in Brasil as *C. numilia* (Silva *et al.* 1968) has recently has been discovered breeding on *A. triplinervia* in the Parrylands oilfield by S. Alston-Smith.

It is my experience that *C. numilia* is found in the northern half of Trinidad only, and I have not seen it any further south than Sangre Grande although Dr. V.C. Quesnel has shown me a male from Talparo (23. II. 1983). If *C. acontius* breeds on the same foodplant, yet is restricted to the south, it would be interesting to know what defines the separate ranges of these two species in Trinidad.

III. On the foodplants of Actinote *spp. (Acraeidae) in Trinidad.*

There seems to be a certain amount of confusion regarding the foodplants of the two species of *Actinote* in Trinidad. Kaye (1921) states for the Small Lacewing, *A. pellenia* Hübn.: "Larvae on *Eupatorium odoratum* also on *Mikania scandens* (W. Büthn) *Eupatorium odoratum* (P.L. Guppy)" and for the Large Lacewing, *A. anteas* Dbl.: "larva on *Ageratum* or *Euoatorium.*" Barcant (1970) reduces this to *E. odoratum* as the foodplant for *A. pellenia* and omits any foodplant for *A. anteas.*

In Trinidad, the normal foodplant for *A. pellenia* is *Austroeupatorium* (formerly *Eupatorium) inulaefolium* (the species with white flowers in September and October). It will not feed on *Chromolaena* (formerly *Eupatorium) odorata* (R.E. Crutwell pers. comm.) although it will sometimes feed on *Mikania micrantha* (own observations). *Mikania scandens* is a North American species that does not occur in Trinidad and was most probably misidentified for *M. micrantha.* The normal foodplant of *A. anteas* is *M. vitifolia* (own observations); I have seen it on no other hostplants.

These observations are reliable only in Trinidad. For example *A. anteas* will feed on *C. odorata* in Central America (Cruttwell pers. comm.) and *A. pellenia* is recorded from other Compositae in Brasil (Silva *et al* 1968).

IV. New butterfly records from Chacachacare Island, including two new records for Trinidad.

On Jan. 7, 1982 on a visit to Chacachacare Island (by courtesy of Hans Boos), I caught 18 species of butterflies of which nine are additions to my list for the island (Cock 1981b). These are:— HESPERIIDAE: *Urbanus carmelita trebia* Möschler ♂; *Mylon pelopidas* Fabricius ♂; *Epargyreus socus chota* Evans ♂, ♀, others seen; *Chioides catillus* Cramer ♂; *Polgonus manueli* Bell & Comstock, sight record only; *Moeris striga strada* Evans ♂; PIERIDAE: *Leucidia exigua* Prittwitz ♀; LYCAENIDAE: *Tecla petauriste*r Druce ♂; *T. cyphara* Hewitson ♂, ♀; *Leptotes cassius* Cramer ♂. All were taken on or near the summit by the lighthouse, on or around flowers of *Chromalaena odorata* (Christmas Bush).

Urbanus carmelita is a rare species in Trinidad, not listed by Kaye (1921, 1940), but recorded by Cock (1982a). *Thecla petauriste*r is the species treated and illustrated as *Calycopis atrius* (H. — S.) by Barcant (1970), based on a mis-identification by Kaye (1921). *T. cyphara* is a new record for Trinidad and is not the species referred to by Barcant (1970) as *Calycopis cyphara nubes* (Druce), which is *T. nubes* Druce. The male *T. cyphara* differs from the male *T. nubes* in having more extensive and brighter orange colouring on the uppersurface of both wings, and the females differ in having slightly different wing shapes and *T. cyphara* having faint orange-red spots near the margin of the hindwing on the uppersurface.

S. Alston-Smith took another addition to the Trinidad list on Chacachacare in July 1981. He captured specimens of a small lycaenid which I have identified as *T. megacles* (Cramer) on flowers by the track to the coastguard building. These 11 additions bring the total for Chacachacare to 35, five of which do not occur elsewhere in Trinidad and Tobago. Since I saw several other species but could not positively identify them, the total for the island can doubtless be added to, e.g. a *Papilio* sp. probably *thoas nealces* R. & J. was seen.

Of the species previously recorded (Cock 1981b), *Ascia menciae janeta* was again common and conspicuous, a single male *Anteros carausius* Westwood was taken, but the two new Hesperiids were not seen.

The checklist for Chacachacare Island (Cock 1981b) printed on page 25 of the 1981 — 1982 'Living World' needs correcting as follows:— taking the line commencing "Hesperiidae *Urbanus* . . . ." as line 1, delete line 3; line 10 replace "*faunalia*" by "Felder,"; line 11 for "*faunali*" read "*faunalia*"; line 13 for "Carmer" read "Cramer."

V. New names for some Trinidad butterflies of the family Nymphalidae

The nymphalid butterflies of the genera related to *Phyciodes* have been revised recently (Higgins 1981) with the result that there are several changes to be made to the Trinidad list:—

Tegosa similis Higgins — YELLOW HANKERCHIEF

This is a newly described species. The names *liriope* and *claudina* used in Barcant (1970) refer to two different species not found in Trinidad. The foodplant of this species is *Mikania micrantha* HBK (Compositae) and the larvae are gregarious (Cock 1982b) Higgins gives the range of this species as "Trinidad, St. Vincent, Panama, Nicaragua, Colombia, Venezuela."

Eresia clara Bates

Eresia clio (L.), the name used in Barcant (1970) for this species, is based on a widely used misidentification dating back to 1950; *(clio* (L.) is probably an Ithomiid). Since Higgins gives the range for this species as "South Mexico through Central and western South America to Peru and Bolivia, and in all the Amazon region including the Guyanas and southwards to western Matto Grosso," it seems likely that the single specimen recorded from Trinidad (Barcant 1970), if authentic, may have strayed from Guyana.

Castilia ofella (Hewitson)

This is simply *Eresia ofella* transferred to a new genus. The range is given as "Guatemala, Costa Rica, Panama, Colombia, Venezuela, Trinidad, Ecuador."

Janatella leucodesma (Felder & Felder) — HANKERCHIEF

Again this is a familiar species transferred to a new genus. The correct authorship should be noted. The range is "Trinidad, St. Vincent, Panama, Nicaragua, Colombia, Venezuela'. It is curious to note that both *T. similis* and *J. leucodesma* are found in Trinidad and St. Vincent but not in Tobago or Grenada.

Anathanassa frisia (Poey)

Higgins records this species from "Cuba, Trinidad, Jamaica, Hispaniola, Puerto Rico, Bahamas and probably on other islands, and USA (Texas, Florida: Key West)", but it is not included in Barcant (1970) or known to local collectors. Illustrations of this species can be found in the works of Riley (1975), Brown & Heineman (1972) and Lewis (1972). Collectors should watch out for this species, but I am very doubtful as to its occurrence in Trinidad. Perhaps the specimen(s) in question were from the town of Trinidad on the south coast of Cuba.

From an earlier revision of another section of Nymphalidae (Higgins 1960) another name change is necessary:—

Chlosyne lacinia saundersi (Doubleday) — LITTLE SOLDIER.

Saundersi — not *saundersii* as given by Kaye (1921) and Barcant (1970) — is a subspecies of the very widespread, polymorphic and variable species *C. lacinia* (Geyer). This species has gregarious larvae which feed on various Compositae, including *Parthenium hysterophorus L.*

VI. New Hesperiidae records from Trinidad

The following records are of species additional to those listed in Cock (1982a). The classification used by Evans (see Cock 1981c, 1982a for details and references) is given in brackets after the name, and this is followed by the number necessary for insertion into the checklist (Cock 1982a).

Elbella etna etna Evans 1951 (A2/15) list no. 4a.

I captured a female specimen of this fine species on the summit of Cumberland Hill in August 1981. Although this species is a member of the Pyrrhopyginae (dealth with in Cock 1981c), it closely resembles *Phocides pigmalion* Cram. and *P. distans* H — S of the Pyrginae which are covered in "The skipper butterflies of Trinidad. Part III." elsewhere in this issue. Apart from the features of the antennae which distinguish these two subfamilies — i.e. the club is almost entirely in the bent section in the Pyrrhopyginae, and the club bent at or beyond the thickest part in the Pyrginae — there are several minor differences in the markings which distinguish these three species. *Elbella etna* can be recognised by the reduction of the middle hyaline band of the forewing to a single quadrate spot in space 3. The specimen was determined by comparison with the collection of the British Museum (Natural History) (BMNH) where there are other specimens of the subspecies from French Guyana and the Amazon.

Autochton bipunctatus Gmelin 1790 (C16/10) list no. 63a.

Although this species was recorded by Kaye (1921), I suggested (Cock 1982a) that this record may have been a misidentification for *A. longipennis* Plötz. I have now seen two specimens captured by June and Floyd Preston — a female taken 6 km south of Siparia on the road to Quinam Bay in November 1981, and a male on the same road 5½ km south of Siparia in May 1982. These records confirm *A. bipunctatus* as a good Trinidad species.

Discophellus nicephorus Hewitson 1876 (D4/1) list no. 68a.

On top of the ridge between Arima Valley and Guanapo Valley there is a wide trace leading south from where the Lalaja South Road crosses the ridgetop. At times I have referred to this locality as the "Morne Bleu-Morne Brule ridge" (these being the peaks at either end of the ridge) and pinpointed my collection site as so many miles north or south of the Lalaja SouthRoad; at other times I have referred to it as "Lalaja South Road, milestone 2" (this being approximately the point at which the road crosses the ridge), and sometimes I have simply referred to it as "Lalaja Ridge" (e.g. Cock 1982a). It is also known (at least to some of the inhabitants) as "Windy Blow" and recently a signpost has been erected referring to it as "Cooker Trace." For the sake of having a standard name for this excellent collecting locality, I propose to use "Lalaja Ridge" on the grounds of clarity and brevity.

This preamble enables me to state that at 19.00h on April 9, 1982, I captured a male *Discophellus nicephorus* on Lalaja Ridge. *Discophellus* spp. are large dusk-, or even night-, flying skippers which I have occasionally trapped at light (i.e. *D. ramusis* ♀, *D. euribates* 2♂), suggesting that the capture time is typical for this species. My specimen is almost devoid of spots, although the type has a few insignificant spots. The degree of spotting is variable in the BMNH series which includes specimens from Mexico to the Amazon.

Pellicia theon tonga Evans 1953 (E21/7) list no. 87a.

This is a rare species of a taxonomically difficult genus, and until a male is taken in Trinidad, my record of a female taken in the Parrylands oilfield (Nov. 1980) must be slightly doubtful. The specimen was compared with the collection of the BMNH which contains specimens of this subspecies from Colombia (type locality), Panama and Venezuela.

Camptopleura auxo Möschler 1878 (F11/2) list no. 126a.

A single female specimen taken by June and Floyd Preston on the Arima-Blanchisseuse Road at milestone 10½ is a new record for Trinidad.

Vehilius vetula Mabille (J28/6) deleted.

This species recorded by Cock (1982a) is an error and should be deleted. The specimen in question, a female from Parrylands with no antennae is *Eutocus matildae vinda* Evans.

Panoquina panoquinoides panoquinoides Scudder (02/2) list no. 245a.

For three years I have had specimens of what I had thought

to be an undescribed species, but was uncertain to which genus it belonged. Initially, on the basis of the structure of the male genitalia, I considered them to belong to the genus *Phlebodes*, and recorded them as *Phlebodes* n. sp. (Cock 1981a). I now find that these specimens are of *Panoquina panoquinoides* Scudder and either belong to the nominate subspecies or merit a new subspecies name. For the present I put them in the nominate subspecies. My captures of the species are as follows:

2♂ Nariva Swamp, Manzanilla-Mayaro Road, milestone 46 track, 23.V.1979.

4♂ 1♀ Same locality, 5.II.1980

2♀ Same locality, 25.XI.1980

1♂ Same locality, 19.VIII.1981

1♂ Oropouche South Lagoon, by Southern Main Road, 8.IX. 1981

1♀ Same locality 23.XII.1981

4♂ 3♀ Caroni Swamp, nr. Cacandee Sluice, 20.II.1982

3♂ 1♀ Same locality, 12.IV.1982

Recently I observed, and subsequently captured, a female of this species as it oviposited on the grass *Paspalum vaginatum* Sw. at milestone 39 on the Manzanilla-Mayaro Road (October 1982). Dr. Adams (pers. comm.) states that this grass is only found in brackish conditions near the coast. I conclude that all the capture localities listed above (as well as the two places I have caught this species in Tobago) fit this description, and that *P. vaginatum* is the normal foodplant of this species.

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The Skipper Butterflies (Hesperiidae) of Trinidad Part 3 Pyrginae (first section)

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THIS is the third of a series of contributions on the Hesperiidae of Trinidad. The first (Cock 1981b) covers the subfamily Pyrrhopyginae, and the second (Cock 1982) is a checklist of the entire family, including records for Tobago. Here part of the second subfamily, Pyrginae, corresponding to Evans's genera group B (Evans 1952) is covered.

Evans (1952) defines the subfamily Pyrginae as having vein 5 of the forewing generally nearer to vein 6 than to vein 4, as shown in Fig 1-3. (The nomenclature of veins, interspaces etc. used here, as in previous parts, follows that of Evans as described in Cock (1981b)). Evans divides the subfamily into two sections as follows:

Section 1. Palpi erect; second segment held against the head, third segment not protruding in front of the second (Fig. 4 6). Forewing cell generally long, equal to two-thirds of the length of the costa and equal to, or longer than, the dorsum (Fig. 1-3).

Section 2. Palpi may be entirely forward pointing (porrect), and the third segment always protrudes in front of the second. Forewing cell generally short, less than two-thirds of the length of the costa and shorter than the dorsum.

If the figures of the palpi (Fig. 4-6) are examined, it can be seen that the third segments of the palpi do protrude beyond the second, although not to the extent that is found in section II of the Pyrginae. This reflects the difficulties that exist in the classification of the Hesperiidae into sections or genera groups. Doubtless the classification of Evans used here will be improved on, but since this is the standard reference for the family it is followed here. Evans divides section I into the following genera groups:

Group B. Third segments of palpi divergent (Fig. 5-6). Wings erect in repose.

Group C. Third segments of palpi parallel. Forewing veins 6 and 7 approximate at their origins (i.e. close together or from a common base). Wings erect in repose.

Group D. Third segments of palpi parallel. Forewing veins 7 and 8 approximate at their origins. Wings flat in repose.

Evans's classification by the position of the wings in repose is erroneous. All the species with which I am familiar in group B rest beneath leaves with their wings held flat. There are certainly exceptions to the generalization about group C, and probably for group D.

The divergent third segments of the palpi are perhaps the best guide for the recognition of group B, but in the Trinidad fauna even this character is indistinct in the genus *Phocides* (Fig. 5). All the Trinidad species of group B except *Entheus priassus L.* have a coastal fold in the male. This is an elongate narrow fold on the costa of the forewing which contains the male scent (androconia) scales. Another general feature of the group is the presence of two spots, or a double spot, in the forewing cell. For most purposes this group can be most readily recognised by examination of the plate of set specimens. The detail of the plate together with the color descriptions below should facilitate the identification of all Trinidad species of group B known to date.

