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REVISION OF ICOSTA (= *LYNCHIA* AUCTT.) WITH ERECTION OF A RELATED GENUS *PHTHONA* (Diptera: Hippoboscidae)[1]

By T. C. Maa[2]

Abstract: *Icosta* Speiser 1905 is restored to replace the mis-used generic name "*Lynchia* Weyenbergh 1881." The genus, as here dealt with, is composed of 56 species and subspecies (plus 6 unnamed ones) which are allotted to 5 subgenera, i. e. *Ornithoponus* Aldr., *Icosta* s. s., *Ardmoeca, Gypoeca* and *Rhyponotum* n. subgen. Being cosmopolitan and largely tropical, the genus has had its distributional center probably in the Ethiopian Region in the past, and in the Oriental Region at the present. The host relationships have apparently been influenced during the process of evolution much more strongly by ecological similarities than by phylogenetic affinities of host-birds. They are, therefore, evidently correlated with structural and bionomic speciation of both the parasites and hosts in question. In addition to descriptions, records and synoptic keys, the paper also provides summaries and analyses of data of distribution, hosts, phoresy and hyperparasitism. Among previously known forms, *ardeae* Mcq. (with ssp. *botaurinorum* Swk.) is resurrected as a species independent of *albipennis* Say; *rufiventris* Bigot, restored to replace *wolcotti* Swk.; *tuberculata* Ferr., degraded as a subspecies of *acromialis* Speis.; *barbata* Theod. & Oldr. and *interrupta* Maa, both sunk as synonyms of *meda* Maa; *penelopes* Weyenb., *rottensis* Statz and *nipponica* Kishida, removed to *Stilbometopa* Coq., *Ornithomya* Latr. and *Crataerina* Olf., respectively; whereas *nigrita* Speis., *modesta* Maa and *leptoptera* Maa, removed to *Phthona*, n. gen. New species and subspecies here described are *bucerotina* (Thailand, Borneo), *corvina* (Ceylon, India, Burma, Thailand), *diluta* (New Guinea), *elbeli* (Burma, Thailand, Malaya, Borneo, Philippines), *fenestella* (Burma, Thailand, Taiwan, Java, Borneo, Philippines), *holoptera omnisetosa* (China, Malaya, Philippines, New Guinea), *humilis* (Liberia), *jactatrix* (New Guinea), *lonchurae* (Thailand, Taiwan, Malaya, Philippines), *papulata* (Komodo I. nr Java), *paramonovi* (Australia), *sensilis* (E. Pakistan, Burma, Thailand, Malaya, Philippines), *sensilis reducta* (India), *spinosa* (Thailand, Laos), *subdentata* (Uganda), *tarsata* (Thailand), *wenzeli* (Philippines). Appended to the paper are a review of *Phthona* n. gen., host index of *Icosta* and *Phthona*, reproduction of Weyenbergh's description of *Lynchia* with translation and annotations, a selected and chronologically arranged bibliography, as well as descriptions of *I. macclurei* (Thailand) *I. malagasii* (Madagascar), and *I. antica* (New Guinea), n. spp.

Icosta Speiser, generally known as "*Lynchia* Weyenbergh" since 1926, is the largest hippoboscid genus and includes about a third of the species of the entire family. Altogether 65 nominal species (1 doutful and 3 partially synonymous) have been described by 20 authors—9 species by Maa; 8 each by Ferris and Speiser; 6 by Macquart; 5 each by Bequaert and Walker; 4 by Rondani; 3 each by Lutz, Swenk and van der Wulp; 2 by

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Bigot; 1 each by Austen, Dugés, Falcoz, Leach, Packard, Paramonov, Percheron, Say, and Theodor et al. World checklists of the genus have been provided by Speiser 1908c, Maa 1963; synoptic keys to "larger" species and to subgeneric groups of the world, by Bequaert 1933b, 1945b and Maa 1963, respectively; key to species of the Americas by Bequaert 1955, that of Palaearctic Region, by Theodor et al. 1964, and that of Africa, by Maa 1964. The nomenclature of the genus has been discussed at length by Bequaert 1926b, 1955 and Maa 1963, and host records of different species have been summarized by Bequaert 1953a and Maa 1963. (For details of historical trends of the genus, see Bibliography). No world revision has ever been published and this report is an attempt to fill that gap. Besides descriptions, redescriptions and synoptic keys, the system of subgeneric groupings is revised, status of certain published names adjusted, a few neo- and lectotypes are selected, distributional patterns, host relationships and evolutionary trends discussed, and occurrences of phoresy and hyperparasitism reviewed. For various reasons, 6 of the species, though included in the keys, are left unnamed.

Terminology

The descriptive terms here used are modified from Bequaert (1953a) and are indicated in fig. 7, 11, 13–14, 21–23, 28–29, 31–32, 140, 142–43, 175, 178. All relative measurements for each species were made under the same magnification. The width of face refers to the smallest width of interocular face; of eye, to the greatest width of an eye in front view of head; of post-vertex and scutellum, respectively, to the interdistance of bases of vertical and of scutellar bristles; of mesonotum, to the interdistance of outermost points of lateral notopleural margins. Lengths of head and thorax were measured along a hypothetical median line; that of palpus includes only its sclerotized pigmented area. The relative lengths of tarsomeres of hindlegs are measured in their dorsal view. The relative length vs width of a certain structure is expressed by the symbol "x" between 2 numerals, for instance, mesonotum 26×35 means it is 26 micrometric units long, 35 units wide. As understood here, the orbital bristles refer only to the macrosetae (usually 2 in number) on each inner orbit, whereas the minor, ordinary setae thereon are termed orbital setae; the occipital margin, only to the section behind postvertex. The "inner" and "outer" margins of legs are so termed as if the leg 1 is stretched cephalad and legs 2 and 3 stretched caudad. The tarsal spine formula refers to the average number of spines under segments 1–4 of fore, mid and hind tarsi, respectively. Thus, the formula 1.0.0.0/2.1.1.0/2.2.1.1 means 1 spine under segment 1 of fore tarsus, no spines under segments 2–4 of same tarsus, 2 spines under segment 1 of mid tarsus, and so on. The laterite 2 refers to the ventral submembranous area under syntergite 1+2 at each side; laterite 3, to the lateral piece embodying abdominal spiracle 3; laterite 7, to the knob-like piece near ♀ abdominal spiracle 7. The different kinds of hairs are arbitrarily classified into 4 categories: *spines*, for short, very stout, dark colored modified hairs; *bristles* or macrosetae, for long, stout, erect or suberect hairs; *setulae*, for extra-fine, very short hairs; *setae*, for ordinary non-modified hairs. The male genitalia are described as if in normal resting position, the apical decurving (as seen in the figures) of an aedeagus or paramere refers to its curving ventrad (of the insect).

Material

The paper is largely based on specimens in Bishop Museum (BISHOP). Those examined in, or borrowed from other institutes are indicated by abbreviations in parentheses.

These are:

AMNH for American Museum of Natural History at New York City,
AMS—Zoölogisch Museum der Universiteit van Amsterdam,
ANIC—Australian National Insect Collection, CSIRO, at Canberra,
BMNH—British Museum (Natural History) at London,
BRX—Institut Royal des Sciences Naturelles de Belgique at Bruxelles,
CAS—California Academy of Sciences at San Francisco,
CNHM—Chicago Natural History Museum (recently renamed Field Nat. Hist. Mus.),
GNV—Museo Civico di Storia Naturale at Genova,
HUJ—Hebrew University Department of Parasitology at Jerusalem,
KBH—Zoologisk Museum at Kobenhavn,
LDN—Rijksmuseum van Natuurlijke Historie at Leiden,
LND—Zoological Institute at Lund,
MAC—Musée Royal de l'Afrique Centrale at Tervuren,
MCZ—Museum of Comparative Zoology at Harvard,
MLN—Museo Civico di Storia Naturale at Milano (M. Bezzi Colln.),
SAIMR—South African Institute for Medical Research at Johannesburg,
STK—Naturhistoriska Riksmuseet at Stockholm,
UCB—University of California Department of Entomology at Berkeley,
USNM—United States National Museum at Washington, D.C.,
VRC—Virus Research Centre at Poona,
ZMB—Institut für Spezielle Zoologie und Zoologisches Museum at Berlin.

The subheading "Material" under each species and subspecies does not include types and other previously reported specimens. For brevity, early authors' types, when existing and re-examined by me, are not so indicated; second code symbols, Bo, NG, PI and SI (for Borneo, New Guinea, Philippines and Solomon Is., respectively) of BBM field numbers are omitted; also omitted are authors' names of birds and initials of collectors' names.

Bibliographies

Bequaert (1953, 1955, 1957) has already published excellent bibliographies for the family as a whole and for various American species (plus *dukei* and *ardeae*). For this reason and due to much nomenclatorial confusion in the past, the bibliographies given in this paper are admittedly quite incomplete. The one appended to the paper was so selected, annotated and arranged that it represents a sketch of historical trends in the studies of the genus; whereas those under various species and subspecies include merely articles containing original descriptions, and more recent revisions and illustrations. The term "Type" following the citation of an original description refers to the holo- or lectotype only.

Illustrations

All accompanying figures, unless otherwise indicated, were drawn with the aid of a camera lucida. Most of them were from microscopic slides and in such cases, the slide number is given at the side of each figure. The tarsi were mounted after being slightly treated with KOH, hence a little disfiguration of their shape must be allowed. The palpi were mounted without KOH treatment.

Names of Hosts

The generic and specific names of host birds used in this paper have been checked with J. L. Peters' (1931 to date) Check-list of birds of the world. The nomenclature and sequence of the families are those of E. Mayr & D. Amadon (1951, *Amer. Mus. Novitates* **1496**: 1-42). To facilitate tracing of original collection data, all field numbers, whenever associated with specimens, are listed.

Acknowledgments: I am deeply indebted to the authorities of the above mentioned institutions for the privilege of studying and reporting on the materials under their charge. Without their aid, generosity and cooperation, this paper could, by no means, have attained completion. I am particularly grateful to Dr Alan Stone for his kindness in examing the Swenk types for me, to Dr D. Colless for sending types of Dr Paramonov's manuscript new species, to Dr R. E. Elbel for much information about his Thailand collection, to Dr H. E. McClure of MAPS (U.S. Army Migratory Animals Pathological Survey), and to many other correspondents for generously providing me additional materials. The drawings were patiently prepared by B. Y. Hu, S. M. Kwang, C. T. Lin and M. F. Tan.

GENERIC NOMENCLATURE

The name of the genus here called *Icosta* has caused much bewildering confusion. Of the published nominal species included therein, none was originally used in combination with *Icosta*. Instead, 31 species were originally assigned to *Olfersia* Wdm. (strictly speaking, not *Olfersia* Lch.), 21 to *Lynchia*, 7 to *Ornithomyia*, 2 to *Ornithophila*, and 1 each to *Hippobosca*, *Feronia*, *Stilbometopa* and *Ornithoponus*. On the other hand, 1 species each, originally assigned to *Ornithoponus* and to *Lynchia*, *i. e.*, the fossil species *rottensis* Statz and the recent species *nipponica* Kishida, do not belong here but to *Ornithomya* and *Crataerina*, respectively. An abridged synonymy of the genus follows.

Icosta Speis. 1905a : 358 (type, *dioxyrhina* Speis.)

Ornithoponus Aldr. 1923 : 77 (type, *americana* Lch.)—Ferr., 1925, Falc. 1926.—Not Statz 1940 which referred to *Ornithomya* Latr. (see Maa 1966).

Hippobosca : Packard 1869.—Not Linn. 1758 (type, *equina* Linn.)

Ornithomyia : Perch. 1838, Wk. 1849-61, Bigot 1885, Dugés 1887.—Not *Ornithomya* Latr. 1802 (type, *avicularia* Linn.)

Feronia : Lch. 1817-18.—Not Lch. 1817 (type, *spinifera* Lch.)

Olfersia : Say 1823.—Not *Olfersia* Lch. 1818 (type, *spinifera* Lch.)

Olfersia : Mcq. 1835-45, Wk. 1849-61, Rndn. 1878-79, Bigot 1858, Wulp 1897-1903, Speis. 1902-08, Austen 1911, Lutz 1915, Swenk 1916.—Not *Olfersia* Wdm. 1830 (type, *spinifera* Lch.)

Ornithophila : Ferr. 1924, Param. 1954.—Not Rndn. 1879 (type, *vagans* Rndn.=*metallica* Schin.)

Lynchia : Beq. 1926-57, Ferr. 1927-30, Maa 1963-64, Theod. & Oldr. 1964.—Not Weyenb. 1881 (type, *penelopes* Weyenb.)

Stilbometopa : Speis. 1904.—Not Coq. 1899 (type, *fulvifrons* Wk.)

As shown in above list and fig. 1, neither of the only available names—*Icosta* and *Ornithoponus*—was found in favor by most workers, whereas the name *Lynchia* (unavailable but common in use for the genus since 1926) has been employed by different authors on

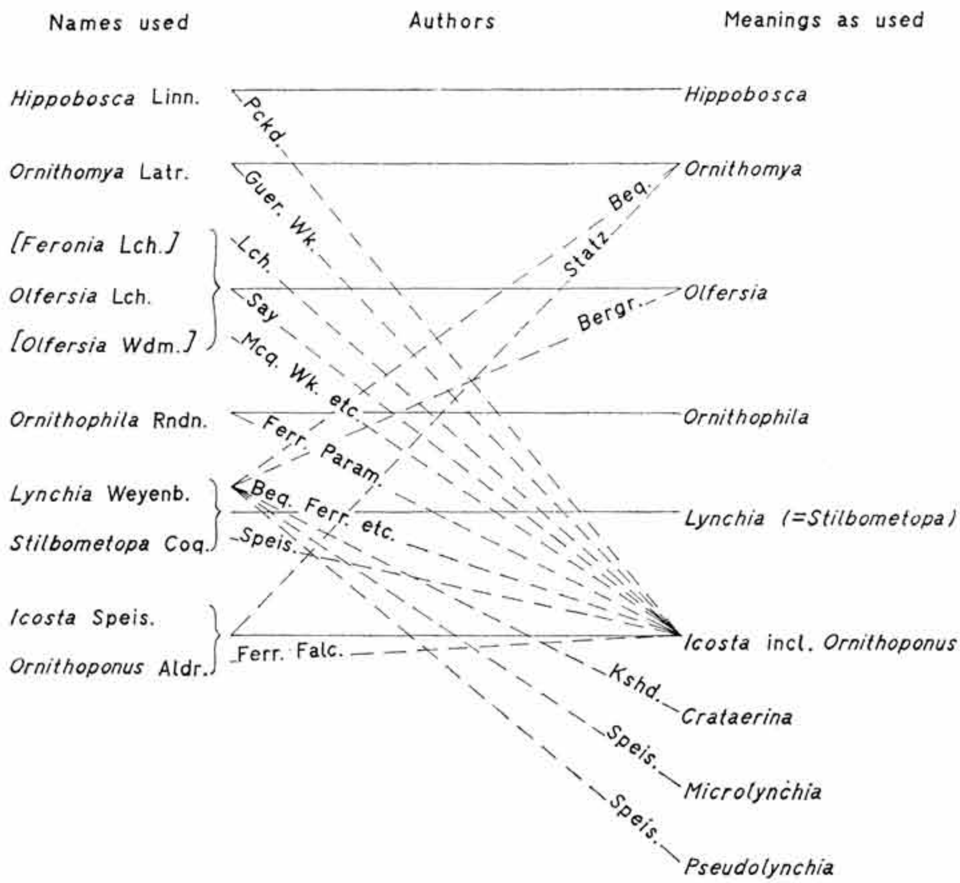

Fig. 1. Nomenclatural confusion around *Icosta* Speis. (=*Lynchia* auctt.) Preoccupied names in square brackets; solid horizontal and broken oblique lines indicating correct and incorrect usages, respectively. For "Guer.", read "Perch."

different occasions in 6 different meanings. It was 40 years ago when most workers used *Olfersia* for *Icosta*, *Pseudolfersia* for true *Olfersia*, and *Lynchia* for *Pseudolynchia*. Then in the very first of his numerous articles on Hippoboscidae, Bequaert (1926b) re-interpreted Weyenbergh's description and concluded that *Lynchia* should be the correct name for what is here called *Icosta*. His interpretation and conclusion were accepted and unchallenged until the appearance of my (1963) paper in which true *Lynchia* was suggested to be synonymous with *Stilbometopa*, and 11 characters of *Icosta* were considered not quite in accord with (if not strongly contradictory to) Weyenbergh's description. Comments so far received from all but one dipterist, were in favor of my suggestion. While I was preparing this report, fresh attacks on this nomenclatorial problem made me more convinced that the name *Icosta* has to be restored for replacing "*Lynchia*." Of course, such a nomenclatorial change will be painful for a while but I hope it might not be more painful than the change from "*Olfersia*" to *Lynchia* advocated 40 years ago.

Bequaert (1926b, 1955) concluded that Weyenbergh's genus is (a) lacking all 3 ocelli,

(b) having a short postvertex and a long mediovertex, and (c) having 2 closed basal cells but no closed anal cell, i. e., having 2, not 3, crossveins. The points (a) and (b) fit both *Icosta* and *Stilbometopa* thus leaving only the key point (c) for which strong emphasis in my long discussion (*l. c.*, p. 106–110, fig. 3, table 3) was made on Weyenbergh's wording, "La nervadura anal nace con raiz doble, se dirige, con fuerte curvatura, al borde posterior del ala." To clarify further the situation and to justify the change suggested here, Weyenbergh's original text and Bequaert's translation, supplemented with explanatory figures, are given in Appendix II. As pointed to by its derivation, *Icosta* (Greek εἰκοστή, the 20th) was so named because it was then the 20th genus ever proposed in Hippoboscidae.

INTERGENERIC AFFINITIES

Under the name "*Lynchia*", *Icosta* was recently re-defined by Bequaert (1955 : 261–64) and Theodor et al. (1964: 46). More important features are : Body strongly flattened. Frons produced into 2 anterior diverging processes which reach or exceed level of antennal apices; interantennal area well exposed. Antenna normal (for the family), short. Vibrissal process often present. Postvertex bare, much smaller than, and well definable from, mediovertex, posterolaterally touching, or nearly touching, inner orbits ; ocelli (except in Simplex group) entirely wanting, represented by single discal pit or short median fovea on postvertex; occipital margin (in front view of head) straight or at most, weakly convex or concave. Pronotum not, or hardly, visible in dorsal view of insect. Humeral callus horn-like. Scutellum always with pair of preapical bristles which are well apart from each other ; setae on lateral sections of posterior margin each at most with very minute basal finger-like tubercle. Prosternum (termed by Bequaert as prothoracic presternum) almost always well developed, setose. Metapleurotergal callus simple, weakly swollen, with strong spines and ordinary setae. Metasternal process rarely present. Wing non-caducous ; R and M branches crowded toward C ; 2 crossveins (*mcu* absent) ; *im* much closer to base than to apex of cell *2bc* ; $Cu_{+}1A$ atrophied, leaving very short basal stub ; 2A strong ; axillary lobe lanceolate ; membrane not wrinkled, but extensively setulose ; anal margin not ciliate ; alar sensory pores situated near apex of vein R_{4+5} and at junction of M_{1+2} and *rm* ; alula oblong, densely ciliate, its hind margin often thickened like a vein. Tibiae and tarsi all with sensillae ; tibia 3 in addition with sensory pores. Tarsal claws actually bifid but seemingly trifid ; empodia feather-like ; pulvilli of same legs virtually symmetrical. Abdominal dorsum medially with broad transversely striolate area ; tergite 3 (and very rarely 5, too) represented by small transverse plate which is in some species absent in ♂ or in both sexes ; tergite 4 never definable ; 6 large, very rarely interrupted at middle ; laterites 3, 4 and 5 rarely definable ; ♀ laterite 7 usually present though never large ; sternite 1 weakly sclerotized, finely setose ; ♀ supra-anal plate wanting ; ♀ pregenital plate, when occasionally present, undivided and very small ; ♂ genitalia normal. Puparium bare, its posterior "cap" clearly divided into 6 sectors, each sector bearing 10–30 pneustic pores arranged in U-shape along outer (anterior) and intersectorial margins. Gynandromorphism unknown ; sexual dimorphism often well exhibited in midleg and in abdominal chaetotaxy and sclerotization. Parasitic on birds.

While several species of *Icosta* can be immediately singled out from all other hippoboscids by certain unique characters they possess, no one such character is universal for the genus, therefore, leaving the genus only to be recognized from a combination of minor characters – postvertex shorter than, and well defined from, mediovertex; scutellum with pair of strong bristles and with no, or hardly any, developed setigerous tubercles on hind margin; metapleurotergal callus simple and weakly swollen; wing with 2 cross-veins, *im* distinctly closer to base than to apex of cell *2bc*.

In Speiser's (1908c: 445) classificatory scheme, the genus was placed along with *Ortholfersia*, *Pseudolynchia* and *Olfersia* in the subfamily Olfersiinae; in Bequaert's (1953: 16), placed with *Pseudolynchia* and *Microlynchia* in Ornithomyinae, Ornithomyini; and in Maa's (1963: 90), placed in Ornithomyinae next to *Pseudolynchia*. In fact, should the presence or absence of the very short and partly colorless vein *im* be neglected, there is no clear-cut dividing line between *Icosta* and *Pseudolynchia*. The finger-like setigerous tubercles on hind scutellar margin and the long numerous laterocentral bristles on prescutum, were long reputed as diagnostic characters of *Pseudolynchia*. But following the discovery of *Ps. serratipes* Maa in New Guinea, they prove to be hardly more than of specific importance. On the other hand, certain characters possessed by Pilosa, Meda and Nigrita groups are evidently much more significant than the mere presence or absence of the vein *im*, and therefore, *Pseudolynchia* might well be rated as a subgenus of *Icosta*. To conserve the currently used system, the status of *Pseudolynchia* is here unchanged, while the Nigrita group is raised to generic rank (as *Phthona*), and Pilosa and Meda groups, to subgeneric rank.

Besides *Pseudolynchia* and *Phthona*, the closest relative of *Icosta* is *Microlynchia* which is mainly characterized by the strongly swollen metapleurotergal callus. Still further apart, there stands *Olfersia* where several unique characters – confluency of medio- and postvertices, absence of scutellar bristles and strongly curved protuberance of metapleurotergal callus – are unknown to related genera. More detailed comparison of the 5 genera are given in Table 1.

Table 1. Comparison of *Icosta* and related genera.

	Icosta	*Phthona*	*Pseudo-lynchia*	*Micro-lynchia*	*Olfersia*
Facial and mesonotal pilosity dense	±	−	+	−	−
Frontal process broadly rounded at apex	±	−	+	−	−
Vibrissal process prominent	±	−	+	−	−
Ocelli well developed	±	−	−	±	−
Anterior thoracic spiracle enlarged	±	+	−	−	−
Scutellum furrowed medially	±	+	−	−	−
Scutellum subtruncate posteriorly	±	+	+	−	+
Scutellar bristle present	+	+	+	+	−
Finger-like setigerous tubercles of scutellum present	±	−	+	−	−
Metapleurotergal callus normal	+	+	+	−	−
Prosternum well developed.	±	+	+	+	−
Metasternal process present	±	+	+	−	−
Vein *im* present	+	+	−	−	+
Tergite 3 present	±	+	+	±	+
Tergite 5 present	±	−	±	±	−
Laterite 3 present	±	+	±	−	±
♀ Laterite 7 present	±	−	−	−	−
♀ Pregenital plate present	±	−	+	−	−
Surface of puparium bare	+	+	+	+	−

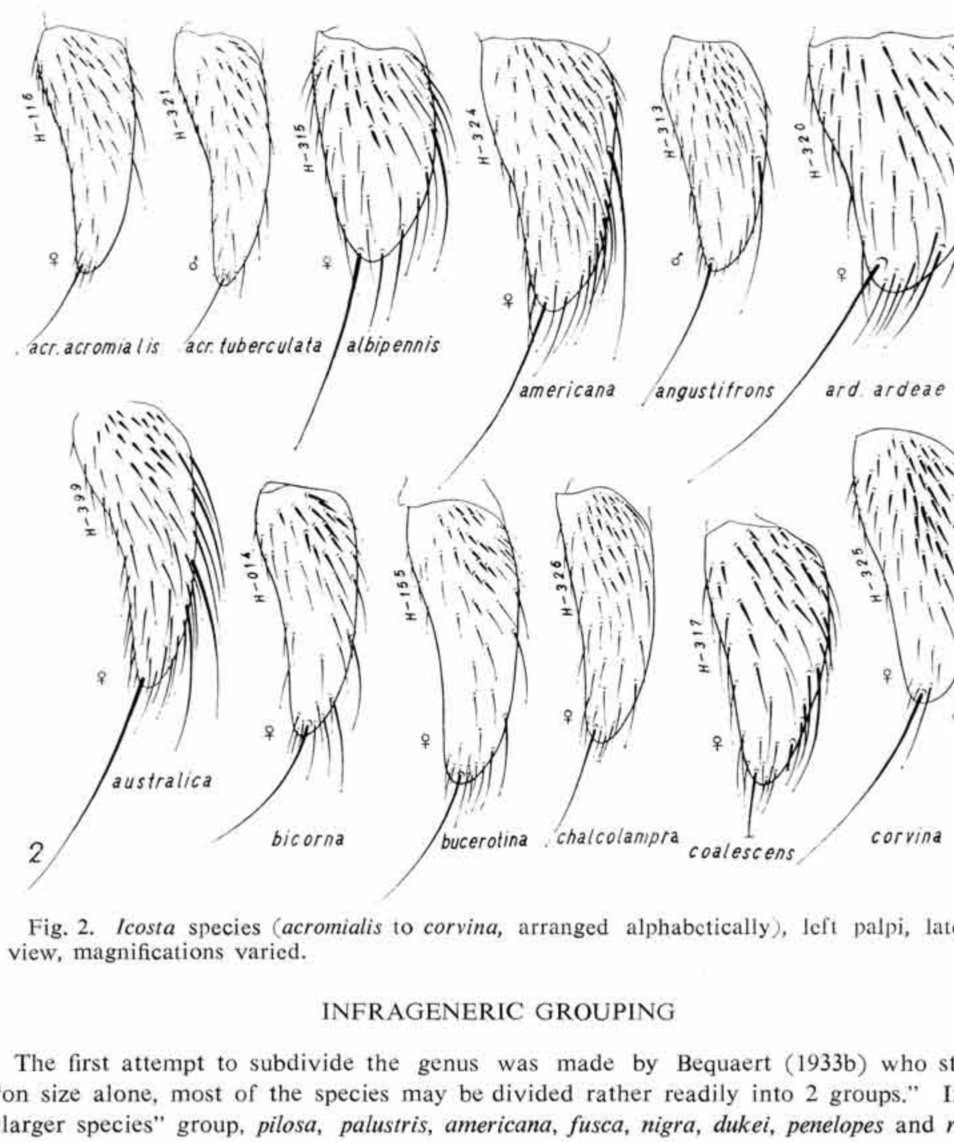

Fig. 2. *Icosta* species (*acromialis* to *corvina*, arranged alphabetically), left palpi, lateral view, magnifications varied.

INFRAGENERIC GROUPING

The first attempt to subdivide the genus was made by Bequaert (1933b) who stated, "on size alone, most of the species may be divided rather readily into 2 groups." In his "larger species" group, *pilosa, palustris, americana, fusca, nigra, dukei, penelopes* and *raptatorum* were included (the "smaller species" were not enumerated). The same group was revised (1945b) with the replacement of "*palustris*" by *schoutedeni* and the additions of *majuscula, wolcotti, massonnati, villadae, macquartii, rufiventris* and *pallidilabris*. As admitted by Bequaert (1933b: 68), this arrangement did not regard true relationship and hence, was merely for convenience. The scheme suggested by Maa (1963), covering 33 species (2 of them unplaced), was comprised of 11 species-groups represented, respectively, by *americana, hirsuta, holoptera, pilosa, massonnati, simplex, plana, dioxyrhina, longipalpis, meda* and *nigrita*. More species are now known. And, by weighing the different characters and correlating them with distributional ranges and host relationships, a revised scheme

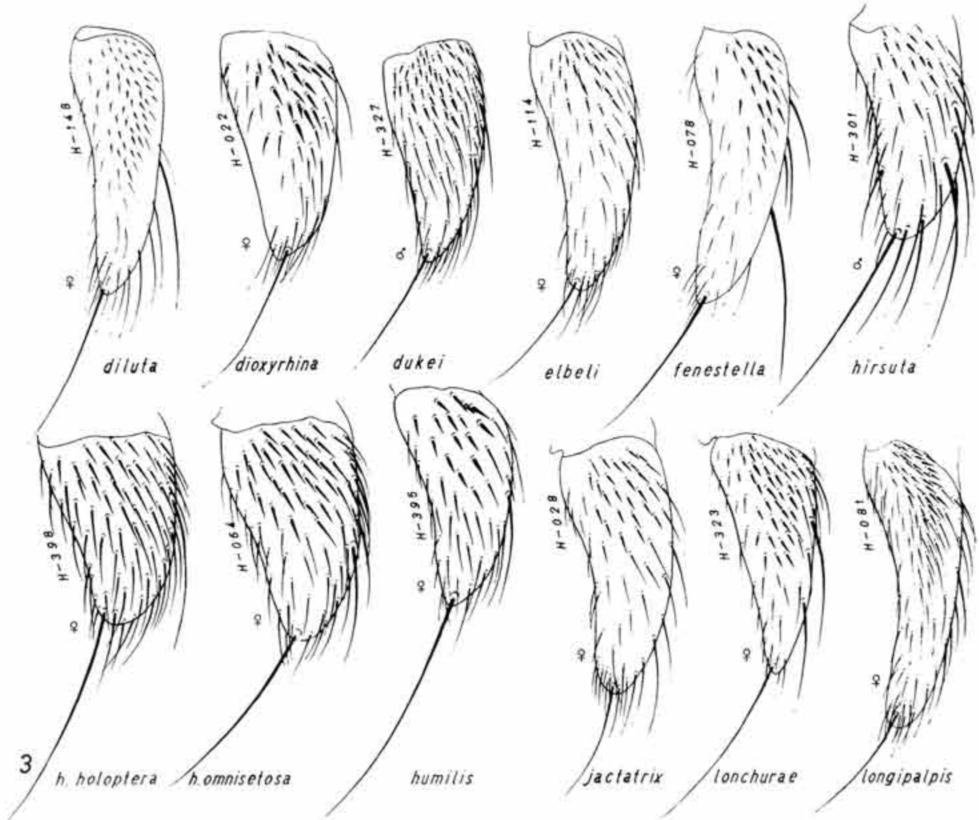

Fig. 3. *Icosta* species (*diluta* to *longipalpis*, arranged alphabetically), left palpi, lateral view, magnifications varied.

is here proposed. The *nigrita* group is assigned to the new genus *Phthona* while the remaining ones re-allotted into 5 subgenera and a number of groups and subgroups. The entire hierarchy follows (see Addendum).

Subgenus *Ornithoponus* Aldr.

Group Americana. 7 species in 3 subgroups: (a) *americana, rufiventris, angustifrons, latifacies*; (b) *dukei, nigra*; (c) *suvaensis*.

Group Hirsuta. 2 species in 2 subgroups: (a) *hirsuta*; (b) *tripelta*.

Group Simplex. 5 species in 2 subgroups: (a) *plaumanni, zumpti*; (b) *maquilingensis, simplex, australica*.

Group Minor. 5 species and subspecies: *minor, sensilis sensilis, s. reducta, lonchurae*, sp. "W".

Group Parallelifrons. 3 species: *parallelifrons, paramonovi, papulata*.

Subgenus *Icosta* Speis., s.s.

Group Plana. 11 species in 3 subgroups: (a) *wenzeli*; (b) *recessa, jactatrix, elbeli*; (c) *tarsata, plana, trita, fenestella, diluta, samoana, chalcolampra*.

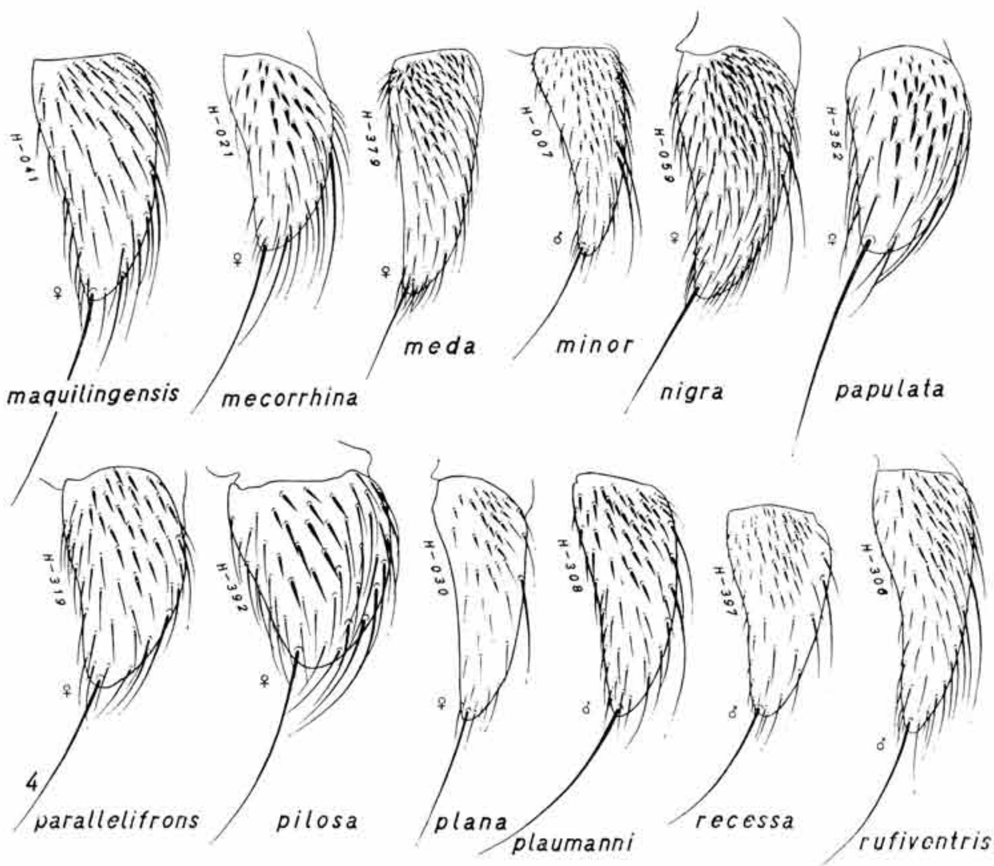

Fig. 4. *Icosta* species (*maquilingensis* to *rufiventris*, arranged alphabetically), left palpi, lateral view, magnifications varied.

Group Longipalpis. 12 species and subspecies in 4 subgroups: (a) *humilis, subdentata*; (b) *coalescens*; (c) *mecorrhina, longipalpis, acromialis acromialis, a. tuberculata*; (d) *corvina, bicorna, spinosa, bucerotina, dioxyrhina*.

Subgenus *Ardmoeca* n. subg.

Group Albipennis. 12 species and subspecies in 2 subgroups: (a) *albipennis, ardeae botaurinorum, a. ardeae*, sp. "S", sp. "N", sp. "T", sp. "F", *massonnati, schoutedeni*; (b) *holoptera holoptera, h. omnisetosa*, sp. "O".

Subgenus *Gypoeca* n. subg. 1 species: *meda*.

Subgenus *Rhyponotum* n. subg. 1 species: *pilosa*.

Key to Genera and Subgenera of Icosta-Complex

1. Face as usual, postvertex much smaller and shorter than, and well defined from, mediovertex, lunula partly, or completely, separated from frons proper by transverse

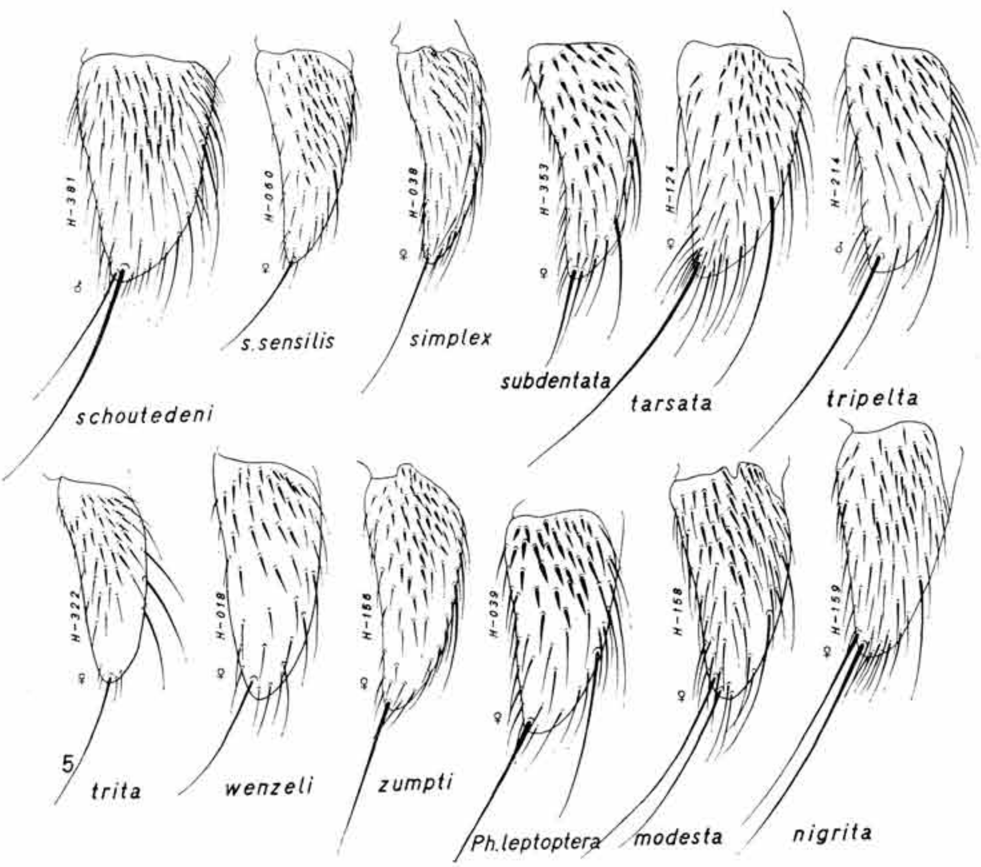

Fig. 5. *Icosta* species (*schoutedeni* to *zumpti*, arranged alphabetically) and *Phthona* species, left palpi, lateral view, magnifications varied.

suture; scutellum with 2 (1+1) bristles; metapleurotergal callus weakly or moderately swollen, at most conical, never forming L-shaped strong protuberance; puparium with smooth surface 2

Face quite unusual in appearance, mediovertex confluent with postvertex, or when very weakly definable then much smaller and shorter than postvertex; lunula and frons proper entirely confluent; scutellum lacking bristles, but ordinary soft setae; metapleurotergal callus very strongly produced into L-shaped protuberance; puparium uniformly spiny.. Genus **Olfersia**

2 (1). Wing with only 1 crossvein (*rm*), hence only 1 closed basal cell (*1bc*); ♀ always with tergite 3, no tergite 5; ♂ either with tergite 5 and no tergite 3, or with both tergites 3 and 5.. 3

Wing with 2 crossveins (*rm* and *im*), hence 2 closed basal cells (*1bc* and *2bc*); tergites 3 and 5 not as above, either both sexes with tergite 3 only, or with (or without) both 3 and 5, very occasionally (in 1 species only) ♀ with tergite 3 and no tergite 5 while ♂ without either 3 or 5.. 4

3 (2). Hind scutellar margin truncate or subtruncate, sharply edged, with a medially broadly interrupted transverse series of tiny finger-like tubercles each bearing a fine short

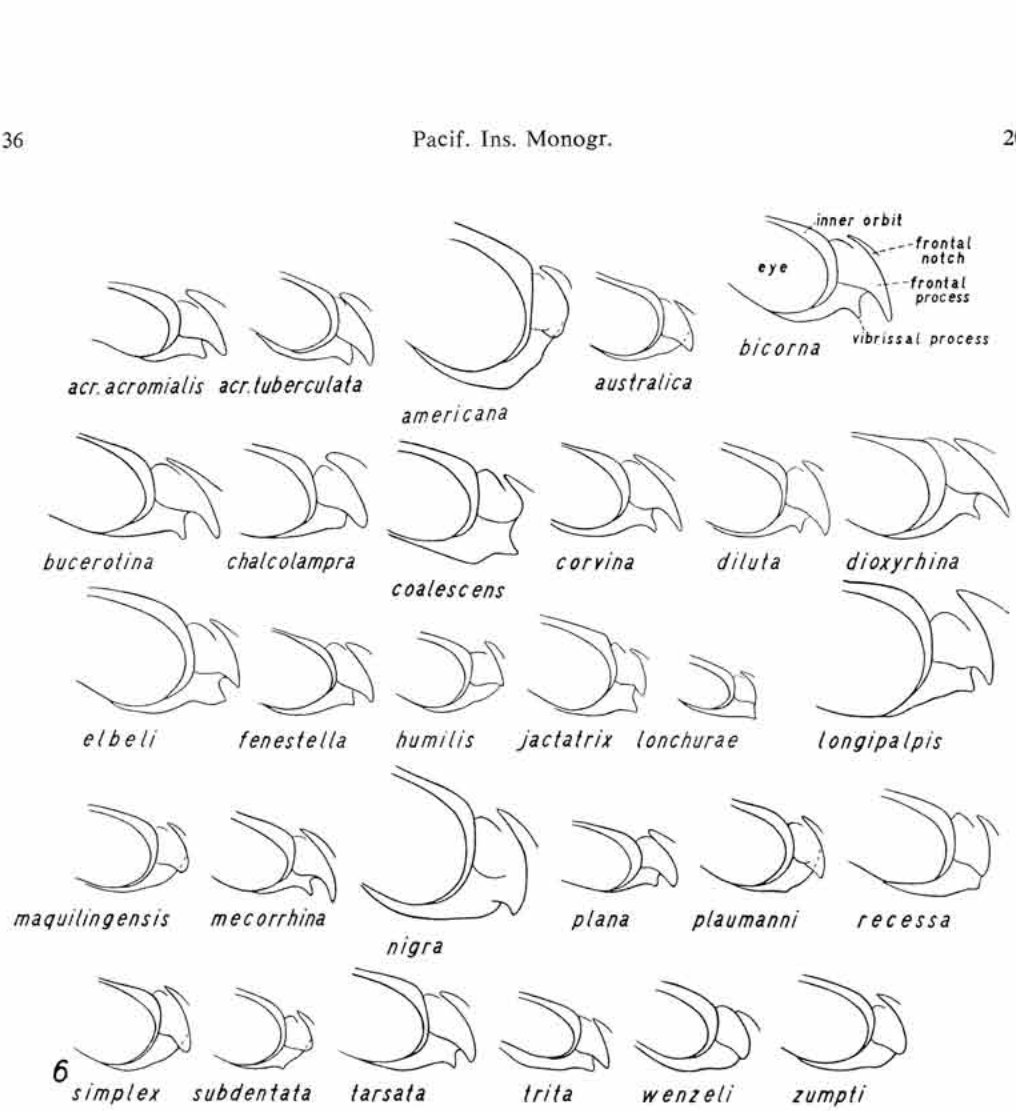

Fig. 6. *Icosta* species (arranged alphabetically), heads in part, dorsolateral view showing frontal and vibrissal processes, same magnification. Drawn from specimens in alcohol.

seta; metapleurotergal callus weakly swollen, not conical; metasternal process well developed; prescutum with numerous laterocentral bristles which reach or surpass transverse mesonotal suture; frontal process in profile broadly rounded, vibrissal area acutely projecting forward .... Genus **Pseudolynchia**

Hind scutellar margin distinctly convex, roundly edged, without above-described tubercles; metapleurotergal callus moderately swollen, conical; metasternal process absent; prescutum with only laterocentral setae which are far from reaching transverse mesonotal suture; frontal process tooth-like, acutely projecting forward; vibrissal area broadly rounded.. Genus **Microlynchia**

4 (2). Eye excessively small, only *ca* 1/3 as wide as face and leaving postorbit about as long as average width of inner orbit; scutellum *ca* 1/2 as long as scutum, posteriorly subtruncate; pro- and mesosterna both lying on horizontal plane and of similar degree of pigmentation and sclerotization, mesosternum anteriorly truncate, not bilobed; tibia 3 (fig. 12, *leptoptera*) with only sensory pores, no sensillae... Genus **Phthona**

Eyes normal in size, more than 1/2 as wide as face and leaving postorbit much short-

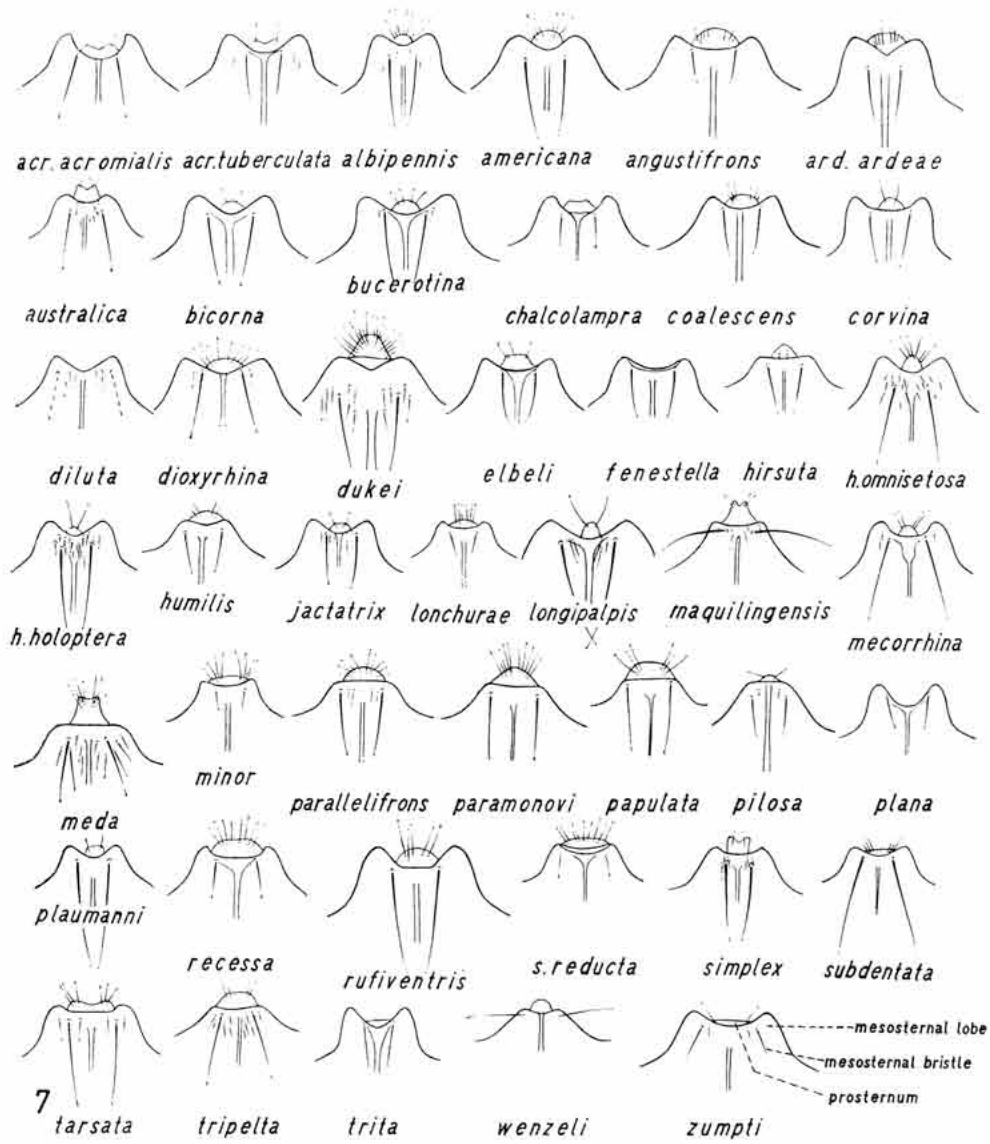

Fig. 7. *Icosta* species (arranged alphabetically), anterior part of thoraces, ventral view showing prosterna and mesosternal lobes, same magnification. Drawn from specimens in alcohol.

er than average width of inner orbit; scutellum not so short, its posterior margin more or less convexly curved; prosternum not as above described, more or less pale and less sclerotized than mesosternum and lying on oblique or vertical plane, mesosternum usually bilobed anteriorly; tibia 3 (fig. 11-12, except *leptoptera*) with both sensory pores and sensillae. Genus **Icosta** 5

5 (4). Mesonotum largely bare, never uniformly pilose; inner orbit entirely, or at least with

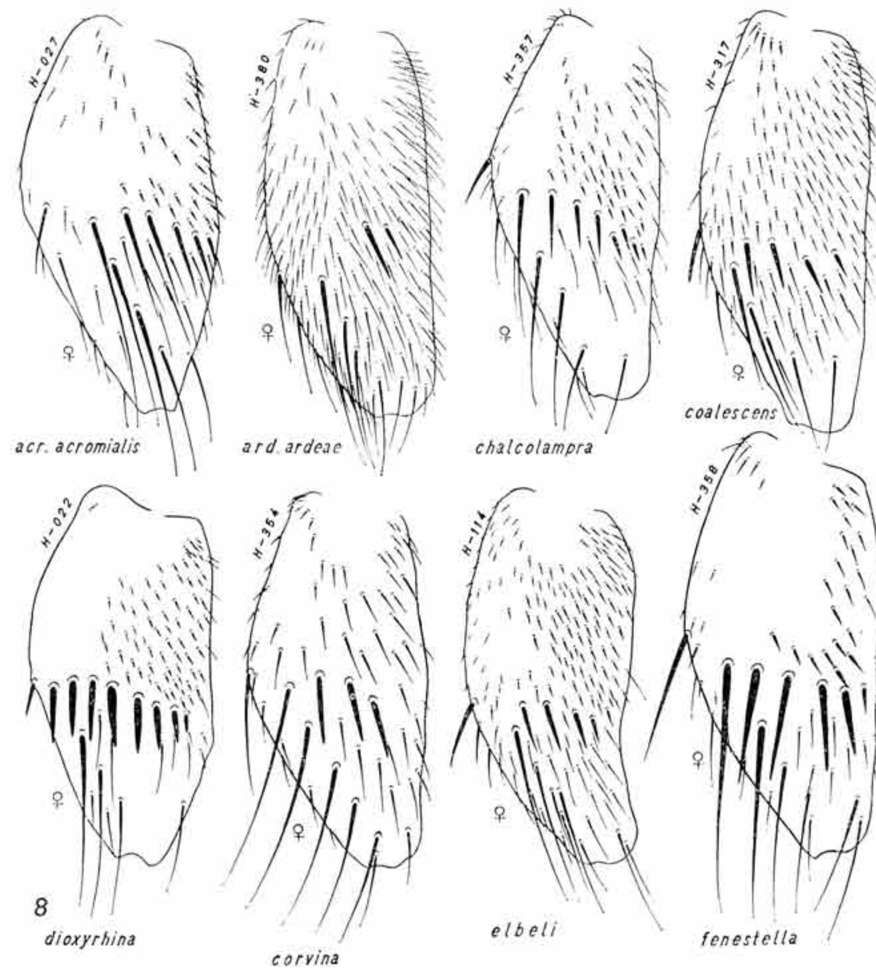

Fig. 8. *Icosta* species (*acromialis* to *fenestella*, arranged alphabetically), fore femora, anterior view, magnifications varied.

outer 2/5 shining; palpus in lateral view at least 1.5× as long as wide; ♂ abdomen never with very robust blunt spines, ♀ laterite 7 never nipple-like 6

Mesonotum (fig. 163) uniformly covered with dense recumbent setae; inner orbit (fig. 166) entirely, or nearly entirely, leathery, not shining; palpus (fig. 4, *pilosa*) in profile hardly longer than wide; ♂ abdomen (fig. 162) with 10-20 exceedingly robust blunt spines at each side near spiracles 4-5, ♀ laterite 7 (fig. 161) exceedingly strongly protuberant .... Subgenus **Rhyponotum**

6 (5). Anterior thoracic spiracle lateral or dorsolateral, often linear, with shorter axis only a fraction as long as longer axis; interdistance of bases of scutellar bristles more than 2× median length of scutellum; ♂ femur 2 lacking spines on inner (posterior) margin 7

Anterior thoracic spiracle dorsal, exceedingly large, with shorter axis *ca* 1/2 as long as longer axis; interdistance of bases of scutellar bristles subequal to median length

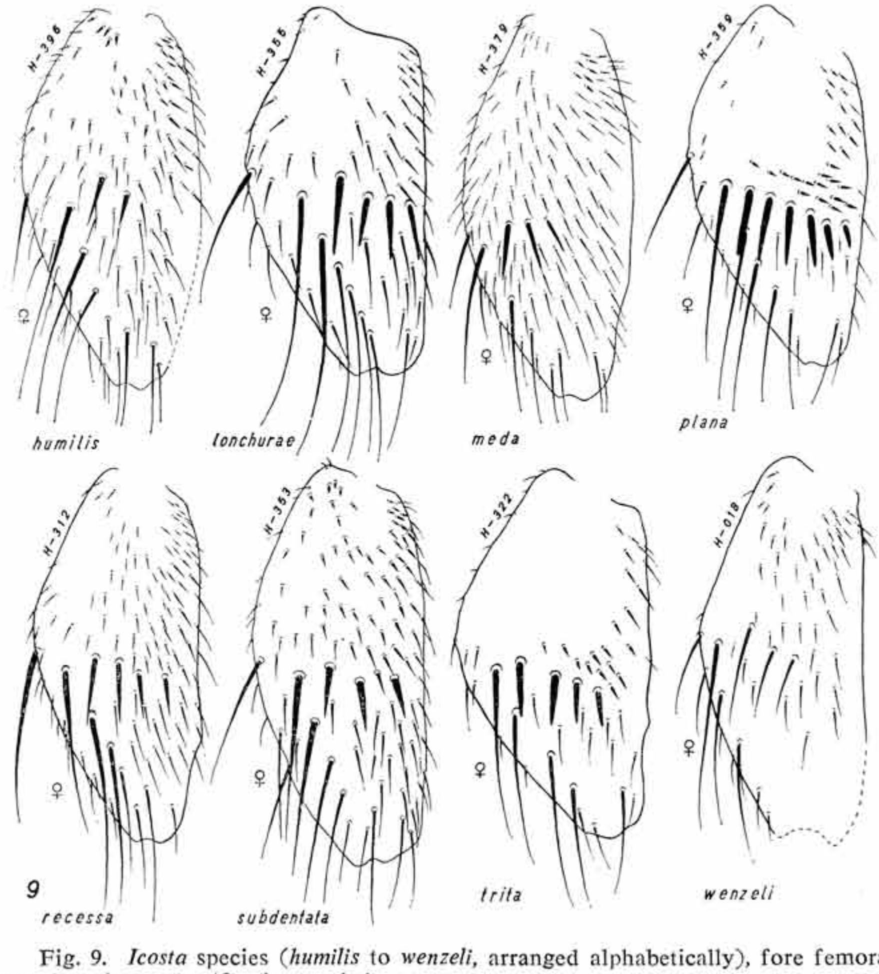

Fig. 9. *Icosta* species (*humilis* to *wenzeli*, arranged alphabetically), fore femora, anterior view, magnification varied.

of scutellum; ♂ femur 2 with patch of spines on inner margin near base.............. .... Subgenus **Gypoeca**

7 (6). Venter of all femora bare besides few marginal setae; all tibiae very sparsely setose; palpus in profile more than 2× as long as wide, when not so long (in Parallelifrons group only) then wing exceedingly thin, colorless (anterior veins very pale yellowish) and cells *1m* and *2m+1a* extensively bare; ocelli absent, occasionally (in Simplex group only) present or each represented by small pit 8

Venter of femur 3 (fig. 147-148) densely uniformly setose except an oval bare area at base, venter of femur 2 sparsely setose, that of femur 1 marginally setose; venter of tibiae 1 and 3 densely uniformly setose; palpus (fig. 2, *albipennis, ardeae*) 1.5-2.0 × as long as wide; wing (fig. 119-122) normal in texture, fuscous, anterior veins blackish, surface entirely setulose, at most bare at posterior 3/4 of cell *2a*; ocelli always absent, represented by single median fovea on postvertex ... Subgenus **Ardmoeca**

8 (7). Vibrissal area (fig. 6, *americana*, etc.) anteroventrally rounded-off (seldom angular or

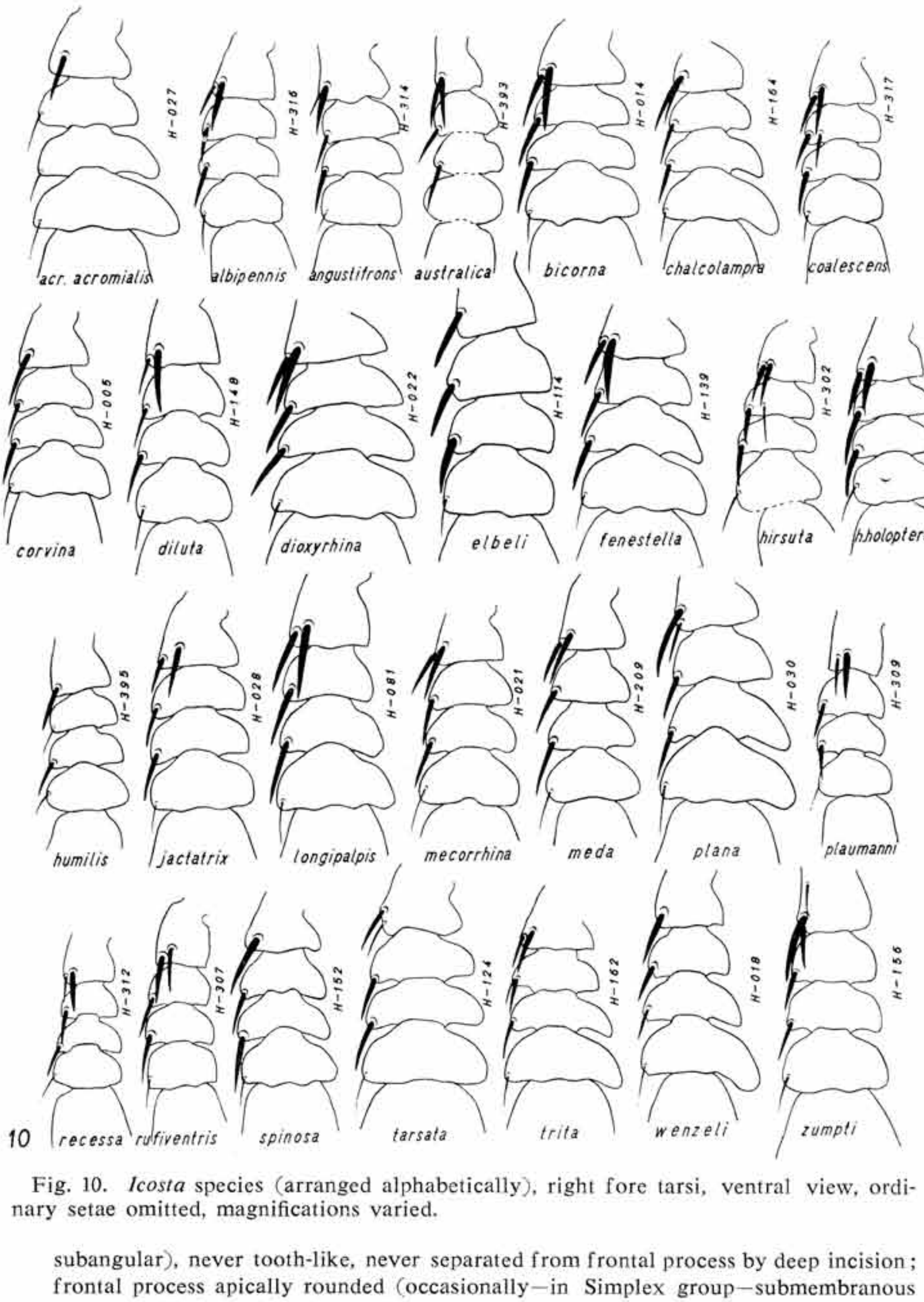

Fig. 10. *Icosta* species (arranged alphabetically), right fore tarsi, ventral view, ordinary setae omitted, magnifications varied.

subangular), never tooth-like, never separated from frontal process by deep incision; frontal process apically rounded (occasionally—in Simplex group—submembranous and tooth-like), and in dorsal view, never exceedingly broad at basal 2/3 and then suddenly narrowed apicad; metabasisternum never produced into posterolateral processes; posterior scutellar margin fairly strongly convex; tarsus 1 never apically

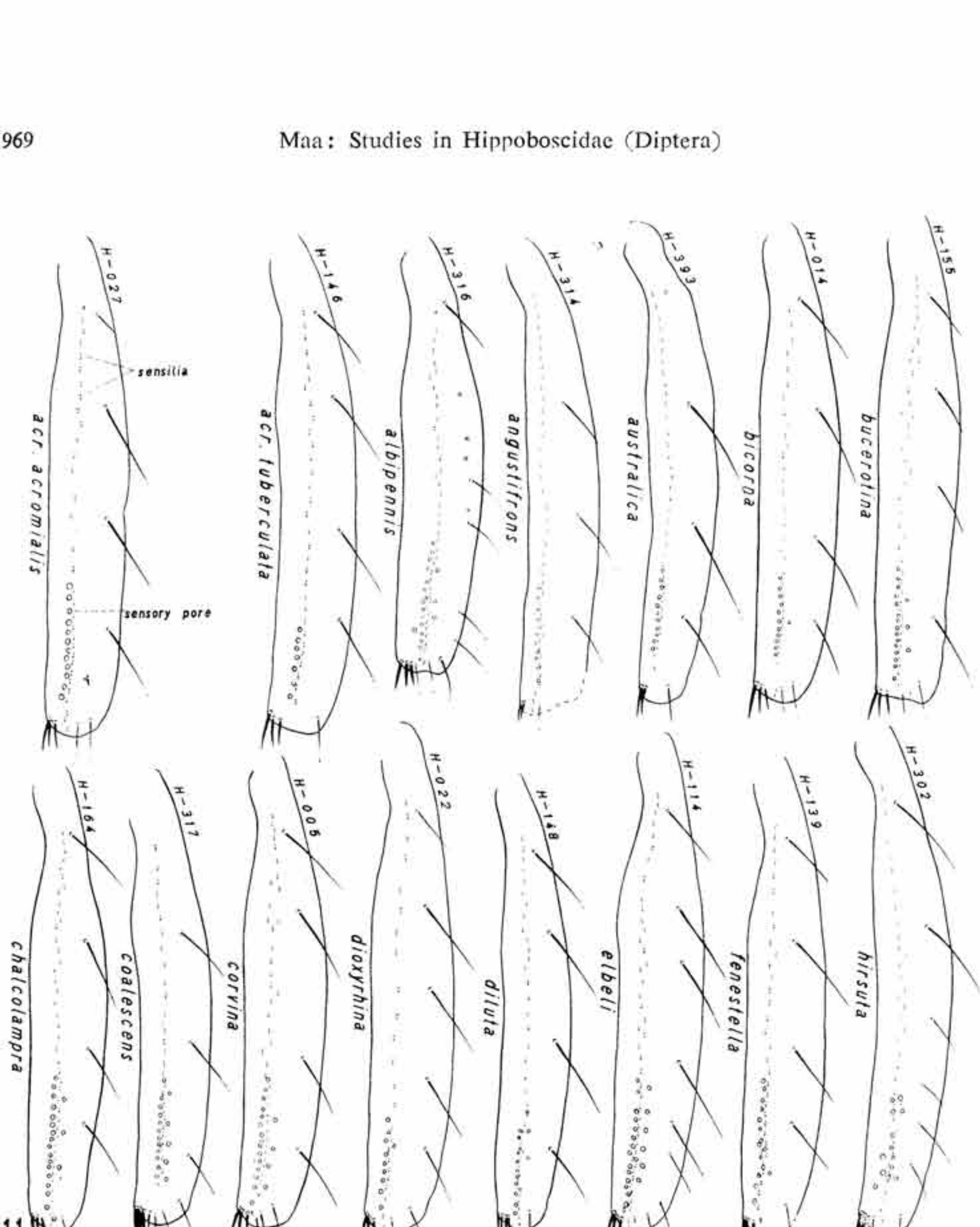

Fig. 11. *Icosta* species (*acromialis* to *hirsuta*, arranged alphabetically), right hind tibiae, posterior view, showing distribution of sensillae and sensory pores, ordinary setae omitted, magnifications varied. For "sensilia", read "sensillae."

asymmetrical .... Subgenus **Ornithoponus**

Vibrissal area (fig. 6, *bicorna*, etc.) anteroventrally produced tooth-like and sharply separated by deep incision or notch from frontal process which is also tooth-like and not submembranous; when vibrissal area and frontal process occasionally not so, then frontal process (in *recessa*, E. Africa and as in fig. 62, *elbeli*) in dorsal view exceedingly broad at basal 2/3 and suddenly narrowed at apical 1/3 and leaving frontal notch broadly U-shaped (and median section of hind scutellar margin almost straight), or metasternal process (in *humilis*, W. Africa, *subdentata*, E. Africa) strongly developed, or tarsus 1 (in *wenzeli*, Philippines) with outer apical lobes of segments 3 and 4 distinctly longer than corresponding inner lobes.........Subgenus **Icosta s.s.**

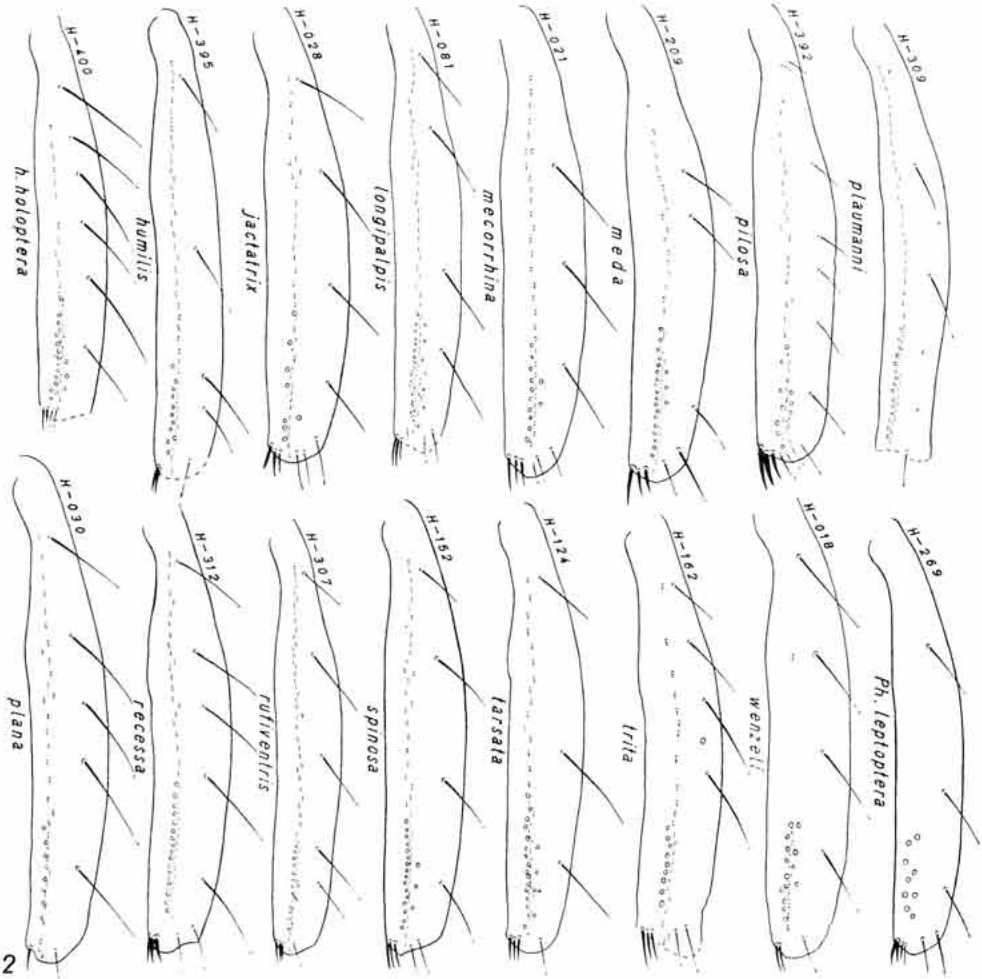

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Fig. 12. *Icosta* species (*holoptera* to *wenzeli*, arranged alphabetically) and *Phthona leptoptera*, right hind tibiae, posterior view showing distribution of sensillae and sensory pores, ordinary setae omitted, magnifications varied.

EVOLUTIONARY TRENDS

The evolutionary trends within the genus have scarcely been investigated, and the only published treatise on this subject appears to be by Maa (1963: 111-12) in which 2 points were discussed. Firstly, the Americana, Hirsuta and Holoptera groups on one hand, and the Nigrita and Meda groups on another, represent the 2 extremes of evolution; the Pilosa and Massonnati groups are rather isolated; and the Plana, Dioxyrhina and Longipalpis groups together form a "Formenkreis." Secondly, the various species-groups have diversified in 14 directions, viz., sexual dimorphism, facial and thoracic pilosity, frontal, vibrissal and mesosternal processes, visual organs, mesothoracic spiracle, median furrow and posterior truncation of scutellum, scutellar bristle, size and shape of wing, crowding of R and M branches toward C, and abdominal sclerotization. These points more or less conform with what are discussed in this paper, and some of them are comparable to those in related genera.

As the diversifications among the various species and species-groups are not always lined in a continuous series and some of the connecting links have probably been lost in the past, it is difficult to draw a clear and convincing picture of the evolution. At first, the genus was assumed to have evolved along 2 main branching-outs, one with frontal and vibrissal processes both broadly rounded at apices and confluent to each other at bases, and another with such processes both acute at apices and sharply separated from each other at bases. The existence of isolated groups and the discovery of intermediate forms deny such an assumption. Analyses of host relationships, with special reference to host-parasite evolutionary parallelism, also failed to shed any light upon this problem. Although phylogenetically closely-related flies are often parasitic on closely-related birds and vice versa, this phenomenon is, as a rule, true only for lower taxonomic categories (species, genera) but not higher ones (families, orders) of birds, and for mono- and oligoxenous but not pleio- and polyxenous flies. Furthermore, same families and orders of birds may harbor flies having different host ranges and different systematic affinities. For instance, the Accipitridae (see Appendix I) probably serve as breeding and occasional hosts of not less than 11 and 4 *Icosta* species, respectively, and among the 11 breeding parasites, 5 each are oligo- and polyxenous, 1 is pleioxenous, and they belong to 5 different species-groups (Americana, Simplex, Plana, Longipalpis, Meda). The "time" or palaeontological factor is also of little help since there is no fossil record for the genus. What can be only speculated are (1) the Americana group, though apparently more generalized than others, probably established itself in the Americas and became flourishing there in a comparatively recent date; (2) the Plana and Longipalpis groups, now flourishing in the Oriental Region, probably established there in a slightly later date; and (3) the Ethiopian Region has apparently been the cradle of the entire genus. Point (1) is evidenced by the Neotropical fauna, as a whole, being geologically young and all species of the genus occurring there being quite closely related, obviously a result of rather recent branching-outs. Points (2) and (3) are supported by the facts that the degree of diversification among the Oriental species of Plana and Longipalpis groups is less significant than that among their Ethiopian counterparts, and at the same time, more significant than that in all American *Icosta* species. Points (2) and (3) are supported further in that the Ethiopian Region is the present-day home of all subgenera and species-groups of *Icosta* with the possible exception of the Parallelifrons group. When the host-birds are classified from both ecological and morphological evidences, it can be seen immediately that ecological factors, especially nidificating sites of birds, have played a very important role in the evolution within the genus *Icosta* (see chapter on Host Rrelationships).

The characters listed in Table 2 are so described as to indicate their presumably generalized conditions in the genus. For instance, the presence of ocelli is presumed to be a generalized character while the reverse, the absence of ocelli, is presumed to be a specialized character. Some of those characters, such as the uni- or multiseriate orbital setae, though being highly useful for specific recognition, obviously bear little or no phylogenetic significance. Some others such as the relative conspicuousness of mesopleural concavity and length of mesotsernal lobes are admittedly and necessarily arbitrary. Still others, such as the dorsoventral compressing of body, degree of sexual dimorphism and of host specificity, are linked to other sorts of speciation and are of high significance. The flattening of body is a general tendency of speciation in many groups of ectoparasites, and within the Hippoboscidae, is most pronounced in Lipopteninae (*Lipoptena*, *Neolipoptena*, *Melophagus*). It is linked with the enlarging and switching-dorsad of mesothoracic spiracle, the shortening of scutellum, the weakening of mesopleural concavity for receiving femur 1 in repose, the strengthening of lateral abdominal setae, the lesser declivity of prosternum and several other characters. The sexual dimorphism is chiefly associated with the degree of ♀ abdominal sclerotization which is in turn an adaptation of the ovoviviparous life of many ectoparasitic flies. The degree of host specificity, particularly in *Icosta*, on the other hand, is correlated with the habits of host-birds.

Regarding the subspecific diversifications, it may be said that geographical isolation has not been effective for flies parasitic on a great variety of birds (polyxenous flies) or on long-distance migratory birds. Of the 62 species, *sensilis*, *acromialis*, *ardeae* and *holoptera* are divided into 2 subspecies each. A preliminary analysis of several pleio- and polyxenous species upsets the attempt to discriminate physiological subspecies.

The theory of evolutionary reduction—that is, generalized forms have more segments, etc., than do the specialized forms—does not work very well in *Icosta*. For instance, even in the quite closely related species *dukei* and *nigra*, the tergite 3 is present in the former and absent in the latter; the presence of tergite 5 is found in the Hirsuta group which is by no means very generalized in other respects. On the other hand, there may be simultaneous positive and negative branching-outs. The basic type of the extent of wing-setulae, as exemplified by the Americana group, tends to evolve towards 2 opposite directions, one tending to cover the entire wing surface as in the Holoptera subgroup and another, decreasing in extent and leaving cells *1m* and *2m+1a* with extensive bare area at base (as in *samoana*, fig. 140), at apex (as in *bucerotina*, fig. 67) or broadly along anal margin of wing (as in *dioxyrhina*, fig. 72). The vestiture of body and legs has a similar tendency.

Table 2. Comparison of Species-Groups of *Icosta*.

	Species-Groups									
	Americana	Hirsuta	Simplex	Minor	Parallelifrons	Plana	Longipalpis	Albipennis	Meda	Pilosa
Body weakly flattened	+	+	+	—	+	+	+	+	+	—
Ocelli present	—	—	±	—	—	—	—	—	—	—
Postorbit very short	+	+	+	+	+	+	+	±	+	+
Frontal process broadly rounded at apex	+	+	±	+	+	∓	∓	+	+	+
Vibrissal area broadly rounded	±	+	+	—	+	∓	∓	+	+	+
Palpus long or moderately long	+	+	+	+	—	+	+	—	+	—
Rostral membrane short	+	+	—	+	+	+	±	—	—	+

Table 2 (cont'd)

	Species-Groups									
	Americana	Hirsuta	Simplex	Minor	Parallelifrons	Plana	Longipalpis	Albipennis	Meda	Pilosa
Orbital setae uniseriate	±	+	+	+	+	+	+	−	−	--
Mesothoracic spiracle small, dorsolateral or lateral	+	+	+	+	+	+	+	±	--	+
Prescutum lacking laterocentral bristles	±	−	+	−	+	+	±	±	−	−
Scutellum long	+	+	+	+	+	±	±	+	+	−
Mesopleural concavity weak	+	+	−	−	+	+	±	−	+	−
Prosternum large	+	±	−	+	+	∓	∓	−	+	−
Mesosternal lobes long	+	−	−	−	−	−	−	+	−	−
Mesosternum with discal setae	+	+	+	−	−	−	−	+	−	++
Metasternal processes absent	+	+	+	+	+	±	−	+	+	+
Vein R_{2+3} apart from C before merging	+	+	+	±	−	+	±	+	+	−
Cell *2bc* long	+	++	+	−	+	+	+	+	++	−
Cell *2m+1a* posteriorly bare	±	−	−	−	+	+	±	−	+	+
Alula bare	±	+	∓	±	+	+	±	−	−	−
Venter of femora largely bare	+	+	+	+	+	+	+	−	+	−
Femora 1 moderately swollen	+	+	+	−	+	±	±	+	+	−
Setae on anterior surface of femora 1 evenly distributed	+	+	+	+	+	∓	∓	+	+	+
Segments 3-4 of tarsi 1 apically symmetrical	+	+	+	+	+	∓	+	+	+	+
♂ Tibiae 2 lacking preapical spines	+	+	+	+	+	+	±	+	+	+
♂ Tarsi 2 lacking peglike spines	±	±	+	+	+	+	+	+	−	+
Segments 1-3 of tarsi 3 apically symmetrical	−	±	−	+	−	−	−	−	−	−
Basitarsi 3 lacking basal spines	−	−	−	∓	−	−	−	−	−	−
Posterolateral lobes of syntergite 1+2 short	∓	−	−	+	−	−	∓	+	−	+
Abdominal striolate area largely bare	±	+	+	+	+	+	∓	+	+	--
♂ Tergite 3 present	±	+	+	−	+	+	+	±	−	+
♀ Tergite 3 present	±	+	+	−	+	+	+	+	+	+
♂ Tergite 6 entire, hardly constricted at middle	+	−	+	+	−	+	+	+	−	−
♀ Laterite 3 definable	±	+	±	−	+	∓	∓	+	+	+
♀ Laterite 7 present	+	+	−	−	−	±	+	−	−	++
♀ Pregenital plate present	−	−	−	−	−	−	−	∓	−	−
Aedeagus moderately long, moderately curved	+	+	+	−	+	±	+	−	+	+
♂ Postgenital plate not Y-shaped	+	+	+	−	+	±	+	−	+	+
Sexual dimorphism weak	+	−	+	+	−	±	−	+	−	−
Host specificity weak	+	−	−	−	−	∓	−	−	−	−

Symbols: +, yes, moderately so; ++, much so; −, no, not so; --, much the reverse; ±, usually so; ∓, usually not so.

Subgenus **Ornithoponus** Aldrich, new status

TYPE-SPECIES. *Feronia americana* Leach, by original designation.

DISTRIBUTION. Worldwide; 23 species and subspecies: 8 in Oriental, 4 in Ethiopian, 5 in Australian, 6 in Neotropical, 5 in Nearctic and 2 in Palaearctic Region. About half are widely distributed and 6 are not confined to one Region. In the Palaearctic and Nearctic Regions, only 1 species each is endemic.

Host Relationships. Nearly half of the species and subspecies are polyxenous, another half of them, partly pleio- and partly oligo- or monoxenous. Preferred hosts are Accipitridae, Phasianidae, Megapodiidae, Columbidae, Psittacidae, Cuculidae, Strigidae and Ploceidae.

Diagnosis. Ocelli often present, or each represented by small pit, tergite 5 sometimes

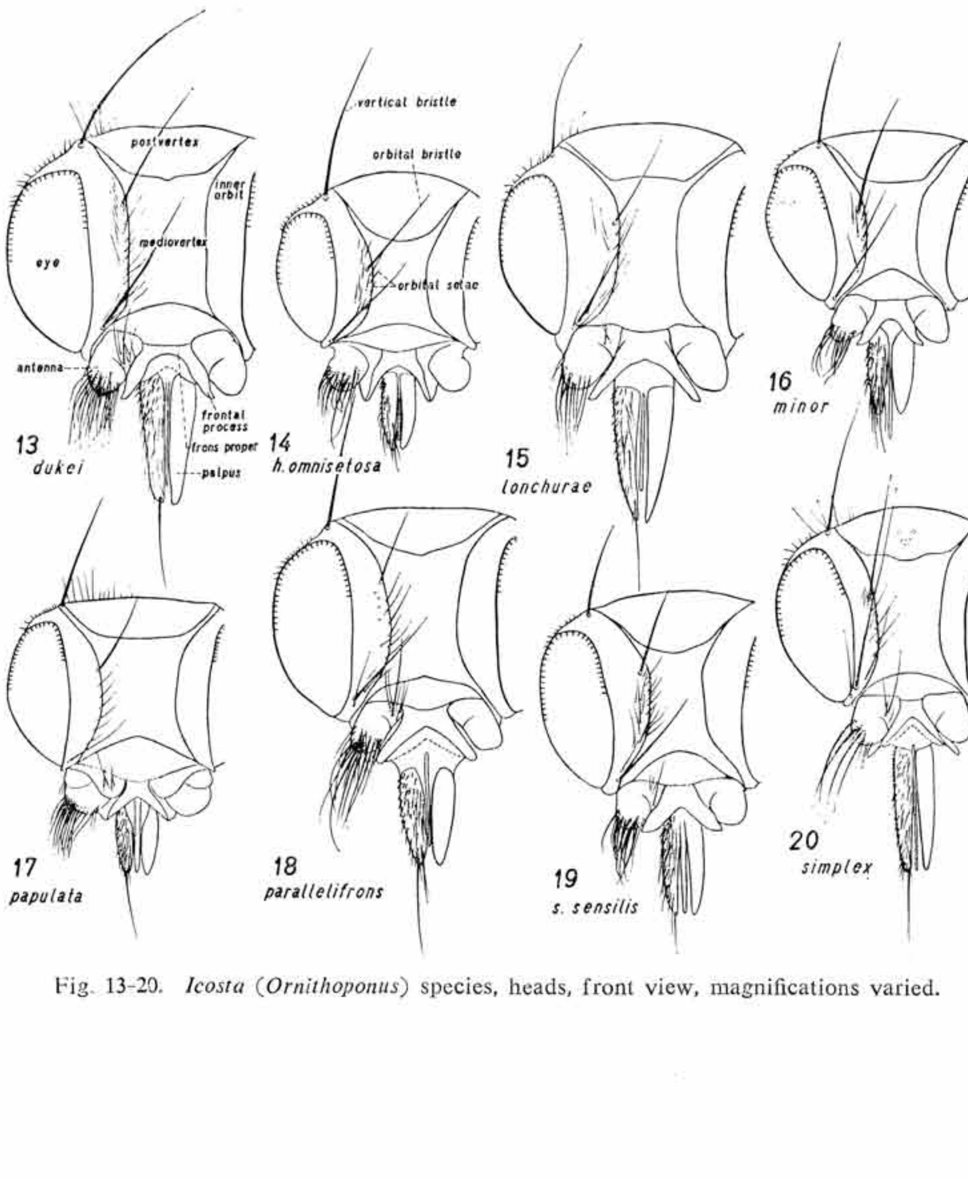


Fig. 13-20. *Icosta* (*Ornithoponus*) species, heads, front view, magnifications varied.

present: these are the only characters unknown in other subgenera. Vibrissal area usually broadly rounded, seldom angular or subangular; wing-setulae varied in extent, usually not covering posterior 1/3-1/2 of cell *2m+1a* and entirety of *1bc*, *2bc*, *2a* and alula; ♂ tibia 2 lacking preapical spines, ♂ tarsus 2 lacking peg-like spines; tergite 3 usually present, tergite 6 normal in shape; aedeagus moderately long and slender. Sexual dimorphism weak. For other characters, see subgeneric key, couplet 5.

Affinities. This subgenus appears to be the least specialized and is, therefore, placed at the beginning of the genus. It is closest to *Icosta*, s.s. and shows little affinity to remain-

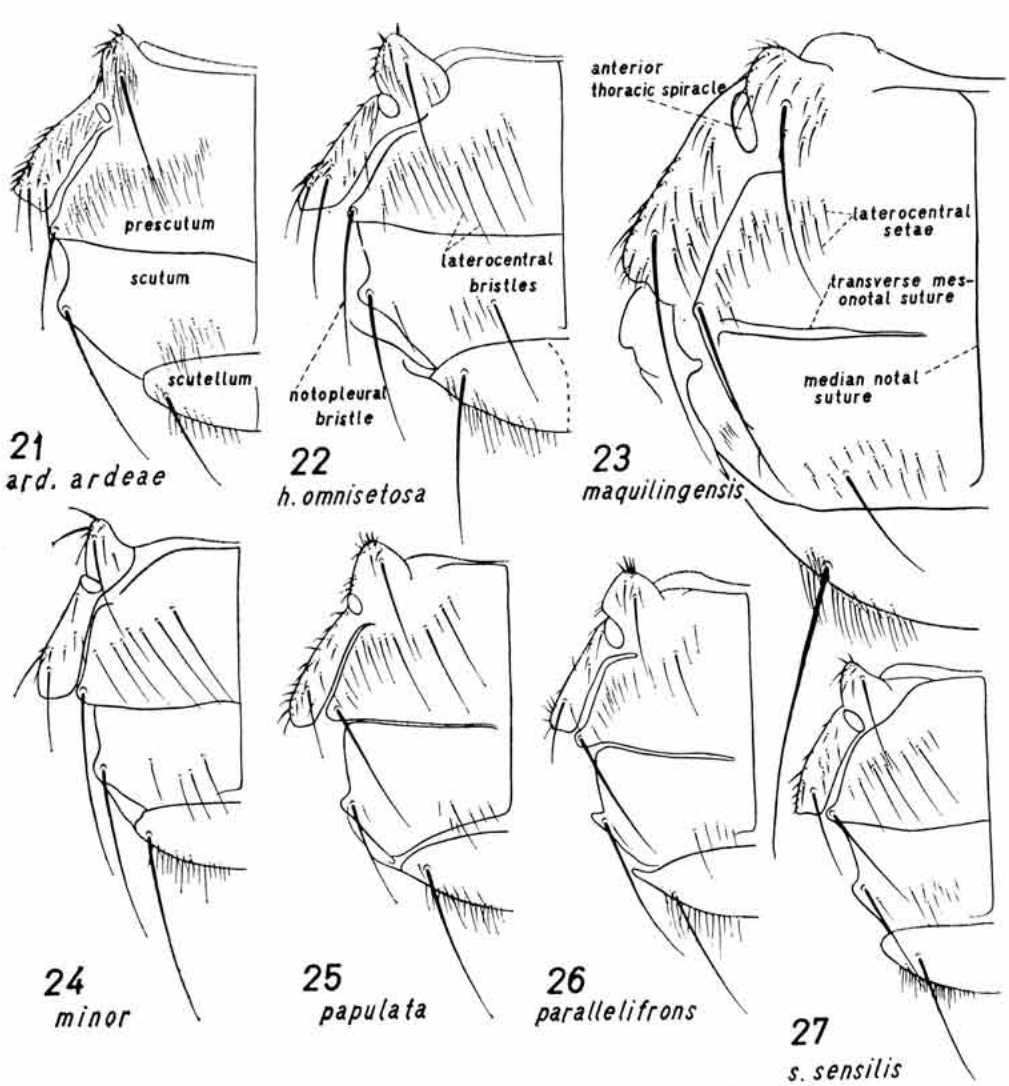


Fig. 21-27. *Icosta* (*Ornithoponus*) and *I.* (*Ardmoeca*) species, thoraces, dorsal view, magnifications varied.

ing subgenera. Of its subdivisions, the Americana group appears to be the most generalized while the 4 others diversify in different directions. The name *Ornithoponus* is derived from Greek ὄρνις (genitive ὄρνιθος), a bird; πόνος, a pain, a toil.

KEY TO SPECIES AND SUBSPECIES OF ICOSTA (ORNITHOPONUS)

1. Ocelli either all well developed, or vestigial, or each represented by small pit on postvertex; frontal process (fig. 6, *australica, zumpti*, etc.) apically submembranous, in profile subangularly produced (often lobe-like) before decurved and rounded-off into vibrissal area; wing-setulae (fig. 37-39) extensive, cell *2m+1a* largely or entirely setulose. Simplex group 2

   Ocelli entirely absent, postvertex at most with single discal pit or median fovea near anterior end; frontal process fully sclerotized, never as above described; wing-setulae varied in extent, usually posterior 1/3 to 1/2 of cell *2m+1a* extensively bare........ 6

2 (1). Cell *2m+1a* and alula (fig. 37-38) entirely setulose, *2a* almost so, only with anal margin narrowly bare; laterite 3 never well pigmented and sclerotized; ocelli always all well developed; tergite 6 (fig. 42) not constricted at middle; aedeagus (fig. 41, 44) more bulged at base. Oriental 4

   Cell *2m+1a* (fig. 39) with bare stripe along basal 2/3 of vein 2A, alula entirely bare besides marginal cilia, cell *2a* almost entirely bare, with only small setulose patch at antero-apical corner; laterite 3 in matured specimens ventrally well pigmented and sclerotized; ocelli often partly or entirely vestigial, or absent and each represented by small pit; tergite 6 more or less constricted at middle; aedeagus (fig. 155) less bulged at base........ 3

3 (2). Setae on venter of laterite 3 similar in length and robustness to those on neighboring membranous area; tergite 6 weakly constricted at middle, its anterior margin not concavely curved. Neotropical Regiond .... **plaumanni**

   Setae on venter of laterite 3 markedly longer and more robust than those on neighboring membranous area; tergite 6 strongly constricted at middle, its anterior margin distinctly concave at middle. Africa. .... **zumpti**

4 (2). Vertical, notopleural and scutellar bristles normal, as dark as other major bristles and more than 2× as long as postvertex; palpus distinctly shorter than eye; wing not more than 6 mm long........ 5

   Vertical, notopleural and scutellar bristles clearly paler than other major bristles and shorter than postvertex; palpus longer than eye; wing 6.9-7.5 mm long. Queensland. .... **australica**

5 (4). Abdominal dorsum (fig. 43) with conspicuous patch of 15± very long robust setae on each side between tergite 3 and spiracle 3; setae on ♀ abdominal venter distinctly uneven in length and robustness; apical section of aedeagus (fig. 44) uniformly slender. Celebes, New Guinea .... **simplex**

   Abdominal dorsum (fig. 40) lacking such setal patches, at most in ♂ occasionally with 1-4 longer, more robust setae amid ordinary ones; setae on ♀ abdominal venter fairly even in length and robustness; apical section of aedeagus (fig. 41) gradually narrowed apicad. Burma to Taiwan and Philippines........ **maquilingensis**

6 (1). Tergite 3 either present or not, tergite 5 never present; posterior 1/3 to 1/2 of cell *2m+1a* bare; vibrissal area angular or broadly rounded, in latter case, either prescutum lacking laterocentral bristles (only ordinary setae) or palpus in profile less than 2× as long as wide 8

   Both tergites 3 and 5 present; cell *2m+1a* (fig. 30) virtually entirely setulose, very slightly bare at base or at posteroapical corner; vibrissal area always broadly round-

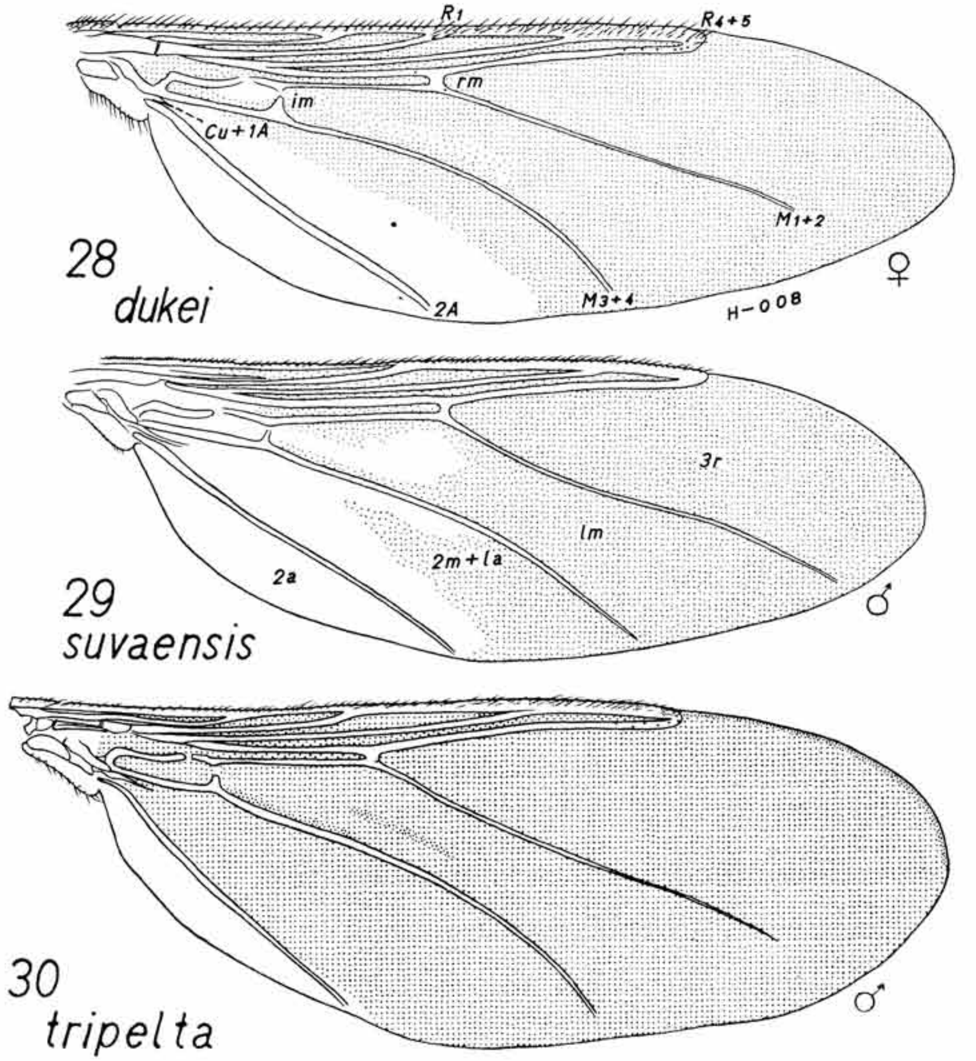


Fig. 28-30. *Icosta* (*Ornithoponus*), wings, magnifications varied.

ed anteroventrally; prescutum always with laterocentral bristles; palpus in profile ca 2.2× as long as wide. Hirusta group 7

7 (6). Tergite 5 much larger than 3, occasionally very narrowly interrupted at middle; laterocentral bristles as long and robust as scutellar bristles; postvertex anteriorly broadly truncate; cell *2m+1a* with very small bare area at base. Western N. America .... **hirsuta**

Tergite 5 much smaller than 3, widely interrupted at middle; laterocentral bristles much shorter, finer than scutellar bristles; postvertex anteriorly subangular; cell *2m+1a* (fig. 30) with very narrow bare stripe at posteroapical corner. Mozambique .... **tripelta**

8 (6). Cell *2bc* (fig. 46-48) only 1/3 as long as *1bc*, alula ventrally setose; prosternum (fig. 7, *minor*, etc.) 4-5× as broad as long and its anterior margin practically in line with that of mesosternum; tergite 3 always absent; orbital setae always uniseriate; prescutum always with distinct laterocentral bristles in addition to short ordinary setae; vibrissal area sharply angular and very slightly produced; color very pale, wing length less than 4.5 mm, cells *1m* and *2m+1a* extensively setulose as in fig. 46-48. Minor group 18

Cell *2bc* 1/2 to 2/5 as long as *1bc*, alula bare on both surfaces; prosternum not as above, either much narrower in proportion or projecting much before mesosternum; tergite 3 almost always present, and vibrissal area almost always broadly rounded, when occasionally lacking tergite 3 (in *nigra* only) and vibrissal area anteroventrally subangular (in *nigra* and *dukei*), then orbital setae multiseriate, color very dark and wing length more than 7.5 mm; prescutum lacking distinct laterocentral bristles, very rarely (in *nigra*) with part of its laterocentral setae distinctly longer but not more robust than remaining ones........................ 9

9 (8). Vertical and humeral bristles as dark as bristles on antennal apex; wing more or less fuscous, cell *3r* uniformly setulose, *1m* almost so, at most (in *suvaensis* only, fig. 29) bare at basal 1/3; prescutum without distinct laterocentral bristles, when occasionally (in *nigra* only) some of laterocentral setae reaching transverse mesonotal suture, then body very dark and wing more than 7.5 mm long. Americana group. 12

Vertical and humeral bristles distinctly paler than bristles on antennal apex; wing less than 5.5 mm long, practically clear hyaline, cell *3r* (fig. 55-57) with narrow bare stripe along basal 1/3 to 1/2 of hind margin, basal 1/2 of *1m* bare; prescutum with distinct laterocentral bristles. Parallelifrons group 10

10 (9). Setae on ♀ abdominal membranous area (fig. 61) almost entirely pale, short, fine and arising from unusually large basal papillae which at dorsolateral area each has a diameter *ca* 2/3 setal length; ♀ dorsal membrane with 2 (1+1) small patches of 4-5 black strong bristles lying shortly before tergite 6; anterior surface of femur 1 with 3-4 pale spines near its midlength which are clearly paler than black bristles on dorsal surface; ♂ unknown. Komodo I. .... **papulata**

Setae on ♀ abdominal membranous area largely black, fairly long and strong, their basal papillae normal in size, with diameter not more than 1/4 setal length; ♀ dorsal membrane either without such bristle-patches, or with such patches lying laterad to tergite 6; spines on anterior surface of femur 1 black, concolor with bristles on dorsal surface 11

11 (10). Dorsal abdominal membrane in ♀ (fig. 58) without very strong bristles laterad to tergite 6, in ♂ (fig. 59) at each side with conspicuous patch of 30-40 long dense bristles posterolaterad to tergite 3, these bristles all longer than longest bristles near abdominal apex; bristles on ♀ tergite 6 never distinctly longer (usually shorter) than tergite itself; ♀ urogenital area flanked at each side by conspicuous patch of numerous dense bristles. New Guinea, Australia .... **parallelifrons**

Dorsal abdominal membrane in ♀ with conspicuous group of 3-4 very strong bristles laterad to tergite 6 at each side, in ♂ (fig. 60) without above-described bristle-patch near tergite 3; bristles on ♀ tergite 6 *ca* 2× as long as tergite itself; ♀ urogenital area flanked by few sparse bristles which never form conspicuous patches. Australia. .... **paramonovi**

12 (9). Orbital setae largely uniseriate, plus a few irregularly arranged ones; vibrissal area broadly rounded off; cells *1r* and *1bc* of wing largely bare; prescutum with 10-20 (usually 11-12) laterocentral setae arranged in 1-2 series 14

Orbital setae clearly multiseriate; vibrissal area angular or subangular; cells *1r* and

1bc entirely setulose; prescutum with 40-50 laterocentral setae in 3-4 series............ 13

13 (12). Tergite 3 absent in both sexes; prosternum distinctly transverse, with only few soft setae; laterocentral setae of prescutum soft, pale, partly reaching transverse mesonotal suture. New World, Hawaii. .... **nigra**

Tergite 3 present in both sexes; prosternum almost as long as wide; laterocentral setae of prescutum stout, black, almost uniform in length, all far from reaching transverse mesonotal suture. Africa .... **dukei**

14 (12). Mediovertex distinctly longer than palpus and than facial width; width of frons proper at base markedly smaller than its shortest distance to eye-margin; inner margin of frontal process in dorsal view virtually straight; dorsal striolate area of ♂ abdomen in American species more or less extensively setulose.....................15

Mediovertex distinctly shorter (10 : 13) than palpus and than facial width; width of frons proper at base hardly smaller than its shortest distance to eye-margin; inner margin of frontal process in dorsal view curved in S-shape; ♂ dorsal striolate area almost bare; wing 5.8-7 mm long. Neotropical Region .... **latifacies**

15 (14). Cell *1m* of wing uniformly setulose, at most bare at extreme base, *2m+1a* bare at posterior 1/3 to 1/2. New World 16

Cell *1m* (fig. 29) bare at basal 1/4 to 1/3, *2m+1a* bare at basal as well as posterior 1/2; wing 6.5 mm long. Fiji Is. .... **suvaensis**

16 (15). Wing 7-8.5 mm long; abdominal syntergite 1+2 laterally with 4-6 heavy spines at each side, laterite 2 with 2-4 heavy spines; ♂ dorsal striolate area extensively setulose; ♀ urogenital area flanked by numerous long bristles................................. 17

Wing 5-6 mm long; syntergite 1+2 with 1-2 heavy spines at each side, laterite 2 without heavy spines; ♂ dorsal striolate area less extensively setulose; ♀ urogenital area flanked by few long bristles; face not, or hardly, wider than eye......... .... **angustifrons**

17 (16). Face not, or hardly, wider than eye, interdistance of bases of vertical bristles subequal to that of outer margins of antennal appendages and much less than eye-length; anterior mesosternal lobe distinctly produced, its bristle closer to anterior than to lateral margin (fig. 7); ♀ laterite 7 usually more than 2× as long as wide; aedeagus (fig. 157) weakly bulged at extreme base.............................. **rufiventris**

Face much wider than eye; interdistance of bases of vertical bristles much smaller than that of outer margins of antennal appendages and hardly smaller than eye-length; anterior mesosternal lobe hardly produced, its bristle equidistant to anterior and lateral margins (fig. 7); ♀ laterite 7 usually about as long as wide; aedeagus (fig. 159) not bulged at base .... **americana**

18 (8). Vertical and notopleural bristles pale and subequal in length to each other; laterocentral bristles and laterocentral setae of prescutum entirely pale 19

Vertical and notopleural bristles black, former much shorter than latter; laterocentral bristles of prescutum long and black, laterocentral setae short and pale, in strong contrast. Australia .... sp. **"W"**

19 (18). Metapleurotergal callus with only pale soft setae, no spines, at most occasionally with 1-2 black stiff setae at right or left side; setae on abdominal venter (fig. 49-50) near spiracle 3 hardly longer than width of their basal papillae 20

Metapleurotergal callus with 2-3 black spines and 3-4 black stiff setae; setae on abdominal venter (fig. 53) near spiracle 3 *ca* 2× as long as width of their basal papillae; outer margin of segment 1 of hind tarsus (fig. 144) with 0-5, usually 0-3 sensillae, that of segments 2-4 altogether with 0-3, usually 0-1 sensillae. Thailand, Taiwan, Malaya, Philippines.. **lonchurae**

20 (19). Lateral fence of ♀ urogenital area (fig. 50) composed of 10± robust setae which are much longer than width of infra-anal plate; setae around ♂ abdominal spi-

racle 3 distinctly more robust than those around spiracles 4 and 5 21

Lateral fence of ♀ urogenital area (fig. 49) composed of 5± robust setae which are hardly longer than width of infra-anal plate; setae around ♂ abdominal spiracles 3-5 almost uniformly fine; ♀ hind tarsus (fig. 145) lacking minor spines under segment 1 near outer (anterior) apical corner but usually with single sensilla on outer margin of each of segments 2-4. Africa, extending to Mediterranean Basin.. **minor**

21 (20). Female hind tarsus always lacking minor spines under segment 1 near outer apical corner and lacking sensilla under segments 2-4 on outer margin. India; (?) Afghanistan.. **sensilis reducta**

Female hind tarsus (fig. 146) usually with 1-2 more or less well developed minor spines under segment 1 near outer apical corner and with 1-2, occasionally 3 sensillae under each of segments 2-4 on their outer margin. Burma to Philippines... .... **sensilis sensilis**

Americana GROUP

Distribution. Nearly worldwide (not found in Palaearctic Region); 7 species: 5 in Neotropical Region (4 spreading to Nearctic), 1 in Ethiopian, and 2 in Australian. Most species are widely distributed.

Host Relationships. 3 species polyxenous, 1 pleioxenous, 1 oligoxenous, 2 remaining species with uncertain host relationships. Largely preferring or restricted to Falconi- and Strigiformes.

Diagnosis. Characterized by a combination of negative characters (see Table 2). Sexual dimorphism very weak, chiefly with details of abdominal chaetotaxy. Vibrissal area rounded, occasionally subangular; orbital setae uniseriate, occasionally multiseriate; palpus long or moderately long; laterocentral bristles absent, very rarely poorly developed; wing-setulae never very extensive, cell *2m+1a* never entirely setulose; abdominal membrane lacking patches of bristles, tergite 3 and ♀ laterite 7 almost always present.

Affinities. This group is related to Hirsuta and Simplex groups and to a lesser extent, to Minor group. Although placed at the beginning of the genus, the group has already undergone speciation in certain direction. Members of the group may be allotted into 3 subgroups:

(a) Medium to large size; vibrissal area rounded; no laterocentral bristles; orbital setae uniseriate; wing-setulae fairly extensive, cell *1m* entirely setulose, *2m+1a* with only posterior 1/3 to 1/2 bare. Neotropical and Nearctic Regions, chiefly on Falconiformes and less frequently on Strigiformes, too; 4 species (*americana, rufiventris, angustifrons, latifacies*).

(b) Large size; vibrissal area subangular; laterocentral setae sometimes partly much longer (but not more robust) than remaining ones; orbital setae multiseriate; wing-setulae as in subgroup (a). Nearctic, Neotropical, Ethiopian and Australian Regions, on Falconiformes; 2 species (*dukei, nigra*).

(c) Medium size; vibrissal area broadly rounded; no laterocentral bristles; orbital setae uniseriate; wing-setulae not so extensive as in subgroups (a) and (b), cell *2m + 1a* with very large bare area at basal as well as posterior 1/2, *1m* basally with fairly large bare area. Australian Region; 1 species (*suvaensis*).

Icosta (Ornithoponus) americana (Leach) Fig. 2, 6, 7, 159.

Feronia americana Lch., 1817a: 11, pl. 27, fig. 1–3. Type: ♀ (BMNH), ex (?) bird, Georgia, U.S.A.

Hippobosca bubonis Packard, 1869: 417, fig. 340, ♀. Type: ♀ (MCZ), ex *Bubo v. virginianus*, Massachusetts.

Olfersia americana: Ferris & Cole, 1922, Parasitology **14**: 194, fig. 11–12, ♀.

Lynchia americana: Ferr., 1927a: 248, fig. 2–3, ♀ (fig. 3 wrongly labeled *L. hirsuta*); 1930c: 67, fig. 5 A, D, F.—Beq., 1955: 272, fig. 14 F, 52–55, ♀♂.

MATERIAL. About 50 fresh specimens from Illinois, Ohio, California, Mexico, Colombia, Peru, Venezuela, Brazil and Argentina were examined. Among them, the following ones seem to represent new distributional and host records. PERU: 1♀ (CNHM), Lambayeque, Chongoyape, 240 m, ex *Tyto alba contempta*, III.1954, Kalinowski. 1♂, 2♀♀ (CNHM), Apurimac, Andahusylas, Hoamozobamba, 2300 m, ex *T. alba*, X.1953, Kalinowski. BRAZIL: 3♀♀ (CNHM), Nova Teutonia, Santa Catarina, ex *Asio flammeus*, I–II. 1957, Plaumann.

Habitats. Common in southern Nearctic Region, relatively less abundant in Neotropical Region (? due to insufficient collecting). No reliable published records for the W. Indies. So far known from Canada (Ontario, Quebec to 48°10'N), U.S.A. (all 49 continental States except Alaska, Arkansas, Idaho, Montana, New Mexico, Oklahoma, S. Dakota, Utah, Wyoming), Mexico, Honduras, Costa Rica, Panama, Peru, Colombia, Guiana, Venezuela, Brazil, Bolivia and Argentina (to 30°S). Polyxenous, probably breeding on Falconi-, Galli- and Strigiformes, with stray records from Ciconii-, Charadrii-, Columbi-, Pici- and Passeriformes. Bequaert's (1955: 292–93, 1957: 577) analysis of 519 verified records is summarized below. Ciconiiformes: Ardeidae (*Cosmerodius*) 1 record; Falconiformes: Accipitridae 145 (*Accipiter* 52, *Aquila* 4, *Buteo* 69, *Circus* 4, *Haliaeetus* 3, genera indet. 12); Falconidae 4 (*Caracara* 1, *Falco* 3); Pandionidae (*Pandion*) 1; Galliformes: Phasianidae 77 (*Bonasa* 57, *Colinus* 9, domestic *Gallus* 1, introduced *Phasianus* 10); Meleagridae (wild *Meleagris*) 5; Charadriiformes: Charadriidae (*Philohela*) 1; Laridae (*Sterna*) 1, Alcidae (*Uria*) 1; Columbiformes: Columbidae 2 (*Columba* 1, *Zenaidura* 1); Strigiformes: Strigidae 275 (*Aegolius* 1, *Asio* 9, *Bubo* 141, *Ciccaba* 1, *Glaucidium* 2, *Otus* 38, *Pulsatrix* 1, *Rhinotynx* 1, *Speotyto* 5, *Strix* 44, *Tyto* 13, genera indet. 19); Piciformes: Picidae (*Dryocopus*) 1; Passeriformes: Fringillidae (*Zonotrichia*) 1; Corvidae 5 (introduced *Calocitta* 1, *Corvus* 4). To the above list, the genera *Micrastur* (Falconidae) and *Pedioecetes* (Phasianidae) should be added as recorded hosts.

Highest density per infested bird was 61 flies ("plus several more escaping") ex a *Bubo virginianus* in New York and 15 flies ex a *Bonasa umbellus* in that same State, and infestation frequency of 147 young *Bonasa* birds was 22% (Beq. 1953a: 232). Host records published after Bequaert's (1955–57) paper were by Sheldon (1956, *Proc. Ent. Soc. Wash.* **58**: 13, *Philohela*), Davies (1958, *J. Parasit.* **44**: 239, *Bubo*, *Bonasa*), Bennett (1961, *Canad. J. Zool.* **39**: 379, hawks and owls) and Wilson (1964, *J. Med. Ent.* **1**: 129, *Buteo*, *Bonasa*, *Colinus*, *Otus*, *Bubo*, *Strix*, *Corvus*).

Systematics. This species, as accepted by Bequaert (1955) and in this paper, is very variable in certain features. The extremes of the variations seemingly represent 2 distinct species which were called "*fusca* Macq." and *americana*, respectively, by Bequaert (1933b, 1945b). The former form was said to be separable from the latter in having color darker, body size smaller (wing length 6.5–7 vs 7–8.5 mm), frons proper usually narrower, frontal processes less spreading, inner orbits subparallel or slightly diverging (not strongly so) toward postvertex, postvertex rather long and semi-elliptical (not short, nor transversely elongate), median ocellus rudimentary or represented by median pit on postvertex (*americana* was said to have no median ocellus and usually no median pit) and in occurring mainly in western N. America and south of the Mexican border (*americana* was said to be restricted to eastern Nearctic Region) and more specific on Strigidae. Unfortunately, I do not have enough adequate material from different countries, hosts and seasons to evaluate and analyze the differences mentioned, to see if they are linked with other structural details. In 1955, Bequaert is said to have examined over 1500 specimens of *americana*, but in 1962 and 1966 I could only find about 200 specimens in the Mus. Comp. Zool., Harvard. The problem is further complicated by the fact that the relative facial width, i.e., the chief criterion used by Bequaert (1955: 267) for the separation of *americana* and *rufiventris* is by no means constant. Although there seem to be no actual transitional specimens in this respect (Beq. 1955: 314), the characters enumerated in the key, couplet 17, will have to be revised later with ample material. The inner orbit in *rufiventris* is stated by Bequaert (1955: 313, as *wolcotti*) to be relatively narrow, usually 1/3 as wide as mediovertex, the palpus to be somewhat longer than in *americana*, being, slightly shorter than mediovertex, and the humeral callus to be more acute and more slender. These differences, as admitted by Bequaert, are difficult to appreciate. The palpus, head in profile, prosternum and ♂ genitalia are as in fig. 2, 6, 7 and 159, respectively.

Both Bequaert (1955) and I (1963) gave a long list of synonyms of *americana*. A fresh re-examination of the types in question revealed that all are referable elsewhere except *bubonis* Pack. plus the nomina nuda *falconis* Harris and *aquilae* Brodie & White. It should be added that in the latter article, the authorship of *Ornithomya fusca* was wrongly accredited to Guérin-Méneville rather than his co-author Percheron.

Icosta (Ornithoponus) rufiventris (Bigot) Fig. 4, 7, 10, 12, 157.

(?) *Ornithomya fusca* "Macquart" Perch., 1838: pl. 6. Type: lost, ex (?) bird, no locality.

Olfersia fusca Mcq., 1845: 346. Type: ♀ (BMNH), ex (?) bird, Nova Grenada. Name preoccupied by Perch. 1838.

Ornithomyia rufiventris Bigot, 1885: 243. Syntypes: (BMNH), ex (?) bird, Brazil.

Olfersia wolcotti Swenk, 1916: 132. Type: ♀ (Nebraska Univ., not seen by me), ex *Buteo p. platypterus*, Michigan.

Lynchia wolcotti: Beq., 1955: 311, fig. 59, 60A, ♂♀.

MATERIAL. About 20 fresh specimens from Costa Rica, Venezuela, Surinam and Brazil were examined. Among them, the following 1 provides a new record for Guiana. SURINAM: 1♀ (LDN), w. mallophagan on hindleg, nr Avanavera Falls, Kabaleco R., IX. 1965, Mees.

Habitats. With somewhat similar distributional and host ranges as in *americana* Lch. but much rarer in the Nearctic Region than the latter species, so far known from 18 localities in the U.S.A. (Michigan up to 46°20′N, Nebraska, New Hampshire), Mexico, Costa Rica, Panama, Guiana, Venezuela, Brazil down to 27°11′S, Bolivia and Argentina. Probably breeding on Falconi- and Strigiformes. Bequaert's (1955: 313, 1957: 577) analysis of 23 verified records may be summarized below. Falconiformes: Accipitridae 11 records (*Accipiter* 1, *Buteo* 4, *Hypomorphnus* 1, *Leucopternis* 1, *Urubitornis* 1, genus indet. 1); Falconidae (*Micrastur*) 3; Strigiformes: Strigidae 9 (*Asio* 2, *Ciccaba* 1, *Glaucidium* 2, *Otus* 1, *Rhinoptynx* 1, *Tyto* 1, genus indet. 1).

Systematics. Rufiventris stands intermediate between *americana* and *angustifrons* both in size and structure. It is so closely similar to *americana* that once under the name *wolcotti*, it was suppressed as a synonym (Beq. 1933b: 78). For their differences, see discussions under *americana*. The palpus, prosternum, fore tarsus, hind tibia and ♂ genitalia are as in fig. 4, 7, 10, 12 and 157 respectively.

The identity and generic status of *Ornithomya fusca* Perch. 1838 are quite uncertain. Percheron attributed the authorship of the name to Macquart. This meant fairly possibly that the specimen(s) involved might have been received from or identified by Macquart. Furthermore, Percheron clearly described and illustrated his species as having enfumed wings. Therefore, as far as I can guess, *fusca* Perch. is perhaps identical with *fusca* Mcq. or *nigra* Perty rather than, as suggested by Bequaert (1933b: 79), referable to *Ornithoctona*, a genus never having enfumed wings. Percheron's specific description reads "Long. 5 lignes. Tête fauve foncée, avec deux bandes brunes au bord interne des yeux; thorax et pattes en dessus d'un brun luisant; abdomen, pattes et thorax en dessous, fauve livide; abdomen d'un brun rougeâtre; ailes d'une teinte de fumée parfaitmente égale. J'ignore la partie de cet insecte, que je sais cependant exotique." His generic description is much longer (nearly 2 full pages) and it was admitted, "Les détails de ce genre ont été pris sur l'*O. aviculaire*." From such remarks and from the different wing shapes in the figures, it is quite obvious that only the 2 unnumbered ones of his figures (in the upper part of that plate) were based upon his *fusca*, the remaining ones, all numbered and all referred to in the generic description, were based upon what Percheron then called *Ornithomya aviculaire*. Bequaert (*l. c.*) concluded that *fusca* Perch. has "evidently nothing in common with" *fusca* Mcq. on the ground that the former is very large in size and that the ocelli were stated by Percheron to be present. As observable in Percheron's uppermost figure showing the natural size of the insect, the length was apparently measured from the tip of head to tip of wing, not of abdomen. Secondly, the statement about the presence of ocelli was included in the generic, not specific, description and is thus not necessarily referable to *fusca* Perch. From Percheron's unnumbered figures and other evidence explained above, *fusca* Perch. 1838 seems most likely to belong to *Icosta*. Although its synonymy with *fusca* Mcq. 1845 is uncertain, it appears best to invalidate the latter name as a junior homonym and to resurrect *rufiventris* Bigot as the name for this species.

Icosta (Ornithoponus) angustifrons (van der Wulp) Fig. 2, 7, 10, 11, 160.

Olfersia angustifrons Wulp, 1903: 430, pl. 13, fig. 3, ♂♀. Type: ♂ (BMNH), ex (?) bird, Costa Rica.

Lynchia angustifrons: Ferr., 1930c: 68, fig. 5E, G.—Beq., 1955: 305, fig. 57-58, ♀.

MATERIAL. Among 10± fresh specimens examined, the following ones deserve listing. SURINAM: 1♀ (CNHM), Wilhelmina Mts, West R., 700 m, ex *Hypomorphnus u. urubitinga*, XI.1961, Beatty. 1♀ (CNHM), Paramarito, Paloemeu Airstrip, Tapanohoni R., ex *Harpa-*

gus b. bidentatus, VI.1961, Beatty.

Habitats. All over continental Neotropical Region, often a summer visitor to the Nearctic Region, so far known from Canada (Ontario 43° 12′ N), eastern U.S.A. (Illinois, Indiana, Maryland, Massachusetts, Michigan, Minnesota to 46° N, Missouri, New Hampshire, Pennsylvania, Texas, Virginia, Wisconsin), Mexico, Honduras, Guatemala, Nicaragua, Costa Rica, Panama, Guiana, Colombia, Venezuela, Brazil to 27° S, Paraguay. The lack of records from the western U.S.A. and western South America is noteworthy. Probably breeding on Falconiformes, with stray records from Charadrii-, Psittaci-, Strigi-, Trogoni-, Coracii-, Pici- and Passeriformes; Bequaert's (1955: 308–09, 1957: 577) analysis of 55 verified records is summarized below. Falconiformes: Accipitridae 25 records (*Accipiter* 7, *Busarellus* 1, *Buteo* 4, *Circus* 1, *Elanus* 1, *Hypomorphnus* 4, *Ictinia* 2, *Leucopternis* 1, *Odontriorchis* 1, genera indet. 3); Falconidae 9 (*Falco* 1, *Herpetotheres* 1, *Micrastur* 5, *Milvago* 2); Cathartidae (*Cathartes*) 1; Charadriiformes: Charadriidae (*Capella*) 1; Psittaciformes: Psittacidae (*Amazona*) 1; Strigiformes: Strigidae 7 (*Ciccaba* 2, *Glaucidium* 3, *Strix* 1, genus indet. 1); Trogoniformes: Trogonidae (*Trogon*) 1; Coraciiformes: Momotidae (*Momotus*) 1; Piciformes: Ramphastidae 6 (*Pteroglossus* 1, *Ramphastos* 5); Passeriformes: Cotingidae (*Pyroderus*) 1; Muscicapidae (*Hylocichla*) 1; Corvidae (*Cyanocorax*) 2. To the above list, the genera *Baryphthengus* (Momotidae), *Veniliornis* (Picidae) and *Pitylus* (Fringillidae) should be added as recorded hosts.

Systematics. As evidenced by the shape of the palpus and relative density of the setae on the dorsal striolate area of the abdomen, *angustifrons* obviously stands intermediate between *americana* and *rufiventris* on one side and *latifacies* on another. From the last species, which is known to me only from dry specimens and original description and which is about the same in body size, it differs in having markedly shorter palpus, narrower face, more generalized shape of frontal process and less developed ♀ laterite 7. From *americana* and *rufiventris*, the differences are smaller size, relatively longer and narrower palpus and aedeagus, more acute humeral callus, fewer setae on prescutum and abdominal striolate area, fewer spines on syntergite 1+2, and fewer long bristles on tergite 6 and on lateral sides of ♀ urogenital area. The ♀ laterite 7 was stated and illustrated by Bequaert (1955: 309, fig. 57A) to be absent. This is not quite true since, at least in specimens at hand, it is "raised, bristly and knob-like" (but not "soft") and is about same in size and shape as that found in *rufiventris*. The unusually narrow face, as suggested by the name *angustifrons*, makes it superficially very similar to *rufiventris*. Meanwhile, this character appears to be more constant than in the latter species. The palpus, prosternum, fore tarsus, hind tibia and ♂ genitalia are as in fig. 2, 7, 10, 11 and 160, respectively.

Icosta (Ornithoponus) latifacies (Bequaert)

Lynchia latifacies Beq. 1955: 302, fig. 56, ♀♂. Type: ♂ (MCZ), ex (?) bird, Brazil.

MATERIAL. No fresh material available.

Habitats. Probably widely spread over Neotropical Region; so far known only from Colombia, Brazil and Paraguay. The only recorded host is Cuculiformes: Cuculidae (*Piaya cayana*).

Systematics. Very rare in collections. The only published illustrations were by Bequaert (*l. c.*, fig. 56A-E). Readily recognizable from *americana*, *rufiventris* and *angustifrons* by using the key, couplet 14, and apparently more specialized than those 3 species, among which it is comparatively closer to *angustifrons* (*q. v.*). The shape of frontal process in dorsal view in *latifacies*, *recessa*, *jactatrix* and *elbeli* apparently provide an example of convergent evolution among hippoboscid flies parasitic on Cuculidae.

Icosta (Ornithoponus) dukei (Austen) Fig. 3, 7, 13, 28, 31, 32.

Olfersia dukei Aust., 1911: 171, ♀. Type: ♀ (BMNH), ex *Haliaeetus v. vocifer*, Uganda. *Lynchia dukei*: Beq. 1933b: 80; 1945b: 102.—Maa 1964: 89, fig. 1.—Theod. & Oldr. 1964: 49, fig. 78, ♂♀.

MATERIAL. 6 ♂♂, 8 ♀♀.

CAMEROONS: 1♂ (MCZ), Yaoundé, ex *Circaetus cinereus*, XI. 1952, Monez; 1♀ (SAIMR), Yaoundé, ex *Lophaetus occipitalis*, II.1958. 1♀ (MCZ), Batanga, ex *Urotriorchis macrurus* #1457, Reis.

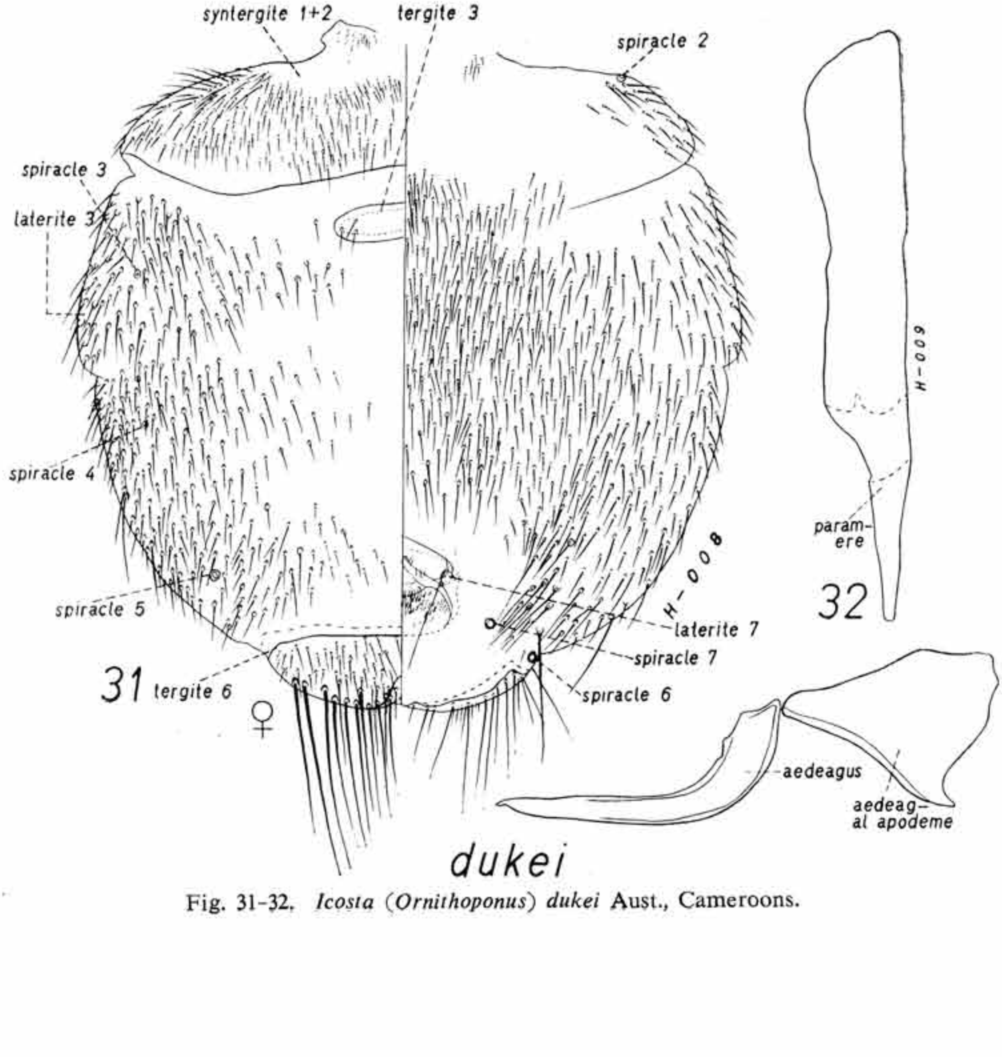


Fig. 31-32. *Icosta* (*Ornithoponus*) *dukei* Aust., Cameroons.

SENEGAL: 1♀ (MCZ), Tonkoui C. I., Ifan, 900–1200 m, ex *Tauraco persa*, IX. 1946, Villiers.

CONGO: 1♀ (MAC), Katanga, Pweto, ex Epervier [sparrow-hawk], VII.1946, Vincke. 3♀♀ (MAC), Mamema, Kasango, Lualaba, ex *Gymnogenys typicus*, VII.1959, Benoit. 2♀♀ (MAC), Uele Bambesa, ex *G. typicus*, XII.1938, Vrijdagh. 1♀ (MAC), Tshuapa, Imbonga, ex *Milvus aegyptius tenebriosus*, XII.1952.

RUANDA: 1♀ (MCZ), Kigali, ex *M. migrans parasiticus*, IV.1953, Fain. 1♂ (MCZ), Astrida, ex *Buteo rufofuscus augur*, II.1953, Fain; 1♀, 1 puparium (MCZ), *id.*, ex *Gymnogenys typicus*.

NYASALAND: 1♂ (MCZ), Lake Nyasa, Mtimbuka, ex *Haliaeetus vocifer*, II. 1949, Loveridge.

UGANDA: 1♀ (MCZ), Jinja, ex *H. vocifer*. 1♂, 1♀ (MCZ), Kazinga Channel, ex *H. vocifer*, coll. Hopkins. 1♂ (BMNH), Entebbe, ex *H. vocifer*, VII.1911.

Habitats. W. and E. African Subregions, at present known from Senegal, Ivory Coast, Cameroons, Congo, São Tomé I., Angola, Ethiopia, Nyasaland, Ruanda, Uganda, Tanganyika and Kenya. Obviously breeding on Falconiformes: Accipitridae (*Aquila, Buteo, Circaetus, Gymnogenys, Gypophierax, Haliaeetus, Hieraaetus, Lophaetus, Milvus, Terathopius, Urotriorchis*). The odd record ex Cuculiformes: Musophagidae (*Tauraco*) was most probably a stray. Highest density per infested bird was 2 ♂♂, 8 ♀♀ ex a *Haliaeetus vocifer* Daudin (Beq. 1953a: 232), which is probably the most preferred host.

Systematics. In the original description, *dukei* was stated to be different from *intertropica* (=*nigra*) in having more elongate palpus, more setose inner orbit and more transversely elongate postvertex. These differences were considered unreliable by Bequaert (1933b: 70, 80; 1945b: 89, 102; 1955: 323) and *dukei* was thus sunk as a synonym of *nigra*. The former was later revived as a distinct species by the same author (1957: 578) on discovering the absence of its tergite 3 in both sexes. In fact, these 2 species, being similar in color pattern, body size and host relationships, can also be distinguished by the shape of prosternum (fig. 7), the nature of laterocentral setae (stout and black in *dukei*, soft and pale in *nigra*) and details of abdominal chaetotaxy (fig. 31) and ♂ genitalia (compare fig. 32 & 158). The palpus, head and wing are as in fig. 3, 13 and 28, respectively

Icosta (Ornithoponus) nigra (Perty) Fig. 4, 6, 158.

Hippobosca nigra Perty, 1833: 190, pl. 37, fig. 15. Type: ♀ (München Mus.), ex (?) bird, Brazil.

Olfersia fuscipennis Macq., 1835: 640. Type: lost, ex (?) bird, Brazil.

(?) *Ornithomya fusca* "Macquart" Perch., 1838: pl. 6. Type: lost, ex (?) bird, no locality.

Olfersia mexicana Mcq., 1843: 435. Type: ♀ (Paris Mus.), ex (?) bird, Mexico.

Ornithomyia intertropica Wk., 1849: 1144. Type: ♀ (BMNH), ex (?) bird, Galapagos.

Olfersia macquartii Rndn., 1878: 160. Type: ♂ (Firenze Mus.), ex (?) bird, Nova Grenada.

Olf. pallidilabris Rndn., 1878: 161. Type: presumably lost, ex (?) bird, Mexico.

Olf. obliquinervis Rndn., 1878: 162. Type: presumably lost, ex (?) bird, Mexico.

Ornithomyia villadae Dugès, 1887: 20, pl. 3, fig. 3. Type: lost, ex *Buteo jamaicensis calurus* and *B. swainsoni*, Mexico.

Olfersia acarta Speis., 1902b: 149; republished as n. sp. in 1902c: 87. Type: destroyed; neotype ♀ (BISHOP), ex *Asio flammeus sandwichensis*, Hawaii.

Olf. raptatorum Lutz, 1915: 181, pl. 28, fig. 3. Type series (no lectotype ever selected) (Inst. Osw. Cruz Rio de Janeiro), ex *Caracara plancus brasiliensis*, *Milvago ch. chimachima*, *Leucopternis polionota*, *Cathartes aura ruficollis*, Brazil.

Lynchia intertropica: Ferr., 1930: 69, fig. 5 B, C, H.

L. nigra: Beq., 1955: 314, fig. 60 B–G, 61, 62, ♀♂.

MATERIAL. 40± fresh specimens from Arizona, Mexico, Brazil, Galapagos. Details of their collection data are not given here since they contain no new distributional and host records.

Habitats. Widely spread in Neotropical Region, sporadically occurring (seasonally?) in Nearctic Region, at present known from Canada (Alberta to 51° N, Brit. Columbia, Quebec), U.S.A. (Arizona, Colorado, Idaho, Kansas, Minnesota, Montana, New Mexico, New York, Texas, Utah, Washington, Wisconsin, Wyoming), Mexico, Honduras, Panama, Venezuela, Guiana, Brazil, Bolivia, Argentina to 28° S, and Galapagos. Its absence in the W. Indies is noteworthy. The species is also found in the Hawaiian Is. and generally believed to have been introduced rather recently. The 1♂, 1♀ (KBH), Oahu, ex "hawaiske Ugle" and 1♂ (KBH), Hawaii I., 1845–47, Voyage Galatea probably represent the earliest catches in those Islands. The record of its occurrence at Cooktown, Queensland (Bau, 1929b, Zool. Anz. **85**: 10, as *intertropica*) is obviously unreliable. Apparently breeding on Falconiformes. Analysis of 66 verified New World records (Beq. 1955: 320–21) is Falconiformes: Accipitridae 43 records (*Accipiter* 1, *Aquila* 1, *Buteo* 22, *Buteogallus* 2, *Circus* 1, *Gampsonyx* 1, *Geranospiza* 1, *Heterospizias* 1, *Ictinia* 1, *Leucopternis* 1, genera indet. 11); Falconidae 17 (*Caracara* 2, *Daptrius* 1, *Falco* 8, *Herpetotheres* 5, *Milvago* 1); Cathartidae (*Cathartes*) 3; Cuculiformes: Cuculidae (*Piaya*) 1; Strigiformes: Strigidae 2 (*Bubo* 1, genus indet. 1). The complete list of recorded hosts also includes Strigidae (*Rhinotynx*).

Systematics. As pointed out under *rufiventris*, because of the body size and wing color, *fusca* Perch. might be referable here. Incidently, *macquartii* Rndn., being actually referable here, was also considered by Macquart to be his *fusca*. This coincidence further strengthens the possibility of the synonymy of *fusca* Perch. with *nigra*.

Ornithomyia villadae was suggested by Bequaert at first (1933b, 1945b) to be possibly synonymous with *americana* and later (1955), to be with *nigra*. From its original description and known hippoboscid-fauna of its hosts, there is little doubt that *villadae* and *nigra* are synonymous. Evidence supporting this probability is: The body was said to be shining blackish brown, wings smoky, length to tip of folded wings 13 mm, ocelli absent; the face was drawn as wider than eye, palpus much longer than frons; and the only known hippoboscids of the type hosts *Buteo jamaicensis calurus* and *B. swainsoni* are *Ornithoica vicina* and *Icosta nigra*.

Among the American species, *nigra* occupies an isolated position in having size large, vibrissal area subangular, inner orbit and thoracic dorsum more richly setose, palpus longer, and ♀ laterite 7 well developed. Its closest relative is the African species *dukei* (*q.v.*) which was once suppressed as a synonym of *nigra*. The palpus, head in profile and ♂ genitalia are as in fig. 4, 6 and 158, respectively.

In Bequaert's (1955: 317, fig. 60 D) drawing of a ♀ from Honduras, the laterocentral setae of prescutum were shown as uniformly short and all far from reaching transverse mesonotal suture. It is impossible to check whether it represents individual variation or something else. But all Hawaiian and Brazilian specimens at hand have some of those laterocentral setae clearly reaching the suture.

Icosta (Ornithoponus) suvaensis (Bequaert) Fig. 29, 33, 152–154.

Lynchia suvaensis Beq., 1941b: 283, fig. 5, ♂. Type: ♂ (BMNH), ex (?) bird, Fiji.—Maa 1962: 599, fig. 2, ♀.

MATERIAL. FIJI: 1♂ (USNM), Vunisea, ex hawk, Mann. 1♂ (BMNH), Suva, ex feathers of a parrot, XII.1908, Knowles.

Habitats. Fiji Is., lowland; host relationships not clear.

Systematics. In the original description, Bequaert compared *suvaensis* with all "*Lynchia*"

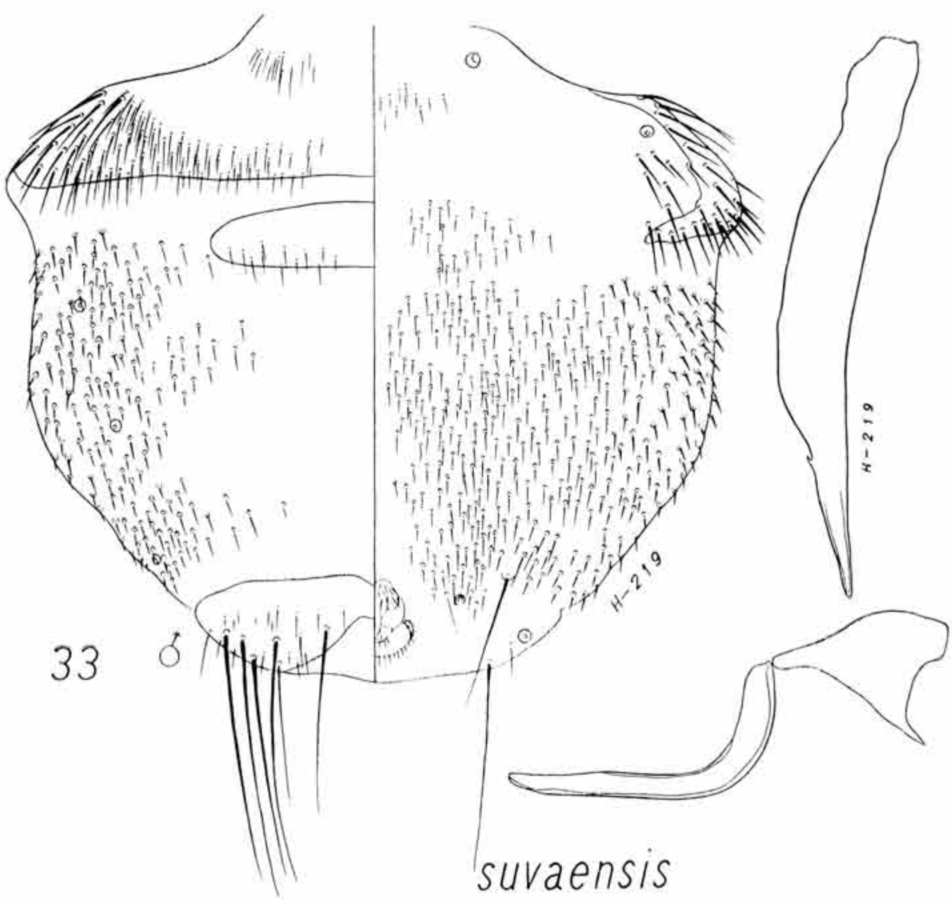


Fig. 33. *Icosta (Ornithoponus) suvaensis* Beq., ♂ abdomen and genitalia.

species then known from the Orient. Since none of the latter belongs to the Americana group, its affinities with any of those are either remote or superficial. Apparently *suvaensis* serves as a link, both in structure and in distribution, between the hawk-infesting species (*americana, rufiventris, angustifrons*) of the Americas and the parrot-infesting species (*parallelifrons, paramonovi*) of Australia-New Guinea. Incidently, the only host records of this species are a hawk and a parrot. The abdominal chaetotaxy and ♂ genitalia of this species are illustrated here for the first time.

♂. *Color* dark, wing fuscous. *Head*: Occipital margin straight except near both ends; vertical bristle 2/3 as long as notopleural bristle; postvertex short. Face narrow, nearly parallel-sided. Frons proper long, shallowly broadly notched at middle; frontal process in dorsal view broad at base and gradually narrowed apicad, in profile anteriorly reaching same level as vibrissal area. Palpus about as long as smallest width of face. Vibrissal area broadly rounded. Gula posteriorly spinose. *Thorax*: Mesonotum 50×72; prescutum rather densely and strongly striate all over; scutellum 15×38, posterolaterally rounded, posteriorly distinctly convex. Metapleurotergal callus with 5-6 stout spines. Prosternum well sclerotized, transversely lanceolate, with pair of soft setae; anterior margin of mesosternum deeply, roundly notched. Wing (fig. 29) 6.3-6.5 mm long; setulae rather extensive, leaving cells *2bc* and *2a* entirely bare, *1m* basally with large, irregularly shaped bare area, *2m+1a* largely bare, antero-apically setulose. Basitarsi 1 and 2 as in fig. 152 and 153, respectively. Tarsal spines 1.1.1.0/2.1.1.0/4.2.2.1; tarsomere 1 (fig. 154) of hindleg 28×11, longer than 2+3+4 and than 5, ventrally with 3 spine-like setae near basal spine; tarsomere 2 of same leg as long as wide. *Abdomen* (fig. 33) medially finely setose, laterally robustly so; dorsal striolate area almost entirely bare. Syntergite 1+2 laterally strongly spined; laterite 2 with similar spines; tergite 3 large, wide; laterite 3 undefinable; tergite 6 posteriorly deeply broadly notched, with 8 pairs of bristles; urogenital area fenced by setae slightly longer than elsewhere, and laterally flanked by a long strong bristle lying anterolaterad to spiracle 7. Aedeagus fairly long, slender and apically straight; paramere apically straight and narrowly rounded. Postgenital plate apically subtruncate, with few setae, not bilobed.

♀. Similar. Wing 7 mm long. Laterite 3 moderately sclerotized, laterite 7 not definable. Urogenital area fenced by strong setae. Postgenital plate with few setae near midlength.

Hirsuta Group

Distribution. 2 species: 1 each in Nearctic (California) and Ethiopian (S. African) Regions.

Host Relationships. Unknown in 1 species, oligoxenous on Galliformes (Phasianidae) in another.

Diagnosis. Both tergites 3 and 5 present. Sexual dimorphism fairly weak except in chaetotaxy on tarsus 2 and abdominal venter.

Affinities. Intermediate between Americana and Simplex groups, slightly closer to the former than to latter (Table 2); differing from both, in addition to the presence of tergite 5, by the strongly developed laterocentral bristles on prescutum. The tergite 5 simulates that in *Pseudolynchia* but otherwise the Hirsuta group has no close affinities with that genus. The 2 species included are not quite closely related, and perhaps they should be assigned to 2 independent species-groups. They differ from each other in the nature of tergite 5, shape of postvertex, tergite 3 and cell *2bc* and other characters (see under *tripelta*).

Icosta (Ornithoponus) hirsuta (Ferris) Fig. 3, 7, 10, 11, 34-36, 149.

Lynchia hirsuta Ferr., 1927a: 249, fig. 1, 4, ♀♂. Type: ♀ (UCB), ex *Lophortyx c. californica*, California.—Beq., 1955: 349, fig. 51, 66, ♀♂.

MATERIAL. 80± specimens, including type series, specimens recorded by Bequaert (*l. c.*) and those kindly supplied by Dr I. B. Tarshis and Chicago Nat. Hist. Mus.

Habitats. Confined to Californian Subregion (California, Idaho, Nevada, Utah). The northernmost published record is 43°30′ N in Idaho and the southernmost, *ca* 33°N in California. Oligoxenous on Galliformes: Phasianidae (*Centrocercus, Dendrapagus, Lophortyx, Oreortyx*); also stray records from Passeriformes: Muscicapidae (*Toxostoma*), Fringillidae (*Junco, Pipilo*) and Corvidae (*Cyanocitta*). Bequaert (*l. c.*) listed 95 and 10 verified records for those 2 bird orders, respectively. The species is known to transmit *Haemoproteus lophortyx* O'Roke and to harbor *Myialges* (*Promyialges*) *lophortyx* Furman & Tarshis and *M.* (*M.*) *anchora* Trouessart.

Systematics. Ferris' fig. 1 in the original description was mislabeled *americana* Lch. but this was corrected later (1929: 285). The puparium was described by O'Roke (1929)

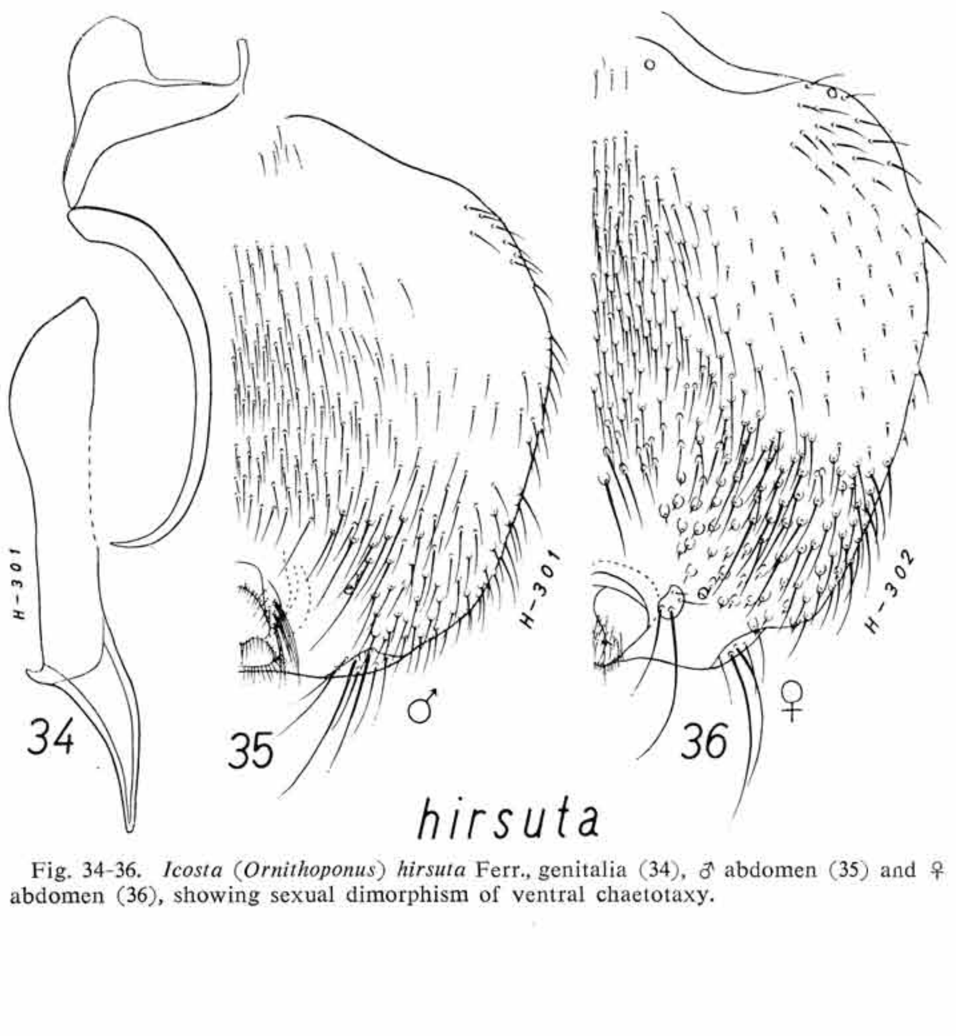


Fig. 34-36. *Icosta (Ornithoponus) hirsuta* Ferr., genitalia (34), ♂ abdomen (35) and ♀ abdomen (36), showing sexual dimorphism of ventral chaetotaxy.

and Bequaert (*l. c.*); the palpus, presternum, fore tarsus, hind tibia, ♂ abdomen and genitalia and basitarsus 3 (fig. 3, 7, 10, 11, 34, 35 and 149, respectively) are here illustrated for the first time. The tarsal spine formula is 2.1.1.0/2.1.1.0/7(3+3+1).2.1.1 in ♂ (no peg-like spines on tarsus 2), and 2.1.1.0/2.1.1.0/8(4+3+1).1.1.1 in ♀; the aedeagus very slender and strongly recurved evenly. Tergite 3 is generally paler and less sclerotized than tergite 5. In 1♀ examined, it is narrowly interrupted at middle; and in 1♂, the tergite 5 is medially interrupted. The ventral setae near ♀ abdominal apex (fig. 36) are much stronger than in ♂.

Icosta (Ornithoponus) tripelta (Maa) Fig. 5, 7, 30, 150, 151.

Lynchia tripelta Maa, 1964: 93, fig. 11–15, ♂. Type: ♂, (Bishop), ex (?) bird, Mozambique.

Material. No fresh material available.

Habitats. S. African Subregion (Mozambique). No host record.

Systematics. This species is known from the unique ♂ type, and differs from *hirsuta* in the following characters (besides those mentioned in the key): color darker; palpus (fig. 5) shorter; cell *2bc* (fig. 30) shorter (abscissa 1 of vein M_{1+2} much shorter than 2); ♂ tarsus 1 with 2.1.1.0 spines, tarsus 2 (fig. 151) with peg-like spines in addition to ordinary ones, tarsus 3 (fig. 150) longer and with more spines; abdominal setae particularly those on lateral and ventral areas longer; tergite 3 larger and poorly setose, dorsal striolate area more extensively setose, tergite 6 with fewer bristles; parameres very slender, nearly straight; aedeagus broader, curved at a point of basal 1/4 and at extreme apex. Quite obviously *tripelta* is much more specialized than *hirsuta*. The prosternum is as in fig. 7.

Simplex Group

Distribution. Pantropical; 5 species: 3 in the Oriental, and 1 each in Ethiopian and Neotropical Regions.

Host Relationships. The Oriental species are oligo- or polyxenous on ground birds (Phasianidae, Megapodiidae, Columbidae); the Ethiopian one polyxenous on Accipitridae and Musophagidae; the Neotropical one probably also on ground birds.

Diagnosis. Ocelli either well developed, vestigial or each represented by small pit on postvertex. Postvertex well separated from inner orbit. Frontal process submembranous apically, in profile subangularly (often lobe-like) produced forward before being decurved and rounded-off into vibrissal area. Wing-setulae extensive or very extensive. Vertical, notopleural and scutellar bristles occasionally discolored and shortened. Aedeagus in profile more or less broad at basal, slender and straight at apical section. Sexual dimorphism very weak.

Affinities. Nearest to Minor group, with some affinities to Plana, Hirsuta and Albipennis groups. With the Minor group, it shares the pale color pattern (except in *zumpti*), broad face, short postvertex, simplified chaetotaxy, extensive wing-setulae, absence of ♀ pregenital plate and laterite 7, short aedeagus and weak sexual dimorphism. In the general shape of head and of frontal process, it is somewhat similar to the Plana as well as Hirsuta group; and in the extent of wing-setulae, it is rather near the Albipennis group.

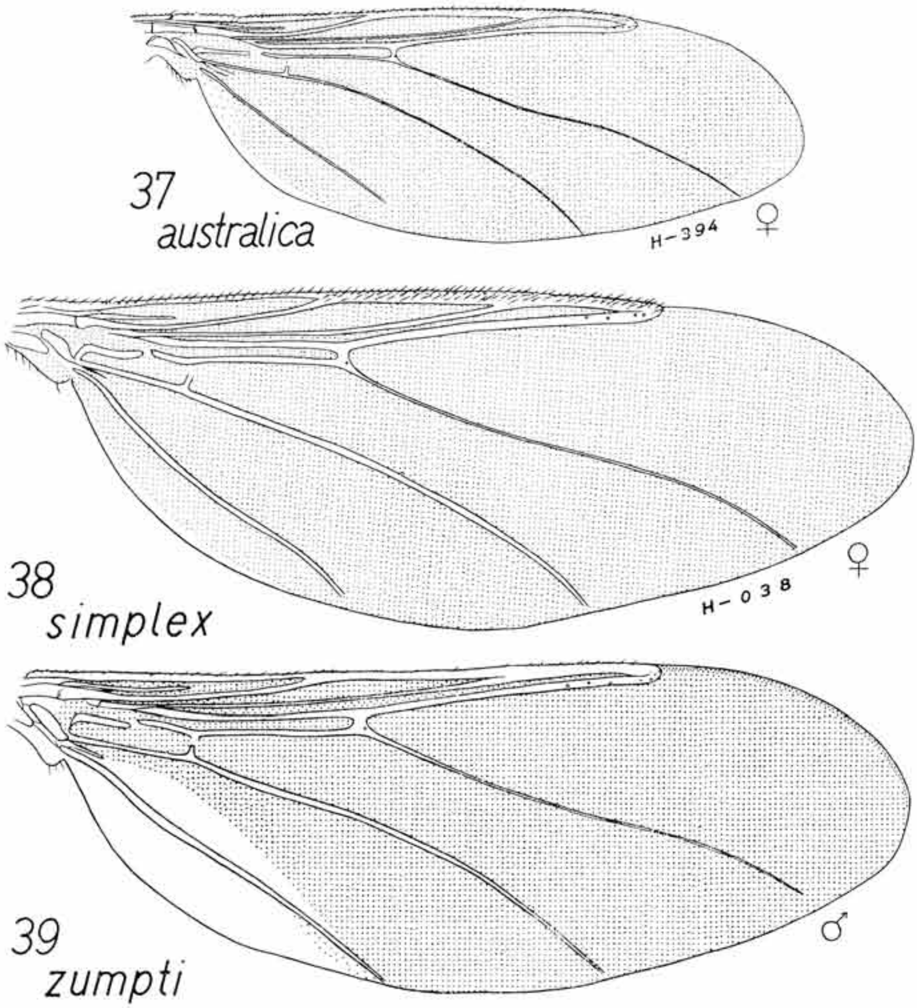


Fig. 37-39. *Icosta (Ornithoponus)* species, Simplex group, wings, magnifications varied.

Within the Simplex group itself, the 5 species can easily be allotted to 2 subgroups which differ from each other not only in structure (see couplet 2 of the key) but also in geographical distribution and host relationships. Among the Oriental species which form together the 2nd subgroup, *maquilingensis* represents the smallest and least specialized and occurs in the NW corner of their overall range, whereas *australica*, the largest and most specialized, is in the SE corner. The discoloring and shortening of certain major bristles in the latter species bring it still closer to the Minor group.

Icosta (Ornithoponus) plaumanni (Bequaert) Fig. 4, 6, 7, 10, 12, 155.

Lynchia plaumanni Beq., 1943c: 132, ♀♂. Type: ♂ (MCZ), ex *Odontophorus c. capueira*, Brazil.—Beq. 1955: 359, fig. 70 A–H, ♀♂.

MATERIAL. No fresh material available.

Habitats. Neotropical Region, at present known from Mexico, Guiana, Brazil and Bolivia. Host preference not clear, possibly breeding on Galliformes and other ground birds. Available records are Tinamiformes: Tinamidae (*Crypturellus*), Galliformes: Cracidae (*Crax, Ortalis*), Phasianidae (*Odontophorus*) and Passeriformes: Formicariidae (*Chamaeza*).

Systematics. Since first published, this species was redescribed by Bequaert (1955) and was placed on the top of the American forms of the genus. As mentioned, it is most closely allied to *zumpti* and differs from the latter in having triangular (not subtruncate) postvertex, slightly shorter palpus, denser and stronger abdominal setae, evenly broad (transversely) tergite 6 and much more slender aedeagus. The tarsal spine formula in ♂ is 2.1.1.0/2.1.0.0/3(2+1).1.1.1. The accompanying figures of palpus, head in profile, prosternum, fore tarsus, hind tibia and ♂ genitalia are based upon a paratype.

Icosta (Ornithoponus) zumpti (Maa) Fig. 5–7, 10, 39.

Lynchia zumpti Maa, 1964: 91, fig. 6–10, ♀♂. Type: ♀ (BISHOP), ex *Accipiter tachiro*, S. Africa.

MATERIAL. 18 ♂♂, 23 ♀♀. CAMEROONS: 1♀ (MCZ), Batanga, ex *Corythaeola cristata*, coll. Good.

CONGO: 1♂ (MCZ), Tshibati, Kivu, ex *Accipiter rufiventris*, X.1954, Chapin.

ETHIOPIA: 1♂, 1♀ (BMNH), Maraco, X.1916, Kovacs. 1♂ (BMNH), "Ethiopia 1958".

KENYA: 1♂ (MCZ), Kapretwa nr Kitale, ex *Musophaga rossae*, III.1938, Hopkins. 1♂ (BMNH), "Brit. E. Afr.", ex *Apus aequatoralis*. 1♂, 1♀ (BMNH), Nairobi, ex owl, VIII.1918, Pomeroy; 1♂ (BMNH), *id., Tauraco*. 1♂ (BMNH), Nairobi, IV.1932, van Someren. 1♂ (BMNH), Kapenguria, X.1954. 1♀ (BMNH), N'Gong, ex *Tauraco agur*, IX. 1934, van Someren.

UGANDA (all in MCZ): 2 ♂♂, 6 ♀♀, in 2 lots, Masaka Distr., ex *Musophaga rossae*, XII.1937 & II.1938, Hopkins. 2♂♂, 2♀♀, Mile 10, Kampala-Entebbe Rd, ex *Corythaeola cristata*, VIII.1937, Hopkins. 1♂, 3♀♀, Kampala, ex *C. cristata*, VIII.1937, Hopkins; 1♂, 2 ♀♀, *id., M. rossae*. 1♂, 3 ♀♀, in 2 lots, nr Kampala, ex *C. cristata*, VIII.1937, Hopkins. 1♀ w. mites on abd., Budongo Forest, ex *Guttera edouardi setsmithi*.

NYASALAND: 1♀ (MCZ), Cholo, ex hawk ≠390, IV.1928, det. Beq. as *testacea* Mcq. 1♀ (BMNH), Zomba, ex *Falco*, X.1962, Sweeney; 1♂ (BMNH), Zomba, ex owl, II.1910, Stannus.

S. AFRICA: 1♀ (BMNH), "Natal", coll. Gueinzins. 1♂ (SAIMR), Mt Cercer, ex *Lophaetus occipitalis*, III.1939.

Habitats. Widespread over Ethiopian Region excl. Madagascar, so far known from Cameroons, Congo, Ethiopia, Kenya, Uganda, Nyasaland, Natal and Cape Prov. Probably breeding on Falconi- and Cuculiformes; with stray records from Galli-, Strigi- and Apodiformes. Analysis of available data follows. Falconiformes: Accipitridae 5 records (***Accipiter*** **2**, ***Lophaetus*** 1, ***Pernis*** 1, genus indet. 1); Falconidae (***Falco***) 1; Cuculiformes: Musophagidae 11 (***Corythaeola*** **5**, ***Musophaga*** 4, ***Tauraco*** 2); Galliformes: Phasianidae

(*Guttera*) 1; Strigiformes: Strigidae (genus indet.) 2; Apodiformes: Apodidae (*Apus*) 1.

Systematics. Zumpti is the only Ethiopian representative of the group. Its affinity to the Neotropical form *plaumanni* is significantly stronger than to the Oriental ones. The median ocellus is always larger and more prominent than lateral ones. In 1♀ from Kampala ex *Corythaeola*, the right lateral ocellus is entirely undefinable, and in 2♀♀ from Masaka ex *Musophaga* both lateral ocelli are absent. The cell *2m+1a* is usually entirely setulose in both sexes (fig. 9 in original description represents the wing of a rubbed specimen). The apical corner of cell *2a* always has some setulae. The most distinctive character of *zumpti* is that the tergite 6 is strongly constricted medially. The palpus, head in profile, prosternum, fore tarsus and wing are as in fig. 5, 6, 7, 10 and 39, respectively.

Icosta (Ornithoponus) maquilingensis (Ferris) Fig. 4, 6, 7, 23, 40, 41.

Ornithophila maquilingensis Ferr., 1924a: 392, fig. 1-2, ♀. Type: ♀ (UCB), ex (?) bird,

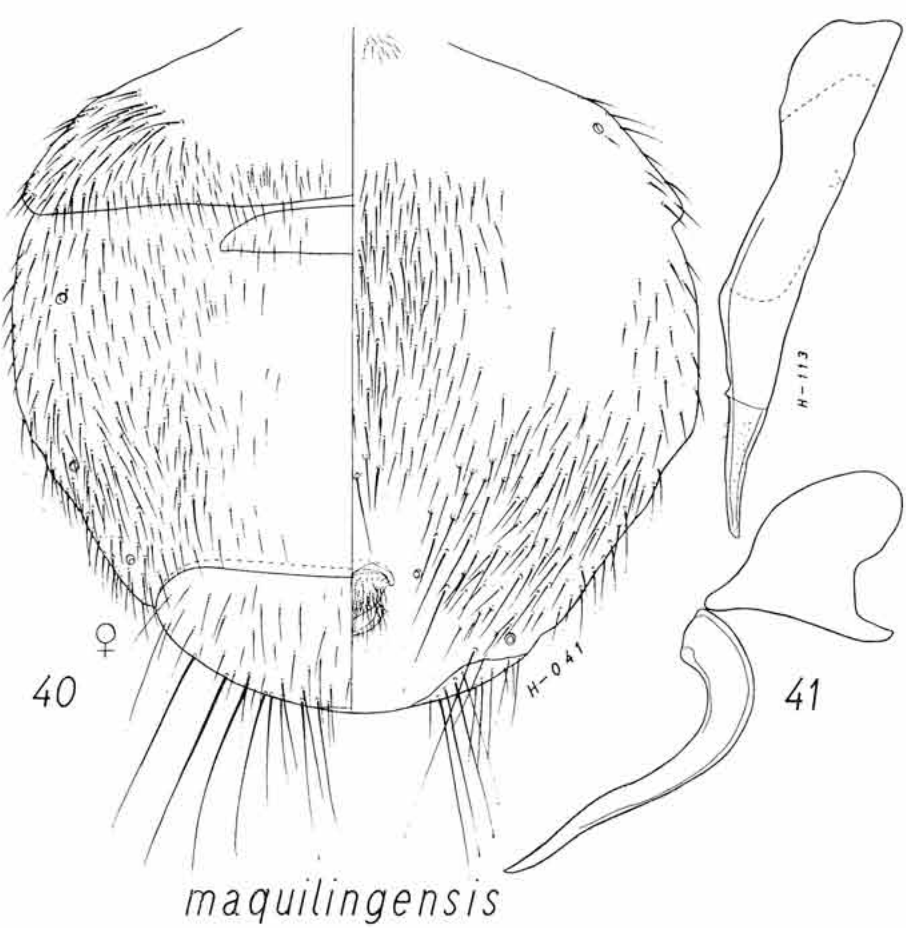


Fig. 40-41. *Icosta (Ornithoponus) maquilingensis* Ferr., Mindanao (♀) and Taiwan (♂), ♀ abdomen (40) and ♂ genitalia (41).

Luzon.—Schuurmans Stekhoven & Hardenberg, 1938, *Capita Zool.* **8** (4): 35, fig. 55-58, ♂.

MATERIAL. 51 ♂♂, 51 ♀♀.

BURMA: 5♂♂, 7♀♀, 2 puparia (MCZ), in 9 lots, partly reared, (1♀ w. mite on abd.), Myitkyina, ex *Gallus gallus*, X.1944-V.1945; 1♂ (MCZ), *id.*, *Centropus sinensis*, IV.1945.

THAILAND: 1♀ (MCZ), Chiengmai, ex *C. sinensis*, coll. Coolidge. 1♂ (CNHM), Loei, Dansai, Koksathon, Phulomlo Mt, 2100 m, ex *Gallus gallus spadicus*, RE 3485, III.1954, Elbel & Boonsong. 1♀, Loei, Wungsapueng, Sretahn, ex *G. gallus*, RE 3260, I.1954, Elbel & Boonsong. 1♂ (USNM), Nakhon Phanom, Nakae, Kanluang, Phukho Mt, 550 m, ex *G. gallus gallus*, RE 3842, VII.1954, Elbel. 1♂, Nan, Ban Pachompoo, ex *G. gallus*, #V-38, XI.1961, Kitti. 2♂♂, Nan, Ban Phahang, ex *G. gallus*, V-105, 194, XII.1961, Kitti. 1♂, Phathalung, Pakphayun, Kofai, ex *G. gallus*, RE 6234-35, VI.1962, Wanit & Wichit. 1♂, 1♀, Phathalung, Pakphayun, Thadindang, ex *G. gallus*, WS 241, VI.1963, Wanit. 1♀ (CNHM), Prachuap Khirikhan, 7 km N of Ban Khluaklang, ex *Gorsachius*, B 17634, XII.1952, Deignan. 2♂♂, 8♀♀, Phangnga, Kokhokhao, ex *G. gallus*, WS 825, 830, III.1964, Wanit. 1♂, 1♀, Ranong, Kapoe, Muang Kluang, ex *G. gallus*, RE 7003, I.1963, Elbel; 1♀, Ranong, Kapoe, Muang Kluang, Thungkha, ex *Psittacula alexandri fasciata*, RE 7051, I.1963, Elbel.

LAOS: 1♂ (MCZ), Muong Yo.

VIETNAM: 1♂, "Vietnam", ex *G. gallus gallus*, R 70021, VI.1960, R. Leach. 1♂, Fyan, 900-1000 m, VII-VIII.1961, Spencer.

TAIWAN: 1♀, Liukuei, Kaohsiung hsien, ex *Megalaima oorti nuchalis* TMT 1819-23, III-IV.1964, Maa & Kuo; 1♀, *id.*, *Gorsachius m. melanolophus* TMT 1731; 7♂♂, 1♀, *id.*, *Arborophila crudigularis*, TMT 1799, 1913, 1973; 4♂♂, 5♀♀, *id.*, *Hierophasis swinhoii*, TMT 1808, 1832; 13♂♂, 11♀♀, *id.*, *Bambusicola thoracica sonorivox*, TMT 1512-13, 1542, 1739, 1776, 1789, 1814, 1909, 1936-37, 2109, 2110. 3♂♂, 1♀, Tzepeng, Taitung hsien, ex *B. thoracica sonorivox* TMT 959, 1272 & 1283, I-II.1964, Maa & Kuo; 1♂, *id.*, *Rallina eurizonoides formosana*, TMT 1396. 2♂♂, 3♀♀, Peiyuan, Tungho, Taitung hsien, ex *B. thoracica sonorivox*, XII.1964, Lien & Lin. 1♂, 3♀♀, Puli, Nantou hsien, ex *B. thoracica sonorivox*, TMT 540, 541, 690, 743, XII.1963, Maa & Kuo; 1♀, *id.*, *Arborophila crudigularis*, TMT 492.

PHILIPPINES: 2♀♀ (CNHM), E slope, Mt McKinley, Davao Prov., 1100 m, Mindanao, ex *Prioniturus discurus waterstradti* #841, IX.1946, Hoogstraal. 1♀ (UCB), Cotabato, Mindanao, ex *Hydrocorax* [*Buceros*] *mindanaensis*, coll. Rivera. 1♂ (MCZ), Palawan.

BORNEO: 1♂ (UCB), Mt Murud, ex *Haematortyx sanguiniceps*.

Habitats. Indo-Chinese, Malaysian and Philippine Subregions, widespread, from sea level to 2100 m; at present known from Burma, Thailand, Laos, Vietnam, Taiwan, Java, Borneo and Philippines. Apparently breeding on Galliformes: Phasianidae, with stray records from Ciconii-, Grui-, Psittaci-, Cuculi-, Coracii- and Piciformes. Analysis of available data follows. Galliformes: Phasianidae 45 records (*Arborophila* 4, *Bambusicola* 19, *Gallus* 19, *Haematortyx* 1, *Hierophasis* 2); Ciconiiformes: Ardeidae (*Gorsachius*) 2; Gruiformes: Rallidae (*Rallina*) 1; Psittaciformes: Psittacidae 2 (*Prioniturus* 1, *Psittacula* 1); Cuculiformes: Cuculidae (*Centropus*) 2; Coraciiformes: Bucerotidae (*Buceros*) 1; Piciformes: Capitonidae (*Megalaima*) 1. Highest densities per infested bird were 2♂♂, 8♀♀ ex *Gallus* (WS 830) in Thailand and 4♂♂, 3♀♀ ex *Hierophasis* (TMT 1832) in Taiwan. Among 13 *Excalfactoria*, 13 *Arborophila*, 53 *Bambusicola* and 10 *Hierophasis* examined in the latter country, 0, 4, 19 and 2, respectively, were found infested with this fly. Average infestation rate of those 89 birds was 28%, and average number of flies per infested bird was 2 (Maa et al. 1965: 399).

Systematics. In size of body and relative length of palpus, *maquilingensis* and *simplex* are so similar that Bequaert (1953a: 318, 1955: 265) suggested them to be inseparable. Besides the characters given in the key, the former species can be distinguished from the latter in having body size slightly smaller, face not less, or hardly less, than 1/2 (19-20: 37) width of head, inner orbit broader, ocelli smaller, tarsal spines under ♀ foreleg 1.0.1.0 (not 2.1.1.0), ♀ laterites 2 and 3 extensively bare at ventral disc (not uniformly setose all over), ♀ tergite 6 slightly widened posteriorly (not anteriorly), lateral setae on ♀ abdomen more robust, ♀ urogenital area anteriorly fenced by 2-3 rows of black moderately long setae (not 1 row). The host preference of the 2 species is also different. The original description was based on a single unfed ♀ and, therefore, is not quite satisfactory regarding the abdominal chaetotaxy. The palpus, head in profile, prosternum, thorax, ♀ abdomen, and ♂ genitalia are as in fig. 4, 6, 7, 23, 40 and 41, respectively.

Icosta (Ornithoponus) simplex (Walker) Fig. 5-7, 20, 38, 42-44.

Ornithomyia simplex Wk., 1861 : 263. Type: ♀ (BMNH) ex (?) bird, Celebes.

MATERIAL. 5 ♂♂, 9 ♀♀. NW NEW GUINEA: 1♂, Bodem nr Sarmi, ex *Goura*, TMP 042, VII.1959, Maa. 1♂, 1♀, Vogelkop Penin., Kebar Vall., 550 m, ex ground dove, BBM 824-25, I.1962, Quate. 1♀, Nabire, ex *Megapodius freycinet*, BBM 21619, VIII.1962, Richards. 1♂, 2 ♀♀, Oransbari, NW side of Geelvink Bay, ex *Talegalla cuvieri*, BBM 22398, II.1963, Thompson & Richards. NE NEW GUINEA: 1♀, Mt Missim, ex *Aepypodius arfakianus*, BBM 20641, III.1963, Clissold. 1♂, Ambunti, Sepik Distr., 160 m, ex *Centropus m. menbeki*, BBM 22549, V.1963, Temple. SE NEW GUINEA: 1♂, 1♀, Balimo, ex *Goura scheepmakeri*, BBM 50246, III.1964, Clissold. 2 ♀♀, Oriomo, ex *Talegalla fuscirostris*, BBM 29614, II.1964, Clissold. 1♀, Soputa, 60 m, ex *Ducula pinon*, BBM 29761, X.1963, Clissold.

Habitats. Celebes (type locality) and New Guinea lowlands, apparently breeding on terrestrial birds. Analysis of available records: Columbiformes: Columbidae 5 records (*Ducula* 1, *Goura* 2, genera indet. 2); Galliformes: Megapodiidae 4 (*Aepypodius* 1, *Megapodius* 1, *Talegalla* 2); Cuculiformes: Cuculidae (*Centropus*) 1. The last record is probably a straggler. The highest density per infested bird was 1♂, 2♀♀ (BBM 22398, ex *Talegalla*).

Systematics. This species is so similar to *australica* and *maquilingensis* that Austen (1903: 263) and Bequaert (1953a: 257) wrongly recorded its occurrence in Queensland, and that the latter author (1953a: 318) suggested *simplex* as possibly inseparable from *maquilingensis*. Obviously, *simplex* stands intermediate of those 2 species and is closer to *maquilingensis* than to *australica*. Since first published, no fresh specimen referable to true *simplex* have ever been reported. The relative measurements given below (scale 1 micrometric unit =0.04 mm) were taken from the type (♀) and its accompanying ♂ from Celebes (figures for ♂ in parentheses); width, head 44 (43) units, face 17 (16), mediovertex 9.5 (10), postvertex 24 (22); length along median line, head plus thorax 89 (84), head from anterior frontal margin to occipital margin 35 (33), eye 29 (28), frons plus lunula 8 (8), mediovertex 20 (17) postvertex 8 (9), palpus 21 (19), prescutum 26 (23), scutum 17 (16), scutellum 13 (12). The frons proper in the type is less than 1/2 as long as lunula and

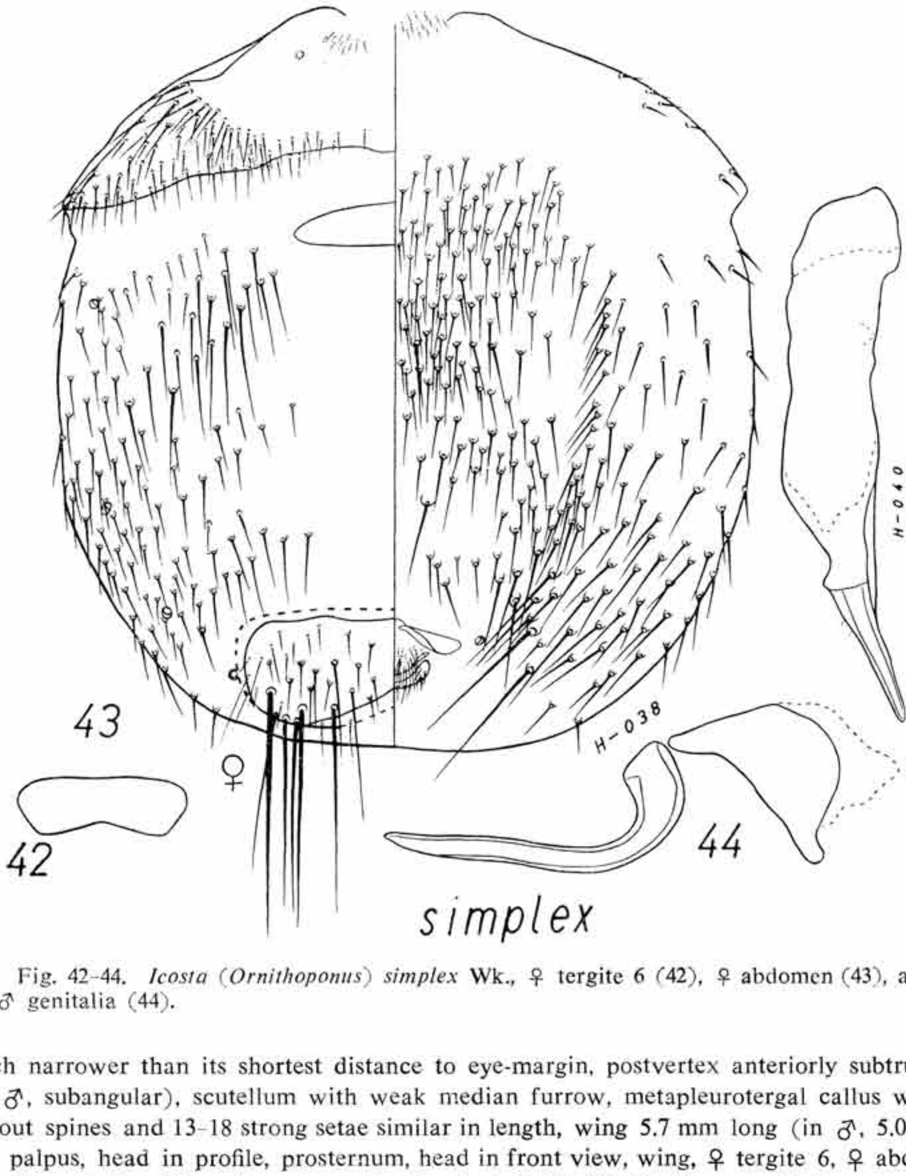


Fig. 42–44. *Icosta (Ornithoponus) simplex* Wk., ♀ tergite 6 (42), ♀ abdomen (43), and ♂ genitalia (44).

much narrower than its shortest distance to eye-margin, postvertex anteriorly subtruncate (in ♂, subangular), scutellum with weak median furrow, metapleurotergal callus with 2–3 stout spines and 13–18 strong setae similar in length, wing 5.7 mm long (in ♂, 5.0 mm). The palpus, head in profile, prosternum, head in front view, wing, ♀ tergite 6, ♀ abdomen and ♂ genitalia of topotypes are as in fig. 5, 6, 7, 20, 38, 42–44, respectively.

Icosta (Ornithoponus) australica (Paramonov) Fig. 2, 6, 7, 10, 11, 37, 45.

Ornithophila australica Param., 1954: 291, "♂". Type: ♀ (not ♂ as originally stated) (ANIC), ex (?) bird, Queensland.