The Pyrginae, like the Pyrrhopyginae but unlike the Hesperiinae, feed (with one exception) on dicotyledonous rather than monocotyledonous plants. The larvae of Pyrginae are usually hairless, unlike those of the Pyrrhopyginae, and the head is large and round or cordiform (heart-shaped), often with brightly coloured eye spots. The head is wider than the body, while the front part of the body is narrower than the rest, and this gives rise to the somewhat grotesque but typical, hesperiid "loose-head" larval form. The larvae spend their lives in a series of leaf shelters. These seem to be of a constant form for each species and would repay further documentation, perhaps throwing light on the classification of the family.

Phocides

This genus contains large robust species comparable to those of the genus *Pyrrhopyge* (Cock 1981b). They also resemble species of the Pyrrhopyginae in colouring and markings. Although there are no Trinidad species of Pyrrhopyginae comparable to *Phocides polybius* F., the species *P. pigmalion* Cram and *P. distans* H-S. resemble *Elbella etna* Evans of the Pyrrhopyginae recorded as new to Trinidad elsewhere in this issue. The possibility of other species of either form being found in Trinidad should not be ignored. What advantage these resemblances have in evolutionary terms is difficult to say.

Although, as pointed out above, the palpi of this genus are not absolutely typical for group B, *Phocides* can usually be recognised by its distinctive venation (Fig. 2). The vein between the origins of veins 4 and 5 (i.e. the discocellular vein) is "arched and very long, twice as long as the distance between the origins of veins 3 to 4 and of 5 to 6; also veins 7 and 8 run contiguously for a third of their length from the cell" (Evans 1952 p. 5). The former character, however, does not hold true for *P. polybius* (Fig. 1). Although Evans (1952) points out that the genitalia are uniform within the genus, comparison of Fig. 1 with Fig. 2 suggests that *P. polybius* may not be congeneric with *P. pigmalion* (or *P. distans* whose venation resembles that of *P. pigmalion*).

8. Phocides polybius polybius Fabricius *1793* (Plate 1 ♀)

This is the species recorded in the Trinidad literature as *Dysenius spurius* Mabille. *Spurius* is a synonym of *phanias* Burmeister, a subspecies of *polybius* from south of the Amazon; *polybius* itself occurs from the Guyanas to Panama, while a third subspecies, *lilea* Reakirt. is found in Central America.

The ground colour of this species is a deep dark blue; the upper-surface of the forewing is rayed with green to about two-thirds on the costa and one-third on the dorsum, a prominent red spot at mid costa, from the cell to the costa, is entirely distinctive for this species in Trinidad; forewing cilia white. Hindwing cilia white at termen, orange-brown at tornus and matching the ground colour on the dorsum, wing narrowly white along margin at mid termen and orange-brown at tornus. Underside similar to upperside, but green rays much reduced on forewing; hindwing has sone green scaling at base and white marginal area

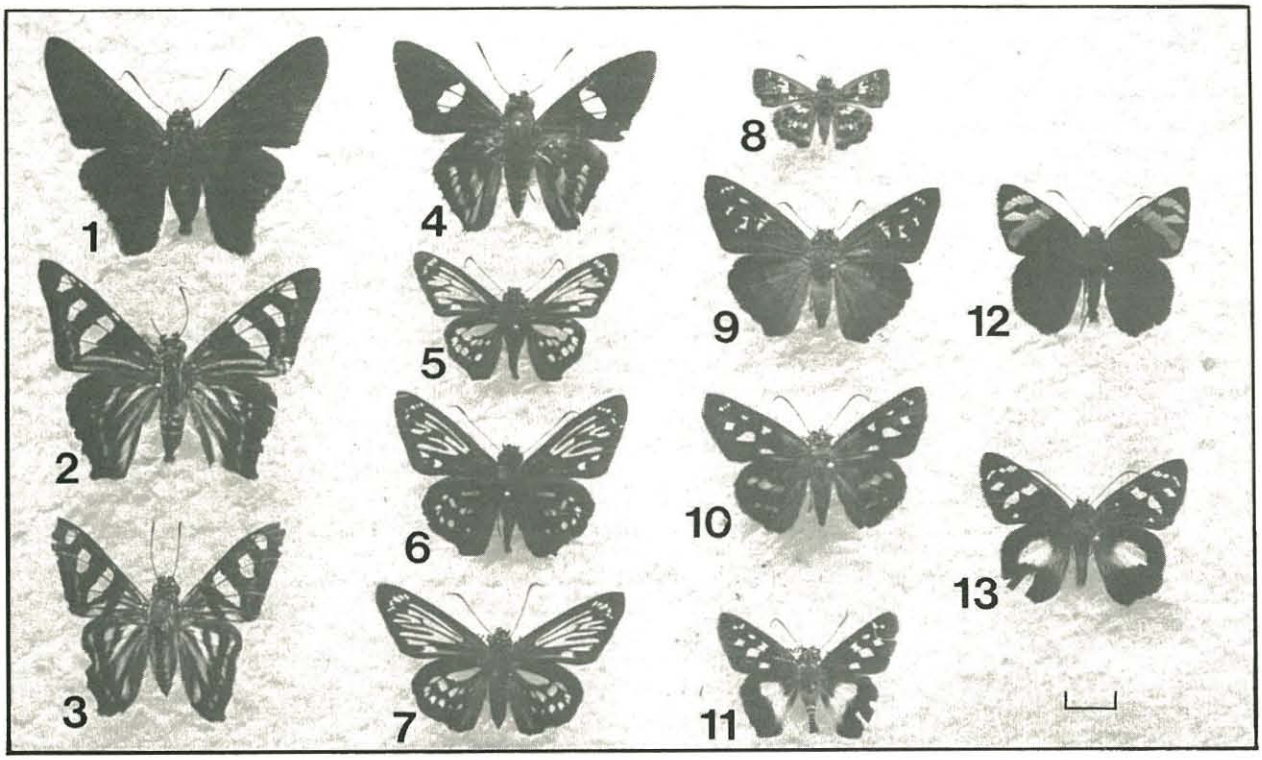

Plate 1-13. Pyrginae (group B) of Trinidad; 1, *Phocides polybius* ♀, Curepe, 24. VII. 1978, MJWC; 2, *P. pigmalion* ♀, Sangre Grande, FC Urich; 3, *P. distans* ♂, Cats Hill, S. Alston-Smith; 4, *Tarsoctenus praecia* ♂, 88.022, Trinidad, ex JJ Joicey coll, specimen in BMNH), 5, *Phanus vitreus* ♂, Andrews Trace, 19. IV. 1982, MJWC: 6, *P. obscurior* ♂, Parrylands, 12. II. 1980, MJWC; 7, *P. marshallii* ♀, San Miguel Valley, 800 ft., 29. VII. 1978, MJWC; 8, *Udranomia orcinus* ♀, French Guyana (specimen in BMNH); 9, *Augiades crinisus* ♀, Parrylands, 2. IX. 1980, MJWC; 10, *Drephalys oriander* ♀, St. Benedicts, 5. IX. 1980, DJ Hunt; 11, *D. alcmon* ♀, Las Lomas, Spanish Farm, 28. V. 1982, MJWC; 12, *Entheus priassus* ♂, Arima-Blanchisseuse Road, milestone 9¾, 9. X. 1980, MJWC; 13, *E. priassus* ♀, Las Lappas Trace, 11. IX. 1979, MJWC. Bar = 1 cm.

is slightly more extensive. Head with palpi and collar red, throax with two pairs of longitudinal green stripes. Male with short costal fold; forewing length ♂ 25 mm; ♀ 30 mm.

This species is widespread in Trinidad and usually to be found in association with its host plant, the guava (*Psidium guajava* L.). Although ova and larvae are readily found on suitable isolated and/or young plants the adults are not often seen. They are most often to be found feeding on flowers, but on one or two occasions I have seen this species resting under leaves with its wings spread flat. The ova are laid on the upper-surface of guava leaves, usually singly; they measure 1.6 mm in diameter and are hemisphereical, 1.2 mm in height with 18-19 thickened ribs rising from near the base to alternately join, and stop just short of, a thickening ring around the top of the ovum; the colour owing to that of the developing larva, is dull red. The first instar larva is dark reddish brown with a shiny brown head; subsequent instars are similar but with a yellow band around the front of each of segments 4 to 11. The final, fifth instar is completely different, the body being white with small, faint black speckles, the prolegs pink and the head with two large yellow eye spots in a darker ventral area. The early instars construct a leaf-shelter by making a half circle or three quarter circle cut in the leaf lamina, and folding the resultant flap up and over until it can be attached to the leaf lamina with silk, forming a little pocket. These flaps are quite conspicuous and the small larvae seem subject to extensive predation by wasps and spiders. The fourth and fifth instar larvae spin two or three leaves together to form a larger shelter, and the green stubby pupa is formed in the last of these.

9. Phocides distans distans Herrich-Schäffer 1869 (Plate 2, ♂)

Although Kaye (1921) records one capture of this species by G.E. Tryhane in St. Ann's Valley, I have never caught it and there are no specimens from Trinidad in the British Museum (Natural History) (BMNH). Scot Alston-Smith, however, has taken this species in the Cats Hill area and it is one of his specimens that is shown in the plate..

The ground colour of this species is black; the forewing has white hyaline bands and bright blue markings; the hindwing has a submarginal band of a similar blue, and basal stripes of a paler blue; the underside is similar. *Phocides distans* can be distinguished from the very similar *P. pigmalion* by the interrupted blue bands in forewing spaces 1A and 1B, which are continuous in *P. pigmalion*, and by the pale blue markings on the abdomen which form longitudinal stripes, while those of *P. pigmalion* form bands around the abdomen. The Pyrrhopyginae species *Elbella etna* also has interrupted blue bands but is larger and can be recognised by the antennae which are reflected at the beginning of the club and by the central hyaline band of the forewing which is confined to space 3 and does not extend into space 4 as it does in *P. distans* and *P. pigmalion*. Forewing length ♂ 25 mm.

10. Phocides pigmalion pigmalion Cramer 1779 (Plate 3, ♀)

First recorded from Trinidad by Kaye in 1940, this is another rare species. There are six subspecies of *P. pigmalion* which occur from Florida and the Greater Antilles to Paraguay. The nominate subspecies occurs from Guatemala to Trinidad.

This species is similar in colour and markings to *Elbella etna* and *P. distans*, the differences are described under the latter species above.

This is a widespread but rare species. I have caught one male in the Northern Range (Piedra Blanca. near rest house, 1700 ft. Oct. 1982) flying in a sunlit clearing and settling beneath a leaf with its wings spread flat. I have also seen specimens from St. Ann's Valley (coll. BMNH), Sangre Grande (ex coll. F.C. Urich, specimen shown in plate) Irois and Calvary (coll. Sir N. Lamont.)

The life history in Trinidad is unknown. In Florida the sub-

species *okeechobee* Worthington is recorded as having a white larva with an orange spotted brown head, and feeding on Red Mangrove *(Rhizophora mangle* L., Rhizophoraceae). Since I have examined and collected around mangroves in Nariva, Caroni and South Oropouche swamps without encountering this species, I believe a different host plant is used in Trinidad. The fact that Rhizophoraceae and Myrtaceae (e.g. guava the host plant of *P. polybius*) are closely related suggests that these and the related Melastomataceae may be the host plants of the genus *Phocides.*

11. Tarsoctenus praecia rufibasis Boullet 1910 (Plate 4, ♂)

This subspecies is recorded from Trinidad and the Guyanas, a further four subspecies range from the Amazons to Bolivia.

The subspecies *rufibasis* has a dark blue ground colour, hyaline spots on the forewing, blue bands on the hindwing and a red thorax and wing bases.

There is a single male specimen of this species from Trinidad in the BMNH and this is the one shown in the plate. It is labelled "88.002 Trinidad/ex J.J. Joicey coll." This label is not comparable with those of any other Trinidad specimens which I have examined in the BMNH. Possibly it is a copy of one of W.E. Broadway's labels as he seemed to use a "year:reference number" system e.g. one specimen of *Phanus obscurior* Kaye is labelled "Trinidad/Broadway 91.40." I know of no other records from Trinidad. In view of its distribution in Guyana this species may be found in the south of Trinidad, but until further captures are made could be regarded as an unconfirmed record.

Moss (1949) records the foodplant of the congeneric *T. corytus* Cramer as *Jacaranda copaia* D. Don (Bignoniaceae); the genus *Jacaranda* does not occur naturally in Trinidad.

12. Phanus vitreus Stoll 1781 (Plate 5, ♂)

This species occurs as the single subspecies from Mexico to Paraguay. In Trinidad it occurs in forests of both the north and south (19 specimens seen) but is not very common, especially in the north. The specimens in the Angostura-Barcant collection over this name are a mixture of *P. obscurior* and *P. marshallii* Kirby. This species can be found along forest trails or in small clearings and settles below leaves with its wings spread. Sometimes it is attracted to flowers (e.g. *Eupatorium* spp.).

This is the smallest species of the genus in Trinidad, and has the most extensive hyaline patches on the wings. The ground colour is black-brown, sprinkled with golden brown in the basal half of the wings on the underside. Female similar, but brown more extensive on underside. Forewing length ♂ 20mm, ♀ 22 mm. The three species of *Phanus* from Trinidad are readily distinguished by the shape of the marking in space 2 of the forewing. in *P. marshallii* this marking is deeply divided and the upper arm is as long as the lower one; in *P. obscurior* it is deeply divided and the upper arm is much shorter than the lower one, while in *P. vitreus* it is only divided to about half its width, and the upper arm is much shorter than the lower one.

The life histories of all three species of *Phanus* seem to be unrecorded.

13. Phanus obscurior Kaye 1924 (Plate 6, ♂)

William James Kaye the principal documentor of Trinidad's Lepidoptera, described this species from Trinidad in 1924. It also occurs, as one subspecies, from Nicaragua to Brazil.

My experience of this species is limited to the capture of two males in Parrylands beside a small stream (Feb. 1980), yet in the collection of the BMNH there are 20 specimens, all from the north of Trinidad, their dates of capture varying from 1881 to 1932, and the season from October to February. Since I have collected extensively in the north of Trinidad, I can only conclude that in recent years this species has become very much rarer or extinct in the north.

The ground colour of this species is brown rather than the black of the other two members of the genus and the hyaline markings are much less extensive in the male. In the female the extent of the hyaline markings approaches that of *P. marshallii* discussed below. Forewing length ♂ 23 mm.

14. Phanus marshallii Kirby 1880 (Plate 7, ♀)

This species was also described from Trinidad. Again as a single subspecies it has been found from Mexico to Bolivia.

The colouring of this species is similar to that of the smaller *P. vitreus.* Forewing length ♂ 24mm, ♀ 24mm.

I have caught and seen *P. marshalli* only in the Northern Range of Trinidad. Similarly the 18 Trinidad specimens in the BMNH which have locality data are all from the north of Trinidad. Sheldon (1938) records one specimen from Speyside, Tobago; this specimen is now in the BMNH. This species is quite common along shady trails of the Northern Range, settling under leaves with its wings spread. Readily disturbed, it has a fast, erratic flight which is difficult to follow in the shade of the forest, but it often re-settles close to the place from which it is disturbed.