MATERIAL. AUSTRALIA (Queensland): 1♀ (MCZ), w. mites under abd., Rocky Scrub, McIlwraith Range, C. York, ex *Alectura lathami*, coll. Darlington. 1♀ (BMNH 50.95),

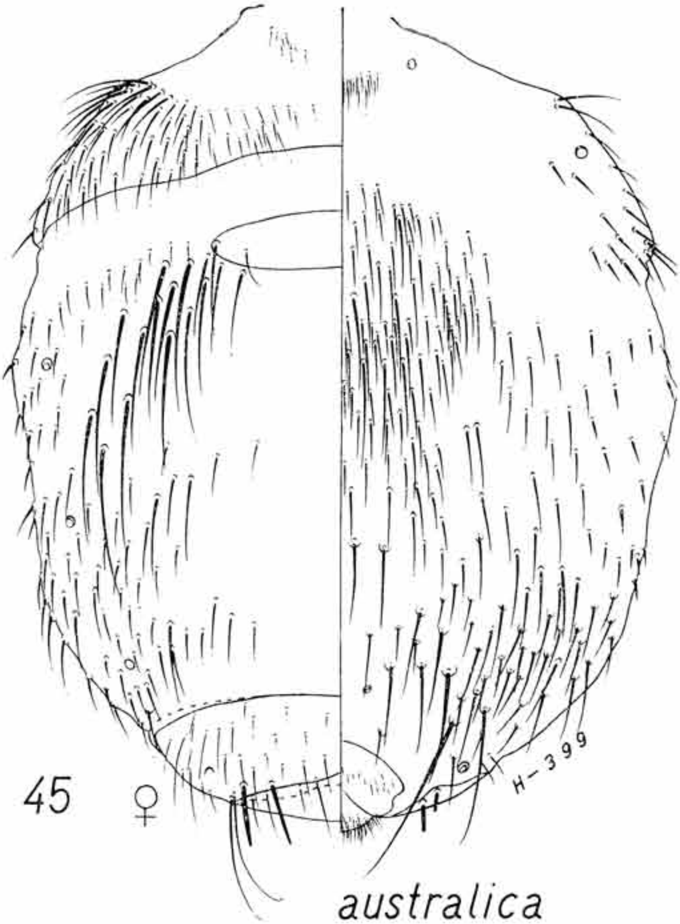


Fig. 45. *Icosta (Ornithoponus) australica* Param., ♀ abdomen.

Port Molle, on board H.M.S. "Rattlesnake", ex *Talegalla* [*Alectura*] *lathami*, coll. MacGillivray. These 2♀♀ form the bases of Queensland records of ***simplex*** by Austen (*l. c.*) and Bequaert (*l. c.*).

Habitats. At present known only from Queensland lowland ex Galliformes: Megapodiidae (*Alectura*), possibly not rare on ground birds in eastern coastal Australia.

Systematics. The original description of this species is rather brief and is composed almost entirely of comparative notes against Ferris' drawing (not actual specimen) of *maquilingensis*. Main points mentioned were: wing length greater, 8 vs 5 mm; mediovertex ("frontal stripe") relatively narrower, 2.5 vs 4× as wide as inner orbit ("orbital stripe"); anterior margin of mediovertex slightly convex, not very convex; bristles at antennal apex much longer; palpus about as long as mediovertex; no bristles [evidently broken off] on mesonotum, scutellum and hind part of mesosternum. The following redescription is based upon the type (pinned) very kindly sent on loan by Dr Paramonov.

♀. Uniformly pale, wing yellowish brown, veins brownish. Occipital margin slightly concave at middle; vertical bristle pale, much shorter and finer than orbital bristle, only about as long and robust as ordinary setae on inner orbit; postvertex 1/3 as long as wide; ocelli very small, widely apart from one another. Relative length of head, face and eye 43 : 20 : 12; inner orbit less than 1/2 as wide as mediovertex, widest above midlength. Frons proper as long as lunula, hardly narrower than its distance to nearest eye-margin, broadly notched anteriorly at middle; frontal process (fig. 6) in dorsal view strongly tapering apicad, in lateral view subangular preapically and slightly surpassing level of vibrissal area. Palpus (fig. 2) longer (25 : 21 : 20) than eye and than width of face, in lateral view distinctly decurved. Gula lacking spines. Mesonotum 45×62; prescutum densely striate all over, its laterocentral setae pale and very short. Scutellum 13×27, shorter than scutum, posterior margin evenly curved; scutellar bristle pale, hardly distinguishable in length and robustness from neighboring soft setae although more erect and originating from larger puncture. Humeral bristle (?); notopleural bristle as short and fine as vertical bristle; mesopleural and postalar bristles long, black. Mesopleural concavity deep, narrow. Metapleurotergal callus with 2-3 black spines and some brown stiff setae. Prosternum (fig. 7) moderately large, 2× as wide as long, well sclerotized, with 1 pair of pale setae. Wing (fig. 37) 6.9 mm long, very narrowly bare along anal margin of cell *2a* (not entirely setulose as described by Paramonov), elsewhere on wing surface including alula entirely setulose; vein *rm* much closer (32 : 67) to *im* than to apex of C and situated slightly apicad to level of apex of R_1; bulla of M_{1+2} lying just at midlength of cell *2bc*. Tarsus 1 and tibia 3 as in fig. 10 and 11, respectively. Tarsal spine formula 1.0.1.0/2.1.1.0/1.1.0.0; tarsomere 1 of hindleg hardly longer than 2+3+4, much longer than 5; tarsomere 2 as long as wide, practically symmetrical. Abdomen (strongly shriveled in type) (fig. 45) dorsally covered largely with pale soft setae; syntergite 1+2 (lateral parts) and tergite 6 with erect blackish setae; 2 (1+1) patches of long stout setae near tergite 3; median striolate area largely bare; tergite 3 very large, almost as wide as scutellum; tergite 6 with 4-5 pairs of bristles at posterolateral corners. Abdominal venter medially with short and laterally with long setae. ♂ unknown.

The accompanying figures are based upon the ♀ from Cape York. The most distinctive character of this species is the degeneration of vertical, notopleural and scutellar bristles. Mainly on the strength of this character, *australica* is here placed on the top of the group.

Minor Group

Distribution. Old World; 5 species: 3 in the Oriental and 1 each in Ethiopian and Australian Regions. Two of the species extend to southern Palaearctic Region.

Host Relationships. The Oriental species are mono- or pleioxenous on Passeriformes particularly Ploceidae; the Ethiopian one polyxenous on Passeriformes and Cuculidae; the Australian one probably on Passeriformes, too.

Diagnosis. Color pattern very pale, some or most of major bristles pale or shortened. Vibrissal area sharply angular and slightly produced. Prosternum large, transverse, almost as strongly sclerotized and almost lying on same plane as mesosternum, its anterior margin virtually in line with that of mesosternum. Cell *2bc* only 1/3 as long as *1bc*; wingsetulae fairly extensive, alula ventrally setulose. Tergite 3 absent in both sexes. Aedeagus in profile broad, basally strongly bulged; ♂ postgenital plate Y-shaped. Sexual dimorphism very weak.

Affinities. Closest to Simplex group, with some affinities to Plana, Albipennis and Hirsuta groups. Its similarities to the Plana group are chiefly with the shape of vibrissal

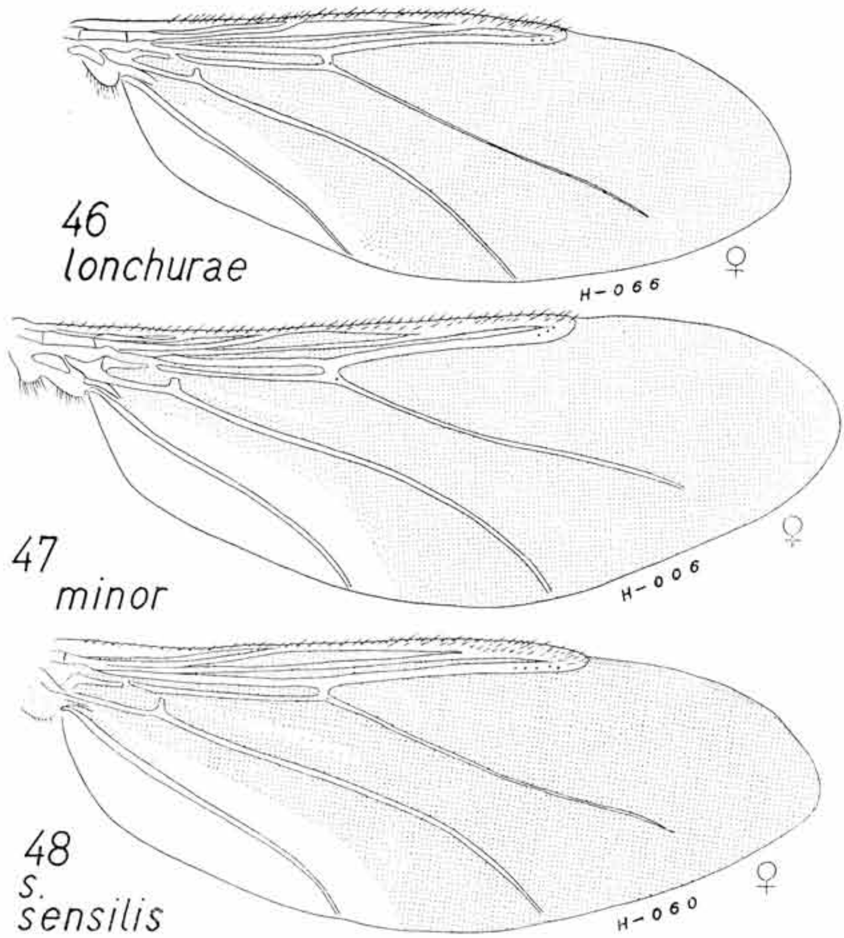


Fig. 46-48. *Icosta (Ornithoponus)* species, Minor group, wings, magnifications varied.

area; to the Albipennis group, with the general shape of face and ♂ genitalia; while to the Hirsuta group, with general features including color pattern and body size (for similarities to the Simplex group, see discussion under the latter). The 5 species and subspecies included are so closely related to one another and the available material is so scanty that the classification scheme suggested below must be considered provisionary and that their separation has to rely upon minor quantitative characters. More subspecies are expected to be discriminated.

Icosta (Ornithoponus) minor (Bigot) Fig. 4, 7, 16, 24, 47, 49, 145.

Olfersia minor Bigot, 1858: 376. Type: ♀ (Paris Mus.), ex (?) bird, Gabon.
Lynchia minor: Theod. & Oldr. 1964: 51, fig. 83-84, ♂♀.—Maa 1964: 89.

MATERIAL. 10 ♂♂, 20 ♀♀.

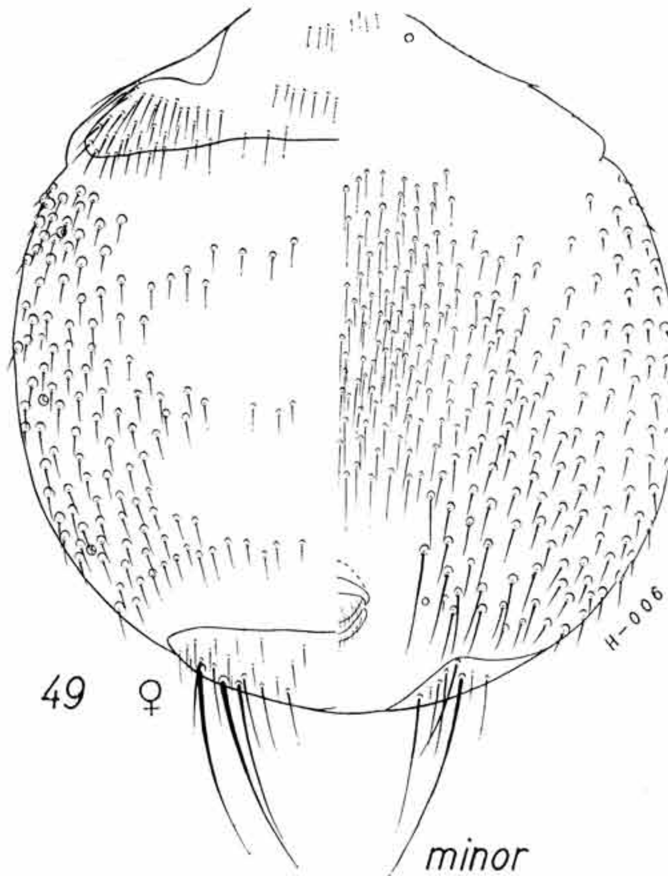


Fig. 49. *Icosta (Ornithoponus) minor* Bigot, Gabon, ♀ abdomen.

CAPE PROV.: 1♀ (SAIMR), Addo Nat. Park, ex *Ploceus capensis*, IV.1963. MOZAMBIQUE: 1♀ (SAIMR), Maputo, ex *Centropus burchellii*, V.1952.

NYASALAND: 1♀ (MCZ), Ruo, ex passerine #141, Wood. TANGANYIKA: 1♀ (MCZ), Morogoro, ex *Tchagra senegala orientalis*, VII. 1917, Loveridge. KENYA: 1♀ (MCZ), Guasa Nyiro, ex blue buffy finch, VI. Allen. 1♀ (BMNH), "Brit. E. Afr.", van Someren. 1♀ (BMNH), Bwamba Valley, ex *Turdus libonyanus*, VII.1945, van Someren. UGANDA (all in MCZ): 1♀, Kampala, ex *Oriolus monachus rolleti*, IX.1934, Hopkins; 2♂♂, 1♀, *id.*, *Centropus superciliosus*; 1♀, *id.*, *Macronyx croceus*; 1♂, 1♀, *id.*, *Lagonosticta senegala*; 1♂, Kampala, ex *Lanius e. exubitarius*, V.1937, Chorley. 1♀, Entebbe, ex *L. exubitarius*, X.1933, Chorley. 1♂, Katwe, Toro, ex *Centropus superciliosus luandae*, coll. Hopkins. RUANDA: 1♀ (MCZ), Kaminiola, betw. Lake Kivu & Tanganyika, ex *Pyromelana [Euplectes] orix leuconota*, II.1927.

ETHIOPIA: 1♂ (BMNH), Fouri, IX.1914, Kovacs. SUDAN: 1♀ (BMNH), Wady Gabgaba, ex *Passer domesticus*.

CONGO: 1♂ (MCZ), Tshibati, Kivu, ex *Cyanomitra alinda* or *Batis diops*, "It flew on to me", 1953, Chapin. 1♀ (MCZ), Kwamouth, VI.1920, Schouteden; 1♂ (MCZ), Kwamouth, ex *Vidua macroura*, XII.1926.

SENEGAL: 1♀ (MCZ), Dakar, Ifan, M'Bas, ex *Melittophagus pusillus*, 1947, Villiers.

MOROCCO: 1♀ (MCZ), Sous, ex *Tchagra senegala cuculatus*, coll. Meinertzhagen. 2 ♀♀, (MCZ), Mogador, IX.1938, Meinertzhagen.

ITALY: 1♀ (MLN ex coll. Bezzi), Belvedere, X.1890, Solari, det. Speiser as *Lynchia falcinelli* Rndn.

TURKEY: 1♂ (MCZ), Kamer, Tatvan, Bitlis, Asia Minor, 1800 m, ex *Pica pica*, VII. 1954, Hoogstraal, det. Bequaert first as *falcinelli* Rndn. and later as n. sp.

Habitats. Entire Ethiopian Region and Mediterranean Basin, so far known from Madagascar, Cape Prov., N. Rhodesia, Mozambique, Nyasaland, Tanganyika, Kenya, Uganda, Ruanda, Ethiopia, Sudan, Congo, Gabon, Senegal, Morocco, British Is., Italy, Asia Minor, and Israel. Obviously breeding on Passeriformes, with stray records from Cuculi- and Coraciiformes. Analysis of data listed above plus that in my earlier (1964) paper follows. Passeriformes: Ploceidae (*Estrilda, Euplectes, Lagonosticta, Passer, Ploceus, Vidua*) 7 records; Laniidae (*Lanius, Tchagra*) 5; Muscicapidae (*Batis, Bradypterus, Turdus*, "finch") 4; Oriolidae (*Oriolus*) 1; Nectarinidae (*Cyanomitra*) 1; Motacillidae (*Anthus, Macronyx*) 2; Corvidae (*Pica*) 1; Cuculiformes: Cuculidae (*Centropus*) 4; Coraciiformes: Meropidae (*Melittophagus*) 1.

Systematics. Since first published, nothing has been added besides redescriptions by Speiser (1902b: 156-57) and Theodor et al. (*l. c.*) and records and notes by Maa (*l. c.*). Tarsal sensillae and other details of the above-listed specimens were not counted and analysed and possibly there exist several geographical races. This species was recognized as new by Bequaert, and many of the specimens in Mus. Comp. Zool., Harvard were labeled as types of his manuscript name. The palpus, prosternum, head, thorax, wing, ♀ abdomen and hind tarsus are as in fig. 4, 7, 16, 24, 47, 49 and 145, respectively.

Icosta (Ornithoponus) sensilis sensilis Maa, new species Fig. 5, 19, 27, 48, 51, 52, 146.

MATERIAL. 10 ♂♂, 27 ♀♀. Holotype ♀ (BISHOP 7579), allotype ♂ and most paratypes (BISHOP); 3 and 5 paratypes (CNHM and MCZ, respectively); others to USNM, BMNH, ANIC.

E. PAKISTAN: Paratype ♂ (MCZ), Sylhet, Baramchal, 50 m, ex *Lanius* #6017, IV.1958, Paynter.

BURMA: Paratypes 1♂, 2 ♀♀ (MCZ), Myitkyina, ex *Centropus b. bengalensis*, IV-V. 1945, U.S. Typhus Lab.; 1♂, 3 ♀♀ (1♀ w. mites on abd.), *id., C. s. sinensis*, IV-V.1945.

THAILAND: 1♀, Chiengmai, Ban Khilek, Amphoe Maetaeng, ex *Ploceus philippinus*, SMRL 544, II.1962. 1♀, Chiengmai, Doi Inthanon, ex *Centropus toulou*, 5E 1521, XII. 1964, Migr. Anim. Path. Surv. 1♀ (CNHM), Chiengrai, Chiangsaenkhao, ex *Motacilla alba*, B 17785, II.1963, Deignan. 1♂, 2 ♀♀ (CNHM), Nakhon Sawan, Ban Photphisai, Tha-ngiu, ex *Centropus bengalensis*, B 21007, III.1953, Elbel. Holotype ♀, allotype ♂, Nakhon Sawan, Paknampho, Kowkat, ex *C. bengalensis*, B 21085, V.1953, Elbel.

MALAYA: Paratypes, 1♀, Subang, Selangor, ex *Pycnonotus goiavier*, M 917, II.1962, McClure; 3♀♀, *id., C. sinensis*, M 911; 1♀ (CNHM), Kuala Lumpur, Selangor, ex *C. ben-*

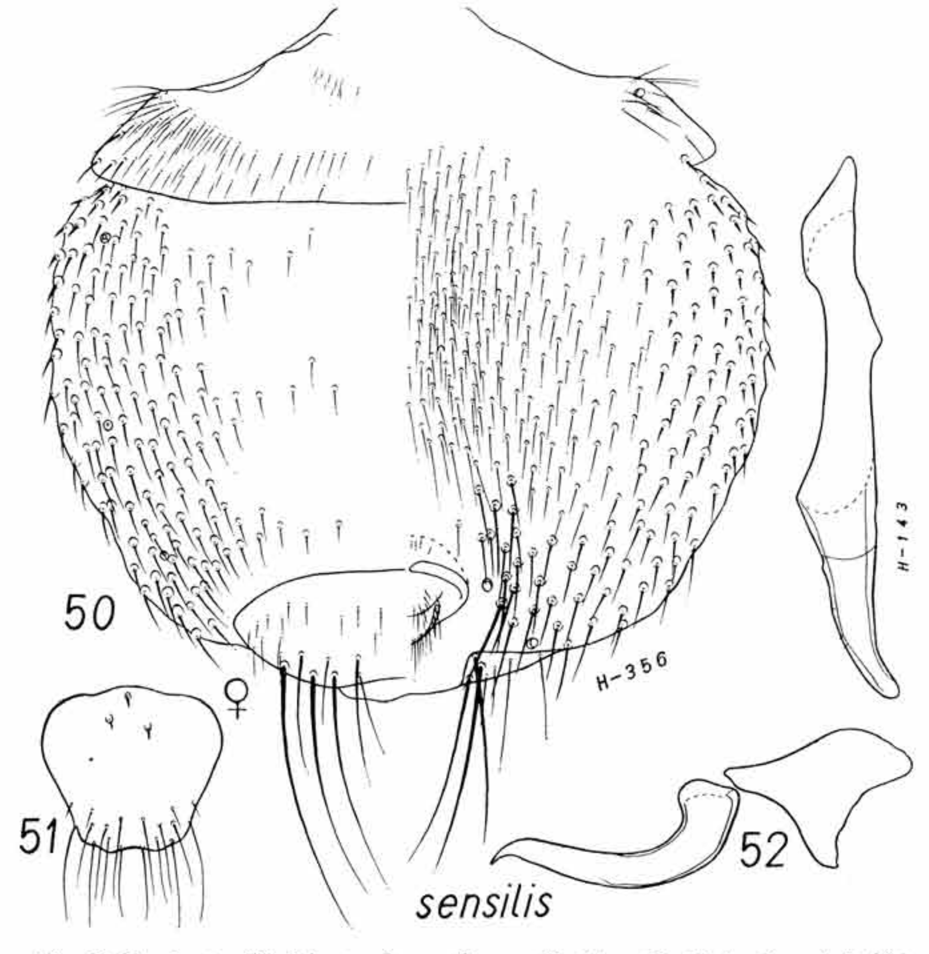


Fig. 50-52. *Icosta (Ornithoponus) sensilis sensilis* Maa (♂, Malaya) and *I. (O.) sensilis reducta* Maa (♀, India). ♀ abdomen (50), ♂ postgenital plate (51), and ♂ genitalia (52).

galensis javanicus, B 8038, IV.1948, Traub & Philip; 1♂ (CNHM), *id.*, *Ploceus philippinus fortunatus*, B 8038. 1♂, 1♀, nr Batu Tiga, Selangor, ex *C. bengalensis*, B 52711, IX.1960. 1♀, Sungei Way, Selangor, ex *Acrocephalus arundinaceus*, 5E 226, X.1964, M.A.P.S.; 1♂ w. mallophagan on wing, *id.*, *Pycnonotus goiavier*, 6E 1584, VIII.1965. 1♀, Bentong, ex *Hirundo tahitica*, 6E 1574, VIII.1965, M.A.P.S.; 1♂, *id.*, *Lanius cristatus*, X.1965.

PHILIPPINES: Paratypes, 1♀, Calatagan, Batangas, Luzon, ex *Rhipidura javanica nigritorquis*, H 156, IX.1964, M.A.P.S. 1♀, Dalton Pass, Nueva Vizcaya, Luzon, ex *Brachypteryx montana*, 6E 0156, XII.1965, M.A.P.S.; 3♀♀, w. mites, *id.*, *Centropus toulou*, 6E 0169, 5E 2417, VIII–IX.1965. 1♀, Negros Oriental, Siaton, ex *Megalurus palustris forbesi*, BBM 6502, VIII.1964, Wilson. 1♂, Balisong, Mt Matutum, Tupi, Cotabato, Mindanao, ex *Lanius schach nasutus*, SU-BBM 1333, II.1964, Rabor. 1♀, Tambo, Marui, ex *Centropus viridis*, 5E 2167, IV.1965, M.A.P.S. 1♀ w. 1 mallophagan each on wing & abd., Tambo, Mundl, Mindanao, ex *Pycnonotus goiavier*, 5E 2211, IV.1965, M.A.P.S.

Habitats. Probably widely spread over Oriental Region, at present known from E. Pakistan, Burma, Thailand, Malaya and Philippines, lowlands, up to 1000± m. Apparently breeding on Cuculi- and Passeriformes. Analysis of available data as below: Cuculidae (*Centropus*) 12 records, Pycnonotidae (*Pycnonotus*) 3, Muscicapidae (*Acrocephalus, Brachypteryx, Megalurus, Rhipidura*) 4, Motacillidae (*Motacilla*) 1, Laniidae (*Lanius*) 3, Ploceidae (*Ploceus*) 2; Hirundinidae (*Hirundo*) 1. Highest density per infested bird was 3 flies in Thailand (B 21007) and Malaya (M 911), both on *Centropus*.

Systematics. Both in structure and geographical range, *sensilis* stands intermediate of *minor* and *lonchurae*. It is so closely similar to *minor* in general features and in host preference that these two perhaps should be considered geographical races of 1 single species. Since the material at hand is too limited and since there is a wide gap between known distributional ranges of the 2 forms, they are here kept separate. In 1♂ from Malaya, the metapleurotergal calli each has 3 black curved setae.

♀. Differing from *lonchurae* in the following points. *Head* (fig. 19): Palpus as in fig. 5. Postvertex often slightly longer; gula posteriorly usually with pale soft setae, seldom partly with fine black ones. *Thorax* (fig. 27): Mesonotum 30×41; scutellum 9×22; metapleurotergal callus with only pale soft setae, very seldom with 1 or 2 black setae at right or left side. *Wing* (fig. 48) 3.6-4.2 mm long. Segment 1 of hind tarsus ventrally usually with 1-2 minor spines each near base and near outer apical corner; outer margin of segments 1-5 with 3-8, 1-3, 1-3, 1-3, 4-9 sensillae, respectively. *Abdomen* (see fig. 50) more finely setose; ventral setae near spiracle 3 hardly more robust than on median area and hardly longer than width of their respective basal papillae; urogenital area on each side flanked by 10± much longer, slightly more robust setae.

♂. Segments 1-4 of hind tarsus (fig. 146) with fewer sensillae on outer margin than in ♀. Setae around spiracle 3 not more, or hardly more, robust than those around spiracles 4 and 5, and in average, hardly longer than width of their basal papillae; urogenital area flanked by setae much shorter than tergite 6. Aedeagus (fig. 52) and paramere as figured. Postgenital plate (fig. 51) with more numerous setae. Other characters similar to *lonchurae*.

Icosta (Ornithoponus) sensilis reducta Maa, new subspecies Fig. 7, 50.

MATERIAL. 2♀♀, with abdomens rather poorly preserved. Holotype (BISHOP 7580) and paratype (BISHOP). INDIA: Holotype ♀, Manjri Farm, Poona, W. Ghats, ex *Corvus macrorhynchos*, A 69682, I.1966, Singh. Paratype ♀, Bombay Rd, Poona, ex *C. splendens*, A 1356, III.1954, Rao.

Habitats. Not quite clear; probably widely distributed in peninsular India on Passeriformes. Prof Theodor wrote me that he has an undescribed Afghan species closely related to *minor*. Perhaps it is referable to *reducta*.

Systematics. Differing from nominotypical *sensilis* only in more reduced sensillae and spines on tarsus 3 (see key). These differences are so slight that I hesitated a long time before giving this Indian form a name. Prosternum and ♀ abdomen as figured. Countings of the outer marginal sensillae of segments 1-5 in the only available specimens are 3.0.0.0.1, 2.0.0.0.2, 1.0.0.0.2 and 1.0.0.0.2, respectively. Countings of the same in typical *sensilis* as well as *lonchurae* are as follows.

Table 3. Outer marginal sensillae of hind tarsomeres in *Icosta* showing variation ranges of geographical races.

Race	Country	Tarsomere I	II	III	IV	V	No. ♀♀ examined
s. sensilis	Burma	3–8	1–3	1–3	1–3	5–7	4
〃	Thailand	5–7	1–2	1	1	4–7	3
〃	Malaya	5–8	1–3	1–2	1–2	6–9	6
〃	Philippines	3–6	1–2	1–2	1–2	5–7	7
lonchurae	Thailand	0–3	0–1	0–2	0–1	1–4	6
〃	Malaya	3	1	0	0–1	3–4	1
〃	Philippines	1–3	0–1	1	0–1	2–4	2
〃	Taiwan	1–5	0–1	0–1	0–1	2–4	36
〃	〃 (average)	1.42	0.24	0.24	0.11	2.75	〃

Icosta (Ornithoponus) lonchurae Maa, new species Fig. 3, 6, 7, 9, 15, 46, 53, 54, 144.

MATERIAL. 15♂♂, 41♀♀. Holotype ♀ (BISHOP 7581), allo- and 54 paratypes, latter in BISHOP, USNM, BMNH, ANIC, TARI.

TAIWAN: Holotype ♀, allotype ♂, Liukuei, Kaohsiung hsien, ex *Lonchura striata phaethonotoptila*, TMT 1881–83, III–IV.1964, Maa & Kuo. Paratypes, 1♂, 1♀, *id.*, TMT 1595, 1880; 1♂, 2 ♀♀, *id., L. punctulata topela*, TMT 2085–86. 1♀, Tzepeng, Taitung hsien, ex *L. punctulata topela*, TMT 1347, I–II.1964, Maa & Kuo. 4 ♂♂, 4 ♀♀, Puli, Nantou hsien, ex *L. punctulata topela*, TMT 161–63, XII.1963, Maa & Kuo. 1♂, 9 ♀♀, *id., Lonchura* TMT 422, etc. 2♀♀, Taipei, ex *L. punctulata*, XI.1960, K.S. Lin; 2♂♂, 8♀♀, *id., L. striata*, IV.1961. 3♂♂, 8♀♀, Hsinshe, Taichung hsien, ex *L. striata*, 5E 1644–47, 1655, 1661–63, 1665, III.1965, Migr. Anim. Path. Surv. 1♂, 1♀, Shuili, Nantou hsien, ex *L. striata*, 5E 1595, 1597, XII.1964, M.A.P.S.; 1♀, *id., L. punctulata*, 5E 1598. 1♀, Lungchin, Taichung hsien, ex *L. striata*, 5E 1643, III.1965, M.A.P.S. 1♂, Tunghai, Taichung, ex *L. striata* 5E 1815, IV.1965, M.A.P.S.

THAILAND: 5 ♂♂, 6 ♀♀, Chiengmai, Ban Khilek, Amphoe Maetaeng, ex *L. punctulata*, SMRL 565, 568, 570, 571, 578, III.1962.

MALAYA: 1♀, "Malaya", ex *L. atricapilla*, H 980, II.1964, M.A.P.S.

PHILIPPINES: 1♀, Dalton Pass, Nueva Vizcaya, Luzon, ex *L. leucogaster* 6E 0236, IV.1966, M.A.P.S.; 1♀, *id., L ferruginosa* 6E 0608, VIII.1964.

Habitats. Indo-Chinese Subregion, at present known from NW Thailand and Taiwan, and spreading southward to Malaya and Philippines. Lowland. Obviously confined to *Lonchura* spp. (Passeriformes: Ploceidae). The highest density per infested bird was 2 ♂♂, 1♀ (SMRL 568) in Thailand. Among 22 *Lonchura* collected during the winter in Taiwan, 6 were found infested by this fly; the average infestation rate was 27% (Maa et al. 1965: 399, as *Lynchia* sp. "L").

Systematics. Lonchurae is slightly smaller in body size, and darker in setal color and has more restricted host and distributional ranges than *sensilis* and particularly *minor*. It is apparently a rather recent offshoot from the ancestral stock of this group.

♀. *Color* very pale, dorsally yellowish brown, ventrally whitish; wing hardly tinted with

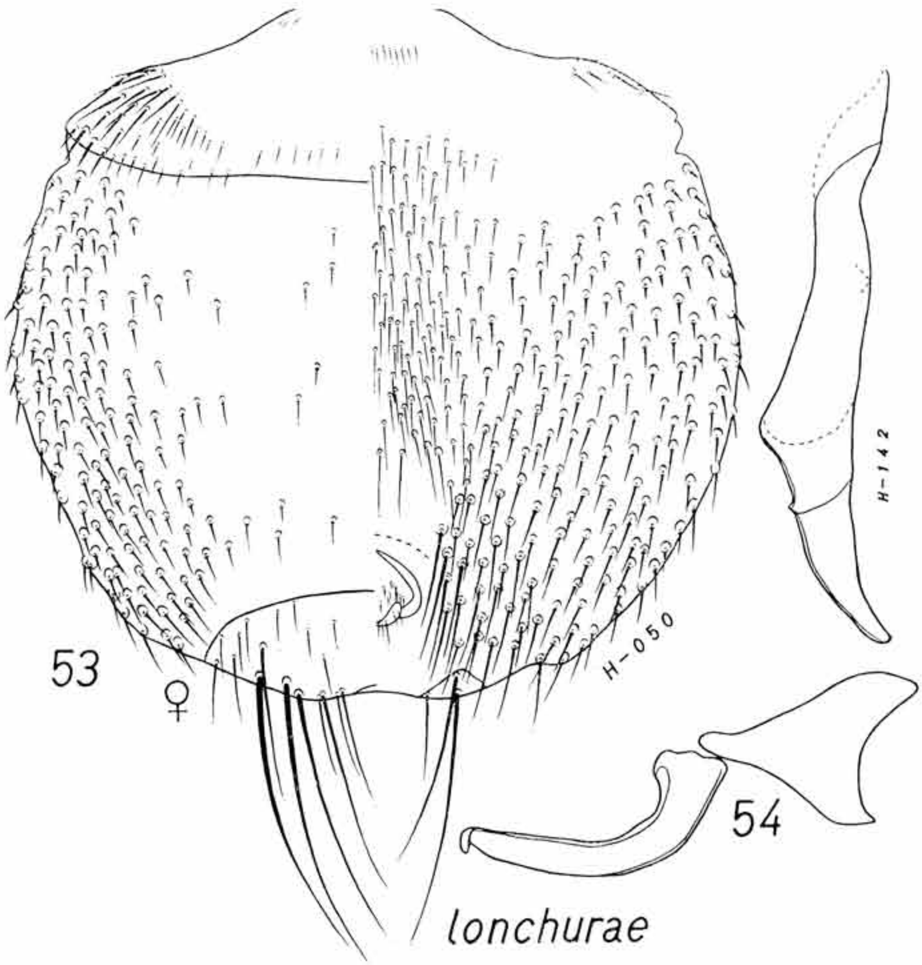


Fig. 53-54. *Icosta (Ornithoponus) lonchurae* Maa, Taiwan, ♀ abdomen (53) and ♂ genitalia (54).

brownish; veins C, Sc and R_1 practically colorless, other anterior veins yellowish brown. ***Head***: (fig. 15): Occipital margin very weakly convex; vertical bristle pale, as long as notopleural bristle; postvertex 3.5-4× as wide as long, anteriorly truncate. Face very wide, hardly narrowed anteriorly. Frons proper scarcely shorter than lunula, its anterior notch narrow, subangular; frontal process (fig. 6) in dorsal view broad at base, strongly narrowed apicad, in profile broadly rounded off into vibrissal area; anterior and ventral margins of vibrissal area forming together an angle of *ca* 90°, ventral margin with pale setae. Palpus as in fig. 3. Gula posteriorly with both pale setae and black spines. ***Thorax***: Mesonotum 26×35; notopleural bristle pale, all other major bristles black; prescutum unsculptured posteromedially, sparsely faintly striate posterolaterally, laterocentral setal patch largely composed of very short pale soft setae, mixed with 4-5 bristles which are also pale and hardly surpass transverse mesonotal suture. Scutellum 7×18, posterior margin evenly convexly curved. Metapleurotergal callus with 2-3 black stout spines and a few pale and black setae. Prosternum (fig. 7) slightly less sclerotized than neighboring sclerites, 3× as wide as long, truncate anteriorly, bearing 2-3 pairs of soft setae. *Wing*: (fig. 46) 3.5-3.8 mm long; setulae covering all cells except *2m+1a* (posterior 2/5) and *2a*. *Legs*: Femur 1 as in fig. 9. Tarsal spines 1.0.0.0/2.1.1.0/2(4).2.1.1; tarsomere 3 of foreleg with outer apical lobe scarcely longer than inner; tarsomere 1 of hindleg as long as 2+3, shorter than 5, its 2 outer apical spines much weaker than 2 inner ones; outer margin of tarsomeres 2-4 of same leg usually lacking sensillae (Table 3). *Abdomen* (fig. 53) finely setose; dorsal striolate area with scattered small setae; ventral setae on median area finer and usually paler than on lateral area; urogenital are flanked on each side by 20± much more robust setae. Syntergite 1+2 anterolaterally with pale soft setae, posterolaterally with black spines; tergite 6 large, posterior margin straight, with 6-8 pairs of bristles. Laterites 3 and 7 and pregenital plate all undefinable; postgenital plate with 3-4 minute setae.

♂. Similar. Tarsus 3 as in fig. 144. Setae around abdominal spiracle 3 distinctly more robust than those around spiracles 4 and 5, and largely more than 2× as long as width of their respective basal papillae; urogenital area flanked by setae nearly as long as tergite 6. Aedeagus (fig. 54) rather robust and apically straight; paramere also robust, apically distinctly decurved. Postgenital plate apically deeply cleft at middle, with only 3-5 setae on each lobe.

Icosta (Ornithoponus) sp. "W"

AUSTRALIA: 1 pinned ♂ (ANIC), nr Penrith, N.S. Wales, no host record, X.1949, Hindwood.

♂. Occipital margin virtually straight; vertical bristle black, much shorter than notopleural bristle, only 2× as long as postvertex; postvertex 1/4 as long as wide, anteriorly truncate. Relative width of head, eye, face and postvertex 49 : 10 : 26 : 31; inner orbit *ca* 1/2 as wide as mediovertex; orbital setae all pale; upper orbital bristle also pale, lower one black and 1/4 longer than vertical bristle. Frons proper distinctly shorter than lunula, with rather broad anterior notch. Palpus shorter (23 : 27) than eye. Gula posteriorly with pale fine setae as well as black stiff ones which are subequal in length to one another. Mesonotum 44×62; major bristles all long and shining black; laterocentral setal patch of prescutum including 7-8 black bristles which are hardly shorter and paler than other major bristles and which distinctly surpass level of transverse mesonotal suture. Scutellum 13×32. Metapleurotergal callus with 2-3 black stiff setae and some paler finer ones. Prosternum well sclerotized. Wing 3.1 mm long; vein *rm* situated distinctly distad to level of R_1- apex and 2× closer to *im* as to C- apex; bulla of M_{1+2} situated slightly distad to midlength of cell *2bc*. Tarsal spines 1.0.0.0/1.1.1.0/? ?. Hindleg (?). Syntergite 1+2 with black ordinary setae at anterolateral area; chaetotaxy of abdominal membrane (?); genitalia (?). Other characters similar to *lonchurae* as described.

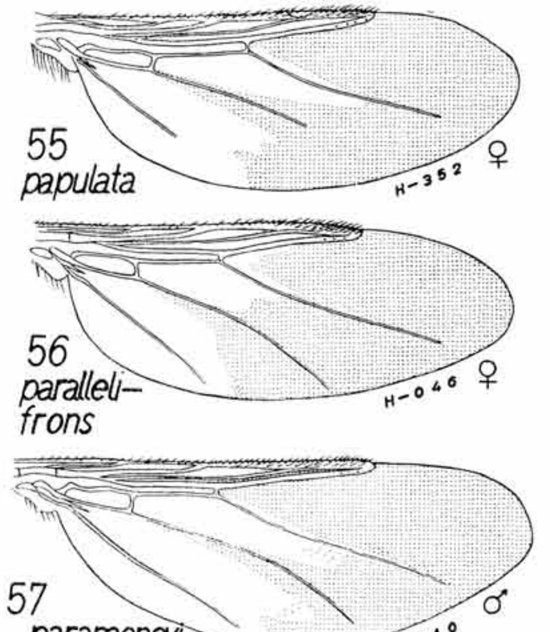


Fig. 55-57. *Icosta (Ornithoponus)* species, Parallelifrons group, wings, magnifications varied.

Parallelifrons Group

Distribution. Confined to the Oriental (2 species) and Australian (1 species) Regions.

Host Relationships. Monoxenous; on Psittacidae (*Cacatua*).

Diagnosis. Face moderately wide; palpus only *ca* 2× as long as wide. Laterocentral bristles of prescutum always present; major thoracic bristles often shortened and discolored. Wing practically clear hyaline, anterior veins yellowish, setulae not extensive. Abdomen largely or almost entirely covered with pale short setae, with conspicuous patches of strong bristles on dorsum; tergite 3 always present, ♀ laterite 7 almost always absent, ♀ pregenital plate always absent. Aedeagus short, bulged at base. Sexual dimorphism weak.

Affinities. In the color pattern, this group simulates the Simplex and Minor groups, whereas in shape of palpus and aedeagus, it approaches the Albipennis group. The ♂ postgenital plate is simple, not Y-shaped as in the Minor and Albipennis groups. By summation of general features, the Parallelifrons group may be considered a connectant between the subgenera *Ornithoponus* and *Ardmoeca*. The 3 species included are very closely related to one another.

Icosta (Ornithoponus) parallelifrons (Speiser) Fig. 4, 7, 18, 26, 56, 58, 59.

Olfersia parallelifrons Speis., 1902b: 336. Type destroyed, ex (?) bird, NW New Guinea; neotype ♂ (Bishop 7582), here designated, in Bishop Mus., ex *Cacatua galerita triton*, Sepik Distr., NE New Guinea.

Icosta cacatuae Maa, 1967: 269, nom. nud.

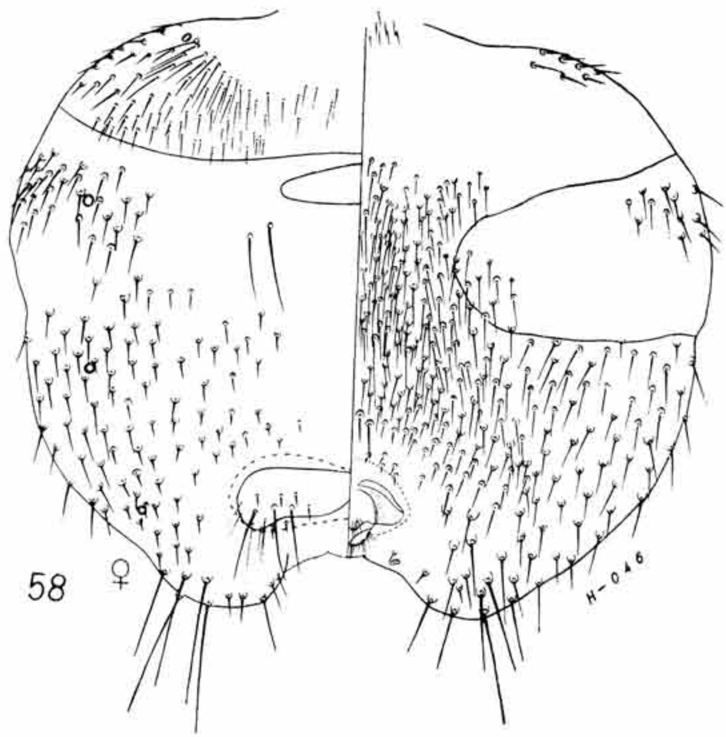
NW NEW GUINEA: 1♂, 1♀, Vogelkop Penin., Kebar Valley, 550 m, ex *Cacatua galerita*, BBM 722, I.1962, Quate. 2♂♂, Oransbari, NW side of Geelvink Bay, ex *C. galerita*, BBM 22346, 22417, I-II.1963, Richards & Thompson. 1♂, Nabire, N of Geelvink Bay, ex *C. galerita*, BBM 21560, VIII.1962, Clissold. NE NEW GUINEA: Neotype ♂, May R., Sepik Distr., ex *C. galerita triton*, BBM 22617, V.1963, Temple. 1♀, Bulolo, 900 m, ex *C. galerita*, HC 42, III.1962, Clissold. SE NEW GUINEA: 1♀ (MCZ), Dobadura, ex *C. galerita*, U. S. Typhus Comm. #462. 1♂, Embi Lakes, 100 m, ex *C. galerita*, BBM 29316, X.1963, Clissold; 5♂♂, 6♀♀, *id.*, cockatoo, BBM 29318, 29336. 1♂, 2♀♀, Jumbora, 60 m, ex cockatoo, BBM 29351, X.1963, Clissold.

AUSTRALIA: 1♂ (ANIC), Grafton, N. S. Wales, ex *C. galerita*.

Habitats. New Guinea and eastern Australia, lowland, up to 900 m, apparently confined to Psittaciformes: Psittacidae, particularly preferring *Cacatua* (*Cacatua*) *galerita*. Highest density per infestated bird was 3♂♂, 6♀♀ (BBM 29336 ex cockatoo), average 2.2 flies.

Systematics. This species is known so far from the original description. The unique type has never been re-examined by later authors and was recently destroyed. There is a single New Guinea specimen in the Mus. Comp. Zool. Harvard labeled by Bequaert as *parallelifrons* but apparently referable elsewhere (see under *jactatrix* n. sp.). Due to lack of any topotypes fitting the description, it was not placed by me (1963: 119) in any subgeneric group.

Fig. 58-59. *Icosta (Ornithoponus) parallelifrons* Speis.: 58, ♀, abdomen; 59, ♂ abdomen including genitalia.



58 ♀

59 ♂

parallelifrons

The original description reads "Die Art steht der *O. papuana* Rnd. [=*plana* Wk.], deren Original-Exemplar ich vergleichen konnte, ausserordentlich nahe, lässt sich aber sicher dadurch unterscheiden, dass die Stirn an sich breiter ist als bei *O. papuana* Rnd., und ferner vorne über den Antennen genau ebenso breit ist als am Scheitel, während bei *O. papuana* Rnd. die Augenränder nach vorn derart convergieren, dass die Stirn vorn beträchtlich, oder doch merklich schmäler ist als am Scheitel. Auch sind die Maxillarpalpen, welche die Rüsselscheide bilden, bei der neuen Art etwas kürzer und breiter. Länge des trocken aufbewahrten Exemplars 3 mm. gegen 3.5 bei Rondani's Art. Die Länge Mundrand-Scutellar-Hinterrand ist aber bei beiden gleich, 2.5 mm und auch die Länge der Flügel bei beiden 4.5 mm. Dattelbraun mit dunklerer Stirn und helleren, dunkel ledergelben Beinen. Kopf rundlich, nur etwa 2/3 so breit, wie der Thorax. Die Innenränder der Augen verlaufen fast genau parallel, so dass die Stirn vorn über den Antennen ganz ebenso breit ist, wie hinten oben am Scheitel. Stirn matt, nur an den Rändern etwas glänzend. Antennenfortsätze klein, mit einem ziemlich kräftigen Büschel schwarzer Borsten, dunkelbraun. Die die Rüsselscheide bildenden Maxillarpalpen kurz, nicht ganz halb so lang als der Kopf, und breit, etwas halb so breit als lang, ebenfalls dattelbraun. Der Thorax bietet keinerlei Besonderheiten, ebenso wenig die Biene, welche ganz ledergelb sind, mit schwarzen Krallen. Auch über das, beim vorliegenden Exemplar stark zusammengetrocknete Abdomen ist nichts zu bemerken. Sehr interessant ist das Flügelgeäder, und fast möchte ich glauben, dass der hier vorliegende, von unsern europäischen Olfersien ganz abweichende Befund genügen würde, eine neue Gattung zu schaffen. Mindestens ist er zur Abgrenzung einer Artengruppe innerhalb der alten Gattung sehr brauchbar. Bei oberflächlicher Betrachtung hat man nämlich den Eindruck, als münde die Radialis nicht in die Costalis, sondern in der Cubitalis! Die Verhaltnisse liegen aber thatsächlich anders. Jenseits der Einmündung der Subcostalis beginnt die bis dahin schmale Costalis sich beträchtlich zu erweitern, sie wird gewissermassen aufgeblasen ... Dass die Flügel selbst fast glashell und die gewöhnlichen Adern ledergelb, wie die Beine sind. Ihre Anordnung ist sonst die gewöhnliche, wie sie *O. papuana* Rnd. und der Mehrzahl der andern Arten zukommt. Die Krallen sind regelrecht doppelt gezahnt, d.h.sie haben je einen accessorischen Zahn zwischen Basalhöcker und eigentlichen Krallenhaken."

Specimens here referred to *parallelifrons* match the original description in every detail and leave no doubts about their identity. The venation as shown in fig. 56 is not so outstanding as strongly emphasized by Speiser. In fact, the thickening of C after meeting R_1 and the seemingly direct joining of R_{2+3} and R_{4+5} at their apices is a feature common to many *Icosta* species. The close affinities of *parallelifrons* to *plana* (=*papuana*) as presumed by Speiser are merely superficial similarities in size, color pattern and several features of head and thorax. Among the *Icosta* species of New Guinea, *parallelifrons* can immediately be recognized by its nearly clear hyaline wings, and secondarily by the short palpus and broad face. It can easily be distinguished from *plana* by these characters as well as the broadly rounded vibrissal area. The nearly parallelsided face is not so distinctive as believed by Speiser.

This species is closely related to both *papulata* and *paramonovi* but has much darker and stronger abdominal setae.

♀. *Color* very pale, dorsally pale brownish, ventrally whitish; in pinned specimens, mesonotum brown, darker than face, humeral callus and scutellum which are entirely or largely yellow; wing almost colorless, anterior veins yellowish. *Head*: (fig. 18) Occipital margin straight; vertical bristle pale, as long as notopleural bristle; postvertex very short. Face very wide, nearly parallel-sided; orbital setae uniseriate. Frons proper short, narrowly roundly notched at middle, frontal process in dorsal aspect fairly broad, weakly tapering apicad, in profile very broadly rounded-off. Palpus (fig. 4) 1/2 as long as eye. Gula posteriorly with pale soft setae. *Thorax*: (fig. 26) Mesonotum 38×53; humeral (and often postalar and scutellar) bristle pale, notopleural and mesopleural ones black; prescutum sparsely, very feebly striate all over, latero-central setal patch composed of both short and long setae, long ones 3-5 in number, more than 2× as long as short ones, not reaching transverse mesonotal suture. Scutellum 10.5×25, its posterior margin evenly convex. Metapleurotergal callus with 4-6 black stout spines. Prosternum (fig. 7) large, transverse, moderately sclerotized, with 4-5 pairs of short soft setae. Wing (fig. 56) 4.7-5.2 mm long; setulae not extensive, *3r* and *1m* setulose except basal corners, *2m*+*1a* with fairly large antero-apical setulose patch, other cells entirely bare. Anterior surface of femur 1 with fine sparse setae all over, with 2-3 black strong erect ones near midlength. Tarsal spines 1.1.1.0/2.1.1.0/10-11.2.1.1; tarsomere 1 of midleg ventrally with 4-5 short, unusually stout setae besides above mentioned spines; tarsomere 1 of hindleg 19×6, slightly longer than 2+3+4, distinctly longer than 5, tarsomere 2 as long as wide; 3 and 4 weakly asymmetrical. *Abdomen* (fig. 58) with dorsal setae stouter than ventral ones; dorsal striolate area hardly setose, occasionally with 1-2 unusually long stout setae posterolaterad to tergite 3; ventral setae near lateral margin distinctly more robust and usually darker than on median and submedian areas; urogenital area anteriorly fenced by few black erect robust setae and a number of ordinary pale

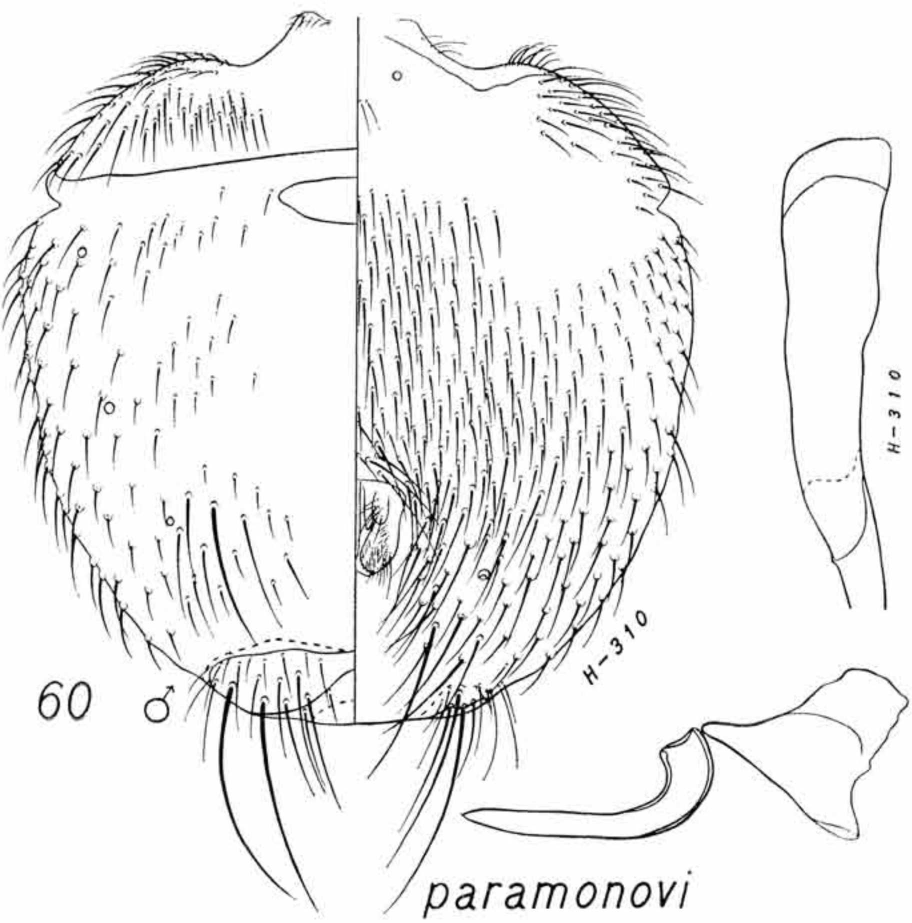


Fig. 60. *Icosta* (*Ornithoponus*) *paramonovi* Maa, ♂ abdomen including genitalia.

recumbent fine ones; lateral area of abdominal apex produced lobe-like and bearing numerous stiff bristles which are much longer than on tergite 6. Setae on lateral part of syntergite 1+2 slightly shorter than those near spiracles 4 and 5; tergite 3 fairly large; tergite 6 moderately large, anteriorly bare, posteriorly not notched, or only slightly so at middle, and with 3-4 pairs of unusually short bristles. Laterite 2 with setae not more robust than near spiracles 4 and 5; laterite 3 in matured specimens dorsally undefinable, evenly setose, ventrally well sclerotized, unusually large, wider than long, largely bare, with few short fine setae near inner and outer margins; laterite 7 undefinable. Postgenital plate bare; infra-anal plate apically deeply incised at middle, apical 1/3 with some fine setae, remaining area bare except 3-4 short erect setae along oblique ridge between plate proper and its basal flap.

♂. Similar. Basal 1/2 of cell *1m* bare. Tarsus 1 with 1.0.0.0 spines. Syntergite 1+2 laterally with long setae; tergite 3 small; tergite 6 rather small, posteriorly broadly, deeply notched at middle and with long bristles. Laterite 2 spinose; laterite 3 hardly definable, its venter evenly setose, with some spines near anterior margin. Dorsal abdominal membrane (fig. 59) with a patch of 30-40 long dense stout bristles on each side, lateral area of abdominal apex not lobe-like but with setae much longer and more robust than elsewhere. Aedeagus moderately long, slender and apically straight; paramere also slender and apically straight, narrowly rounded at extreme apex. Postgenital plate simple, apically with fine pale setae mixed with few short

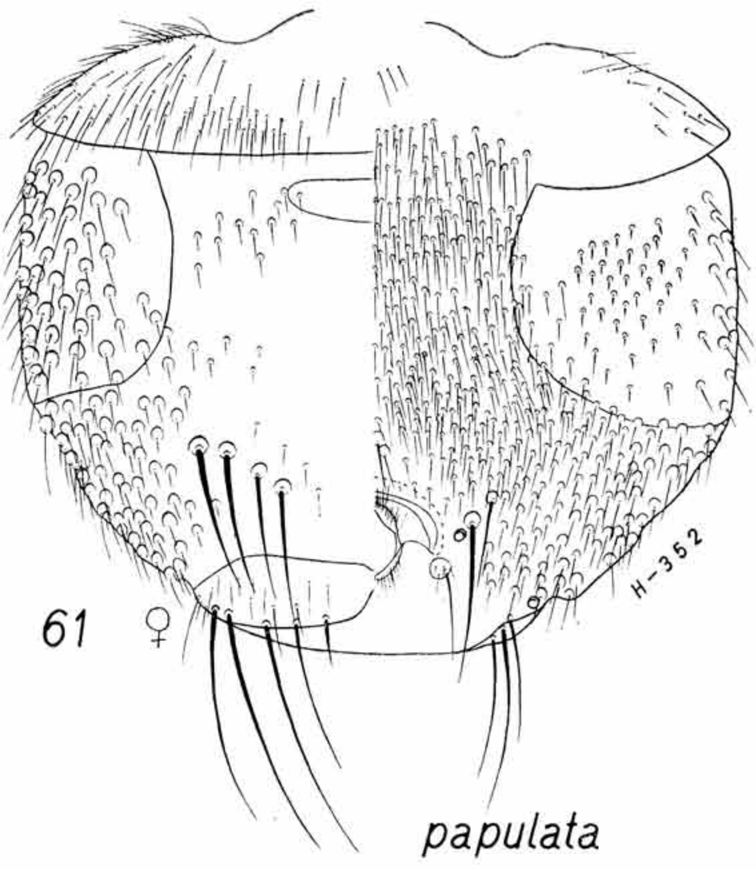


Fig. 61. *Icosta (Ornithoponus) papulata* Maa, ♀ abdomen.

black spines.

Icosta (**Ornithoponus**) **paramonovi** Maa, new species Fig. 7, 57, 60.

MATERIAL. 2♂♂, 2♀♀. Holotype ♀ (ANIC), allotype ♂ (BISHOP), paratypes (ANIC). 11384G
AUSTRALIA: Holotype ♀, "S. Australia", ex *Cacatua r. roseicapilla*, XI.1928. Allotype ♂, 3 km N of Wilpena Pound, N. Flinders Range, S. Australia, ex *C. r. roseicapilla*, XI. 1951, Brown. Paratypes 1♂, 1♀ (ANIC), nr Deneliquin, N. S. Wales, ex *C. r. roseicapilla*, VIII.1950, Spence. Besides the type series, I briefly examined years ago several S. Australian specimens received from Queen Victoria Museum, Launceston. They are believed to be referable here but no direct comparison with the type series was made then.

Habitats. Confined to Australia and obviously to Psittaciformes: Psittacidae. At present known from N. S. Wales and S. Australia ex *Cacatua* (*Eolophus*) *roseicapilla* Vieillot. Both the subgenus and species of this bird are endemic to Australia.

Systematics. More closely related to *papulata* of the Lesser Sunda Is. than to *parallelifrons* of New Guinea-Australia. This is perhaps due to the existence of an early faunal bridge between the Sundaland and Australia via Timor and Key Is. As shown in the key, couplets 10–11, chief differences of the 3 species are the color, relative length, density and robustness of setae-bristles on legs and abdomen. Named in honor of the late Dr S. J. Paramonov.

♀. Very similar to *parallelifrons*, differing in following characters. Occipital margin hardly convex. Orbital, vertical and all major thoracic bristles pale, in contrast with black bristles at antennal apex. Prosternum as in fig. 7. Wing (fig. 57) 4.5 mm long; cell *2r* setulose at apical 1/2, *1r* and *1bc* with few setulae near apex, setulose stripe of *2m+1a* narrower. Abdominal membrane on each side with group of 3 or 4 very strong bristles anteriorly to tergite 6; lateral area of abdominal apex not produced lobe-like, bearing only 2 or 3 stiff bristles which are shorter than on tergite 6. Tergite 3 small; bristles on tergite 6 of normal length, i.e. *ca* 2× as long as tergite itself. Laterite 2 with pale fine setae and scattered short black spines. Laterite 3 well defined both dorsally and ventrally, its dorsum longer than wide, with 2 or 3 short black spines and good number of pale soft setae, venter nearly as long as wide, with pale soft setae on outer margin, elsewhere with short black spines.

♂. Similar. Abdomen as in fig. 60. Lateral setae on syntergite 1+2 about as long as near spiracles 4 and 5; tergite 3 slightly larger than in ♀; tergite 6 shorter than in ♀, posteriorly straight, with 5-6 pairs of long bristles. Laterite 2 with pale soft setae; laterite 3 ventrally smaller and bearing fewer spines than in ♀. Lateral area of dorsal abdominal membrane uniformly covered with short sparse setae, posteriorly with 6-7 moderately strong bristles near each side of dorsal striolate area; ventral membrane entirely covered with pale fine setae.

Icosta (**Ornithoponus**) **papulata** Maa, new species Fig. 4, 7, 17, 25, 55, 61.

MATERIAL. 1♀. Holotype (BISHOP 7583). INDONESIA: Holotype ♀, Komodo I., ex bird BBM 85228, VIII.1965, Stusak.

Habitats. At present known only from Komodo, a small islet between Sumbawa and Flores in the Lesser Sunda Is.; host bird undetermined, possibly *Cacatua* (*Cacatua*) *sulphurea* Gmelin, a close relative of *C.* (*C.*) *galerita* Latham.

Systematics. Very closely allied to *parallelifrons* of New Guinea-Australia and particularly to *paramonovi* of Australia. As suggested by its name (*papula*, a pimple, a pustule), this new species is chiefly characterized by large prominent papillae giving rise to pale short setae on abdominal membrane. The 2 groups of black strong bristles lying before tergite 6 are similar to those in *paramonovi*.

♀. *Color* very pale, almost entirely yellowish white, darkest on occiput immediately above foramen, anterior margin of prescutum, posterior rims of thoracic spiracles, claws and abdominal syntergite 1+2; thorax with 1 pair of brownish stripes each between humeral calli, mesad to notopleural bristles and below humeral calli. *Wing* practically colorless, very thin, anterior veins very weakly tinted yellowish. *Head* (fig. 17) and *thorax* (fig. 25) similar to *parallelifrons*, palpus and frontal process as in fig. 4 and 7 respectively, occipital margin very weakly convex, all major bristles pale, mesonotum 35×47, scutellum 11×23, laterocentral bristles of prescutum more than 4× as long as laterocentral setae and reaching transverse mesonotal suture, metapleurotergal callus with pale spines, wing (fig. 55) 4.6 mm long, anterior surface of femur 1 with 3-4 pale spines near midlength (in contrast to black bristles on dorsal surface), tarsal spines 1.1.0.0/2.1.0.0/13(8+5).2.1.1. *Abdomen* (fig. 61) with pale very fine short setae covering entire

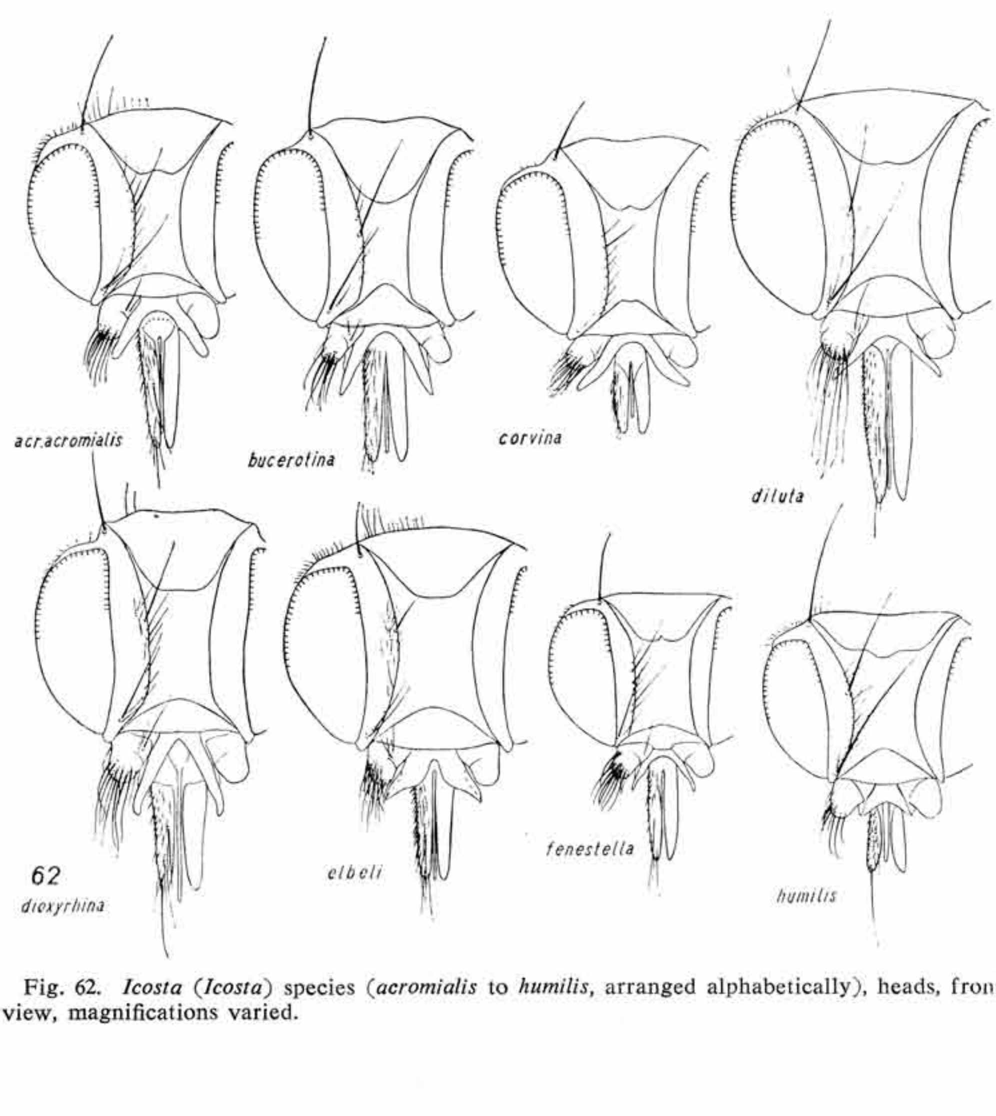


Fig. 62. *Icosta (Icosta)* species (*acromialis* to *humilis*, arranged alphabetically), heads, front view, magnifications varied.

membranous area, basal papillae of such setae at lateral areas exceptionally large, giving the surface fairly roughened appearance; 1 pair of patches of 3-4 black strong bristles lying shortly before tergite 6. Syntergite 1+2 entirely covered with short pale setae; dorsal striolate area virtually bare; tergite 6 with longer stronger pale setae plus 7± pairs of long black bristles, its posterior margin distinctly notched at middle. Laterite 3 pale, though well definable, dorsum covered with pale short setae similar to those on syntergite 1+2, venter with shorter stronger setae; laterite 7 roundish, vestigial, exceedingly small, bearing 1 black bristle and 3-4 pale setae of varied length. Urogenital area anteriorly fenced with 6 erect setae which are hardly longer and stronger than recumbent setae on disc of abdominal venter, each side flanked by 3 strong black bristles including the one on laterite 7. ♂ unknown.

Subgenus **Icosta**, s. str.

TYPE-SPECIES. *Olfersia dioxyrhina* Speis.

Distribution. Palaeotropical; 23 species and subspecies: 18 in Oriental and 5 in Ethiopian Region; mostly rather localized.

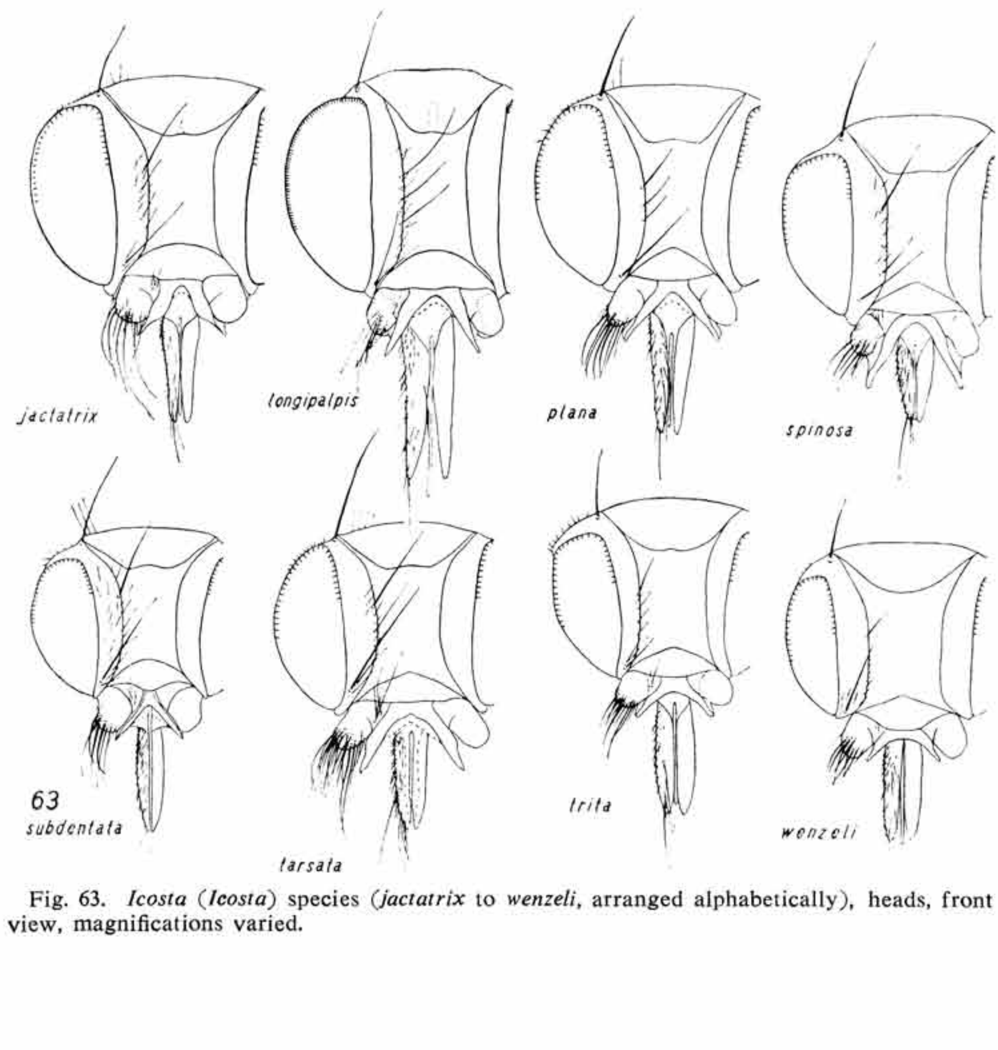


Fig. 63. *Icosta* (*Icosta*) species (*jactatrix* to *wenzeli*, arranged alphabetically), heads, front view, magnifications varied.

Host Relationships. One species polyxenous, all remaining ones mono- or oligoxenous. Preferred hosts are Falconi-, Psittaci-, Galli-, Cuculi-, Coracii-, Pici- and Passeriformes.

Diagnosis. Frontal and vibrissal processes strongly produced and separated from each other by a distinct notch or incision; when occasionally not so, then tarsomeres 3 and 4 of foreleg distinctly asymmetrical, or metasternal process well developed, or frontal process in dorsal view strongly narrowed apicad and with inner margin distinctly curved in S-shape. Palpus never very short. Aedeagus slender, usually long. Sexual dimorphism weak to strong.

Affinities. This subgenus can usually be recognized by the tooth-like frontal and vibrissal processes which are also found in the genus *Pseudolynchia*. Following the inclusion of 4 anomalous species (*wenzeli* in Oriental, and *recessa*, *subdentata*, and *humilis* in Ethiopian Region), the subgenus has to be defined upon certain alternative or conditional characters. The asymmetrical fore tarsus is unique for all hippoboscids and the well developed metasternal process is found only in the genera *Stilbometopa* and *Pseudolynchia* rather than in other subgenera of *Icosta* itself. But those 2 characters are again not universal for the entire subgenus although in some species, they are linked with the well developed frontal and vibrissal processes. The subgenus is here placed next to *Ornithoponus* with which it has probably been primary branching-outs from the common ancestor of *Icosta*. Its similarities to *Stilbometopa* and *Pseudolynchia* mentioned above very likely represent secondary convergence. The subgenus is here rather arbitrarily divided into 2 groups, 7 subgroups. The separation of the different groups and species is not always easy and the following key is admittedly artificial.

Key to species and subspecies of Icosta (Icosta)

1. Vein R_{2+3} normal, evenly or nearly evenly narrow; its combined width with C, after merging together, not or hardly wider than apical section of R_{4+5}; when wing has bare stripe along anal margin, then vibrissal area in profile toothlike, strongly projecting 2
   Vein R_{2+3} (fig. 69) abnormal, its apical 1/2 suddenly widened and coalescent with C, their combined width, after coalescence, nearly 2× as wide as apical section of R_{4+5}; wing with fairly broad bare stripe along anal margin; vibrissal area in profile broadly rounded, not projecting. W. & E. Africa .... **coalescens**

2(1). Frontal process (fig. 6, *humilis, recessa, subdentata, wenzeli*) in profile broadly rounded, not projecting, not clearly separated from vibrissal area except in color and in degree of sclerotization; vibrissal area also broadly rounded, at most subdentate and hardly projecting 3
   Frontal process (fig. 6, *dioxyrhina* etc.) in profile sharply projecting, toothlike, clearly separated from vibrissal area by deep sharp notch; vibrissal area also toothlike and distinctly projecting 6

3(2). Cell *2m+1a* (fig. 80, 135) bare at posterior 1/3; *2a* entirely bare; *2bc ca* 1/2 to 2/5 as long as *1bc* 5
   Cell *2m+1a* (fig. 75, 82) uniformly setulose, at most with very small bare area near base, *2a* with tiny patch of setulae at its anteroapical corner; *2bc* only 1/3 as long as *1bc* 4

4(3). Vibrissal area (fig. 6) broadly rounded; metasternal process *ca* 2× as wide at base as long, narrowly rounded at apex; frontal process (fig. 62) in dorsal view 1/2 as long as palpus; occipital margin weakly concave at middle. W. Africa .... **humilis**

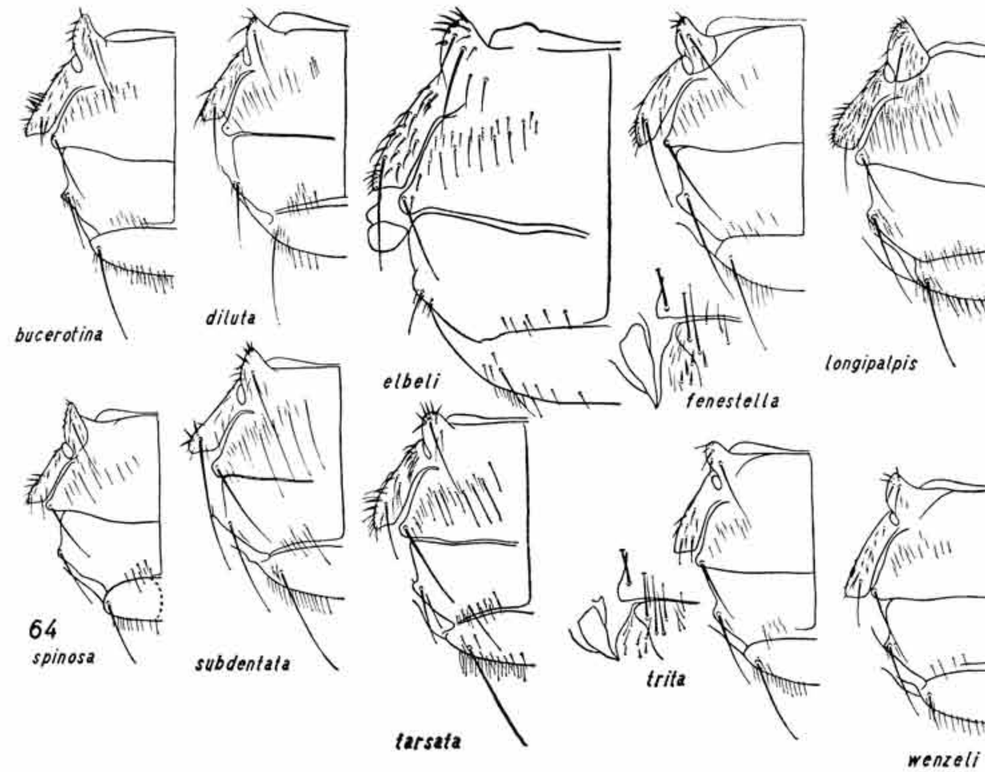


Fig. 64. *Icosta* (*Icosta*) species (arranged alphabetically), thoraces, dorsal view, magnifications varied; also for *fenestella* and *trita*, lateral view in part showing absence of spines on mesepimerum in latter species.

Vibrissal area (fig. 6) sharply angular, slightly projecting; metasternal process almost as wide at base as long, pointed at apex; frontal process (fig. 63) in dorsal view *ca* 1/3 as long as palpus; occipital margin straight at middle. E. Africa .... **subdentata**

5 (3). Vibrissal area (fig. 6) broadly rounded; segments 3 and 4 of tarsus 1 (fig. 10) distinctly asymmetrical, their outer apical lobes distinctly longer than corresponding inner lobes; frontal process (fig. 63) in dorsal view gradually narrowed apicad and with practically straight inner margin. Philippines .... **wenzeli**

Vibrissal area (fig. 6) angular; segments 3 and 4 of tarsus 1 symmetrical, not as above; frontal process (as in fig. 62, *elbeli*) in dorsal view unusually broad, suddenly narrowed apicad from about midlength, its inner margin curved in S-shape. E. Africa .... **recessa**

6 (2). Wing (fig. 77) 8.5-9.5 mm long, entirely covered with setulae except posterior 3/4 to 2/3 of cell *2a* where it is bare; palpus (fig. 3, 63) much longer than mediovertex. E. Pakistan to Philippines .... **longipalpis**

Wing not more than 7.5 mm long, setulae not so extensive, cell *2a* at most with few setulae at antero-apical corner, never forming complete stripe along vein 2A; cell *2m+1a* often bare at posterior 1/2 to 1/3; palpus almost always distinctly shorter than mediovertex 7

7 (6). Scutellum normal, with evenly curved posterior margin; frontal process in dorsal

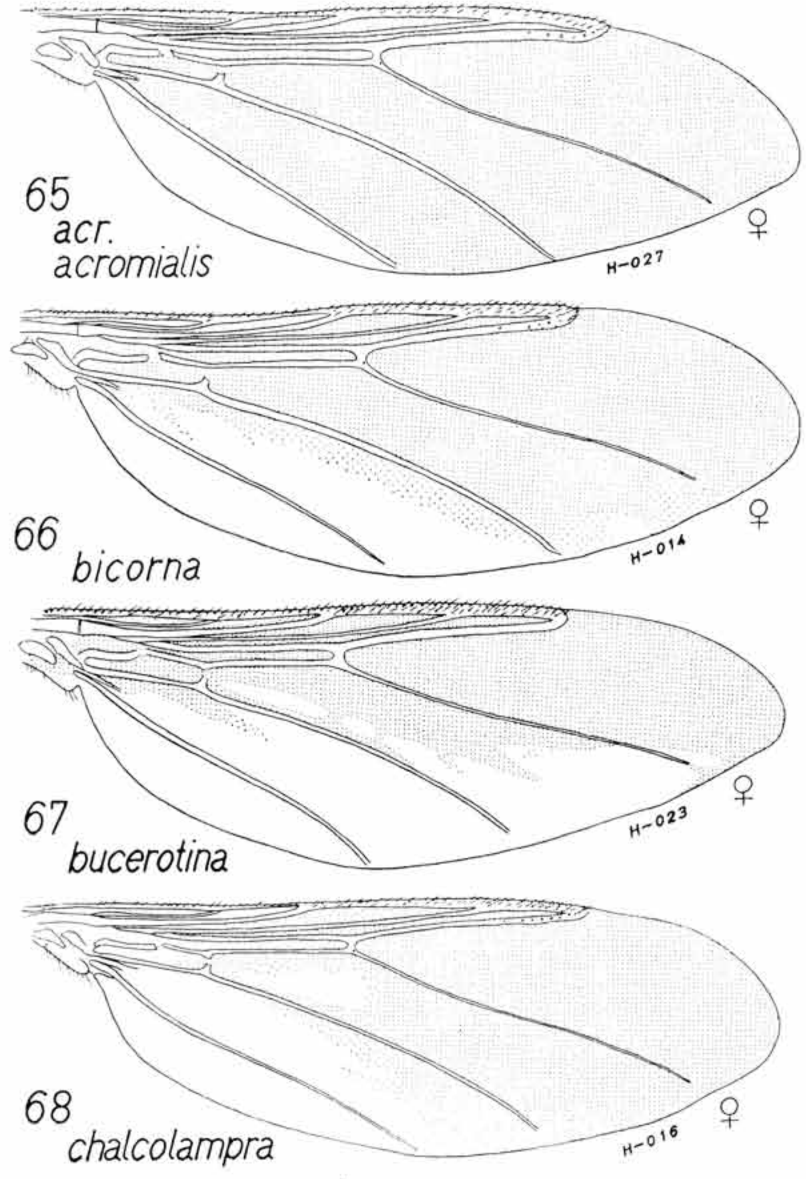


Fig. 65-68. *Icosta* (*Icosta*) species, *acromialis* to *chalcolampra*, wings, magnifications varied.

view also normal, gradually narrowed apicad, with practically straight inner margin 9

Scutellum (fig. 64, *elbeli*) unusually short, posteriorly subtruncate; frontal process (fig. 62, *elbeli*) in dorsal view unusually broad, suddenly narrowed apicad from about midlength, its inner margin curved in S-shape 8

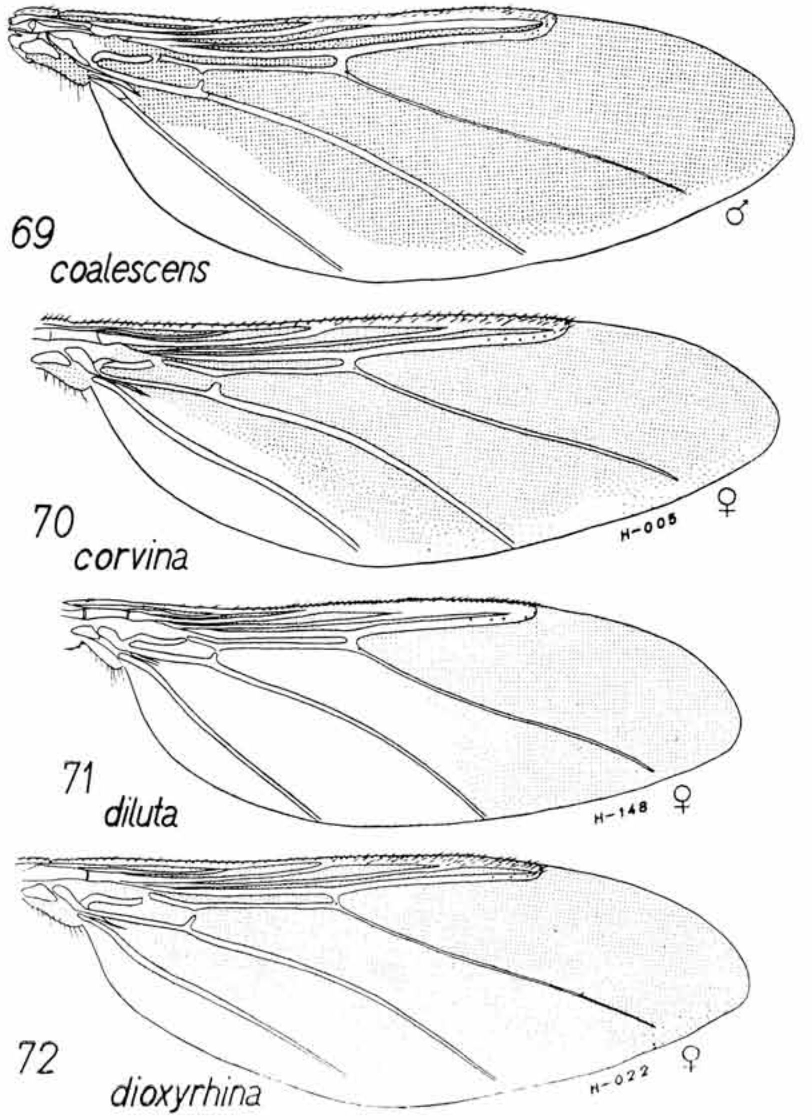


Fig. 69-72. *Icosta* (*Icosta*) species, *coalescens* to *dioxyrhina*, wings, magnifications varied.

8 (7). Wing (fig. 73) 6.2-6.6 mm long, setulose area of cell $2m+1a$ in ♀ triangular, much longer than wide, with 1 side of that triangle lying along apical 3/4 of abscissa 2 of vein M_{3+4}; scutellar bristle (fig. 64) markedly finer and often paler than vertical and other major bristles; ♂ abdominal dorsum with lateral setae much more robust than sublateral setae. Assam to Philippines..**elbeli**

Wing (fig. 76) 4.6-5.1 mm long, setulose area of cell $2m+1a$ in ♀ transverse, lying on apical rather than anterior margin of that cell; scutellar bristle not noticeably finer

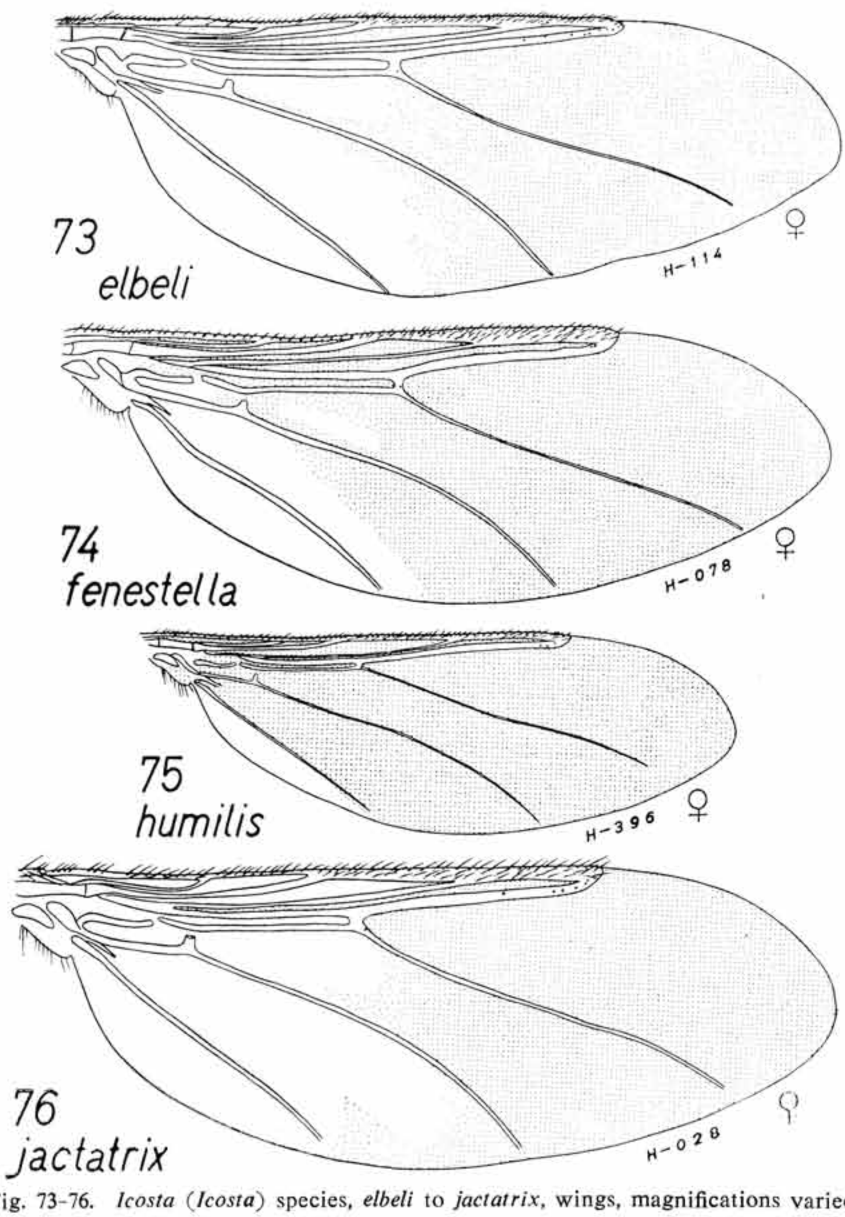


Fig. 73-76. *Icosta* (*Icosta*) species, *elbeli* to *jactatrix*, wings, magnifications varied.

than vertical and other major bristles, always black; ♂ abdominal dorsum with lateral and sublateral setae nearly equal in fineness. New Guinea .... **jactatrix**

9(7). Setulose area of wing posteriorly reaching or even surpassing vein 2A; abdominal dorsum never with conspicuous patch of bristles on membrane 10

Setulose area of wing posteriorly far from reaching vein 2A; abdominal dorsum often with conspicuous bristle-patches on membrane 12

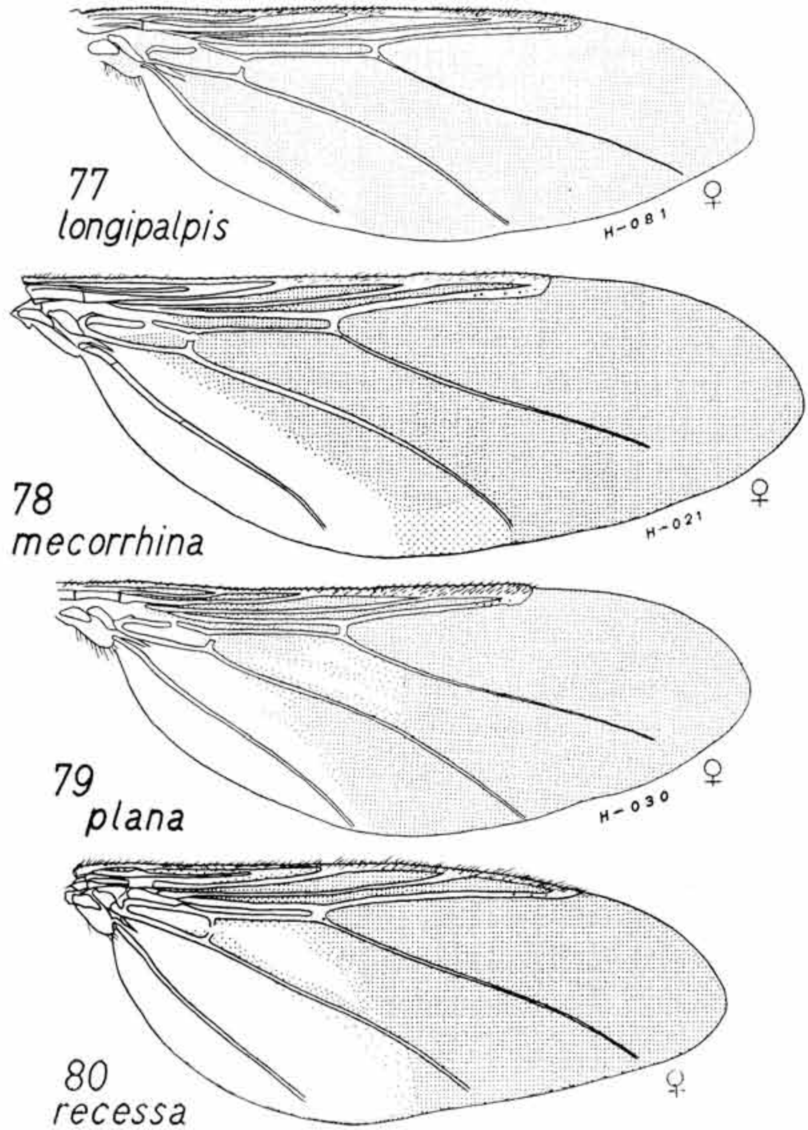


Fig 77-80. *Icosta* (*Icosta*) species, *longipalpis* to *recessa*, wings, magnifications varied.

10 (9). Wing lacking bare stripe along anal margin; metasternal process *ca* 1/2 as wide at base as long, narrowly rounded at apex; ♂ tibia 2 lacking preapical spines............ 11

Cell *3r* (in part), *1m* and *2m+1a* (fig. 72) with fairly broad bare stripe along anal margin of wing; metasternal process 2× as wide at base as long, pointed at apex; ♂ tibia 2 ventrally with series of preapical spines. Papuan Subregion.........**dioxyrhina**

11 (10). Female abdominal dorsum with 3-4 outstandingly long and robust setae mesad to each of spiracles, 3, 4 and 5; setae covering ♂ laterite 2 not longer (or hardly so)

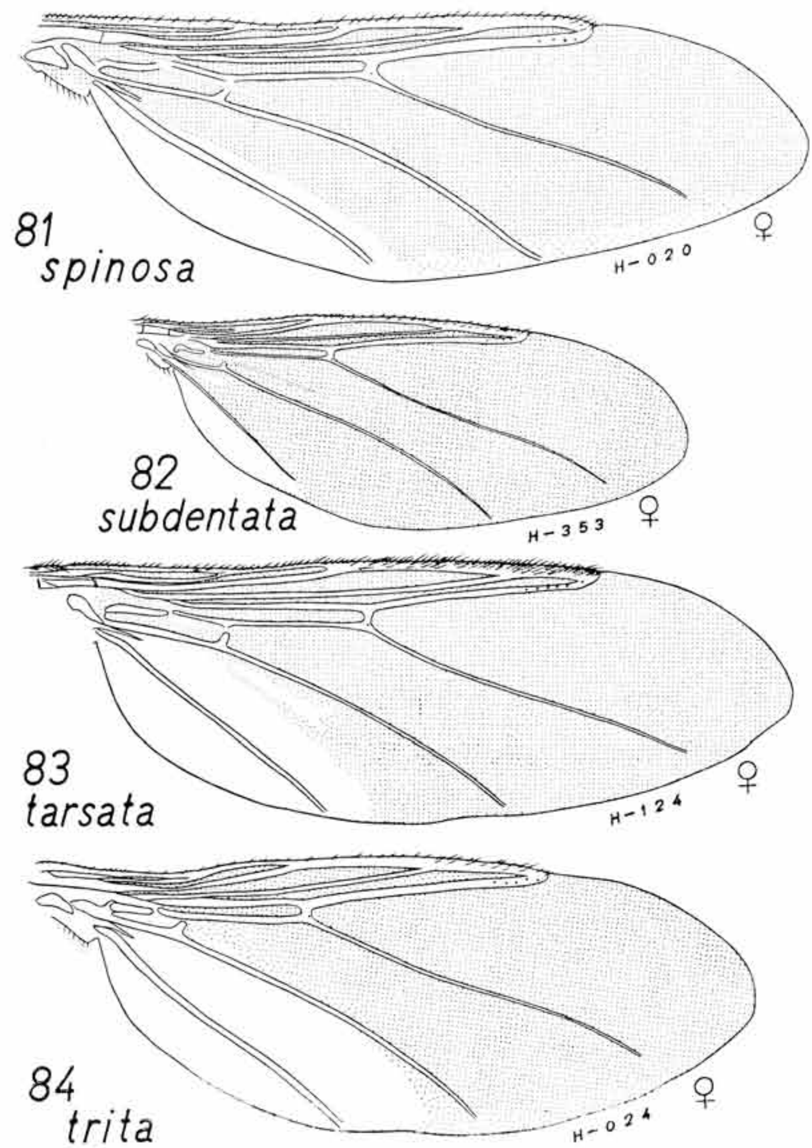


Fig. 81-84. *Icosta* (*Icosta*) species, *spinosa* to *trita*, wings, magnifications varied.

and stouter than those near spiracles 4 and 5; tarsomere 1 of ♂ midleg with single apical spine. Philippines... **a. tuberculata**

Female abdominal dorsum (fig. 107) lacking such setae, at most occasionally with 1-2 outstandingly long but not noticeably more robust setae mesad to spiracle 3 (not 4 and 5 as well); ♂ laterite 2 covered by spines (not ordinary setae) which are markedly longer and stouter than setae near spiracles 4 and 5; tarsomere 1 of ♂ midleg with 2 apical spines. Papuan Subregion .... **a. acromialis**

12 (9). Metasternal process about as wide at base as long or even longer than wide, acute or subacute at apex; segments 3 and 4 of tarsus 1 symmetrical; wing often with bare stripe along anal margin 19

Metasternal process undefinable, at most represented by slight waving (never acute or subacute) of posterolateral margin of metasternum; segments 3 and 4 of tarsus 1 more or less asymmetrical, their outer apical lobes more or less longer than corresponding inner lobes; wing never with bare stripe along anal margin 13

13 (12). Setulose area of cell *2m+1a* (fig. 68, 83, etc.) stretching along full length of abscissa 2 of vein M_{3+4}; cell *1m* either entirely setulose or at most with tiny bare patch or stripe at base 15

Setulose area of cell *2m+1a* (fig. 71, 140) confined to apical corners or apical margin of that cell; *1m* either extensively bare at basal 1/2 or with 2-3 setulose stripes at apical part 14

14 (13). Postvertex (fig. 62) trapezoidal, *ca* 1/2 as long as mediovertex; setulose area of cell *1m* (fig. 71) divided into 2-3 stripes; dorsal striolate area of abdomen (fig. 100) practically bare. New Guinea .... **diluta**

Postvertex subtriangular, slightly shorter than mediovertex; setulose area of *1m* (fig. 140) undivided; dorsal striolate area with scattered setae. Samoan Is............ **samoana**

15 (13). Basal 1/2 of anterior (inner) surface of femur 1 (fig. 8) fairly evenly setose; tarsus 1 (fig. 10) strongly asymmetrical; ♀ laterite 7 entirely undefinable, urogenital area anteriorly fenced by outstandingly long robust setae; ♂ laterite 3 with small patch of spine-like setae about as robust as those on lateral area of syntergite 1+2. Oriental Region, widespread.............................. **chalcolampra**

Basal 1/2 of anterior surface of femur 1 (fig. 8, *fenestella*) largely bare, with only few rows of setae along transmedian line and lower margin; tarsus 1 weakly asymmetrical; ♀ laterite 7 clearly definable, urogenital area not as above, anteriorly fenced by ordinary setae; setae on ♂ laterite 3 distinctly finer than those on lateral area of syntergite 1+2 16

16 (15). Wing 5.7-5.9 mm long; setae on basal 1/2 of anterior surface of femur 1 largely fine, subrecumbent (particularly those of lowest row), only those near extreme base short, robust, erect and somewhat similar to discal spines on coxa 1; prosternum (fig. 7) well developed, almost equally sclerotized as mesosternum and bearing 3-5 pairs of black setae. N. Thailand.............................. **tarsata**

Wing less than 5 mm long; setae on basal 1/2 of anterior surface of femur 1 largely or entirely spine-like, those arranged along transmedian line distinctly shorter and heavier than those near extreme base; prosternum not definable, or hardly so, never similarly sclerotized as mesosternum and never with black setae 17

17 (16). Setulose area of cell *2m+1a* long, broad, extending along full length of apical abscissa of vein M_{3+4}; mesepimerum with 3-5 very heavy spines besides ordinary setae; face and thoracic dorsum in fully matured specimens yellowish or reddish brown, lacking metallic lustre; ♂ syntergite 1+2 posterolaterally with 3 or more pairs of heavy spines; ♀ urogenital area anteriorly fenced by pair of patches of fine pale setae 18

Setulose area of cell *2m+1a* (fig. 84) triangular, confined to antero-apical corner of that cell; mesepimerum (fig. 64) at most with 1 spine, usually only fine setae; face and thoracic dorsum in fully matured specimens black with strong metallic lustre; ♂ syntergite 1+2 lacking heavy spines; ♀ urogenital area anteriorly fenced by single row of black setae. Burma to Taiwan .... **trita**

18 (17). Femur 1 (fig. 9) strongly swollen, widest at a point of *ca* basal 1/3, its anterodorsal edge generally with 5 bristles; frons proper with width only 1/2 its shortest

distance to eye-margin; frontal process (fig. 6) in profile distinctly longer, broader than vibrissal process; humeral callus in fully matured specimens not or hardly paler than mesonotum. New Guinea .... **plana**

Femur 1 (fig. 8) moderately swollen, widest very near midlength, its anterodorsal edge generally lined with 4 bristles; frons proper with width 4/5 its shortest distance to eye-margin; frontal process (fig. 6) in profile slightly longer, distinctly narrower than vibrissal process; humeral callus in fully matured specimens distinctly paler than mesonotum. Burma to Taiwan and Philippines .... **fenestella**

19 (12). Oriental species; frontal process in dorsal view not longer, usually much shorter than palpus; hind basitarsus ventrally with not more than 4 spines; aedeagus not as described below 20

Ethiopian species; frontal process in dorsal view markedly longer than palpus; hind basitarsus ventrally with 7-9 spines; aedeagus short and slightly decurved at apex .... **mecorrhina**

20 (19). Female abdominal dorsum (fig. 112) with only ordinary setae betwen tergite 3 and spiracle 3; ♂ tibia 2 ventrally lacking preapical spines; wing-setulae in ♀ (fig. 66) practically covering entirety of cell *1m* and anterior 1/3 of *2m+1a*, in ♂ covering anterobasal 1/2 of *1m* and forming short narrow stripe near anterobasal corner of *2m+1a*. Philippines .... **bicorna**

Female abdominal dorsum (fig. 110, 114-115) with conspicuous patch of heavy bristles between tergite 3 and spiracle 3; ♂ tibia 2 ventrally with series of preapical spines; wing-setulae not as described above 21

21 (20). Palpus not longer, or hardly so than frontal process and much shorter than mediovertex; venter of ♀ laterite 3 either partly spinose or with setae distinctly longer, stouter than dorsal setae near spiracle 3; wing-setulae not as below 22

Palpus (fig. 62) 1/2 longer than frontal process and subequal to mediovertex in length; venter of ♀ laterite 3 (fig. 115) with only ordinary setae similar in length and robustness to dorsal setae near spiracle 3; wing-setulae (fig. 67) in ♀ covering only basal 3/4 of cell *1m* and forming narrow stripe in *2m+1a* along basal 1/2 of vein M_{3+4}, in ♂ forming short narrow stripes along anterobasal margin of both *1m* and *2m+1a*; aedeagus (fig. 116) decurved at apex. Thailand .... **bucerotina**

22 (21). Venter of ♀ laterite 3 (fig. 114) with very heavy spines; spines between ♀ tergite 3 and spiracle 3 subequal in length to median part of tergite 6; ♂ cell *3r* posteriorly rather broadly bare, *1m* extensively bare, with narrow setulose stripes along anterior and posterior margins and very small setulose patches on apical margin; aedeagus (fig. 114) decurved at apex. Thailand, Laos .... **spinosa**

Venter of ♀ laterite 3 (fig. 110) with only ordinary stiff setae; spines between ♀ tergite 3 and spiracles 3 *ca* 2× as long as median part of tergite 6; ♂ cell *3r* posteriorly uniformly setulose, *1m* entirely setulose except along apical margin; aedeagus (fig. 111) straight at apex. Ceylon, India to Thailand .... **corvina**

Plana Group

Distribution. Palaeotropical; 11 species: 10 in Oriental and 1 in Ethiopian Region; nearly all species are fairly localized in distribution.

Host Relationships. One species polyxenous (and widely distributed), 1 or 2 monoxenous, remaining ones oligoxenous. Preferred hosts are Accipitridae, Psittacidae, Cuculidae, Alcedinidae, Capitonidae and several passerine families.

Diagnosis. Tarsomeres 3 and 4 of each foreleg more or less asymmetrical; metasternal process not or poorly developed; frontal process and scutellum sometimes abnormal in shape; aedeagus apically never hook-like. Sexual dimorphism fairly weak, only with abdominal chaetotaxy.

Affinities. Both in structure and in tendency of sexual dimorphism, this group shows closer affinities to the subgenus *Ornithoponus* than does the next group. Within the group itself, 3 subgroups may be recognized.

(a) Frontal process apically submembranous, broadly rounded in profile and separated from vibrissal area by very shallow angular notch; vibrissal area broadly rounded, hardly projecting; scutellum normal for the subgenus; cell *2bc* of wing 1/2 as long as *1bc*; tarsus 1 strongly asymmetrical; ♀ laterite 7 absent, urogenital area anteriorly not fenced by strong setae. On Psittacidae; 1 species: *wenzeli*.

(b) Frontal process in dorsal view unusually broad and with inner margin distinctly curved in S-shape, thus resulting in U-shaped frontal notch; vibrissal area more or less projecting, either angular or produced into tooth-like process; mesonotum short, scutellum either normal or unusually short and posteriorly subtruncate; cell *2bc* of wing clearly less than 1/2 as long as *1bc*; tarsus 1 hardly asymmetrical; ♀ laterite 7 present, urogenital area anteriorly not fenced by strong setae; aedeagus relatively short. On Alcedinidae and Cuculidae; 3 species: *recessa, jactatrix, elbeli*.

(c) Frontal and vibrissal processes and scutellum all normal for the subgenus; cell *2bc* of wing clearly less than 1/2 as long as *1bc*; tarsus 1 weakly to strongly asymmetrical; either ♀ laterite 7 present or urogenital area anteriorly fenced by strong setae. On Accipitridae, Psittacidae, Capitonidae, Muscicapidae, Dicruridae, Corvidae, Paradisaeidae; 7 species: *tarsata, trita, plana, fenestella, diluta, samoana, chalcolampra*.

Icosta (Icosta) wenzeli Maa, new species Fig. 5-7, 9, 10, 12, 63, 64, 85, 86, 135.

MATERIAL. 4♂♂, 6♀♀. Holotype ♀ (BISHOP 7584), allo- and 4 paratypes (BISHOP); 4 paratypes (CNHM). PHILIPPINES: Holotype ♀, Leyte I., Tambi Burauen, Mt Lobi Range, ex *Tanygnathus lucionensis talautensis*, B 1532, V.1964, Rabor. Allotype ♂, Leyte I., Paniniklan, Mt Kabalanti-An, Mahaplag, ex *T. lucionensis talautensis*, BBM 2995-96, VII. 1964, Wilson. Paratypes, 1♀, Balang-Balang, Mt Hilong-Hilong, Cabadbaran, Agusan Prov., Mindanao, ex *T. sumatranus everetti*, SU-PI 4365, IV.1963, Rabor. 1♂, 2♀♀ (CNHM), Maco, Tagum, Davao Prov., Mindanao, nr sea level, ex *Buceros hydrocorax mindanaensis* #1057, X.1946, Hoogstraal. 1♂, 1♀ (CNHM), Puerto Princesa, Palawan, nr sea level, ex *Centropus sinensis bubutus* #2465, III.1947, Werner; 1♀ (CNHM), *id.*, *Corvus enca pusillus* #2648, III.1947, Hoogstraal; 1♂ (CNHM), *id.*, found on skinning table.

Habitats. Chiefly Philippine Subregion, at present known from lowlands in Mindanao and Leyte islands, also spreading to Palawan which belongs to Malaysian Subregion. Breakdown of above-given data: Psittaciformes: Psittacidae (*Tanygnathus*) 3, Cuculiformes: Cuculidae (*Centropus*) 1, Coraciiformes: Bucerotidae (*Buceros*) 1, Passeriformes: Corvidae (*Corvus*) 1. Probably breeding on Psittacidae.

Systematics. This species is named after Dr Rupert L. Wenzel of the Chicago Nat. Hist. Mus. as a token of my gratitude for his help during my studies and for my admiration of his achievement in the study of New World Streblidae. It is an anomalous member of this species-group and can be distinguished immediately by the scarcely deve-

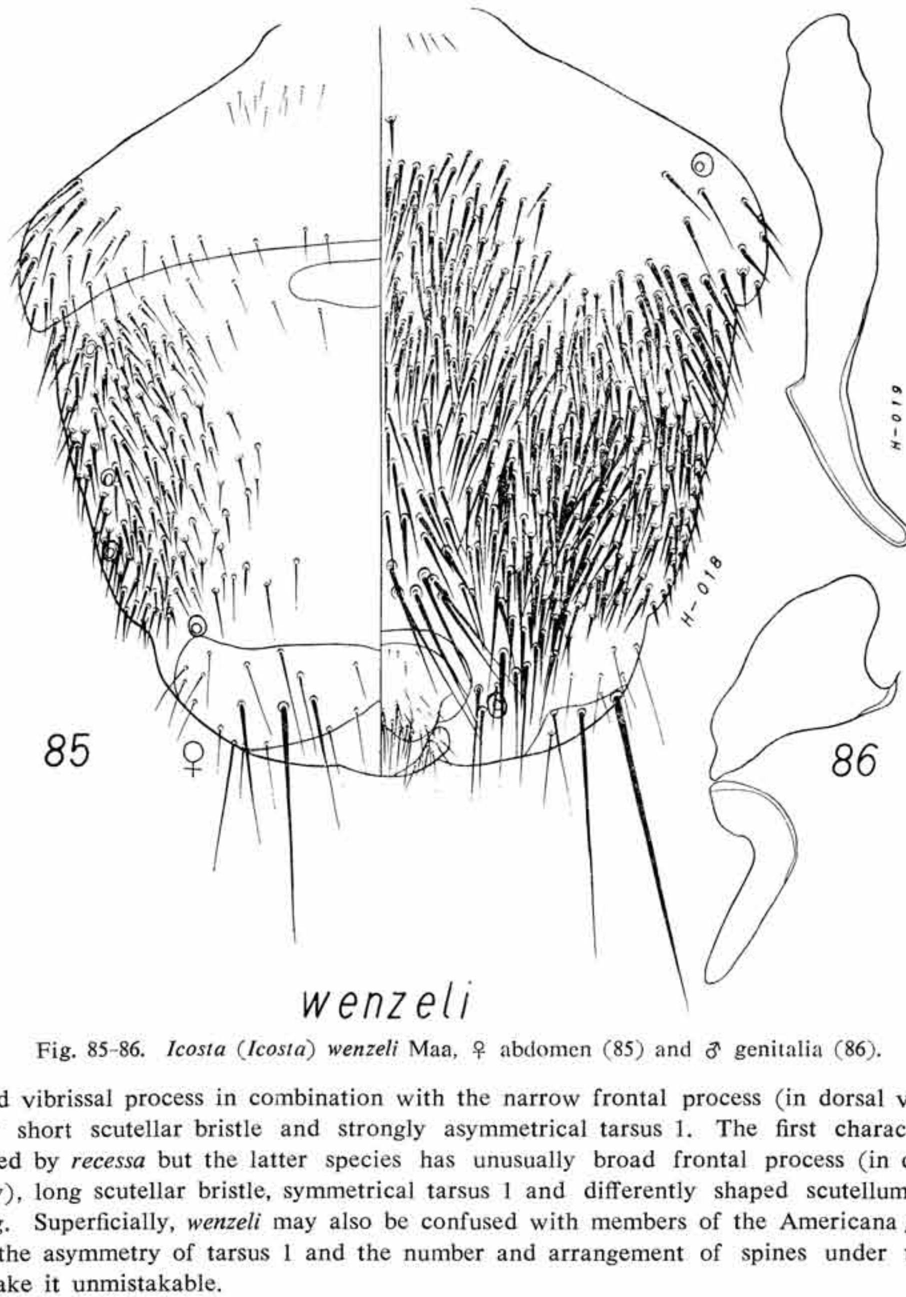


Fig. 85-86. *Icosta (Icosta) wenzeli* Maa, ♀ abdomen (85) and ♂ genitalia (86).

loped vibrissal process in combination with the narrow frontal process (in dorsal view), very short scutellar bristle and strongly asymmetrical tarsus 1. The first character is shared by *recessa* but the latter species has unusually broad frontal process (in dorsal view), long scutellar bristle, symmetrical tarsus 1 and differently shaped scutellum and wing. Superficially, *wenzeli* may also be confused with members of the Americana group but the asymmetry of tarsus 1 and the number and arrangement of spines under tarsus 3 make it unmistakable.

♀. *Color* fairly dark, wing weakly fuscous. *Head* (fig. 63): Occipital margin practically straight; vertical bristle 1/2-2/3 as long as notopleural bristle, often pale; postvertex short. Face wide, nearly parallel-sided. Frons proper short, very widely notched at middle; frontal process (fig. 6) less than 2/3 as long as palpus (fig. 5), apically almost membranous, in profile unusually short, broadly rounded at apex and separated from vibrissal process by very shallow angular notch. Vibrissal process in profile broad, broadly rounded, almost reaching same level of frontal process. Gula posteriorly spined. *Thorax* (fig. 64): Mesonotum 34×48; prescutum sparsely feebly striate all over; scutellum 10.5×26; posterolaterally rounded, posteriorly distinctly convex; scutellar bristle unusual, pale and slightly shorter than scutellum itself. Metapleurotergal callus with 2, rarely 3 spines. Prosternum (fig. 7) well sclerotized. Metasternal process hardly definable. *Wing* (fig. 135): 4.2–4.7 mm long; setulae covering all cells except *2m* +*1a* (posterior 1/2) and *2a*; *1m* usually with short narrow bare stripe near base; *2bc* 1/2 as long as *1bc*. *Legs*: Femur 1 (fig. 9) strongly swollen, basal part of its anterior surface very sparsely setose all over; anterior surface of femur 2 with 1 spine, with basal part largely bare. Tibia 3 as in fig. 12. Tarsal spines 1.1.1.0/2.1.1.0/3.2.1.1; tarsomeres 3 and 4 of foreleg (fig. 10) with outer apical lobes much longer than inner ones; tarsomeres 1 of hindleg 14×7, much shorter than 2+3+4 and as long as 5; tarsomeres 2–4 distinctly asymmetrical. *Abdomen* (fig. 85) with moderate long and robust setae; dorsal striolate area almost entirely bare; ventral setae on lateral area as long and robust as those on median area, although often darker, setae fencing urogenital area similar in robustness but longer than elsewhere on venter. Tergite 3 rather narrow; tergite 6 posteriorly concavely curved, with 4 pairs of bristles. Laterite 3 poorly sclerotized, with setae not longer (or hardly so) and more robust than near spiracles 4 and 5; laterite 7 undefinable. Postgenital plate with scattered minute setae.

♂. Similar. Foreleg with only 1.0.0.0 tarsal spine. Abdominal setae shorter. Aedeagus (fig. 86) short, apical part straight; paramere also short, apically gently decurved and narrowly rounded. Postgenital plate medially membranous, apical margin with 8–10 setae.

Icosta (Icosta) recessa (Maa) Fig. 4, 6, 7, 9, 10, 12, 80, 156.

Lynchia recessa Maa, 1964: 91, fig. 2–5, ♀. Type ♀ (GNV), ex (?) bird, Uganda.

MATERIAL. 2♂♂, 9♀♀. UGANDA: 3♀♀ (BMNH), Entebbe, ex *Centropus superciliosus*, IX.1951, Williams. 1♀ (MCZ), Bukinda, Kigezi, ex *Clamator caffer* #672, VII.1940, Hopkins. 1♂ (MCZ), Kampala, ex *C. caffer*, coll. Hopkins; 1♀ (MCZ), *id.*, *Centropus superciliosus* #423, VIII.1939; 1♀ (MCZ), *id.*, *Cent. superciliosus luandae*, I.1938, 1♂, 2♀♀ (MCZ), Kasokwe, Bunyoro, ex *Cent. monachus fischeri*, coll. Hopkins.

Habitats. Hitherto known only from Uganda. Probably breeding on Cuculiformes: Cuculidae (*Centropus*, *Clamator*).

Systematics. This is a rather isolated species and is placed here near the beginning of the subgenus because of the poorly developed frontal and vibrissal processes and the generalized features of tarsus 1 and abdomen. In the original description, it was placed in the Americana group and next to *dukei*, with which species it shares the angular vibrissal area and several other characters of minor importance. Following the discovery of the 2 new Oriental species *jactatrix* and *elbeli*, one of which is also parasitic on Cuculidae, it becomes very obvious that *recessa* is allied to them although the frontal, vibrissal and metasternal processes as well as scutellum in the last species is more generalized. A supplementary description follows. Vertical bristle nearly as long as notopleural bristle. Upper orbital bristle much finer than, and only *ca* 1/3 as long as, lower bristle. Frontal process (fig. 6) in dorsal view as in *jactatrix* and *elbeli*, in lateral view very broadly rounded off into vibrissal area, no incision or notch separating from latter. Vibrissal area angular, not protruding. Gula posteriorly lined with pale long setae. Palpus (fig. 4) shorter in proportion than in *elbeli*. Laterocentral setae of prescutum black, stiff, composed of both short and long ones. Scutellum normal in shape, posterior margin evenly convex. Prosternum (fig. 7) with 4-7 pairs of soft setae. Metasternal process absent. Wing 5.0-5.5 mm long; vein M_{3+4} at midpoint of its 2nd abscissa distinctly closer to M_{1+2} than to 2A, although when wing surface fully stretched (as in fig. 4 of original description, here reproduced as fig. 80) it is almost equidistant to those 2 veins. Femur 1 (fig. 9) moderately swollen, with 4-6 spines on anterior surface, basal part of anterior surface covered with suberect setae all over; anterior surface of femur 2 with 2± spines and evenly setose. Tarsus 1 and tibia 3 as in fig. 10 and 12, respectively. Tarsal spines 2.1.1.0/2.1.1.0/2.2.1.1 in both sexes. Abdominal syntergite 1+2 laterally with more strong spines in ♂ than in ♀; chaetotaxy on membranous area distinctly stronger and more numerous in ♂; laterite 3 not definable, or hardly so, its setae in ♀ hardly dissimilar to those on surrounding area, in ♂ strong and somewhat spine-like; ♀ laterite 7 not definable; setae forming lateral fence of urogenital area in ♀ long, in ♂ moderately long. Aedeagus (fig. 156) much shorter in proportion than in *elbeli*.

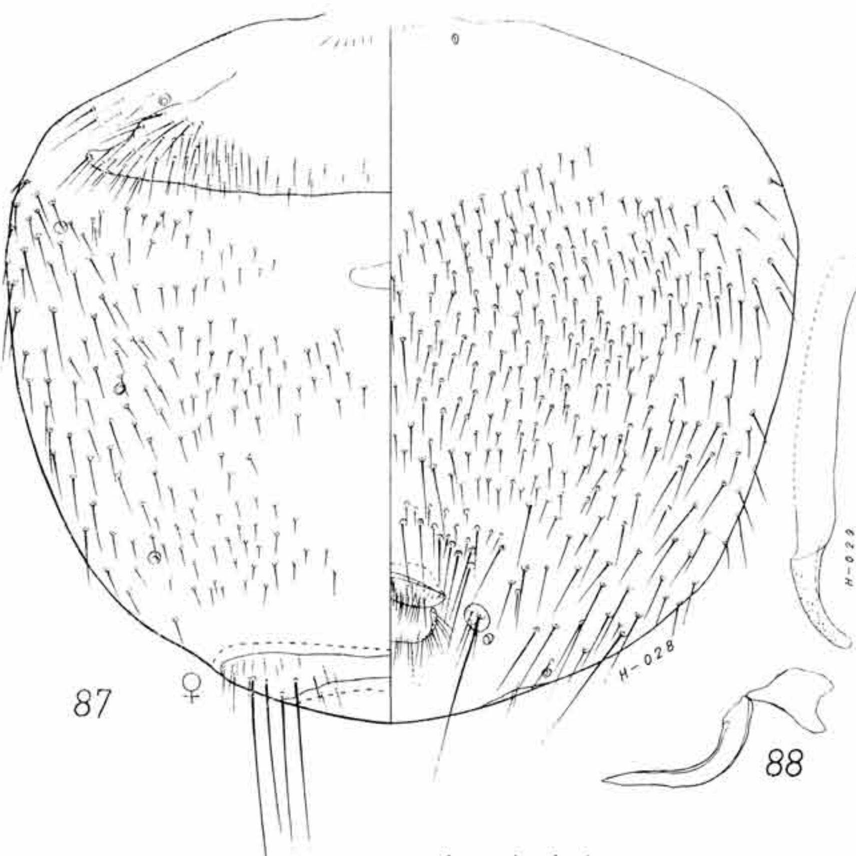


Fig. 87-88. *Icosta (Icosta) jactatrix* Maa, ♀ abdomen (87) and ♂ genitalia (88).

Icosta (Icosta) jactatrix Maa, new species Fig. 3, 6, 7, 10, 12, 63, 76, 87, 88.

MATERIAL. 3♂♂, 4♀♀. Holotype ♀ (BISHOP 7585), allotype and 4 paratypes (BISHOP), 1 paratype (MCZ). NEW GUINEA: 2♂♂, 1♀ incl. allotype ♂, Oransbari, NW of Geelvink Bay, 3 m, ex *Tanysiptera galatea*, BBM 22386, 22409, II.1963, Richards & Thompson. Holotype ♀, Ahola, 50 m, SE New Guinea, ex kingfisher BBM 29909, X.1963, Clissold; 1♀, *id.*, Amboga, 60 m, BBM 29929; 1♀, *id.*, Jumbora, 80 m, BBM 29536. 1♂ (MCZ), Dobadura, SE New Guinea, ex kingfisher #352, U. S. Typhus Comm., det. Beq. as *parallelifrons* Speis.

Habitats. New Guinea, lowland; possibly oligoxenous on Coraciiformes: Alcedinidae or kingfishers. The species seems very rare and its population density is unusually low.

Systematics. Jactatrix clearly serves as a connectant between *recessa* and *elbeli* both in structure and distributional ranges. Bequaert's interpretation of *parallelifrons* is not accepted here since the specimen involved obviously would not match the original description of that species. The name *jactatrix* (*iactator*, a boaster) is in allusion to the shape of frons.

♀. Similar to *elbeli* (next species) except for the following points. *Head* (fig. 63): Postvertex fairly long. Face moderately wide, narrowed anteriorly. Frontal process (fig. 6) more than 1/2 as long as palpus (fig. 3). Vibrissal process slightly shorter than wide at base. *Thorax*: Mesonotum 32×57; scutellar bristle normal; scutellum 9×32. Prosternum (fig. 7) more acute, usually with only pale fine setae; mesosternum shallowly notched anteriorly. *Wing* (fig. 76) 4.6-5.1 mm long; setulae less extensive, cells *sc* and *1r* practically entirely bare, *2m+1a* with only very small triangular setulose patch at antero-apical corner. Tarsus 1 and tibia 3 as in fig. 10 and 12, respectively. Tarsomere 1 of hindleg as long as 2+3+4 and as 5. *Abdomen* (fig. 87) very finely setose; setae on lateral area longer and more robust than on median ventral area; laterites 2 and 3 each with only 1-2 spines in addition to ordinary fine setae; laterite 7 small, roundish.

♂. As in ♀, scutellar bristle normal, cells *sc* and *1r* almost entirely bare, setae on lateral abdominal area slightly longer and much finer, and spines on laterites 2 and 3 fewer, longer and finer. Tarsal spines of legs 1 and 2 similar in robustness. Aedeagus (fig. 88) more slender. Other characters as in ♂ *elbeli*.

Icosta (Icosta) elbeli Maa, new species Fig. 3, 6-8, 10, 11, 62, 64, 73, 89, 90.

MATERIAL. 11♂♂, 27♀♀. Holotype ♀ (BISHOP 7586), allotype ♂ and most paratypes (BISHOP); 1 paratype each (BMNH, CNHM and MCZ).

ASSAM: Paratype ♀ (BMNH 1924. 100), Mungpoo, ex *Cuculus* sp., IV.1920, Senior-White.

BURMA: Paratype ♀ (MCZ), Myitkyina, ex *Centropus sinensis intermedius*, VI.1945.

THAILAND: 2♂♂, 3♀♀ incl. holo- and allotypes, Phang Nga, Muangthai-chang, ex *Phaenicophaeus d. diardi*, RE 6427, VII.1962, Wanit. 2♀♀, Chanthaburi, Khaosoidaotai, ex *C. sinensis* #2652, IV.1966, King. 1♂, 2♀♀, Ranong, Kapoe, Muangkluang, ex *C. s. intermedius*, RE 6947, XII.1962, Wanit & Wichit. 2♂♂, 12♀♀, *id.*, RE 7066, II.1963, Elbel. 1♂, 1♀, Ranong, Kapoe, Banghin, ex *C. s. intermedius*, RE 7082, II.1963, Wanit & Wichit. 1♂, Ranong, Kapoe, Muangkluang, ex *Phaenicophaeus tristis longicaudatus*, RE 7007, I.1963, Elbel. 2♀♀, Phang Nga, Thapput, Thamthonglang, ex *C. s. intermedius*, RE 7088, II.1963, Elbel. 2♀♀, Phang Nga, Kokhokhao, Khura, ex *C. sinensis*, WS 817, II.1964, Wanit & Wichit.

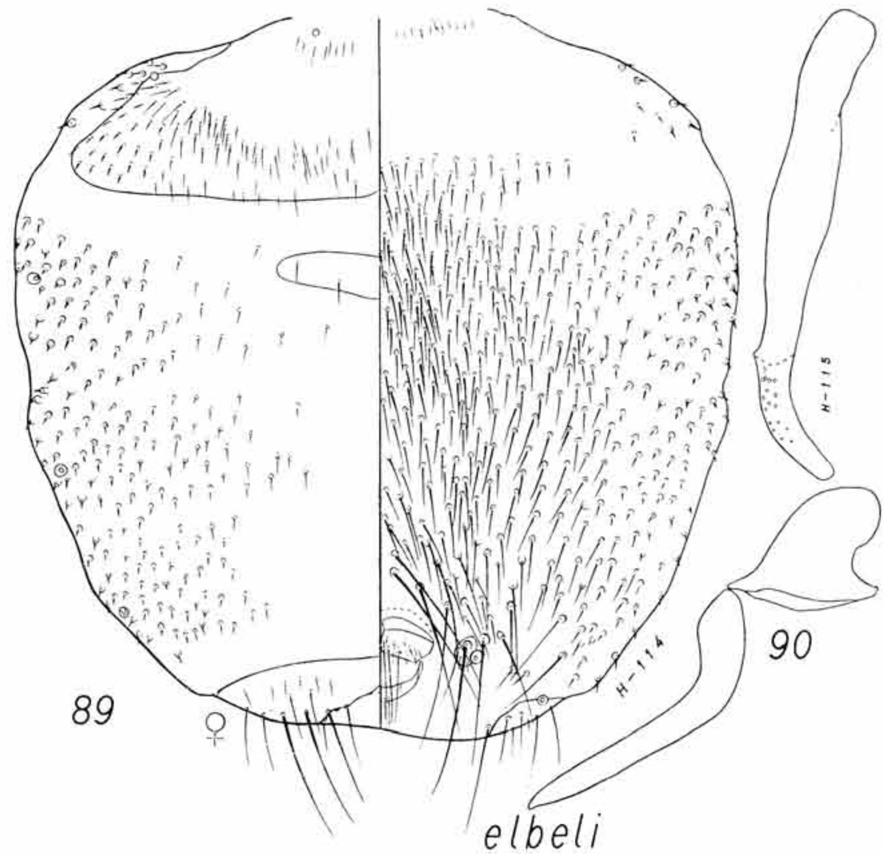


Fig. 89-90. *Icosta (Icosta) elbeli* Maa, Thailand, ♀ abdomen (89) and ♂ genitalia (90).

MALAYA: Paratypes, 1♂, 1♀, Selangor, ex *C. sinensis*, BL 3186, Lim.

BORNEO: Paratypes, 2♂♂, Ranau, Sabah, wooded area, ex *Phaenicophaeus curvirostris*, PJ 9223, IX.1960, Kuntz.

PHILIPPINES (Palawan): Paratype ♂, Macagua, Brooke's Point, ex *Ph. curvirostris*, BBM 761, III.1962, Thompson.

Habitats. Indo-Chinese and Malaysian Subregions, so far known from Assam, Burma, Thailand, Malaya, Borneo and Philippines (Palawan). Apparently breeding on Cuculiformes: Cuculidae (*Centropus, Phaenicophaeus*). Highest density per infested bird was 14 flies (RE 7066, ex *Centropus*).

Systematics. I take much pleasure in naming this interesting species after Dr Robert E. Elbel. It is very closely allied to *jactatrix* but a little more specialized in the thoracic bristles and abdominal setae. The different host preference of the 2 species provides another exceptional case of the parallelism of host-parasite evolution.

♀. *Color* dark, wing weakly fuscous. *Head* (fig. 62)· Occipital margin hardly concave, virtually straight at median section; vertical bristle 2/3 as long as notopleural bristle; postvertex short. Face wide, almost parallel-sided. Frons proper short; frontal notch somewhat U-shaped; frontal process (fig. 6) less than 1/2 as long as palpus (fig. 3), quite unusual in dorsal view, with basal 2/3 very broad and suddenly narrowed at apical 1/3, thus leaving inner margin distinctly S-shaped and extreme apex thin and leaf-like; in profile, entire process very gently recurved, apically narrowly rounded and anteriorly only slightly surpassing level of vibrissal process which is large, in profile normal, triangular, as long as wide at base. Gula posteriorly spinose. *Thorax* (fig. 64): Mesonotum 49×73; 1 humeral and 1 notopleural bristle; scutellar markedly finer and often paler than other major bristles; scutellum 14×40, posterolaterally rounded, posteriorly very weakly convex, practically straight at median section. Metapleurotergal callus usually with 3 spines. Prosternum (fig. 7) weakly sclerotized, with 2-3 pairs of short stiff setae. Metasternal process hardly definable. *Wing* (fig. 73): 6.2-6.6 mm long; setulae not extensive, not covering cells *1bc*, *2bc*, *1m* (basal 1/4) and *2a*; *2m+1a* with large triangular setulose patch which is about 2/3 as long as anterior margin and 3/4 of apical margin. *Legs*: Femur 1 (fig. 8) moderately swollen, basal part of its anterior surface uniformly covered with stiff setae; anterior surface of femur 2 with 2± spines, with small bare area at a point of basal 1/3. Tibia 3 as in fig. 11. Tarsal spines 2.1.1.0/2.1.1.0/3.2.1.1; tarsomeres 3-4 (fig. 10) of foreleg symmetrical; tarsomeres 1-4 of hindleg all asymmetrical; tarsomere 1 of same leg 15×7, as long as 2+3+4, slightly longer than 5, ventrally with 5-6 setae near base which are noticeably more robust and probably represented spines at same place found in all other groups in the genus except Minor. *Abdomen* (fig. 89) with short setae on dorsum, moderately long ones on venter; dorsal striolate area largely bare; setae on lateral area slightly stouter and often darker than those on median area; ventral setae fencing urogenital area longer and more robust than elsewhere. Tergite 3 narrow, tergite 6 with 4-5 pairs of bristles. Laterite 3 weakly sclerotized, and as in laterite 2, almost entirely covered with rather strong spines; laterite 7 large, elongate, with 4-6 setae and bristles. Postgenital plate with few minute setae.

♂. Similar. Cell *1m* largely bare, with narrow setulose stripes along anterior margin and near apical margin; *2m+1a* with only few setulae very narrowly along extreme apical margin. Tarsal spines on foreleg much weaker than on midleg. Aedeagus (fig. 90), short, apical 2/3 straight; paramere with apical part gently decurved. Postgenital plate short, very weakly bilobed, with few setae on apical margin.

Icosta (Icosta) tarsata Maa, new species Fig. 5-7, 10, 12, 63, 64, 83, 91-93.

MATERIAL. 1♂, 2♀♀. Holotype ♀ (BISHOP 7587) and paratype (BISHOP), allotype ♂ (USNM). THAILAND: 2♀♀ incl. holotype, Chiengmai, Doi Inthanon, ex *Myiophoneus caeruleus temminckii*, 5E 1518, XII.1964, Migr. Anim. Path. Surv. Allotype ♂ (USNM), Loei, Thali, Ban Muangkhai, *ca* 600 m, ex *M. caeruleus eugenei*, RE 4430, I.1955, Elbel.

Habitats. Thailand, 600-1000 m, known only from Passeriformes: Muscicapidae (*Myiophoneus*).

Systematics. Closely allied to *fenestella* but size much larger, face wider, palpus and tarsomere 1 of hindleg shorter and abdominal setae stronger. In size, it approaches *chalcolampra* but differs in the shape of face, palpus, tarsi 1 and 3 and in the abdominal chaetotaxy. The name *tarsata* refers to the unusually short tarsus 3, particularly segment 1.

♀. *Color* fairly dark, wing weakly fuscous. *Head* (fig. 63): Occipital margin hardly convex, with median 1/2 practically straight; vertical bristle slightly shorter than notopleural bristle; postvertex short. Face very wide, weakly narrowed anteriorly. Frons proper short; frontal notch broad, subangular; frontal process (fig. 6) slightly shorter than palpus (fig. 5), in profile gently decurved, apically pointed. Vibrissal process in profile normal, triangular, about as wide

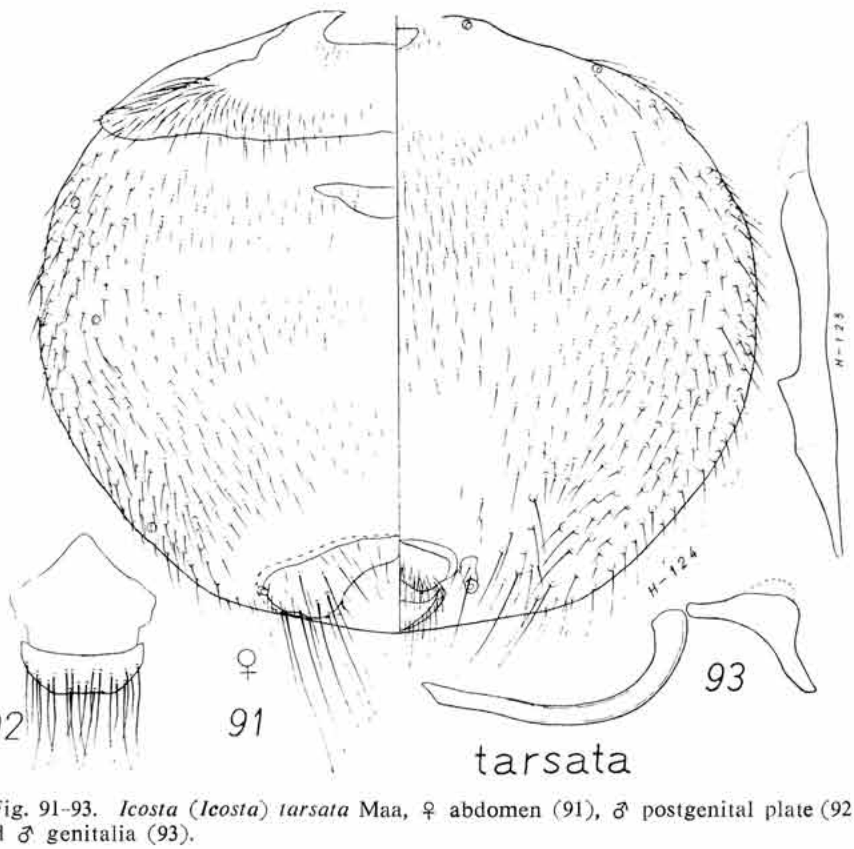


Fig. 91–93. *Icosta (Icosta) tarsata* Maa, ♀ abdomen (91), ♂ postgenital plate (92) and ♂ genitalia (93).

as apical part of frontal process and as long as wide at base. Gula posteriorly spinose. *Thorax* (fig. 64): Mesonotum 43×56; prescutum densely strongly striate all over; scutellum 12×28, posterolaterally rounded, posteriorly distinctly convex. Metapleurotergal callus bearing 5 spines. Prosternum (fig. 7) well sclerotized, bilobed, with 2–4 pairs of stiff setae. Metasternal process poorly developed, broadly rounded. *Wing* (fig. 83) 5.7–5.9 mm long; setulae covering all cells except *2m*+*1a* (posterior 1/2) and *2a*. Tibia 3 as in fig. 12. Tarsal spines 2.1.1.0/2.1.1.0/3.2.1.1; tarsomeres 3 and 4 (fig. 10) of foreleg with outer apical lobes practically as long as inner; tarsomere 1 of hindleg 13×9.5, subequal in length to 2+3 and 2/3 as long as 5; tarsomeres 2–4 of same leg weakly asymmetrical. *Abdomen* (fig. 91) with rather long and fine setae; dorsal striolate area with 3 groups of fine setae; ventral setae on lateral area longer and slightly more robust than on median area, those fencing urogenital area not noticeably longer and more robust. Tergite 3 narrow; tergite 6 with posterior margin deeply broadly notched, with 10± pairs of bristles. Laterite 3 not definable; 7 fairly large, with 3–4 bristles and 1–2 setae. Postgenital plate with scattered setae.

♂. Similar. Syntergite 1+2 posterolaterally with dense, very stout spines; tergite 3 large; setae around spiracle 3 of similar length and robustness as those around spiracles 4–5. Aedeagus (fig. 93) fairly short, slender and straight at apical part; paramere also apically straight. Postgenital plate (fig. 92) with 2± rows of setae.

Icosta (Icosta) trita (Speiser) Fig. 5–7, 9, 10, 12, 63, 64, 84, 94, 95.

Olfersia trita Speis., 1905a: 357. Type ♀ (GNV), ex *Megalaima franklinii ramsayi*, Tenasserim.

MATERIAL. 92♂♂, 107♀♀.

BURMA: 1♂ (MCZ), Myitkyina, ex *Megalaima a. asiatica*, II.1945, U.S. Typhus Lab., det. Beq. as *pollicipes* Ferr.! 1♀ (MCZ) *id.*, ex *M. zeylanica hodgsoni*,

THAILAND: 1♂, 1♀, Chiengmai, Banbokheo, ex *M. zeylanica hodgsoni*, V 425, II. 1962, SEATO Med. Res. Lab. 1♀ (CNHM), Kanchanaburi, Trakhanum, Hinlaem, left bank, ex *M. z. hodgsoni*, B 17068, XI.1952, Elbel. 1♀ (USNM), Loei, Thali, Bangmuangkhai, ex *M. incognita elbeli*, RE 4548, I.1955, Elbel. 1♂ (USNM), Loei, Dansai, Nahaeo, Banmuang, 1780 m, ex *M. z. hodgsoni*, RE 4108, X.1954, Elbel.

VIETNAM: 1♂, Kela, ex *Pycnonotus* #218, X.1960.

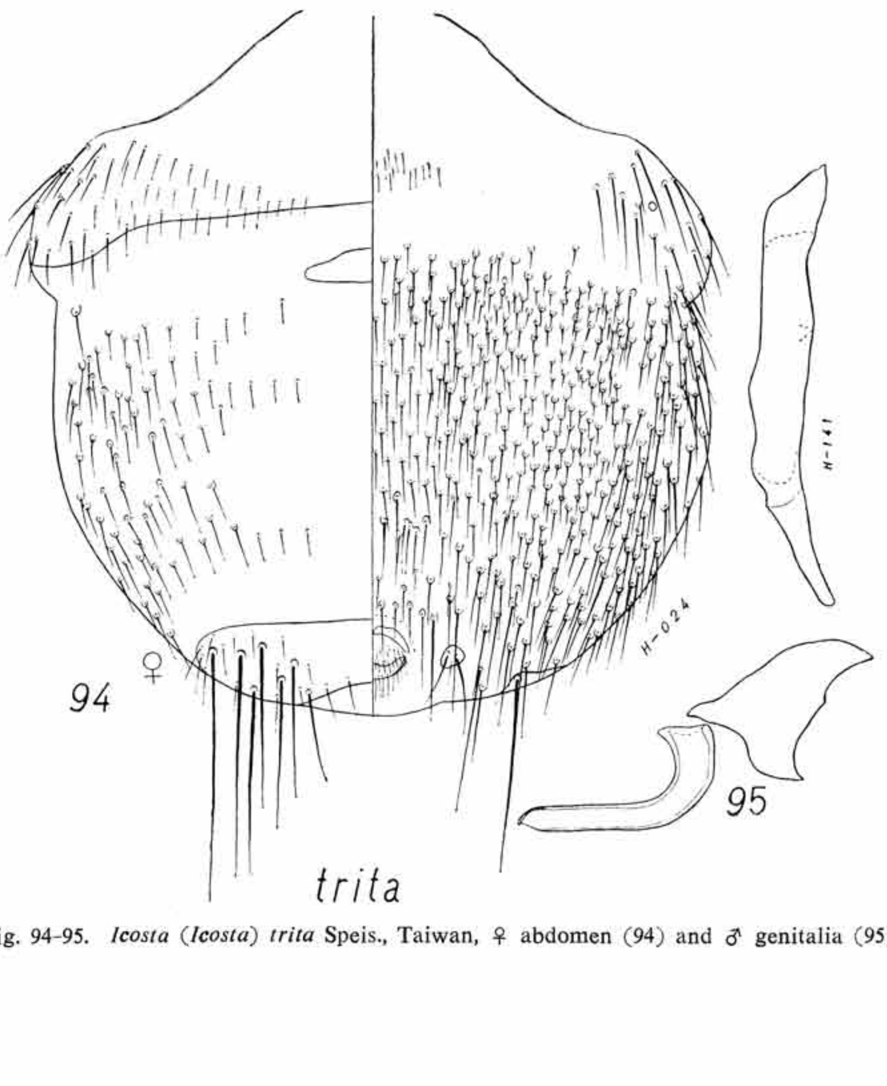


Fig. 94–95. *Icosta (Icosta) trita* Speis., Taiwan, ♀ abdomen (94) and ♂ genitalia (95).

TAIWAN: 53♂♂, 69♀♀, Liukuei, Kaohsiung hsien, ex *Megalaima oorti nuchalis*, TMT 1503, 1515, 1521, 1580, 1583, 1600, 1625–27, 1634–35, 1835, 1851–53, 1874–75, 1891–96, 1903, 1921–23, 1931, 1962, 1969–70, 1992–93, 1995–97, 2053–54, 2108, 2132–35, II–III.1964, Maa & Kuo. 32♂♂, 33♀♀, Tzepeng, Taitung hsien, same host, TMT 901, 950, 964, 971, 973, 977, 983, 985, 992, 996, 1002, 1016, 1039, 1044, 1070–74, 1086, 1116, 1119, 1125–30, 1133, 1152, 1174–75, 1197, 1203–05, 1231, 1247, 1296–97, 1361, 1374, I–II.1964, Maa & Kuo. 3♂♂, 1♀, Peiyuan tsuen, Tungho, Taitung hsien, same host, III.1965, Lin; 1♀, *id.*, I.1965, Ni.

Habitats. Indo-Chinese Subregion, at present known from Burma, Thailand, Vietnam and Taiwan, largely found in lowlands. Obviously confined to Piciformes: Capitonidae (*Megalaima*). The single record ex *Pycnonotus* was probably a straggler or a result of contamination. Highest density per infested bird was 5 flies (TMT 971, 1583, 1650, 1818, all ex *Megalaima*). In Taiwan, 36.3 % of 259 *Megalaima* were found infested and in average, 2 flies were collected ex each infested bird (Maa et al. 1965: 398). Obviously by oversight, Speiser (1908c: 304) wrongly listed *trita* as a Neotropical species.

Systematics. Bequaert (1953: 140, 272) confused *trita* with *pollicipes* [=*chalcolampra*] and suggested them to be possibly synonymous. In fact, the 2 species are different in body size, color, structure and host preference, and *trita* is a close relative of *tarsata* and *fenestella*. In addition to characters mentioned in the key, it can be easily separated from the last species by the smaller size, longer postvertex, shorter spines on femur 2, shorter tarsus 3, heavier abdominal setae and shorter stouter aedeagus. The unique type of this species is in rather poor condition, its wings are partly folded and partly missing.

♀. *Color* very dark, with metallic luster, wing weakly fuscous. *Head* (fig. 63): Occipital margin practically straight; vertical bristle slightly shorter than notopleural bristle; postvertex moderately long. Face fairly wide, weakly convergent forward. Frons proper rather long; frontal notch broad, rounded; frontal process (fig. 6) 2/3 as long as palpus (fig. 5), in profile broad, gently recurved, apically narrowly rounded. Vibrissal process in profile normal, triangular, as wide as apical part of frontal process, and as long as width at base. Gula posteriorly setose, with 1-2 spines intermixed. *Thorax* (fig. 64): Mesonotum 32×40; prescutum densely strongly striate all over; scutellum 8×21, posterolaterally rounded, posteriorly distinctly convex. Mesepimerum usually lacking, rarely with 1 spine. Metapleurotergal callus with 2-3 weak spines. Prosternum (fig. 7) transversely linear, entirely overlapped by mesosternum, with 1 pair of pale short setae. Metasternal process hardly definable, represented by very weak curvature of margin. *Wing* (fig. 84) 3.5-4.2 mm long; setulae extensive leaving only cells *2bc* (largely or entirely), *2m+1a* (largely) and *2a* (entirely) bare; *2m+1a* anteroapically with small triangular setulose area which is hardly longer than wide, not more than 1/4 as long as abscissa 2 of vein M_{3+4}. *Legs*: Femur 1 (fig. 9) strongly swollen, basal part of its anterior surface largely bare, with only few stiff setae along lower margin and near transverse row of spines; anterior surface of femur 2 with 5± short spines, its basal part largely bare. Tibia 3 as in fig. 12. Tarsal spines 2.1.1.0/2.1.1.0/2.2.1.1; spines on tarsus 1 generally weaker than on 2; tarsomeres 3 and 4 (fig. 10) of foreleg with outer apical lobes scarcely longer than inner lobes; tarsomere 1 of hindleg 11×7.5, shorter than 2+3+4 and than 5; tarsomere 2 of same leg distinctly transverse, 3 and 4 weakly asymmetrical. *Abdomen* (fig. 94) with rather stout setae; dorsal striolate area virtually entirely bare; ventral setae on median area long, fine, usually pale, those on submedian area short but stiff, on lateral area long and robust; setae fencing urogenital area longer or more robust than on ventral disc. Tergite 3 large; 6 posteriorly broadly notched, with 5± pairs of bristles. Laterite 3 not definable; setae near spiracle 3 similar in length and robustness to those near spiracles 4 and 5; laterite 7 large, with 2-3 bristles and 1-3 setae. Postgenital plate with scattered minute setae.

♂. Similar. Syntergite 1+2 and laterite 2 sparsely covered with spine-like setae; setae on laterite 3 normal. Aedeagus (fig. 95) short, rather robust and with apical part straight; paramere apically hardly decurved. Postgenital plate not bilobed, with few setae on apical margin.

Icosta (Icosta) plana (Walker) Fig. 4, 6, 7, 9, 10, 12, 63, 79, 96, 97.

Ornithomyia plana Wk., 1861: 254. Type (probably ♀), (BMNH), ex (?) bird, Vogelkop, New Guinea.

Olfersia papuana Rndn., 1878: 162. Type ♀ (GNV), ex (?) bird, Vogelkop, New Guinea.

MATERIAL. 13♂♂, 26♀♀. NW NEW GUINEA: 1♂, Vogelkop, Kebar Valley, ex *Paradisaea m. minor*, BBM 810, I.1962, Quate; 1♀, *id.*, *Pitta erythrogaster macklotii*, BBM 789. 2♀♀, Archbold Lake, ex *Pitohui kirhocephalus*, BBM 475, XII.1961, Quate. 1♂, Oransbari, 3 m, NW of Geelvink Bay, ex *P. ferrugineus*, BBM 22317, I.1963, Richards & Thompson; 2♂♂, 1♀, *id.*, *Cracticus cassicus*, BBM 22310; 2♀♀, *id.*, *C. quoyi* BBM 22424, II.1963. SW

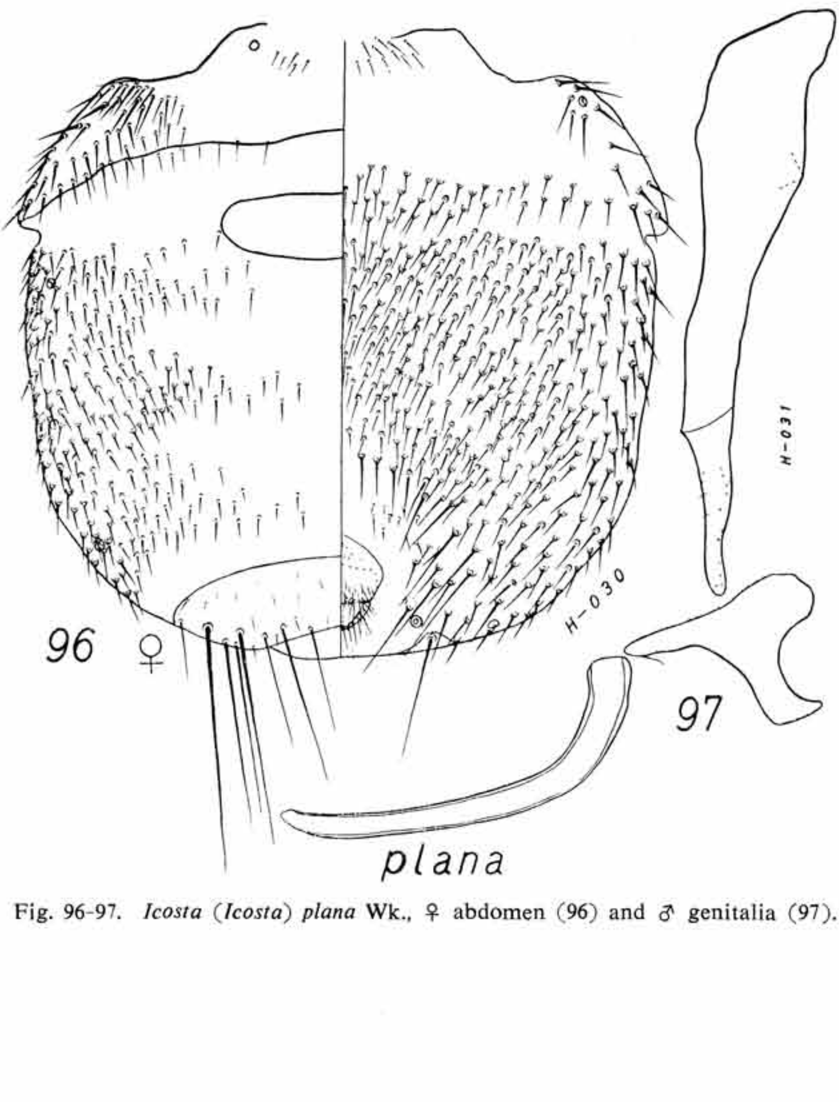


Fig. 96-97. *Icosta* (*Icosta*) *plana* Wk., ♀ abdomen (96) and ♂ genitalia (97).

NEW GUINEA: 3♂♂, 4♀♀, Bomberi, 700-900 m, nr Fak Fak, ex corvid TMP 22, VI.1959, Maa. NE NEW GUINEA: 1♀, Bulolo, 700 m, ex bird-of-paradise HC 72, III.1962, Clissold. 1♀, Bulolo, ex *Cracticus cassicus*, S 193, II.1962, Sedlacek; 1♂, *id.*, *Paradisaea raggiana*, S 170, I.1962. 3♀♀, Bulolo R., ex *Ailuroedus buccoides*, BBM 27840, 27846, V.1963, Shanahan. 1♂, Manke Mt, 900 m, ex bird-of-paradise HC 60, III.1962, Clissold. 1♀, Nakata Ridge, ex *Pachycephalopsis poliosoma*, BBM 27788, V.1963, Shanahan. 1♂, Songarin, ex bird-of-paradise, BBM 27741, IV.1963, Shanahan. 1♂, Wau, Morobe Distr., ex (?) bird-of-paradise, BBM 29008, VIII.1963, Clissold; 1♀, *id.*, *Oriolus szalayi*, HC 150, V.1962. 1♀, Wau Creek, ex *O. szalayi*, BBM 20400, III.1963, Clissold. SE NEW GUINEA: 2♀♀, Oriomo, ex *Ailuroedus crassirostris*, BBM 29577, II.1964, Clissold; 1♀, *id.*, bird-of-paradise BBM 29455; 2♀♀, *id.*, *Cracticus* sp. BBM 29567-68; 2♀♀, *id.*, dove BBM 29580, 50002; 1 ♂, *id.*, bird BBM 29557; 2♀♀, *id.*, bird BBM 29641. 1♂, Oriomo R., ex *Trichoglossus haematodus*, BBM 29384, II.1964, Clissold.

Habitats. New Guinea, lowland, up to 900 m. Probably breeding on small passerines, particularly Paradisaeidae. Analysis of available data follows. Columbiformes: Columidae ("dove") 2 records; Psittaciformes: Psittacidae (*Trichoglossus*) 1; Passeriformes: Pittidae (*Pitta*) 1; Muscicapidae 3 (*Pachycephalopsis* 1, *Pitohui* 2); Corvidae (genus indet.) 1; Oriolidae (*Oriolus*) 2; Cracticidae (*Cracticus*) 5; Ptilonorhynchidae (*Ailuroedus*) 3; Paradisaeidae 7 (*Paradisaea* 2, genera indet. 5). Highest density per infested bird was 2♂♂, 1♀ (BBM 22310 ex *Cracticus*).

Systematics. This species is so far known from very short and inadequate descriptions by Walker and Rondani (*l. c.*) and their types. It is a close relative of *fenestella* and by convenience, can be recognized by the pale pattern and slightly stouter abdominal setae.

♂. *Color* very pale, dorsally yellowish and ventrally whitish, wing very weakly tinted fuscous. *Head* (fig. 63): Occipital margin hardly concave; vertical bristle slightly shorter than notopleural bristle; postvertex short. Face wide, very weakly narrowed anteriorly. Frons proper short; frontal notch narrow, subangular; frontal process (fig. 6) 2/3 as long as palpus (fig. 4), in profile very broad, gently decurved, narrowly rounded apically. Vibrissal process in profile normal, large, triangular, slightly wider at base than long. Gula posteriorly spined. *Thorax*: Mesonotum 32×41; prescutum densely strongly striate all over; scutellum 9×23. Metapleurotergal callus with 4± spines. Prosternum (fig. 7) apparently not definable. Metasternal process poorly developed. *Wing* (fig. 79) 4-4.8 mm long; setula-distribution as in *fenestella*. *Legs*: Femur 1 (fig. 9) strongly swollen, basal part of its anterior surface largely bare, with only few spinules lined along lower margin and near transverse row of major spines; anterior surface of femur 2 with 5± spines, and with basal part largely bare. Tibia 3 as in fig. 12. Tarsal spines 2.1.1.0/2.1.1.0/2.2.1.1; tarsomeres 3 and 4 (fig. 10) of foreleg with outer apical lobes much longer than inner ones; tarsomere 1 of hindleg 16×6.5, slightly longer than 2+3+4, subequal to 5; tarsomeres 2-4 of same leg asymmetrical. *Abdomen* (fig. 96) very finely setose; dorsal striolate area with few scattered setae; ventral setae on lateral area distinctly more robust han on median area, those fencing urogenital area largely pale and very fine, but here and there mixed with 1 or 2 longer, more robust black ones. Tergite 3 fairly large; tergite 6 transversely rectangular, with 6-7 pairs of bristles. Laterite 3 hardly definable, its setae similar to those near spiracles 4 and 5; laterite 7 at most poorly definable, with 1 bristle and 1-3 setae. Postgenital plate with few minute setae.

♂. Similar. Syntergite 1+2 posterolaterally with some very stout spines; setae on laterite 3 hardly more robust than those near spiracles 4 and 5. Aedeagus (fig. 97) long, almost straight at apical part; paramere apically blunt, almost straight. Postgenital plate not bilobed, with 2-3 rows of fine setae near apical margin.

Icosta (Icosta) fenestella Maa, new species Fig. 3, 6–8, 10, 11, 62, 64, 74, 98, 99.

MATERIAL. 63♂♂, 95♀♀. Holotype ♀ (BISHOP 7588), allotype ♂ and most paratypes (BISHOP); 1, 2, 4 and 7 paratypes (BMNH, MCZ, USNM and CNHM), respectively.

BURMA: Paratype ♀ (MCZ), Myitkyina, ex red-billed blue pie, I.1945; 1♂ (MCZ), *id.*, tree pie, III.1945.

THAILAND: Paratypes 1♂, 1♀, Chiengmai, Banbokaeo, ex *Monticola solitarius*, V 399, II.1962, SEATO Med. Res. Lab.; 1♀, *id.*, *Otus*, V 358, I.1962; 1♂, 1♀, *id.*, *Dicrurus leucophaeus*, V 334. 2♀♀, Chiengmai, Banboluang, Amphoe Hot, ex *Garrulax chinensis*, V 721, IV.1962, S.M.R.L. 1♀, Chiengmai, Bantham, Amphoe Chiengdao, ex *Pericrocotus flammeus*, V 1929, XI.1962, S.M.R.L. 1♀, Chiengmai, Doi Inthanon, ex *Accipiter virgatus* or *Muscicapa grandis* [probably latter host], H 938, XI.1964, Migr. Anim. Path. Surv. 1♂, Chiengmai, Doi Sutep, ex *Dendrocitta formosae*, V 1004, V.1962, S.M.R.L. 2♀♀ (CNHM), Chieng-

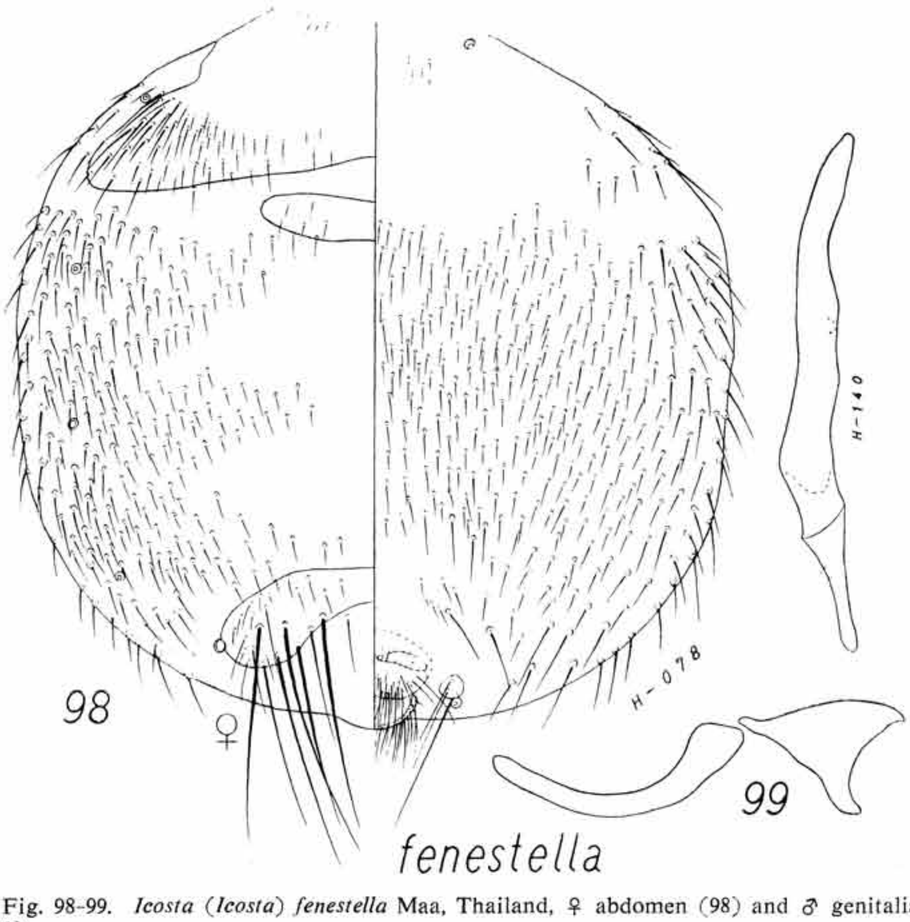


Fig. 98–99. *Icosta (Icosta) fenestella* Maa, Thailand, ♀ abdomen (98) and ♂ genitalia (99).

rai, Chiangsaenkhao, ex *Dicrurus leucophaeus*, B 17791, 17836, II.1953, Deignan; 1♂ (CNHM), *id.*, *Garrulax leucolophus*, B 17816. 1♂, Khonkhaen, Padonglan, Amphoe Chumphae, ex *Dicrurus paradiseus*, V 1991, XI.1962, S.M.R.L. 1♀ (CNHM), Lampang, Pangla, ex *Oriolus chinensis*, B 17756, II.1953, Deignan. 1♂, 1♀ (USNM), Loei, Dansai, Koksathon, Phulomlo Mt, 2100 m, ex *Garrulax leucolophus diardi*, RE 4656, 4681, II.1955, Elbel. 1♂ (USNM), Loei, Dansai, Nahaeo, Bannamuang, 1780 m, ex *Dicrurus macrocercus cathoecus*, RE 4104, X.1954, Elbel. 1♀ (USNM), Loei, Dansai, Naphung, Bannonwai, 1780 m, ex *Dendrocitta formosae himalayana*, RE 4280, XI.1954, Elbel; 1♀ (USNM), *id.*, *Dicrurus hottentotus*, RE 4282; 1♂ (USNM), *id.*, *Picus chlorophus laotianus*, RE 4377. 1♀ (USNM), Loei, Thali, Banmuangkhai, 600 m, ex *Irena p. puella*, RE 4431, I.1955, Elbel. 1♂, Nan, Banphahang, ex *Garrulax leucolophus*, V 141, XII.1961, Kitti. 1♀ (CNHM), Nan, Pang namun, ex *Oriolus xanthornus*, B 17713, I.1953, Deignan. 1♀ (CNHM), Prachuap Khiri Khan, Ban kluaklang, ex *Dicrurus leucophaeus*, B 17673, XII.1952, Deignan. 2♀♀ (CNHM), Sakon Nakhon, Khokphu, Bansangkho, ex *Garrulax leucolophus diardi*, RE 3357, I.1954, Elbel & Boonsong. 1♂, 1♀ (CNHM), Saraburi, Kaengkhoi, Muaklek, ex *Dicrurus paradiseus malabaricus*, RE 2918-1, IX.1953, Elbel & Boonsong. 2♀♀, Chanthaburi, Khaosoidaotai, ex *D. paradiseus*, #060-01391, 060-01400, VI.1966, Migr. Anim. Path. Surv.; 1♂, 2♀♀ (1♀ w. mallophagan), *id.*, *Pitta cyanea*, #050-01927, 050-01928; 1♂, *id.*, *Monticola gularis*, #030-38619. 1♂, Chanthaburi, Khaosabap, ex *Dicrurus remifer*, #040-05721, IV.1966. 1♀, Chiengmai, Doi Phahompok, ex *Pericrocotus ethologus*, MAPS 3129, XII.1965; 2♀♀ (1 w. mallophagan), *id.*, *Dicrurus leucophaeus*, MAPS 3285, 3399; 1♀, *id.*, *D. hottentottus*, MAPS 1964, X.1965.

TAIWAN: Holotype ♀, allotype ♂, Liukuei, Kaohsiung hsien, ex *Dendrocitta f. formosae*, TMT 1547, III-IV.1964, Maa & Kuo, Paratypes, 20♂♂, 30♀♀, *id.*, TMT 1499, 1530-31, 1548, 1579, 1596, 1601, 1616, 1623, 1635, 1713, 1754, 1791, 1815, 1855-56, 1879, 1899, 1904-06, 1938-39, 1950, 1958, 1967-68, 1974-76, 2060-63, 2114. 5♂♂, 5♀♀, Tzepeng, Taitung hsien, ex *D. f. formosae*, TMT 902-03, 968, 1006, 1291, 1373, 1380, I-II.1964, Maa & Kuo. 6♂♂, 8♀♀, Puli, Nantou hsien, ex *D. f. formosae*, TMT 297, 455, 473, 525, 557-58, 588, 628, 653-54, 675, 683, 808-19, XII.1963-I.1964, Maa & Kuo. 3♀♀, Peiyuan, Tungho, Taitung hsien, ex *D. f. formosae*, II.1965, Lin. 23♂♂, 22♀♀, Liukuei, ex *Urocissa caerulea*, TMT 1518, 1597-98, 1612, 1633, 1693, 1744, 1753, 1890, 1919-20, 1955, 1964-65. 2♀♀, Tzepeng, ex *U. caerulea*, TMT 1018. 1♀, Liukuei, ex *Yuhina zantholeuca griseoloris*, TMT 1763; 3♀♀, *id.*, *Oriolus chinensis diffusus*, TMT 1638, 1639; 1♂, *id.*, *Bambusicola thoracica sonorivox*, TMT 1915; 1♀, *id.*, no host data. 1♀, Peiyuan, no host data, I.1965, Sü. 2♀♀, Kungdien, Fanlu, Chiayi hsien, ex wild pigeon, X.1957, Ni.

INDONESIA: Paratype ♀, Bogor, Java, ex *Dicrurus l. leucophaeus* BBM 85097, VII. 1965, Stusak. 1♀, Sindanglaja, Java, ex bird BBM 85641, II.1966, Stusak. 1♂, 3♀♀, Tjampea, Java, ex bird BBM 85147, VIII.1965, Stusak. 1♀, Tjibogo, Java ex bird BBM 85525, I.1966, Stusak. 2♀♀, Komodo I., ex bird BBM 85209, VIII.1965, Stusak.

BORNEO: Paratype ♀ (USNM), Mt Kinabalu, 2500 m, Sabah, VII.1951, Traub & Johnson. 1♂ (BMNH), Kiau, 1000 m, Mt Kinabalu, at light, IV.1929, Pendlebury.

PHILIPPINES (Palawan); Paratype ♀, Pinigisan, Mantalingajan Range, Brooke's Pt, ex bird BBM 1547, IV.1962, Thompson.

Habitats. Indo-Chinese and Malaysian Subregions, at present known from Burma, Thailand, Taiwan, Java, Komodo I., Borneo and Palawan, lowland, up to 2500 m. Obviously breeding on Passeriformes, particularly Corvidae, Dicruridae and Muscicapidae; with stray records from Falconi-, Galli-, Columbi-, Strigi- and Piciformes. Analysis of available data follows. Falconiformes: Accipitridae (*Accipiter*) 1 record; Galliformes: Phasianidae (*Bambuscola*) 1; Columbiformes: Columbidae (genus indet.) 1; Strigiformes: Strigidae (*Otus*) 1; Piciformes: Picidae (*Picus*) 1; Passeriformes: Pittidae (*Pitta*) 2; Irenidae (*Irena*) 1; Campephagidae (*Pericrocotus*) 2; Muscicapidae 8 (*Garrulax* 4, *Monticola* 2, *Muscicapa* 1, *Yuhina* 1); Oriolidae (*Oriolus*) 3; Dicruridae (*Dicrurus*) 14; Corvidae 53 (*Dendrocitta* 38, *Urocissa* 13, genera indet. 2). Highest density per infested bird was 5♂♂, 3♀♀ (TMT 1955) ex *Urocissa*, Taiwan. The infestation rate in Taiwan on 234 *Dendrocitta* and 26 *Urocissa* examined were 19% and 58% respectively (Maa et al. 1965, as *Lynchia* sp. "P").

Systematics. This new species is a relative of *trita* and *chalcolampra*. They coexist in Burma, Thailand, Taiwan and probably several other countries. Chief differences are with the body size, shape of femur 1, tarsi 1 and 3 and abdominal chaetotaxy. The smaller bare stripe on cell *1m*, as suggested by its name *fenestella* (Latin, a small window, a little opening), serves as a convenient character for *fenestella* but is by no means always reliable.

♀. Differing from *chalcolampra* in the following points. *Color* paler. *Head*: (fig. 62) Frontal notch rather narrow. Palpus and frontal process in profile as in fig. 3 and 6, respectively. *Thorax* (fig. 64): Mesonotum 35×49; prescutum less strongly striate; scutellum 10×26. Prosternum (fig. 7) apparently not definable. Wing (fig. 74) 4.2-4.8 mm long; setulae more extensive, cells *c*, *sc*, *1r* and *1bc* entirely or almost entirely setulose; basal bare stripe of *1m* generally much smaller and narrower. Femur 1 (fig. 8) similar to that in *trita*, basal part of anterior surface largely bare; anterior surface of femur 2 more strongly setose and with much longer but less robust spines, with small bare area at a point of basal 1/3. Tibia 3 as in fig. 11. Tarsal spines 2.1.1.0/2.1.1.0/3.2.1.1; tarsomere 3 and 4 (fig. 10) of foreleg with outer apical lobe hardly longer than inner lobes; tarsomere 1 of hindleg 14×9, almost as long as 2+3, much shorter than 5, ventrally with inner apical spine much paler and smaller than outer ones. *Abdomen*: Ventral setae (fig. 98) on median area including those fencing urogenital area very fine, generally pale; setae on submedian area shorter, those on lateral area longer and more robust. Laterite 7 well sclerotized, with 1 bristle and 1-2 setae.

♂. Similar. Setae on laterite 3 uniform in length and robustness, similar to those near spiracles 4 and 5. Aedeagus (fig. 99) more slender and straight at apical part; paramere not decurved at apex. Postgenital plate with fewer setae.

The single ♀ from Borneo is noticeably smaller (wing 3.8 mm long), with cell *2bc* almost entirely setulose and metapleurotergal spines distinctly weaker.

Icosta (Icosta) diluta Maa, new species Fig. 3, 6, 7, 10, 11, 62, 64, 71, 100.

MATERIAL. 2♀♀. Holotype ♀ (BISHOP 7589) and paratype (BISHOP). NE NEW GUINEA: Holotype ♀, Bulolo R., Wau area, 900 m, ex *Coracina caeruleogrisea*, BBM 27885, IV.1963, Shanahan. Paratype ♀, Wau, 1200 m, ex bird BBM 20157, VII.1962, Sedlacek.

Habitats. New Guinea, 900-1200 m, probably breeding on passerine birds. The only available host record is a campephagid.

Systematics. As suggested by the name, *diluta* is chiefly characterized by the little setulose wing and fine scattered abdominal chaetotaxy. The closest relative appears to be

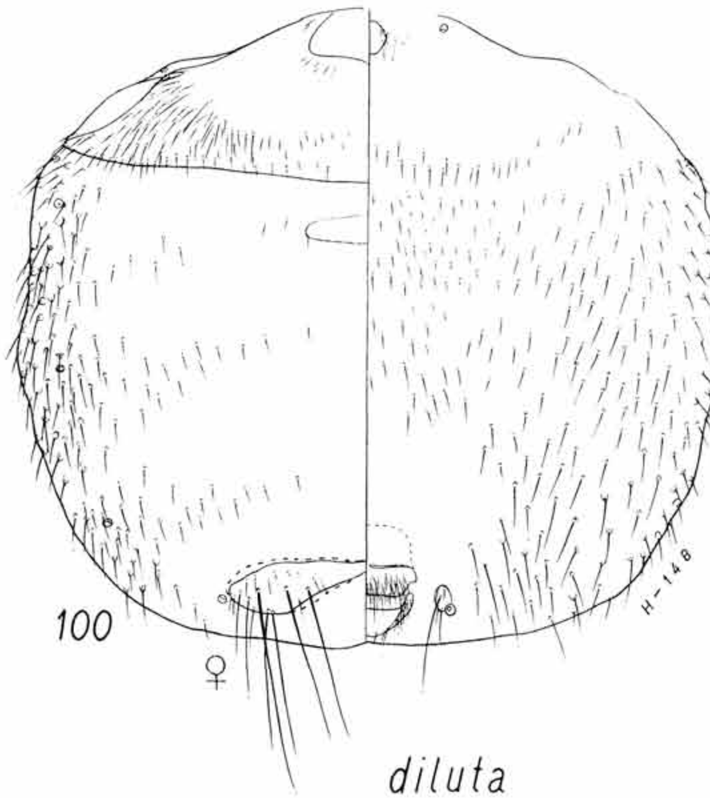


Fig. 100. *Icosta (Icosta) diluta* Maa, ♀ abdomen.

samoana in which the occipital margin is very weakly concave, wing more extensively setulose, abdomen more densely setose and metasternal process more prominent.

♀. *Color* dark, wing weakly fuscous. *Head* (fig. 62): Occipital margin very weakly convex vertical bristle of normal length; postvertex short. Face moderately wide, narrowed anteriorly. Frons proper short; frontal notch narrow, angular; frontal process (fig. 6) 1/2 as long as palpus (fig. 3), in profile gently decurved, apically pointed. Vibrissal process in profile normal, slightly shorter than wide at base, apically subacute. Gula posteriorly spinose. *Thorax* (fig. 64): Mesonotum 40×57; prescutum medially hardly sculptured, laterally densely, feebly striate; 1 humeral and 1 mesopleural bristle; scutellum 12×30, posterolaterally rounded, posteriorly strongly convex. Metapleurotergal callus with 4-5 spines. Prosternum (fig. 7) very poorly sclerotized. Metasternal process hardly definable. *Wing* (fig. 71) 5.2 mm long; setulae not extensive, with cells *1bc, 2bc, 1m* (basal 3/5), *2m+1a* (entirely or nearly so), *2a* all bare; cells *2m+1a* almost entirely bare in paratype, with short median setulose stripe near apex in holotype. Femur 1 moderately swollen, basal 1/2 of anterior surface sparsely covered with very fine short pale setae, only its lower margin with 2 rows of black and stronger setae. Tibia 3 as in fig. 11. Tarsal spines 2.1.1.0/2.1.1.0/3.2.1.1; tarsomeres 3-4 (fig. 10) of foreleg symmetrical; tarsomere 1 of hindleg 18×7, hardly shorter than 5, as long as 2+3+4, tarsomeres 2-3 of same leg distinctly asymmetrical, 4 hardly so. *Abdomen* (fig. 100) with short fine scattered setae; dorsal striolate area practically bare; setae on lateral area longer and with much larger basal papillae; ventral setae on median area fine, scattered; urogenital area not fenced by strong setae. Tergite 3 narrow, tergite 6 with 4-5 pairs of bristles. Laterite 3 not definable; laterite 7 large, elongate, with 2 bristles and several setae. Postgenital plate apparently bare. ♂ unknown.

Icosta (Icosta) samoana (Ferris) Fig. 140, 179.

Lynchia samoana Ferr., 1927b: 17, fig. 5, 6, ♀♂. Type ♀ (BMNH), ex *Turdus samoensis*, Samoa.

MATERIAL. 1♀ (MCZ), no collection data, compared with type and labeled by Bequaert as *L. samoensis*!

Habitats. Samoan Is., lowland, so far only recorded from Passeriformes: Muscicapidae (*Myiagra*, *Turdus*).

Systematics. This species appears to be related to *diluta* of New Guinea and as admirably illustrated by Ferris, is chiefly characterized by the distribution of setulae on wing (fig. 140) and of suberect setae on basal part of femur 1, the poorly developed metasternal process, the uniformly fine setae on abdominal membranous area and the minute ♀ laterite 7. See Addendum.

Icosta (Icosta) chalcolampra (Speiser) Fig. 2, 6-8, 10, 11, 68, 101, 102.

Olfersia chalcolampra Speis., 1904a: 335. Type ♀ (GNV), ex (?) bird, NE New Guinea.
Lynchia pollicipes Ferr., 1927c: 228, fig. 16, 17, ♀♂. Type: ♀ (UCB), ex *Accipiter* sp., Palawan, Philippines.

MATERIAL. 68♂♂, 148♀♀.

BURMA: 1♂, 2♀♀ (MCZ), Myitkyina, ex *Ketupa zeylonensis*, X.1945, Stager & Jellison; 1♀ (MCZ), *id.*, cuckoo-shrike, II.1945; 1♀ (MCZ), *id.*, *Streptopelia chinensis*. 1♂, 1♀ (MCZ), no data except fld. #3283, perhaps from Myitkyina.

THAILAND: 1♀, Chanthaburi, Khaosabapnamtok, ex *Accipiter badius* #2830, IV.1966, Migr. Anim. Path. Surv.; 1♀, *id.*, *A. nisus* #2960. 1♀, Chanthaburi, Khaosoidaotai, ex *A. trivirgatus* #2665, IV.1966, M.A.P.S.; 1♂, *id.*, *Cuculus saturalis* #2749. 2♀♀, Chiengmai, Doi Inthanon, ex *A. trivirgatus*, 5E 1519, XI.1964, M.A.P.S.; 2♀♀, *id.*, *A. virgatus*, H 938; 1♀, *id.*, ex *Treron* sp. (? *sphenurus*), H 905. 1♀ (CNHM), Chiengrai, Chiangsaenkhao, ex *Corydon sumatranus*; B 17806, II.1953, Deignan; 1♀ (CNHM), *id.*, *Dicrurus leucophaeus*, B 17836. 1♀ (USNM), Loei, Dansai Naphung, Bannanwai, 1780 m, ex *Streptopelia orientalis agricola*, RE 4316, XI.1954, Elbel. 1♀ (USNM), Loei, Thali, Banmuangkhai, ex *Gallus gallus spadica*, RE 3242, XII.1953, Elbel & Boonsong. 1♀, Padonglan, Amphoe Chumphae, Khonkhaen, ex *Chalcophaps indica*, SMRL 1922, XI.1962.