15. Udranomia orcinus Felder 1867 (Plate 8, ♀)

This species has been recorded as a single subspecies from Guatemala to Brasil. Kaye (1940) records the capture of this species: "1♂ Manzanilla, 22.III.1922 (Dr. F.W. Jackson)". Although some of Dr. Jackson's butterflies are in the BMNH, there are no Trinidad specimens of this species, and neither have I caught or seen any. The specimens in the Angostura-Barcant collection over this name are of *Clito littera littera* Mabille, which I recently recorded as new to Trinidad (Cock 1982). Interestingly, Kaye records Dr. Jackson's capture of the riodinid *Nymphidium pelope* Fabricius (mis-spelt *pelops* by Kaye (1940) and subsequently Barcant (1970)) "A very distinctive species of *Nymphidium* discovered at Manzanilla in the swamps 23. iii. 1922 (F.W. Jackson)" and the hesperiid *Chiomara asychis* Stoll "In 1915 and at Manzanilla in iii. 1922 both records made by Dr. F.W. Jackson" suggesting that all three species may have been caught on the same occasion. *Chiomara asychis* I have recorded as occurring quite commonly on the edge of the Nariva Swamp (Cock 1981a) and it also occurs on the edge of Caroni Swamp. While I have not caught *N. pelope*, Barcant (1970) records it from "a trace south of the airfield at Point Fortin." I have visited the airfield at Point Fortin and noted that the trace south-west from the airfield leads to a mangrove-bordered river. If this is the area where Barcant caught *N. pelope*, then this too would seem to be a species associated with swampy conditions. Accordingly Dr. Jackson's records of *N. pelope* and *C. asychis* seem to be reliable records of swamp butterflies and there seems little reason to doubt his record of *U. orcinus.* Somewhere in the swamps of east Trinidad this species probably awaits rediscovery.

The specimen shown in the plate is from French Guyana (specimen in BMNH). It is a small brown butterfly with hyaline markings.

Moss (1949) records the foodplant of *U. orcinus* as *Gomphia subscandens* Planch. (Ochnaceae) but since this species does not occur in Trinidad and none of the Trinidad Ochnaceae is recorded from swamps, this does not throw much light on the Trinidad situation. Moss describes the larva as "yellow green with a big round head which is bifurcated at the crown."

16. Drephalys oriander oriander Hewitson 1867 (Plate 10, ♀)

Recently, I introduced this species to the Trinidad list (Cock 1982) and recorded two captures: my own from El Naranja at about 2000 ft. (March 1979) and Dr. David Hunt's from the Mt. St. Benedict's Pax Guest House (Sept. 1980). To date these remain the only captures.

On the upperside the ground colour is brown, the hindwing spots, the spots in spaces 1A and 1B of the forewing, the fore-

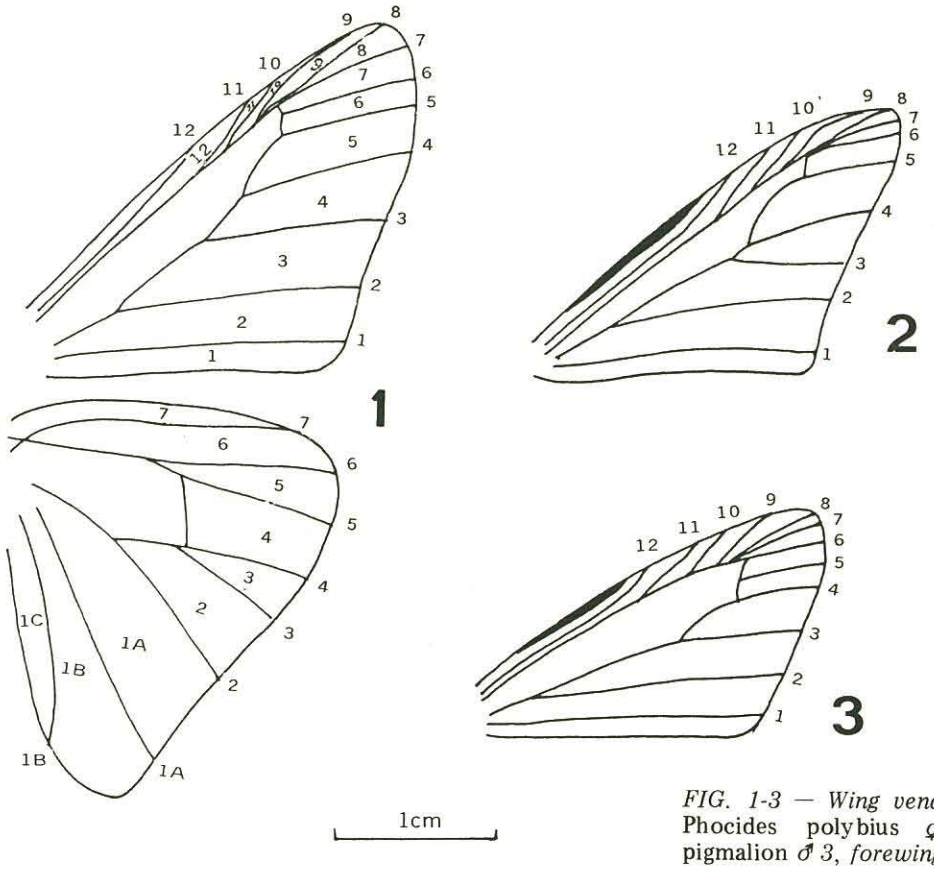

FIG. 1-3 — Wing venation of Pyrginae; 1, Phocides polybius *♀; 2, forewing* P. pigmalion *♂ 3, forewing* Phanus marshallii *♂.*

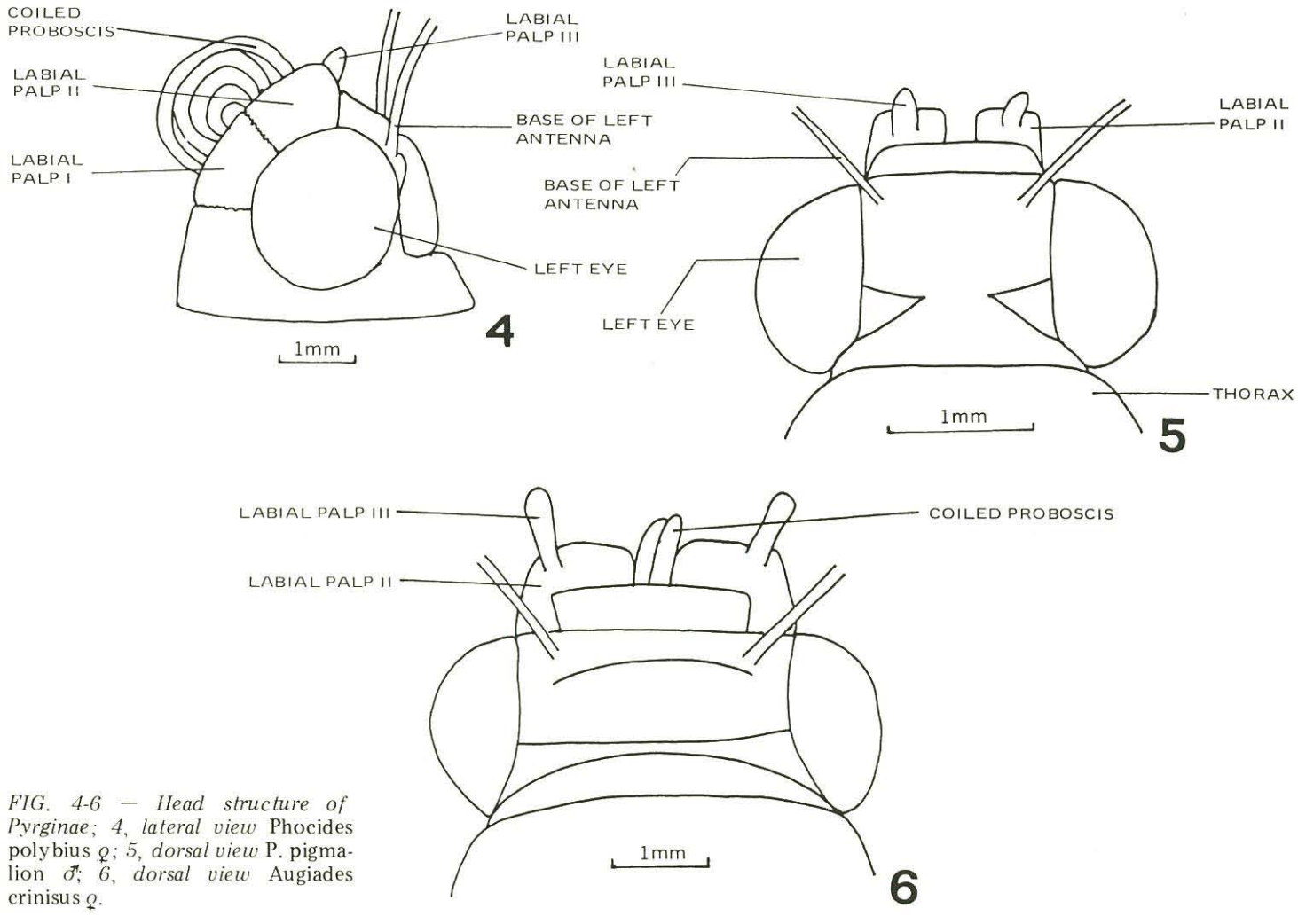

FIG. 4-6 — Head structure of Pyrginae; 4, lateral view Phocides polybius *♀; 5, dorsal view* P. pigmalion *♂; 6, dorsal view* Augiades crinisus *♀.*

wing base and the hindwing dorsum are yellow-orange, while the remaining spots of the forewing are white. This combination of yellow and white spots is very distinctive. The underside of the forewing is similar, but tinged mauve apically. The hindwing underside ground colour is mauve with a metallic violet tint; the spots (as on the upper surface), spaces 1A, 1B and the edge of 1C are faun, except the marginal area of 1A and 1C which is black; a black area between the two rows of spots at the edge of space 1C. Sexes similar. Forewing length ♂ 22 mm; ♀ 22 mm.

17. Drephalys alcmon Cramer 1779 (Plate 11, ♀)

This is a rare species known from the Guyanas and Amazons. Kaye (1940) records one specimen captured "Port of Spain, ii, 1930 (A. Hall)". Since many of the Reverend Hall's specimens are in the BMNH and there are no Trinidad specimens of this species in the BMNH, I doubted this record until I caught a female at Spanish Farm, near Las Lomas (May 1982). Evidently this is a rare species in Trinidad.

This distinctive butterfly is black, marked with white on the upperside. On the underside the forewing costa is yellow-brown to two-thirds of its length; the hindwing white band extends to the wing base, while the marginal area is brown rather than black. Forewing length ♀ 17 mm.

The larva is black, with eleven white bands and ochreous head and anal plate (Moss 1949); it feeds on two undetermined species of Rosaceae.

18. Augiades crinisus Cramer 1780 (Plate 9, ♀)

This species occurs as one subspecies from Costa Rica to Bolivia. Although Kaye (1921) records the capture of a specimen from St. Ann's (Oct.-Dec. 1920, A. Hall) I have encountered this species in the south-west of Trinidad only. In the Parrylands oilfield it is to be found occasionally, both in forest where it rests beneath leaves, and in the open feeding on, for example *Chromalaena (Eupatorium) odorata* L. flowers. In both situations the wings are held flat.

The ground colour is a reddish brown, and there is some variation in the white hyaline markings, the forewing to about one-third and the hindwing to about two-thirds are flushed (strongly on hindwing) with orange. On the underside the forewing base is flushed with white instead of orange, and white spots in spaces 12 and costa extend the discal band to the costa. The underside hindwing markings consist of a broad orange discal band and a narrow submarginal one, spaces 1A and 1B are pale and the wing base is light brown. Forewing length ♂ 25 mm; ♀ 25 mm.

In Brasil the foodplant of this species is *Lecythis jarana* (Hübner) A.C. Smith (Lecythidaceae) (Moss 1949). This species does not occur in Trinidad where the family Lecythidaceae is represented by the cannon ball tree (*Coroupita guianensis* Aubl.) and *Eschweilera subglandulosa* (Steud.) Miers, both of which are possible foodplants. Moss describes the larva as light yellow grey and very thin skinned, the head is very big, heart-shaped, light red and adorned in the middle by large black eye spots.

19. Entheus priassus priassus Linnaeus 1758 (Plate 12, ♂; 13, ♀)

This species was added, without comment, to the Trinidad list by Barcant (1970). There are three undated male specimens from Tabaquite in the BMNH, and I have captured a female on Las Lappas Trace (Sept. 1979) and a pair near the Arima-Blanchisseuse Road, milestone 9¾ (Oct. 1980). In addition, recently I saw what I believe to be a male of this species on Morne Catharine sitting under leaves at a height of 8-10 m in a sunlit clearing, and Dr. Victor Quesnel has shown me a male he found in his greenhouses at Talparo. Hence, this is another rare but widely distributed species in Trinidad.

Entheus priassus shows perhaps the most striking sexual dimorphism of any hesperrid in Trinidad. The male is black with markings in yellow and orange which are repeated on the underside. The female is dark brown marked in white, with a short orange streak at the base of the cell; the underside lacks this streak and the discal white spot of the hindwing extends to the dorsum and the base of the wing. Forewing length ♂ 20 mm; ♀ 20 mm.

Moss (1949) also records this species as feeding on Lecythidaceae (cf. *Augiades crinisus*), the species being *Gustavia ruizana* Berg and *Lecythis* sp. The same two plants suggested for *A. crinisus* may be used by *E. priassus* as foodplants. Moss describes the larva as dull whitish green; the head rather flat, heart-shaped, plain glossy red-brown without eye spots.

ACKNOWLEDGEMENTS

I would like to thank the Trinidad collectors F. Clive Urich and Scot Alston-Smith who kindly provided specimens and data, Angostura Bitters Ltd. who allowed me access to the Angostura-Barcant collection of butterflies, and Dr. J.D. Holloway of the Commonwealth Institute of Entomology and Dr. R.I. Vane-Wright of the British Museum (Natural History) who kindly facilitated my studies at the museum.

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Recent Data on Some Localised Trinidad Butterflies

By Richard Raby 9-13 Zurcher Street, San Fernando

MY work in the oilfields first brought me to South America in early 1981. During my first posting to Venezuela, I became fascinated with the wealth of New World insect life. I moved to Trinidad in February 1982, just in time to observe the famous Trinidad wet-season butterflies.

Using "The Butterflies of Trinidad and Tobago" by Malcolm Barcant (1970) as my basic reference I decided to make a small collection. I have somewhat restricted my interests to the larger and mostly forest-dwelling species with emphasis on the families Papilionidae (Swallowtails or Pages), Brassolidae (Barks, Mort Bleus & Dynastors) and some of the more specialised Nymphalidae (Shoemakers).

With the onset of the rainy season it became quite apparent that many things have changed since Barcant published his book. I feel it may be useful to add some recent findings to supplement his work.

I must state now that my present knowledge of many species is due to the invaluable background assistance of resident collectors such as John ffrench, Felix Gomez and especially Scott Alston-Smith and Clive Urich.