TAIWAN: 2♀♀, Chiayi hsien, Fanlu hsiang, Kungdien, ex wild pigeon, X.1957, Ni. 1♂, Hwalien hsien, Hwalien city, ex *Milvus migrans formosanus*, PF 7709, IV.1960, Kuntz. 3♀♀, Kaohsiung hsien, Liukuei, ex *Accipiter trivirgatus formosae*, TMT 1504, 1528, 1716, III-IV.1964, Maa & Kuo. 3♂♂, 1♀, Taitung hsien, Tzepeng, ex *A. trivirgatus formosae*, TMT 838, 1173, I-II.1964, Maa & Kuo. 1♀, Yilan hsien, Nan-Ao, ex *A. trivirgatus formosae*, PF 7060, III.1960, Kuntz; 2♀♀, *id.*, *Corvus macrorhynchos colonorum*, PF 7061.

PHILIPPINES: 1♂, 3♀♀ (CNHM), Puerto Princesa, nr sea level, Palawan, ex *Centropus sinensis bubutus*, #2466, 2595, IV.1947, Werner. 1♀, Limot Mati, Davao Prov., Mt

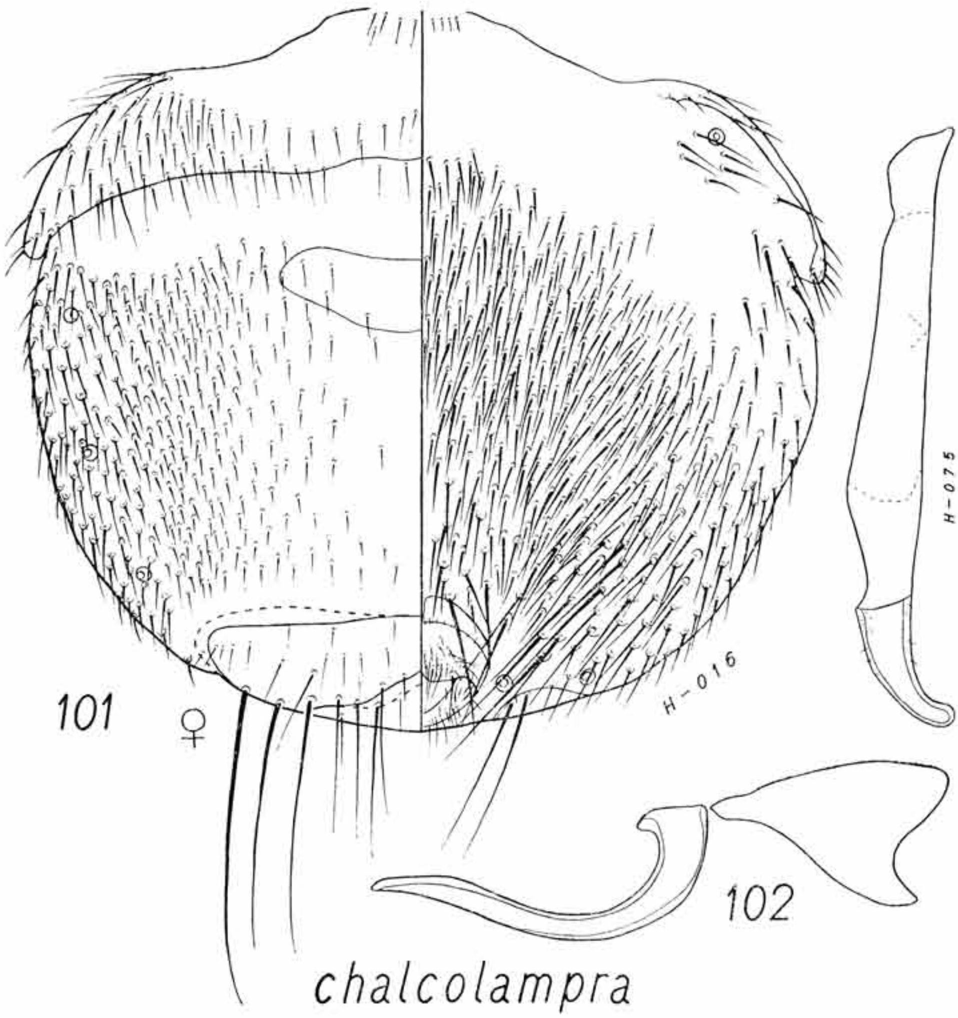


Fig. 101-102. *Icosta* (*Icosta*) *chalcolampra* Speis., New Guinea, ♀ abdomen (101) and ♂ genitalia (102).

Mayo, Mindanao, ex *Chalcophaps i. indica*, B 8326, VI.1965, Rabor.

NW NEW GUINEA: 1♀ (MCZ), "Dutch New Guinea", ex hawk #B-C 15, Jewett & Hoogstraal. 1♀ (MCZ), Doromana, ex parrot #B-C 12-13, III.1945, Jewett & Hoogstraal. 1♂, Vogelkop, Kebar Valley, 550 m, ex *Geoffroyus geoffroyi pucherani*, BBM 771, I. 1962, Quate; 1♀, *id.*, *Mino d. dumontii*, BBM 749; 5♂♂, *id.*, *Phonygammus k. keraudreni*, BBM 779; 6♀♀, *id.*, *Probosciger aterrimus goliath*, BBM 739; 1♂, *id.*, *Trichoglossus haematodus berauensis*, BBM 764. 1♂, Nabire, N of Geelvink Bay, ex *Cacatua galerita*, BBM 21560, VIII.1962, Clissold. 1♀, Oransbari, 3m, NW of Geelvink Bay, ex *C. galerita*, BBM 22346, I.1963, Richards & Thompson; 1♂, *id.*, *Lorius lory*, BBM 22290. SW NEW GUINEA: 1♂, 6♀♀, Bomberi, 700-900 m, nr Fak Fak, ex corvid TMP 22, VI.1959, Maa. NE

NEW GUINEA: 1♀, Bulolo, 700 m, ex *Accipiter novaehollandiae*, HC 110, III.1962, Clissold; 1♀ *id.*, *Falco severius*, HC 37. 1♀, Bulolo R., 900 m, ex *Coracina caeruleogrisea*, BBM 27885, VI.1963, Shanahan. 1♂, Bulldog Rd, 2500 m, Wau area, ex *Gymnophaps albertisi*, HC 231, VI.1962, Clissold. 1♂, Coviak, Wau area, 1300 m, ex *Trichoglossus haematodus*, BBM 28490, VI.1963, Shanahan. 1♂, Forestry, Morobe Distr., 1300 m, ex honey-eater BBM 28642, VIII.1963, Clissold. 1♀, Finschhafen, ex *Aviceda subcristata*, BBM 27661, IV.1963, Clissold. 1♀, Green R., Sepik Distr., 160 m, ex *Accipiter novaehollandiae*, BBM 22697, VI.1963, Temple. 1♂, 1♀, Karimui, 1100 m, ex bird BBM 20066, VII.1963, Sedlacek. 1♂, 1♀, May R., Sepik Distr., 130 m, ex *Larius roratus* BBM 22658, VI.1963, Temple. 1♂, Monke Mt, 800 m, ex *Alisterus chloropterus*, HC 43, III.1962, Clissold. 1♀, Nakata Ridge, Wau area, 1300 m, ex *Coracina caeruleogrisea*, BBM 28495, VI.1963, Shanahan; 1♂, *id.*, blue jay BBM 27783, V.1963; 1♂, 1♀, Nakata Ridge, ex *Lorius lory*, BBM 27768, V.1963, Clissold. 1♀, Wau, 1300 m, ex *Accipiter fasciatus*, S 175, II.1962, Sedlacek; 1♂, Wau, ex *Cacatua galerita*, HC 174, V.1962; Clissold; 2♂♂, 3♀♀, *id.*, green-back pigeon HC 183; 1♀, *id.*, *Elanus caeruleus*, BBM 28607, VII.1963; 1♀, *id.*, fruit pigeon BBM 21263, VI.1963. SE NEW GUINEA: 1♂ (MCZ), Dobadura, ex hawk N 44, U.S. Typhus Comm. 1♀, Ahola, 50 m, ex kingfisher BBM 29896, X.1963, Clissold; 1♂, 1♀, *id.*, *Lorius lory*, BBM 29877, 29905; 1♀, *id.*, *Corvus orru*, BBM 29262; 1♂, *id.*, *Aplonis* BBM 29878. 1♂, Balimo, ex *Accipiter* BBM 50444, IV.1964, Clissold; 1♀, *id.*, cockatoo BBM 50221, III. 1964; 2♂♂, *id.*, *Larius roratus*, BBM 29571, 50185. 1♀, Buka Bara, sea level, ex *Mino dumontii*, BBM 28815, IX.1963, Shanahan. 1♂, Cape Killerton nr sea level, ex pigeon BBM 29231, X.1963, Clissold; 2♂♂, 2♀♀, *id.*, *Lorius lory*, BBM 29242, 29253, 29281. 1 ♀, Embi Lake, 100 m, ex *M. dumontii*, BBM 29341, X.1963, Clissold. 1♂, 6♀♀, Jumbora, 60 m, ex *Corvus orru*, BBM 28735, 28747, 28770, 29346, IX–X.1963, Clissold; 2♀♀, *id.*, *M. dumontii*, BBM 28745, 28774; 1♂, *id.*, dove BBM 29693; 1♂, *id.*, *Accipiter novaehollandiae*, BBM 28746; 1♂, *id.*, pigeon BBM 29363; 1♀, *id.*, *Larius roratus*, BBM 29695; 1♀, *id.*, *Lorius lory*, BBM 29672. 1♂, Mt Lamington, Amboga R., 1500 m, ex *Henicopernis longicauda*, BBM 25258, VII.1966. 2♀♀, Popondetta, N. Distr., 70 m, ex *Accipiter cirrocephalus*, BBM 28697, IX.1963, Clissold; 1♀, *id.*, *Mino dumontii*, BBM 28678; 1♂, 1♀, *id.*, *Aplonis*, BBM 28707. 1♂, Saha, 80 m, ex *Accipiter* BBM 29970, X.1963, Clissold. 2♀♀, Simburu, 80 m, ex *A. novaehollandiae*, BBM 28727, IX.1963, Clissold. 2♂♂, 4♀♀, Soputa, 30 m, ex *Larius roratus*, BBM 29762, 29764, 29832, 29862, X.1963, Clissold; 3♀♀, *id.*, *Lorius lory*, BBM 29717, 29859; 1♀, *id.*, bird-of-paradise BBM 29869; 1♀, *id.*, hawk BBM 29842; 5♀♀, *id.*, *Accipiter novaehollandiae*, BBM 29867; 1♂, Tegona, ex parrot BBM 50481, IV.1964, Clissold. 1♂, Zenani, 130 m, ex *L. roratus*, BBM 29956, X.1963, Clissold.

NEW BRITAIN: 2♀♀ (KBH), Kwalakessi, VII.1962, Noona Dan Exped. 1♀, Gaulim, ex *Lorius lory*, BBM 20875, XI.1962, Clissold; 3♂♂, 3♀♀, *id.*, *Lorius roratus*, BBM 20682, 20873; 1♂, 1♀, *id.*, *Accipiter luteoschistaceus*, BBM 20689. 1♀, Riaet, ex *Acc. novaehollandiae*, BBM 20734, XI.1962, Clissold; 1♀, *id.*, *Artamus insignis*, BBM 20711; 1♂, 3♀♀, *id.*, *Centropus ateralbus*, BBM 20735; 3♀♀, *id.*, *C. violaceus*, BBM 20714, 20743. 4♂♂, 1♀, Mt Sinewet, ex *C. violaceus*, BBM 20768, 20782, XI.1962, Clissold. 1♂, Taliligap, ex *Larius roratus*, BBM 20664, X.1962, Clissold. 1♀ (MCZ), "New Britain", ex *Caloenas n. nicobarica*, P 107, Coultas. 1♂ (MCZ), Nakanai Mts, ex *Centropus violaceus*, P 134, Coultas.

SOLOMON IS.: 1♀, Toumoa, Fauro, 10 m, ex *Haliastur indus*, BBM 23795, IV.1964, Temple. 1♂, 3♀♀, Malangona, Choiseul-Fauro, 10 m, ex *Corvus woodfordi*, BBM 23724, III.1964, Temple. 3♀♀, Pusisama, Vella Lavella, 5 m, ex *Centropus phasianinus*, BBM 23132, 23187, XI.1963, Temple; 1♂, 2♀♀, *id., Aplonis grandis*, BBM 23251; 1♂, 4♀♀, *id., Larius roratus*, BBM 23130, 23204, 23206, 23245. 1♀, Ulo Crater, Vella Lavella, 10 m, ex *L. roratus*, BBM 23298, XII.1963, Temple. 1♂, 2♀♀, Gollifer's Camp, Kolombangara, 500 m, ex *Centropus milo*, BBM 23412, I.1964, Temple. 1♂, 2♀♀, Nini Ck., Roroni, Guadalcanal, 20 m, ex *Accipiter novaehollandiae*, BBM 23840, V.1964, Temple & Shanahan; 1♀, *id., Aplonis grandis*, BBM 23834. 4♀♀ (BMNH), Lunga, Guadalcanal, IV.1934, Lever. 2♀♀, Tabalia, Guadalcanal, ex *Accipiter albogularis*, BBM 23913, V.1964, Temple & Shanahan; 1♂, *id., Aviceda subcristata*, BBM 23912; 1♀, *id., Centropus milo*, BBM 23978, VI.1964. 1♂, 2♀♀ (MCZ, USNM), Wainoni Bay, San Cristobal, 1916, Mann. 1♀ (MCZ), Malaita, ex kakatoe #39678, III.1930, Coultas. 1♂ (BMNH), Russell I., VIII.1936, Lever.

AUSTRALIA (Queensland): 1♀ (BMNH), Kuranda, coll. Dodd. 1♀ (BMNH), "New Holland", coll. Gould, listed by Walker 1849 as *Ornithomyia australasiae*! 1♀ (ANIC), Mt Jukes, Mackay, ex *Dacelo gigas*, VI.1964, Domrow & Welch.

Habitats. Widely spread over Oriental Region, at present known from Burma, Thailand, Taiwan, Philippines, New Guinea, New Britain, Solomon Is., and Queensland. Obviously breeding on Falconi- and Psittaciformes, and perhaps also Columbi-, Cuculi- and Passeriformes; with stray records from Galli-, Strigi- and Coraciiformes. Analysis of available data follows. Falconiformes: Accipitridae 35 records (*Accipiter*=*Astur* 23, *Aviceda* 2, *Elanus* 1, *Haliastur* 1, *Henicopernis* 1, *Milvus* 1, genera indet. 3); Falconidae (*Falco*) 2; Galliformes: Phasianidae (*Gallus*) 1; Columbiformes: Columbidae 13 (*Caloenas* 1, *Chalcophaps* 2, *Streptopelia* 2, *Treron* 1, genera indet. 7); Psittaciformes: Psittacidae 39 (*Alisterus* 1, *Cacatua*=*Kakatoe* 3, *Geoffroyus* 1, *Larius* 14, *Lorius* 8, *Probosciger* 1, *Trichoglossus* 2, genera indet. 9); Cuculiformes: Cuculidae 13 (*Centropus* 12, *Cuculus* 1); Strigiformes: Strigidae (*Bubo*) 1; Coraciiformes: Alcedinidae 2 (*Dacelo* 1, genus indet. 1); Passeriformes: Eurylaimidae (*Corydon*) 1; Campephagidae 3 (*Coracina* 2, genus indet. 1); Meliphagidae (genus indet.) 1; Sturnidae 10 (*Aplonis* 4, *Mino* 6); Dicruridae (*Dicrurus*) 1; Corvidae 8 (*Corvus* 7, genus indet. 1); Paradisaeidae 2 (*Phonygammus* 1, genus indet. 1.) Besides these, Psittacidae: *Prioniturus* was also listed as host by Ferris (*l.c.*). Highest densities per infested bird were 6 flies (BBM 739 ex *Probosciger*) in New Guinea, 4 flies (BBM 23724 ex *Corvus*) in the Solomon Is. The average infestation density of this fly in other countries is lower.

Systematics. This widely distributed species has been admirably illustrated by Ferris (*l. c.*, as *L. pollicipes*). It can easily be recognized from the 4 preceding species by the larger body size, larger basal bare stripe of cell *1m*, more strongly asymmetrical tarsus 1, longer segment 1 of tarsus 3, absence of ♀ laterite 7 and presence of spine-like setae on ♂ laterite 3. In Ferris' (1927c) figure, the tarsus 1 was drawn as if the inner rather than outer apical lobes of segments 3-4 were abnormally lengthened.

♀. *Color* fairly dark, wing weakly fuscous. *Head*: Occipital margin almost straight; vertical bristle 2/3 as long as notopleural bristle; postvertex fairly short. Face moderately wide, narrowed anteriorly. Frons proper short, widely notched at middle; frontal process (fig. 6) 1/2 as long as palpus (fig. 2), in profile gently decurved, apically acute or subacute. Vibrissal process in profile normal, shorter than wide at base, apically blunt or subacute. Gula posteriorly spined. *Thorax*: Mesonotum 44×58; prescutum densely strongly striate all over; scutellum 11×33, posterolaterally rounded, posteriorly distinctly convex. Metapleurotergal callus with 3-4 spines. Prosternum (fig. 7) poorly sclerotized. Metasternal process poorly developed. *Wing* (fig. 68) 5.1–5.7 mm long; setulae covering entirety of cells *2r* and *3r*; *2a* entirely, *c, sc, 1r, 1bc* and *2bc* basally and *2m+1a* posteriorly bare; *1m* basally with fairly large bare stripe. *Legs*: Femur 1 (fig. 8) strongly swollen, basal part of its anterior surface rather evenly setose; anterior surface of femur 2 with 6± short spines, its basal part with very fine often pale setae. Tibia 3 as in fig. 11. Tarsal spines 1.1.1.0/2.1.1.0/3.2.1.1; tarsomeres 3 and 4 (fig. 10) of foreleg with outer apical lobes much longer than inner ones; tarsomere 1 of hindleg 19×7, subequal in length to 2+3+4, hardly longer than 5; tarsomeres 2–4 of same leg asymmetrical. *Abdomen* (fig. 101) with moderately long and robust setae; dorsal striolate area with scattered ones; ventral setae practically uniform in length and robustness, those fencing urogenital area longer, more robust and generally darker than elsewhere. Tergite 3 fairly narrow; tergite 6 posteriorly concavely curved, with 4–5 pairs of bristles. Laterite 3 poorly sclerotized; 7 undefinable. Postgenital plate with few setae near anterior margin.

♂. Similar. Setae on laterite 3 largely spine-like and nearly as robust as posterior spines of laterite 2, much longer and more robust than setae near spiracles 4 and 5. Aedeagus (fig. 102) fairly short, apical part almost straight; paramere apically blunt and gently decurved. Postgenital plate not bilobed, apically setose.

Longipalpis Group

Distribution. Palaeotropical; 12 species and subspecies: 8 in Oriental and 4 in Ethiopian Region; nearly half of them are fairly widely distributed.

Host Relationships. Two species monoxenous, all others oligoxenous. Preferred hosts are Accipitridae, Phasianidae, Bucerotidae, Sturnidae and Corvidae.

Diagnosis. Tarsomeres 3 and 4 of foreleg usually symmetrical; metasternal process strongly produced; frontal process (in dorsal view) and scutellum normal for the subgenus; vertical and some other major bristles often shortened; apical cells of wings often with narrow bare stripe along their apical margin; aedeagus sometimes apically hook-like. Sexual dimorphism strong, both in abdominal chaetotaxy and leg armature.

Affinities. Closely related to but obviously more specialized than the preceding group. Similar to the Hirsuta and Meda groups in bearing peg-like spines underneath ♂ tibia 2 in certain species, and similar to the genus *Pseudolynchia* in having well developed frontal, vibrissal and metasternal processes. As mentioned above, both similarities are very likely secondary convergence rather than of phylogenetic significance. In my previous scheme (1963), *dioxyrhina* and its relatives were placed under an independent group. Following the discovery of connectant forms, they are combined together with *longipalpis* and then divided into 4 subgroups.

(a) Frontal process in profile broadly rounded; vibrissal area broadly rounded or sharply angular and very slightly projecting; palpus moderately long; wing-setulae extensive, vein R_{2+3} normal; metasternal process shorter than wide at base or as long as wide; ♀ abdominal dorsum with only ordinary setae. ♂ unknown. On Phasianidae; 2 species: *humilis, subdentata*.

(b) Frontal process in profile broadly rounded; vibrissal process prominent, strongly projecting; palpus moderately long; apical cells of wing with bare stripe along their apical margin, apical 1/3 of vein R_{2+3} as thick as and coalescent with C; metasternal process slightly longer than wide at base, apically acute; ♂ tibia 2 lacking preapical spines; ♀ abdominal dorsum with only ordinary setae; aedeagus apically not hook-like, ♂ postgenital plate not bilobed. On Bucerotidae; 1 species: *coalescens.*

(c) Frontal and vibrissal processes both acute and projecting in profile; palpus long or very long; wing-setulae extensive, vein R_{2+3} normal; metasternal process shorter than wide at base, apically broadly rounded; ♂ tibia 2 lacking preapical spines; ♀ abdominal dorsum only with ordinary setae; aedeagus not hook-like apically, ♂ postgenital plate not bilobed. On Accipitridae, Sturnidae and Corvidae; 4 species and subspecies: *mecorrhina, longipalpis, acromialis acromialis, a. tuberculata.*

(d) Frontal and vibrissal processes both acute and projecting in profile; apical cells of wing with bare stripe along their apical margin, vein R_{2+3} normal; metasternal process much longer than wide at base, apically acute or subacute; ♂ tibia 2 often with preapical spines; ♀ abdominal dorsum often with patches of very dense spine-like bristles; aedeagus usually hook-like at apex, ♂ postgenital plate bilobed. On Bucerotidae and Corvidae; 5 species: *corvina, bicorna, spinosa, bucerotina, dioxyrhina.*

Icosta (Icosta) humilis Maa, new species Fig. 3, 6, 7, 9, 10, 12, 62, 75, 103.

MATERIAL. 1♀. Holotype: (MCZ). LIBERIA: Holotype ♀, Gbanga, ex *Francolinus bicalcaratus thornei*, IX.1962, Grant.

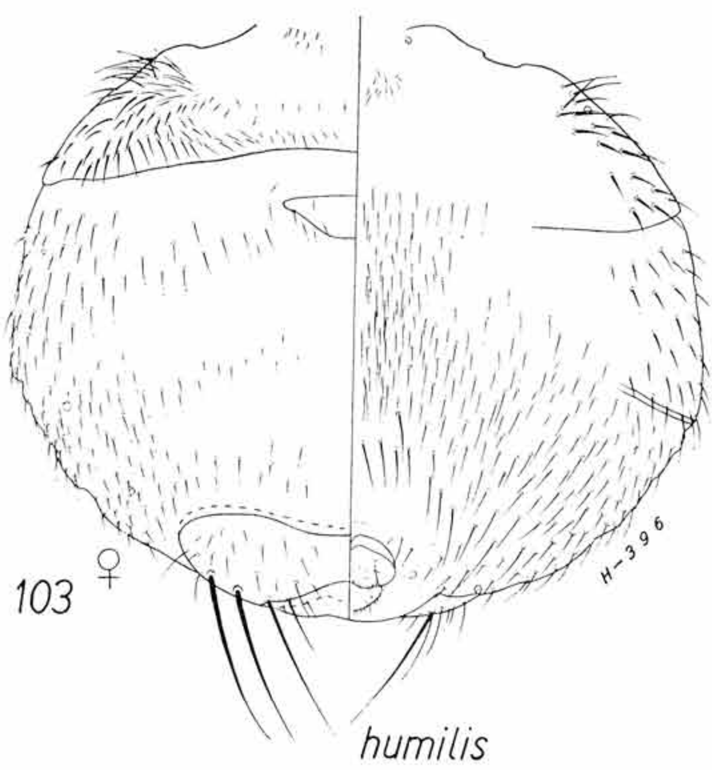


Fig. 103. *Icosta (Icosta) humilis* Maa, ♀ abdomen.

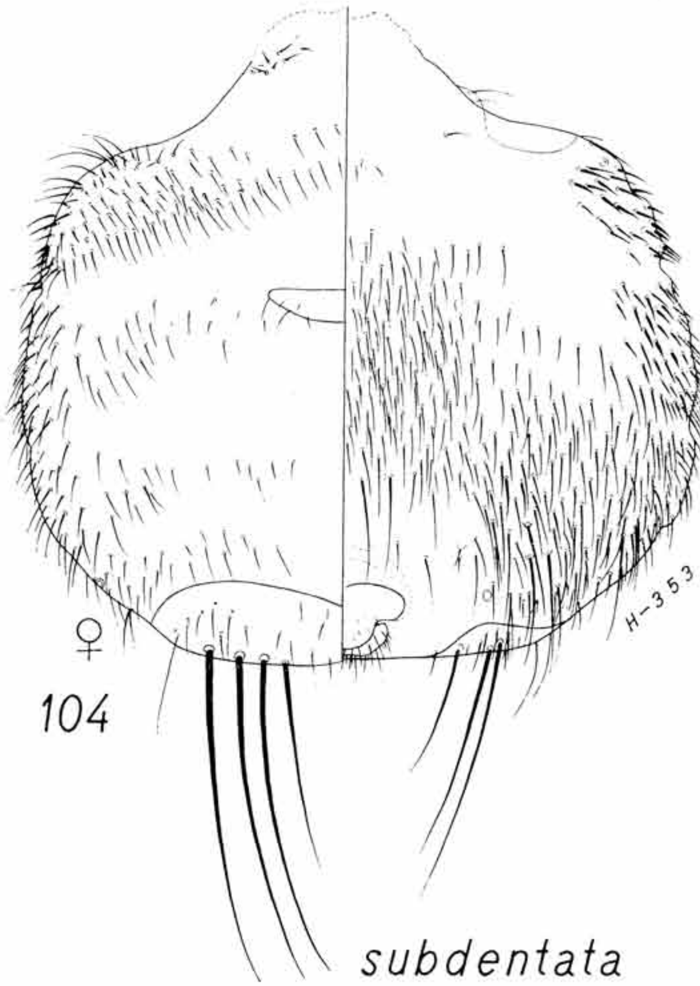


Fig. 104. *Icosta* (*Icosta*) *subdentata* Maa, ♀ abdomen.

Habitats. Western African Subregion (Liberia). Host preference not clear, the only available record is Galliformes: Phasianidae (*Francolinus*).

Systematics. This and the next species are so closely related that Bequaert considered them conspecific and labeled them under the same manuscript name. The differences enumerated below, being clearly more than individual variation, well justify the recognition of the 2 independent species. The name *humilis* (humble, poor, insignificant) refers to the seemingly simplicity of this species which stands at the very beginning of the Longipalpis group.

♀. Differing from *subdentata* in following points. Lateral areas of abdominal syntergite 1+2 dark brown. *Head* (fig. 62): Occipital margin weakly concave at midpoint; postvertex short, anteriorly slightly produced at middle, with conspicuous pit. Face wider and more weakly convergent forward. Frons proper moderately long, moderately broad; frontal notch more broadly rounded; frontal process (fig. 6) 1/2 as long as palpus (fig. 3), fairly broad in dorsal view. Vibrissal area broadly rounded. Mesonotum 34×47; laterocentral bristles of prescutum stronger, darker and extending well beyond transverse mesonotal suture, some of them darker and scarcely finer than vertical bristle; scutellum 9×26. Metapleurotergal callus with 3-4 strong spines in single series. Prosternum (fig. 7) *ca* 3× as wide as long, moderately sclerotized. Metasternal process *ca* 1/2 as long as wide at base, narrowly rounded at apex. *Wing* (fig. 75) 4.8 mm long. Setae on anterior surface of femur 1 (fig. 9) longer, finer. Tarsus 1 and tibia 3 as in fig. 10 and 12 respectively. Tarsal spines 1.1.1.0/2.1.1.(1)/6.2.1.1. Abdominal setae (fig. 103) more uniform in length and robustness; posterior margin of syntergite 1+2 with series of black stiff setae near its lateral ends; tergite 3 *ca* 3× as wide as long, well sclerotized; laterite 3 weakly definable; tergite 6 with 3± pairs of bristles; lateral fence of urogenital area insignificant, anterior fence formed by fairly long setae. ♂ unknown.

Icosta (Icosta) subdentata Maa, new species Fig. 5-7, 9, 63, 64, 82, 104.

MATERIAL. 1♀. Holotype: (MCZ). UGANDA: Budongo Forest, Bungoro, ex *Guttera edouardi setsmithi*, VII.1937, Hopkins. Besides this, 1♀ (BMNH), Entebbe, Uganda, ex *Musophaga rossae*, IX.1955, Williams, perhaps also belongs here.

Habitats. Eastern African Subregion (Uganda), submontane. Host preference not clear; the only available records are Galliformes: Phasianidae (*Guttera*) and Cuculiformes: Musophagidae (*Musophaga*).

Systematics. This is another anomalous species and can be distinguished easily from all its congeners by the strongly developed metasternal process, sub-bilobed vibrissal area in combination with broadly rounded frontal process. The last character is shared in this subgenus only by *coalescens*, *recessa* and *humilis* of tropical Africa and *wenzeli* of the Philippines which have angular or broadly rounded vibrissal areas and not any or hardly any, developed metasternal process. In size and color pattern, it is superficially similar to *plana*. And among the Ethiopian species, it bears nearly same color pattern, thoracic chaetotaxy and extent of wing-setulae as *minor* which is much smaller and belongs to a different subgenus. The type bears Bequaert's manuscript name which means narrow wing.

♀. *Color* very pale, uniformly yellowish brown, darkest on claws (black) and on last tarsomeres and abdominal syntergite 1+2 (brown). Wing very weakly stained with yellowish, anterior veins yellowish brown, not darker than legs. *Head* (fig. 63): Occipital margin very weakly curved at both ends, otherwise straight; vertical bristle as long as and hardly finer than notopleural bristle; postvertex fairly short, anteriorly bilobed. Face fairly wide, narrowed forward. Frons proper long, narrow; frontal notch narrow, rounded; frontal process (fig. 6) *ca* 1/3 as long as palpus (fig. 5), narrow in dorsal view, very broadly rounded in lateral view. Vibrissal area sharply angular and slightly projecting, not well defined from frontal process except in pigmentation and sclerotization, its lower margin forming very insignificant preapical lobe which is observable only in anterolateral view. Gula posteriorly with pale strong setae. *Thorax* (fig. 64): Mesonotum 32×45; prescutum finely feebly striated all over, laterocentral bristles all pale, quite fine, reaching transverse mesonotal suture; scutellum 8.5×22, posterior margin evenly convex. Metapleurotergal callus with 5-7 strong spines in 2 series. Prosternum (fig. 7) transversely linear, weakly sclerotized, with 4-5 pairs of soft setae. Metasternal process almost as long as wide at base, acute at apex. *Wing* (fig. 82) 4.8 mm long; setulae extensive, cell *1m+1a* with small bare area at extreme base, otherwise uniformly setulose, *2a* practically entirely bare, with a few setulae narrowly along apical section of vein 2A; cell *2bc* only 1/3 as long as *1bc*. *Legs*: Femur 1 (fig. 9) moderately swollen, anterior surface with 3-4 spines, and its basal part rather evenly covered with sparse suberect setae; anterior surface of femur

2 with 2-3 weak spines, with small bare area at a point of basal 1/3. Tarsal spines 1.0.1.0/2.1.1.0/4.2.1.1; tarsomeres 3 and 4 of foreleg symmetrical; tarsomere 1 of hindleg 10.5×3.5, distinctly longer than 2+3+4 and than 5; tarsomere 2 of same leg slightly shorter than wide, 3 and 4 slightly asymmetrical. *Abdomen* (fig. 104) with pale fine setae on median area and darker stronger ones on lateral area including that of syntergite 1+2; posterior margin of syntergite 1+2 with only pale soft setae; tergite 3 transversely linear, poorly sclerotized; laterite 3 not definable; dorsal striolate area with few fine setae in 3 transverse series on each side; tergite 6 large, with 7 pairs of bristles, its hind margin concavely curved; lateral fence of urogenital area formed by long strong setae, anterior fence insignificant; no laterite 7. ♂ unknown.

Icosta (Icosta) coalescens (Maa) Fig. 2, 6-8, 10, 11, 69.

Lynchia coalescens Maa, 1964: 98, fig. 23-27, ♂. Type: ♂ (CNHM), ex (?) bird, Gabon.

MATERIAL. 3♂♂, 1♀. CAMEROONS: 1♂ (MCZ), Sangmelina, VI.1932, Good. CONGO: 1♂ (MCZ), Luputa, Lomami, sur calao [hornbill], XI.1934, Bouvier. UGANDA: 1♂, 1♀ (MCZ), Budongo Forest, ex *Bycanistes subcylindricus*, V.1936, Meinertzhagen # 7676.

Habitats. W. and E. African Subregions, at present known from Cameroons, Gabon, Congo and Uganda. By implication of host relationship of related forms, *coalescens* probably breeds on Coraciiformes: Bucerotidae (*Bycanistes*). The holotype was labeled "on shirt, may have come from a hornbill held in my hand".

Systematics. As pointed out in the original description, *coalescens* can be recognized readily from any of its congeners by the abnormal vein R_{2+3} of which the apical 1/2 is unusually thickened and coalescent with C. The frontal process in lateral view is also unusual in being broadly membranous (and pale colored) before meeting vibrissal area. The marginal bare stripe of apical cells of the wing is common to that found in *dioxyrhina* and other Oriental relatives. Femur 1 is moderately swollen, anterior surface bearing 3-4 heavy spines, and its basal part is evenly covered with suberect setae; anterior surface of femur 2 almost uniformly setose, with 1 spine near midlength. Tarsal spines are similar in number in both sexes, but segment 2 of tarsus 1 may have 2 spines in ♀. The ♀ abdominal chaetotaxy differs very little from the ♂; the ♀ laterite 7 is roundish, well developed, and bears 4± bristles and few setae. In the original description, tergite 3 was stated to be present and tergite 6 to be posteriorly emarginate. By oversight, they were not so drawn in the accompanying figures. Since the frontal process (fig. 6), femur 1 (fig. 8) and abdominal chaetotaxy are fairly generalized and the sexual dimorphism is weak, *coalescens* is placed here near the beginning of the group; notwithstanding, the venation is highly specialized. The palpus, prosternum, fore tarsus, hind tibia and wing are as in fig. 2, 7, 10, 11 and 69, respectively.

Icosta (Icosta) mecorrhina (Maa) Fig. 4, 6, 7, 10, 12, 78.

Lynchia mecorrhina Maa, 1964: 95, fig. 16-22, ♀♂. Type: ♀ (CNHM), ex *Cassinaetus africanus*, Gabon.

(?) *L. dioxyrhina*: Falcoz 1929: 47 (Grande Comore Is.).

MATERIAL. 18♂♂, 29♀♀.

LIBERIA: 1♂ (MCZ), Kakatown, ex *Accipiter r. rartlaubi*, VIII.1926; 1♂, 1♀ (MCZ), *id.*, *Lophoceros* [*Tockus*] *fasciatus semifasciatus*. 1♂, 1♀ (MCZ), Du R., Camp #3, ex *Ceratogymna elata*, VIII.1926; 1♂ (MCZ), *id.*, *L. f. semifasciatus*.

IVORY COAST: 1♀ (MCZ), env. Abidjan, ex *Gypohierax angolensis*, VIII.1883.

CONGO: 1♂ (MCZ), Avakubi, 27°31′E, 1°20′N, ex *Astur* [*Accipiter*] *tonssenelii* #5348, XII.1914, Chapin. 1♀ (MAC), Uvira, ex *Criniger zonurus*, I.1951, Lambrecht.

ETHIOPIA: 3♀♀ (BMNH), Maraquo, C. Abyssinia, V.1914, Kovacs.

UGANDA: 3♂♂ (MCZ), Kampala, ex *Accipiter tachiro sparangensis*, coll. Hopkins; 1♂, 2♀♀ (MCZ), *id.*, *A. r. rufiventris*; 1♀, 6♀♀ (MCZ), *id.*, *A. ovampoensis*. 2♂♂, 3♀♀ (MCZ), Kinkinzi, Kigezi, ex *A. ovampoensis*, VII.1940, Hopkins. 1♀ (MCZ), Mpumu, 1912, Duke. 3♂♂, 2♀♀ (BMNH) (1♀ w. fungus on abd.), nr Jinja, bred from nest material of cormorants & little egrets, X.1956. William. 2♂♂, 6♀♀ (MCZ), Toro, ex *A. m. melanoleucus*, IV & VIII.1940, Hopkins. 1♀ (MCZ), Mt Debasien, ex *Circaetus g. gallicus*, XII.1933, Loveridge.

ZULULAND: 1♂, 1♀ (MCZ), both w. mites on thorax, Eshewe, ex *Bycanistes bucinator*, XI.1934, de Meillon.

Habitats. Widespread over Ethiopian Region, at present known from Liberia, Ivory Coast, Gabon, Congo, Ethiopia, Uganda and Zululand. Probably breeding on Accipitridae and Bucerotidae, with stray records from Musophagidae and Caprimulgidae. Analysis of available data follows. Falconiformes: Accipitridae 14 (*Accipiter* 9, *Cassinaetus* 1, *Circaetus* 1, *Gymnogenys* 1, *Gypohierax* 1); Cuculiformes: Musophagidae (*Crinifer*) 1; Caprimulgiformes: Caprimulgidae (*Caprimulgus*) 1; Coraciiformes: Bucerotidae 4 (*Bycanistes* 1, *Ceratogymna* 1, *Tockus* 2).

Systematics. As suggested by the name, *mecorrhina* is chiefly characterized by the unusually long frontal process (fig. 6). By this outstanding character alone, the species can hardly be mistaken for any of its congeners. The extent of wing-setulae (fig. 78) is somewhat different in the 2 sexes. In ♀♀, the under surface of cells *3r* and *1m* has an obscure bare stripe along their apical margin, whereas in ♂♂, those cells often have narrow longitudinal bare stripes rather similar to those found in *Ornithomya*. The species is rather isolated. Although being placed here near *longipalpis* and *acromialis*, it has no close affinities with the 2 latter species. The palpus, head in profile, prosternum, fore tarsus and hind tibia are as in fig. 4, 6, 7, 10 and 12, respectively.

Icosta (**Icosta**) **longipalpis** (Macquart) Fig. 3, 6, 7, 10, 12, 63, 64, 77, 105, 106, 143.

Olfersia longipalpis Mcq., 1835: 630. Type lost, ex (?) bird, Java.
O. longirostris Wulp, 1897: 144. Type destroyed, ex (?) bird, Ceylon.
Lynchia majuscula Beq., 1945b: 98, fig. 2-3, ♀. Type: ♀ (MCZ), ex *Spilornis cheela spilogaster*, Ceylon.

MATERIAL. 10♂♂, 36♀♀.

E. PAKISTAN: 1♀ (MCZ), Baramchal, Sylhet, 50 m, ex *S. cheela*, IV.1958, Paynter.

BURMA: 1♂, 1♀ (MCZ), Lonkin, N. Burma, I.1935, Verney-Hopwood Exped.

THAILAND: 2♀♀ (CNHM), Chaiyaphum, Pookhiew, Bantardpoon, ex *S. cheela*, B 17557, XII.1952, Elbel. 1♀, Chanthaburi, Khaosoidaotai, ex *Ictinaetus malayensis*, #2332, III.1966, Migr. Anim. Path. Surv. 3♀♀, Chiengmai, Doi Inthanon, ex *Aquila nipalensis*, 5E 1520, XI.1964, Migr. Anim. Path. Surv. 1♂, 1♀, Chiengmai, Doi Phahompok, ex *Aquila nipalensis* #1239, X.1965, M.A.P.S. 1♂, 2♀♀ (CNHM), Kanchanaburi, Trakhanun, Hinlaem, right bank, ex *S. cheela*, B17069, XI.1952, Elbel. 3♀♀ (LDN), Kwae Noi Riv. Exped., Niki, 150 m, C. Thailand, IV–V.1946, Jonkers. 2♀♀, Namtokthaphae, Amphoe Chawang, ex *S. cheela*, SMRL 1535, IX.1962. 1♀, Phangnga, Thapput, ex *Bubo s. sumatrana*, RE 6407, VII.1962, Wanit. 1♀ (CNHM), Prachuap Khirikhan, Bankhluaklang, ex *Pernis* sp. B 17650, XII.1952, Deignan. 1♂, 4♀♀ (CNHM), Sakon Nakhon, Koekpue, Bansahngkaw 2, ex *S. cheela*, RE 3353, 3376, I–II.1954, Elbel & Boonsong. 1♂, 1♀, Songkhla, Nathawi, ex *S. cheela bassus*, RE 6496, Wanit. 1♀, Satun, Muang Thungnui, ex *S. cirrhatus limnaeetus*, RE 6281, VI.1962, Wanit & Wichit.

MALAYA: 1♂ (BMNH), Selangor, ex "Enggang", III.1932, Seimund.

SUMATRA: 2♀♀ (AMS), Buo, Pad. Bov., III.1914, E. Jacobson. 2♀♀ (AMS), Tandj. Anadals, V.1914, Jacobson. 1♀ (AMS), Biaro ex "Roof-vogel #3087", X.1913, Jacobson.

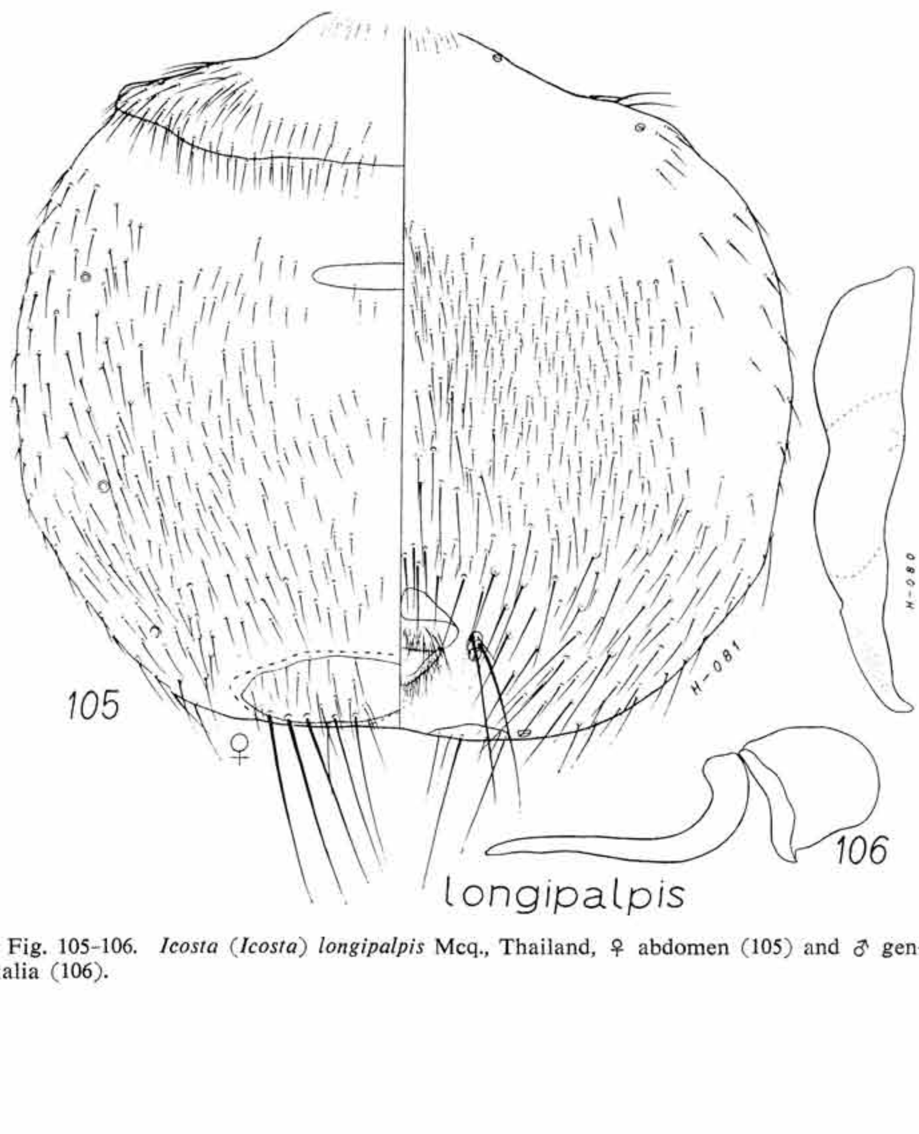


Fig. 105–106. *Icosta (Icosta) longipalpis* Mcq., Thailand, ♀ abdomen (105) and ♂ genitalia (106).

JAVA: 1♂ (LDN), "Java", Mrs. Walsh. 1♀ (BRX), "Java".

BORNEO: 1♀, Ranau, Sabah, ex *Haliastur indus intermedius*, PJ 9466, IX.1960, Kuntz. 1♂, 1♀ (BMNH), Sandakan, Sabah, III.1893, Cator.

PHILIPPINES (Mindanao): 1♂, 3♀♀, Dapitan Peak, 1720–2320 m, Mt Malindang, Misamis occ., ex *Spilornis cheela holospilus*, BBM 510, I.1963, Rabor. 1♀, Limot Mati, Davao Prov., Mt Mayo, ex *S. cheela holospilus*, B 8245, VI.1965, Rabor.

Habitats. Widely spread over western Oriental Region; so far, known from lowland up to 2000 m in Ceylon, E. Pakistan, Burma, Thailand, Malaya, Sumatra, Java, Borneo and Philippines (Mindanao). Obviously breeding on Falconiformes: Accipitridae, particularly the genus *Spilornis*. Analysis of above given data, Falconiformes: Accipitridae 15 records (*Aquila* 2, *Haliastur* 1, *Ictinaetus* 1, *Pernis* 1, *Spilornis* 9, *Spizaetus* 1); Strigiformes: Strigidae (*Bubo*) 1. Highest density per infested bird was 1♂, 3♀♀ (BBM 510, ex *Spilornis*).

Systematics. The only published illustrations known to me of this species were by Bequaert (*l. c.*, as *L. majuscula*), which were mislabeled as of ♂, rather than ♀ holotype, and in fig. 2B, abdomen, as from both above and below, rather than from above only. As suggested by the names *longipalpis*, *longirostris* and *majuscula*, this species can be easily recognized by the long palpus and large body size. The very extensive wing-setulae is unknown to other species of the subgenus; the metasternal process is short; tarsus 1 practically symmetrical, aedeagus rather short, hardly S-shaped. It has no very close relative.

♀. *Color* dark, wing fuscous. *Head*: Occipital margin distinctly concave; vertical bristle 2/3 as long as notopleural bristle; postvertex fairly long. Face wide, almost parallel-sided. Frons proper very short, narrowly notched at middle; frontal process (fig. 6) 1/2 as long as palpus (fig. 3), in profile gently decurved, apically pointed. Palpus *ca* 5/7 as long as distance between frontal notch and occipital margin. Vibrissal process in profile normal, small, as long as wide at base, apically acute. Gula posteriorly spinose. *Thorax*: Mesonotum 72×100; prescutum densely, strongly striate all over; scutellum 19×50, posterolaterally subangular, posteriorly very weakly convex, with median 1/3 of posterior margin almost straight; scutellar bristle very close to posterior margin. Metapleurotergal callus with 4–6 very stout spines and 6–10 black strong setae, latter irregularly arranged and largely lying dorsad to spines. Prosternum (fig. 7) very small, moderately sclerotized, with 1 pair of soft setae. Metasternal process (fig. 143) 1/2 as long as wide at base, broadly rounded. *Wing* 8.5–9.5 mm long; setulae very extensive, leaving only posterior part of cell *2a* bare. Femur 1 moderately swollen, basal part of its anterior surface rather evenly covered with fine suberect setae; anterior surface of femur 2 with small bare area and $2\pm$ spines near midlength. Tibia 3 as in fig. 12. Tarsal spines 2.1.1.0 /2.1.1.0/3.2.1.1; tarsomeres 3–4 (fig. 10) of foreleg with outer apical lobes hardly longer than inner ones; tarsomere 1 of hindleg 33×13.5, longer than $2+3+4$ and than 5; tarsomeres 2–4 of same leg slightly asymmetrical. *Abdomen* (fig. 105) rather uniformly covered with moderately long and fine setae; dorsal striolate area unevenly setose; ventral setae on lateral area slightly more robust than on median area, those fencing urogenital area markedly longer and more robust than elsewhere. Tergite 3 rather wide; tergite 6 shallowly concave at anterior and posterior margins, with $7\pm$ pairs of bristles. Laterite 3 well sclerotized ventrally, its setae as long and fine as those near spiracles 4 and 5; laterite 7 small, roundish, with 2 bristles and 2–4 setae. Postgenital plate extensively setose.

♂. Similar. Foreleg with 1.0.1.0 tarsal spines; tarsomeres 1 and 5 of hindleg equal in length. Setae on laterite 3 distinctly more robust than near spiracles 4 and 5. Aedeagus (fig. 106) fairly short, strongly sclerotized, hardly decurved at apical part; paramere short, apical part decurved and pointed. Postgenital plate long, broadly rounded (not bilobed), with many setae on and near apical and apicolateral margins.

Icosta (Icosta) acromialis acromialis (Speiser) Fig. 2, 6-8, 10, 11, 62, 65, 107, 109.

Olfersia acromialis Speis., 1904d: 386. Type destroyed, ex (?) bird, NE New Guinea; neotype ♀ (BISHOP 7590), ex *Mino dumontii*, N New Guinea.

MATERIAL. 8♂♂, 25♀♀.

NW NEW GUINEA: 1♀, Vogelkop, Kebar Valley, 550 m, ex *Mino dumontii*, BBM 749, I.1962, Quate. NE NEW GUINEA: Neotype ♀, Finschhafen, ex *M. dumontii*, BBM 27648, IV.1963, Clissold. 1♂, 1♀, Karimui, 1100 m, ex bird BBM 20066, VII.1963, Sedlacek. SE NEW GUINEA: 1♂, Ahola, ex *Aplonis* sp. BBM 29878, X.1963, Clissold. 1♀,

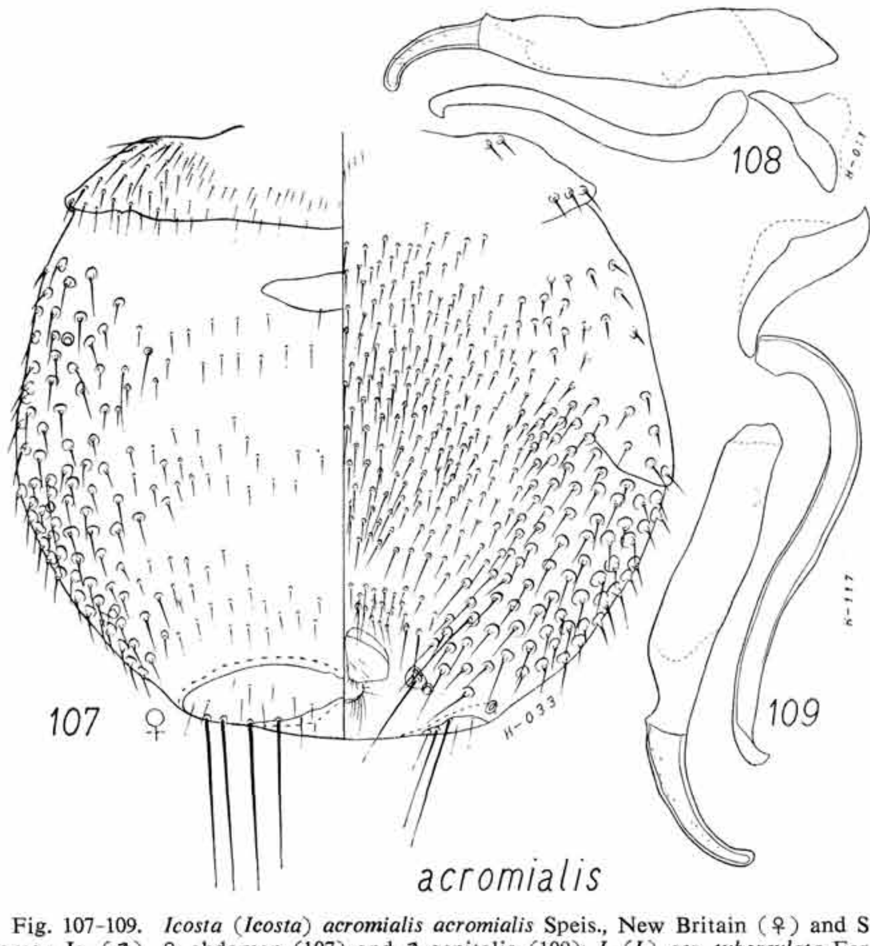


Fig. 107-109. *Icosta (Icosta) acromialis acromialis* Speis., New Britain (♀) and Solomon Is. (♂), ♀ abdomen (107) and ♂ genitalia (109); *I. (I.) acr. tuberculata* Ferr., Philippines, ♂ genitalia (108).

Buka Bara, ex *M. dumontii*, BBM 28815, IX.1963, Shanahan. 1♀, Cape Killerton, ex *Corvus orru*, BBM 29262, X.1963, Clissold. 3♀♀, Jumbora, ex *M. dumontii*, BBM 28745, 28774, 29341, IX–X.1963, Clissold; 1♂, 6♀♀, *id.*, *Corvus orru*, BBM 28735, 28747, 28770, 29346. 1♀, Popondetta, N. Distr., ex *M. dumontii*, BBM 28678, IX.1963, Shanahan.

NEW BRITAIN: 3♂♂, 4♀♀, Gaulim, ex *Corvus orru*, BBM 20691, X.1962, Clissold.

SOLOMON IS.: 1♂, 3♀♀, Malangona, Choiseul-Fauro, ex *Corvus woodfordi*, BBM 23724, III.1964, Temple. 1♀, Niki Creek, Roroni, Guadalcanal, ex *Aplonis grandis*, BBM 23834, V.1964, Temple & Shanahan. 2♀♀, Pusisuma, Vella Lavella, ex *Lamprocorax* [=*Aplonis*] *grandis*, BBM 22351, XI.1963, Temple. 1♂, Boala, 60 m, Ysabel, ex *Corvus woodfordi*, BBM 24257, VIII.1964, Shanahan. 1♀, Tatamba, Ysabel, 20 m, ex *C. woodfordi*, BBM 24321, IX.1964, Shanahan.

Habitats. Papuan Subregion, at present known from New Guinea, New Britain and Solomon Is., lowland, up to 1100 m. Probably breeding on Corvidae and Sturnidae. Breakdown of above given data, Passeriformes: Corvidae (*Corvus*) 9 records; Sturnidae 10 (*Aplonis* 3, *Mino* 7). Highest density per infested bird was 3♂♂, 4♀♀ (BBM 20691, ex *Corvus*) in New Britain.

Systematics. This fairly widely spread species is so far known from the original description which reads:

"Die Art gehört in die Verwandtschaft der amerikanischen Olfersien, *O. fusca* Macq., *O. rufiventris* Big. und *O. angustifrons* Wulp, unterscheidet sich aber von allen diesen und den sonstigen näher verwandten Species durch vorne deutlich hell rahmgelb umrandete Schulterecken. Lange 6¼ mm., Mundrand-Scutellarrand 3 mm. Dunkel braunschwarz, mit Ausnahme der Stirnstrieme und des mattgrauen Hinterleibs glänzend, fast unbehaart. Die Antennenfortsätze innen und die Vorderkante und Spitze der Schulterecken rahmgelb abgesetzt. Kopf klein, Scheitel gleichmässig gerundet, Scheiteldreieck vorne in der Mitte deutlich eingekerbt. Stirnstrieme nach vorne verschmälert, aber auch vorne über dem Clypeus noch gut 2/3 so breit als ein Auge. Clypeus mit Querfurche, nach der Stirnplatte zu, zwar in Ganzen eingedrückt, aber ohne Grübchen, vorne spitzwinklig ausgeschnitten, so dass zwei mittellange Zipfel entstehen. Antennenfortsätze kurz, schwarz beborstet; Maxillarpalpen ziemlich lang und nach abwärts gebogen, durchaus braunschwarz. Thorax glatt, mit helleren Schulterecken, das Scutellum fast geradlinig abgestutzt, aber doch noch ziemlich lang, mit einer feinen vertieften Linie in der Mitte. Beine schwarzbraun, ohne Besonderheiten. Flügel nussbraun mit hellerem Analfeld, Geäder wie bei den anderen Arten. Abdomen weichhäutig, grau, zusammengetrocknet."

Specimens here referred to *acromialis* fit the original description very well, and I have no doubts about their identity. The antennal appendages were said by Speiser to be pale on the inner side and the frons proper to be without dimple (Grübchen), but both are inconstant characters. The scutellum was said to be "fast geradlinig abgestutzt", this is apparently an exaggeration since, if so (as in *jactatrix* and *elbeli*), the scutellum would not be "aber doch noch ziemlich lang." The anal field of wing (cell *2a*) was said to be paler which is obviously a result of the absence of setulae in that particular area. The collection data of the neotype (designated Maa 1963: 12) is corrected here.

Acromialis and *tuberculata* are so similar to each other in structure and in host relationships that they must be considered conspecific. They apparently serve as connecting links of the Plana and Longipalpis groups. Their tarsi 1 are distinctly asymmetrical and metasternal process moderately developed. Therefore, they can be placed in either group. But the aedeagi are elongate and apically hook-like. On the strength of this character, they are here assigned to the Longipalpis group within which they stand closest to *corvina* although their structure and host relationships are less specialized than in the latter species. The supposedly close affinities of *acromialis* to *rufiventris* Big. (=*fusca* Mcq.) and *angustifrons* Wulp as emphasized by Speiser are nothing but superficial similarities.

♀. *Color* dark, wing weakly fuscous. *Head* (fig. 62): Occipital margin very weakly convex in general outline, hardly concave at median section; vertical bristle 2/3 as long as notopleural bristle; postvertex moderately short. Face moderately wide, parallel-sided in dorsal view of insect, very weakly narrowed anteriorly in front view of head. Frons proper short, widely notched at middle; frontal process (fig. 6) 2/3 as long as palpus (fig. 2), in profile very broad, rather strongly decurved, apically narrowly rounded. Vibrissal process in profile normal, triangular, as long as or slightly shorter than wide at base. Gula posteriorly spinose. ***Thorax***: Mesonotum 41×52; prescutum densely strongly striate all over; scutellum 12×29, posterolaterally almost rounded, posteriorly distinctly convex. Metapleurotergal callus with 3-4 spines. Prosternum (fig. 7) weakly sclerotized, with 2 pairs of soft setae. Metasternal process moderately developed, 1/2 as long as wide at base. *Wing* (fig. 65) 4.6-5.2 mm long; setulae covering entire membrane except cell *2a*. Femur 1 (fig. 8) strongly swollen, basal part of its anterior surface unevenly covered with spinules; anterior surface of femur 2 with 6± long slender spines, its basal part largely bare. Tibia 3 as in fig 11. Tarsal spines 1.0.0.0/2.1.1.0/2.2.1.1; tarsomeres 3-4 (fig. 10) of foreleg with outer apical lobes distinctly longer than inner ones; tarsomere 1 of hindleg 14×8, nearly as long as 2+3 and slightly shorter than 5; tarsomeres 2-4 of same leg all asymmetrical. *Abdomen* (fig. 107) with moderately long setae; dorsal striolate area with few scattered fine short setae; membrane between tergite 3 and spiracle 3 often with 1-2 setae longer (but not noticeably stouter) than neighboring ones; setae on lateral area distinctly stouter and with much larger basal papillae than on median ventral area, those fencing urogenital area scarcely more robust. Tergite 3 narrow, tergite 6 with 5-7 pairs of bristles. Laterite 3 well sclerotized, bearing spine-like setae; laterite 7 small, with single bristle and 1-2 setae. Postgenital plate with 10± pairs of short setae near anterior margin.

♂. Similar. Tergite 3 larger; laterite 3 hardly sclerotized but easily recognizable by presence of spines, which are markedly longer and stouter than setae near spiracles 4 and 5. Aedeagus (fig. 109) long, distinctly S-shaped, apically decurved and hook-like. Postgenital plate not bilobed, with few setae on apical margin.

Icosta (Icosta) acromialis tuberculata (Ferris) Fig. 2, 6, 7, 11, 108.

Lynchia tuberculata Ferr., 1927c: 224, fig. 12-13, ♂. Type: ♀ (UCB), ex *Corvus pusillus*, Palawan.

MATERIAL. 4♂♂, 2♀♀. PHILIPPINES: 1♂, Limot Mati, Davao Prov., Mt Mayo, Mindanao, ex ***Prioniturus***, B 9457, VI-VII.1965, Rabor; 2♂♂, *id*., *Corvus macrorhynchos philippinus*, B 7887, 8121. 1♀, Talagutong, Malita, Davao Prov., ex *C. m. philippinus*, SU-BBM 1010, XII.1963, Rabor. 1♂, Pinigisan, Mantalingajan Range, Brooke's Point, Palawan, ex *Gracula religiosa*, BBM 1251, IV.1962, Thompson. 1♀ (CNHM), San Pedro, Culion Is., Calamianes Group, nr sea level, ex *G. religiosa palawanensis* #3103, III.1947, Hoogstraal.

Habitats. Chiefly Philippine Subregion; at present, known from lowlands in Mindanao, and Culion Islands, spreading southward to Palawan which belongs to Malaysian Subregion. Obviously breeding on Passeriformes: Corvidae (*Corvus*) and Sturnidae (*Gracula*), with one stray record from Psittacidae (*Prioniturus*).

Systematics. *Tuberculata* is so far known from the unique type (♂) and original description. It is so closely similar in structure and host preference to *acromialis* that the 2 forms are here considered conspecific. The palpus, prosternum and hind tibia are as in fig. 2, 7 and 11, respectively.

♀ (undescribed). Differing from nominotypical *acromialis* in following points. Frontal process (fig. 6) 4/5 as long as palpus, in profile not very broad, gently decurved and apically subacute. Vibrissal process slightly shorter than wide at base. Abdominal dorsum mesad to each of spiracles 3, 4 and 5 with 3-4 unusually strong setae which are several times as long and robust as neighboring ones; lateral setae on venter much longer and with much larger basal papillae; setae fencing urogenital area stouter and more numerous.

♂. Tarsomere 1 of midleg with single spine. Laterite 3 with setae not longer, or hardly so, but stouter than those near spiracles 4 and 5. Aedeagus (fig. 108) broader and less curved, paramere shorter. Other characters as in typical ♂ *acromialis*.

Icosta (Icosta) corvina Maa, new species Fig. 2, 6-8, 10, 11, 62, 70, 110, 111.

MATERIAL. 4♂♂, 6♀♀. Holotype: ♀, (CNHM); allotype (BISHOP 7591) and 4 paratypes, (BISHOP); 1 paratype each, (BMNH, MCZ and VRC).

CEYLON: Paratype ♂ (BMNH), Uva Hills, Namunukula, Tonacombe, ex (?) crow, IX.1952, Phillips.

INDIA: Paratypes 2♂♂, 2♀♀, Manjri Farm, Poona, ex *Corvus macrorhynchos*, A 1445, 1446, 69682, III.1954 & I.1966, Virus Res. Centre Poona.

BURMA: Paratype ♀ (MCZ), Myitkyina, ex *C. macrorhynchos*, IV.1945, Stager & Jellison.

THAILAND: Holotype ♀, allotype ♂ (CNHM), Kamphaena Phet, Khanu, ex *C. macrorhynchos*, B 21021, IV.1953, Deignan. 1♀, Chaiyaphum, Pookliew, Banlad, ex *C. macrorhynchos*, B 16549, XII.1952, Elbel.

Habitats. Indian and Indo-Chinese Subregions; at present, known from Ceylon, Peninsular India, Burma and Thailand, lowland, up to 500 m. Possibly monoxenous on Passeriformes: Corvidae: *Corvus macrorhynchos* Wagler, which is very widely distributed over Oriental Region.

Systematics. This species is closely related to *bucerotina* and *spinosa* and can easily be distinguished from them by smaller size, shorter postvertex, shorter thoracic bristles, straight aedeagus and different abdominal chaetotaxy. In the presence of preapical spines on ♂ tibia 2, *corvina* also shows affinities to *dioxyrhina*.

♀. *Color* dark, wing weakly fuscous. *Head* (fig. 62): Occipital margin distinctly concave; vertical bristle 1/2 as long as notopleural bristle; postvertex short. Face wide, almost parallel-sided. Frons proper very short, rather narrowly notched at middle; frontal process (fig. 6) as long as palpus (fig. 2), in profile gently decurved, apically pointed. Vibrissal area in profile normal, slightly shorter than wide at base, apically blunt or subtruncate. Gula posteriorly with fine black setae. *Thorax*: Mesonotum 49×70; major thoracic bristles all fairly short, scutellar weaker and paler than others; prescutum densely strongly striate all over. Scutellum 15×40, posterolaterally subangular, posteriorly gently convex. Metapleurotergal callus with 4± spines. Prosternum (fig. 7) poorly sclerotized, with 1 pair of soft setae. Metasternal process small, 1/2 longer than wide at base. *Wing* (fig. 70) 5.5-5.9 mm long; setulae covering all cells except posterior 1/3 of *2m+1a* and entirety of *2a*; apical margin of *3r* (part), *1m* and *2m+1a* uniformly bare on upper surface, more or less irregularly bare on lower surfaces. Femur 1 (fig. 8) strongly swollen, basal part of its anterior surface evenly covered with setae; anterior surface of femur 2 with 2± spines, its basal area largely bare. Tibia 3 as in fig. 11. Tarsal spines 1.1.1.

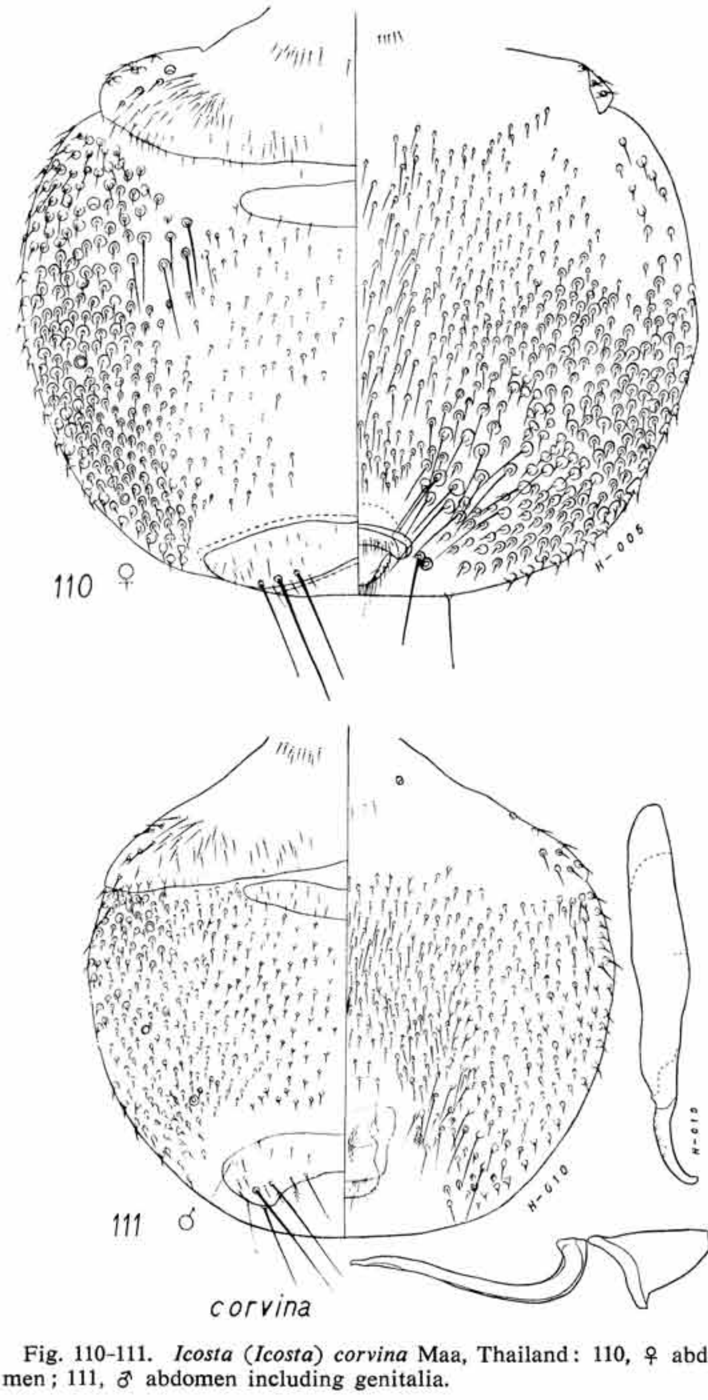


Fig. 110-111. *Icosta (Icosta) corvina* Maa, Thailand: 110, ♀ abdomen; 111, ♂ abdomen including genitalia.

0/2.1.1.0/3.2.1.1; tarsomeres 3-4 (fig. 10) of foreleg with outer apical lobes hardly longer than inner; tarsomere 1 of hindleg 13×6.5, hardly longer than 5, much shorter than 2+3+4 which are distinctly asymmetrical. *Abdomen* (fig. 110) with short, rather uniform setae; setae on lateral area stouter and with much larger basal papillae; membranous area between tergite 3 and spiracle 3 with 4-8 long stout setae. Ventral setae on median area longer, those lying laterad to urogenital area much longer and stouter than elsewhere on abdominal membrane. Tergite 3 wide, tergite 6 bearing 4-5 pairs of bristles. Laterite 3 well sclerotized, its dorsum similarly setose as neighboring membranous area, venter sparsely setose; laterite 7 small, with 1 bristle. Postgenital plate with scattered minute setae.

♂. Similar. Apical margin of cells *1m* and *2m+1a* more extensively bare on both surfaces. Tibia 2 ventrally with series of blunt peg-like preapical spines. Spines on tarsus 1 much weaker than on tarsus 2. No long stout setae between tergite 3 and spiracle 3. Laterite 3 weakly sclerotized, its setae distinctly more robust and slightly longer than on neighboring membranous area; tergite 6 with 3± pairs of bristles. Aedeagus (fig. 111) long, in profile gently decurved apically, not hook-like; paramere very long, apical part in profile strongly decurved. Postgenital plate long, bilobed, with few setae at apical margin.

Icosta (Icosta) bicorna (Ferris) Fig. 2, 6, 7, 10, 11, 66, 112, 113.

Lynchia bicorna Ferr., 1927c: 230, fig. 18, 19, ♂. Type: ♂ (UCB), ex *Penelopides manillae*, Luzon.

MATERIAL. 2♂♂, 3♀♀. PHILIPPINES: 1♂, Canon, Mutya, Mt Malindang, 1000 m, Mindanao, ex *Buceros hydrocorax*, XII.1961, Rabor & Gonzales; 1♀, *id.*, *Aceros l. leucocephalus*. 1♂, Limot Mati, Davao Prov., Mt Mayo, Mindanao, ex *Lonchura malacca jagori*, B 8269, VI.1965, Rabor. 1♀, Santa Cruz, Mahaplag, Leyte, ex *Eurystomus orientalis cyanocollis*, B 1883, VI.1964, Rabor. 1♀ (MCZ), Catbalogan, Samar, det. Bequaert as "*L. dioxyrhina* Speis. = *bicorna* Ferr."

Habitats. Philippines Subregion; at present known from lowland up to 1000 m in Luzon, Samar, Leyte and Mindanao. Apparently breeding on Coraciiformes: Bucerotidae (*Aceros, Buceros, Penelopides*); the odd records ex Coraciidae (*Eurystomus*) and Passeriformes: Ploceidae (*Lonchura*) were strays.

Systematics. Apparently *bicorna* represents the most generalized form of the *Icosta* species parasitic on Oriental hornbills. Its vibrissal process and vein R_{2+3} are normal, ♀ abdomen lacks modified setae on membrane between tergite 3 and spiracle 3 and on laterite 3, and ♂ tibia 2 lacks preapical spines. In the shape of aedeagus, it is similar to *dioxyrhina* and *corvina*; and in the extent of wing-setulae, similar to *bucerotina*. In the original description, the venter of ♂ abdomen was drawn as if largely bare. This is not true (see fig. 113).

♀ (undescribed). *Color* dark, wing weakly fuscous. *Head*: Occipital margin distinctly concave; vertical bristle 1/2 as long as notopleural bristle; postvertex short. Face rather narrow, narrowed anteriorly. Frons proper very short, rather narrowly notched at middle; frontal process (fig. 6) 1/3 longer than palpus (fig. 2), in profile gently decurved, apically pointed. Vibrissal process in profile normal, slightly longer than wide at base, apically subtruncate. Gula posteriorly with pale fine setae. *Thorax*: Mesonotum 48×66; prescutum densely strongly striate all over. Scutellum 15×37, posterolaterally subangular, posteriorly distinctly convex. Metapleurotergal callus with 3 spines. Prosternum (fig. 7) poorly sclerotized, with 1 pair of soft setae. *Wing* (fig. 66) 6 mm long; setulae more extensive than in ♂, cell *1m* with small bare area on apical margin, otherwise entirely setulose; *2m+1a* bare at posterior 2/3 and on apical margin.

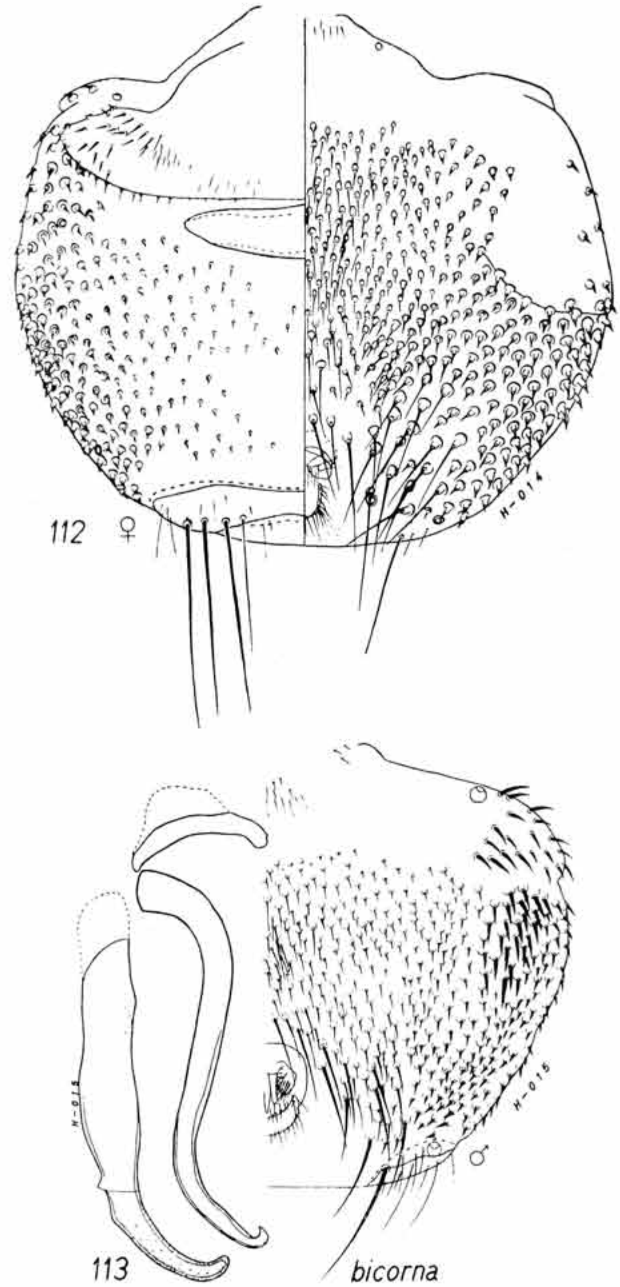


Fig. 112-113. *Icosta* (*Icosta*) *bicorna* Ferr.: 112, ♀ abdomen: 113, ♂ abdomen including genitalia.

Femur 1 strongly swollen, basal part of its anterior surface bare on upper half, covered with spinules on lower half; anterior surface of femur 2 as in *corvina*. Tibia 3 as in fig. 11. Tarsal spines 1.1.1.0/1.1.1.0/3.2.1.1; tarsomeres 3-4 (fig. 10) of foreleg symmetrical; tarsomere 1 of hindleg 13×6, slightly longer than 5 but much shorter than $2+3+4$; tarsomeres 2-3 of same leg asymmetrical, 4 hardly so. *Abdomen* (fig. 112) with short setae; setae on lateral area stouter and with much larger basal papillae, those on dorsal striolate area rather scattered, no modified setae between tergite 3 and spiracle 3; ventral setae on median area longer, those fencing urogenital area much longer and stronger. Tergite 3 wide; tergite 6 with $4\pm$ pairs of bristles. Laterite 3 weakly sclerotized, similarly setose as neighboring area, ventrally extensively bare; laterite 7 small, bearing single bristle. Postgenital plate with scattered minute setae.

♂. Similar. Tibia 2 lacking preapical spines. Tarsal spines 1.1.1.0/2.1.1.0/4.2.1.1. Laterite 2 (fig. 113) with rather stout short spines, laterite 3 ventrally with similar spines. Aedeagus (fig. 113) long, distinctly S-shaped, apically hook-like; paramere moderately long, apically strongly decurved. Postgenital plate bilobed, with few setae on apical margin.

Icosta (Icosta) spinosa Maa, new species Fig. 10, 12, 63, 64, 81, 114.

MATERIAL. 1♂, 2♀♀. Holotype ♀ (BISHOP 7592) and allotype ♂ (BISHOP), paratype (CNHM). LAOS: Holotype ♀, allotype ♂, Thateng, Bolovens Plateau, ex *Anthracoceros albirostris*, R 70427, VII.1960, Leech. THAILAND: 1♀ (CNHM), Chaiyaphum, Pookhiew, Bamnapoo, ex *A. malabaricus*, B 17554, XII.1952, Elbel.

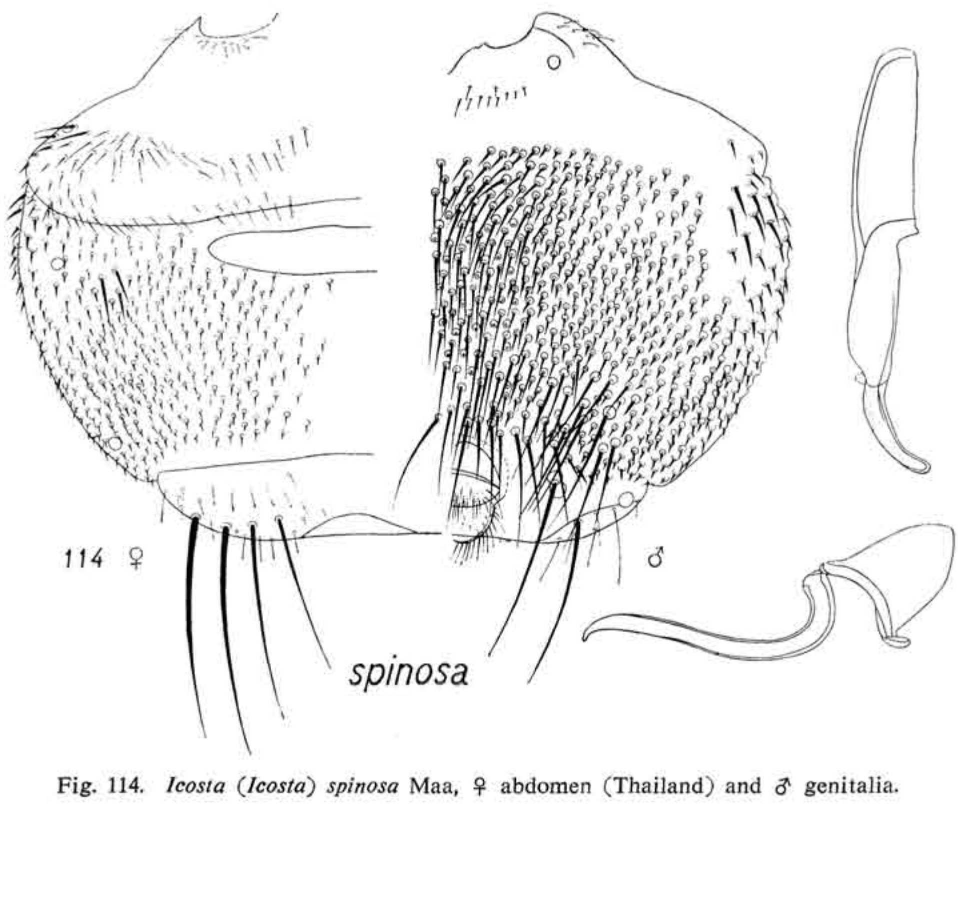


Fig. 114. *Icosta (Icosta) spinosa* Maa, ♀ abdomen (Thailand) and ♂ genitalia.

Habitats. Indo-Chinese Subregion, at present known from Thailand and Laos, lowland; obviously breeding on Coraciiformes: Bucerotidae, perhaps monoxenous on *Anthracoceros*.

Systematics. Closely related to *bucerotina*, being chiefly characterized by strong spines on laterite 3 in both sexes and slightly more extensive wing-setulae. The palpi are relatively shorter. Other relatives are *bicorna* and *corvina* from which *spinosa* can be distinguished by similar characters and by body size, ♂ preapical tibial spines and relative size of basal papillae of abdominal setae.

♀. *Color* dark, wing very weakly fuscous. *Head* (fig. 63): Occipital margin weakly concave; vertical bristle less than 1/2 as long as notopleural bristle; postvertex fairly long. Face wide, almost parallel-sided. Frons proper very short, rather narrowly notched at middle; frontal process in profile gently decurved, apically pointed. Palpus as long as frontal process. Vibrissal process in profile normal, slightly longer than width at base, apically blunt. Gula posteriorly with fine pale setae and 1-2 black spines. *Thorax* (fig. 64): Mesonotum 55×74; prescutum densely strongly striate all over. Scutellum 16×42, posterolaterally subangular, posteriorly gently convex. Metapleurotergal callus with 2 spines. Prosternum poorly sclerotized, with 1 pair of soft setae. Metasternal process large, distinctly longer than wide at base, apically narrower than in *bucerotina*. *Wing* (fig. 81) 6.1-6.4 mm long; setulae covering all cells except posterior 1/3 of *2m+1a* and entirety of *2a*, with narrow bare stripe on apical margin (upper surface only) of *3r* (part), *1m* and *2m+1a*. Tibia 3 as in fig. 12. Tarsal spines 1.1.1.0/2.1.1.0/3.2.1.1; tarsomeres 3-4 (fig. 10) of foreleg symmetrical; tarsomere 1 of hindleg 14×7, hardly longer than 5 but much shorter than 2+3+4 which are apically symmetrical. *Abdomen* (fig. 114) rather uniformly covered with short setae; membrane between tergite 3 and spiracles 3 with 3-4 stout spines. Tergite 3 wide; tergite 6 bearing 5± pairs of bristles; setae on median part of ventral membrane long; those fencing urogenital area very long and robust. Laterite 3 hardly sclerotized, ventrally with 10-11 stout spines which are slightly shorter than those lying between tergite 3 and spiracle 3; laterite 7 small, with 1 bristle. Postgenital plate with 10± setulae.

♂. Similar. Scutellum as in ♂ *bucerotina*, slightly longer and posteromedially flattened. Wing-setulae less extensive, cell *3r* rather broadly bare along posterior margin, *1m* narrowly setulose along basal 1/3 of anterior and posterior margins and with small setulose patches on apical margin, *2m +1a* with subtriangular setulose patch along basal 1/2 of anterior margin. Tibia 2 with similar preapical spines as in ♂ *bucerotina*. Laterite 3 with heavy spines which are in average 3× as long as setae surrounding spiracles 4-5; no modified setae between tergite 3 and spiracle 3. Genitalia (fig. 114) closely similar to that of *bucerotina*, a little more slender in outline.

Icosta (Icosta) bucerotina Maa, new species Fig. 2, 6, 7, 11, 62, 64, 67, 115, 116.

MATERIAL. 5♂♂, 11♀♀. Holotype ♀ (BISHOP 7593), allotype ♂ and most paratypes (BISHOP); 1 paratype (CNHM).

THAILAND: 2♂♂, 2♀♀ (1♀ w. fungus) incl. holo- and allotypes, Phattalung, Nawaong ex *Anorrhinus galeritus carinatus*, RE 7128, III.1963, Wanit & Wichit. 2♂♂, 2♀♀ (1 ♀ w. fungus), Trang, Muang Khaochong, ex *Berenicornis comatus*, WS 189, IV.1963, Wanit. 4♀♀, Ranong, Kapoe, Thungkha, ex *Rhyticeros plicatus subruficollis*, RE 7043, I.1963, Wanit & Wichit. 1♀ w. mite on abd., Satun, Muang Thungnui, ex *Anthracoceros malabaricus leucogaster*, RE 6279, VI.1962, Wanit & Wichit. 1♂, 1♀, Phangnga, Takuapa, ex bird #WS 787, II.1964, Wanit & Wichit.

BORNEO: Paratype ♀ (CNHM 211705), Sapagaya, Sandakan Distr., Sabah, ex *Spizaetus* #280, VII.1950, Inger & Davis.

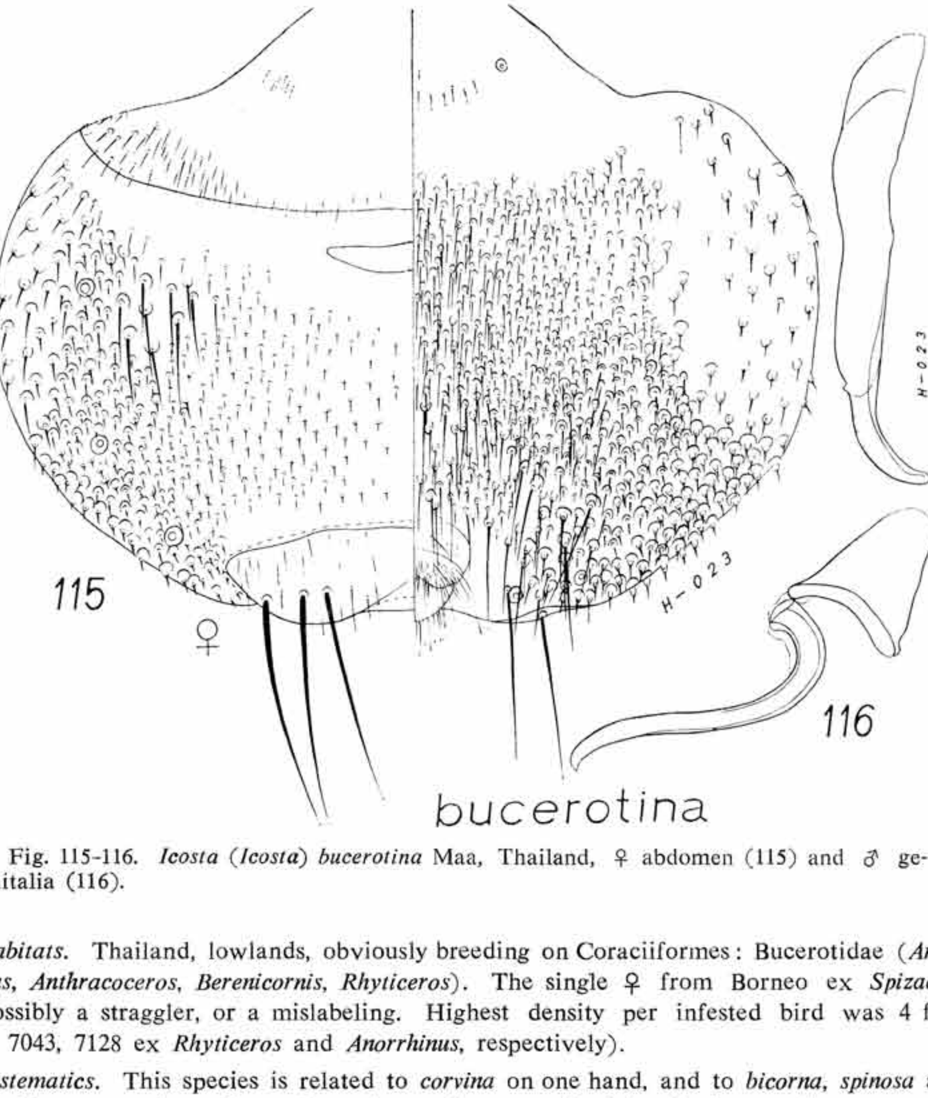


Fig. 115-116. *Icosta (Icosta) bucerotina* Maa, Thailand, ♀ abdomen (115) and ♂ genitalia (116).