THE PAPILIONIDAE:

Battus belus varus: This southern resident appears to have had an excellent year. Good numbers were observed on virtually every visit to the favoured habitat in Parrylands and South Forest Reserve throughout the wet season.

Battus lycidas: Though no specimens were caught, reasonable numbers were however observed in Parrylands, Forest Reserve and Grande Ravine. Often encountered flying with *belus varus*, they were much more wary and very seldom came down low. The iridescent bluish green sheen to the upperside of the wings is a diagonastic field marker.

**Eurytides telesilaus:* The Southern White Page; A solitary specimen of this magnificent rarity was observed in September close to Grande Ravine. Trips to Catshill, Inniss Field, in August and September however failed to produce this species, or other rare Papilionidae, in this area considered a "stronghold" in the past.

**Eurytides protesilaus:* The Northern White Page; A single specimen was heard of from the Toco area in September, coming to water. This was considered unusual and probably a stray. I understand that Dr. M. Cock observed good numbers in August, at high elevation, close to the summit of El Tucuche. Its apparent host-plant is *Phoebe elongata* (unpublished data, Mr. Barcant) but although searches were made no caterpillars have been found in recent years.

**Eurytides pausanias:* The Pausanias; This is another very localised Trinidad species, however Mr. Felix Gomez has captured at least two male specimens this year in the Fondes Amandes area.

THE NYMPHALIDAE:

Probably the most interesting events of this season were the discovery of breeding localities for two of Trinidad's rarest Nymphalids. *Catonephile acontius* (The Orange Banded Shoemaker) and *Archeoprepona meander* (The Dark Banded King Shoemaker). *Anaea eribotes*, another rare and localised species was also located.

Anaea eribotes: The Scarce Blue Shoemaker: A chance finding of a female of this species laying eggs (in the Parrylands district) provided myself and C. Urich the opportunity to rear this uncommon butterfly in captivity. The host-plant was a species of "Candle Bush," still to be positively identified. This plant grows in dense secondary forests in the South and possesses only very small "candle" flowers. The butterfly shows a distinct preference for laying on small plants, on the underside of the leaf, and remarkably low to the ground.

Anaea morvus. The Blue Shoemaker: Though very few adult specimens were observed, many caterpillars were found on the host plant, *Ocotea glomerata*, in the Southgate area of Forest Reserve, and successfully raised. Mr. C. Urich is at present rearing a southern caterpillar on the northern food-plant, an interesting experiment which looks likely to succeed.

Archeoprepona meander: The Dark Banded King Shoemaker: A little luck led to the discovery of the host-plant. Taking a few caterpillars from the plant *Phoebe elongata* (and assuming them all to be the more common species *A amphimachus*, the Banded King Shoemaker), I was pleasantly surprised to find that I had reared both species. There are distinct differences in the larval stage which I list below. These differences become more obvious after the second skin shedding.

A. meander: Few body markings and very pale overall. Black and white tails. Plain brown head.

A. amphimachus: Overall darker and more strongly marked. Black and Pink tails. "V" mark on front of head.

Both caterpillars are typically "King Shoemaker" in their overall appearance, being smooth-skinned, hunch-backed, possessing twin tails and two small head horns. (See also Papworth, 1981-82). This is the first time, to my knowledge, that *A. meander* has been reared in Trinidad.

Archaeoprepona demophoon: The Silver King Shoemaker: Though a reasonably well known species I take this opportunity to list its host-plant in the South. This is *Ocotea glomerata*, the same plant as for *Anaea morvus.*

Catonephile acontius: The Orange Banded Shoemaker: This is listen by Barcant as one of the twelve rarest butterflies in Trinidad and Tobago. He rightly assumed it to be a resident breeding species. through never proven in his day. Scott Alston-Smith deserves the credit for this new knowledge of the species. Whilst the butterfly was seen and recognised by myself, Scott Alston-Smith independently came across the same locality a few days later and located the host-plant complete with eggs and

*In Barcant (1970) these butterflies are listed under the name *Graphium.*

caterpillars. This same locality in Parrylands has proved very productive for the whole season.

Scott, myself and Clive Urich all bred out caterpillars. Urich tried captive mating but was unsuccessful in his first attempt, he was however successful in getting captured females already fertile, to lay in captivity.

The foodplant *Alchornea triplinervia* (Euphorbiaceae) is the same as that of *C. numelia*, The Grecian Shoemaker, from the Northern Range.**

Metamorpha epaphus: The Rusty-Tipped Page. This previously very rare butterfly can now be found regularly at high altitude in the Northern Range especially at Lalaja.

THE BRASSOLIDAE

The rare *Catoblepia berecynthia*, Brown Mort Bleu, appears to be more common now. Several specimens were baited to traps in the Parrylands area and individual specimens were also caught on the wing in Forest Reserve, Catshill, and, by Felix Gomez, in the Cascade area near Port of Spain.

Large numbers of the "Barks" *Opsiphanes cassiae* and *O. cassina* were taken in traps all season especially in Parrylands and Southgate, Forest Reserve along with *Caligo eurilochus*, the Forest Mort Bleu.

C. berecynthia apparently lays very easily in captivity on Ornamental Palm (C. Urich).

THE SATYRIDAE

The very rare species *Antirrhaea philoctetes* (The Queen of the Night) has been captured in some numbers by Feliz Gomez in the Cascade area. He finds them attracted to dense shade where there is fallen cocoa. Very little appears to be known of the life history of this species (Trinidad's rarest Satyrid). It is hoped to study this butterfly in captivity soon. The caterpillar apparently eats dead, dry, palm leaves.

Help wanted. Please check your homes at night for the Black Dynastor (Living World 1981 82 Cover photo). or the Brown Dynastor, brown with creamy yellow spots but the same size and shape. The females show a habit of being attracted to light just after dusk. With a live female specimen Mr. Clive Urich would stand a very good chance of breeding the species in captivity and adding to the very limited world knowledge, of the early stages of this very rare, primitive family of butterflies.

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** See Matthew Cock's note on p. 35 of this issue. Ed.

Ectoparasite of A "Galap" *Rhinoclemmys punctularia* (Daudin) in Trinidad, W.I.

Dave D. Chadee, Ashton Le Maitre, R. Ganesh and R.C. Persad, Insect Vector Control Division, Ministry of Health and Environment, P.O. Box 556, Port of Spain, Trinidad, W.I.

THE ectoparasite, *Amblyomma dissimile* is widely distributed in th forested areas of Trinidad, West Indies. It is known to parasitize a wide range of reptiles and amphibians, including snakes, large lizards (*Ameiva ameiva* and *Tupinambis nigropuctatus*), caimans and the large toad, (*Bufo marinus*) (Aitken et al, 1968).

During 1961-1962, a total of 5,870 *Amblyomma* ticks including *Amblyomma longirostre, A. calcaratum* and *A. dissimile* were collected in the Bush Bush Forest, Nariva Swamp, Trinidad, West Indies. All ticks collected were tested for naturally occurring viruses but no isolations were made (Jonkers et al, 1968). This paper reports the first collection of the ectoparasite, *Amblyomma dissimile*, from the fresh water turtle, *Rhinoclemmys punctularia* (Daudin), in the Guayaguayare Firest, Trinidad, West Indies.

Rhinoclemmys punctularia, formerly classified as *Geomyda punctulariola* (Fretey et al. 1977), is distributed from eastern Panama south into western Columbia and Ecuador and east through norhtern Columbia, Venezuela, Trinidad, Guyana, Suriname, French Guiana and the Brazalian Territory of Amapa and the state of Para. It is the only member of the genus found east of the Andes (Pritchard, 1979).

In Trinidad, *R. punctularia* is commonly referred to as the "galap." It is widely distributed and has been collected on many occasions in the Aripo Savannah (Underwood, 1963).

The galap, *R. punctularia*, was collected on the 6 April, 1981 while Insect Vector Control Division (IVCD), Ministry of Health and Environment, conducted entomological investigations in the Guyaguyare Forest. The tortoise was transported to the Caribbean Epidemiology Centre (CAREC) to be tested for viruses. A blood sample was taken and tested but no isolations were made.

This study was done as a result of reports of sick and dead howler monkeys *(Aloutta seniculus)* and porcupines *(Condu prehensilis)*. It should be noted that examination of the three available monkeys showed that two of the howler monkeys were shot while the third was chopped on the head by the game hunter. The two porcupines, on the other hand, were in a state of almost total decomposition. Specimens were collected but could not be processed for virus isolation owing to the decayed state of the animals.

We wish to thank Dr. E.S. Tikasingh, Entomologist/Parasitologist from the Caribbean Epidemiology Centre for assisting in the identification of the ectoparasite. In addition we thank the laboratory and field staff of IVCD for their assistance. The specimens of *Amblyomma dissimile* are lodged in the reference collection at the Caribbean Epidemiology Centre, P.O. Box 164, Port of Spain, Trinidad, West Indies. In addition, we thank Dr. R. Paul, Specialist Medical Officer, Insect Vector Control Division for her support and advice during part of this study.

This paper is published with the permission of the Ministry of Health and Environment, Trinidad and Tobago.

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Underwater Observations on Two Rare Southern Caribbean Cones, (Mollusca, Gastropoda) - *Conus mappa* (Lightfoot) 1786 and *Conus centurio* Born 1778 in Trinidad & Tobago

By Peter L. Percharde, Trinmar Limited, Point Fortin, Trinidad & Tobago

INTRODUCTION

IN the past, several workers have published excellent papers on *Conus*, a gastropod genus of the Phylum Moclusca. They have written extensively on the complex and potent venom systems used in conjunction with their very specialized "harpoon-like" radular teeth to capture prey. Also, there have been detailed references relating *Conus* radula morphology and structure to the diet of these molluscs (Kohn, 1959, 1960, 1966; Endean & Rudkin, 1965, Nybakken, 1970, 1970a).

In March 1974, the author completed a paper on lengthy underwater observations on the behaviour and econogy of *Conus ermineus* Born 1778 (Percharde, 1974). This paper was the first part of a detailed study of the three largest *Conus* species found in the waters of Trinidad and Tobago.

Conus ermineus was found to be a piscivore, feeding on small fish which are captured at night and very rapidly digested in the gut. Although *Conus ermineus* is fairly common in its habitat areas continuing this work has been a problem because *Conus mappa* and *Conus centurio* are quite rare. In consequence, deep dives to observe and collect can often be non-productive. Carefully following the numerous mollusc tracks in the fine silt of the habitat areas only to find at the termination of the track either a different species of mollusc or the unmistakable signs that some predatory crab or fish has been there before you can be quite frustrating. Sometimes, the freshly broken shell fragments are from what must have been a large handsome specimen of the very species under study. A high degree of self-discipline is required to ensure that enthusiasm for the search does not interfere with sound diving practice and adequate decompression.

The study of the tracks left by molluscs is of considerable interest and the author has found that an accurate identification of the genus of a mollusc can often be made from the type of track observed.

The rarity of the two species under study make it impossible to carry out as comprehensive a review of these two species as was alone for *Conus ermineus*. However, many interesting observations have been made concerning the econogy and behaviour of these two rare molluscs, and the author has once again been able to confirm the validity of Nybakken's Key, which refers *Conus* radula tooth structure to diet (Nybakken in A. Myra Keen's "Seashells of Tropical West America" and Nybakken, 1970, 1970a).

One of the more interesting aspects of the study of the diets of *Conus* species in a given habitat area in the Caribbean faunal province is the possibility of making comparisons with the situation which is known to exist in the Indo-Pacific where many species of the genus *Conus* can exist together with a high population density, but without competition, because of their widely differing diets. In the southern Caribbean, with a much reduced number of *Conus* species, it was considered that there would be far fewer species — specific dietary preferences. However, studies on the three largest species of *Conus* in the waters of Trinidad & Tobago, revealed that *Conus ermineus* is a piscivore, *Conus mappa* is a vermivore feeding on the Amphinomidae (Fire worms) *Conus centurio* may be a molluscivore, although the evidence is by no means conclusive.

CONUS MAPPA AND *CONUS CENTURIO* IN THE LITERATURE

Conus mappa (Lightfoot, 1786) is the present name of a mollusc that has had a very interesting past history in the conchological world and in taxonomy. This history dates back to the early 1700's, when it was known as the "Matchless Cone" or *Conus cedonulli*. See figures (d), (e) and (f). Plate 1.

Dance (1966) published a detailed account of the past history of this then famous species in which he explained how some of the uncertainty concerning the true identify of this shell came about. However, in a footnote, Dance advises us that Linnaeus gave the name "cedonulli" to the shell in 1767, basing this on a figure published by A. Seba in his Thesaurus (Vol. 3 pl. 48, Fig. 8). Dance concluded that this figure suggests a form of *Conus ammiralis* which is an Indo-Pacific species. It is difficult to argue over old lithographed figures but the author possesses one specimen, and has examined many, almost identifical to Seba's published figures. These are specimens of *Conus mappa* from the Island of St. Vincent and were obtained a few years ago, when extensive dredging was being carried out (see under habitat).

Recently Dunn (1971) published a recommendation that *Conus mappa* be again named *Conus cedonulli* Linné, 1767 restoring the old original name. However, Holman and Kohn (1970), had attempted to clear up some of the confusion that existed concerning the taxonomy of this species. In this work they considered that *Conus mappa* (Lightfood, 1786) was the valid name and that *Conus insularis* Gmelin 1791, *Conus aurantius* Hwass 1792, *Conus dominicanus* 1792 and also Hwass's infraspecific taxa of *Conus cedonulli* are synonyms. Most recently, Vink (1977) has published a detailed review of the *Conus cedonulli* complex.

The author is in agreement with these views, especially after comparing the behaviour and examining the radular teeth of most of the above listed forms of this very variable species of cone from aseveral areas of the Southern Caribbean. It is also considered that *Conus mappa* is very closely related to the more common *Conus regius* Gmelin.

The radular teeth are very similar and the strange diet of amphinomid works is common to all these previously mentioned forms. Nybakken (1970) referred to work and figures published by Van Mol, Tursch and Kempf (1967) and predicted that with the very specilized type of tooth, figured for *Conus regius*, he expected that this species would feed on amphinomids. This diet can be confirmed, since during the course of this present study the author has examined two specimens of *Conus regius* from the northern Caribbean and found that both specimens con-

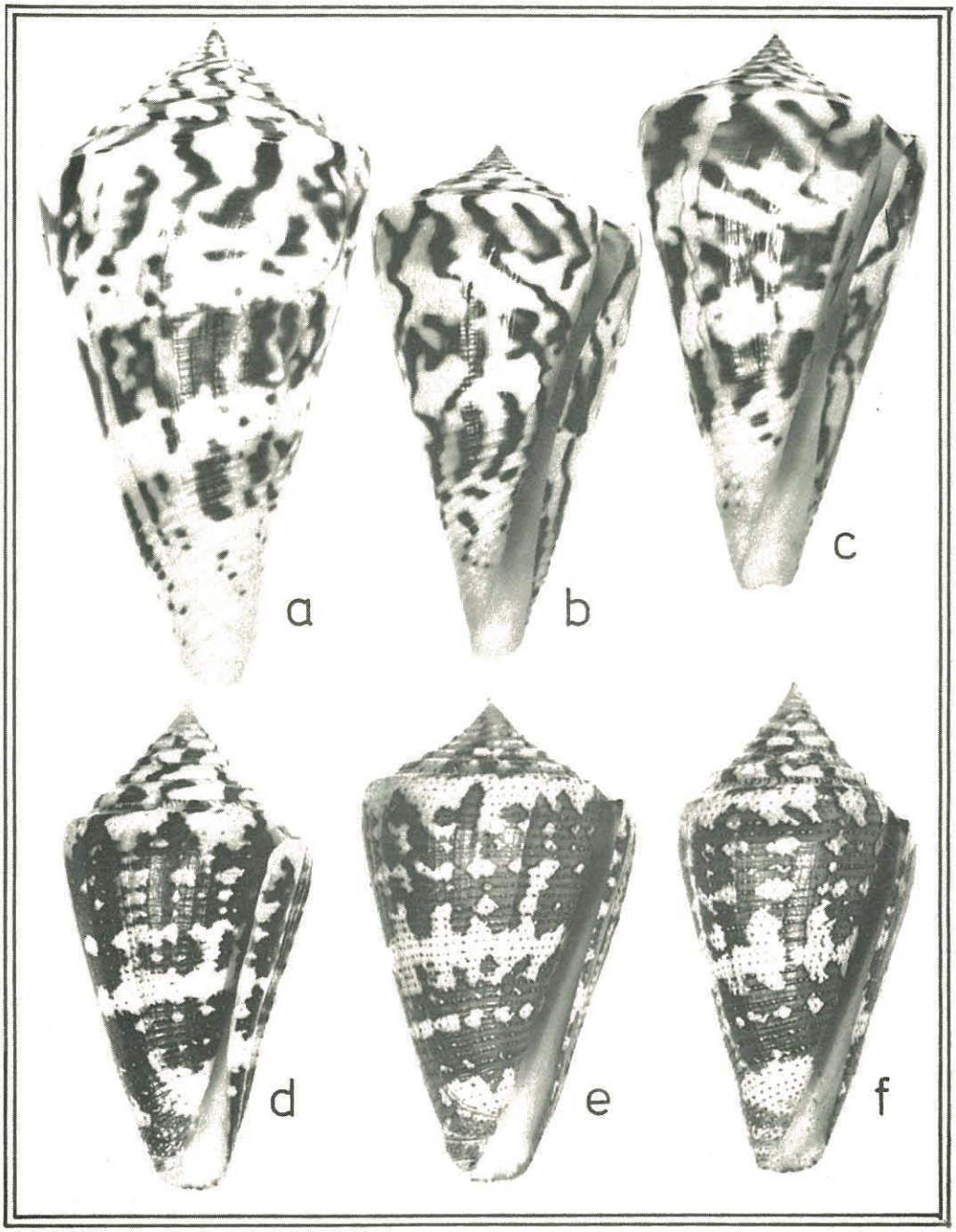

PLATE 1. Specimens of the two rare Conus *species from the First Boca.*

FIGURE (a): Conus centurio, *very large male — 82 mm from 40 metres depth.*

FIGURE (b): Conus centurio, *female 55 mm from 42 metres depth.*

FIGURE (c) Conus centurio, *female — 63 mm from 38 metres depth.*

FIGURE (d): Conus mappa, *male — 50 mm from 37 metres depth.*

FIGURE (e) Conus mappa, *female 48 mm from 30 metres depth.*

FIGURE (f) Conus mappa, *male — 51 mm from 28 metres depth.*

tained packets of amphinomid setae in thick mucus.

Many excellent figures of *Conus mappa/Conus cedonulli* in both black and white and in full colour, have been published in the past but the author has been unable to find any detailed references to the species's behaviour or ecology other than that of Seamon & Seamon (1967) and Van Pel (1969).

Conus centurio Born 1778 is by no means as well known as the previous species. It is, however, a most handsome and interesting mollusc. See Figures (a), (b) and (c). Plate 1. In 1970 Clench figured a specimen that had been donated to the Harvard Museum of Comparative Zoology by the author. This specimen was the largest the author had observed or collected and it measured 91 mm in length. It was obtained from the flat silty ledge at 49 metres off Miramar Bay in the First Boca of Trinidad.

Wagner & Abbot (1967) cited *Conus bifasciatus* Gmelin 1791, *Conus woolseyi* Smith 1946, and *Conus tribunus* Gmelin

1791 as synonyms. Clench (1942) mentioned that little is known concerning this species except that it had been dredged in 5 fathoms (9 metres) of water in the harbour of Puerto Plata in the Dominican Republic. No specimens of *Conus centurio* have been collected or observed in water as shallow as this in the waters of Trinidad & Tobago.

Nowell-Usticke (1959) figured a beautiful specimen of this species from Ham Bay, St. Croix, U.S. Virgin Islands but did not give ecological or habitat data.

Warmke & Abbott (1961) figured two specimens from Puerto Rico, both appeared worn, shallow-water specimens.

Rios (1970), figured two specimens from Itapua, Brazil and cited several other locations off the Brazilian coast ranging in depth from 17 to 106 metres. Marsh & Rippingale (1964) figured a specimen from the British Museum (Natural History) from the de Burgh collection; the locality was given as Amboina! However, it is pointed out that this is in error, as *Conus centurio* is an endemic West Indian or Caribbean faunal province species. It is possible that there is a relationship between *Conus centurio* and *Conus delessertii* Recluz 1843 of the northern Caribbean (Florida) area. The shells are similar and so are the radular teeth but the author has been unable to find any ecological or behavioral studies on *Conus delessertii* for comparison. It is also possible that *Conus centurio* is a cognate species with *Conus recurvus* from the Panamic Province, and Nybakken has advised that the teeth are very similar (personal communication).

OBSERVATIONS ON HABITAT

In Trinidad & Tobago, the adult forms of both *Conus mappa* and *Conus centurio* share the same habitat (see map Plate 3). The adult shells of *Conus mappa* measure 50 mm — 70 mm in length. Juvenile specimens of *Conus mappa* can be found in shallow water habitats where there is calcareous grit. They are often found in transitional areas where grit and muddy silt meet. These areas are marked by the presence of red algae.

Vink of Curacao, Netherlands Antilles, has reported that he found both juvenile and adult forms of *Conus aurantius* in shallow water (4.6 — 9 metres) habitats, buried in coral rubble (personal communication). Vink is a diver and has studied the *Conus mappa / Conus aurantius* problem intensively; he does not support the view that these species are identical. However, he has recently confirmed that *Conus aurantius* feeds on amphinomid worms (Vink 1974).

The only large adult specimens of *Conus mappa* found by the author in shallow water have been dead shells transported up the slopes by hermit-crabs. Surprisingly, no specimens of *Conus centurio* have been found above 30 metres and even crab occupied shells are only found in deep water. In these deep water habitats *Conus mappa* is rare but can be found by careful searching and by feeling through the silt, especially in small depressions, close to specimens and aggregations of the deep water octocoral *Leptogorgia setacea.*

Conus mappa shares this same habitat. On several occasions, the author has collected large specimens of both species partially buried in the silt 20 cm to 30 cm apart, in the same shallow depression. The very large specimen of *Conus centurio* donated to the Harvard Museum was collected in daylight in an octo-coral area on the eastern side of the First Boca.

Clench (1970), published the author's observations on the habitat of both these *Conus* species. At that time other molluscs found in association were listed as *Polystira albida* (Perry), *Cyphoma intermedium* (Sowerby) and *Murex cabritti* Bernardi. The listing of this latter species was in error, as the author has now found, thanks to the late G. Radwin of the San Diego Natural History Museum, that the long siphoned, spiny muricid, from this deep water habitat is *Murex donmoorei* Bullis 1964. Recent diving at night time has not really furthered the study on the two *Conus* species, but has revealed that another species of rare *Conus* shares this deep water habitat. This is *Conus stimpsoni* Dall 1902. This species remains buried in the silt during daytime and only emerges after 2200 hours each night. It is quite common at this time but the author has not found one living specimen during daylight hours.

The most consistently productive habitat area for the two species of *Conus* under study however, has been the flat silt areas of the First Boca off Morris Bay, Miramar Bay and Scotland Bay.

No specimen of these species has been found at similar depths in either the Second or Third Bocas. This may be due to the fact that the substrate in these areas is either coarse or medium grit and lacks the muddy silt.

Recent diving and collecting observations (1974 and 1977) carried out by the author have revealed that both species of *Conus* are out on the seabed actively moving and feeding during the month of December. At this time, owing to upwelling cold water, the temperature in the habitat area has always been below 19°C and on one or two occasions it has been below 17.2°C. The surface water temperature was 26.6°C on an average.

In Grenada, to the north of Trinidad, the author has collected several specimens of *Conus mappa* buried in calcareous sand in coral reef areas at depths between 6 and 9 metres. The water temperatures in these areas are between 26.1°C and 27.2°C. As mentioned previously, dredging work in St. Vincent a few years ago produced many beautiful specimens of *Conus mappa.* Many of these specimens had been dead for a considerable period of time and had remained buried in the carbonate sand and grit. It is the author's opinion that burial in carbonate sand for lengthy periods enhances the colour and the three-dimensional effect of the patterns on the shell of *Conus mappa* specimens. The author possesses two specimens, one from St. Vincent and one from Morris Bay, Trinidad. Both had been buried for long periods, prior to collection.

Three of the specimens figured by Cameron (1961) exhibit this enhanced three-dimensional effect and also the shift of the colouring towards the lighter reds and orange-reds. The specimen figured by Dunn (1971) from the Usticke collection is also cited as coming from St. Vincent. This specimen exhibits the marked three-dimensional effect in the pattern of the shell.

FORMS AND VARIABILITY OF *CONUS MAPPA* AND *CONUS CENTURIO*

The past taxonomic history of *Conus mappa* will no doubt prepare any worker studying this species for acceptance of the great variability in both colour and pattern, and to a certain extent also, the form of this shell. Specimens in Trinidad & Tobago appear to be fairly consistent in these features, except for sexual dimorphism which is quite marked. Females are larger and the angle of the spire of the shell is 80° — 100°. In males, the spire angle is 70° — 80°. The shells of comparably sized females also tend to be more dense and often appreciably heavier than those of males. Both males and females possess narrow apertures and internally there appears to be a further narrowing or a rounded plication on the internal section of the columella by way of the siphonal end of the aperture. This feature renders the removal of the soft parts of the molluscs for dissection extremely difficult.

It is apparent that whilst *Conus mappa* is consistent in form in a specific geographical or isolated habitat area, considerable variation exists in specimens from differing geographical areas. The coasts of north and east Brazil and the northern coast of South America (including Trinidad & Tobago) appears to produce consistently similar forms. This consistency extends as far as the Paraguana Peninsula of Venezuela. The Caribbean coast of Columbia appears to produce specimens of considerable variation. In fact Vink (1977) has created a new taxon for the species found off the Columbian coast — *Conus sanctaemarthae* Vink.

The islands of Curacao, Aruba and Bonaire, which lie some distance offshore from the northern South American coastline, produce their own distinctive endemic forms. The islands of Grenada and St. Vincent in the Windward group, again produce forms of considerable variation, with the specimens from St. Vincent being the most distinctive of all.

Conus centurio does not appear to be very variable at all. All the specimens and figures examined by the author, exhibit

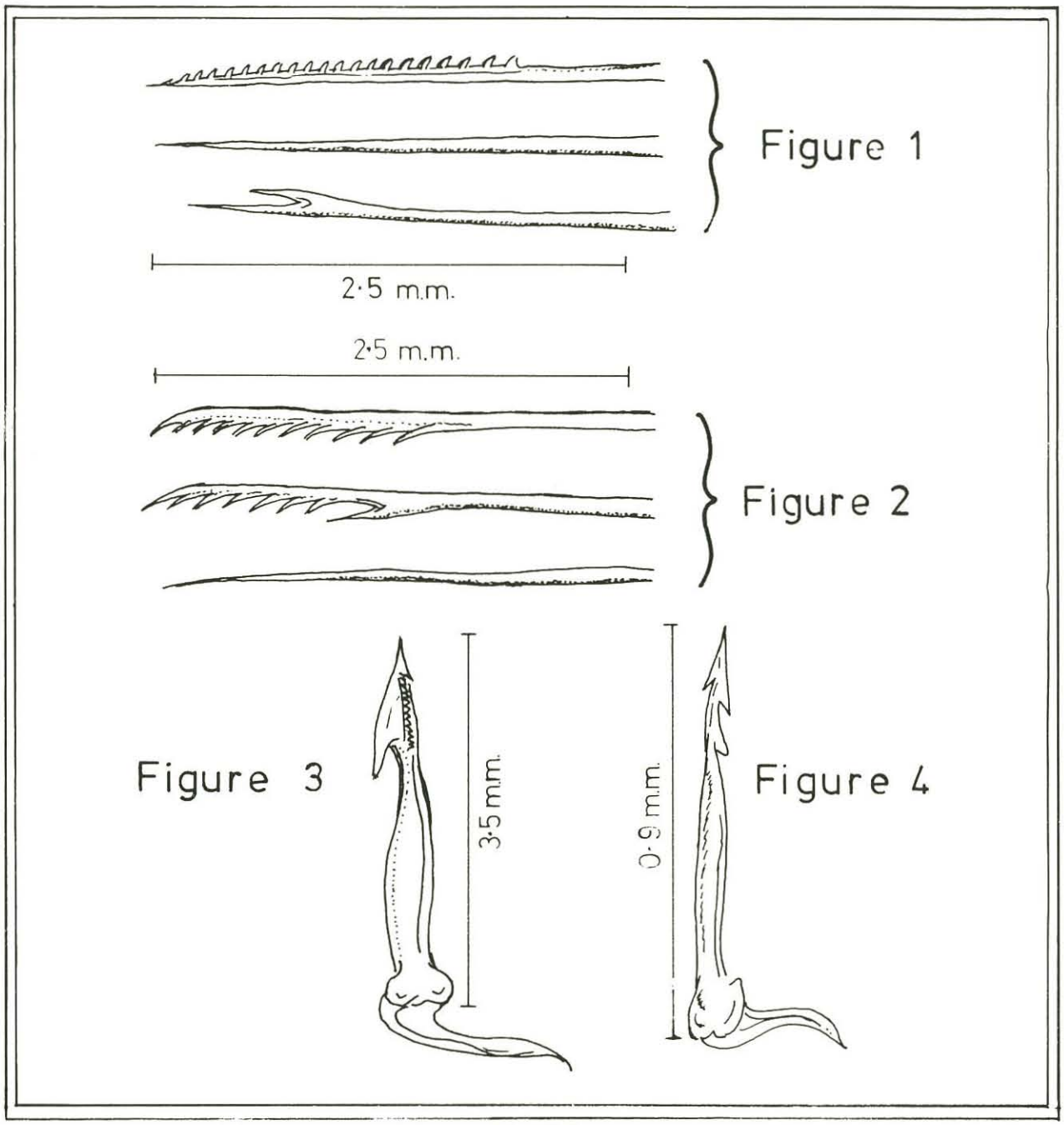

PLATE 2

FIGURE 1: Specimens of Amphinomid venomous setae found in thick mucus packets in specimens of Conus mappa. *These setae believed to be from the amphinomid (fire worm)* Evrythoe complanata *(Pallas).*

FIGURE 2: Specimens of setae taken from Conus mappa *which had been feeding on the amphinomid* Hermodice carunculata *(Pallas).*

FIGURE 3. "Harpoonlike" radular tooth from Conus mappa.