Habitats. Thailand, lowlands, obviously breeding on Coraciiformes: Bucerotidae (*Anorrhinus, Anthracoceros, Berenicornis, Rhyticeros*). The single ♀ from Borneo ex *Spizaetus* is possibly a straggler, or a mislabeling. Highest density per infested bird was 4 flies (RE 7043, 7128 ex *Rhyticeros* and *Anorrhinus*, respectively).

Systematics. This species is related to *corvina* on one hand, and to *bicorna, spinosa* and *dioxyrhina* on another. From those, it can be recognized by the long palpus, narrower face, less extensive wing-setulae, and different abdominal chaetotaxy.

♀. *Color* dark, wing fuscous. *Head* (fig. 62): Occipital margin distinctly concave; vertical bristle 1/2 as long as notopleural bristle; postvertex fairly long. Face narrow, almost parallel-sided. Frons proper very short, rather narrowly notched at middle; frontal process (fig. 6) in profile gently decurved, apically pointed. Palpus (fig. 2) 1/2 longer than frontal process, slightly longer than mediovertex. Vibrissal process in profile normal, slightly longer than width at base, apically blunt or subtruncate. Gula posteriorly with pale or dull fine setae. *Thorax*: Mesonotum 59×79; major thoracic bristles normal; prescutum densely strongly striate all over. Scutellum 17×44, posterolaterally subangular, posteriorly distinctly convex. Metapleurotergal callus with 4-6 spines. Prosternum (fig. 7) weakly sclerotized, with 1 pair of soft setae. Metasternal process large, distinctly longer than width at base, apically curved mesad. *Wing* (fig. 67) 6.2-6.6 mm long; setulae not extensive, posteroapical 1/3 of cell *1m* bare; *2m+1a* only with short narrow setulose stripe along basal 1/2 of vein M_{3+4}, elsewhere bare. Femora 1 and 2 similar to that of *bicorna*. Tibia 3 as in fig. 11. Tarsal spines 1.1.1.0/2.1.1.0/3.2.1.1; tarsomeres 3-4 of foreleg symmetrical; tarsomere 1 of hindleg 14×7, as long as 5, much shorter than 2+3+4 which are distinctly asymmetrical. *Abdomen* (fig. 115) with short and rather uniform setae; setae on lateral area stouter and with larger (less large than in ♀ *corvina*) basal papillae; membranous area between tergite 3 and spiracles 3 with conspicuous patch of 5-10 long, very robust setae; ventral setae on median area slightly longer and more robust, those lying anterolaterad to urogenital area much longer and stouter. Tergite 3 wide, tergite 6 bearing 4± pairs of bristles. Laterite 3 not definable, or hardly so, its setae longer, stouter than those of neighboring area; laterite 7 small, bearing single bristle. Postgenital plate with scattered minute setae.

♂. Similar. Wing-setulae forming short narrow stripes along anterobasal margin of *1m* and *2m+1a*, otherwise those 2 cells bare. Tibia 2 ventrally with series of short pointed preapical spines. Tergite 6 bearing 3-4 pairs of bristles. Aedeagus (fig. 116) long, distinctly S-shaped, apically slightly hook-like; paramere long, apical part strongly decurved. Postgenital plate long, bilobed, with few setae on apical margin.

Icosta (Icosta) dioxyrhina (Speiser) Fig. 3, 6-8, 10, 11, 62, 72, 117, 118.

Olfersia dioxyrhina Speis., 1904d: 387. Type destroyed, ex *Rhyticeros plicatus*, NE New Guinea; neotype ♂ (Bishop 7594), here designated, ex *Rh. plicatus*, NE New Guinea.

Material. 6♂♂, 8♀♀.

NW NEW GUINEA: 2♂♂, Vogelkop, Kebar Valley, 550 m, ex *Rh. plicatus*, BBM 832, 835, I.1962, Quate; 1♀, *id.*, no host record. 1♂, 2♀♀, Oransbari, NW of Geelvink Bay, 3m, ex *Rh. plicatus*, BBM 22293, I-II.1963, Thompson & Richards. NE NEW GUINEA: Neotype ♂, Finschhafen, ex "kokomo" [*Rh. plicatus*], I.1963, Shanahan.

NEW BRITAIN: 1♀, seriously damaged, Gaulim, ex *Ducula finschii*, BBM 20877, XI. 1962, Clissold. 1♂, Mt Sinewet, ex "kokomo", BBM 20767, XI.1962, Clissold.

SOLOMON IS.: 1♂, 4♀♀, Toumea, Fauro, Guadalcanal, 10 m, ex *Rhyticeros plicatus*, BBM 23806, 23807, IV.1964, Temple.

Habitats. Papuan Subregion, lowlands; so far, known from New Guinea, New Britain and Solomon Is. Obviously breeding on Coraciiformes: Bucerotidae: *Rhyticeros plicatus*, the only hornbill occurring in those countries. Highest density per infested bird was 4 flies (BBM 23806). The single record of a seriously damaged ♂ ex Columbiformes: Columbidae (*Ducula*) is apparently a result of contamination. As pointed out previously (Maa 1964: 100), the Grande Comore (in Mozambique Channel) record of *dioxyrhina* by Falcoz (1929: 47) is certainly erroneous and probably referable to *mecorrhina*. The Borneo record by Schuurmans Stekhoven (1941 *Bull. Mus. Hist. Nat. Belg.* **17** (66): 8) is erroneous, too.

Systematics. This is a very distinct species and can easily be distinguished from all other Oriental species by the broad bare stripe on apical margin of cells *3r*, *1m* and *2m+1a* and by very strong spines on femora 1 and 2. Bequaert's (1953a: 271) suggestion of its possible conspecificity with *bicorna* was apparently guesswork based upon the coincidence of host preference in these 2 species. The species was so far known only from

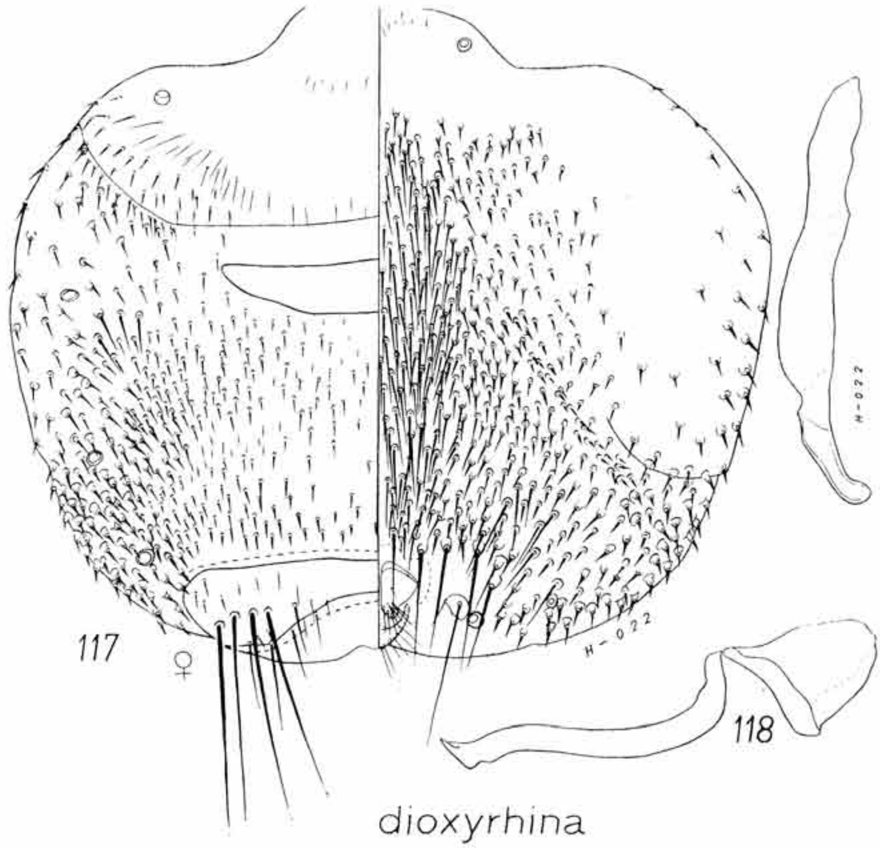


Fig. 117-118. *Icosta (Icosta) dioxyrhina* Speis., New Guinea, ♀ abdomen (117) and ♂ genitalia (118).

the original description.

♀. *Color* very dark, wing fuscous. *Head* (fig. 62): Occipital margin weakly concave; vertical bristle 2/3 as long as notopleural bristle, unusually robust; postvertex fairly long. Face rather narrow, almost parallel-sided. Frons proper very short, narrowly notched at middle; frontal process (fig. 6) as long as palpus (fig. 3), in profile gently decurved, apically pointed. Vibrissal process in profile normal, hardly longer than wide at base, apically blunt or subacute. Gula posteriorly spinose. ***Thorax***: Mesonotum 58×75; prescutum densely strongly striate all over; scutellum 15×41, posterolaterally subangular, posteriorly gently convex. Metapleurotergal callus with 2-3 spines. Prosternum (fig. 7) small, transverse, well sclerotized, with 3-4 pairs of soft setae. Metasternal process narrow, $2\times$ as long as width as base. *Wing* (fig. 72): 5.8-6.9 mm long; setulae extensive, leaving only entirety of cell *2a* and fairly broad stripe along apical margin of *3r*, *1m* and *2m+1a* bare; this apical stripe is largely bare on both surfaces and partly (at posterior part of cell *3r* and anterior part of *1m*) bare on upper surface. Femur 1 (fig. 8) strongly swollen, with 9± very heavy spines is a row crossing both anterior and dorsal surfaces; basal 1/2 of anterior surface bare on upper 1/2, covered with spinules on lower 1/2; anterior surface of femur 2 with 2± very heavy spines, its basal area entirely bare. Tibia

3 as in fig. 11. Tarsal spines 2.1.1.0/2.1.1.0/3.2.1.1; tarsomeres 3-4 (fig. 10) of foreleg symmetrical; tarsomere 1 of hindleg 13×7, hardly shorter than 5, as long as $2+3+4$ which are distinctly asymmetrical. *Abdomen* (fig. 117) with short and rather uniform setae; setae on lateral area slightly longer, much stouter and with larger basal papillae; membranous area between tergite 3 and spiracle 3 with 3-4 moderately long, robust setae; ventral setae on median area longer, those fencing urogenital area longer, stouter. Tergite 3 wide, tergite 6 with 5-6 pairs of bristles. Laterite 3 well sclerotized, similarly setose as neighboring area, ventrally extensively bare; laterite 7 small, roundish, with $2\pm$ bristles. Postgenital plate with few minute setae on anterior margin, elsewhere bare.

♂. Similar. Tibia 2 ventrally with series of short pointed preapical spines. Tarsal spines 2.1.1.0/2.1.1.0/3.3.2.2. Setae on laterite 2-3 somewhat spine-like, distinctly stouter than on neighboring area. Aedeagus (fig. 118) rather short, apically obliquely truncate and somewhat axe-like; paramere long, apical part rounded, strongly decurved. Postgenital plate with few setae on apical margin.

Subgenus **Ardmoeca** Maa, new subgenus

TYPE-SPECIES. *Olfersia ardeae* Mcq., here designated.

Distribution. Worldwide; 12 species and subspecies (5 unnamed): 2 (1 endemic) in Oriental, 4 (2 endemic) in Ethiopian, 2 (both non-endemic) in Neotropical, 4 (2 non-endemic, other 2 of doubtful status) in Palaearctic, 3 (2 endemic) in Australian and 3 (all non-endemic) in Nearctic Region. Two of the species are each divisible into 2 subspecies.

Host Relationships. All species are oligoxenous on aquatic and semiaquatic birds, viz., Pelecaniformes (Phalacrocoracidae), Ciconiiformes (Ardeidae, perhaps Ciconiidae and Threskiornithidae as well), Gruiformes (Rallidae) and Charadriiformes (Charadriidae).

Diagnosis. Postvertex laterally in close contact with inner orbit; palpus short, never more than 2× as long as wide. Wing-setulae exceedingly extensive, cell *2a* at least setulose along vein 2A. Apical 1/2, or almost entirety of femora 2 and 3 (fig. 147, 148), densely uniformly setose. Aedeagus bulging at extreme base, straight or nearly straight at apical 1/2; ♂ postgenital plate Y-shaped; ♀ pregenital plate often present. Sexual dimorphism strong or moderately strong. Body surface of matured specimens generally pollinose.

Affinities. Ardmoeca appears to be rather isolated and with only remote affinities toward *Gypoeca* and *Rhyponotum* in general features of head and leg pilosity. The terminalia of both sexes, however, shows some tendency toward that in *Pseudolynchia* and in Minor group (of subgenus *Ornithoponus*), especially when the ♂ postgenital plate and basal bulging of aedeagus are compared. Within the subgenus the various species clearly fall in 2 groups which differ from one another not only in structure (see couplet 1 of the key) but also in host relationships. The group parasitic on Pelecani- and Ciconiiformes may be divided, on the same bases again, into 2 subgroups. In structural peculiarities and sexual dimorphism, the subgroup parasitic on Pelecaniformes (Phalacrocoracidae) surpasses the remainder of the subgenus. The subgeneric name is derived from Greek *ardmos*, a watering place; *oeka, oekos*, belong to a house. The following key is admittedly incomplete and artificial. *Massonnati* is doubtfully placed and sp. "F" not included. When structural details of the unnamed forms are better known, the key will need a thorough revision.

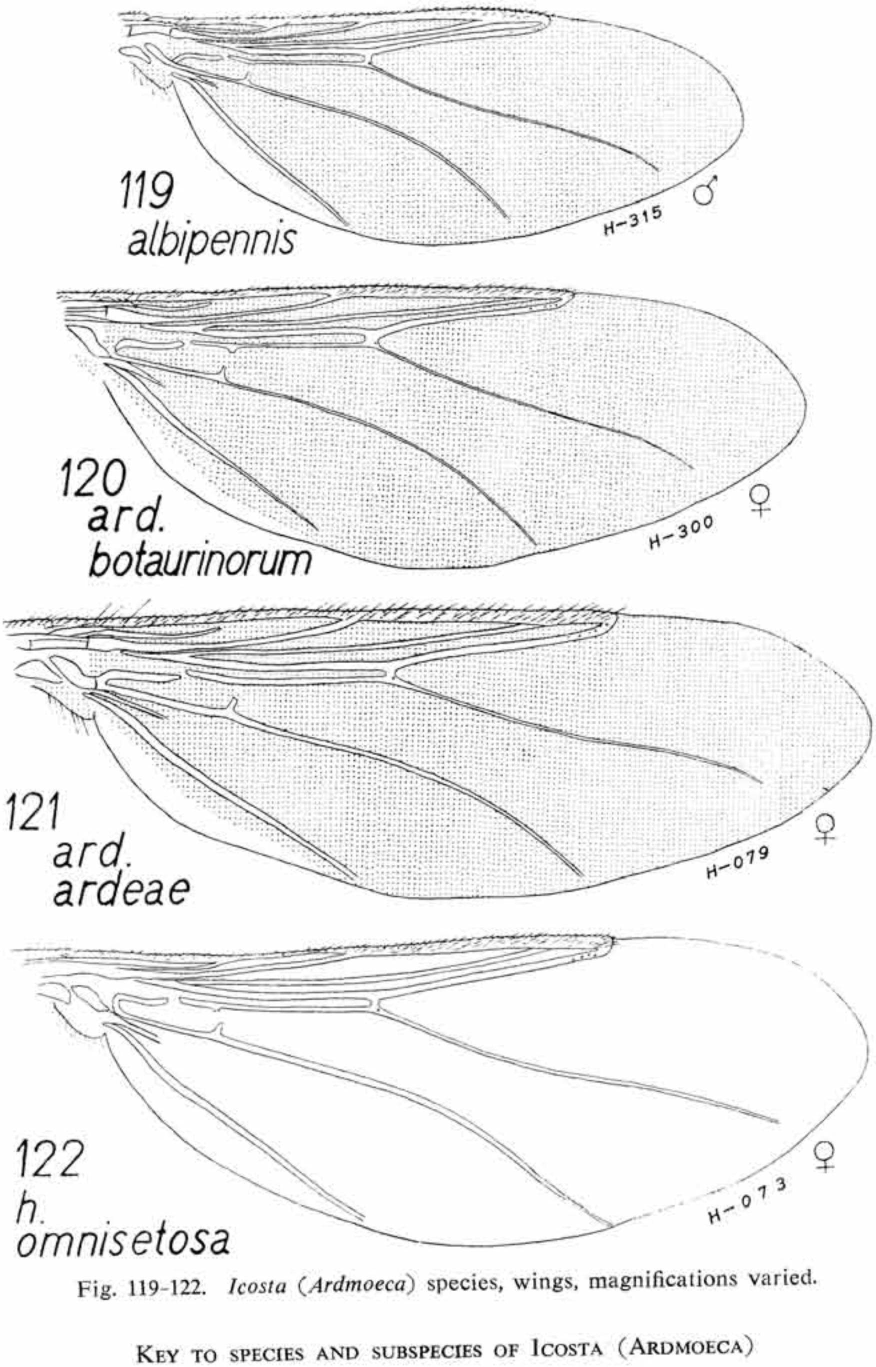


Fig. 119-122. *Icosta* (*Ardmoeca*) species, wings, magnifications varied.

KEY TO SPECIES AND SUBSPECIES OF ICOSTA (ARDMOECA)

1. At least apical (inner) 1/3 of cell *2a* bare on both surfaces; jugular area simple, not

angular, no ental process (fig. 141); vein 2A with apex lying either much apicad or much basad to level of *rm*; mediovertex markedly longer than postvertex, wider than inner orbit and narrower than eye. Normally breeding on Phalacrocoracidae and Ardeidae.. 2

Under surface of cell *2a* entirely setulose, bare stripe on upper surface running narrowly along apical (inner) margin and only about as wide as vein 2A; jugular area sharply angular or produced into an ental process at each side of labial theca (fig. 142); apex of vein 2A lying just on level of *rm*; mediovertex less significantly so. Normally breeding on Rallidae and Charadriidae.. 9

2 (1). Prescutum with laterocentral bristles which are distinctly more robust than neighboring ordinary setae, reach or extend beyond transverse mesonotal suture and originate from punctures markedly coarser than those giving rise of neighboring ordinary setae..3

Prescutum (fig. 6) with only short ordinary setae which are almost uniformly fine, recumbent, and far from reaching transverse mesonotal suture, their originating punctures uniform or almost uniform in size.. 6

3 (2). Setulose area of cell *2a* not wider, or hardly so, than vein 2A, not extending to wing margin; posterior scutellar margin evenly curved; ♂ tergite 3 clearly present 4

Setulose area of cell *2a ca* 1/2 as wide as that cell and extending to wing margin; posterior scutellar margin subangular at median and obliquely straight at lateral sections; median length of frons proper smaller than average width of frontal process; ♂ tergite 3 untraceable (in dry specimen). Australia..................................sp. "S"

4 (3). Female with 1 or 2 pairs of conspicuous tufts of very dense strong bristles on abdominal dorsum, lacking pregenital plate, urogenital area fenced anteriorly by many rows of dense fine setae and laterally by strong spines each arising from unusually large and prominent basal papilla; ♂ with well sclerotized laterite 3, with tergite 3 only *ca* 1/3 as wide as tergite 6..5

Female lacking above described bristle-tufts but with elongate fairly large pregenital plate, urogenital area fenced anteriorly by single row of sparse robust setae and laterally by ordinary setae; ♂ with poorly defined laterite 3, with tergite 3 *ca* 1/2 as wide as tergite 6. New World.. **albipennis**

5 (4). Female abdominal dorsum with only 1 pair of above described bristle-tufts; ♂ unknown. France .... **massonnati**

Female abdominal dorsum with 2 pairs of bristle-tufts; ♂ tergite 6 *ca* 4× as wide as long. W. and E. Africa .... **schoutedeni**

6 (2). Female often with very small pregenital plate, fencing of urogenital area either similar to *schoutedeni* or *albipennis*; ♂ tergite 6 either *ca* 2 or 4× as wide as long (see Addendum for revision of couplets 5 and 6) 7

Female with above described bristle-tufts, always lacking pregenital plate, fencing of urogenital area similar to that in *schoutedeni*; ♂ unknown. S. Africa...............sp. "T"

7 (6). Tergite 6 in ♀ subtriangular and *ca* 3/4 as long as wide, in ♂ transversely elliptical and *ca* 1/4 as long as wide; ♀ abdominal dorsum with a pair of conspicuous tufts of very dense strong bristles, urogenital fencing similar to that in *schoutedeni* (see couplet 4); aedeagus more elongate. Australia .... sp. "N"

Tergite 6 in both sexes transversely elliptical and *ca* 1/5 to 1/6 as long as wide; ♀ lacking above described bristle-tuft, urogenital fencing similar to that in *albipennis*; aedeagus very short (fig. 127)...8

8 (7). Wing narrower in proportion (fig. 121); ♂ lacking tergite 3; ♀ with setae on median area of abdominal venter distinctly paler, longer and finer than those on submedian area which are more or less spine-like and similar to ventral setae near laterite 3. Old World .... **ardeae ardeae**

Wing broader in proportion (fig. 120); ♂ with tergite 3; ♀ with setae on median and submedian areas of abdominal venter not sharply different in color, length and robustness. N. America .... **ardeae botaurinorum**

9 (1). Postvertex anteriorly unilobed; wing not more than 5.2 mm long; jugular area distinctly produced into recurved process.. 10

Postvertex anteriorly bilobed; wing 5.5 mm long; jugular area angular, not produced into recurved process. C. Africa.. sp. "**O**"

10 (9). Abdominal setae longer and denser (fig. 133); postvertex relatively shorter, often anteriorly subtruncate. Oriental Region .... **holoptera omnisetosa**

Abdominal setae shorter and sparser (fig. 131); postvertex relatively longer, never anteriorly subtruncate. New World .... **holoptera holoptera**

Icosta (Ardmoeca) albipennis (Say) Fig. 2, 7, 10, 11, 119, 123, 124, 138.

Olfersia albipennis Say, 1823: 101. Type lost, ex *Ardea h. herodias*, "United States"; neotype ♀ (not seen by me) in Nebraska Univ., ex *Butorides v. virescens*, Nebraska.

O. propinqua Wk., 1849: 1141. Type: ♂ (BMNH), ex (?) bird, Jamaica.

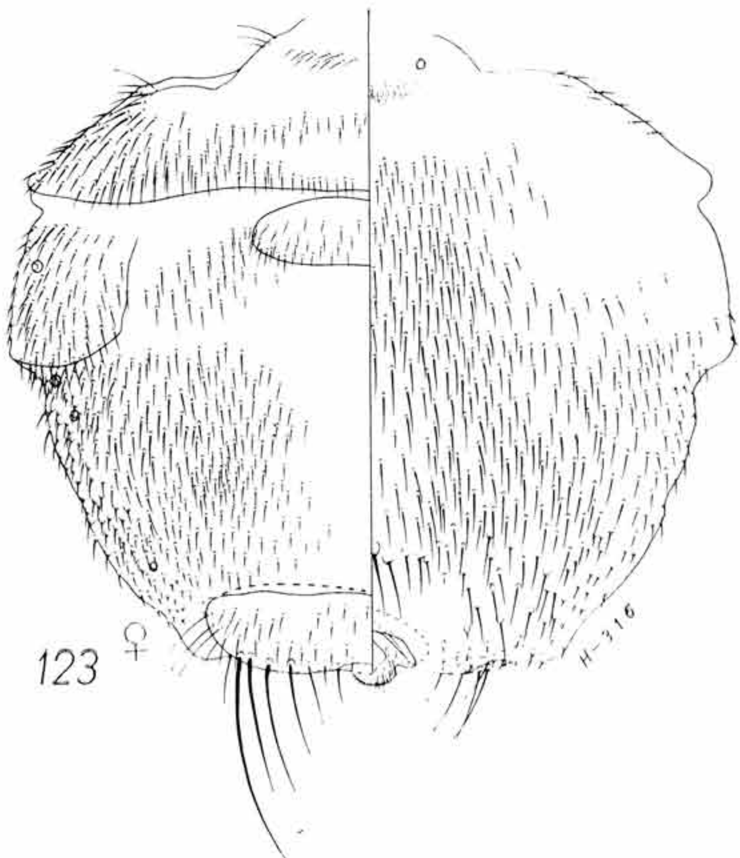


Fig. 123. *Icosta (Ardmoeca) albipennis* Say, Galapagos Is., ♀ abdomen.

O. coriacea v. d. Wulp, 1903: 430 (pt., paratype of the species, ex (?) bird, Mexico: Presidio).

Stilbometopa podopostyla Speis., 1904d: 394 (pt., paratype of the species, ex (?) bird, Brazil: Mato Grosso).

Olfersia palustris Lutz, 1915: 183, pl. 28, fig. 4. Lectotype ♀, here designated, (MCZ), ex *Tigrisoma lineatum marmoratum*, Brazil.

Lynchia albipennis (pt.): Beq. 1955: 330, fig. 63 B, C, F, G, H.

MATERIAL. Some 100 specimens at AMNH, BMNH, CAS, CNHM, MCZ and USNM, largely previously studied and listed by Bequaert (1955, 1957), were checked. Summation of their collection data follows.

CANADA: Quebec, *Anas brasiliensis*, 1 record.

U.S.A.: Alabama, *Florida c. caerulea*, 1 record. Florida, *Ardea h. herodias*, 2; no host, 1. Iowa, *Ardea h. herodias*. 1, Kansas, *Nycticorax nycticorax hoactli*, 1. Louisiana, no host, 1. Maryland, no host, 1. Massachusetts, *N. nycticorax hoactli*, 1; *Tringa melanoleuca*, 1. Minnesota, no host, 1. Mississippi, *Butorides v. virescens*, 1. New Hampshire, *Cosmerodius ılbus egretta*, 1. New Jersey, *Ardea h. herodias*, 1. New York, *Butorides v. virescens*, 1;

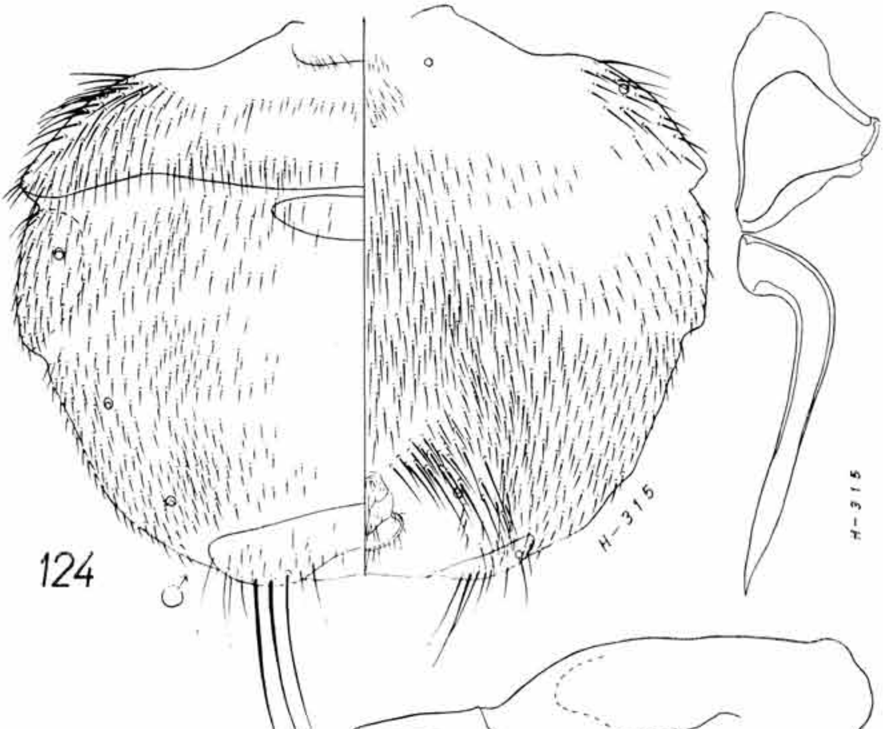


Fig. 124. *Icosta (Ardmoeca) albipennis* Say, Galapagos Is., ♂ abdomen including genitalia.

Florida c. caerulea, 1 ; *N. nycticorax hoactli*, 1 ; no host, 1. North Carolina, no host, 1. Ohio, *Cosmerodius albus egretta*, 1 ; *Falco s. sparverius*, 1. South Carolina, *Leucophoyx th. thula*, 1. Texas, *Dichromanassa r. rufescens*, 1 ; *Hydranassa tricolor*, 1 ; *Nyctanassa v. violacea*, 1. Utah, *Leucophoyx th. thula*, 1.

W. INDIES : Bahama, *Butorides virescens bahamensis*, 1 record. Cuba, *Nyctanassa v. violacea*, 1 ; no host, 1. Jamaica, *Ardea h. herodias*, 1 ; *Butorides virescens maculatus*, 1 ; no host, 1 (types of *propinqua* Wk.).

C. AMERICA : Mexico, no host (paratype of *coriacea* v. d. Wulp), 1 record. Honduras, *Jabiru mycteria*, 1. El Salvador, "Jalletan", 1. Panama, *Cochlearius cochlearius panamensis*, 1 ; on collector's hair, 1.

S. AMERICA : Colombia, *Leucophoyx th. thula*, 1 record ; no host, 1. Guiana, *Theristicus caudatus*, 1. Brazil, *Anas brasiliensis*, 1 ; *Ardea cocoi*, 1 (paratype of *palustris* Lutz); *Tigrisoma lineatum marmoratum*, 1 (lectotype of *palustris* Lutz). Paraguay, no host, 1. Argentina, *T. lineatum marmoratum*, 1. Galapagos, *Ardea herodias cognata*, 2 ; *Butorides sundevalli*, 1 ; *Nyctanassa violacea pauper*, 4, *Pelecanus occidentalis*, 1 ; no host, 3.

Habitats. All over Neotropical Region including the Galapagos, spreading northward to Nearctic Region where it overlaps practically entire range of *ardeae botaurinorum* Swk. There was only 1 odd record for "*albipennis*" (Beq. 1955) each from British Columbia (Wasa), Washington (Pullman), Montana (Ravalli) and Wyoming (no precise locality), and none from Oregon, Idaho, California, Nevada, Utah, Colorado, Arizona and New Mexico. (Recently I received from Dr Elbel a ♂ ex *Leucophoyx*, Fish Springs, Utah. See above). The scarcity of this, or these, ardeid-infesting flies in the Rocky Mts and western slope is noteworthy. From the above list, *albipennis* is apparently more abundant, has a much wider host range than *botaurinorum*, and is apparently breeding on Ciconiiformes : Ardeidae (*Ardea, Butorides, Cosmerodius, Cochlearius, Dichromanassa, Florida, Hydranassa, Ixobrychus, Leucophoyx, Nyctanassa, Nycticorax, Tigrisoma*). Its occurrence on the following birds is probably accidental. Pelecaniformes : Pelecanidae (*Pelecanus*) ; Ciconiiformes : Threskiornithidae (*Theristicus*), Ciconiidae (*Jabiru*) ; Anseriformes : Anatidae (*Anas*); Falconiformes : Falconidae (*Falco*); Charadriiformes : Charadriidae (*Tringa*). In addition to the above enumerated genera, Bequaert (*l. c.*) also listed 1 record each (except *Mycteria* which has 2 records) of the following as hosts of "*albipennis*" : Ardeidae (*Mesembrinibis*, Brazil ; *Syrigma*, Argentina); Threskiornithidae (*Eudocimus*=*Guara*, Cuba), Ciconiidae (*Mycteria*, Ohio and Mexico); Accipitridae (*Accipiter*, Pennsylvania); Eurypygidae (*Eurypyga*, Brazil); Rallidae (*Porphyrula*, Kansas ; *Porzana*, Kansas) ; Laridae (*Larus*, Galapagos); Strigidae (*Rhinotynx*, Brazil ; *Tyto*, S. Carolina); Thraupidae (*Piranga*, Virginia). I am unable to verify these records, most of which probably referred to true *albipennis* and only a few (perhaps *Accipiter, Porphyrula, Porzana, Tyto, Piranga*), to *botaurinorum*.

Systematics. The nomenclature of this species is exceedingly confusing. In addition to the synonyms listed above, it was called, by misidentifications at one time or another, *ardeae* Mcq., *botaurinorum* Swk., *intertropica* Wk. and *massonnati* Falc. (see Beq. 1955 : 331–32). On the other hand, the name *albipennis* was applied also to *ardeae* and *botaurinorum*, notably since Bequaert (*l. c.*) lumped together these 3 names. I (1964 : 88–89) first raised doubts about the correctness of Bequaert's conclusion by pointing out some differences between the Old and New World forms while Theodor *et al.* (1964 : 47) suggested to call the Old World form *Lynchia albipennis ardeae*. Upon my request, Dr Alan Stone very kindly compared the neotype of *albipennis* with some of my Galapagos specimens and found they were conspecific as far as their body size, extent of wing-setulae (fig. 119), abdominal chaetotaxy (fig. 123, 124) and ♀ pregenital plate (fig. 138) are concerned. This results that the name *albipennis* must be applied only to the southern form of the New World and *ardeae*, to an independent species occurring in the Old World as well as the northern part of the New World. According to Dr Stone (*in litt.*), the wing length in the neotype of *albipennis* is 5.25 mm, in type of *botaurinorum* 5.95, in type of *scutellaris* 5.6. Other differences of *albipennis* from *ardeae*, incl. *botaurinorum*, are: prescutum with laterocentral bristles, setulose stripe in cell *2a* not broader, or hardly so, than vein 2A and not reaching, or hardly so, apical margin of that cell (in *ardeae* more than 2× as broad as that vein, and at its broadest point nearly 1/3 to 1/2 as broad as cell *2a*, and always reaching apical margin of that cell); ♂ abdominal membrane with numerous pale fine setae, no black erect robust setae near spiracle 5, all setae on lateral areas of membrane distinctly finer than those on laterite 3 (in ♂ *ardeae*, with black erect robust setae near spiracle 5, most setae on lateral area of membrane almost as robust as those on laterite 3); ♂ tergite 3 always present (in *ardeae*, present or absent); ♀ pregenital plate large, elongate, well pigmented and sclerotized (in *ardeae*, very small, subtriangular, usually poorly pigmented and sclerotized); aedeagus longer, with weaker basal bulging. *Albipennis* was so named by T. Say because of the pollinosity which results in the appearance of the wings (and other parts of body, notably thoracic dorsum) as if dusted with a gray powder and which also occurs in *ardeae* and *Olfersia* species as well as many dragonflies (see Ferris 1930c: 70). Here this species is placed at the beginning of the subgenus chiefly on the basis of the well developed ♀ pregenital plate which is rudimentary in *ardeae* and undefinable in other *Ardmoeca* species. The palpus, prosternum, fore tarsus and hind tibia are as in fig. 2, 7, 10 and 11, respectively.

Icosta (Ardmoeca) ardeae botaurinorum (Swenk), new status Fig. 120, 125.

Olfersia botaurinorum Swk., 1916: 128. Type ♀ (not seen by me) in Nebraska Univ., ex *Ixobrychus e. exilis*, Nebraska.

O. scutellaris Swk., 1916: 128. Type ♀ (not seen by me) in Nebraska Univ., ex *I. e. exilis*, Michigan.

Lynchia albipennis (pt.): Beq. 1955: 330, fig. 63A, D, E, 64-65.

Material. Some 100 specimens at AMNH, BRX, CAS, CNHM, LDN, MCZ and USNM, largely previously studied and listed by Bequaert (1955, 1957), were checked. Their collection data are summarized as follows:

Ex *Botaurus lentiginosus*: British Colombia (Wasa) 1 record, Illinois 3, Louisiana 3, Michigan 1, Minnesota 3, Montana 1, New York 1, Ohio 3, Pennsylvania 2, Wisconsin 1, Wyoming 1.

Ex *Ixobrychus exilis*: North Carolina 1 record, South Dakota 1.

Ex *Nycticorax nycticorax*: Pennsylvania 1 record.

Ex *Pandion haliaetus*: New York 1 record.

No host records: Ontario 1 record, Florida 1, Indiana 1, Iowa 1, Massachusetts 1, Ohio 1, Pennsylvania 1, Wisconsin 1.

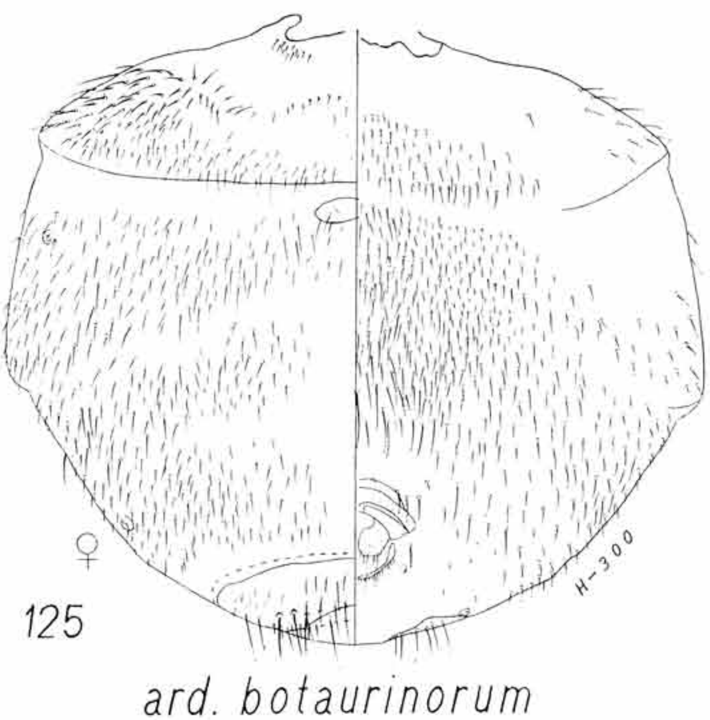


Fig. 125. *Icosta (Ardmoeca) ardeae botaurinorum* Swk., Louisiana, ♀ abdomen.

Habitats. Widely spread over southern half of Nearctic Region. In Canada, it was reported as *albipennis* Say by Bequaert (*l. c.*) from Alberta (54°N) and British Columbia; in the United States it is, as listed above, known from Wyoming, South Dakota, Minnesota, Wisconsin, etc., in the north, and from Louisiana and Florida in the south. The southernmost limit of its range is not yet clear. In the MCZ collection, I noted 1♂ labeled "Cuba. Coll. H. Loew" and 2♀♀ "Rio de Janeiro, Coll. C. W. Johnson". For unknown reasons all 3 specimens were not included in Bequaert's list. As appropriately suggested by the name *botaurinorum*, the most preferred host of this subspecies is *Botaurus lentiginosus* Rackett, and its occurrence on *Ixobrychus exilis* Gmelin and *Nycticorax nycticorax* Linn. is almost negligible. These 3 birds all belong to Ciconiiformes: Ardeidae and seem to be very rarely, if ever, serving as hosts of true *albipennis* (*q. v.*). The odd record from Falconiformes: Pandionidae (*Pandion*) is probably a stray.

Systematics. This is a weak geographical race of *ardeae*. For its difference from the Old World counterpart, see key and discussions under the nominate subspecies. The names *botaurinorum* and *scutellaris* were published in the same article. Since the former has page priority, it was based upon 2, rather than 1, original specimens and has been used more often; it is selected here for this race. From Swenk's descriptions, *botaurinorum* differs from *scutellaris* in having the "visible basal width of apical section of clypeus along dividing sulcation" not more than 1/3 distance (in *scutellaris*, 3/8) across emargination between lateral apices; mesonotum and scutellum blackish brown (in *scutellaris*, mesonotum dark brown, scutellum yellowish); orbital margins shining, glabrous (in *scutellaris*, opaque, hairy). None of these differences is reliable. On the other hand, Bequaert (1955: 342-44) examined 77 specimens of a mixture of *botaurinorum* plus *albipennis* and found the subcosta was incomplete in both wings in about 1/2 of them, complete in both wings in about 1/3, and incomplete in only one wing in less than 1/4. By typographical error, *scutellaris* was wrongly listed by me (1963: 64, 114) as a synonym of *americana* Lch. Theodor *et al.* (1964: 47) mentioned that the ♀ tergite 3 in American examples was almost 2× as large as that in Old World ones. This does not agree with my observation and possibly they were dealing with true *albipennis* against *ardeae ardeae*. Measurements of 10 ♀♀ of *botaurinorum* picked up at random revealed that their tergite 3 varied, 3-5 micrometric units in length and 7-11 in width, whereas in ♀♀ from Old World, 6-8 in length and 9-12 in width. The wing and ♀ abdomen are as in fig. 120 and 125, respectively.

Icosta (Ardmoeca) ardeae ardeae (Macquart) Fig. 2, 7, 8, 21, 121, 126, 127, 139, 141.

Olfersia ardeae Mcq., 1835: 640. Type lost, ex "heron", Sicily.

O. botauri Rndn. 1879: 22. Type ♀ in Firenze Mus., ex *Pyrrherodia purpurea*, C. Italy.

Lynchia setosa Ferr. 1927c: 224, fig. 14-15, ♀♂. Type ♂ (UCB), ex *Bubulcus ibis coromandus*, Palawan.

L. albipennis (pt.): Beq. 1955: 330.—Theod. & Oldr. 1964: 47, fig. 70-73, ♂♀.

L. ardeae: Maa 1964: 88.

Icosta albipennis ardeae: Maa 1967: 262.

Material. 250± specimens, part of which are selected and listed below. For brevity, field numbers and collector's names are omitted.

MADAGASCAR: 1♀ (MCZ), w. mites on legs & abd., ex *Ardea cinerea johannae*. 1♀ (BMNH), Tananarive, ex *Bubulcus i. ibis*; 2♀♀, *id.*, *Cosmerodius albus melanorhynchus*; 1♀, *id.*, *Melanophoyx ardesiaca*.

S. AFRICA: 1♀ (MAC), Pretoria, ex *Pyrrherodia purpurea*, I.1963; 1♂ (SAIMR), *id.*, V.1963. 1♀ (SAIMR), Chobe R., Bechuanaland, ex *Egretta garzetta*, IV.1958. 1♂ (SAIMR), Maun, I.1955.

MOZAMBIQUE: 1♀ (SAIMR), Limpopo, ex *C. albus*, VIII.1953.

RHODESIA: 2♀♀ (MAC, SAIMR), nr Monze, ex *E. garzetta*, VIII.1959. 1♂, 1♀ (BMNH, MCZ), Matatsi R., Wanki Distr., ex *Ixobrychus*, XII.1932.

NYASALAND: 1♂, 1♀ (BMNH), Chia R. nr shore of Lake Nyasa, ex *Ardea goliath*, XI.1910. 1♀ (BMNH), Katumbi, Kaporo R., VI.1910. 1♂ (MCZ), Ruo, ex charadriid #124; 1♀, *id.*, *Nycticorax nycticorax*. 1♂ (MCZ), SW Lake Nyasa, Mtimbuka, ex *E. garzetta*, I.1949.

TANGANYIKA: 2♂♂, 1♀ (BMNH), Dar-es-Salaam, ex egret, VI.1918; 1♀, *id.*, nightjar.

KENYA: 1♂ (BMNH), "Brit. E. Afr.". 1♀ (BMNH), Nairobi, VII.1930.

UGANDA: 1♂ (MCZ), Butiaba, Bunyoro, ex *Ibis ibis*, III.1936; 1♂, *id.*, *Ardea melanocephala*. 2♂♂, 4♀♀ (MCZ), Entebbe, ex *A. goliath*; 1♂, 4♀♀, *id.*, *P. purpurea*. 1♀ (BMNH), Lake Victoria, Kimi I., ex egret. 1♂, 1♀ (MCZ) (♀ w. mites under abd.), Port Bell nr Kampala. 1♀ (MCZ), Kiageve, Namaneoe, ex *A. melanocephala*.

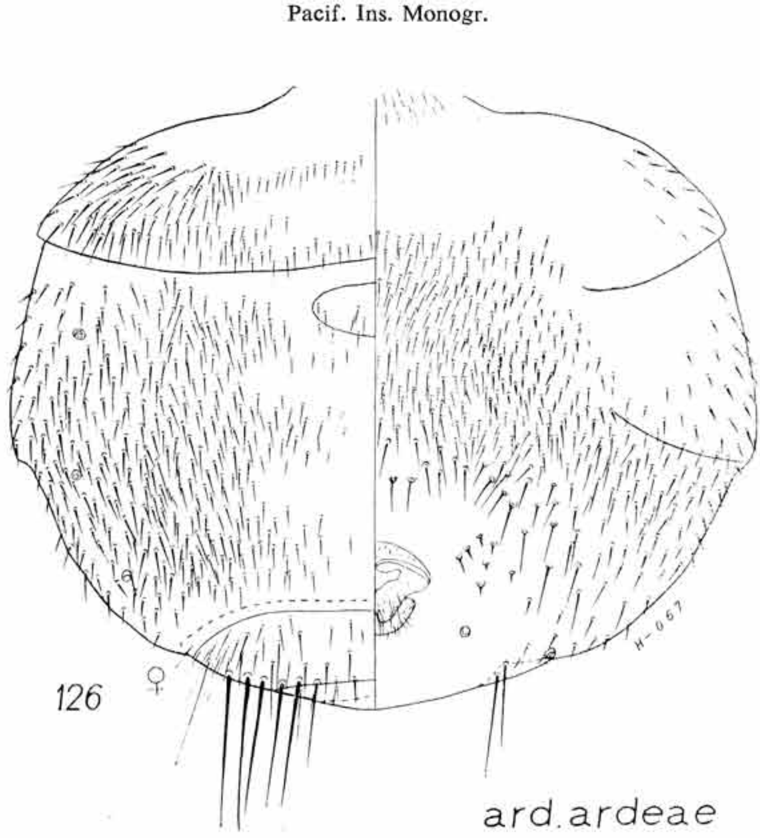


Fig. 126. *Icosta (Ardmoeca) ardeae ardeae* Mcq., Taiwan, ♀ abdomen.

RUANDA-URUNDI: 1♀ (MCZ), Astrida, ex *P. purpurea*.

CONGO: 1♂ (MCZ), Banalia, Tanga, ex *Ardeola ralloides*, XII.1913. 1♀ (MCZ), Bukama, ex *P. purpurea*, VII.1923. 2♀♀ (MCZ) (1♀ w. mites on abd.), Kamaniola, ex *Bubulcus ibis*, II.1927. 1♂ (MCZ) w. mites on abd., nr Lake Tsale, Upper Luapula, Katanga, ex *A. goliath*. 1♂ (MAC), Lubudu, Katanga, ex egret, IX.1948. 1♂ (MAC), Lusambo, ex *B. ibis*, I.1922. 1♂ (MAC), Titule, ex *C. albus*, I.1942. 1♂ (MCZ), Whibati, Kivu, ex *B. ibis*, VI.1955. 1♀ (MAC), Terr. Yahuma, XII.1948. 1♀ (BRX), Rutshuru, I.1938.

NIGERIA: 1♀ (BMNH), Benue R., ex egret. 1♀ (BMNH), nr Lagos, XII.1919. 1♂ (BMNH), Quittah Lagoon, on canoe, VI.1911. 1♀ (BMNH), Zaria, ex *Limnocorax flavirostra*, XII.1963.

SUDAN: 1♂, 1♀ (BMNH), Wadi Medani, ex *Ixobrychus m. minutus*, XI.1946. 3♂♂ (MCZ), Kosti, ex *A. goliath*, V.1936; 2♂♂ *id.*, *A. melanocephala*; 1♀, *id.*, *Actophilornis africanus*; 1♂, 1♀, *id.*, *Gallinula chloropus brachyptera*.

EUROPE: 1♂, 1♀ (BMNH), Thames, England, ex *Botaurus stellaris*, III.1913. 3♀♀ (LUN), Svarta Havet, Sweden, ex *P. purpurea*. 1♀ (ZMB), Prov. Brandenburg, Germany. 1♂ (MCZ ex coll. Loew), "prob. from Europe, *Lynchia enigmatica* Beq. paratype." 1♀ (AMS), Zwarte Meer, Netherlands, I.1951. 1♂, 3♀♀ (coll. Hill), Carmargue, La Tow de

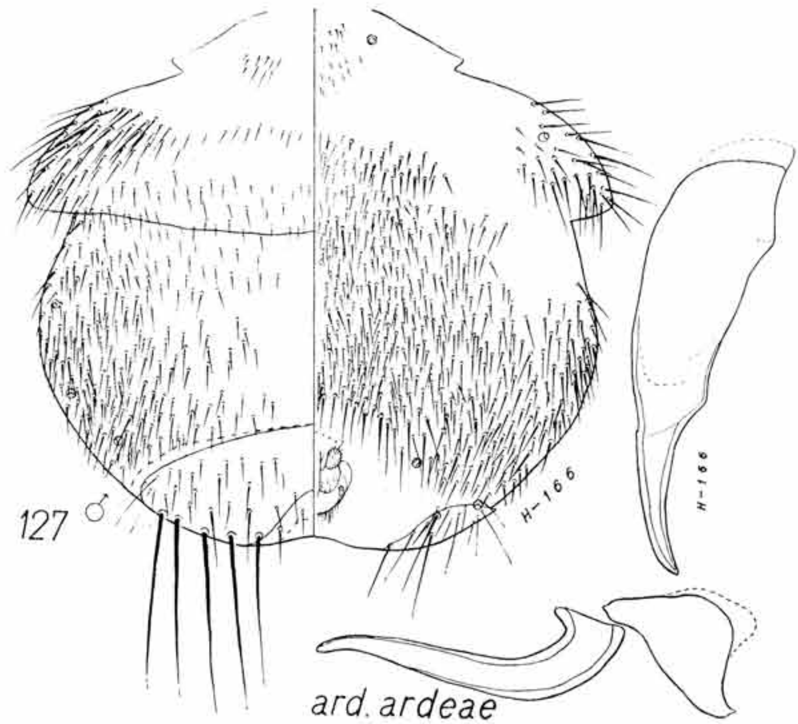


Fig. 127. *Icosta (Ardmoeca) ardeae ardeae* Mcq., Mozambique, ♂ abdomen including genitalia.

Valat, France, ex *Nycticorax nycticorax*, IV.1955; 4♂♂, 2♀♀, *id.*, *P. purpurea*; 1♂, 2♀♀, *id.*, *Tringa glareola*, VIII.1962. 2♀♀ (GNV), Genova, Italy, ex *B. stellaris*, IV.1881; 1♀, w. young mallophagan on abd., Liguria, ex *B. stellaris*, I.1924; 1♀, w. mite on wing, "Italy", ex *B. stellaris*; 1♂, 1♀, Genova, ex *P. purpurea*, V.1920 & IV.1926; 1♂, *id.*, *Cosmerodius albus*, IV.1953; 1♂, 1♀ (BMNH, MLN), Parma; 1♀ (MLN), Pavia, XI.1890. 2♂♂, 1♀ (MCZ), Akratiri Bay, Cyprus, ex *P. purpurea*; 1♀ (MCZ), Yermasoya R., ex *Circus cineraceus*. 1♂, 2♀♀ (LDN, ZMB ex coll. Loew), Rhodes I.

SW ASIA: 1♂ (HMB), Anatolia, ex *I. minutus*, V.1950. 1♀ (BMNH), w. mites on abd., San'a, Yemen, 2600 m, X.1937. 1♂, 1♀ (BMNH), Khor Musa, Persian Gulf, ex *P. purpurea*, IV.1961. 1♀ (JRS), Bethshaen, Israel, ex *Ardeola ralloides*, III.1960; 1♀ (JRS), Beth-Alpha, ex *B. stellaris*, II.1960; 1♀ (JRS), Kf. Kasaryk, ex *P. purpurea*, VI.1959.

INDIA: 1♂ (BMNH), Manipur, Moriana, ex *Ardeola idae*, I.1952.

CEYLON: 1♀ (MLN), ex *Ardea* sp., det. Bezzi as *Olfersia longipalpis* Mcq.!

BURMA: 1♂ (MCZ), Myitkyina, ex *P. purpurea manillensis*, VII.1945; 1♂ (MCZ), *id.*, flying in laboratory.

THAILAND: 1♂, 8 km NNE of Markham, ex *Ixobrychus cinnamomeus*, IV.1966. 1♀ (USNM), Bung Borapet, ex *Mesophoyx intermedius*, VI.1932. 1♀ (CNHM), Prachuap Khirikhan, Ban Khluaklang, ex *Dupetor flavicollis*, XII.1952.

CHINA: 2♀♀ (USNM), Yalu R., 200–300 km from mouth, Manchuria-Korea border, V.1914. 2♂♂, 2♀♀, Makung, Pescadores Is., ex *B. ibis coromandus*, IV.1961. 1♂, 1♀, Shihkuang, Shinchu, Taiwan, ex *B. ibis*, VI.1966. 1♀, Kueishan, Taoyuan, Taiwan, ex *B. i. coromandus*, VIII.1961. 6♂♂, 14♀♀, Taipei, Taiwan, ex *M. i. intermedius*, IX.1957, X. 1957, IX.1960 & IX.1964.

KOREA: 1♂ (BMNH), Chemulpo.

SUMATRA: 1♀ (AMS), Lugu, Simalur I., V.1913.

PHILIPPINES (Mindanao): 1♂ (CNHM), Liquasang Marsh, Cotabato, ex *M. i. intermedius*, XII.1946. 5♂♂, 5♀♀, Lake Mainit, Cuyago, Jabonga, Agusan Prov., ex *Dupetor f. flavicollis*, V.1963; 2♂♂, 1♀, *id.*, *P. purpurea manillensis*; 1♂, *id.*, *Gallinula chloropus orientalis*. 1♂ (CNHM), Davao City, ex *Buceros hydrocorax mindanensis*, XII.1946.

MICRONESIA: 1♂ (USNM), Saipan.

AUSTRALIA: 1♀ (BMNH), S. Alligator R., Northern Terr., ex *Ardea sumatrana*, X. 1902. 1♂, 1♀ (MCZ), Northwest I., Queensland, ex *Demigretta sacra*; 1♂ (ANIC), Heron I., ex *D. sacra*, XII.1963.

Habitats. Widespread in the Old World, more commonly met with in the tropics and subtropics. At present known from Sweden, Ireland, England, Netherlands, Germany, France, Czechoslovakia, Italy, E. Prussia (now part of Russia), Greece, Bulgaria, S. Russia in Europe; Tunis, Egypt, Sudan, Nigeria, Gold Coast, Congo, Ruanda-Urundi, Eritrea, Uganda, Kenya, Tanganyika, Rhodesia, Nyasaland, Transvaal, Bechuanaland, Mozambique, Madagascar in Africa; Arabia, Turkey, Iran, India, Ceylon, Burma, Thailand, China (Manchuria, Taiwan), Korea, Japan, Sumatra, Philippines in Asia; Australia and Mariana in Oceania. The northernmost record was *ca* 59° N in Sweden and the southernmost, *ca* 25° S in Transvaal and Queensland. The recorded hosts are Ciconiiformes: Ardeidae (*Ardea, Ardeola, Botaurus, Bubulcus, Cosmerodius, Demigretta, Dupetor, Egretta, Ixobrychus, Melanophoyx, Mesophoyx, Nycticorax, Pyrrherodia*); Ciconiidae (*Ibis*); Falconiformes: Accipitridae (*Circus*); Gruiformes: Rallidae (*Gallinula, Limnocorax*); Charadriiformes: Jacanidae (*Actophilornis*); Charadriidae (*Tringa, Xiphidiopterus*); Caprimulgiformes: Caprimulgidae ("nightjar"); Coraciiformes: Bucerotidae (*Buceros*). Almost certainly breeding solely on Ardeidae.

Systematics. This subspecies has been admirably illustrated by Ferris (*l. c.*) under the name *setosa* and its terminalia of both sexes, by Theodor *et al.* (*l. c.*) under *albipennis*. Differing from *botaurinorum* in having wing (fig. 121) narrower, lateral abdominal setae (fig. 126, 127) more robust, median setae on abdominal venter markedly paler and finer than submedian ones, and tergite 3 (♀) averaging slightly larger. On the strength of these minor differences, *ardeae* is here placed behind *botaurinorum*. Bequaert (1955: 349) believed that the absence of tergite 3 in the holotype ♂ of *setosa* was due either to contraction of the soft areas of the abdomen or to flattening by pressure of the coverglass on the slide-mount. This is not true. In the ♀ ex *Egretta*, Bechuanaland, the pregenital plate (fig. 139) is unusually large (though not so large as in *albipennis*) and somewhat elongate, about 3× as long as wide; in the ♂ ex *Gallinula*, Sudan, the left 1/2 of syntergite 1+2 is much larger than the right 1/2. Besides the synonyms listed above, the nomen nudum *Hippobosca metallica* Schummel (1832 Uebersicht Arb. Veränd. Schlesisch. Ges. Vaterl. Cultur: 71) ex *Botaurus stellaris*, Silesia most probably belongs here, also. Ferris (1927c: 228), merely by guessing from inadequate description, somewhat suspected his *setosa* being synonymous with *nigrita* Speis. The palpus, prosternum, fore femur, thorax and venter of head are as in fig. 2, 7, 8, 21 and 141, respectively.

Icosta (**Ardmoeca**) sp. "S"

AUSTRALIA: 1♂ (ANIC), Town Cannon, Turtle, ex jabiru [*Xenorhynchus asiatus*], IX.1958, H.S.L.

Intermediate of *albipennis* and *schoutedeni*, chiefly characterized by the shape of frons and scutellum and the chaetotaxy of inner orbits, prescutum aud abdomen.

♂. *Color* dark, wing weakly fuscous, anterior veins blackish brown. *Head*: Occipital margin hardly convex; vertical and notopleural bristles pale, subequal in length; postvertex only 1/3 as long as wide, its lateral margin abruptly marked off inner orbit and thus conspicuously more raised than latter. Eye 1/4 (11 : 45) as wide as head. Face moderately wide, almost parallel-sided, its width at midpoint smaller (22 : 27) than eye-length; inner 3/5 of surface of inner orbit leathery, only other 2/5 shining; orbital setae 3-seriate, innermost series composed of 6–7 fine erect setae 3× or more as long as fine soft setae of 2 outer series. Frons proper quite short, its median length distinctly smaller than average width of frontal process; frontal process in dorsal aspect uniformly narrow, in profile very broadly rounded off to vibrissal area. Palpus 2× as long as antenna, surface with short black strong but recumbent setae in addition to pale soft setae on inner margin and strong bristles on apex. Gula posteriorly finely setose, no spines. *Thorax*: Anterior spiracle laterodorsal, moderately large, distinctly smaller than in *schoutedeni* and in sp. "N". Mesonotum 49×69; prescutum anterolaterally finely striate, posteromedially smooth; 6–8 laterocentral bristles at each side which are robust and extend beyond transverse mesonotal suture; surface around those bristles also leathery. Scutellum 15×35, hardly shorter (15 : 17) than scutum, posterior margin weakly angular at median and obliquely straight at lateral section. Mesopleural concavity (for receiving femur 1 in repose) less pronounced than in *schoutedeni*, widened anteroventrad, upper rim less prominent than in sp. "N" and anteriorly stopping near lower margin of spiracle. Metapleurotergal callus with 3 black strong setae and some pale fine ones, no spines. Prosternum poorly sclerotized, triangular, with 3 pairs of pale fine setae; mesosternum subtruncate anteriorly, base of its bristle equidistant to anterior and lateral margins. *Wing* 6.5 mm long; surface (incl. alula) entirely setulose except posterior 1/2 of cell *2a*; vein *rm* as thick as adjacent part of R_{4+5}, lying closer (35 : 50) to *im* than to C-apex and apicad to level of R_1-apex; bulla of M_{1+2} situated at apical 1/4 of cell *2bc*. Tarsal-spine formula 1.0.0.0/2.1.1.0/7.1.1.1; tarsomere 1 of hindleg 16×6, longer than 2+3+4 and than 5; tarsomere 2 of same leg slightly asymmetrical, slightly wider than long; tarsomeres 3 and 4 more strongly so. *Abdomen*: Setae on dorsal striolate area not quite even in distribution, largely shorter than those on lateral areas of membrane; setae on venter largely pale and soft. Syntergite 1+2 with both black and pale setae, black ones nearly uniform in length. Tergite 3 untraceable; tergite 6 large, uniformly setose, with 8± pairs of bristles, anterior and posterior margins subparallel. Laterite 3 significant, uniformly setose as neighboring areas, posteriorly broadly rounded, dorsal part distinctly narrowed apicad, ventral part not so, about same size as dorsal part. Aedeagus and paramere, as seen from pinned specimen, less curved and more slender than in *ardeae*.

Icosta (**Ardmoeca**) sp. "N"

W. AUSTRALIA: 1♂, 1♀ (ANIC), Crawley, taken in laboratory after examination of shot cormorants, VII. & XI.1936, Norris. 1♀ (BMNH), Houtmans, Albatross I., purchased from Gould (#44.66). The BMNH specimen is probably what Walker (1849: 1142) listed as "*Ornithomyia australasiae* Fabr."

Allied to *schoutedeni* from which the ♀ differs in having no bunches of strong bristles and the ♂ in having much narrower tergite 6.

♀. *Color* dark, wing weakly fuscous, anterior veins blackish brown. *Head*: Occipital margin straight; vertical and notopleural bristles subequal in length, former pale, latter black; postvertex 1/3 as long as wide, strongly convex at disc, gently descending laterad; mediovertex much more depressed than postvertex. Eye 1/4 (11 : 49) as wide as head. Face slightly narrowed anteriorly, its width greater (24 : 11) than that of eye and subequal to eye length; inner orbit 1/2 as wide as mediovertex, outer margin strongly raised, inner depressed and with single series of pale long setae plus few irregularly arranged short ones. Frons proper shorter than average width of frontal process, about as wide as antennal base, anteriorly fairly broadly notched at middle; frontal process in dorsal aspect straight along inner margin, distinctly narrowed apicad, in profile very broadly rounded off to vibrissal area. Palpus 2× as long as antenna, surface largely covered by mixture of pale and black long setae. Gula posteriorly with 2(1+1) spines. *Thorax*: Anterior spiracle dorsal, large, 2× as wide as long. Humeral callus anteriorly with fine spines, posteriorly with short fine setae. Mesonotum 56×77; prescutum finely striate all over; laterocentral bristles replaced by moderately long setae which are only 2× as long as neighboring shorter setae and far from reaching transverse mesonotal suture. Scutellum 14×39, shorter (14 : 17) than scutum, with evenly curved posterior margin. Mesopleural concavity very pronounced, with distinct upper rim. Metapleurotergal callus bearing 3-4 long spines and some soft setae of similar length. Prosternum exceedingly small, triangular, poorly sclerotized, with 1 pair of pale setae; mesosternum emarginate anteriorly, base of its bristle closer to anterior than to lateral margin, mesosternum posteromedially with small patch of pale setae. *Wing* 7.8 mm long; surface (incl. alula) entirely setulose but setulose stripe of cell *2a* only 2× as wide as vein 2A and not reaching apical margin of that cell; vein *rm* as thick as adjacent part of R_{4+5}, closer (46 : 53) to *im* than to apex of C, lying apicad to level of apex of R_1; bulla of M_{1+2} situated at apical 1/3 of cell *2bc*. Tarsal-spine formula 2.1.1.0/2.1.1.0/8.2.1.1; tarsomere 1 of hindleg 15×6, hardly longer than 2+3+4 and than 5, tarsomere 2 of same leg slightly asymmetrical, slightly shorter than wide, tarsomeres 3 and 4 more distinctly so. *Abdomen* quite unevenly setose; syntergite 1+2 slightly produced posterolaterally, uniformly covered with long pale setae, lateral marginal area with some small black setae. Tergite 3 bare, 2× as wide as long, hardly larger than anterior thoracic spiracle. Laterite 3 in dorsal view subquadrate, slightly longer than wide, *ca* 1/2 as wide as mesonotum, inner margin very gently curved, surface bare, only with a few fine black setae ectad to level of spiracle 3. Dorsal striolate area largely bare, with a few small black papillae at sides of tergite 3 and a row of larger papillae shortly before tergite 6, those small papillae bearing pale small setae whereas larger papillae bearing spines and setae of varied length and robustness; a large compact patch of exceedingly strong bristles between posteromesal corner of laterite 3 and anterolateral corner of tergite 6, anterior ones of those bristles longer than posterior ones, averaging about as long as postvertex, their basal papillae almost contacting one another; some sparse strong setae behind outer posterior corner of laterite 3. Tergite 6 subtriangular, 31×42, narrowly rounded at apex, surface with sparse pale fine setae, fringed with strong bristles. Laterite 2 almost entirely bare; venter of laterite 3 similarly shaped as its dorsum, 37×26, outer 1/2 with sparse strong short setae, inner 1/2 bare. Setae of abdominal ventral membrane largely pale, moderately long and recumbent; those intermediate of laterite 3 and urogenital openings short, spine-like and with exceedingly large and prominent basal papillae; those lining immediately before urogenital openings pale, fine, dense and each emerging from prominent blackish papilla.

♂. Similar. Wing 6.7 mm long. Tarsal spines 1.0.0.0/2.1.1.0/7.2.1.1. Abdominal dorsal striolate area with more numerous and extensive pale setae; tergite 3 (?); laterite 3 (not clearly definable in unique dry specimen) uniformly covered with rather long black setae; no patch of spines between laterite 3 and tergite 6; tergite 6 *ca* 2× as wide as long, with long black setae and posterolaterally with 3-4 pairs of bristles. Chaetotaxy of abdominal venter similar to that of dorsum. Genitalia in profile, as seen in pinned specimen, similar to that in *schoutedeni* but aedeagus more slender, apically slightly more curved, paramere apically less acute.

Icosta (**Ardmoeca**) sp. "T"

One ♀ (SAIMR) ex *Microcarbo africanus*, Beroni, Transvaal, VI.1954 has uniformly short laterocentral setae on prescutum. It may be either an independent species or a geographical race of *schoutedeni*.

Icosta (**Ardmoeca**) sp. "F"

Chao (1949 Fukien Christ. Univ. Agric. J. **10**: 143, 146) listed a specimen (? sex) determined by Bequaert as *schoutedeni* and collected ex *Cosmerodius albus modestus*, Fukien, SE China. This record was repeated by Bequaert (1953a: 252). The specimen in question, not seen by me, was said to be deposited in Zool. Inst., Academia Sinica, Shanghai. The occurrence of *schoutedeni* in the interior of China seems most improbable and the species involved is quite likely an undescribed one.

Icosta (**Ardmoeca**) **massonnati** (Falcoz)

Ornithoponus massonnati Falc., 1926: 31, fig. 28–29, ♀, as n. name for *Olfersia americana* (misidentification) of Massonnat 1909: 304, pl. 5, fig. 40–42, ♀. Type presumably lost, ex ***Platalea** leucorodia*, eastern France.

Lynchia massonnati: Theod. *et al.* 1964: 49 (partial translation of Massonnat's description).

This enigmatic species was so far known from a single specimen said to be ♀. The true identity was discussed by Bequaert (1945b: 94, 1953: 253), Maa (1964: 95) and Theodor *et al.* (*l.c.*) but remains uncertain. The 2 former authors suggested to be synonymous with *schoutedeni*, while the latter ones suggested it synonymous with *schoutedeni* or *dukei*. Following the discoveries of related species in Transvaal and Australia and by checking once again Massonnat's paper, I am now inclined to accept *massonnati* as an independent species. Massonnat did not draw the abdominal chaetotaxy properly (all hairs were as if exceedingly fine including those on tergite 6) but described "En arrière du bourrelet, on trouve une partie médiane blanche et des parties latérales de couleur marron foncé, couvertes de poils noirs, courts et gros. Plus en arrière, toujours latéralement, on observe une partie moins chitinisée avec poils noirs plus longs. Enfin, tout à fait en arrière, se trouve une région marron clair, bien délimitée avec quelques poils noirs, longs, surtout à la partie postérieure." (This passage was omitted in Falcoz and Theodor *et al.* papers). There is a pair of tufts of "courts et gros" hairs caudad to laterites 3 in his figure and these are exactly at the same position as in *schoutedeni*. The absence of another pair of bristle-tufts at sides of tergite 3, a feature similar to that in sp. "N" from Australia, is most probably real and serves as a marked difference from *schoutedeni*. The possible synonymy of *massonnati* with *dukei*, suggested by Theodor *et al.*, is not accepted here. In Massonnat's figures, the inner orbit is so wide, palpi so short, vein 2A so short (far from reaching level of *rm*) and laterites 3 so characteristic (in dorsal view, nearly isogonally triangular, anterior margin strongly divergent from syntergite 1+2) that it can hardly be mistaken for *dukei* which belongs to the subgenus *Ornithoponus* and is so far unrecorded from north of the Sahara. The occurrence of *massonnati* on an aquatic bird (Ciconiiformes: Threskiornithidae) also fits the general host pattern of *Ardmoeca*.

Icosta (Ardmoeca) schoutedeni (Bequaert) Fig. 5.

Lynchia schoutedeni Beq., 1945b: 93, fig. 1, ♀♂, as n. sp., actually n. name for *L. palustris* (misidentification) of Beq. 1933: 71. Type: ♀ (MAC), ex *Halietor africanus*, Congo. — Theod. & Oldr. 1964: 50, fig. 79–82, ♂♀.

MATERIAL. 15± specimens, among which the following are new records. RUANDA: 1♂ (MCZ), Ruhengeri, ex cormorant, 1948, Fain. 1♂ (MCZ), Lake Mohasi, ex *Pelecanus onocrotalus*, IV.1953, Fain. UGANDA: 1♂ (BMNH), Lodwar, Turkana Prov., VI. 1934, Rudolf.

Habitats. W. and E. African Subregions, at present known from Congo, Ruanda, Uganda, Kenya and Ethiopia. On Pelecaniformes: Phalacrocoracidae (*Anhinga, Halietor, Phalacrocorax*) and Pelecanidae (*Pelecanus*), the last record is probably a stray.

Systematics. This species was recently redescribed and illustrated (head, ♀ abdomen, ♂ genitalia) by Theodor *et al.* The sexual dimorphism is so strong and the ♀ so characteristic in abdominal chaetotaxy and sclerotization that *schoutedeni* is clearly the most highly specialized species of the subgroup. The ♂, on the other hand, is fairly normal for the genus in abdominal chaetotaxy. Its laterite 3 is larger and more sclerotized, otherwise very similar to ♂ *albipennis* or *ardeae*. The palpus is as in fig. 5.

Icosta (Ardmoeca) holoptera holoptera (Lutz) Fig. 3, 7, 10, 12, 128–131.

Olfersia holoptera Lutz, 1915: 184. Type ♀ (not seen by me) in Inst. Osw. Cruz in Rio de Janeiro, ex *Rhynchotus r. rufescens*, Brazil.

Lynchia holoptera: Beq. 1955: 355, fig. 67–69, ♀♂.

MATERIAL. No fresh material available.

Habitats. Little collected. Available records are sporadic and are from the U.S.A. (Massachusetts, Ohio, Pennsylvania, S. Carolina, Wisconsin) and Brazil (State of Rio de Janeiro). Probably widely distributed over Nearctic and Neotropical Regions. Oligoxenous on Gruiformes: Rallidae (*Armides, Coturnicops, Rallus*). The odd records ex Tinamiformes: Tinamidae (*Rhynchotus*) and Passeriformes: Formicariidae (*Thamnophilus*) are most probably strays.

Systematics. The ♂ of this species was first briefly described by Bequaert (1957: 578) while the ♀ was illustrated by MacArthur (1948: 410, 425, fig. 252–253) and Bequaert (1955: 355, fig. 67–69). The abdomen (fig. 128–131) in this and next species does not show as much specialization as found in *schoutedeni*, but the head, venation and wing-setula extent are evidently more specializalized. Since the former character seems to be of less phylogenetic significance than the latter, these 2 species are here placed on the top of the subgenus. In Bequaert's (1955) scheme of American species, *holoptera* was arranged between *hirsuta* and *plaumanni* and near the top of the genus. The palpus, prosternum, fore tarsus and hind tibia are as in fig. 3, 7, 10 and 12, respectively.

Icosta (Ardmoeca) holoptera omnisetosa Maa, new subspecies Fig. 3, 7, 14, 22, 122, 132–134, 142, 147, 148.

MATERIAL. 6♂♂, 12♀♀. Holotype ♀ (BISHOP 7595); allotype ♂ and most paratypes (BISHOP), 2 paratypes (CNHM), 1 paratype each (BMNH and MCZ).

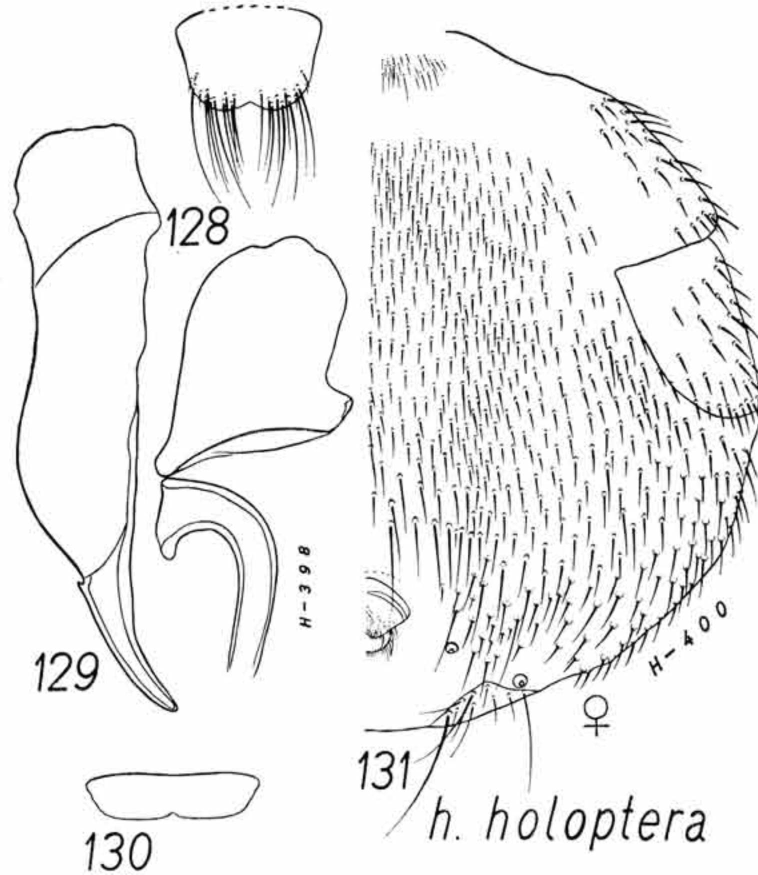


Fig. 128-131. *Icosta (Ardmoeca) holoptera holoptera* Lutz, Colombia, ♂ postgenital plate (128), ♂ genitalia (129), ♀ tergite 6 (130), ♀ abdomen in ventral view (131).

NEW GUINEA: Holotype ♀, Vogelkop Penin., Kebar Valley, 550 m, ex *Porzana t. tabuensis* (BBM 753-54), I.1962, Quate. Allotype ♂, Enarotali, NW New Guinea, ex *Gallinula tenebrosa* (BBM 21401), VII.1962, Wilson; 1♀, *id.*, *Porphyrio melanopterus* (BBM 21333). 1♂, Telefomin, Sepik Distr., NE New Guinea, 500 m, ex *Rallus pectoralis* (BBM 22754), VIII.1963, Temple.

PHILIPPINES: 1♂, Dalton Pass, Nueva Vizcaya, Luzon, ex *Lanius cristatus*, 6E 0167, VIII.1965, M.A.P.S.

MALAYA: 2♂♂, 2♀♀, Selangor, ex *Rallus striatus* (M 1436-27, 1693, 1741), 1962, McClure; 1♂, 1♀, *id.*, *Amaurornis phoenicurus* (M 1689, 2108). 1♀ (CNHM), Subang, Selangor, ex *R. striatus gularis* (R 47523), VIII.1956, Inst. Med. Res. Malaya; 3♀♀ (CNHM), *id.*, *Capella stenura* (R 47523), II.1957. 1♀ (BMNH), Selangor, 7th mi. Cheras Rd., III. 1921, Seimund.

CHINA: 1♂ (MCZ), Tunglu, Chekiang.

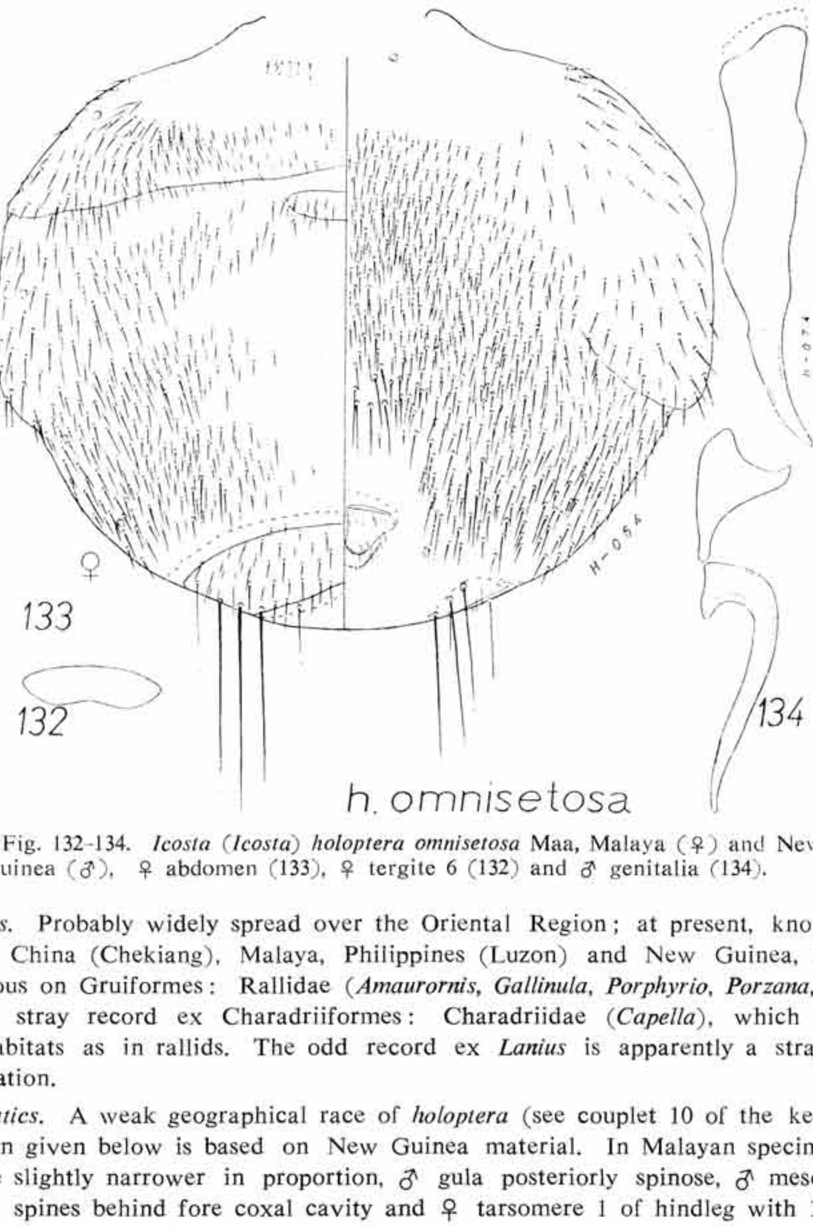


Fig. 132-134. *Icosta (Icosta) holoptera omnisetosa* Maa, Malaya (♀) and New Guinea (♂), ♀ abdomen (133), ♀ tergite 6 (132) and ♂ genitalia (134).

Habitats. Probably widely spread over the Oriental Region; at present, known only from SE China (Chekiang), Malaya, Philippines (Luzon) and New Guinea, lowland. Oligoxenous on Gruiformes: Rallidae (*Amaurornis, Gallinula, Porphyrio, Porzana, Rallus*), with one stray record ex Charadriiformes: Charadriidae (*Capella*), which frequent similar habitats as in rallids. The odd record ex *Lanius* is apparently a straggler or contamination.

Systematics. A weak geographical race of *holoptera* (see couplet 10 of the key). The description given below is based on New Guinea material. In Malayan specimens, the wings are slightly narrower in proportion, ♂ gula posteriorly spinose, ♂ mesosternum with 10± spines behind fore coxal cavity and ♀ tarsomere 1 of hindleg with 10 spines beneath. These may be merely individual variation.

♀. *Color* dark, wing weakly fuscous. *Head* (fig. 14): Occipital margin weakly convex; vertical bristle as long as notopleural bristle, often pale; postvertex moderately long. Face very wide, almost parallel-sided. Frons proper long, narrowly roundly notched at middle; frontal process in dorsal view almost uniformly narrow, in profile very broadly rounded off to vibrissal area. Palpus (fig. 3) 1.5× as long as antenna. Venter of head (fig. 142) with a pair of erect tooth-like jugular processes near bases of vibrissal bristles (i.e., near sides of rostral membrane);

gula posteriorly spinose. *Thorax* (fig. 22): Mesonotum 49×60; prescutum sparsely feebly striate all over, with 3-4 anterolateral bristles which reach or surpass transverse mesonotal suture; scutellum 11×28, posterolaterally rounded, posteriorly distinctly convex. Metapleurotergal callus with 3-4 stout spines. Prosternum (fig. 7) well sclerotized, very small, semicircular, with 2-3 pairs of stiff setae; mesosternum roundly shallowly notched, its bristle 1.5× as far from lateral margin as from anterior margin. *Wing* (fig. 122) 4.8-5.2 mm long; setulae covering entire membrane including alula; upper surface of cell *2a* with very narrow bare stripe along posterior margin; vein *rm* as thick as adjacent part of R_{4+5}. Femur and tibia 3 as in fig. 147, 148. Tarsal spines 2.1.1.0/2.1.1.0/7-8.2.2.1; tarsomere 1 of hindleg 18×8, as long as 2+3+4 and as 5, tarsomere 2 slightly wider than long and as tarsomeres 3 and 4, distinctly asymmetrical. *Abdomen* (fig. 133) rather uniformly covered with moderately long and stout setae; dorsal striolate area largely bare, with 6 small groups of setae; setae on median and lateral areas of venter similar in length and robustness, those fencing urogenital area hardly more robust and not longer than elsewhere. Syntergite 1+2 with short setae; tergite 3 small; tergite 6 (fig. 132) large, uniformly setose, with 10± pairs of bristles, anterior and posterior margins almost parallel. Laterite 2 membranous, with few very stout setae; laterite 3 well sclerotized, slightly wider than long, broadly rounded posteriorly, dorsal part smaller and distinctly narrowed behind, ventral part larger and evenly broad. Pregenital plate undefinable; postgenital plate more setose than in *ardeae*, with 40± minute setae; infra-anal plate more uniformly setose than in *ardeae*.

♂. Similar. Gula posteriorly setose. Tergite 3 larger; ventral setae at level of spiracle 2 distinctly shorter and stouter than in ♀. Genitalia (fig. 134) as in *ardeae*, but aedeagus longer and more slender, apical part of paramere longer and less decurved, postgenital plate also longer in proportion.

Icosta (**Ardmoeca**) sp. "O"

ETHIOPIA: 1♀ (BMNH), Sululta, 2300 m, ex *Gallinago* [*Capella*] *nigripennis*, VII. 1948, Guichard.

Possibly another geographical race of *holoptera*.

Postvertex 4/5 as long as mediovertex, discally depressed, anteriorly bilobed. Inner orbit more than 1/2 as wide as mediovertex. Frons proper slightly narrower than base of antenna. Jugular area sharply angular but not produced as an ental process at each side. Prescutum with both ordinary short setae and long laterocentral bristles, latter as long as median scutellar length, not reaching transverse mesonotal suture. Anterior thoracic spiracle narrow, laterodorsal. Mesopleural concavity (for reception of femur 1 in repose) widened anteroventrad, as in *schoutedeni* but much shallower. Wing 5.5 mm long, setulae distributed as in *holoptera*, i.e., covering entire lower surface. Abdominal dorsum lacking bristle-tufts; tergite 6 of usual size; urogenital area anteriorly fenced by ordinary setae, not by those as found in *schoutedeni* ♀.

Subgenus **Gypoeca** Maa, new subgenus

TYPE-SPECIES. *Lynchia meda* Maa, by present designation.

Distribution. 1 species, Ethiopian, and part of Palaearctic and Oriental Regions, i.e., from S. Africa to India via E. Mediterranean Basin.

Host Relationships. Oligoxenous, on Aegypiinae or vultures.

Diagnosis. Scutellar bristles submedian, not lateral; anterior thoracic spiracle dorsal, fairly large. Femora 1-2 in ♂ with group of strong spines on ventral margin. Tergite 3 absent in ♂, large in ♀; tergite 6 narrowly interrupted at middle in ♂, very large in ♀. In fully matured ♀, sternite 5 large, medially interrupted, laterites 3 and 6 both large, well sclerotized. Urogenital openings slightly shifted cephalad. Aedeagus long, slender, apically straight.

Affinities. Isolated in the genus. The size of anterior thoracic spiracles, degree of sclerotization in ♀ abdomen and the position of urogenital openings bring the subgenus fairly close to *Phthona*, and perhaps it might be more proper to be placed there instead. The name is derived from Greek, *gyps, gypos*, a vulture; *oeka, oekos*, belonging to a house.

Icosta (Gypoeca) meda (Maa) Fig. 4, 7, 9, 10, 12, 137.

Lynchia meda Maa, 1963: 161, fig. 40, 41, ♀. Type: ♀ (CNHM), ex *Gyps fulva*, Iraq.—Maa 1964: 103, fig. 35, 36, ♀.

L. barbata Theod. & Oldr., 1964: 48, fig. 74–77, ♂♀. Type: ♀ (BMNH), ex *G. fulva*, Palestine. **New synonomy**.

L. interrupta Maa, 1964: 100, fig. 28–34, ♂. Type: ♂ (BISHOP), ex "vulture". Bechuanaland. **New synonomy**.

MATERIAL. 12♂♂, 4♀♀. S. AFRICA: 1♂, 1♀ (BMNH), Pt Natal, ex *Vultur fulvus* [*Gyps fulva*], coll. Gueinzins. UGANDA: 1♂ (MCZ), Katwe, Toro, ex *Pseudogyps africanus*, I.1939, Hopkins. KENYA: 1♀ (BMNH), Voi, XII.1953, Sheldrick. INDIA: 1♂, 1♀ (BMNH), Bharatpur, Rajputana, ex *Ps. bengalensis*, I.1952, Clay. 1♂ (MCZ), Deccan, ex *Ps. bengalensis*, coll. A. Meinertzhagen #8607; 5♂♂, 1♀ (MCZ), *id., Sarcogyps* [*Torgos*] *calvus*, #8816; 2♂♂ (MCZ), *id., Neophron peronopterus ginginianus*, #8801, 8777. 1♂ (MCZ), Barabanki nr Lucknow, ex *Ps. bengalensis*, III.1951.