FIGURE 4: Radular tooth from Conus centurio.

uniformity in form, pattern and coloration. The specimen figured by Nowell-Usticke is almost identical to specimens from Trinidad or those collected by shrimp-trawlers off the Brazilian coasts These localities are approximately two thousand miles apart.

Sexual dimorphism is apparent in *Conus centurio.* Once again, the females tend to be larger and the spires of the shells are of greater angle: females 100° — 120°, males 90° — 100°. *Conus centurio* does not possess the restriction in the aperture that is found in *Conus mappa.* The shell of *Conus centurio* is very light and fragile. Even in a large specimen, the outer lip is always thin and sharp.

Recently, the author has collected two recently dead specimens of *Conus centurio* without the distinctive three yellow, horizontal bands around the shell. There was also a marked reduction of the brown pattern. These specimens appear very similar to *Conus clerii* Reeve. Except for these marked differences in the pattern and coloration, the shell morphology appeared almost identical to the typical *Conus centurio.* The author is endeavouring to obtain a live or preserved specimen of *Conus clerii* from off the Brazilian coast to examine and compare with *Conus centurio.*

EXAMINATION OF THE SOFT PARTS, RADULAR TEETH AND ASSOCIATED VENOM SYSTEMS

One of the problems the author has experienced during this study concerns the removal of the soft parts from specimens of *Conus mappa*. No difficulty has been experienced in removing the soft parts from shells of *Conus centurio* despite the fact that the aperture in this species is also narrow and the lip of the shell very fragile. The problem with *Conus mappa* concerns the restricted aperture and the rounded plication on the columella which causes even further restriction in the internal aperture.

This structure, which is not found in either *Conus ermineus* or *Conus centurio* is most probably related to the strange diet of this species. Pulling a "harpooned" amphinomid worm into the siphonal or head end of the aperture of the shell, suitably lubricated with mucus, would be analogous to pulling coarse wool through the eye of a darning needle. All the venomous setae of the prey, would be deflected outwards, thus preventing the mollusc being pierced and poisoned. However, it must be noted, that this restriction is not found in either *Conus aurantius* or *Conus regius*, which also feed on amphinomid worms.

During the author's previous studies on *Conus ermineus*, Nybakken had advised (personal communication), that in order to kill *Conus* specimens and at the same time arrest the digestive processes in the gut, specimens should be boiled for a few minutes in sea water as soon as possible after being collected. This has proven to be of great help for all species of *Conus*, other than *Conus mappa*. Boiling, even for short periods, hardens the musculature of *C. mappa* and with the restricted aperture, subsequent removal is impossible without either breaking up the animal or the shell. Attempts to relax the animal, using conventional chemicals have not been very successful.

The internal anatomy of both *Conus mappa* and *Conus centurio* is typical of all *Conus* species. In *Conus mappa* the foot and proboscis are coloured bright red or orange-red. In males the penis is quite large, the latter two-thirds being a flattened blade, coloured bright red. It is positioned on the right side, well back from the mollusc's head.

The venom system, comprising associated glands, ducts and explusion bulb, is much smaller than that of an equivalent sized specimen of *Conus ermineus*. The radular teeth are 3 — 4 mm in length; they are typical of the specialized type of tooth used by *Conus* species feeding on amphinomid polychaete worms (Nybakken, 1970a; see figure (3) Plate 2.)

Only six or eight teeth are found fully developed ready for use with the venom system.

In *Conus centurio*, the coloration of the foot and proboscis is a bright sulphur yellow. Other parts of the musculature are white. In males the penis or verge is often coloured bright yellow with an orange-yellow margin around the blade. This is also positioned on the right side of the mollusc.

The venom system is typical and once again the organs, when compared to those from equivalent sized specimens of *Conus ermineus*, are smaller, approximately two-thirds the size. They are, howevr, comparable to those in similar sized specimens of *Conus mappa*. The radula sac is small and contains 12 — 14 teeth. The teeth (see figure (4) Plate 2) are not typical of those *Conus* species which feed solely on other molluscs, and it is possible that *Conus centurio* has a more complex or varied diet (see Food and Feeding). Both *Conus centurio* and *Conus mappa* possess smaller heads, eyes and tentacles than specimens of *Conus ermineus* of equivalent size.

REPRODUCTION

Neither egg cases nor any form of reproductive behaviour has been observed in either species. It is possible, however, that the increased activity in both species under study during the month of December may be related to reproduction. Continued observation may produce more evidence but the rarity of these species in their deep habitat areas is not conducive to observations being made on short term events. Observations in aquaria may be of help but the maintaining of the correct temperature, approximately 5 — 15°F below ambient air temperatures, would pose many problems. The author has also observed that many species of female molluscs from other genera automatically produce egg capsules and lay infertile eggs as soon as they are collected and placed in aquaria, possibly due to the trauma of being collected and placed under much reduced hydrostatic pressure and higher temperatures.

FOOD AND FEEDING

As mentioned in the introduction, it is in the area of food an feeding that the genus *Conus* has generated tremendous interest for malacologists during the past ten years. The discovery that there was a definite relationship between the structure of their radular teeth and their observed dietary preferences of differing vertebrate and invertebrate prey has stimulated considerable interest in the genus. However, accurate work in this field can only come from repeated observation and the examination of the gut contents of many specimens. The author has often marvelled at the density of different *Conus* species in a relatively small habitat area in the Indo-Pacific. In these areas the collection and examination of large numbers of specimens pose few problems. Marsh (1971) was able to carry out valuable work on vermivorous *Conus* species on the Barrier Reef of Australia because he could examine many specimens of many species.

Great difficulty is experienced, however, when attempting to carry out work on rare species. During the course of this present study, the author has been faced with two choices. Either collecting and examining the gut contents of each and every specimen of *Conus mappa* and *Conus centurio* found, or observing as much as possible on the sea-bed and only collecting selected specimens at night or early in the morning when there is a better chance of finding undigested food in the gut.

Conservation must be a guiding factor in a study such as this and after adopting the second choice the author has observed that over a six year period there has been a decline in populations. Frozen specimens from friends on shrimp trawlers have been of help but it is impossible to obtain meaningful data, since the small crew are usually fully engaged in shrimping activities.

The author's observations on the gut contents of *Conus mappa* have confirmed that they feed on amphinomid worms. Two different groups of setae have been found (see figures 1 & 2 Plate 2). Sixty percent of the setae examined were found to be from *Hermodice carunculata*. The remaining 40% are from an amphinomid yet to be positively identified (see drawings), but suspected to be *Eurythöe complanata* (Pallas, 1766). In the waters of Trinidad & Tobago *Hermodice carunculata* lives in shallow water habitats usually under coral or rock slabs. Recent observations however, have revealed that they often move down into deep water sponge beds at night. The specialized tooth structure of amphinomid-eating *Conus* species is distinctive and unlike any other vermivorous *Conus* species (Nybakken 1970a).

The author has been unable to advance any further theory as to the specific advantage of this tooth structure in the capture of amphinomid prey, but it must be related to obtaining a very secure hold on the worm, injecting the venom and then pulling the worm in through the restricted aperture to avoid the venomous setae. It is interesting to note that some specimens of *Hermodice carunculata* are five or six times the length of an adult specimen of *Conus mappa*.

Observations on the feeding behaviour of *Conus centurio* should have raised no problems as the author had collected specimens in 1969 apparently feeding on the mollusc *Cyphoma intermedium*. *Cyphoma intermedium* has always been considered rare, and specimens have only been obtained by dredging in other areas but in Trinidad, this small ovulid gastropod species is fairly common in the deep water habitat areas shared by *Conus mappa* and *Conus centurio*. *Cyphoma intermedium* exhibits the same affinity for the octocorals as the shallow water Caribbean species of *Cyphoma*. *Cyphoma intermedium* lives and feeds on the

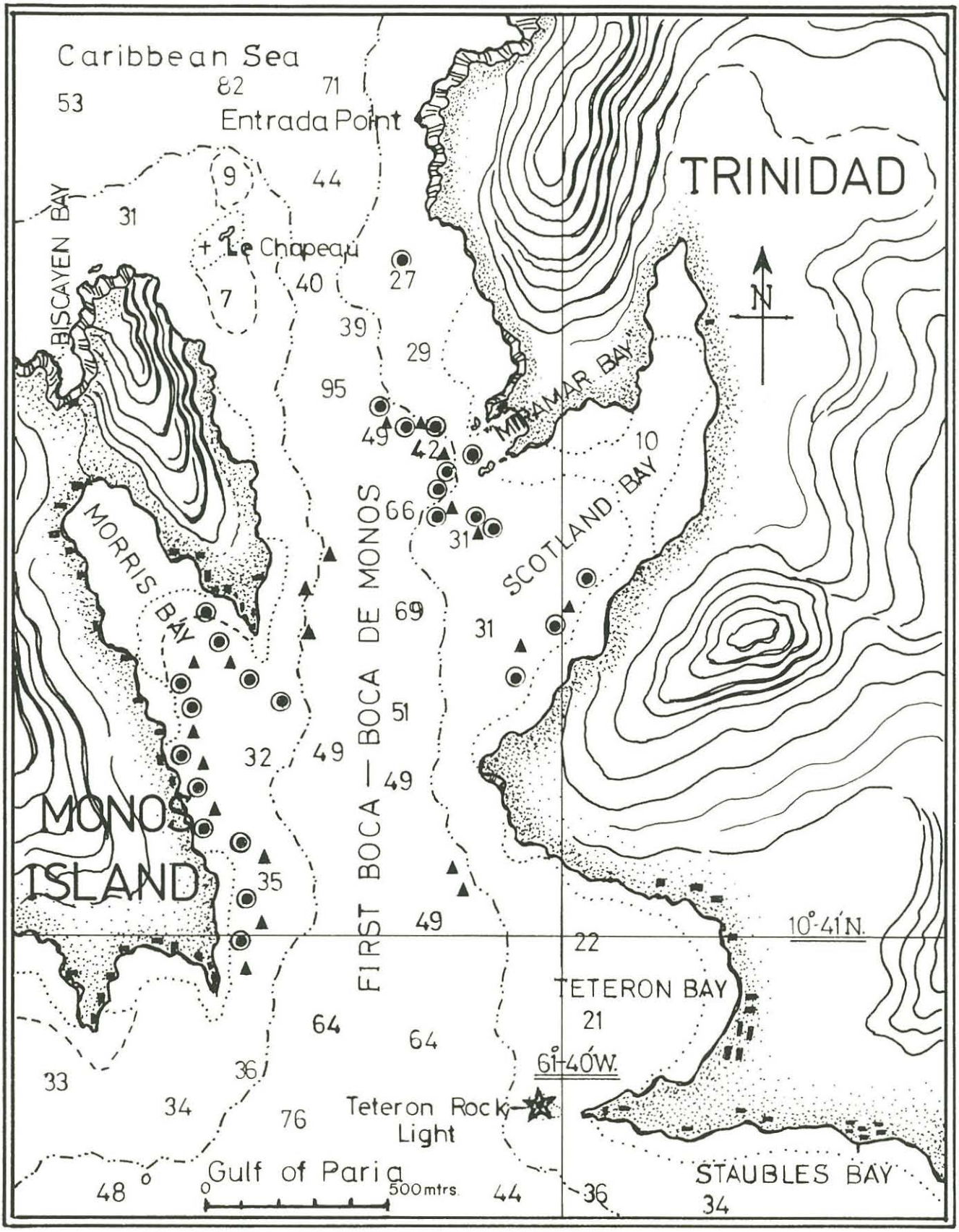

PLATE 3:

CHART of study area — First Boca, Boca de Monos, off the Northwest peninsula of Trinidad. Soundings in metres.

⊙ = *Collection or observation site on* Conus mappa.

▲ = *Collection or observation site on* Conus centurio.

polyps of the deep water octocoral *Leptogorgia setacea*. This is a small green coloured species, which resembles a marine plant and is fairly common in areas where there are currents. *Cyphoma intermedium* is often found on the sandy silt substrate in octocoral areas, moving from one octo-coral host to another. During this movement, they are preyed upon by *Conus centurio*. Three observations of *Conus centurio* preying on this small ovulid mollusc have been made. What concerns the author, however, is the fact that the tooth structure of *Conus centurio* is not typical of molluscivorous *Conus*. Recent examination of the gut contents of a male specimen of *Conus centurio* revealed the partially digested remains of a small mollusc which was possibly a species of *Marginella*. However, examination of the gut contents of a large female specimen of *Conus centurio* definitely revealed the remains of an enteropneust (Acorn worm) or similar marine invertebrate but certainly not a mollusc. This uncertainty is disappointing to the author as it may take many years of underwater investigations before sufficient evidence can be obtained to make a positive determination of the diet of *Conus centurio*.

ENEMIES

Very few specimens of either *Conus mappa* or *Conus centurio* are found without the signs of serious shell demage. This damage to the lip of the shell has usually been repaired by the continuation of the whorls. This type of damage is mainly caused by a deep water crab, *Calappa* sp. The author has often been puzzled by this type of damage to molluscs and especially to *Conus* species. In view of the power and persistence of *Calappa* as a predator on molluscs, the question arises as to what factor causes them to abandon an attack on a *Conus* species after seriously damaging only the outer lip of the shell.

In the same habitat area, not one specimen of *Polystira albida* has ever been observed or collected by the author, without the marks of shell damage and subsequent repair. On one occasion a juvenile specimen of *Conus centurio* was removed from the interior of an asteroid. The asteroid had ingested the entire 36 mm specimen of *Conus centurio* which produced a very large proturbence. Observations on asteroids ingesting and consuming *Oliva reticularis* in more shallow areas are quite common in the waters of Trinidad. Some of the more common predators on molluscs such as rays, turtles, spiny lobsters and toad fishes have not been observed by the author in the colder deep water habitat areas frequented by the *Conus* species under study. However, the batrachoid fish, *Amphichthys cryptocentrus*, which is very common in the shallow waters above the habitat areas of *Conus centurio* and *Conus mappa*, is a voracious predator on mulluscs.

CONCLUSION

In the waters of Trinidad & Toabgo, which offer a very wide range of ecological and environmental niches, the genus *Conus* is poorly represented, and although the author has collected fourteen species in the course of sixteen years, a collector would experience difficulty in finding more than six or seven species today. By far the most common is *Conus ermineus*, a fish eater. This interesting species appears to have adapted itself to many differing habitats and can be found in fair numbers from depths between 3 and 50 metres.

Conus mappa and *Conus centurio* are recognized as being rare species throughout the Caribbean area. In Trinidad & Tobago, however, small groups of these two rare, but quite distinctively separate species, have been found sharing the same cold, deep water habitat.

Conus mappa is a mollusc with a long and interesting taxonomic history exhibiting many variations of colour and pattern in isolated populations of the Southern Caribbean. This has been responsible for the erection of many synonyms. All these forms, however, share the same unusual diet of amphinomid worms and possess the highly distinctive type of radular teeth characteristic of *Conus* species which prey on amphinomids (Kohn, Nybakken & Van Mol 1972).