Habitats. Probably all over continental Africa and spreading eastward to India via E. Mediterranean Basin; at present known from Natal, Bechuanaland, Uganda, Kenya, Israel, Iraq and India. On Falconiformes: Accipitridae: Aegypiinae (*Aegypius, Gyps, Neophron, Pseudogyps, Torgos*).

Systematics. Since published, Prof Theodor (*in litt.*) kindly pointed out *interrupta* to be the opposite sex of *meda*. A direct comparison of the unique types of *interrupta* and *meda* with type series of *barbata* revealed that all 3 names refer to one and the same species. The palpus, prosternum, fore femur, fore tarsus, hind tibia and wing are as in fig. 4, 7, 9, 10, 12 and 137, respectively.

Subgenus **Rhyponotum** Maa, new subgenus

TYPE-SPECIES. *Olfersia pilosa* Mcq., here designated.

Distribution. 1 (possibly 2) species, continental Ethiopian Region, spreading to Palaearctic (Mediterranean) Region in certain seasons.

Host Relationships. Oligoxenous, on Gruiformes (Otididae).

Diagnosis. Inner orbit (fig. 166) except its narrow outer margin very densely setulose, hence giving a leathery appearance; palpus (fig. 4) hardly longer than wide, strongly narrowed apicad. Thorax (fig. 163) very strongly flattened; mesonotum and scutellum uniformly covered with short recumbent and fairly strong setae; anterior spiracle dorsal, moderately large; scutellum lacking median furrow; prosternum (fig. 7) convexly curved

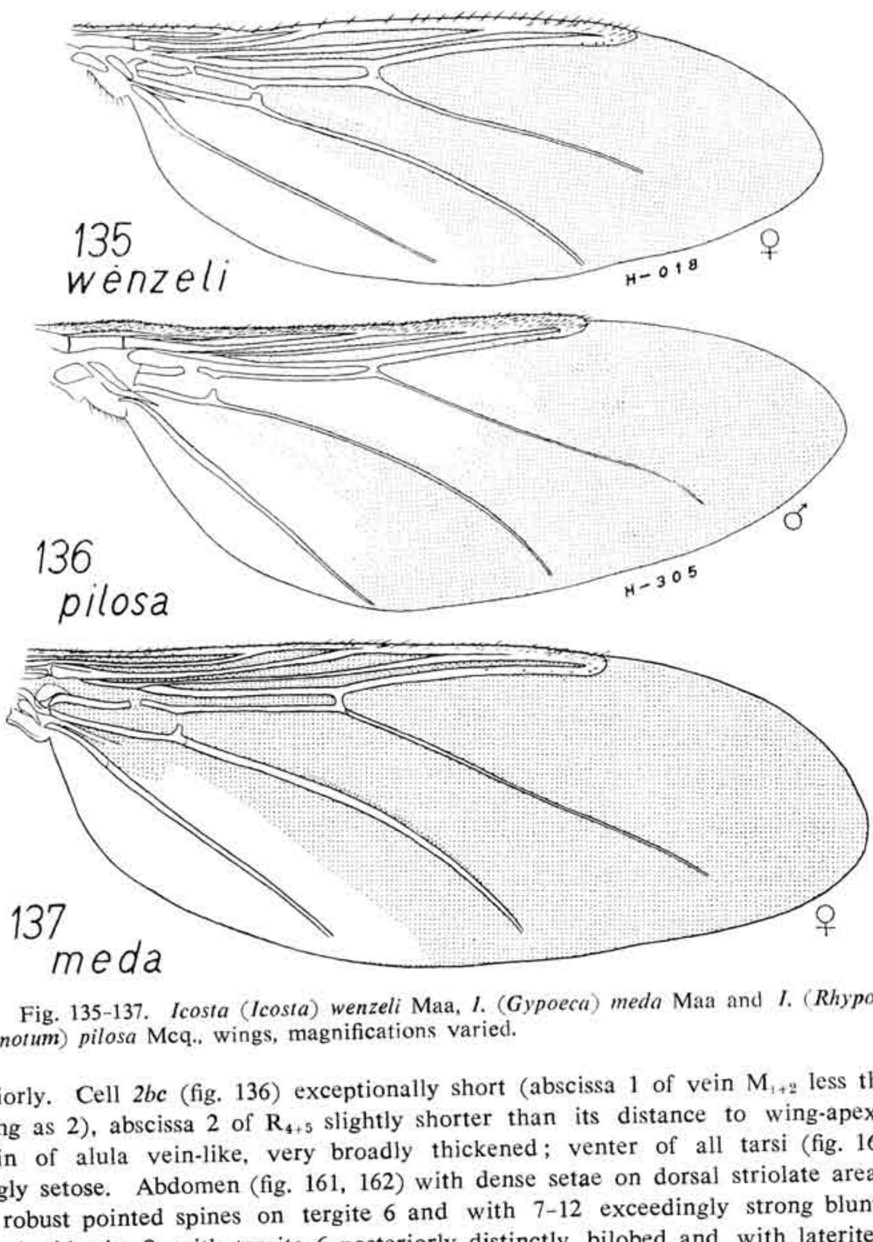


Fig. 135-137. *Icosta* (*Icosta*) *wenzeli* Maa, *I.* (*Gypoeca*) *meda* Maa and *I.* (*Rhyponotum*) *pilosa* Mcq., wings, magnifications varied.

anteriorly. Cell *2bc* (fig. 136) exceptionally short (abscissa 1 of vein M_{1+2} less than 1/2 as long as 2), abscissa 2 of R_{4+5} slightly shorter than its distance to wing-apex; hind margin of alula vein-like, very broadly thickened; venter of all tarsi (fig. 164, 165) strongly setose. Abdomen (fig. 161, 162) with dense setae on dorsal striolate area; in ♂ with robust pointed spines on tergite 6 and with 7-12 exceedingly strong blunt spines on each side; in ♀ with tergite 6 posteriorly distinctly bilobed and with laterite 7 very strongly raised and bristled. Aedeagus (fig. 162) long, in profile broadest at a point of basal 1/4, from there strongly narrowed basad, extreme apex gently decurved.

Affinities. Isolated in the genus. Superficially somewhat similar to *Pseudolynchia* because of the dense pilosity on inner orbits and thoracic dorsum. The subgeneric name is in allusion to that character (Greek *rhypos*, dirt, unclean; *notos*, wide surface, the back).

Icosta (Rhyponotum) pilosa (Macquart) Fig. 4, 7, 12, 136, 161–166.

Olfersia pilosa Mcq., 1843 : 434. Type : ♂ in Paris Mus., ex (?) bird, "Africa".
Lynchia pilosa : Beq. 1945b : 90, ♂♀.—Maa 1964 : 95.

MATERIAL. 50± specimens.

CONGO : 1♂ (MAC), Terr. de Banningville, R. Kwilu, Bagata, ex *Lissotis melanogaster*, II.1945, A. Fain.

SUDAN : 1♀ (BMNH), Darfur, El Fasher, 1920, H. Lynes.

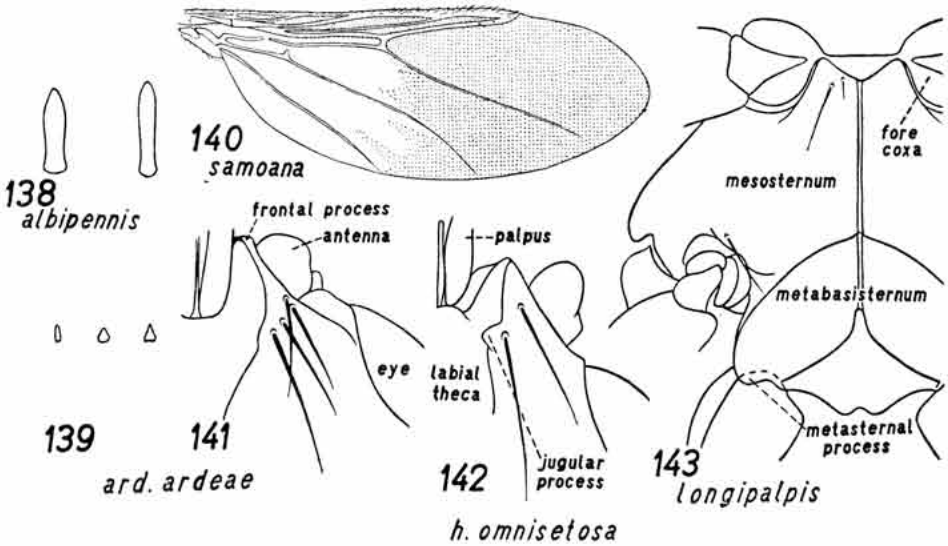


Fig. 138–143. *Icosta* species, ♀♀, details of certain structures. 138–139, pregenital plates showing variation, drawn to same scale (138, *albipennis*, Galapagos Is.; 139, *ardeae ardeae*, Taiwan); 140, *samoana*, wing, redrawn from Ferris 1927b; 141–142, venter of head showing absence and presence of jugular process, drawn to same scale (141, *ardeae ardeae*, Taiwan; 142, *holoptera omnisetosa*, Malaya); 143, *longipalpis*, Thailand, venter of thorax showing weakly developed metasternal process.

KENYA : 2♂♂, 3♀♀ (BMNH), Makueni, Ukamba, ex *L. melanogaster*, VII.1947, van Someren. 4♂♂, 2♀♀ (BMNH), Kedung (? Kulung), ex *Choriotis kori*, IX.1943, van Someren. 1♀ (BMNH), Adi R., 1600 m, ex *Ch. kori*. 1♀ (BMNH), Kima, ex *L. melanogaster*, I.1946, van Someren. 1♂, 1♀ (MCZ), "Kenya", ex *Ch. kori*, I–II.1948, N.A. Weber.

UGANDA : 1♂ (BMNH), Entebbe.

S. AFRICA : 1♂, 2♀♀ (SAIMR), Ontjo, SW Africa, ex *Pterocles bicinctus*, IX.1952. 1♀ (SAIMR), Namutovi, ex *Ch. kori*, IX.1952. 4♂♂ (MAC, SAIMR), nr Tsane, Bechuanaland, ex *Ch. kori*, I.1955. 1♂, 5♀♀ (MAC), nr Kikong, Bechuanaland, ex *Ch. kori*, I. 1958. 2♂♂, 2♀♀ (SAIMR), Oebete, Bechuanaland, ex *Ch. kori*, VII.1956. 1♀ (SAIMR), Debete, Bechuanaland, ex *Ch. kori*, VII.1956. 1♂ (BMNH), Wolmaranstad Distr., Transvaal, ex *Afrotis atra*, VI.1902, Hamilton. 1♂ (SAIMR), Rive del Lago Tuai, ex *Choriotis kori struthiunculus*, XI.1938.

Habitats. Widely spread in E. and S. African Subregions, so far known from Sudan, Ethiopia, Kenya, Uganda, Tanganyika, Rhodesia, SW Africa, Bechuanaland, Transvaal, Orange State and Zululand. Its records from Morocco and Congo may perhaps be considered seasonal or strays; that from the Reunion I. (Bigot 1863 *In* Maillard, Notes sur l'île de la Réunion: M38) is apparently erroneous. Breeding on Otididae. Recorded hosts are Galliformes: Phasianidae (*Francolinus*); Gruiformes: Otididae (*Afrotis, Choriotis, Eupodotis, Lissotis, Neotis*); Columbiformes: Pteroclidae (*Pterocles*).

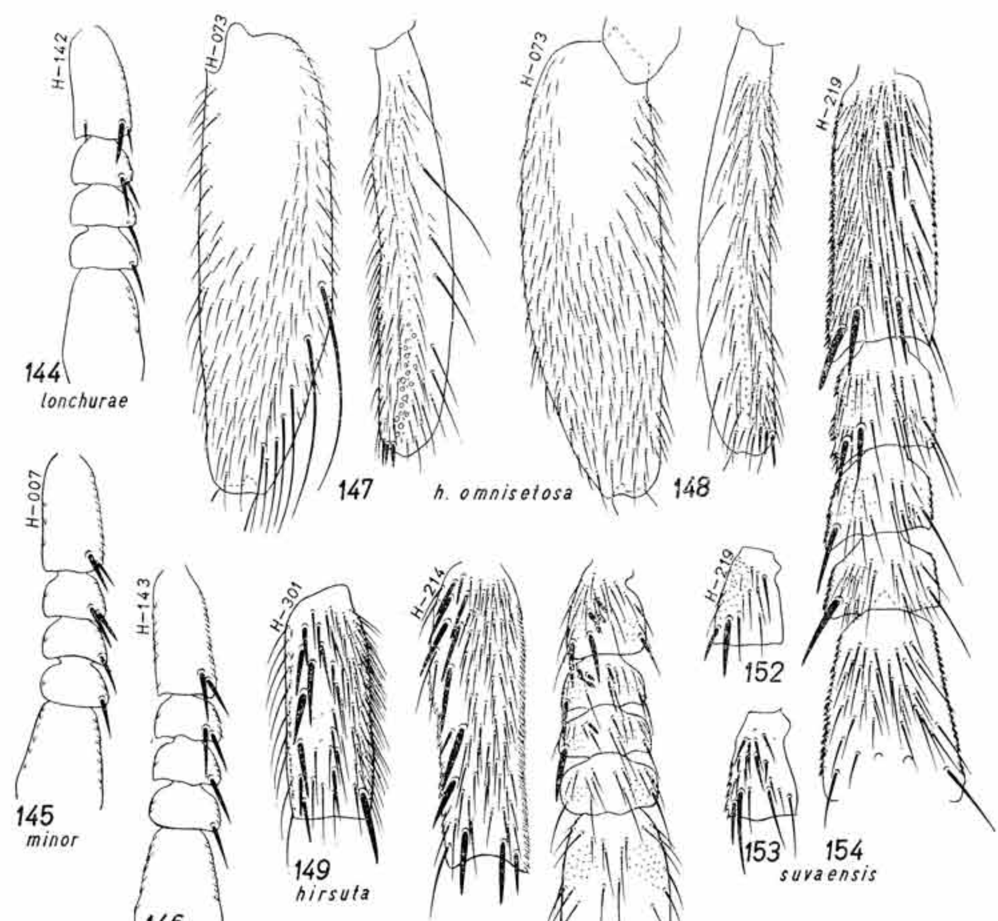


Fig. 144–154. *Icosta* species, ♂♂, details of legs. 144–146, right hind tarsi, showing number and arrangement of sensilla, drawn to same scale, ordinary setae omitted (144, *lonchurae*, Taiwan; 145, *minor*, Gabon; 146, *sensilis sensilis*, Thailand); 147–148, right hind femur and tibia in posterior and anterior views showing setoseness in subgenus *Ardmoeca*, drawn to same scale; 149–150, left hind basitarsi, showing differences in shape and chaetotaxy, magnifications varied; 151, left mid tarsus, showing presence of peg-like spines; 152, left fore basitarsus; 153, left mid basitarsus; 154, left hind tarsus. All except fig. 147–148 in ventral view.

Systematics. This species seems to have never been illustrated and the only redescription was by Bequaert (*l.c.*). The sexual dimorphism is strong and concerned chiefly with the shape of tergite 6 and the nature of tarsal and abdominal chaetotaxy rather than with the relative width of interocular face and the extent of wing-setulae as stressed by Bequaert. The wing-setulae in ♀ are generally less extensive than, but occasionally as extensive as in ♂ (fig. 136). There is thus no clear cut difference in sexes in this respect. The spines on humeral callus, anepisternum and femur 1 are scanty and relatively weak, but on metapleurotergal callus there are 10± very strong spines arranged in single row. The hind tibia is as in fig. 12. The tarsal-spine formula is 1.(1).(1).0/1.1.1.0/14(12+2).2.2.2 in ♂ and 1.(1).(1).0/2.1.1.0/8(7+1).2.2.2 in ♀ ; in addition, there is, particularly in ♂, a good number of minor spines amid ordinary setae. Tergite 6 in ♂ is normal in shape but with its long bristles replaced by unusually robust spines; in ♀, it is posteriorly bilobed and with long bristles. Other character sare as in the accompanying figures. I noted in MCZ a damaged but abnormal ♂ collected along with anormal ♂ ex *Choriotis kori* #2013 at Kenya, 1°25′ S, 35°10′ E to 1°38′ S, 35°17′ E, 120 km WSW of Naork. Its wing is 8.5 mm long (in normal ♂ *pilosa*, 5.5–7 mm), palpus and postvertex relatively shorter, wing-setulae less extensive, mesonotum with some black bristles and pale recumbent setae, abdomen with fewer lateral spines. Without dissection of fresh material the systematic status of that very specimen is uncertain. It may be either individual variation or a second species of the subgenus.

Genus **Phthona** Maa, new genus

TYPE-SPECIES. *Olfersia nigrita* Speis., here designated.

Distribution. 3 species, all Oriental, 1 each in Indo-Chinese, Malaysian and Philippine Subregions.

Host Relationships. Monoxenous, on *Microhierax* (Falconidae) or falconets which nest in old holes left by woodpeckers or barbets.

Diagnosis. Eye exceedingly small, not broader, or hardly so, than inner orbit (in front view of head). Thorax sometimes unusually short; scutellum always very short, posteriorly subtruncate; anterior thoracic spiracle dorsal, large; prosternum (fig. 167–169) large, as strongly pigmented and sclerotized as mesosternum and lying on same level as latter. Wing often abnormal in shape, sometimes strongly narrowed; tibiae (fig. 12) and tarsi apparently with only sensory pores, no sensilla. Urogenital openings strongly shifted forward; tergite 6 medially always interrupted; ♀ often with large oblique plates near abdominal apex. Aedeagus in profile slender to moderately robust, strongly curved near apex, virtually straight near apex. Sexual dimorphism strong, chiefly with abdominal sclerotization.

Affinities. Isolated and obviously the most highly specialized in the *Icosta* complex. The speciation is evidenced not only by structural peculiarities and strong sexual dimorphism but also, by the fact that though all species included are monoxenous on the same bird-genus in 3 neighboring Subregions, they differs sharply from one another. It is also interesting to note that the 2 southern forms are less specialized and closer to each other than to the northern form. The subgeneric name is in allusion to the small eyes, large dorsal thoracic spiracles and short truncate scutellum as if a person were very angry and envious (Greek *phthonos*, an envy).

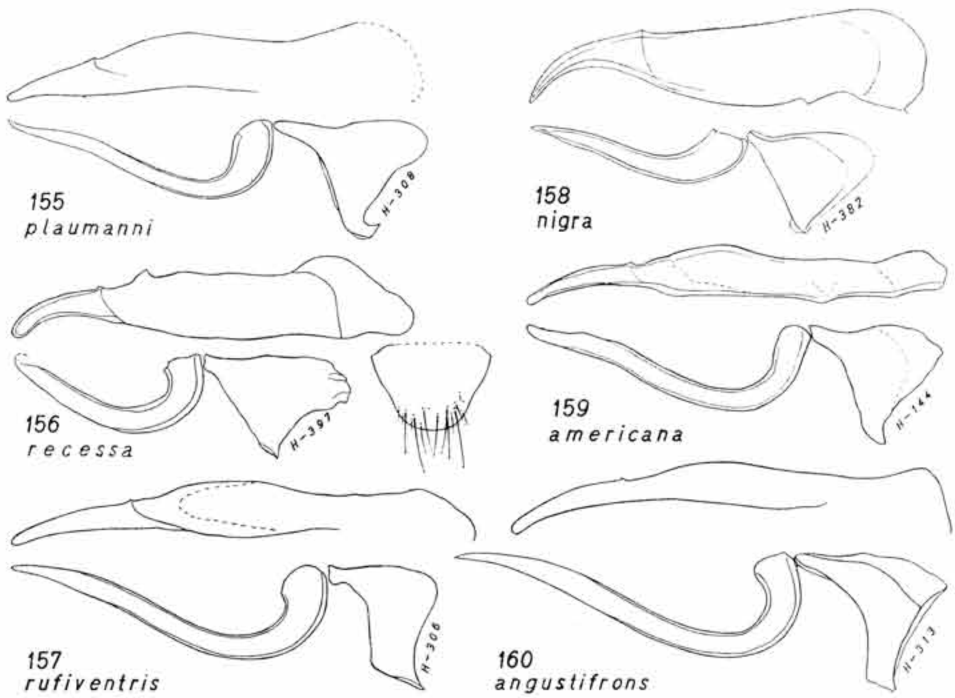


Fig. 155-160. *Icosta* species, ♂ genitalia, magnifications varied. ♂ postgenital plate shown is of *recessa*.

Key to species of Phthona

1. Apical margin of cell *2m+1a* distinctly longer than vein 2A; cell *2a* only *ca* 3× as long as wide; ♀ abdominal venter with 2 (1+1) large oblique plates nearly as wide as head and lying anterolaterally to urogenital openings .... **nigrita**
   Apical margin of cell *2m+1a* distinctly shorter than vein 2A; cell *2a* not less than 5× as long as wide; ♀ abdominal venter either lacking above described plates or they are less than 1/2 as wide as head.. 2
2. Wing evenly narrow, *ca* 3.7× as long as wide, intermediate section of posterior margin almost straight and parallel to anterior margin; ♂ tergite 3 hardly shorter than scutellum; ♀ abdominal venter lacking extra plates anterolaterally to urogenital openings, but pregenital plate large and well sclerotized .... **leptoptera**
   Wing normal in shape, *ca* 3× as long as wide, intermediate section of posterior margin distinctly convergent apicad to anterior margin; ♂ tergite 3 not more than 1/2 as long as scutellum; ♀ abdominal venter with 2 (1+1) large plates anterolaterally to urogenital openings, pregenital plate indistinct .... **modesta**

Phthona modesta (Maa) Fig. 5, 167.

Lynchia modesta Maa, 1963: 166, fig. 44, 46, 48, 50, 52, 53, ♀♂. Type: ♀ (AMS), ex *Microhierax fringillarius*, Sumatra.

Material. 4♂♂, 2♀♀. THAILAND: 1♀, Satun, Muang Thung Nui, ex *M. fringillarius*, WS 482, X.1963, Wanit Songprakob. 1♂, 1♀, Songkhla, Nathawi, ex *M. fringilla-*

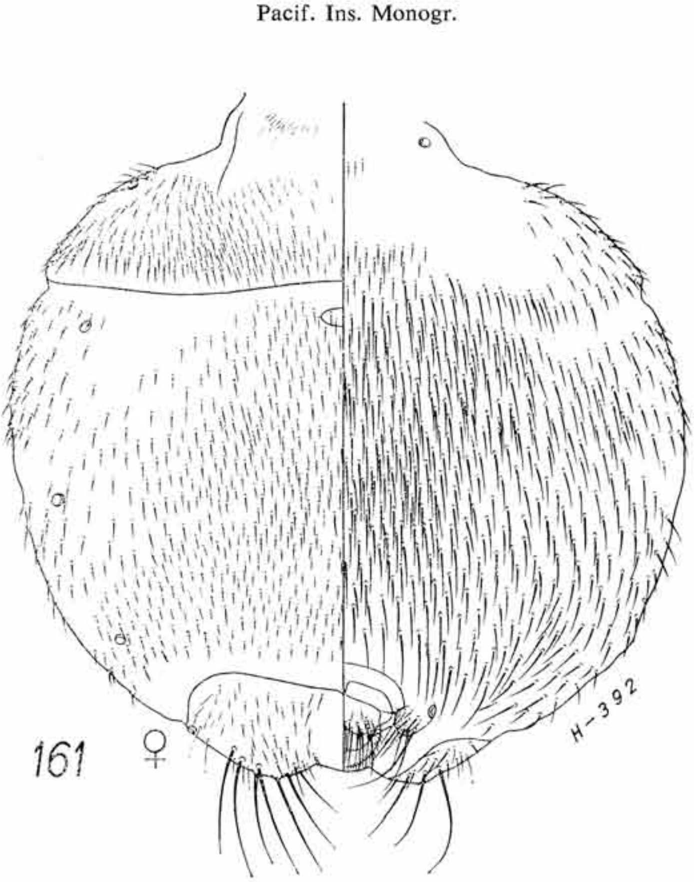


Fig. 161. *Icosta (Rhyponotum) pilosa* Mcq., Uganda, ♀ abdomen.

rius, RE 6495, X.1962, Wanit. SUMATRA: 2♂♂ (MCZ). JAVA: 1♂ (LDN), head missing, "Java", labeled by an unknown hand as "*Ornithomyia falconis* F."

Habitats. Malaysian Subregion, lowland; at present, known from Peninsular Thailand, Sumatra and Java. On *Microhierax fringillarius.*

Systematics. On bases of the shape of wing and ♂ genitalia, this species is here considered the most generalized of the genus. Even so, the size reduction of tergite 3 and the presence of sublateral plates on abdominal venter clearly indicate *modesta* already having strongly deviated from the ancestral stock of the genus. The tarsal-spine formula is 2.1.1.0/2.1.1.0/8(6+2).2.2.1 in ♂ and 2.2.1.0/2.1.1.1/6(4+2).2.2.1 in ♀. The palpus and prosternum are as in fig. 5 and 167, respectively.

Phthona nigrita (Speiser) Fig. 5, 169–171.

Olfersia nigrita Speis., 1905a: 358. Type: ♂ in Wien Mus., ex (?) bird, Luzon.—Maa 1963: 167, fig. 42, 43, ♂♀.

Ornithoponus sartus Ferr., 1925b: 333, fig. 3, 4, ♀♂. Type: ♀, (UCB), ex *Microhierax erythrogenys*, Samar, Philippines.

MATERIAL. 9♂♂, 10♀♀. PHILIPPINES: 1♂, 1♀, Balang-Balang, Mt Hilong-Hilong,

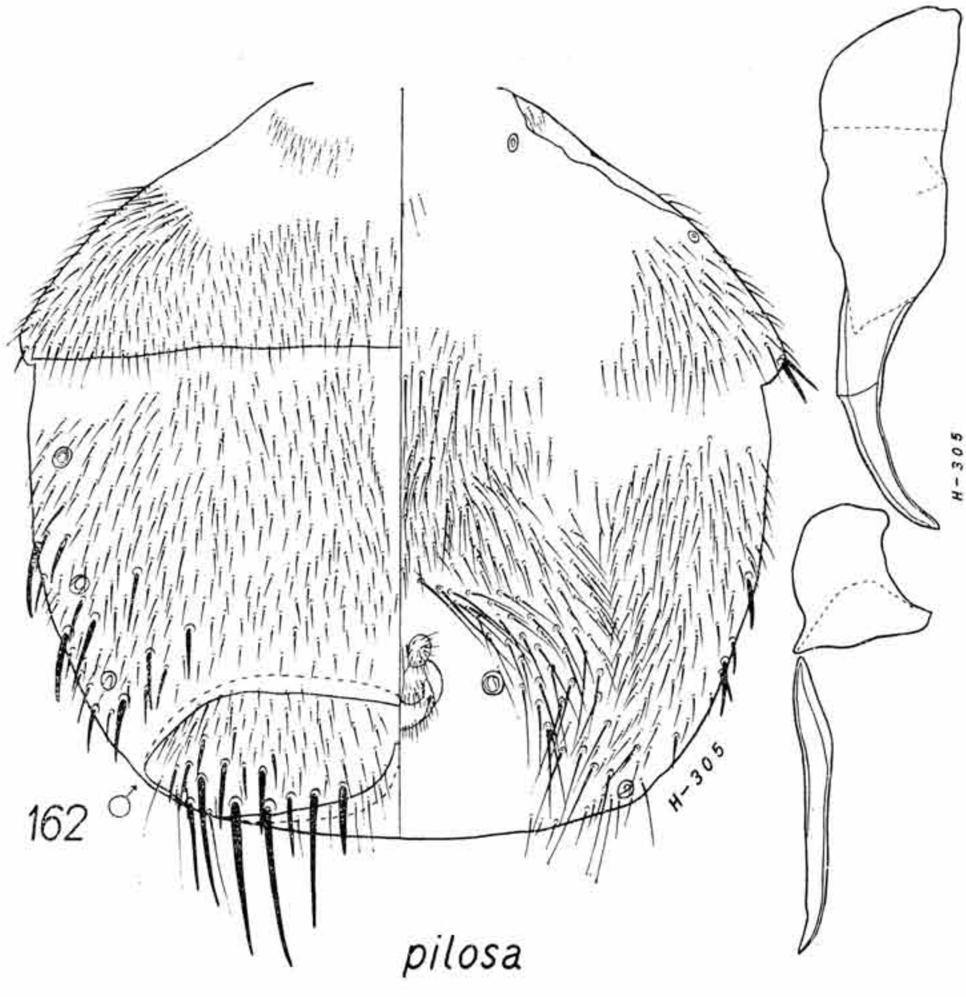


Fig. 162. *Icosta* (*Rhyponotum*) *pilosa* Mcq., Sudan, ♂ abdomen including genitalia.

Cabadbaren, Agusan Prov., Mindanao, 150-300 m, ex *M. erythrogenys*, SU-PI 4204, IV. 1963, Rabor. 2♂♂, 3♀♀, Balisong, Mt Matutum, Tupi, Cotabato Prov., Mindanao, ex *M. erythrogenys*, SU-BBM 1250, 1326, I-II.1964, Rabor. 2♂♂, 3♀♀, Limot Mati, Mt Mayo, Davao Prov., Mindanao, ex *M. erythrogenys*, B 7972, 8975, VI-VII.1965 Rabor; 1♂, *id.*, Unloh Mati, ex *Dicrurus hottentottus striatus*, B 8853. 1♂ (MCZ), Puerto Gallera, ex *M. erythrogenys*. 2♂♂, 3♀♀, Dalton Pass, Nueva Vizcaya, Luzon, ex *M. erythrogenys*, 6E 0067, I.1966, M.A.P.S.

Habitats. Philippine Subregion, lowland; at present, known from Luzon, Samar and Mindanao. On *Microhierax erythrogenys*, with stray records from Coraciiformes: Bucerotidae (*Buceros* [=*Hydrocorax*]) and Passeriformes: Dicruridae (*Dicrurus*). Highest density per infested bird was 2♂♂, 1♀ (SU-BBM 1250).

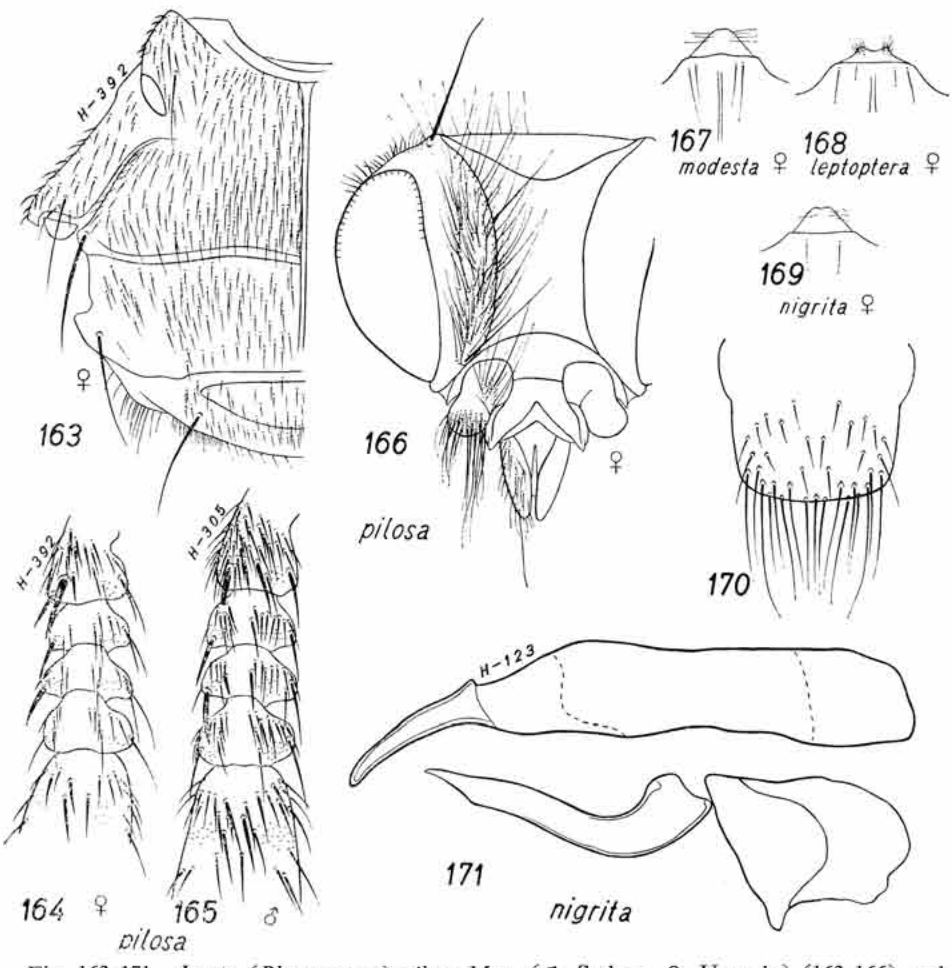


Fig. 163-171. *Icosta (Rhyponotum) pilosa* Mcq. (♂, Sudan; ♀, Uganda) (163-166) and *Phthona* species (167-171). 163, thorax, dorsal view; 164, right fore tarsus, ventral view; 165, right mid tarsus, ventral view; 166, head, front view; 167-169, anterior part of thoraces, ventral view, drawn to same scale; 170-171, ♂ postgenital plate and genitalia, drawn to same scale.

Systematics. Although possessing several outstanding characters, *nigrita* is closer to *modesta* than to *leptoptera*. The strongly sclerotized plates on ♀ abdomen do not conform with those found in any generalized hippoboscids. Their presence is here considered a specialized character. The dorsal sclerite embracing spiracle 5 probably represents partial consolidation of both tergites and laterites of abdominal segments 4 and 5, whereas the sublateral plates on venter are in turn, largely if not entirely, a consolidation of sternites 4 and 5. These 2 pairs of huge sclerites are apparently a compensation for the size reduction and wide median interruption of tergite 6, as well as an adaptation to the shifting forward of urogenital openings. The strong bristles forming posterior fringes of those sublateral plates obviously serve to protect those openings. The apical margin of cell *2m+1a* in 2♂♂ examined is hardly concavely curved, or not distinctly so; and the sublateral plates in 1♀, probably somewhat teneral, are much paler than other abdominal sclerites. From Speiser's inadequate description, Ferris (1927c: 228) surmised that *nigrita* might be the same as his *setosa*. The tarsal spine formula is 2.2.1.0/2.2.1.0/6(3+3).2.2.2 in ♂. The palpus, prosternum and ♂ genitalia are as in fig. 5, 169–171, respectively.

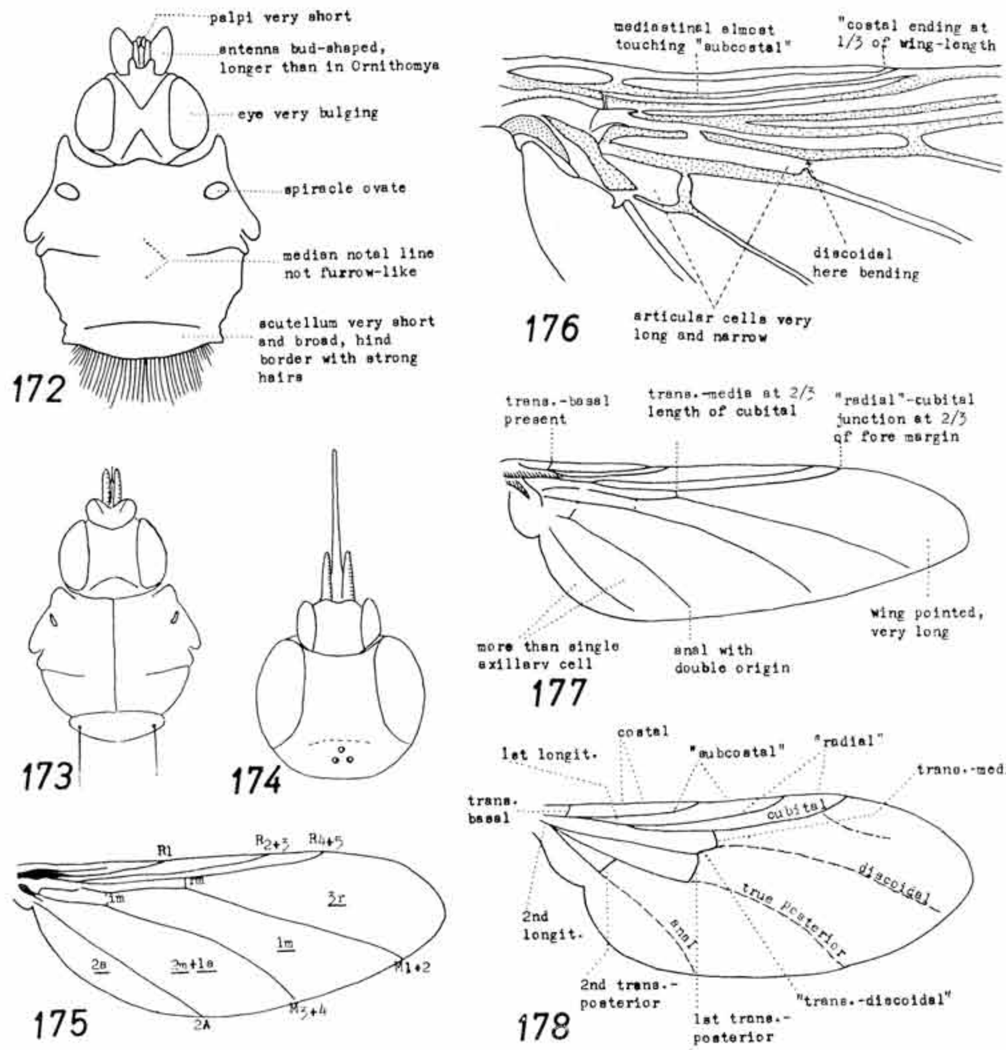


Fig. 172–178. Interpretation of Weyenbergh's description of *Lynchia*. 172, *Stilbometopa ramphastonis* Ferr., head and thorax; 173, *Icosta americana* Lch., head and thorax; 174, *Ornithomya viridis* Latr. [= *avicularia* Linn.], head; 175, *Icosta americana*, wing, notations mine; 176, *Stilb. impressa* Bigot, basal part of wing, traced from enlarged photograph; 177, *Stilb. ramphastonis*, wing; 178, *Ornith. avicularia*, wing, with Weyenbergh's venational terminology. Fig. 172 & 177 redrawn from Ferris 1930c; 173, redrawn from Ferris 1927a; 174 & 178, redrawn and enlarged from Meigen 1830.

Phthona leptoptera (Maa) Fig. 5, 12, 168.

Lynchia leptoptera Maa, 1963: 168, fig. 45, 47, 49, 51, 54, 55, ♀♂. Type: ♀ (CNHM), ex *Microhierax caerulescens*, Thailand.

MATERIAL. 1♂, 4♀♀. ASSAM: 1♀ (BMNH), Mungpoo, ex *M. eutolmus*, III.1920, Senior-White. BURMA: 1♂, 1♀ (MCZ), Myitkyina, ex bird #B44, III.1945, Stager. TONKIN: 2♀♀ (MCZ), 1 w. mites on abd., Muong Moun, ex *M. melanoleucus* #772, 892, V. T.

Habitats. Indo-Chinese Subregion; at present, known from Assam, Burma, Thailand and Tonkin. On *Microhierax* spp. The type host, not mentioned in the original description, was *M. caerulescens* (RE 2958).

Systematics. The strongly shortened thorax and narrowed wing of *leptoptera* are characters unique for *Icosta*-complex. The anterior thoracic spiracle and scutellum are noticeably smaller than in *modesta* and *nigrita*. These are linked with the shortening of the thorax as a whole, whereas the reduction of strong bristles on ♀ tergite 6, with the shifting forward of urogenital openings. In other features, including the short and posterolaterally produced syntergite 1+2 as well as the medially narrowly interrupted ♀ tergite 6, the abdomen is more closely similar to most species of the genus *Icosta* than to *modesta* and *nigrita*. The ♂ genitalia appears to be less generalized than in the 2 latter species. The tarsal-spine formula is 2.1.1.0/2.1.1.0/8(6+2).3.2.2 in ♀. The palpus, hind tibia and prosternum are as in fig. 5, 12 and 168, respectively.

HOST RELATIONSHIPS

Bequaert (1953: 213-336) has discussed various phases of host relationships of Hippoboscidae, and listed 136 genera of birds as hosts of the following *Icosta* species: *albipennis* [=*albipennis*+*ardeae ardeae*+*ardeae botaurinorum*], *americana*, *angustifrons*, *bicorna*, *dukei*, *fusca* [=*americana*], *holoptera*, *longipalpis*, *maquilingensis*, *massonnati*, *nigra*, *pilosa*, *pollicipes* [=*chalcolampra*+*trita*], *samoana*, *sarta* [=*nigrita*], *schoutedeni*, *simplex* [nec Wk., =*australica*], *tuberculata*, *wolcotti* [=*rufiventris*]. In his 1955a, 1957 papers, detailed records for all American species were enumerated and analyzed, and 10 additional bird genera were included as hosts of *Icosta*. Though still far from complete, more information is now available, and it seems worthwhile to review certain aspects of this problem. The terms "breeding" and "accidental" in the discussions given below and given under each species in the taxonomic account are understood to be by presumption, and the latter term includes stragglers, contaminations and mislabelings.

Over-all Host Range of Icosta and Phthona

Up to now, 263 genera of birds in 18 orders and 61 families are known as hosts of various *Icosta* and *Phthona* species. There is no record for Struthio-, Procellarii- Podicipi-, Gavii-, Rhei-, Casuarii-, Sphenisci- and Apterygiformes; the odd records for Tinami-, Anseri-, Charadrii-, Caprimulgi, Apodi- and Trogoniformes should most probably be considered accidental; and only about 27 families in 12 orders serve as true breeding hosts. A concise list of different *Icosta* and *Phthona* species under each bird genus is in Appendix I, that under each bird order is given below.

TINAMIFORMES (Tinamidae). Accidental: *holoptera* (Albipennis group) and *plau-*

manni (Simplex group), 1 single record each.

PELECANIFORMES (Phalacrocoracidae, Pelecanidae). Aquatic; usually nesting on ground in colonies. Breeding: *schoutedeni*, sp. "F", sp. "N", sp. "T" (Albipennis group). Accidental: *albipennis* (Albipennis group).

CICONIIFORMES (Ardeidae, Ciconiidae, Threskiornithidae). Semiaquatic; nests loose, usually in colonies, high above ground in damp environment. Breeding: *albipennis*, *ardeae*, *botaurinorum*, sp. "S" (Albipennis group). Accidental: *americana* (Americana group), and *maquilingensis* (Simplex group). Status uncertain: *massonnati* (Albipennis group).

ANSERIFORMES (Anatidae). Accidental: *albipennis* (Albipennis group), 2 records.

FALCONIFORMES (Accipitridae, Falconidae, Pandionidae, Cathartidae). Diurnal birds of prey; nests loose but fairly durable, often in trees or in lofty aeries, occasionally (in *Microhierax*) in hollowed trees. Breeding: *americana*, *angustifrons*, *dukei*, *nigra*, *rufiventris* (Americana group); *zumpti* (Simplex group); *chalcolampra* (Plana group); *longipalpis*, *mecorrhina* (Longipalpis group); *meda* (Meda group); *leptoptera*, *modesta*, *nigrita* (Nigrita group). Accidental: *albipennis*, *ardeae*, *botaurinorum* (Albipennis group); *fenestella* (Plana group); *bucerotina* (Longipalpis group). Status uncertain: *suvaensis* (Americana group).

GALLIFORMES (Megapodiidae, Cracidae, Phasianidae, Meleagridae). Ground birds, often gregarious; nests crude, usually on ground. Breeding: *americana* (Americana group); *australica*, *maquilingensis*, *plaumanni*, *simplex* (Simplex group); *hirsuta* (Hirsuta group). Accidental: *zumpti* (Simplex group); *chalcolampra*, *fenestella* (Plana group); *pilosa* (Pilosa group). Status uncertain: *humilis*, *subdentata* (Longipalpis group).

GRUIFORMES (Eurypygidae, Rallidae, Otididae). Semiaquatic and ground birds; nests loosely constructed on ground in dry or damp environment. Breeding: *holoptera*, *omnisetosa* (Albipennis group); *pilosa* (Pilosa group). Accidental: *albipennis*, *ardeae* (Albipennis group); *maquilingensis* (Simplex group).

CHARADRIIFORMES (Jacanidae, Charadriidae, Laridae, Alcidae). Accidental: *albipennis*, *ardeae*, *omnisetosa*, sp. "O" (Albipennis group); *americana*, *angustifrons* (Americana group).

COLUMBIFORMES (Pteroclidae, Columbidae). Ground birds; nests crude, above ground, often in trees or on rocky ledges. Breeding: *simplex* (Simplex group); *chalcolampra* (Plana group). Accidental: *americana* (Americana group); *fenestella*, *plana* (Plana group); *dioxyrhina* (Longipalpis group); *pilosa* (Pilosa group).

PSITTACIFORMES (Psittacidae). Arboreal, often gregarious; nests in hollowed trees either by digging themselves or by modifying nests deserted by woodpeckers, etc., usually no nesting material inside, only wood fragments. Breeding: *papulata*, *parallelifrons*, *paramonovi* (Parallelifrons group); *chalcolampra*, *wenzeli* (Plana group). Accidental: *angustifrons* (Americana group); *maquilingensis* (Simplex group); *fenestella*, *plana* (Plana group); *tuberculata* (Longipalpis group). Status uncertain: *suvaensis* (Americana group).

CUCULIFORMES (Musophagidae, Cuculidae). Arboreal; nests fairly finely constructed, above ground, some species parasitic in other birds' nests. Breeding: *zumpti* (Simplex group); *sensilis* (Minor group); *chalcolampra*, *elbeli*, *recessa* (Plana group). Accidental: *dukei*, *nigra* (Americana group); *maquilingensis*, *simplex* (Simplex group); *wenzeli* (Plana group); *mecorrhina* (Longipalpis group). Status uncertain: *latifacies* (Americana group); *subdentata* (Longipalpis group).

STRIGIFORMES (Strigidae). Nocturnal birds-of-prey; nests usually very dirty, in hollowed trees, many species build their own nests of twigs in the hollow. Breeding: *americana, rufiventris* (Americana group). Accidental: *albipennis* (Albipennis group); *angustifrons, nigra* (Americana group); *zumpti* (Simplex group); *chalcolampra, fenestella* (Plana group); *longipalpis* (Longipalpis group).

CAPRIMULGIFORMES (Caprimulgidae). Accidental: *ardeae* (Albipennis group), *mecorrhina* (Longipalpis group), 1 single record each.

APODIFORMES (Apodidae). Accidental: *zumpti* (Simplex group), 1 record.

TROGONIFORMES (Trogonidae). Accidental: *angustifrons* (Americana group), 1 record.

CORACIIFORMES (Coraciidae, Alcedinidae, Meropidae, Momotidae, Bucerotidae). Habits much varied, some nesting in tunnels on banks of rivers or in termitaria or in hollowed trees. Breeding: *jactatrix* (Plana group); *bicorna, bucerotina, coalescens, dioxyrhina, spinosa* (Longipalpis group). Accidental: *ardeae* (Albipennis group); *minor* (Minor group); *angustifrons* (Americana group); *maquilingensis* (Simplex group); *chalcolampra, wenzeli* (Plana group); *mecorrhina* (Longipalpis group); *nigrita* (Nigrita group).

PICIFORMES (Picidae, Ramphastidae, Capitonidae). Arboreal; nests usually above ground, often in hollowed trees. Breeding: *trita* (Plana group). Accidental: *americana, angustifrons* (Americana group); *maquilingensis* (Simplex group); *fenestella* (Plana group).

PASSERIFORMES (Eurylaimidae, Irenidae, Nectarinidae, Formicariidae, Pittidae, Cotingidae, Hirundinidae, Pycnonotidae, Campephagidae, Muscicapidae, Motacillidae, Laniidae, Meliphagidae, Thraupidae, Fringillidae, Ploceidae, Sturnidae, Oriolidae, Dicruridae, Corvidae, Cracticidae, Ptilonorhynchidae, Paradisaeidae). Habits much varied, largely arboreal, often feeding on ground; nests finely constructed, above ground. Breeding: *minor, lonchurae, reducta, sensilis* (Minor group); *chalcolampra, fenestella, plana, tarsata* (Plana group); *acromialis, corvina, tuberculata* (Longipalpis group). Accidental: *albipennis, holoptera* (Albipennis group); *americana, angustifrons, samoana* (Americana group); *plaumanni* (Simplex group); *hirsuta* (Hirsuta group); *trita, wenzeli* (Plana group); *bicorna* (Longipalpis group); *nigrita* (Nigrita group). Status uncertain: *diluta* (Plana group).

Degree of Host Specificity

The host specificity in ectoparasites can usually be measured by analysis of positive records, count of infestation frequency and infestation density, and implication of evolutionary parallelism with due consideration to vagaries of collecting. Of a given species, when available host records are too scanty and at the same time systematic affinities are not quite clear, its host specificity cannot be or can hardly be ascertained. This is the case for *Icosta diluta, humilis, latifacies, massonnati, subdentata, suvaensis* and *tripelta*. The remaining species fall into 4 categories, as follows.

Monoxenous (11 species): *australica* on *Alectura* (Megapodiidae), *corvina* on *Corvus* (Corvidae), *dioxyrhina* on *Rhyticeros* (Bucerotidae), *leptoptera* on *Microhierax* (Falconidae), *lonchurae* on *Lonchura* (Ploceidae), *modesta* on *Microhierax* (Falconidae), *nigrita* also on *Microhierax*, *parallelifrons* and *paramonovi* on *Cacatua* (Psittacidae), *tarsata* on *Myiophoneus* (Muscicapidae), *trita* on *Megalaima* (Capitonidae). Among these, *australica, corvina* and *tarsata* may in the future prove to be oligoxenous.

Oligoxenous (28 species): *albipennis* on Ardeidae, *ardeae* on Ardeidae, *bicorna* on Bucerotidae, *botaurinorum* on Ardeidae, *bucerotina* and *coalescens* on Bucerotidae, *dukei* on Accipitridae, *elbeli* on Cuculidae, *hirsuta* on Phasianidae, *holoptera* on Rallidae, *jactatrix* on Alcedinidae, *longipalpis* on Accipitridae, *maquilingensis* on Phasianidae, *mecorrhina* and *meda* on Accipitridae, *omnisetosa* on Rallidae, *pilosa* on Otididae, *recessa* on Cuculidae, *samoana* on Muscicapidae, *schoutedeni* on Phalacrocoracidae, *wenzeli* on Psittacidae. Among these, *samoana* and *wenzeli* may actually be polyxenous instead. By employing the hypothesis that very closely related species have similar host relationships, *papulata* is here surmised to breed on Psittacidae, *spinosa* on Bucerotidae, sp. "F", sp. "N" and sp. "T" on Phalacrocoracidae, sp. "S" on certain Ciconiiform birds, and sp. "W" on certain Passeriform birds.

Pleioxenous (5 species): *acromialis* on Sturnidae, Corvidae (Passeriformes), *fenestella* on Corvidae, Dicruridae, Muscicapidae (Passeriformes); *nigra* on Accipitridae, Falconidae (Falconiformes); *plana* on Paradisaeidae, Cracticidae, Ptilonorhynchidae (Passeriformes); *plaumanni* on Cracidae, Phasianidae (Galliformes).

Polyxenous (8 species): *americana* on Strigidae (Strigiformes), Accipitridae (Falconiformes), Phasianidae (Galliformes); *angustifrons* on Accipitridae, Falconidae (both Falconiformes), Strigidae (Strigiformes), Ramphastidae (Piciformes); *chalcolampra* on Accipitridae (Falconiformes), Psittacidae (Psittaciformes), Columbidae (Columbiformes), Cuculidae (Cuculiformes), Sturnidae, Corvidae (both Passeriformes); *minor* on Ploceidae, Laniidae, Muscicapidae (all Passeriformes), Cuculidae (Cuculiformes); *rufiventris* on Accipitridae (Falconiformes), Strigidae (Strigiformes); *sensilis* on Cuculidae (Cuculiformes), Muscicapidae (Passeriformes); *simplex* on Columbidae (Columbiformes), Megapodiidae (Galliformes); *zumpti* on Musophagidae (Cuculiformes), Accipitridae (Falconiformes).

In the above list it may be noted that: (a) mono- plus oligoxenous species much outnumber pleio- plus polyxenous species, about in the ratio of 7 to 3; (b) among mono- and oligoxenous species, 11 are on arboreal birds, 12 on aquatic and semi-aquatic birds, 12 on birds nesting in hollowed trees, 3 on terrestrial birds; (c) no aquatic, semiaquatic and hollowed-tree nesting birds (with possible exception of bucerotids harboring *mecorrhina*) serve as breeding hosts of pleio- and polyxenous flies; (d) among the 10 species of *Icosta* known to breed on Accipitridae, 3 are oligoxenous, 1 pleioxenous, 6 polyxenous but none monoxenous.

Infestation Frequency, Population Density

From the very scanty data thus far available, the infestation frequency in *Icosta* shows significant variation with seasons, localities and kinds of birds (even those belonging to same preferred family). Thus:

I. americana. In New York State, June to August, 22% of 147 young *Bonasa* and in Connecticut, October to November, 50% of 36 adult *Bonasa* were found infested (Beq. 1953: 232, 1955a: 294). Of the 518 and 28 verified Nearctic and Neotropical records, respectively, 28% and 22% were from Falconiformes and 17% and none, from Galliformes (Beq. 1955a: 293–95).

I. ardeae botaurinorum plus *I. albipennis.* In temperature North America, most flies were collected from May to September, a few in April and October, none from mid December to March (Beq. 1955a: 340).

I. fenestella. In Taiwan, December to April, 19% of 234 *Dendrocitta* and 58% of 26 *Urocissa* were found infested (both birds belong to Corvidae) (Maa et al. 1965: 397-99, as *Lynchia* sp. "P").

I. hirsuta. In Chiles Valley, California where collection records were available on an annual basis, there was a complete absence of flies from January to May, and the peak months for fly appearance were from August to October (Furman et al. 1953 J. Parasit. 39: 70).

I. lonchurae. In Taiwan, December to April, 27% of 22 *Lonchura* were found infested (Maa et al. *l. c.*, as *Lynchia* sp. "L").

I. maquilingensis. In Taiwan, December to April, 31% of 13 *Arborophila*, 36% of 53 *Bambusicola*, 20% of 10 *Hierophasis*, none of 13 *Excalfactoria* were found infested (all birds belong to Phasianidae). And in *Bambusicola*, the infestation rates for SW, SE and central Taiwan were 62%, 23% and 27% respectively (Maa et al., *l. c.*).

I. trita. In Taiwan, December to April, 26% of 259 *Megalaima* were found infested (Maa et al. *l.c.*).

The average density of *Icosta* is about 2 flies per infested bird. It is, therefore, lower than in *Ornithoica* and *Ornithomya*. In general, this density is also lower on accidental and small-sized hosts than on breeding and large-sized ones and when records are not too scanty and are based on proper collecting methods, the highest density in each species of flies is to be found only on breeding hosts. Available records of highest density of the various species are: *acromialis*, 7 flies on a *Corvus*; *americana*, 61± flies on a *Bubo* and 15 flies on a *Bonasa*; *bucerotina*, 4 on *Anorrhinus* and on *Rhyticeros*; *chalcolampra*, 6 on *Probosciger* and 4 on *Corvus*; *dioxyrhina*, 4 on *Rhyticeros*; *dukei*, 10 on *Haliaeetus*; *elbeli*, 14 on *Centropus*; *fenestella*, 8 on *Urocissa*; *lonchurae*, 3 on *Lonchura*; *longipalpis*, 4 on *Spilornis*; *maquilingensis*, 10 on *Gallus* and 7 on *Hierophasis*; *meda*, 7 on *Torgos*; *nigrita*, 3 on *Microhierax*; *parallelifrons*, 9 on *Cacatua*; *plana*, 3 on *Cracticus*; *sensilis*, 3 on *Cuculus*; *simplex*, 3 on *Talegalla*; *trita*, 5 on *Megalaima*.

The population density of a given *Icosta* species may also be affected by its association with other hippoboscids on same individual birds. In such cases, the mono- or oligoxenous species usually outnumber pleio- or polyxenous species if the bird involved is a preferred host of that particular fly. Multiple infestation is usually an uncommon phenomenon, unless 2 or more oligoxenous species coexist on a certain bird in the same area. Of 194 infested birds of *Lophortyx californica* in California, 36% were found harboring both *I. hirsuta* and *Stilbometopa impressa* Bigot, both of which are specific on Phasianidae. In another unusual case, on a *Cracticus cassicus* (BBM-NG 29567) in New Guinea, found together were 1 fly each of *I. plana*, *Ornithoica zamicra* Maa, *O. stipituri* Schin. and *Ornithophila metallica* Schin. plus 2 flies of *Ornithoica exilis* Wk. Other cases of multiple infestation so far published (Beq. 1953: 224; Maa 1966 Pacif. Ins. Monogr. **10**: 115; Maa et al. 1965: 400) are less complicated. Thus:

I. angustifrons. Associated with *I. rufiventris* plus *Ornithoctona erythrocephala* Lch., on *Hypomorphnus*, 1 case.

I. chalcolampra. Associated with *Ornithoica exilis* plus *Ornithophila metallica*, 1 case; with *O. exilis* plus *O. stipituri*, 1 case; with *O. exilis* alone, 11 cases; with *O. stipituri*, 3 cases; with *O. zamicra*, 1 case.

I. fenestella. Associated with *O. metallica*, on *Dendrocitta* and *Urocissa*, 2 cases each.

I. parallelifrons. Associated with *O. exillis*, on *Cacatua*, 3 cases.

I. plana. Associated with *O. exilis* plus *O. stipituri*, 1 case; with *O. exilis* alone, 1 case; with *O. stipituri* alone, 3 cases.

I. simplex. Associated with *O. exilis*, on *Talegalla*, 1 case.

I. rufiventris. Associated with *Ornithoctona erythrocephala*, on *Micrastur*, 1 case.

Host Habits and Habitats

In theory, the host relationship of a bird lousefly is governed by the degree of competition among parasites, ability of a host bird to get rid of its parasite(s), appropriateness of host blood as a nutrient for adult fly (and its developing larva), appropriateness of host plumage as a shelter for adult fly as well as appropriateness of host nesting site as a shelter for development of fly-pupa. It is, therefore, not surprising that closely related flies usually have similar patterns of host relationship, and that flies emerging from highly specialized ecological niches such as hollowed tree are usually highly specific in host relationship and even highly specialized in structure. These are particularly true for *Icosta* and *Phthona*. The absence of any host specific species of these 2 genera breeding on Struthioni-, Tinami-, Procellarii-, Caprimulgi-, Apodi- and Trogoniformes is at least partly due to competition of hippoboscids of other genera, viz., *Struthiobosca, Microlynchia, Olfersia, Pseudolynchia, Crataerina-, Myophthiria*, and *Ornithoctona* respectively. The absence on Podicipi- and Charadriiformes is apparently due to the poor adaptability of these flies to marine life; that on Gavii- and Sphenisciformes, due to their incapability to survive in polar areas and to the nature of host plumage; that on Anseriformes, due to the oily short plumage, damp nesting sites and almost instant-lasting nestling period of those birds. The absence on Rhei-, Casuarii- and Apterygiformes, merely by guessing, is perhaps something related to the geological history of such birds. The nature of host blood, which is closely linked to phylogenetic affinities of different orders, families and genera of birds, obviously does not play a very important role in *Icosta* and *Phthona*. If the order, families etc., of birds are temporarily set aside, the various *Icosta* and *Phthona* species may arbitrarily be segregated into 6 ecological categories; and under each category, if occasional hosts frequenting similar natural habitats as those of breeding hosts are taken out of the list, it will leave but few true stragglers including contaminations. In such a way, the host range and host preference of the species can more easily be explained. The categories are as follows.

(a) On birds frequenting swamps and similar environments. 12 species and subspecies, probably all oligoxenous, belonging to Albipennis and Pilosa groups. 270± available host records, 4% of which were stragglers.

(b) On birds nesting in hollowed trees and similar sites. 12 species, 7 mono- and 5 oligoxenous, belonging to Parallelifrons, Nigrita, Plana and Longipalpis groups. They are *bicorna, bucerotina, coalescens, dioxyrhina, leptoptera, modesta, nigrita, papulata, paramonovi, parallelifrons, spinosa, trita*. 146 available host records, 4% of which were stragglers.

(c) On terrestrial birds. 5 species, 1 mono-, 2 oligo-, 1 pleio- and 1 polyxenous (perhaps the monoxenous one is actually oligoxenous), belonging to Simplex and Hirsuta groups. They are *australica, hirsuta, maquilingensis, plaumanni, simplex*. 176 available host records, 12% of which were stragglers.

(d) On birds of prey. 8 species, 4 oligo-, 1 pleio- and 3 polyxenous, belonging to America, Simplex, Longipalpis and Meda groups. They are *angustifrons, dukei, longipalpis, mecorrhina, meda, nigra, rufiventris, zumpti*. 213 available host records, 9% of which were stragglers including "live" contaminations (preys).

(e) "Highly" polyxenous species, on birds of prey, etc. 2 species, both very widely distributed, belonging to Americana and Plana groups. They are *americana, chalcolampra*. 670 available host records, 2% of which were stragglers.

(f) On birds making fine above-ground nests. 14 species, 2 mono-, 6 oligo-, 4 pleio- and 2 polyxenous, belonging to Minor, Plana and Longipalpis groups. They are *acromialis, corvina, elbeli, fenestella, jactarix, lonchurae, minor, plana, recessa, samoana, sensilis, tarsata, tuberculata, wenzeli*. 257 available host records, 3% of which were stragglers.

(g) Host relationships uncertain. 7 species, belonging to Americana, Minor, Plana and Longipalpis groups. They are *diluta, humilis, latifacies, subdentata, suvaensis, tripelta*, sp. "W". 8 available host records.

Of the stragglers, category (a) had 8, (b) had 1, (f) had 2 records ex birds of prey which might possibly have been "live" contaminations as a sequence of preying by those predators. The other straggler records were: category (a), Pteroclidae, Bucerotidae and Thraupidae, 1 each; (b), Columbidae, Pycnonotidae, Ploceidae, Dicruridae and Cracticidae, 1 each; (c), Tinamidae 1, Ardeidae 2, Rallidae 1, Capitonidae 1, Bucerotidae 1, Psittacidae 2, Cuculidae 3, Formicariidae 1, Muscicapidae 2, Fringillidae 6, Corvidae 1; (d), Ramphastidae 6, Bucerotidae 3, Musophagidae and Corvidae, 2 each, Charadriidae, Psittacidae, Trogonidae, Momotidae, Cotingidae and Muscicapidae, 1 each; (e) Corvidae 5, Phasianidae, Picidae and Fringillidae, 1 each; (f), Columbidae 2, Bucerotidae, Phasianidae and Picidae, 1 each. Noteworthy was the entire absence of records from birds of prey in category (c), from aquatic and semiaquatic birds in (d), (e) and (f), and from hollowed-tree nesting birds in (b).

The very short palpi and very dense pilosity on legs and wings in category (a) are possibly related to the nature of plumage and habitats of aquatic and semiaquatic birds; the enlarging of anterior thoracic spiracles, the reduction of eyes and wings and the very dull pattern of body in category (b), obviously adaptations to the dull, seclusive, poorly ventilated nesting sites of their hosts; and the presence of complete or vestigial ocelli in category (c) is possibly an adaptation to the open nests of their hosts. In categories (d), (e) and (f), there are various forms of structural speciations which have developed to various extents to adapt to respective habitats of different hosts.

Since birds of the same order or family may serve as breeding hosts of several unrelated *Icosta* species and since more generalized birds do not necessarily serve as breeding hosts of more generalized *Icosta*, the hypothesis of host-parasite evolutionary parallelism appears not quite applicable to the entire genus. This may be attributed to the probability that the evolutionary deviations in *Icosta* have been more profoundly effected by ecological factors than that in its hosts birds. On the other hand, there are several pairs or series of *Icosta* species clearly demonstrating host-parasite evolutionary parallelism in a subgeneric scale. Members of respective pairs or series are closely related to one another and have similar or nearly identical patterns of host relationships. This phenomenon is also correlated to the vicariism (see chapter on Distributional Pattern).

It is exemplified by: *ardeae* vs *albipennis*, *modesta* vs *nigrita* vs *leptoptera*, *dukei* vs *nigra*, *parallelifrons* vs *paramonovi* vs *papulata*, *minor* vs *lonchurae* vs *sensilis*, and *bucerotina* vs *dioxyrhina* vs *coalescens* vs *bicorna*. The extreme of this phenomenon resulted the splitting of a given species such as *ardeae* and *acromialis*, into geographic forms.

As mentioned, birds unrelated to a breeding host but frequenting habitats similar or nearby to that of the latter may harbor flies normally breeding on that particular host. The occurrence of flies on such unrelated birds often attains a fairly high percentage of host records which thus obscures the true picture of host relationship of the fly-species in question. Since ecological factors affect both hosts and parasites, birds living under similar environments may more or less exhibit evolutionary convergence with regard to their plumage and certain other adaptative features. Meanwhile, the non-breeding hosts, under certain circumstances, may serve as alternate or secondary hosts of that fly-species. For instance, records are available for *Icosta albipennis* plus *ardeae* ex different kinds of aquatic and semiaquatic birds viz., Ardeidae, Threskiornithidae, Ciconiidae, Anatidae, Charadriidae, Eurypygidae, Rallidae, Jacanidae and Laridae. These 2 *Icosta* species normally breed on the Ardeidae but possibly also use one or more of the above enumerated bird-families as secondary hosts. Unfortunately there are no rearing records to confirm or disconfirm this possibility.

DISTRIBUTIONAL PATTERN

Distributional Ranges

Icosta is almost cosmopolitan. Its northern- and southernmost limits, so far recorded, are 59° N in Sweden (*ardeae ardeae*), 49° N in Canada (*americana*), 35° S in South Australia (*paramonovi*), and 30° S in Argentina (*americana*) and SE Brazil (*albipennis*). This more northerly extension in distribution is largely due to higher average temperature in the Northern than Southern Hemisphere and is also a feature in many north-south widely distributed individual species. For instance, *albipennis* extends from 50° N to 30° S; *ardeae ardeae*, from 59° N to 25° S; *americana*, from 49° N to 30° S; *angustifrons*, from 46° N to 27° S; *nigra*, from 57° N to 28° S; *rufiventris*, from 46° N to 27° S. Most probably these extreme limits were largely if not entirely based upon warm season records, and the breeding-season range of the genus as a whole and that of individual species are not so extensive. Of the various species, less host-specific ones and those breeding on long distance migratory birds such as *americana*, *nigra*, *dukei*, *chalcolampra*, have much wider distributional ranges, and in different countries in different seasons they may have different preferred hosts. A result is that the distributional range of a given parasite may be wider than that of its host. On the contrary, the highly host-specific species, being inadaptable or poorly adaptable to adverse and/or varied environments, have much more limited or sporadic distribution than their breeding hosts.

Continental vs Oceanic

Apparently *Icosta* is poorly adaptable to marine life and is almost entirely absent in small islets and atolls. There are only a few odd records of *albipennis* from Bahama Is., Cuba, Jamaica, Puerto Rico, Galapagos; *ardeae ardeae* from Mariana Is.; "*dioxyrhina*" from Grande Comore Is.; *nigra* from Jamaica, Galapagos, Hawaii; "*pilosa*" from Reunion

Is.; *samoana* from Samoa and *suvaensis* from Fiji. Besides *nigra*, *samoana* and *suvaensis*, it is doubtful whether or not those records are reliable and whether or not those species are permanently established. No *Icosta* species other than *ardeae* are known to occur in New Zealand and Madagascar. The occurrence of *nigra* in Hawaii is possibly a rather recent introduction (earliest record is 1845). If so, it is a case unique for *Icosta*.

Distributional Centers

The present day distributional center of *Icosta* is obviously in the Oriental Region where more than half of the species of the genus, including many endemicities, occurs. In the evolutionary past, however, the primary distributional center has probably been in the Ethiopian Region. This is evidenced by that even at present, it has more infrageneric groups than any other Region and has a good number of endemic species (Table 4), and its representatives for different infrageneric groups are as a rule more generalized than counterparts from other Regions (see chapter on Evolutionary Trends). The Nearctic and Neotropical Regions, the former in particular, have a much poorer fauna with a few endemic species and no endemic infrageneric groups. Neither do the Palaearctic and Australian Regions have endemic infrageneric groups, and both are practically attenuations of the Oriental fauna; the former has no endemic species and the latter has only a few. Interregional faunal affinities are most significant in Oriental vs Ethiopian and in Nearctic vs Neotropical, and in each case, there are involved a number of species and infrageneric groups common to both Regions. Affinities of Palae- and Nearctic Regions, not as in many other groups of animals and plants, are quite insignificant and have only one species (*ardeae*) in common. This may perhaps be attributed to the fact that *Icosta* is basically tropical and subtropical. Affinities of the Oriental vs Palaearctic and Australian Regions, as explained above, are almost equally insignificant. In the Southern Hemisphere, affinities of Ethiopian vs Neotropical are distinctly stronger than

Table 4. Number of species and subspecies of *Icosta* endemic in different regions (non-endemic forms in parentheses).

Region	Infrageneric Groups										Total no. of species	Total no. of groups
	Americana	Hirsuta	Minor	Parallelifrons	Simplex	Plana	Longipalpis	Albipennis	Meda	Pilosa		
Oriental	—	—	3	1(1)	3	9	8	1(1)	-(1)	—	25(3)	-(7)
Ethiopian	1	1	-(1)	—	1	1	4	3(1)	-(1)	1	12(3)	1(8)
Australian*	1(1)	—	1	1(1)	—	1	—	2(1)	—	—	6(3)	-(5)
Neotropical	1(4)	—	—	—	1	—	—	-(2)	—	—	2(6)	-(3)
Palaearctic	—	—	-(2)	—	—	—	—	2(1)	-(1)	—	2(4)	-(3)
Nearctic	-(4)	1	—	—	—	—	—	1(2)	—	—	2(6)	-(3)
Total	7	2	5	3	5	11	12	13	1	1	60	10

* Incl. Hawaii, Samoa and Fiji.

those of Australian vs Neotropical Regions. The former is demonstrated by *dukei* vs *nigra*, *ardeae* vs *albipennis* and *zumpti* vs *plaumanni*, each pair of which occurs side by side across the Atlantic Ocean. It is interesting to note that none of the various Subregions of the same Regions (except, perhaps the Papuan and Philippine of the Oriental) is well definable in its *Icosta* fauna.

Faunal List of Regions

In the following list, species and subspecies at present known to be endemic to a particular zoogeographic Region are in roman, non-endemic ones are in *italics*; species of *Phthona* n. gen. are in brackets.

ORIENTAL REGION. acromialis, *ardeae*, australica, bicorna, bucerotina, chalcolampra, corvina, diluta, dioxyrhina, elbeli, fenestella, jactatrix, [leptoptera,] lonchurae, longipalpis, maquilingensis, *meda*, [modesta, nigrita,] omnisetosa, papulata, *parallelifrons*, plana, reducta, sensilis, simplex, spinosa, tarsata, trita, tuberculata, wenzeli.

ETHIOPIAN REGION. *ardeae*, coalescens, dukei, humilis, mecorrhina, *meda*, *minor*, pilosa, recessa, schoutedeni, subdentata, tripelta, zumpti, sp. "O", sp. "T".

PALAEARCTIC REGION. *ardeae*, massonnati, meda, minor, *reducta* (?), sp. "F".

AUSTRALIAN REGION. *ardeae*, *nigra*, *parallelifrons*, paramonovi, samoana, suvaensis, sp. "N", sp. "S", sp. "W".

NEOTROPICAL REGION. *albipennis*, *americana*, *angustifrons*, *holoptera*, latifacies, *nigra*, plaumanni, *rufiventris*.

NEARCTIC REGION. *albipennis*, *americana*, *angustifrons*, botaurinorum, hirsuta, *holoptera*, *nigra*, *rufiventris*.

Distributional Overlapping

The high frequency of overlapping and vicariism (geographic replacement) in closely related species is one of the significant features in the distributional pattern of *Icosta*. The extent of overlappings varies with species and probably with seasons also, and the preferred hosts of the species involved are usually closely related, very occasionally the same bird-species. In *americana*, *angustifrons* and *rufiventris*, insofar as known, their overall northern- and southernmost limits extend from 49° N to 30° S and their overlapping area, from 46° N to 27° S. Several bird-genera such as *Accipiter*, *Buteo*, *Leucopternis* and *Micrastur* are known as hosts of all these *Icosta* species, and many other bird-genera are known as hosts of 2 of the 3 species (see Appendix I). Coexistence of 2 or 3 of these *Icosta* species on the same individual birds, if it ever occurs in nature (no published records), must be quite rare since there seems to be a delicate balance in regional population density, host preference and interspecific competition amongst these species. This is demonstrated by several examples. In Canada and the U.S.A. where *ardeae botaurinorum* and *albipennis* extensively overlap each other, the former species is almost entirely confined to *Botaurus*, while the latter chiefly breeds on *Ardea*, *Butorides*, *Florida*, *Ixobrychus*, *Leucophoyx* and *Nycticorax*. Among the 200± examined specimens of these *Icosta* species, I could find only 2 and 1 *botaurinorum* ex *Ixobrychus* and *Nycticorax*, respectively, and not a single specimen of *albipennis* ex *Botaurus*. In Australia, *parallelifrons* and *paramonovi* slightly overlap each other. They are confined to *Cacatua galerita* and *C.*

roseicapilla, respectively, and the coexistence of the 2 species on the same individual birds is thus largely if not entirely ruled out.

Geographic Replacement.

The vicariism or geographic replacement in *Icosta* is more often by the flies themselves rather than by their breeding hosts, i.e., the distributional ranges of flies more often exceed that of birds than vice versa. This is perhaps correlated to the possibility that in the past the evolutionary deviation speed of flies has been higher than that of birds, or that an ecological factors have had a more profound effect on the flies than on the birds. Examples of various types of replacements are given below. *Cosmerodius a. albus*, *C. a. melanorhynchus* and *C. a. modestus* serve as breeding hosts of *Icosta a. ardeae* in the Old World, whereas *C. a. egretta* serves as that of *I. albipennis* in the New World; *Nycticorax n. nycticorax*, as that of *I. a. ardeae* in the Old World, too, but *N. n. hoactli*, as that of *I. a. botaurinorum* in the Nearctic as well as of *I. albipennis* in the Neotropical Region; *Rhyticeros plicatus ruficollis* and *Rh. p. subruficollis*, as that of *I. dioxyrhina* in the Papuan Subregion and of *I. bucerotina* in the Indo-Chinese Subregion, respectively; *Corvus m. macrorhynchos* and *C. m. philippinus*, as that of *I. corvina* in the Indian plus Indo-Chinese Subregions and of *I. parallelifrons tuberculata* in the Philippine Subregion, respectively, while *C. orru* in New Guinea and New Britain as well as *C. woodfordi* in the Solomon Is. both serve as that of *I. p. parallelifrons*; *Rallus striatus* in Malaya as well as *R. pectoralis* in New Guinea both as that of *I. holoptera omnisetosa*, while *R. limicola* in Wisconsin, as that of *I. h. holoptera*; *Microhierax eutolmus* in Assam, *M. caerulescens* in Thailand as well as *M. melanoleucus* in Tonkin, all as that of *I. leptoptera*. In a broader sense of the term "replacement", each pair of *dukei* vs *nigra*, *ardeae* vs *botaurinorum*, *omnistosa* vs *holoptera*, and many other non-overlapping closely allied forms has its 2 involved counterparts found side by side in 2 proximate or remote countries.

PHORESY, HYPERPARASITISM

The phenomena of mallophagan phoresy and fungus- and mite-parasitism in *Icosta* have been little explored, and only in very few cases have the organisms involved been identified. A summary of all cases known to date is given in Tables 5-7. Of the 21 cases of phoresy, 9 species of birds (in 8 families, 4 orders) and 9 species of *Icosta* were involved. Each such fly usually carried a single louse. In an exceptional case, as many as 31 nymphs were found on 1 fly. Birds carrying phoresy flies were not necessarily their breeding hosts. In 2 cases, the lice were *Ardeicola botauri* Osborn. Of the 23 cases of fungus infection, 7 species of birds (in 6 families, 5 orders) and 8 species of *Icosta* were involved. None of such fungi was identified. Of the 117 cases of mite infestation, 42 species of birds (in 17 families, 10 orders) and 27 species of *Icosta* and *Phthona* were involved. Three species of the mites were identified, viz., *Myialges (Myialges) caulotoon* Speis. on *Icosta a. ardeae* ex *Pyrrherodia purpurea* in Tanganyika; *M. (M.) anchora* Trouessart and *M. (Promyialges) lophortyx* Furman & Tarshis, both on *I. hirsuta* ex *Lophortyx californica* in California. It is thus evident that the same individual flies may harbor more than one species of mites. For details of the mites see the monograph by Fain. (1965).

Table 5. Mallophagan phoresy in *Icosta* species.

Bird	Country	Fly	No. of lice
Ardeidae (Ciconiiformes)			
Botaurus stellaris	Italy	*I. a. ardeae*, 1♀	1
Cosmerodius albus (see Beq. 1953a: 172)	Pennsylvania	*I. americana*, 1 fly	31[1]
Accipitridae (Falconiformes)			
Circus cinereus (see Beq. 1957: 577)	Brazil	*I. angustifrons*, 1♀	1
〃 〃 〃	〃	〃 , 1♀	5
Capitonidae (Piciformes)			
Megalaima oorti, TMT 1152, 1296, 1583, 1736	Taiwan	*I. trita*, 2♂♂, 2♀♀	1 each
〃 〃 TMT 1515, 1773	〃	〃 , 1♂, 1♀	2 each
〃 〃 TMT 1503	〃	〃 , 1♀	3
Pittidae (Passeriformes)			
Pitta cyanea, 050-01927	Thailand	*I. fenestella*, 1♀	1
Dicruridae (Passeriformes)			
Dicrurus leucophaeus, MAPS 3285	Thailand	*I. fenestella*, 1♀	1
Psittacidae (Psittaciformes)			
Alisterus chloropterus, HC 43	NE New Guinea	*I. chalcolampra*, 1♂	1
Pycnonotidae (Passeriformes)			
Pycnonotus goiavier, 6E 1584	Malaya	*I. sensilis*, 1♂	1
〃 〃 , 5E 2211	Philippines	〃 , 1♀	2
Corvidae (Passeriformes)			
Dendrocitta formosae, TMT 1548, 1815	Taiwan	*I. fenestella*, 2♀♀	1 each
〃 〃 , TMT 1548	〃	〃 , 1♀	2
Bird undet.	Surinam	*I. rufiventris*, 1♀	1
〃 〃 (See Beq. 1953a: 173)	Mexico	*I. albipennis*, 1♀	5[2]

1) *Ardeicola botauri* Osborn, all immatures.
2) *Ardeicola botauri* Osborn.

Table 6. Fungus infection in *Icosta* species.

Bird	Country	Fly
Phalacrocoracidae (Pelecaniformes)		
Anhinga rufa (see Beq. 1953a: 140)	Uganda	*I. schoutedeni*, 2♀♀
Psittacidae (Psittaciformes)		
Cacatua galerita, BBM 21560	NW New Guinea	*I. parallelifrons*, 1♂
Bucerotidae (Coraciiformes)		
Anorrhinus galeritus, RE 7128	Thailand	*I. bucerotina*, 1♀
Berenicornis cornutus, WS 189	〃	〃 , 1♀
Bucerotid indet., WS 787	〃	〃 , 1♂
Capitonidae (Piciformes)		
Megalaima asiatica (see Beq., *l.c.*, as for *I. chalcolampra*)	Burma	*I. trita*, 1♂, 1♀
Formicariidae (Passeriformes)		
Thamnophilus unicolor (see Beq. 1957: 578)	Colombia	*I. holoptera*, 2♂♂, 9♀♀
Corvidae (Passeriformes)		
Dendrocitta formosae, TMT 1612, 1974	Taiwan	*I. fenestella*, 1♂, 1♀
Bird undet. (see Beq. 1953a: 141)	Celebes	*I. simplex*, 1♀
Cormorant or egret nest material	Uganda	*I. mecorrhina*, 1♀

Table 7. Mite infestation of *Icosta* and *Phthona* species.

Bird	Country	Fly
Ardeidae (Ciconiiformes)		
Ardea cinerea	Madagascar	*I. a. ardeae*, 1♀
〃 *goliath*	Congo	〃 , 1♂
Pyrrherodia purpurea	Yemen	〃 , 1♀
〃 〃 (see Fain 1965: 58)	Tanganyika	〃 , 2♀♀
Botaurus lentiginosus (see Beq. 1953a: 156, as for *I. albipennis*)	Michigan	*I. a. botaurinorum*, 1♂
〃 〃 〃	Minnesota	〃 , 2♀♀
〃 〃 〃	Pennsylvania	〃 , 1♂
〃 〃 〃	Wisconsin	〃 , 2♀♀
〃 〃 (see Beq. 1955: 340, as for *I. albipennis*)	Nebraska	〃 , 1♀
〃 〃	Illinois	〃 , 1♀
〃 *stellaris*	Italy	*I. a. ardeae*, 1♀
Bubulcus ibis	Congo	〃 , 1♀
Florida caerulea (see Beq. 1955: 340)	S. Carolina	*I. albipennis*, 1♀
Nycticorax nycticorax	Galapagos	〃 , 1♀
Accipitridae (Falconiformes)		
Accipiter bicolor (see Beq. 1953a: 157)	Brazil	*I. nigra*, 1♀
〃 *novaehollandiae*, BBM 23840	Solomon Is.	*I. chalcolampra*, 2♀♀
〃 *striatus* (see Beq. 1953a: 157)	Ontario	*I. angustifrons*, 1♀
Buteo galapagoensis (see Beq. 1955: 322)	Galapagos	*I. nigra*, 1♀
〃 *jamaicensis* (〃)	Montana	〃 , 1♀
〃 〃 (see Beq. 1953a: 157)	Arizona	〃 , 1♀
〃 〃 (〃)	Brit. Columbia	〃 , 3♀♀
〃 *magnirostris* (see Beq. 1957: 577, as for *I. wolcotti*)	Brazil	*I. rufiventris*, 2♀♀
Hypomorphnus urubitinga (see Beq. 1957: 577)	Brit. Honduras	*I. angustifrons*, 1♂
Falconidae (Falconiformes)		
Microhierax erythrogenys, SU-BBM 1250, 1326, SU-PI 4204	Philippines	*Ph. nigrita*, 3♂♂, 4♀♀
〃 *melanoleucus*	Tonkin	*Ph. leptoptera*, 1♀
Milvago chimachima (see Beq. 1953a: 157)	Brazil	*I. nigra*, 1♂
Cathartidae (Falconiformes)		
Cathartes aura (see Beq. 1955: 322)	Arizona	*I. nigra*, 1♀
Phasianidae (Galliformes)		
Gallus gallus, RE 6234-35, WS 830	Thailand	*I. maquilingensis*, 1♂, 1♀
〃 〃	Burma	〃 , 1♀
Guttera edouardi	Uganda	*I. zumpti*, 1♀
Hierophasis swinhoei, TMT 1808, 1832	Taiwan	*I. maquilingensis*, 1♂, 2♀♀
Lophortyx californica (see Beq. 1953a: 158)	California	*I. hirsuta*, 12± flies
〃 〃 〃	〃	〃 , 1♂, 3♀♀
Megapodiidae (Galliformes)		
Alectura lathami	Queensland	*I. australica*, 1♀
Rallidae (Gruiformes)		
Amaurornis phoenicurus, M 1689	Malaya	*I. holoptera omnisetosa*, 1♀

Table 7 (cont'd)

Columbidae (Columbiformes)		
Ducula pinon, BBM 29761	SE New Guinea	*I. simplex*, 1♀
"Wild pigeon", Kungdien	Taiwan	*I. chalcolampra*, 1♀
Cuculidae (Cuculiformes)		
Centropus sinensis	Burma	*I. sensilis*, 1♀
〃 *toulou*	Philippines	〃 , 2♀♀
Phaenicophaeus curvirostris, BBM 761	〃	*I. elbeli*, 1♂
Strigidae (Strigiformes)		
Bubo virginianus (see Beq. 1953a: 157 as for *I. fusca*)	California	*I. americana*, 11 flies
〃 〃 〃	〃	〃 , 2♂♂, 6♀♀
Otus asio (see Beq. 1953a: 158, as for *I. fusca*)	Alabama	〃 , 2 flies
Tyto alba 〃	Brazil	〃 , 1♂, 1♀
Coraciidae (Coraciiformes)		
Eurystomus orientalis, B 1883	Philippines	*I. bicorna*, 1♀
Alcedinidae (Coraciiformes)		
"Kingfisher", BBM 29929	SE New Guinea	*I. jactatrix*, 1♀
Bucerotidae (Coraciiformes)		
Anthracoceros malabaricus, RE 6279	Thailand	*I. bucerotina*, 1♀
Bycanistes bucinator	Zululand	*I. mecorrhina*, 1♂, 1♀
Rhyticeros plicatus, BBM 23806, 23807	Solomon Is.	*I. dioxyrhina*, 1♂, 3♀♀
Capitonidae (Piciformes)		
Megalaima oorti, TMT 1152	Taiwan	*I. trita*, 1♂
〃 *zeylanica*, V 425	Thailand	〃 , 1♂
Muscicapidae (Passeriformes)		
Muscicapa grandis, H 938	Thailand	*I. fenestella*, 1♀
Corvidae (Passeriformes)		
Corvus orru, BBM 28747	SE New Guinea	*I. a. acromialis*, 1♀
"Blue jay", BBM 27783	NE New Guinea	*I. chalcolampra*, 1♂
Paradisaeidae (Passeriformes)		
"Bird-of-Paradise", BBM 27741	NE New Guinea	*I. plana*, 1♂
Bird undet.	Solomon Is.	*I. chalcolampra*, 1♀
〃 〃	Uganda	*I. a. ardeae*, 1♀
〃 〃	Arabia	*I. a. ardeae*, 1♀
〃 〃 (see Beq. 1953a: 158, as for *I. fusca*)	Brazil	*I. americana*, 3♀♀
〃 〃	Pennsylvania	*I. a. botaurinorum*, 1♂
〃 〃 (see Beq. 1953a: 157, as for *I. albipennis*)	Iowa	〃 , 1♀

Appendix I. HOST INDEX

Under each bird-family, non-breeding species of flies are in roman, breeding species are in *italics*. Generic names of birds are also in *italics*. Numerals in parentheses refer to approximate numbers of described species in respective bird-families.

TINAMIDAE (33): holoptera, plaumanni.
Crypturellus: plaumanni. *Rhynchotus*: holoptera.

PHALACROCORACIDAE (31): *schoutedeni, spp. "N" & "T"* nr schoutedeni.
Anhinga, Halietor: schoutedeni. *Microcarbo*: sp. "T". Phalacrocoracid indet. ("cormorant"): sp. "N". *Phalacrocorax*: schoutedeni.