The more common *Conus regius* is considered to be very closely related as it possesses a similar shell, the same diet and almost identiical radular tooth structure.

Conus centurio has always been considered rare, although specimens have been collected from locations as far apart as Puerto Rico and Brazil.

Unlike *Conus mappa*, *C. centurio* does not appear to be very variable; in fact, specimens and figures examined reveal uniformity in morphology, colouration and pattern.

Although several observations have been made on the diet of this species, no positive determination can be made as to whether it is a molluscivore or not.

Subsequent to completing most of this paper, the author has learnt from Dr. J. Nybakken that his observations on the Western American *Conus* species have revealed that *Conus diadema* feeds on both worms and molluscs (Nybakken, pers. comm.).

The radular structure of *Conus diadema*, however, is not similar to that found in *Conus centurio*. The tooth of *Conus diadema* although small, is morphologically similar to the radular structure possessed by molluscivorous species of *Conus*.

The study of molluscs in the Southern Caribbean poses many problems which are usually related to endemic species living in very restricted localities. There are many examples of this — *Ancilla tankervillei*, *Cypraea mus*, *Fusinus closter*, *Murex argo*, *M. margaritensis* to name a few (Abbot 1958).

At first the author considered that some of the *Conus* species would fall into this same restricted category. However, this is not so. *Conus ermineus* appears to be very widely distributed. *Conus mappa* has produced two or three endemic forms, whilst *Conus centurio* is found in its true habitat, in deep water close to rock slopes or ledges, areas in which it is difficult to collect by trawling or dredging.

The association of *Conus mappa* and *Conus centurio* that was found in this study may be peculiar to the waters of Trinidad only.

During the course of many years of underwater observations the author has observed that many species of mollusc present in these waters exhibit two quite distinct forms — a shallow water and a deep water form. Owing to upwelling of cold bottom water in certain areas along the north coast and in the Bocas many species of deep water molluscs have been collected in water depths not greater than 46 metres. *Conus mappa* can be found in much shallower depths in other areas of the Southern Caribbean in much warmer water. *Conus centurio* has been found as far North as Puerto Rico whilst *Conus mappa* is still restricted to the Southern Caribbean.

Underwater observations in the northern areas of the Caribbean may reveal that *Conus centurio* is not so rare once its habitat is recognized. In fact it may be recognized that *Conus centurio* and *Conus delessertii* have the same close relationship as *Conus mappa* and *Conus regius*. *Conus mappa* may not be found in the north, as it is probably represented in these areas by *Conus regius*. Only extensive diving will provide the answers.

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An Introduction to the Tarantula Spiders of Trinidad, W.I.

By Rick West, 3174 Yew St., Victoria, B.C. Canada.

THE tarantula spiders are the largest of all spiders. The Brazilian species *Theraphosa leblondi* attains a diagonal leg span of over 25 cm.

The name "tarantula" refers to the large hairy *mygalomorph* spiders of the family Theraphosidae and can be found exclusively between the 40° latitudes around the world. These spiders should not be confused with the lycosid spiders, also called "tarantulas," in the Mediterranean region. Other names are given to the tarantulas. In Mexico and other Central American countries the tarantulas are known as *aranas peludas grande*, "giant hairy spiders," or *arãnas de caballo*, "horse spiders." The local people believe that if a tarantula bites a horse on the foot the hoof will fall off; in reality, the hoof drops off owing to a bacterial or fungal infection not caused by a spider bite. Their belief is supported by the fact that horse hair is found in the silk lip of the tarantula's ground burrow in pasture lands.

In Brazil, the tarantulas are called *carangueigeiras*, "bony-leg crab spiders" because of the appearance and gait of the male tarantula. In Argentina, the larger tarantulas are called *aranas pollitos*, "little chicken spiders" from the fact that they can prey on very small chickens. In Africa, they are called "monkey" or "baboon spiders" because of the resemblance of a monkey's velvet-bottomed, hairy, finger to that of a tarantula's leg. Similarly, in India, they are known as "cat-leg spiders" by the same analogy. The rest of the world where they are found simply knows them as "bird-eating spiders" or *mygales*. A few large arboreal species of tarantula have been seen by naturalists eating bats and very small hummingbirds, but on the whole, tarantulas are insectivorous. In capacity, where prey capture can be controlled, I have had tarantulas kill and eat live snakes, lizards, birds, rodents, frogs, fish, insects, and other arachnids.

For more than 40 million years the tarantula spider has virtually remained unchanged as can be seen by a few existing fossils. They have survived scores of natural enemies and geographical changes. Now, tarantulas are faced with the biggest threat to their existence man.

Tarantulas have unjustly earned the reputation of being deadly venomous, therefore they are killed on sight wherever they are found. In the United States, Canada, Great Britain, and Europe, large numbers of tarantulas are sold as exotic pets as they are long lived, easy to care for, mild in disposition, and bite only if teased or injured. This, combined with the heavy use of pesti cides and the transformation of jungles, deserts, and other undisturbed land for industrial and agricultural development, will rapidly make the tarantula a rare sight in the world.

Very little venom toxicity research has been done on tarantulas as a whole, but it would appear that the bite, though painful, is no more dangerous than a bee sting in most New World species. Most Old World species of tarantula on the other hand are nasty in disposition, very agile when disturbed, and have a stronger and more venomous bite, though not fatal if treated. I have never heard of a death that was due just to a bite of a tarantula, although I have heard of a few rare fatalities resulting from secondary infections of untreated tarantula bites in parts of East Asia. In Malaysia, the aborigines believe the only cure for a tarantula bite is to mash the tarantula up with herbs and leaves and past it over the wound. There are other unusual uses for tarantulas. Witch doctors of a West African tribe used tarantulas in a ceremony to tell the future or fate of another tribal member. Similarly, aborigines in Malaysia regard the tarantula as a messenger of one of their gods, and to harm one is to bring a disaster to a hunt, crops, or even one's own life. In Cambodia, Viet Nam, and Laos, the tarantula is not only a symbol of good luck but is used for medicinal purposes. The tarantula is mashed and mixed with herbs and juices, the mixture being either fried and eaten or allowed to ferment and drunk as a brew to remedy stomach ache and diarrhea. Aboriginal people throughout Africa and Oriental Australian regions use the tarantula as a valuable food source. The tarantula is prepared by killing it, removing the fangs, then skewering it on a stick and holding it over an open fire to remove the hair before cooking it.

Mygalomorph spiders are not like the majority of other spiders. They have paraxial or vertical movement of their chelicerae or jaws (See Fig. 1) unlike other spiders which have only sideways movement of their chelicerae like a pair of pincers. The chelicerae are attached to the front of the head in mygalmorph spiders, whereas in other spiders, the chelicerae are attached below the head. Mygalomorphs have eight eyes arranged on a tubercle on the head of the carapace. (Fig. 1) Most other spiders have one pair of book lungs while the mygalomorph spiders have two pairs, (Fig. 1) all with a single posterior slit, on the ventral surface of the abdomen. The venom glands of a mygalomorph spiders are harboured inside the chelicerae (Fig. 2c) but in other spiders they are found inside the head region. The mygalomorph spiders have a foveal groove on the carapace that may be procurved, transverse, recurved, or straight, but not longitudinal to the body axis as in most other spiders. (Fig. 1)

Theraphosids, or true tarantulas, may be distinguished from other mygalomorph spiders by the basic presence of claw tufts and tarsal scopulae on all four pairs of legs. (Fig. 2b) There are two pairs of spinnerets the anterior pair is small and unsegmented while the posterior pair is three-segmented with the last terminal joint long and stout. There is no "digging rake" or rastellum present on the chelicerae and the lip is free and moveable. There are normally two claws on each tarsus but in the theraphosid sub-family Selenocosmiinae there is a rudimentary third claw in some species. The foveal groove on the carapace is like other mygalomorphs, except for two genera *Sphaerobothria*, from Costa Rica, and *Ceratogyrus*, from South Africa, where a foveal horn protrudes above the carapace. The evolutionary purpose of this horn is unknown to me.

Tarantulas are separable into two sexes at maturity. Prior to sexual maturity however, males and females cannot be externally distinguished; both book and behave alike, living alone or in colonies in the ground.

Male tarantulas can be easily recognised from females at maturity. They are generally smaller in body size with long thin legs. On the tarsus of each pedipalp is a copulatory organ called an embolus. (Fig. 2a) This structure is important not only for breeding but for distinguishing genera and species from each other. On the tibia of the first pair of legs there are one or two curved spurs (Fig 2d) but not all species of tarantula males have this structure.

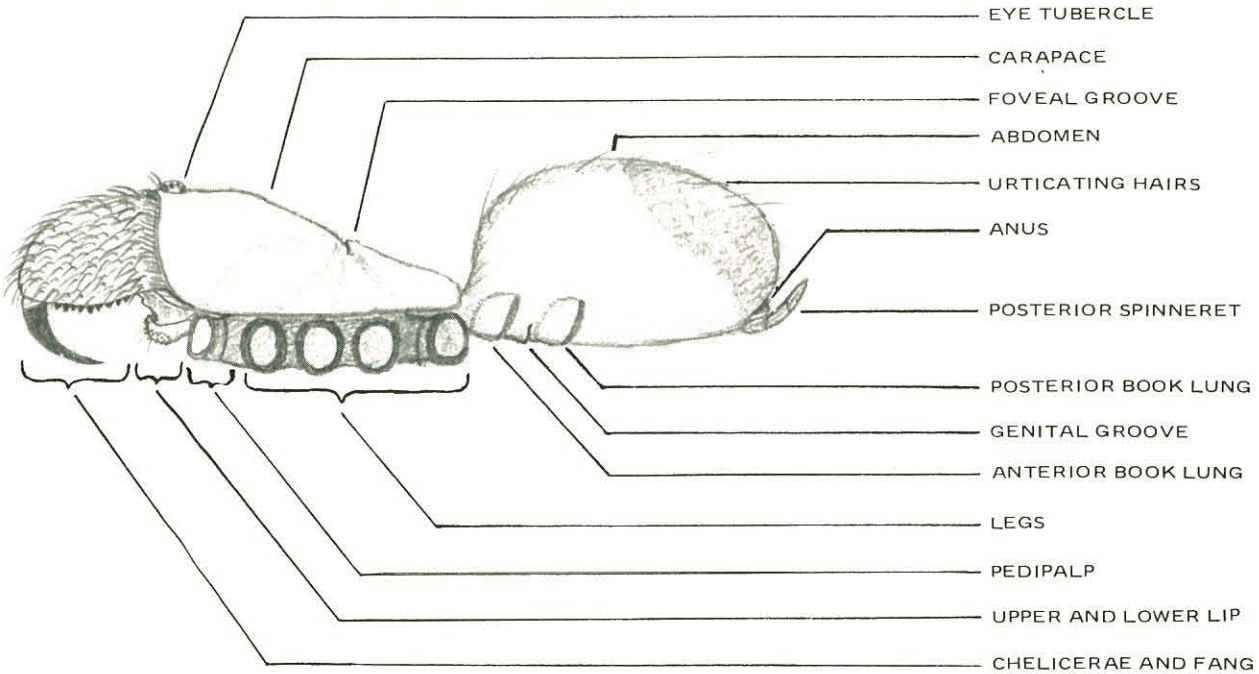

FIG. 1 A THERAPHOSID BODY

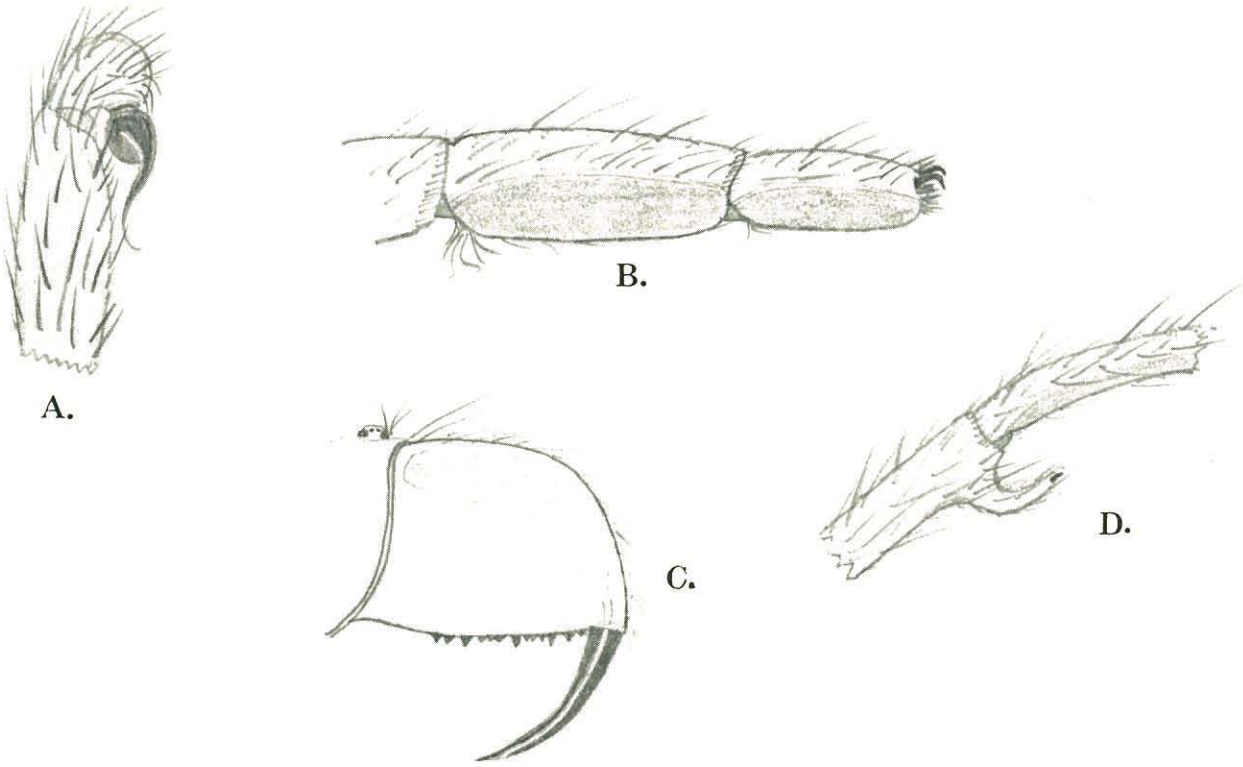

FIG. 2 A. MALE PEDIPALP WITH EMBOLUS

B. TARSAL AND METATARSAL SCOPULAE WITH CLAWS AND CLAW TUFTS.

C. VENOM GLAND AND VENOM DUCT

D. TIBIAL SPUR OF A MALE

Female tarantulas at maturity have no external genitalia. There is a genital opening found between the first and second pair of book lungs on the anterior ventral surface of the abdomen. (Fig. 1) Inside the genital groove are two chitinous seminal receptacles or spermathecae. The females are generally more robust in legs and body and are longer lived than the male tarantula. The males generally live for several months up to a year, whereas a female can live for several years and sometimes as long as 25 years.

Breeding of tarantulas takes place in most countries in the months of September through to December. The male tarantula constructs a sperm web either horizontal to the ground or at a 45 degree angle to it. The male crawls upside down under it and deposits spermatic fluid on the roof of this web. The male carefully crawls out and on top of the web, then reaches under with his pedipalps and with a drumming action fills his emboli by capillary action. Having charged these bulbs, the male sets off on a migration to locate a mature female of his own species.

The vision of a tarantula is very poor and the detection of a female is by chemoreception. Tarantulas are equipped with sensory hairs of various kinds that play a principal role in locating a female, prey, or an enemy. Male tarantulas can be seen wandering day or night in the forest, on highways, or in your house. When a male locates the burrow of a female he quivers and carefully entices her out. Mating is head on. The female rears bach with fangs spread. The male locks her fangs and arches her back with the spurs on the first pair of legs. This arching exposes the genital groove. The male rapidly beats his pedipalps on the sternum of the female and carefully inserts each embolus into the spermathecae discharging the seminal fluid. The mating can be brief with the insertion of only one embolu or it can be long with repeated insertion of both emboli. Having finished, the male carefully releases the female and flees for his life. Sometimes the male can be caught and devoured by the female either before or after mating. If the male escapes he generally constructs another sperm web and repeats the mating process.

After mating, the female will build a chamber either underground or in her arboreal silk tube. Layers of silk are laid down and depending on the species, anywhere from 40 to 500 yellowish eggs, about 1.5 mm in diameter, are deposited in the silk hammock. More layers of silk are deposited over the eggs then the whole mass is cut away from the chamber and rolled into a crude semi-spherical ball. More webbing is added later to strengthen the egg case. The egg cases vary in size, depending on the species, from 20 to 45 mm and are generally constructed in March through to May. Incubation varies from 18 to 60 days, again depending on species. During this time the females are very aggressive and ignore food, staying concealed in their chambers. The young hatch and stay with the female for protection until they are able to feed. They then rapidly disperse and remain solitary until they reach sexual maturity. Female tarantulas generally produce one egg case per year however, I did have female *Hapalopus incei* produce two egg cases a few months apart. Both were fertile.

In May of 1981, I came to study and collect tarantulas on Trinidad and Tobago for one month. My first two weeks were spent at the Simla Biological Research Station, four miles north of Arima on the Blanchisseuse Road, high in the northern mountain rainforest. Collecting by daylight produced four species of tarantulas, *Cyriocosmus elegans* (Simon), *Hapalopus incei* (F.O. Cambridge), *Psalmopoeus cambridgei* (Pocock), and *Tapinauchenius plumipes* (C.L. Koch). One important point should be made at this time and that is that the family Theraphosidae is in a chaotic taxonomic mess. Species names I have given in this article are taken from old taxonomic keys and to the best of my knowledge are the true species so named. I welcome any correspondence if someone disagrees.

Numerous specimens of *Hapalopus incei* (see back cover), some with egg cases, were found under boards lying on the ground or in ground burrows along the old bat building foundations at Simla. The burrows were about 25 cm in depth and lightly lined with silk webbing. Numerous specimens of this species were also found in silk lined burrows amongst the ferns, mosses, and vines on the vertical roadside banks near the top of the mountain range on Blanchissuese Road near the Textel Station.

The females of this species are about 27 mm in body length, the legs are olive brown, the carapace is dark brown with a brassy pubescence radiating from the foveal groove, the abdomen is light brown with six dark brown traverse bands on the dorsal surface extending down the sides and ending on the ventral sides of the abdomen. I did not find any males of this specees.

Numerous young specimens of *Psalmopoeus cambridgei* (back cover) were found in silken tubes in such places as the corners of the wire bat pens, in old pipes, hollow broken *Cecropia* tree branches, under the edges of the corrugated tin roof, in dry leaf piles, in clusters of bromeliads, and on the bare vertical rock cliffs at the higher altitudes along Blanchisseuse Road. The occasional immature specimen was observed wandering on the forest floor during the day apparently in search of food. Previous to this I thought only adult males migrated in search of females and that immature and female specimens led a sedentary life.

Psalmopoeus cambridgei is mainly arboreal. It grows to a large size, the average body length of a female being about 68.5 mm. The legs are covered in long feathery fringes and have wide scopulated pads which assist the spider to "float" with legs outstretched when jumping from danger, or when coming to the end of a bare branch, similar to that of the little salticid or jumping spiders.

The body colour of the immature and female specimens is as follows: legs are basically olive brown intermixed with olive green pubescence on the dorsal surface of the femurs. The ventral surfaces of the legs are dark brown and the scopulated pads are a rainbow of iridescent colours. Each tarsius and metatarsius has a rust-red stripe running longitudinally on its dorsal surface. The carapace is olive brown with a greenish grey pubescence, which is prominent in freshly moulted specimens. The first one-third of the abdomen is pale brown dorsally, while the remaining two-thirds is a darker olive brown. There is a narrow dark brown line that runs the full length of the dorsal surface of the abdomen and is transected by four distinct black bands ending on the ventral surface of the abdomen. The ventral surface of the abdomen and sternum are dark brown except around the fangs which are fringed with red setae.

The male of *Psalmopoeus cambridgei* has a totally different appearance from the female. This is unlike most other theraphosids where the males and females have the same characteristic patterns and colour. I found one specimen in a hollow *Crecropia* tree branch. Its description is as follows: body length about 35 mm; legs, abdomen, and carapace on the dorsal surface grey brown, the ventral surface dark grey brown. The oral fringe had red setae and the tarsus of each leg had a rust-red stripe running longitudinally. On the dorsal surface of the abdomen was a small dark grey-brown spot. I observed no males in the jungle.

One mature female and one immature specimen of *Cyriocosmus elegans* (Fig 3) were found under old boxes that were stacked against the old bat research buildings at Simla. These specimens were not caught on the same day and were not there on previous searches so they must have wandered the rainforest floor during the night and sought refuge there during the day.

Each had constructed a fine labyrinth of silk tunnels leading from the edge of the box for a distance of 30 cm under it. Total body length for the female was 16 mm, and for the immature specimen 13 mm. Their colour is as follows: legs are brown with the femurs being a lighter brown, carapace is an iridescent mahogany brown, the dorsal surface of the dark brown abdomen has three parallel-longitudinal rows of five light brown spots making a total of fifteen small spots. The ventral surface of the abdomen and sternum is a medium brown. Both these specimens died shortly after capture; they refused to eat and were very docile in captivity.

One male *Cyriocosmus elegans* (Fig. 4) was presented to me by Jack Price who found it wandering on the main grounds at Simla. The body length is about 12 mm. The dorsal surface of the

FIG. 3. A female Cyriocosmus elegans.

FIG. 4. A male Cyriocosmus elegans.

chelicera and cephalic region of the carapace are black while the remainder of the carapace has an orangey brown pubescence. The dorsal surface of the coxa and trochanter are orangey brown like the carapace, while the legs and pedipalps are dark grey.

On the dorsal surface of the patella running down to the tarsus of each leg is a narrow light grey longitudinal stripe. The dorsal surface of the abdomen is black with a small orangey brown "heart" shape. The ventral surface of the abdomen is beige brown with four bands of the same colour running vertically up each side ending in a point near the dorsal surface.

A few specimens of *Tapinauchenius plumipes* (back cover) were found at the lower altitudes along Blanchisseuse Road near the gravel quarries below the Simla Research Station grounds. These specimens were found under dead and hanging bark on old sapucaia nut and silk cotton trees in heavily silken burrows. More than once I got a thrill when, trying to secure a specimen from up high, it would run with rapid agility down my arm and body to the ground.

The body length of a mature female is about 40 mm. The body colour in females and near mature speicmens is as follows: the dorsal surface of the entire body is an iridescent mahogany brown, the abdomen being a little darker reddish brown. The legs are brown with reddish brown feathery fringes, characteristic of arboreal species, especially noticeable on the third and fourth legs. The ventral surface is black brown except for the red oral fringe of setae. A freshly moulted specimen in capitivity looks entirely different from a wild caught specimen.

A live gravid female of *Tapinauchenius plumipes* was sent to me by Julius Boos three years ago. Just before I came to Trinidad the offspring that I reared from her had begun to moult, some becoming males. Their full body length is about 25 mm. The colour is generally sooty grey, intermixed with a hint of red, yellow, and green iridescent hairs on the dorsal surface of the legs. The ventral body surface is dark grey except for the red oral fringe of setae. The male has the general appearance of a male *Psalmopoeus cambridgei* with the same dark brown small spot on the dorsal surface of the abdomen and the feathery fringes on the legs, and does not at all resemble the female in colour and pattern.

Two *Stichoplastus sanguinceps* (F.O. Cambridge) (Fig. 5) were found at the base of the old bat building foundations at night. These theraphosids sat poised at the edge of an unwebbed hole and if detecting any vibration quickly retreated. I caught one specimen which turned out to be a mature female. The total body length is about 28 mm. The carapace and dorsal surface of the coxa and trochanter are iridescent orange. The abdomen is all dark grey. I did not find any males of this species.

FIG. 5. A female Stichoplastus sanguinceps.

I spent the remaining two weeks in May at Turpin's Beach Resort in Charlotteville, Tobago. I did happen to find one specimen of *Psalmopoeus cambridgei* in a dead hollow root jutting out of the roadside bank near the old lighthouse, high on the eastern end of the Main Ridge Mountains but other activities prevented a thorough search on Tobago.

Other species of theraphosid spiders may occur in Tobago, perhaps the same as those of Trinidad, but I would not hazard a guess without a proper search for them.

I spent one day on Little Tobago Island, bird watching, and although I found centipedes, hermit crabs, and representatives of another family of mygalomorph spider I did not find any theraphosids. Again, one day is not adequate time to say for sure if they do or do not occur on the islands around Trinidad and Tobago.

Hans Boos has collected a few specimens of the large theraphosid spider, *Avicularia avicularia* (Lamarck) (back cover). These amboreal spiders live in large silken tubes on the sides of trees or old wooden buildings. Hans's specimens were found in the region of Maraval towards the base of the Northern Mountain Range. Other specimens have been seen in the higher altitudes of the

Chaguaramas region on Chacachacare and Monos Islands, in Maracas. Talparo and Rio Claro. In fact, *Aricularia* is widespread and quite common.

The total body length of a female was about 52 mm; the males varied greatly in body sizes, probably depending on the availability of their food in early development. The average body length was 35 — 45 mm.

Aside from the genitalia and breeding emboli on the male's pedipalps, both sexes appear generally the same in colour. In overall appearance the female is more robust while the male is more slender with longer legs. The dorsal and ventral surfaces are basically black. The carapace is covered in a woolly blue-green pubescence. The legs are black intermixed with a slight blue-green pubescence, especially noticeable on the dorsal surface of the femurs. The long setae on the legs are tipped white which is more prominent in the females than males. The tarsal tips of each leg are fringed with orangey red or pinkish hairs which vary in colour in different specimens. The legs are heavily scopulated with tarsal and metatarsal pads for climbing up smooth surfaces of bark, walls, or leaves.

This particular Trinidadian theraphosid spider has a secondary defence and that is to shed the fine dorsal abdominal hairs by rubbing its hind leg against them when irritated. These fine hairs cause great itching or urtication when coming into contact with a mammal's skin, especially the eyes or nostrils, leaving a rash for several days.

One other theraphosid was found in Trinidad in the drier forests of the Chaguaramas region. The specimen was collected and photographed by Mr. Joseph R. Dinardo in May, 1974. I did not have this epcimen in hand to study so I cannot hazard a guess from a photo as to what species it may be. There are also a few other described species of theraphosid spiders that do occur in Trinidad that I did not find, so have not covered them in this article.

I would like to express my thanks to Hans and Julius Boos, as well as Jack Price for their contribution of live theraphosids to make this article possible. My thanks to Joseph Dinardo for his photograph of the unknown theraphosid and to Mrs. Joanne Hamel for proof-reading and typing my manuscript.

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Recent Changes in the "Official" Designations of Certain Trinidad Birds

By Richard ffrench, St. Peter's School. Texaco Trinidad Inc., Pointe-a Pierre.

IN A recent publication (A.O.U. 1982) the American Ornithologists' Union, the most prestigious ornithological society in the Western Hemisphere, has announced the results of the deliberations of its Committee on Classification and Nomenclature of birds. In due course it will be publishing the 6th edition of the Check-list of North American birds; this new edition will for the first time include all authenticated species on the mainland south to Panama, as well as the West Indies south to Trinidad. Thus it will be possible to find in one work the names of all birds found in Trinidad and Tobago, updated in line with the most recent pronouncements on their taxonomy.

Meanwhile the present list includes many species known in our islands. Certain changes have been made official, both in the scientific designation and in the English name, and since other publications will in future be using these new names, it seems worthwhile to list here those changes that apply to birds on the Trinidad and Tobago list. I make no pretence of understanding the taxonomic reasons for these changes, but the members of the A.O.U. Committee comprise some of the most eminent and respected persons in America ornithology, so I have no reason to doubt their conclusions.

In my publication on local birds (ffrench 1973) some of the following name changes were already included under the heading of "Other names." Others are more recent.

THE CHANGES

Tachybaptus dominicus Least Grebe in place of *Podiceps dominicus.*

Phalacrocorax olivaceus Olivaceous Cormorant in place of Neotropic Cormorant.

Egretta caerulea Little Blue Heron in place of *Florida caerulea.*

Egretta tricolor Tricolored Heron in place of *Hydranassa tricolor.*

Egretta rufescens Reddish Egret in place of *Dichromanassa rufescens*

Dendrocygna bicolor Fulvous Whistling-Duck in place of Fulvous Tree-Duck.

D. autumnalis Black-bellied Whistling-Duck in place of Black-bellied Tree-duck.

Chen caerulescens Snow Goose in place of *Chen hyperborea.*

Rostrhamus sociabilis Snail Kite in place of Everglade Kite.

Gallinula chloropus Common Moorhen in place of Common Gallinule.

Pluvialis dominica Lesser Golden-Plover in place of American Golden Plover.

Charadrius wilsonia Wilson's Plover in place of Thick-billed Plover.

C. hiaticula Common Ringed Plover in place of Ringed Plover.

Calidris himantopus Stilt Sandpiper in place of *Micropalama himantopus.*

Limnodromus griseus Short-billed Dowitcher in place of Common Dowitcher.

Sterna nilotica Gull billed Tern in place of *Gelochelidon nilotica.*

Sterna caspia Caspian Tern in place of *Hydroprogne caspia.*

Nyctidromus albicollis Common Pauraque in place of Pauraque.

Tyrannus savana Fork-tailed Flycatcher in place of *Mascivora tyrannus.*

The other revisions apply to familial classification. Thus the old families of Icteridae (American Orioles), Parulidae (Wood Warblers), Coerebidae (Honeycreepers) and Traupidae (Tanagers) all disapper. All are now to be included in one family, the Emberizidae, which is hence to be sub-divided into the subfamilies Parulinae, Coerebinae, Cardinalinae, Traupinae, Emberizinae, and Icterinae. This affects over 50 species of birds in Trinidad and Tobago.

It can be seen that in many causes the revised concepts tend to find closer relationships between species than had hitherto been seen. Thus many old genera have been discarded, since the fashion among modern taxonomists seems to be "lumping together," rather than "splitting."

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