PELECANIDAE (6): albipennis, schoutedeni.
Pelecanus: albipennis, schoutedeni.

ARDEIDAE (59): *albipennis, americana, ardeae, botaurinorum,* maquilingensis, sp. "F" nr schoutedeni.
Ardea: albipennis. *Ardeola*: ardeae. *Botaurus*: ardeae, botaurinorum. *Bubulcus*: ardeae. *Butorides, Cochlearius*: albipennis. *Cosmerodius*: albipennis, americana, ardeae, sp. "F". *Demigretta*: ardeae. *Dichromanassa*: albipennis. *Dupetor, Egretta*: ardeae. *Florida*: albipennis. *Gorsachius*: maquilingensis. *Hydranassa*: albipennis. *Ixobrychus*: albipennis, ardeae, botaurinorum. *Leucophoyx*: albipennis. *Melanophoyx*: ardeae. *Mesembrinibis*: albipennis. *Mesophoyx*: ardeae. *Nyctanassa*: albipennis. *Nycticorax*: albipennis, ardeae, botaurinorum. *Pyrrherodia*: ardeae. *Syrigma, Tigrisoma*: albipennis.

CICONIIDAE (17): *albipennis, ardeae, sp. "S"* nr ardeae.
Ibis: ardeae. *Jabiru, Mycteria*: albipennis. *Xenorhynchus*: sp. "S".

THRESKIORNITHIDAE (28): albipennis, massonnati.
Endocimus: albipennis. *Platalea*: massonnati. *Theristicus*: albipennis.

ANATIDAE (145): albipennis.
Anas: albipennis

ACCIPITRIDAE (205): albipennis (or botaurinorum ?), *americana, angustifrons,* ardeae, bucerotina, *chalcolampra, dukei,* fenestella, *longipalpis, mecorrhina, meda, nigra, rufiventris, suvaensis, zumpti.*
Accipiter: albipennis (or botaurinorum ?), americana, angustifrons, chalcolampra, fenestella, mecorrhina, nigra, rufiventris, zumpti. Accipitrid indet. ("hawk"): suvaensis. *Aegypius*: meda. *Aquila*: americana, dukei, longipalpis, nigra. *Aviceda*: chalcolampra. *Busarellus*: angustifrons. *Buteo*: americana, angustifrons, dukei, nigra, rufiventris. *Buteogallus*: nigra. *Cassinaetus*: mecorrhina. *Circaetus*: dukei, mecorrhina. *Circus*: ardeae, americana, angustifrons, nigra. *Elanus*: angustifrons, chalcolampra. *Gampsonyx, Geranospiza*: nigra. *Gymnogenys, Gypophierax*: dukei, mecorrhina. *Gyps*: meda. *Haliaeetus*: americana, dukei. *Haliastur*: chalcolampra, longipalpis. *Heterospizias*: nigra. *Hieraaetus*: dukei. *Hypomorphnus*: angustifrons, rufiventris. *Ictinaetus*: longipalpis. *Ictinia*: angustifrons, nigra. *Leucopternis*: angustifrons, nigra, rufiventris. *Lophaetus*: dukei, zumpti. *Milvus*: chalcolampra, dukei. *Neophron*: meda. *Odontriorchis*: angustifrons. *Pernis*: longipalpis, zumpti. *Pseudogyps*: meda. *Spilornis*: longipalpis. *Spizaetus*: bucerotina, longipalpis. *Terathopius*: dukei. *Torgos*: meda. *Urotriorchis*: dukei. *Urubitornis*: rufiventris.

FALCONIDAE (58): albipennis, americana, angustifrons, chalcolampra, *leptoptera, modesta, nigra, nigrita,* rufiventris, zumpti.
Caracara: americana, nigra. *Daptrius*: nigra. *Falco*: albipennis, americana, angustifrons, chalcolampra, nigra, zumpti. *Herpetotheres*: angustifrons, nigra. *Micrastur*: americana, angustifrons, rufiventris. *Microhierax*: leptoptera, modesta, nigrita. *Milvago*: angustifrons, nigra.

PANDIONIDAE (1): americana, botaurinorum.

Pandion: americana, botaurinorum.

CATHARTIDAE (6): angustifrons, nigra.
Cathartes: angustifrons, nigra.

MEGAPODIIDAE (10): *australica, simplex.*
Alectura: australica. *Aepypodius, Megapodius, Talegalla*: simplex.

CRACIDAE (38): *plaumanni.*
Crax, Ortalis: plaumanni.

PHASIANIDAE (190): *americana*, chalcolampra, fenestella, *hirsuta*, humilis, *maquilingensis*, pilosa, plaumanni, subdentata, zumpti.
Arborophila: maquilingensis. *Bambusicola*: fenestella, maquilingensis. *Bonasa*: americana. *Centrocercus*: hirsuta. *Colinus*: americana. *Dendragapus*: hirsuta. *Francolinus*: humilis, pilosa. *Gallus*: americana (on domestic fowl), chalcolampra, maquilingensis. *Guttera*: subdentata, zumpti. *Haematortyx, Hierophasis*: maquilingensis. *Lophortyx*: hirsuta. *Odontophorus*: plaumanni. *Oreortyx*: hirsuta. *Pedioecetes, Phasianus* (introduced): americana.

MELEAGRIDAE (2): americana.
Meleagris: americana.

EURYPYGIDAE (1): albipennis.
Eurypyga: albipennis.

RALLIDAE (132): albipennis (or botaurinorum ?), ardeae, *holoptera*, maquilingensis, *omnisetosa.*
Aramides: holoptera. *Amaurornis*: omnisetosa. *Coturnicops*: holoptera. *Gallinula*: ardeae, omnisetosa. *Limnocorax*: ardeae. *Porphyrio*: omnisetosa. *Porphyrula*: albipennis (or botaurinorum ?). *Porzana*: albipennis (or botaurinorum ?), omnisetosa. *Rallina*: maquilingensis. *Rallus*: holoptera, omnisetosa.

OTIDIDAE (23): *pilosa.*
Afrotis, Choriotis, Eupodotis, Lissotis, Neotis: pilosa.

JACANIDAE (7): ardeae.
Actophilornis: ardeae.

CHARADRIIDAE (152): albipennis, americana, angustifrons, ardeae, omnisetosa, sp. "O" nr holoptera.
Capella: angustifrons, omnisetosa, sp. "O". *Philohela*: americana. *Tringa*: albipennis, ardeae. *Xiphidiopterus*: ardeae.

LARIDAE (89): albipennis, americana.
Larus: albipennis. *Sterna*: americana.

ALCIDAE (22): americana.
Uria: americana.

PTEROCLIDAE (16): pilosa.
Pterocles: pilosa.

COLUMBIDAE (289): americana, *chalcolampra*, dioxyrhina, fenestella, plana, simplex.
Caloenas, Chalcophaps: chalcolampra. *Columba*: americana. Columbid indet.: fenestella, plana. *Ducula*: dioxyrhina, simplex. *Goura*: simplex. *Streptopelia, Treron*: chalcolampra. *Zenaidura*: americana.

PSITTACIDAE (316): angustifrons, *chalcolampra*, fenestella, maquilingensis, *papulata*, *parallelifrons*, *paramonovi*, plana, suvaensis, tuberculata, *wenzeli*.
Alisterus: chalcolampra. *Amazon*: angustifrons. *Cacatua*: chalcolampra, parallelifrons, paramonovi. *Geoffroyus*, *Larius*, *Lorius*: chalcolampra. *Prioniturus*: chalcolampra, maquilingensis, tuberculata. *Probosciger*: chalcolampra. Pittacid indet.: papulata, suvaensis. *Psittacula*: maquilingensis. *Tanygnathus*: wenzeli. *Trichoglossus*: chalcolampra, plana.

MUSOPHAGIDAE (19): dukei, subdentata, mecorrhina, *zumpti*.
Corythaeola: zumpti. *Crinifer*: mecorrhina. *Musophaga*: subdentata, zumpti. *Tauraco*: dukei, zumpti.

CUCULIDAE (128): *chalcolampra*, *elbeli*, latifacies, maquilingensis, minor, nigra, *recessa*, *sensilis*, simplex, wenzeli.
Centropus: chalcolampra, elbeli, maquilingensis, minor, recessa, sensilis, simplex, wenzeli. *Clamator*: recessa. *Cuculus*: chalcolampra. *Phaenicophaeus*: elbeli. *Piaya*: latifacies, nigra.

STRIGIDAE (134): albipennis, *americana*, angustifrons, chalcolampra, fenestella, longipalpis, nigra, *rufiventris*, zumpti.
Aegolius: americana. *Asio*: americana, nigra, rufiventris. *Bubo*: americana, chalcolampra, longipalpis, nigra. *Ciccaba*, *Glaucidium*: americana, angustifrons, rufiventris. *Lophostrix*: (?) rufiventris. *Otus*: americana, fenestella, rufiventris. *Pulsatrix*: americana. *Rhinotynx*: albipennis, americana, nigra, rufiventris. *Speotyto*: americana. Strigid indet. ("owl"): zumpti. *Strix*: americana, angustifrons. *Tyto*: albipennis (or botaurinorum ?), americana, rufiventris.

CAPRIMULGIDAE (67): ardeae, mecorrhina.
Caprimulgid indet. ("nightjar"): ardeae. *Caprimulgus*: mecorrhina.

APODIDAE (79): zumpti.
Apus: zumpti.

TROGONIDAE (35): angustifrons.
Trogon: angustifrons.

CORACIIDAE (17): bicorna.
Eurystomus: bicorna.

ALCEDINIDAE (87): jactatrix, chalcolampra.
Dacelo: chalcolampra. *Tanysiptera*: jactatrix.

MEROPIDAE (25): minor.
Melittophagus: minor.

MOMOTIDAE (8): angustifrons.
Baryphthengus, *Momotus*: angustifrons.

BUCEROTIDAE (45): ardeae, *bicorna*, *bucerotina*, *coalescens*, *dioxyrhina*, maquilingensis, *mecorrhina*, nigrita, *spinosa*, wenzeli.
Aceros: bicorna. *Anorrhinus*: bucerotina. *Anthracoceros*: bucerotina, spinosa. *Berenicornis*: bucerotina. *Buceros*: ardeae, bicorna, maquilingensis, nigrita, wenzeli. *Bycanistes*: coalescens, mecorrhina. *Ceratogymna*: mecorrhina. *Penelopides*: bicorna. *Rhyticeros*: bucerotina, dioxyrhina. *Tockus*: mecorrhina.

PICIDAE (210): americana, angustifrons, fenestella.
Dryocopus: americana. *Picus*: fenestella. *Veniliornis*: angustifrons.

RAMPHASTIDAE (37): angustifrons.
Pteroglossus, Ramphastos: angustifrons.

CAPITONIDAE (76): maquilingensis, *trita*.
Megalaima: maquilingensis, trita.

EURYLAIMIDAE (14): chalcolampra.
Corydon: chalcolampra.

IRENIDAE (14): fenestella.
Irena: fenestella.

NECTARINIIDAE (104): (?) minor.
Cyanomitra: (?) minor.

FORMICARIIDAE (221): holoptera, plaumanni.
Chamaeza: plaumanni. *Thamnophilus*: holoptera.

PITTIDAE (23): fenestella, plana.
Pitta: fenestella, plana.

COTINGIDAE (90): angustifrons.
Pyroderus: angustifrons.

HIRUNDINIDAE (75): sensilis.
Hirundo: sensilis.

PYCNONOTIDAE (109): sensilis, trita.
Pycnonotus: sensilis, trita.

CAMPEPHAGIDAE (72): chalcolampra, diluta, fenestella.
Coracina: chalcolampra, diluta. *Pericrocotus*: fenestella.

MUSCICAPIDAE (1460): angustifrons, *fenestella*, hirsuta, minor, plana, *samoana*, sensilis, *tarsata*.
Acrocephalus: sensilis. *Batis*: minor. *Brachypteryx*: sensilis. *Bradypterus*: minor. *Garrulax*: fenestella. *Hylocichla*: angustifrons. *Megalurus*: sensilis. *Monticola, Muscicapa*: fenestella. *Myiagra*: samoana. *Myiophoneus*: tarsata. *Pachycephalopsis, Pitohui*: plana. *Rhipidura*: sensilis. *Toxostoma*: hirsuta. *Turdus*: minor, samoana. *Yuhina*: fenestella.

MOTACILLIDAE (48): minor, sensilis.
Anthus, Macronyx: minor. *Motacilla*: sensilis.

LANIIDAE (67): minor, omnisetosa, sensilis.
Lanius: minor, omnisetosa, sensilis. *Tchagra*: minor.

MELIPHAGIDAE (160): chalcolampra.
Meliphagid indet. ("honeyeater"): chalcolampra.

THRAUPIDAE (474): albipennis (or botaurinorum ?)
Piranga: albipennis (or botaurinorum ?)

FRINGILLIDAE (293): americana, angustifrons, hirsuta.
Junco, Pipilo: hirsuta. *Pitylus*: angustifrons. *Zonotrichia*: americana.

PLOCEIDAE (263): bicorna, *lonchurae, minor, sensilis*.
Estrilda, Euplectes, Lagonosticta: minor. *Lonchura*: bicorna, lonchurae. *Passer*: minor.

Ploceus: minor, sensilis. *Vidua*: minor.

STURNIDAE (103): *acromialis, chalcolampra, tuberculata.*
Aplonis: acromialis, chalcolampra. *Gracula*: tuberculata. *Minor*: acromialis, chalcolampra.

ORIOLIDAE (34): fenestella, minor, plana.
Oriolus: fenestella, minor, plana.

DICRURIDAE (20): chalcolampra, *fenestella*, nigrita.
Dicrurus: chalcolampra, fenestella, nigrita.

CORVIDAE (100): *acromialis*, americana, angustifrons, *chalcolampra, corvina*, fenestella, minor, *tuberculata*, wenzeli.
Calocitta (introduced): americana. Corvid indet.: plana. *Corvus*: acromialis, americana, chalcolampra, corvina, reducta, tuberculata, wenzeli. *Cyanocitta*: hirsuta. *Cyanocorax*: angustifrons. *Dendrocitta*: fenestella. *Pica*: minor. *Urocissa*: fenestella.

CRACTICIDAE (11): *plana.*
Cracticus: plana.

PTILONORHYNCHIDAE (17): plana.
Ailuroedus: plana.

PARADISAEIDAE (43): chalcolampra, *plana.*
Paradisaea: plana. *Phonygammus*: chalcolampra.

Appendix II. ORIGINAL DESCRIPTION OF *LYNCHIA* WITH TRANSLATION AND ANNOTATIONS

Lynchia was originally published by Weyenbergh (1881) in An. Soc. Cient. Argentina **11** (5): 195–200 (reprint: 3–8). The journal and reprint in question are so rare and the interpretation is so important in nomenclature, that a reproduction of the description, along with Bequaert's (1955: 269–72) revised translation (omitting the passages on color pattern) seems worthwhile. Bequaert's (1926b: 266–71) first translation differs very little from the revised one. To his annotations (in parentheses) are added mine [in brackets]; the italics are mine.

"En cuanto á la otra especie, ya dejo dicho, que ella debe formar un nuevo género, lo cual no puede estrañar á nadie que recuerde lo que dice Schiner en la descripcion de los dípteros del Viaje de la Novara. [Weyenbergh's footnotes: Reise der Oesterreichischen Fregatte Novara. Schiner, Diptera, Wien 1868. p. 372. "insbesondere gilt dies"—dass die Gattungen zu weit begrenzt sind—"von der Gattung Ornithomyia, mit einem Gemenge von Arten, die sich schon durch das Flügelgeäder allein in ganz wohlberechtigte Gattungen einreihen liessen".] No tengo, pues, escrúpulos en seguir el consejo dado por este célebre especialista, y quiero dedicar este género á nuestros jóvenes dipterólogos argentinos, los señores hermanos Lynch de Buenos Aires, ya conocidos en el mundo científico por sus publicaciones. Llamo por consiguiente al nuevo géneros: Lynchia m. Caractéres del género. Antennae gemmiformes elongatae setosae, lateribus hipostomatis insertae. Ocelli nulli. Tarsi unguibus tridentatis. Alae latae incumbentes abdomine multo longiores, acuminatae.

"Este género debe ser colocado entre Ornithomyia y Olfersia; si bien las antenas son botoniformes, son mas alargadas que en Ornithomyia, y peludas, especialmente en su estremo, y están implantadas muy abajo. Los dos ojos compuestos son muy esféricos y dejan entre sí una frente ancha, pero no existen ojos simples, á pesar de que se observa, en el lugar donde generalmente suelen encontrarse, un pequeño escudo triangular, oscuro y un poco elevado. Por esta particularidad, la falta de ocelli, este género se aleja de Ornithomyia y se acerca á Olfersia. Las uñuelas tridentadas de los tarsos lo aproximan, por el contrario, á aquel y lo alejan de éste, en el cual son bidentadas. Las alas se asemejan, en general, á las de las Ornithomyia y de las Olfersia, pero en estas son muy redondeadas en el estremo y en Ornithomyia son igualmente bastante obtusas, al paso que en el género Lynchia son muy punctiagudas, á pesar de ser al mismo tiempo bastante largas."—This genus must be placed between Ornithomyia and Olfersia. Although the antennae are button-shaped, [botón, a bud, sprout, button; here *botoniformes* should be translated gemmiform or bud-like], they are *longer than* in Ornithomyia and hairy, especially at the tips, and are inserted very low down. The two compound eyes are *very* globular (*bulging*) and leave between them a wide frons (interocular face); but there are no simple eyes, instead of which the spot which usually bears them forms a small dusky somewhat raised plate (postvertex). This lack of ocelli removes the genus from Ornithomyia and brings it near Olfersia. The tridentate claws, on the other hand, place it near the former and farther from the latter. (The structure of the claws is the same in Ornithomyia, Olfersia and Lynchia.) The wings are on the whole similar to those of Ornithomyia and Olfersia but in the latter, they are *much rounded off* at apex and they are also *quite obtuse* in the former; while in Lynchia they are *very pointed* but at the same time *very long*.

"La cabeza es chata, disciforme, como en los otros géneros citados, é igualmente se asemeja á estos por la articulacion con el tórax y todo el aspecto general. Los órganos bucales son muy cortos y están completamente ocultos en la corta vaina que los contiene. La línea ó sutura transversal ondulosa que divide el tórax en dos es muy distinta en este género, pero la longitudinal, que en los otros géneros se asemeja á un surco, es muy elevada en Lynchia, de modo que forma mas bien, por el contrario, una elevacion lineal. En el ángulo esterno del protorax se vé un estigmato oval, con varios pelos duros en el borde anterior. El escudete es muy corto y ancho. El abdómen lleva fuertes espinas en las márgenes laterales de sus segmentos y largos pelos en el estremo. Las patas son poco peludas, encontrándose solamente algunos pelos mas fuertes cerca de las uñuelas.—The head is flat, disk-shaped, as in the genera mentioned, which it also resembles in its articulation on the thorax and general appearance. The mouth-parts are *very short* and completely hidden within the *short* surrounding sheath (palpi). The line or transverse suture, dividing the thorax into two (transverse mesonotal suture), is very distinct; but the longitudinal line (median notal suture), which is furrow-like in the other genera, is *much raised* in Lynchia, even forming a narrow ridge. The *outer angle* of the thorax bears an *ovate* spiracle, with several stiff setae on the anterior margin. Scutellum *very short and broad.* Abdomen with strong spines on the side margins of the *segments* [in *Icosta* of the Americas, only single segment with strong side-spines] and long setae at apex. Legs sparsely hairy, with only a few stronger setae near the claws.

"Las nervaduras de las alas son bestante caraterísticas, presentando todavía algun parecido con las de las Ornithomyia, pero las diferencias son mas grandes que la semejanza. Tres nervaduras solamente se estienden desde la articulacion hasta el borde inferior (posterior). Igualmente, como lo observamos en Ornithomyia, el sistema de las nervaduras alares es de color oscuro en la parte situada hácia el borde anterior y la articulacion, como si hubiese una sustancia espesa dentro de estos tubos, miéntras que lo demás es delgado y transparente. Meigen lo espresa [sic !] muy bien en sus dibujos del género Ornithomyia (System. Beschr. d. Europ. Zweifl. Ins. T. VI, Tab. 64).—The venation is characteristic, though somewhat similar to that of Ornithomyia; but the differences outweigh the similarities. Only three veins runs from the articulations to the lower (hind) margin of the wing. As in *Ornithomyia*, the veins are dark colored in the area near the anterior margin and the articulation (base), as if the hollowed veins were filled with opaque matter; while elsewhere the veins are delicate and hyaline. [Meigen showed these very well in his figures of Ornithomyia (System. Beschr......)]

"En cuanto á esto, existe en Lynchia una particularidad que ha llamado mi atencion, la cual consiste en que siempre la nervadura discoidal está interrumpida por una parte clara y transparente; esta parte se encuentra en la mencionada nervadura, á corta distancia de la division de la posterior comun en dos: la discoidal y la verdadera posterior. A primera vista, se cree que la nervadura efectivamente está interrumpida en este punto, pero, fijándose bien, pronto se apercibe uno de que no es mas que una interrupcion en la sustancia que llena el vaso y no en el vaso mismo. He creido primeramente ver una anomalía casual, mas ahora me parece que es una particularidad típica.—I noticed the following peculiarity of Lynchia in this connection: the discoidal vein (4th longitudinal) is always broken by a clear and transparent stretch, a short distance beyond the fork of the common posterior (stem vein) into the discoidal and the true posterior (5th longitudinal). At first the vein seems actually interrupted there, but correct focusing proves that the break is not in the vein itself but in the substance filling the vein. I supposed originally that this was an accidental abnormality but I now regard it as a constant feature.

"La nervadura costal es muy corta, pues no se estiende mas de una tercera parte del largo del ala, punto en donde la subcostal se une á ella y forma entónces casi otra tercera parte de márgen anterior, estendiéndose hasta el punto donde la radial se une con la subcostal. La mediastina casi toca la subcostal, y el espacio entre ambas es por consiguiente muy angosto. No falta tampoco la transverso-basal, pero está colocada oblícuamente hácia afuera, entre la costal y la subcostal, antes del punto en que esta da orígen á la mediastina.—The costal vein (1st and 2nd sections of costa) [1st section only] is *very short*, not extending beyond one-third of the wing, where the subcostal (1st longitudinal) unites with it and then forms one-third more of the anterior margin, to the junction of the radial (2nd longitudinal) and *subcostal*. The mediastinal (subcosta) almost touches the subcostal (1st longitudinal), the space between them being very narrow. The transverso-basal (humeral cross-vein) is *present*, but is outwardly slanted between the costal and subcostal basad of the origin of the mediastinal from the subcostal. [In Stilbometopa or true Lynchia, but not in Icosta, vein C has a small bulla lying immediately before the junction of C and Sc. The presence of this bulla most probably led Weyenbergh to consider (a) the 1st section of C as if representing the entire length of his costal vein, (b) the section of C between its junctions with R_1 and with R_{2+3} as if forming the apical continuation of his "subcostal" vein, and similarly (c) the section of C between its junctions with R_{2+3} and with R_{4+5}, as if forming the apical continuation of his radial vein (see fig. 178)].

"La primera longitudinal se bifurca en radial y cubital muy cerca de su orígen; la radial se dirige hácia el borde anterior, por donde sigue aún un poco, como si fuese la continuacion de la subcostal y no tarda en unirse, bajo un ángulo agudo, con la cubital, es decir, en el mismo borde; esta reunion se efectúa poco mas ó ménos á los dos tercios de la longitud de dicho borde. Todo lo demás de la márgen del ala está desprovisto de nervaduras.—The first longitudinal (base of 2nd and 3rd longitudinals) bifurcates into the radial (2nd longitudinal) and the cubital (3rd longitudinal) very close to its own origin. The radial runs toward the anterior margin where it continues for some distance as the *continuation of the subcostal* (1st longitudinal) and soon unites at a sharp angle with the cubital, also in the anterior margin; the junction lies at about *two-thirds* [in larger species of American *Icosta*, beyond 2/3] of the length of the anterior margin. Along the remainder of the margin there is no vein.

"La segunda longitudinal ó posterior comun se bifurca casi inmediatamente despues de su orígen, y el resultado de esta bifurcacion es la discoidal y la verdadera posterior; la primera se dirige primeramente un poco hácia el borde posterior y despues, formando un ángulo, hácia el anterior, de lo cual resulta, que la primera célula articular (que se encuentra entre la nervadura cubital y la discoidal y que es cerrada por la transverso-media) es bastante angular en su parte esterna. Despues de haberse unido con la cubital, hacia poco mas ó ménos los dos tercios del largo de ésta, por intermedio del mencionado transverso-medio, la discoidal se dirige, suavemente encorvada, al borde inferior del ala, donde termina hácia el cuarto próximamente de la longitud del dicho borde. La otra rama, la verdadera posterior, se dirige, tambien con una suave curvatura, al mismo borde, en cuyo medio, poco mas ó ménos, termina. El nérvulo transverso-discoidal la une con la nervadura discoidal en el punto donde ésta forma el mencionado ángulo, resultando así la formacion de la célula discoidal. No existen nérvulos transverso-posteriores.—The second longitudinal or common posterior (stem-vein of 4th and 5th longitudinals) bifurcates almost at once beyond its origin, forming the discoidal (4th longitudinal) and the true posterior (5th longitudinal). The discoidal runs at first somewhat toward hind margin, then bends [in Icosta, this bend is not, or hardly, noticeable] toward the anterior margin, so that the first articular cell (1st basal cell), between the cubital (3rd longitudinal) and discoidal and closed by the transverso-media (anterior cross-vein), is very angular outwardly. The discoidal is connected with the cubital by the transverso-media at about *two-thirds* [in larger American species of Icosta, distinctly beyond 2/3] of the length of the cubital, beyond which the discoidal gradually *curves* toward hind margin of wing, where it ends at about apical fourth. The other branch or true posterior (5th longitudinal) also curves gently toward the same margin where it ends at about mid-length. The transverso-discoidal (anterior basal cross-vein) reaches the discoidal at the above-mentioned bend of this vein, to form the discoidal cell (2nd basal cell). There are *no transverso-posterior* veins (anal and discoidal cross-veins) [sic ! see annotation(e)].

"La nervadura anal nace con raiz doble, se dirige, con fuerte curvatura, al borde posterior del ala y termina hácia los tres cuartos de la longitud de éste (contando desde la punta del ala).—The anal vein (6th longitudinal) [in Icosta, that is the 7th longitudinal] has a *double origin*, is *strongly curved* toward the hind margin and stops at about three-quarters of the margin, as measured from the tip of the wing.

"Todo el conjunto de nervaduras que forma lo que llamamos el sistema anterior se encuentra muy cerca del borde anterior del ala, y lo mismo se puede decir tambien de la nervadura discoidal, de lo cual resulta que las células ó espacios internerviales son muy largas y angostas; solamente las tres células posteriores y *las* axilar son grandes y anchas. —The several veins of what I call the anterior system are crowded near the anterior margin, the cells and spaces between the veins being *very long and narrow*. Only the three posterior [cells] and the axillary cells are large and wide. [In what is here called Icosta, there is only single axillary cell which was labeled by Bequaert in 1926b: 268 as 2d A; in Weyenbergh's Lynchia, there are 2 such cells, one before and another behind vein 2A, both cells lying behind the 3 posterior cells which are here labeled as 1r, 1m and 2m. Note the word "las", not "la" in the original text].

"Esta colocacion de dicho sistema cerca de la márgen anterior del ala se observa tambien en las Ornithomyia, pero no tan pronunciada como en el género Lynchia, y por consiguiente las células aludidas no son en Ornithomyia tan alargadas y angostas como en Lynchia. Otra diferencia con Ornithomyia es la falta de la nervadura mediastina en este género, la cual forma una sola con la subcostal. La transverso-basal es mas perpendicular en Ornithomyia. Parece que en este género nace una nervadura incompleta en el punto donde la cubital termina en la márgen anterior y se dirige, con fuerte curvatura, á la punta del ala, cortando una parte de la primera célula posterior, pero incompletamente, porque, como acabo de decir, esta nervadura rudimentaria no llega al borde mismo. Tambien parece que en Ornithomyia, la márgen anterior está orillada por una nervadura que se estiende hasta corta distancia de la punta, lo cual no se vé en Lynchia.— The crowding of veins near the anterior margin is also seen in Ornithomyia but not so marked as in Lynchia, so that the cells between them are not so long and narrow. Ornithomyia also differs in *lacking a mediastinal* (subcosta) which is fused with the subcostal (1st longitudinal). (This is erroneous. The subcosta or mediastinal is present in Ornithomyia as well as in Lynchia and most other genera of Hippoboscidae). The transverso-basal (humeral cross-vein) is more perpendicular in Ornithomyia. It appears that in that genus an *incomplete vein* starts from the point where the cubital (3rd longitudinal) ends in the anterior margin, and forms a strong curve toward the tip of the wing, cutting off part of the first posterior cell [cell 3r], but imcompletely since this rudiment of vein does not reach the margin itself. It also seems that in Ornithomyia the anterior margin is bordered by a vein to within a *short distance* of the tip, a feature not seen in Lynchia. (No specimen of Ornithomyia or any other hippoboscid I have seen shows the incomplete vein curving off from the tip of the 3rd longitudinal, or the extension of the costal vein to near the tip of the wing as described by Weyenbergh. This author was misled by Meigen's defective figure of the wing of Ornithomyia. In Ornithomyia the apex of the 1st posterior cell bears microtrichia on both sides of the membrane and this area is sometimes set off by a curved crease simulating a spurious vein.)

"Además, en Ornithomyia existe el primer nérvulo transverso-posterior, el cual se observa casi al nivel del transverso-discoidal, cuya continuacion parece ser, formando con él una figura algo semejante á S, y es especialmente esta circunstancia la que establece una diferencia importante en esta parte del ala, cuando se comparan los dos géneros entre sí. Tambien parece existir en Ornithomyia un segundo nérvulo transverso-posterior, situado muy cerca de la articulacion, entre las nervaduras anal y posterior, inmediatamente detrás de la bifurcacion del posterior comun en discoidal y verdadero posterior. Como mas arriba dejo dicho, en Lynchia no existen absolutamente estos nérvulos.—In addition, Ornithomyia has a *first transverso-posterior* vein [vein *im*] placed about opposite the transverso-discoidal (anterior basal cross-vein) [recte: not a cross-vein, but the short section of M_{1+2} between *rm* and *im*] which it appears to extend forming with it an S-shaped figure; this feature especially produces an important difference in that part of the wing when comparing the two genera. (Weyenbergh used for comparison a drawing of the wing of Ornithomyia by Meigen (1830, **6**, pl. 64) which explains some of his erroneous interpretations. He failed to note that the first transverso-posterior vein which he described in Ornithomyia corresponds [sic !] to what he called the transverso-discoidal in Lynchia, the second basal cell being so long in Ornithomyia that the anterior cross-vein and the anterior basal cross-vein are close together; in Lynchia these two cross-veins are far apart). In Ornithomyia there seems to be a second transverso-posterior vein (anal cross-vein) very near the articulation (basally), connecting the anal (6th longitudinal) and the posterior (5th longitudinal) immediately beyond the forking of common posterior (stem-vein) into the discoidal (4th longitudinal) and true posterior (5th longitudinal). As I mentioned, this cross-vein is entirely lacking in Lynchia.

"Las particularidades del ala de Ornithomyia han sido tomadas del dibujo publicado por el exacto dipterólogo Meigen y la nomenclatura de las nervaduras es la de Schiner, algo modificada por V. d. Wulp. [Weyenbergh's footnote: Véase v.d. Wulp Overzigt van de jongste stelsels der benamingen voor het aderbeloop der vleugels van Diptera (Nederl. Tijdschr. v. Entomol. T.XIV (1871), p. 79–99)]. Se vé, pues, que existen bastantes diferencias notables entre los géneros Ornithomyia y Lynchia.

"Los tarsos son como en toda la familia y los halteres ó balancines se asemejan á los del género Ornithomyia.—Tarsi as usual in the family; halteres as in Ornithomyia.

"Lynchia Penélopes n. sp. L. sepia-obscura, oculis subfuscis margine orbitali piceo. Antennae flavescentes extremo obscuro. Frons flavescens. Alae hyalinae. Femora anteriora aurata ... Estos ojos son grandes y esféricos y presentan las facetas como si fuesen puntos ... encima del occipucio se vé un escudo triangular oscuro y un poco elevado ... escudo torácico, el cual lleva pelos en su borde posterior ... Los fémures son chatos ... El vientre es finalmente granulado ó chagrinado, lo cual se vé especialmente, con mucha claridad, en la hembra. La interrupcion de la nervadura discoidal cerca de su orígen, que ya he mencionado en la descripcion del género, no es quizás sinó un carácter específico; por lo demás, esta particularidad me parece ser constante. La mayor estension de las alas es, medidas desde la punta de la una hasta la de la otra, 2.5 centím.; la longitud del animal (incluyendo la cabeza, pero no las alas) es, en la hembra, da 1 centím. y en el macho de 8 milím. Esta especie vive parásita entre las plumas del ave que aquí llaman Pavo del Monte, Yacú ó Charata, y que en la ciencia lleva el nombre de Penelope canicollis Wagl. El ave y su parásito no son raros en la provincia de Tucuman, segun el Señor D. F. Schulz.—The eyes are *large and* spherical ("esféricos" meaning *bulging* or convex), with punctiform facets ... the top of occiput bears a triangular dusky somewhat raised plate (postvertex) ... scutellum, the latter bearing *hairs* at the hind border ... Femora flat...Venter *finely granulose* or shagreened, particularly in the female. The break in the discoidal vein (4th longitudinal) mentioned in the generic description, is possibly a specific character only; but it seems to be constant. Spread of wings, from one wing tip to the other, 2.5 cm. Length, including the head, but not the wing, 1 cm. in ♀, 8 mm in ♂."

Evidently Weyenbergh was handicapped by the lack of any appropriate specimens to compare with his new genus and had difficulty in horismology. He relied heavily on Meigen's defective figures of *Ornithomya* (here enlarged and reproduced) and van der Wulp's somewhat confusing venational terminology which resulted in several serious discrepancies. These have been partly pointed out by Bequaert and are explained below (venational notations mine).

(a) "The tridentate claws place Lynchia farther from Olfersia." Weyenbergh might have been misled by Schiner's (1864 Fn. Austr. 2: 645) description of *Olfersia* "Beine in der Hauptsache wie bei Hippobosca" for which the claws were described as "unten mit je einer zweiten stumpfen Afterklaue."

(b) "The wings in Olfersia are much rounded off at apex." Perhaps Weyenbergh got such an impression by comparing Leach's (1817a) figures of *Feronia spinifera* and *F. americana* and Macquart's (1835, 1847a, 1847b) figures of *Olfersia ardeae*, *O. bisulcata* and *O. rufipes*.

(c) "The wings in Ornithomya are quite obtuse at apex, etc." This was evidently based on Macquart's figure which also misled Weyenbergh in describing *Ornithomya* as if without an Sc, with a curved incomplete vein below the apex of R_{4+5}, and apex of R_{4+5} to be within a short distance of wing tip.

(d) "The radial [R_{2+3}] in Lynchia runs as the continuation of subcostal [R_1]." Weyenbergh termed the penultimate and ultimate sections of C as a part of R_1 and R_{2+3} respectively (see fig. 178). Probably the existence of a transparent interruption of C near the true apex of R_1 in his *Lynchia* (but not *Icosta*) gave him a wrong impression that the C did terminate at that interruption.

(e) "There are no transverso-posterior veins in Lynchia." This statement misled Speiser and others in interpreting *Lynchia* as what are now called *Pseudolynchia* and *Microlynchia* which have no *im* and *mcu*. Bequaert simply annotated these veins as *im* and *mcu* but did not give any comments or explanations as to why Weyenbergh's description would fit the genus here called *Icosta*, which clearly has an *im*. My explanations are that, first, the transverso-posteriors in Weyenbergh's sense were the cross-veins lying behind what he termed or considered transverso-discoidal (see next entry), and second, Weyenbergh considered the Cu+1A (anal) of his *Lynchia* to have a double origin, hence the real *mcu* was assumed by him to be not a transverso-posterior but one of the origins of Cu+1A (see below).

(f) "In addition, Ornithomyia has first and second transverso-posterior veins." Bequaert annotated the 2nd transverso-posterior as *mcu* but did not annotate nor give any comments on the 1st one. I was at first (1963: 106-09, Table 3) unable to interpret this bewildering term, and now probably find the explanation. Weyenbergh's wording "in addition (ademàs)" should be interpreted as "in addition to the above-mentioned veins including transverso-discoidal". His transverso-discoidal in *Ornithomya* should instead be the short section of M_{1+2} lying between *rm* and *im*. If this was not the case, the cross-veins *rm* and *im* in *Ornithomya* (particularly in Meigen's figure) would jointly form a W-, not S-shaped figure! Following this precondition, Weyenbergh, therefore, termed the *im* and *mcu* as the 1st and 2nd transverso-posteriors, respectively.

(g) "The anal vein has a double origin." The seemingly double-origined Cu+1A in Weyenbergh's *Lynchia* is a character unknown in any other hippoboscid genera and quite obviously is the basis of his mis-statement that there were no "transverso-posterior veins" which in turn led to Bequaert's mis-interpretation of that generic name. Bequaert did not give any comments regarding the meaning of "raiz doble". A discussion on this character was provided by me (1963: 105, fig. 3-4) and is not repeated here.

In addition, several negative characters in Weyenbergh's description should be examined. It is surprising that while stressing the distinctiveness of the bulla (transparent interruption) on vein M_{1+2}, he failed to mention the bullae on C and *im*, and the setulae (microtrichia) on wing-membrane. Their possible explanations seem to be that the bulla on C might have been considered by him the demarcation of his costal and mediastinal or "first longitudinal" veins, that the bulla on *im* might have been considered too variable and too indistinctive (this is particularly true in dry specimens; in what I call *Icosta*, the bulla is much longer and more conspicuous) and that there are no such setulae in his genus, although fairly conspicuous in *Icosta*. Furthermore, while describing the granuloseness of abdominal venter, Weyenbergh did not mention the transverse striation of abdominal dorsum which is not to be found in his *Lynchia* but is very conspicuous in *Icosta*.

The non-conformities of Weyenbergh's description against what is here called *Icosta* have been discussed at length by me (1963: 104-11). A few additional points since then were disclosed and are incorporated in the following list and accompanying figures (fig. 172-178): Antennae longer than in *Ornithomya*, eyes very bulging, mouthparts very short, palpi short, median notal suture much raised, anterior thoracic spiracles ovate, scutellum very short and broad and bearing bristles (pelos) on hind margin, wings very pointed and very long, first section of vein C not more than 1/3 as long as wing, vein *h* present, junction of veins C and R_{4+5} lying about 2/3 of length of anterior wing-margin, vein *rm* joining R_{4+5} at about 2/3 of length of latter, vein M_{1+2} with a bend at its junction with *im*, apical sections of veins M_{1+2} and M_{3+4} both gently curved, that of Cu+1A more strongly so, vein Cu+1A (seemingly) with a double origin, spaces and cells between branches of veins R and M very long and narrow, more than one "axillary cells", more than one abdominal segments with strong spines on their side margins, abdominal venter finely granulose.

One must be reminded that the non-conformities listed above do not necessarily apply to *Icosta* species occurring in the Old World, and that not all these points are of equal importance and significance. Also to be noted is the fact that Bequaert gave no comments on these non-conformities nor on some of Weyenbergh's discrepancies such as the true nature of the 4 cross-veins (transverso-media, transverso-discoidal, 1st and 2nd transverso-posteriors) and the double-originated anal vein. These omissions might be deliberate or by oversight. For comparison, Meigen's figures of *Ornithomya* are here enlarged and redrawn, (fig. 174, 178), along with figures of the 2 largest and commonest American species of *Icosta* as well as *Stilbometopa ramphastonis* Ferr. which is possibly synonymous with Weyenbergh's species. To avoid possible prejudice and subjectivity, figures of the latter species (fig. 172, 173, 175, 177) are redrawn from Ferris (1927a: fig. 2, 3, 1930c: fig. 1, 2).

Although *Lynchia* Weyenb. 1881 (not of Beq., etc.) is evidently synonymous with *Stilbometopa* Coq. 1899 and clearly has priority over the latter name, it seems best to conserve *Stilbometopa* instead. The names have been shifted about so much, and the interpretations of Weyenbergh's description have been so diverse, that the strict application of the law of priority would merely cause endless confusion. A proposal to reject *Lynchia* Weyeneb. is going to be submitted to the International Commission of Zoological Nomenclature.

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1830. Wiedemann, C. R. W. Aussereur. zweifl. Ins. **2**: 602–14. (*Olfersia* n. name for *Feronia* Lch. nec Latr.)

1835. Macquart, J. Hist. nat. Ins. Dipt. **2**: 1–705 (*Olfersia* n. spp. *ardeae, fuscipennis, longipalpis*).

1838. Percheron, A. R. *In* Guérin-Méneville & A. R. Percheron, Genn. d. Ins. ou Exposit. detaill. **6** (9): pl. 6, 3 unnumbered pp. (*Ornithomyia* n. sp. *fusca*).

1843. Macquart, J. Mem. Soc. Sci. Lille **1842**: 162–460. (*Olfersia* n. spp. *mexicana, pilosa*).

1845. Macquart, J. Mem. Soc. Sci. Lille **1844**: 133–364. (*Olfersia* n. sp. *fusca*).

1849. Walker, F. List Dipt. Ins. Brit. Mus. **4**: 689–1172. (*Olfersia* n. sp. *propinqua*; *Ornithomyia* n. sp. *intertropica*).

1858. Bigot, J. M. F. *In* J. Thomson, Archives Ent. **2** (Voy. Gabon): 346–76. (*Olfersia* n. sp. *minor*).

1861. Walker, F. J. Proc. Linn. Soc. (London) Zool. **5**: 229–302. (*Ornithomyia* n. spp. *obscurata, plana, simplex*).

1869. Packard, A. S. Guide to the study of insects: 1–702 (*Hippobosca* n. sp. *bubonis*).

1878. Rondani, C. Ann. Mus. Stor. Nat. Genova **12**: 150–70. (*Olfersia* n. spp. *macquartii, obliquinervis, pallidilabris, papuana*).

1879. Rondani, C. Boll. Soc. Ent. Ital. **11**: 3–28. (*Ornithophila* n. g. for n. sp. *vagans*; *Olfersia* n. sp. *botauri*).

1881. Weyenbergh, H. An. Soc. Cient. Argentina **11** (5): 193–200. (*Lynchia* n. gen. for n. sp. *penelopes*).

1885. Bigot, J. M. F. Ann. Soc. Ent. Fr. ser 6, **5**: 225–46. (*Ornithomyia* n. sp. *rufiventris*).

1887. Dugès, A. La Naturaleza (Mexico) ser 2, **1** (1): 18–21. (*Ornithomyia* n. sp. *villadae*).

1897. van der Wulp, F. M. Termész. Füzetek **20**: 136–44. (*Olfersia* n. sp. *longirostris*).

1902a. Speiser, P. Termész. Füzetek **25**: 327–38. (*Olfersia* n. sp. *parallelifrons*).

1902b. Speiser, P. Zs. Hym. Dipt. **2**: 145–80. (*Olfersia* n. sp. *acarta*).

1902c. Speiser, P. Fn. Hawaii. **2** (2): 86–92. (*Olfersia* n. sp. *acarta*, republished).

1903. van der Wulp, F. M. Biol. Centr. Amer. Dipt. **2**: 429–32. (*Olfersia* n. spp. *angustifrons, coriacea*).

1904a. Speiser, P. Ann. Mus. Stor. Nat. Genova **41**: 332–50. (*Olfersia* n. sp. *chalcolampra*).

1904d. Speiser, P. Ann. Mus. Nat. Hungarici **2**: 386–95. (*Olfersia* n. spp. *acromialis, dioxyrhina, Stilbometopa* n. sp. *podopostyla*).

1905a. Speiser, P. Zs. Hym. Dipt. **5**: 347–60. (*Icosta* n. g. for *dioxyrhina*; *Olfersia* n. spp. *nigrita, trita*).

1908c. Speiser, P. Zs. Wiss. Ins.-Biol. **4**: 241–46, 301–05, 420–27, 437–47. World checklist; included under *Olfersia* are 21 spp., viz., *acarta, acromialis, albipennis, americana, angustifrons, ardeae, botauri, fusca* Mcq., *intertropica, longipalpis, macquartii, minor, nigra, nigrita, pallidilabris, papuana, parallelifrons, propinqua, rufiventris, testacea* Mcq. 1843, *trita*; included under *Lynchia* are 11 spp., viz., *brunnea* Latr. 1812, *capensis* Bigot 1885, *exornata* Speis. 1900, *falcinelli* Rndn.

1879, *garzettae* Rndn. 1879, *lividicolor* Bigot 1885, *maura* Bigot 1885, *penelopes* Weyenb. 1881, *pusilla* Speis. 1902, *rufipes* Mcq. 1847, *simillima* Speis. 1904; included in *Icosta* is 1 sp., viz. *dioxyrhina*). [Here the nominal spp. with authors names and years are those wrongly included. In the original List, *mexicana* and *coriacea* were included under *Pseudolfersia*; *obscurata* and *podostyla* were retained under *Ornithomyia* and *Stilbometopa*, respectively. On the other hand, *bubonis, chalcolampra, fusca* Perch., *fuscipennis, longirostris, obliquinervis*, and *villadae* were not included in the List, probably either by oversight or being considered synonymous or of doubtful status].

1911. Austen, E. E. Bull. Ent. Res. **2**: 169-72. (*Olfersia* n. sp. *dukei*).

1915. Lutz, A. *In* Lutz, Neiva & Costa Lima, Mem. Inst. Osw. Cruz **7**: 173-99. (*Olfersia* n. spp. *holoptera, palustris, raptatorum*).

1916. Swenk, M. H. J. N. York Ent. Soc. **24**: 126-36. (*Olfersia* n. spp. *botaurinorum, scutellaris, wolcotti*; key to 7 Amer. spp.).

1923. Aldrich, J. M. Insec. Inscit. Menstr. **11**: 75-79. (*Ornithoponus* n. g. for *americana*).

1924a. Ferris, G. F. Philip. J. Sci. **25**: 391-403. (*Ornithophila* n. sp. *maquilingensis*).

1925b. Ferris, G. F. Philip. J. Sci. **28**: 329-39. (*Ornithoponus* n. sp. *sartus*).

1926. Falcoz, L. Fn. France **14** (Dipt. Pupip.): 1-64. (*Ornithoponus massonnati* n. name for *Olfersia americana* Massonnat nec Lch.).

1926b. Bequaert, J. Psyche **32** (for 1925): 266-77. (*Pseudolynchia* n. name for "*Lynchia* Weyenb." of Speiser, etc.; translation & interpretation of Weyenbergh's description; *Ornithoponus* suppressed as synonym of *Lynchia*).

1927a. Ferris, G. F. Canad. Ent. **59**: 246-51. (*Lynchia* n. sp. *hirsuta*).

1927b. Ferris, G. F. Ins. Samoa **6** (1): 10-21. (*Lynchia* n. sp. *samoana*).

1927c. Ferris, G. F. Philip. J. Sci. **34**: 207-33. (*Lynchia* n. spp. *bicorna, pollicipes, setosa, tuberculata*).

1930c. Ferris, G. F. Canad. Ent. **62**: 62-70. (*Lynchia americana, intertropica* redescribed).

1933b. Bequaert, J. Psyche **40**: 68-82. (Revision of "larger" species of *Lynchia*—wing 6 or more mm long; key to 6 spp.—*pilosa, palustris, fusca, americana, nigra, dukei*; appended are *penelopes* and *raptatorum*).

1940. Statz, G. Palaeontographica (A) **91**: 119-74. (*Ornithoponus* n. sp. *rottensis*).

1941b. Bequaert, J. Occas. Pap. Bishop Mus. **16** (11): 247-92. (Key to 5 *Lynchia* spp. of Oceania—*nigra, albipennis*, n. sp. *suvaensis, samoana, pollicipes*).

1943c. Bequaert, J. J. Parasitol. **29**: 131-35. (*Lynchia* n. sp. *plaumanni*).

1945b. Bequaert, J. Psyche **52**: 88-104. (Further revision of "larger" spp. of *Lynchia*; key to 8 spp.—*pilosa*, n. sp. *schoutedeni*, n. sp. *majuscula, americana, wolcotti, fusca, nigra, dukei*).

1953a. Bequaert, J. Ent. Amer. n. ser. **32** (for 1952): 1-210; **33**: 211-442.

1953a. Bequaert, J. The Hippoboscidae or louse-flies (Diptera) of mammals and birds. Part I. Structure, physiology and natural history. Ent. Amer. n. ser. **32** (for 1952): 1-210; **33**: 211-442.

1954. Paramonov, S. J. Ann. Mag. Nat. Hist. ser. 12, **7**: 283-92. (*Orhithophila* n. sp. *australica*).

1954-57. Bequaert, J. The Hippoboscidae or louse-flies (Diptera) of mammals and birds. Part II. Taxonomy, evolution and revision of American genera and species. Ent. Amer. n. ser. **34-36**: 1-611. (Monograph of American spp. of *Lynchia*, p. 260-363; key to 9 spp.; n. sp. *latifacies*).

1963. Maa, T. C. Genera and species of Hippoboscidae (Diptera): types, synonymy, habitats and natural groupings. Pacific Ins. Monogr. **6**: 1-186. (Synonymy and subgeneric classification of *Lynchia* spp. of the world; Weyenbergh's description re-interpreted; 31 spp. listed as distinct; revision of *L. meda* and *nigrita* groups incl. n. spp. *meda, modesta, leptoptera*).

1964. Theodor, O. & H. Oldroyd. Hippoboscidae. *In* E. Lindner, Die Flieg. Pal. Reg. **65**: 1-70. (Monograph of palaearctic spp. of *Lynchia*, p. 45-52; key to 5 spp.; n. sp. *barbata*).

1964. Maa, T. C. On the genus *Lynchia* from Africa (Diptera, Hippoboscidae). J. Med. Ent. **1**: 87-103. (Key to 11 spp. in 8 groups; n. spp. *mecorrhina, coalescens, interrupta, tripelta, zumpti, recessa*).

1965. Maa, T. C. & J. S. Kuo. A field survey of arthropod parasites of birds in Taiwan. J. Med. Ent. **1** (for 1964): 395-401. (Frequency, interspecific association etc of 5 *Lynchia* spp.).

1965. Fain, A. A review of the family Epidermoptidae Trouessart parasitic on the skins of birds. Verh. Vlaamse Acad. Wetensch. Belgie, Kl. Wetensch. **84**: 1-176.

1966. Maa, T. C. Studies in Hippoboscidae (Diptera). Pacific Ins. Monogr. **10**: 1-148. (*Ornithoponus rottensis* transferred to genus *Ornithomya* and redescribed).

1967. Maa, T. C. Diptera: Hippoboscidae; Streblidae. Ins. Micronesia **14**: 251-74. (Listed from Pacific islands, 26 *Icosta* species incl. nom. nuda which are fully described in this article).

ADDENDUM

Since the above paper went in press, fresh specimens of *Icosta samoana* and 3 apparently undescribed species came into my hands. They are added below.

Icosta (Icosta) samoana (Ferris) Fig. 179.

SAMOA: 1♀ (USNM), W. Samoa, ex *Turdus poliocephalus*, IV.1966, N. Hertford, USNM Pacif. Biol. Survey.

The following descriptive notes are based on the above-listed specimen. Occipital margin straight; vertical bristle of normal length; postvertex 7.5×22, shorter than in Ferris' figure. Inner orbit slightly less narrowed forward than in Ferris' figure. Frons proper short; frontal notch rather wide, rounded; frontal process slightly shorter than palpus, in profile gently curved, subacute at apex. Vibrissal process in profile normal, triangular, slightly shorter than wide at base, fringed with dense pale setae, apex acute, with 1 black bristle on inner surface. Gula posteriorly with 1-2 spines at each side. Palpus (fig. 179) moderately long. Mesonotum 36×47; prescutum feebly densely striate all-over; 2 humeral and 2 mesopleural bristles; laterocentral setae not uniform in length, 3 or 4 of them at each side ca 4-6× as long as interdistance of their basal punctures. Scutellum 10×25, posterior margin evenly convex. Metapleurotergal callus bearing 4-5 strong curved spines in single series plus some irregularly arranged setae of varied length and robustness. Prosternum transversely linear, poorly sclerotized. Metasternal process less pronounced than in Ferris' figure. Wing as in fig. 140 but cell *1m* with small patch of setulae on basal corner, therefrom forming a narrow stripe which runs subparallel to vein M_{3+4} and apically merges into the extensive setulose area. Femur 1 strongly swollen, basal 1/2 of anterior surface with 2 rows of short setae near lower margin, otherwise bare. Tibia 3 similar to that in *diluta* as shown in fig. 11. Tarsal spines 2.1.1.0/2.1.1.0/2.2.1.1; tarsomeres 3-4 of foreleg hardly asymmetrical; tarsomere 1 of hindleg 9×4, as long as 2+3 and as 5; tarsomeres 2-4 of same leg distinctly asymmetrical. Abdomen of ♀ as figured by Ferris but setae on laterite 2 and lateral membrane longer, stronger; laterite 7 small, roundish, with 1 bristle plus 1-2 setae; urogenital area anteriorly fenced by row of fine short setae.


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Fig. 179. *Icosta (Icosta) samoana* Ferr., ♀ palpus.

Icosta (Ardmoeca) macclurei Maa, new species Fig. 180-185.

MATERIAL. 1♂, 18♀♀. Holotype ♀ (BISHOP 7617), allotype ♂ (BISHOP), paratypes (BISHOP & USNM). THAILAND: Pathumthani, Wad Philom, ex *Anastomus oscitans* (7E 1489-1500), 15.III.1967, Migr. Anim. Path. Surv.

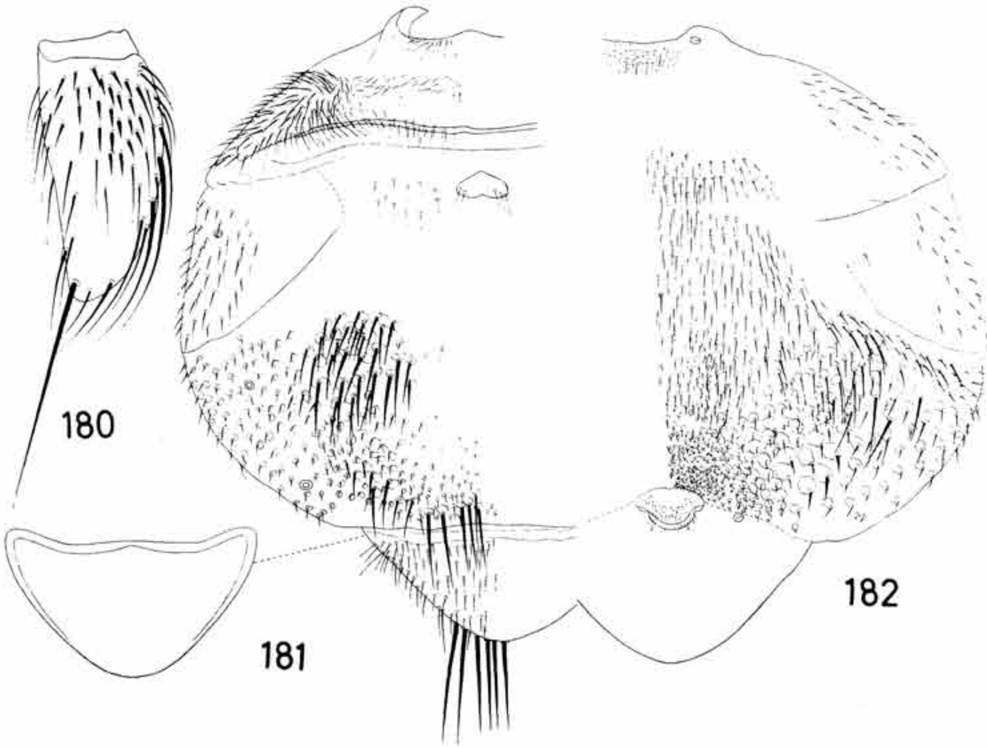

Fig. 180–182. *Icosta (Ardmoeca) macclurei* Maa: 180, ♀ palpus; 181, ♀ abdomen, dorsal; 182, ♀ abdomen, ventral.

Habitats. At present known only from Thailand, possibly widely distributed in the Orient, and perhaps the sp. "F" from Fukien, China referable here. Apparently breeding on Ciconiiformes: Ciconiidae (Anastomus).

Systematics. Related to *schoutedeni* from which it differs in: ♀ abdomen with a number of strong setae immediately before tergite 6, tergite 6 subtriangular, not trapezoid, bristle-tufts lying at level of spiracle 4 rather than 3; ♂ tergite 6 shorter and with fewer setae, aedeagus strongly curved more closely to base, postgenital plate longer. The body-size is relatively larger and palpus narrower. Runs to *massonnati* in the key on p. 139 which may be revised as follows.

5. Female abdominal dorsum with a number of strong setae arranged immediately before tergite 6 and with bristle-tufts lying at level of spiracles 4; ♂ tergite 6 (fig. 183) very short, postgenital plate (fig. 185) comparatively longer. Thailand .... **macclurei**

   Female abdominal dorsum with at most very few short fine setae lined immediately before tergite 6; bristle-tufts, when present or definable, lying at level of spiracle 3 (i. e., just at sides of tergite 3); ♂ tergite 6 longer, postgenital plate comparatively shorter (♂ of *massonnati* unknown) 5a

5a. Female abdominal dorsum with pair of conspicuous tufts of dense strong bristles at sides of tergite 3 (i. e., at level of spiracle 3), tergite 6 unusually large and long, trapezoid in outline; ♂ tergite 6 ca 4× as wide as long. W. and E. Africa..................... **schoutedeni**

Female abdominal dorsum (so far as figured by Massonnat, 1909) lacking such bristle-tufts, tergite 6 not as above; ♂ unknown. France .... **massonnati**

6. S. African form; ♀ lacking pregenital plate, laterite 3 triangular in dorsal view; ♂ unknown .... sp. "T"

Non-African forms; ♀ with distinct pregenital plate (though often small), laterite 3 subquadrate in dorsal view; ♂ tergite 6 ca either 2 or 4 × as wide as long 7

Massonnati is impossible to be compared in detail since it is inadequately known and its type is apparently lost. But the above couplets should probably leave no or little difficulty in recognizing the new species. In shape of tergite 6, site of bristle-tufts and other features of ♀♀, *macclurei* is very closely similar to sp. "N" (known to me only from dry specimens) but the short laterocentral setae and subquadrate laterite 3 in that Australian species probably would not be mistaken for *macclurei*. The species is named in honor of Dr H. Elliott McClure of the Migratory Animal Pathological Survey in recognition of his cooperation during last 6 years and of the wonderful achievments of the Survey.

♀. *Color* very dark, wings weakly fuscous, anterior veins black. *Head*: Occipital margin straight; vertical bristle brown, distinctly paler than and ca as long as notopleural bristle; postvertex ca 1/3 as long as wide, evenly raised, anteromedially gently depressed, anterior margin virtually straight, and very close to median pit; mediovertex much more depressed than postvertex. Relative width of eye, inner orbit and mediovertex at level of widest part of head (in front view) 12 : 8 : 15. Face practically parallel-sided, its smallest width equal to eye-length; inner orbit raised, inner margin depressed, lined with 2 series of pale setae. Frons proper ca 1/2 as long as average width of frontal process, narrower than antennal base; frontal notch angular;

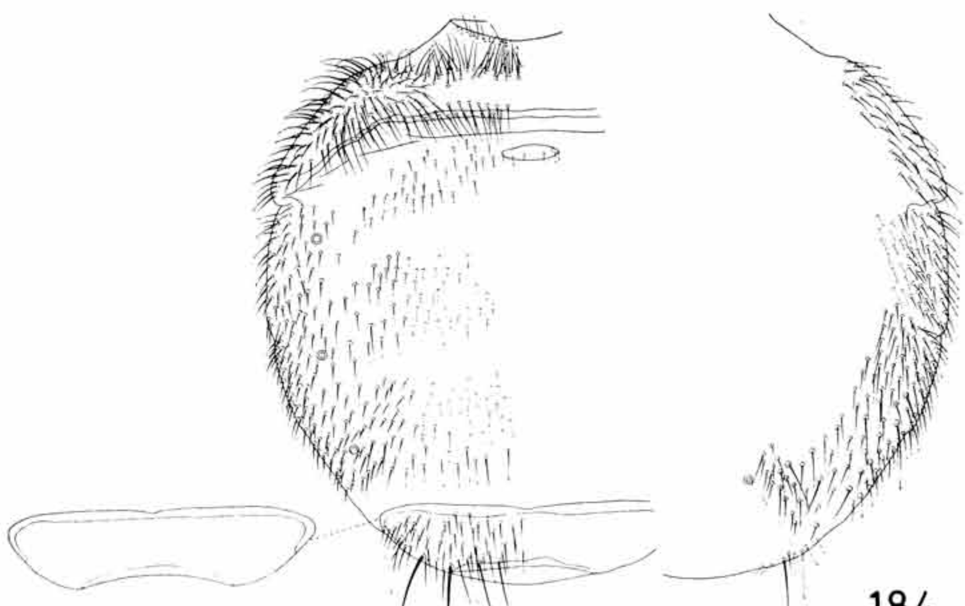

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Fig. 183-184. *Icosta* (*Ardmoeca*) *macclurei* Maa: 183, ♂ abdomen, dorsal; 184, ♂ abdomen, ventral.

frontal process in dorsal aspect straight along inner margin, ca 4/5 as long as palpus. Palpus as in fig. 180. Gula posteriorly lined with single series of 10± pale setae or black spines or mixture of both. *Thorax*: Anterior spiracle dorsal, large, 2× as wide as long. Humeral callus anteriorly with rather short spines, posterior with, besides 1 humeral bristle, some pale setae. Mesonotum 76×99; prescutum finely striate all-over, anterior striae much denser than posterior ones; laterocentral bristles ca as long as width of anterior spiracle, almost reaching transverse mesonotal suture. Scutellum 18×51, shorter than scutum, with evenly curved posterior margin. Mesopleural concavity with distinct upper and lower margins. Metapleurotergal callus with 3-5 long spines and some soft setae of similar length. Prosternum subtriangular, moderately sclerotized, with 15 ± long pale setae; anterior mesosternal lobe emarginate, base of its bristle equidistant to anterior and lateral margins; mesosternum posteriorly with pair of small patches of pale setae. Wing 7.7-8.6 mm long; surface (incl. alula) entirely covered with setulae but setulose stripe of cell *2a* hardly wider than vein 2A and not reaching apical margin of that cell; vein *rm* as thick as adjacent part of R_{4+5}, closer (53 : 72) to *im* than to apex of C, lying at or hardly apicad to level of apex of R_1; bulla of M_{1+2} situated at a point of apical 1/3 of cell *2bc*. Tarsal spines 2.1.1.0/2-3.1.1.0/7-9.2.1.1; tarsomere 1 of hindleg hardly longer than 2+3+4 and than 5, tarsomeres 2-4 distinctly asymmetrical, each shorter than wide. *Abdomen* (fig. 181-182) quite unevenly setose. Syntergite 1+2 produced posterolaterally, with pale setae, laterally mixed with some black erect setae. Tergite 3 small, laterally with some small setae. Dorsum of laterite 3 triangular, uniformly covered with short sparse setae. Dorsal striolate area largely bare, posteriorly with several rows of strong setae of varied length; area behind laterite 3 with

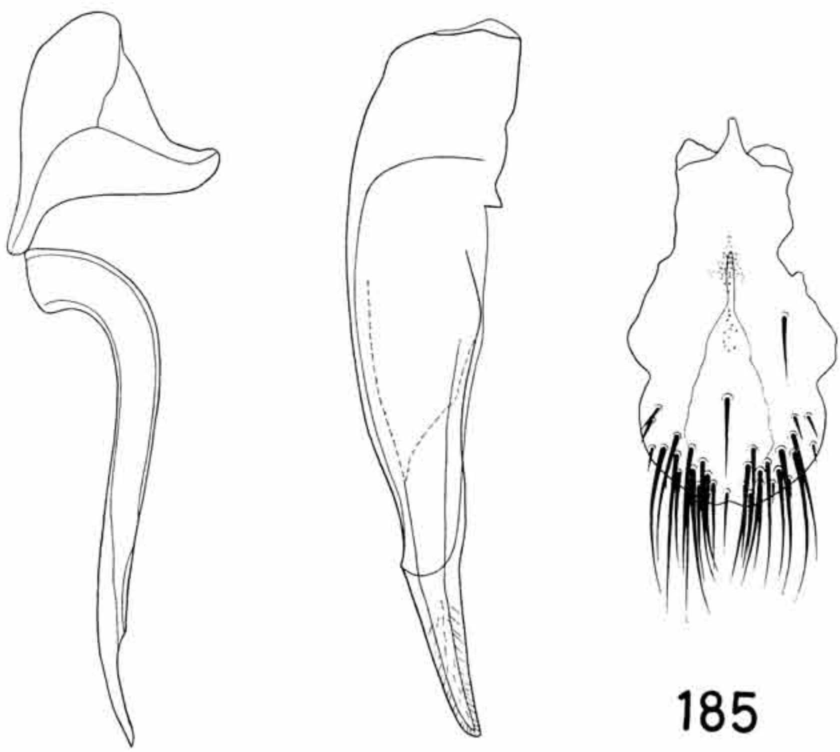

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Fig. 185. *Icosta* (*Ardmoeca*) *macclurei* Maa: ♂ aedeagus, paramere, and postgenital plate.

roundish compact tuft of long strong bristles at level of spiracle 4, followed by patch of strong spines of varied length. Tergite 6 subtriangular, strongly protruding caudad, apex narrowly rounded, apical margin with strong bristles, dorsal surface with similar setae as on laterite 3, ventral surface membranous, bare. Laterite 2 sparsely setose; venter of laterite 3 also subtriangular, inner 1/2 bare. Setae of ventral membrane much varied in length and robustness and in size and pustulateness of basal papillae; discal setae long, fine, with small basal papillae, mostly pale, and followed by 4-5 rows of moderately strong setae with large basal papillae and then by large patch of exceedingly dense fine short setae, this patch forming anterior fence of urogenital area; setae on posterolateral area short, heavy, curved, their basal papillae large and strongly pustulate. Pregenital plate small, roundish or transversely elliptical.

♂. Similar. Laterocentral bristles reaching or almost reaching transverse mesonotal suture. Abdomen (fig. 183-184) similar to that of *schoutedeni* but laterite 3 comparatively narrower, tergite 6 shorter and with fewer setae. Genitalia as in fig. 185.

Icosta (Icosta) malagasii Maa, new species Fig. 186-190.

MATERIAL. 1♀. Holotype in alcohol, in Brit. Mus. (Nat. Hist.), with left wing apically damaged and right midleg missing. MADAGASCAR: "Parasite sur aile d'un Coezach/ Sahafanjana/N : 115/R. M./Inst. Sci. Madagascar", no further details.

Habitats. Apparently confined to the Malagasy Subregion; the "Lynchia dioxyrhina" of Falcoz (1930, *Encycl. Ent.* B **5**: 47) from the Grande Comore Is. probably referred to *malagasii.* Hosts unknown but by implying parallelism in host relationships with related species (*chalcolampra* Speis. and *mecorrhina* Maa), this Malagasy species is perhaps chiefly a parasite of Falconiformes.

Systematics. In spite of the geographical position of Madagascar, this new species shows strong Oriental, rather than Ethiopian affinities. It is the only Ethiopian member of the Plana subgroup and stands most closely to *chalcolampra.* From the latter species, *malagasii* can immediately be recognized by its narrower face, shorter palpi, less extensive wing-setulae, moderately swollen femora 1, broader tergite 3 and unusual feature of anterior fence of ♀ urogenital area. Among the known Ethiopian species of the subgenus, *mecorrhina* may be counted as its remote relative but the disparity is well marked. The quite long frontal processes, symmetrical tarsi 1, richly spinose basitarsi 3 and rather uniform abdominal setae in the former species can hardly be mistaken for the latter. Most significant features of abdominal chaetotaxy in *malagasii* are the strong contrast in size and prominence of setigerous papillae at dorsolateral area versus elsewhere, and the pair of setal patches fencing ♀ urogenital area. For the inclusion on *malagasii* the "14" at ending of the couplet 13 (p. 95) should be changed to "13a" and the "14 (13)" at the beginning of the next couplet, changed to "14 (13a)", and a new couplet should be inserted in between:

13a (13). Tarsomeres 3 and 4 of foreleg virtually symmetrical at apices; ♀ abdomen with basal papillae of dorsolateral setae similar in size and prominence to those of setae on other membranous area; ♀ urogenital area lacking anterior fence as described below 14

Tarsomeres 3 and 4 of foreleg clearly asymmetrical, with posterior apical lobes markedly longer than corresponding anterior ones; ♀ urogenital area anteriorly fenced by pair of small setal patches. Madagascar .... **malagasii**

♀. *Color* fairly dark, wing very weakly infuscated. *Head* (fig. 186): Occipital margin almost

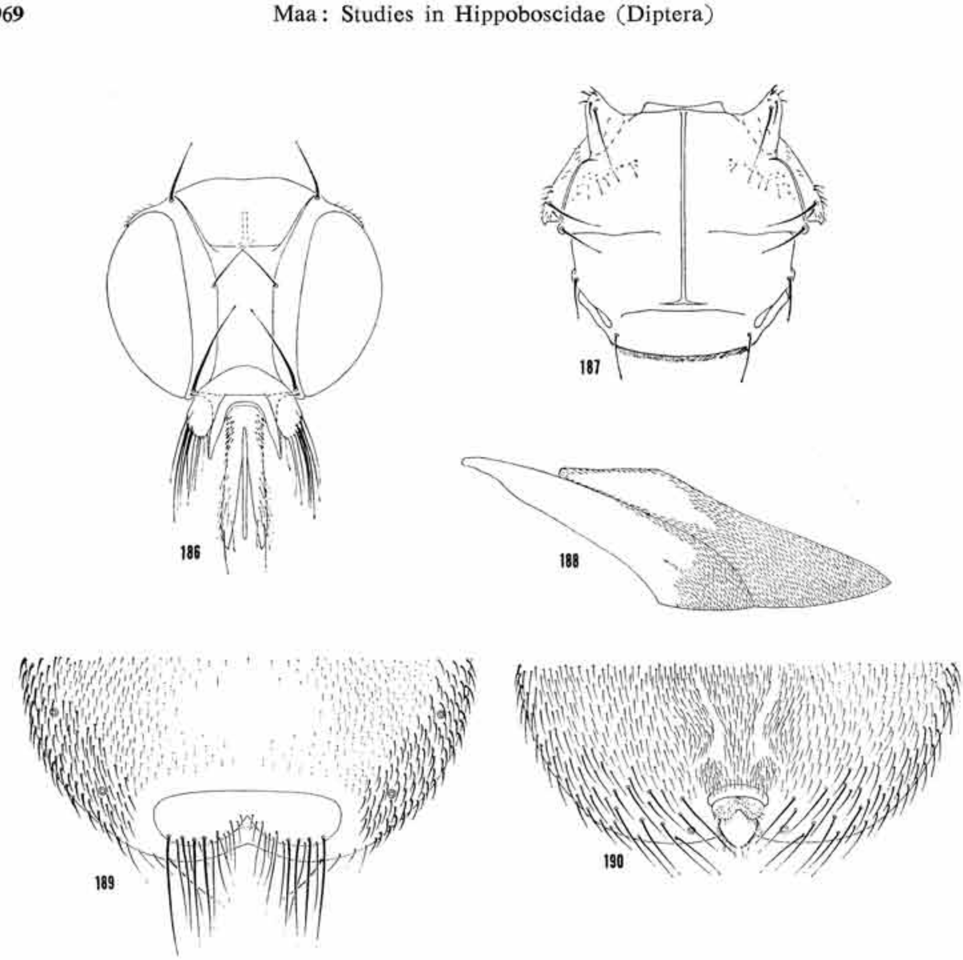

Fig. 186-190. *Icosta* (*Icosta*) *malagasii* Maa, ♀. 186, head in front view; 187, thorax in dorsal view; 188, wing (pt.), semidiagrammatic, showing distribution of setulae on cells *1m* and *2m+1a*; 189, abdominal apex, dorsal view; 190, abdomen apex, ventral view. Drawn from holotype (in alcohol) by Miss Suzanne Keenan; basal papillae of setae in fig. 189 and 190 are actually larger in proportion than that shown here.

straight; vertical bristle 2/3 as long as notopleural bristle; postvertex short, anteriorly truncate, anterior 1/2 of median fovea distinct. Face slightly wider than eye, hardly narrowed anteriorly; posterior pair of orbital bristles poorly developed. Frons proper very short, anteriorly widely notched at middle; frontal process less than 1/2 as long as palpus, in profile gently decurved, apically subacute. Vibrissal process in profile normal, shorter than wide at base, apically blunt, dorsally separated from frontal process by pale submembranous stripe. Gula posteriorly with an incomplete series of spines. *Thorax* (fig. 187): Prescutum densely strongly striate all over, laterocentral setae all pale, very fine and far from reaching transverse mesonotal suture; scutellum normal, scutellar bristle finer than notopleural bristle; metapleurotergal callus with 4-5 spine-like setae and several minor ones. Prosternum ca 2.5 × as wide as long, well sclerotized; metasternal process poorly developed. Wing (fig. 188) 5.5 mm long; setulae about as extensive as in *samoana* Ferr. and *diluta* n. sp. and covering cell *3r* as a whole and *1r*, *2r*, *1m* and *2m+1a* in part; *1r* and *2r* bare at extreme bases, *1m* largely bare at basal 1/2, *2m+1a* setulose only at apex and narrowly along part of anterior margin. Femur 1 moderately swollen, basal 1/2 of anterior surface bare at upper part and evenly covered with short erect setae at lower part; anterior surface of femur 2 traversed at midlength by an arcuate series of 7–8 slender spines of varied length, basal part of surface with pale, very fine setae. Tibia 3 similar to that of *chalcolampra*. Tarsal spines 1.1.1.0/3.1.1.0/2.2.1.1; posterior apical lobe of tarsomere 4 of foreleg much longer than corresponding anterior lobe, that of tarsomere 3 moderately so. Tarsomere 1 of hindleg 2/5 as wide as long, hardly shorter than 2+3+4, slightly longer than 5; tarsomeres 2–4 slightly asymmetrical at apices. *Abdomen* (fig. 189–190) with short, rather fine setae on dorsal striolate area and immediate vicinities; dorsolateral setae with much larger and more prominent basal papillae than setae on remaining membranous area; ventral setae uniform, longer and more robust than dorsal ones, those fencing urogenital area not noticeably longer or more robust but forming pair of small roundish patches. Tergite 3 fairly wide; tergite 6 posteriorly concavely curved, with 7–8 pairs of bristles. Laterite 3 moderately sclerotized, its discal setae more or less spine-like; laterite 7 entirely undefinable. ♂ unknown.

Antica Group

Distribution. 1 species; probably confined to the Papuan Subregion.

Host Relationships. Not clear; the only record was from Casuariiformes (Casuariidae), but that needs verification.

Diagnosis. No laterocentral setae or bristles; all setae on prescutum arranged closely along lateral margins of latter; prescutellar setae evenly strong, much stronger than orbital setae. Wing very ample, anterior longitudinal veins not quite closely approaching costa; cell *2bc* exceptionally large and long, with bulla on its anterior margin (i. e., vein M_{1+2}) much closer to base rather than apex or middle of the cell; *2a* broad; vein 3A almost as strong as 2A. Tarsal claws so small that it is quite out of proportion to other parts of body, heel small and well apart from preapical tooth which is close to apical tooth.

Affinities. Insofar as the above mentioned diagnostic characters are concerned, this group appears to stand at the very beginning of Recent forms of *Icosta*-complex. The broad axillary lobe in combination with the strong vein 3A and the small heel of the tarsal claws strongly suggests the convergence of this group to the archaic genus *Ornithophila*. In the key to genera and subgenera of *Icosta*-complex (p. 34), the group runs to subgenus *Ornithoponus* largely because the vibrissal area is broadly rounded into frontal process and the legs are thinly setose. Relatively it is closer to the Americana than to any other groups and shares with the Americana group characters listed in Table 2 except for: mesopleural concavity fairly distinct, cell *2bc* exceedingly long, *2m+1a* and alula both uniformly setulose, ♂ tarsus 2 with peg-like spines, syntergite 1+2 with long posterolateral lobes.

Icosta (Ornithoponus) antica Maa, new species Fig. 191–197.

Material. NE NEW GUINEA: 2♂♂, Clear Water, base of Mt. Missim, Wau, Morobe Distr., ex cassowary (BBM 54411), 6.IX.1967. Holotype (Bishop 7573) and paratype in Bishop Museum.

Habitats. New Guinea, submontane; host relationship, as mentioned above, not clear, nor has the cassowary involved been determined to species (there are 3 species of cassowaries in New Guinea, all belonging to *Casuarius* which is the only genus of the family

Casuariidae). If cassowaries prove to be the real host, the modification of thoracic and abdominal chaetotaxy and the reduction of tarsal claws and pulvilli in the new species may be construed as an adaptation to the short scanty feathers of these birds.

Systematics. For the inclusion of the new species, a new couplet may be added to the key on p. 48, between couplets 5 and 6; the "6" at end of couplet 1, changed to "Sa"; and the "6(1)" at beginning of couplet 6, changed to "6(5a).

5a (1). No laterocentral setae and bristles, prescutum entirely bare except for single series of setae arranged closely along its lateral margins; cell *2bc* more than 1/2 as long as *1bc*; preapical tooth of tarsal claws closer to apical tooth than to heel. Antica group. New Guinea .... **antica**

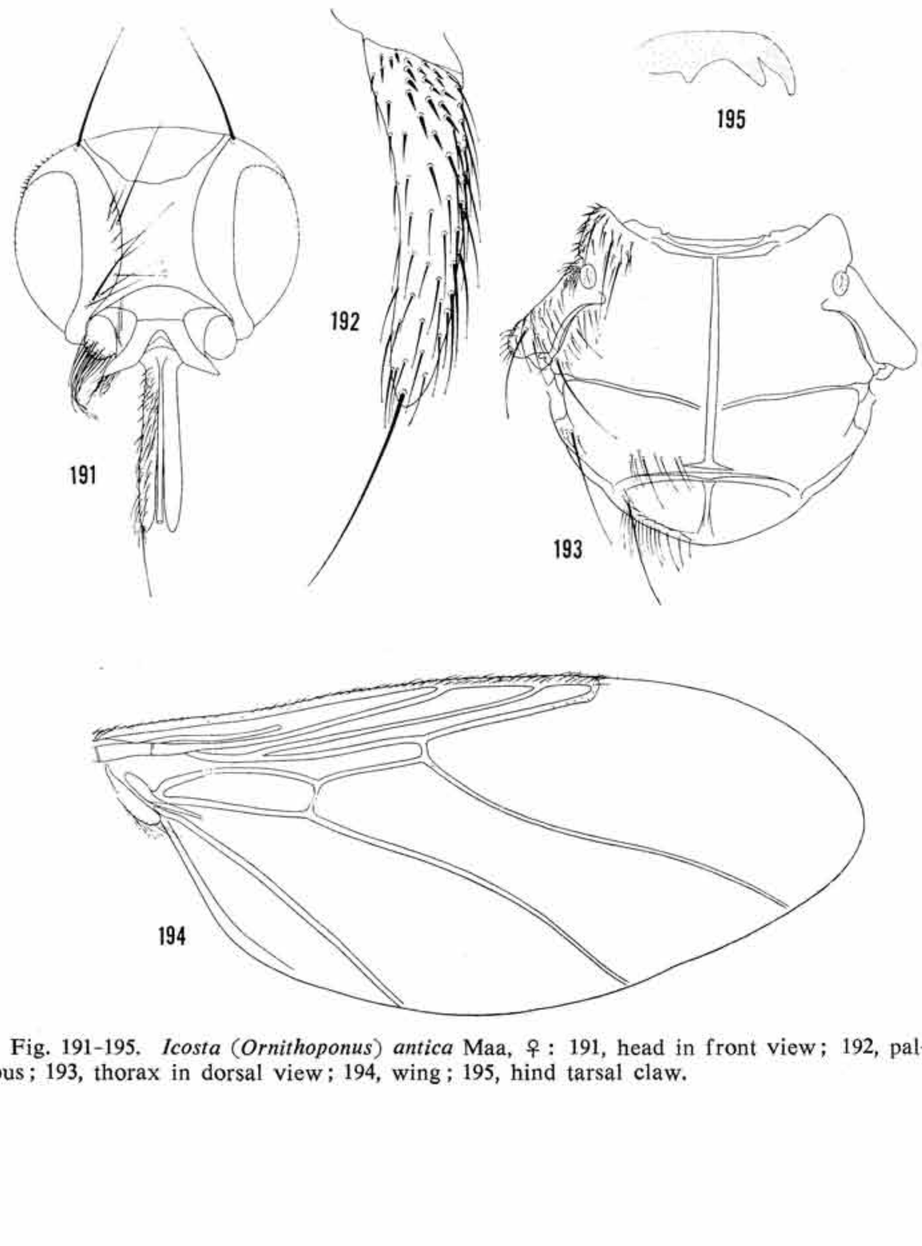

Fig. 191-195. *Icosta (Ornithoponus) antica* Maa, ♀: 191, head in front view; 192, palpus; 193, thorax in dorsal view; 194, wing; 195, hind tarsal claw.

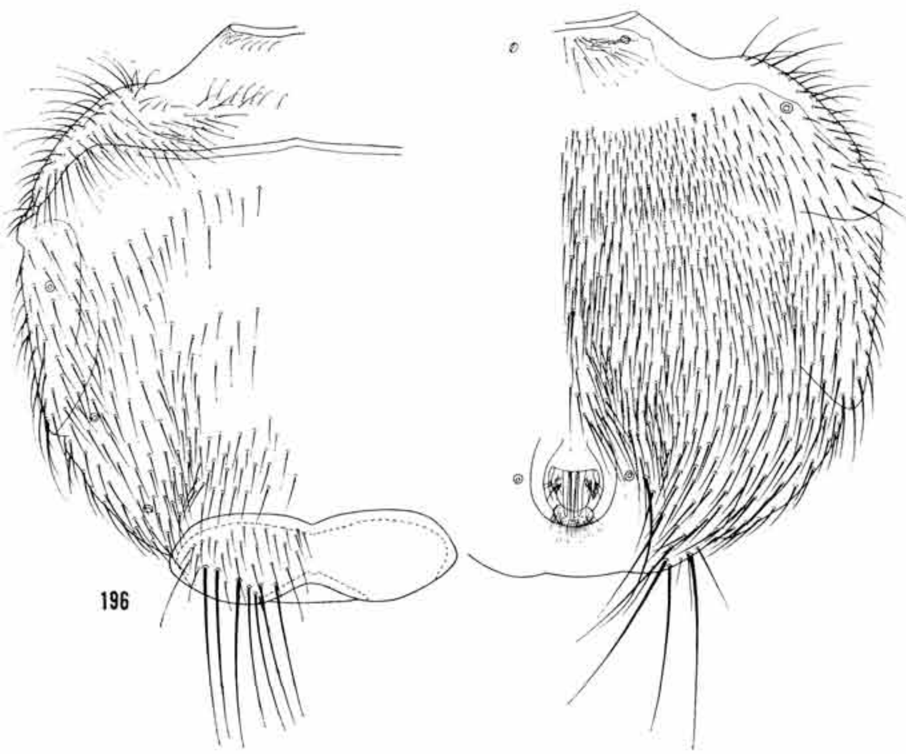

Fig. 196. *Icosta (Ornithoponus) antica* Maa, ♂ abdomen in dorsal and ventral views.

Prescutum not as described as above, either laterocentral setae, or lateral bristles, or both present; cell *2bc* much less than 1/2 as long as *1bc*; preapical tooth of tarsal claws closer to heel than to apical tooth....................6

Since *antica* is the sole representative of an isolated group, comparison against its congeners will be superfluous. A more detailed description follows.

♂. *Color* dark, wing uniformly fuscous, anterior veins brown, 3A similar in color to 2A. *Head* (fig. 191): Occipital margin straight; vertical bristle as long as notopleural bristle; postvertex short, truncate anteriorly, clearly separated laterally from inner orbits, median fovea virtually undefinable; postorbit moderately long, rather similar to that in *nigra* Perty. Face very wide, slightly widened at both ends; inner orbit raised, with uniseriate orbital setae. Frons proper short, deeply roundly notched at middle; frontal process in dorsal view broad at base, gradually narrowed apicad and with distinctly curved inner margin, in profile very gently rounded off into anterior margin of vibrissal area which is densely fringed with strong biseriate setae of uniform length. Palpus (fig. 192) ca as long as mediovertex, in profile gently curved and gently narrowed apicad. Vibrissal bristle single, distinctly longer and stouter than any other bristle on head and thorax. Gula posteriorly lined with long fine setae. Eye in lateral view of head widest near lower end. *Thorax* (fig. 193): Pronotum fairly long (for the genus) and narrow (not reaching laterally to level of inner margins of humeral calli). Anterior thoracic spiracle dorsolateral; humeral callus densely covered with setae of varied length and robustness. Prescutum densely finely striate all over, with 12± moderately long setae at each side arranged in single series (1 or 2 setae may be out of alignment) closely along lateral margin (i. e., between anterior spiracle and notopleural bristle), elsewhere of surface bare; transverse mesonotal suture oblique, hence median length of scutum equal to that of scutellum; prescutellar setae black, strong; scutellum with deep narrow median fovea and evenly and strongly curved posterior margin. Anepisternum, in dorsal view of thorax, distinctly widened posteriorly, with posterolateral corner much surpassing level of basal sclerites of wing in repose, surface setose, no strong bristles nor spines. Mesopleural concavity fairly deep; posterior part of mesopleurum with numerous short spines, practically no setae. Metapleurotergal callus with an oblique series of 5–6 strong setae plus a number of irregularly arranged ones. Prosternum triangular, ca as long as wide, moderately sclerotized, with 3 pairs of fairly strong black setae. Mesosternum anteriorly with pair of strong bristles and posteriorly with pair of submedian patches each of 4–5 fine short setae. Median length of metabasisternum much smaller than of corresponding furcasternum, latter with posterior margin evenly gently convex. Wing (fig. 194) 7.2 mm long, surface (incl. alula) uniformly setulose except a linear strip behind vein 3A; cell *2bc* ca 2× as wide and more than 1/2 as long as *1bc*, 2nd abscissa of R_{4+5} ca 2× as close to R_{2+3} as to M_{1+2}, extreme apex of R_{4+5} strongly curved to meet C, other details of venation as figured. Legs with setae much sparser than in *nigra*; coxa 1 almost entirely covered with short spines; femur 1 weakly swollen, anterior surface traversed at midlength by a series of 2–3 bristles, setae rather evenly distributed, those basad to bristle-series shorter and more or less erect. Tibia 2 ventrally with 4± preapical spines in single series. Basitarsus 2 ventrally with 4–5 peg-like spines in addition to ordinary spines and setae; basitarsus 3 slightly longer than 3 following segments together. Tarsal spines 1.1.2.0/3.3.2.1/14–16.5.5.4. Pulvilli each less than 1.5× as long as wide; claws (fig. 195) very small. *Abdomen* finely sparsely setose on dorsum, no spines on membrane and sclerites; tergite 3 absent, tergite 6 shallowly emarginate posteriorly and with 10± pairs of bristles; laterite 3 very distinct, oblong, slightly more than 2× as long as wide; gonapophyses much smaller and anal ring much shorter than in *nigra*; other details as in fig. 196–197. ♀ unknown.

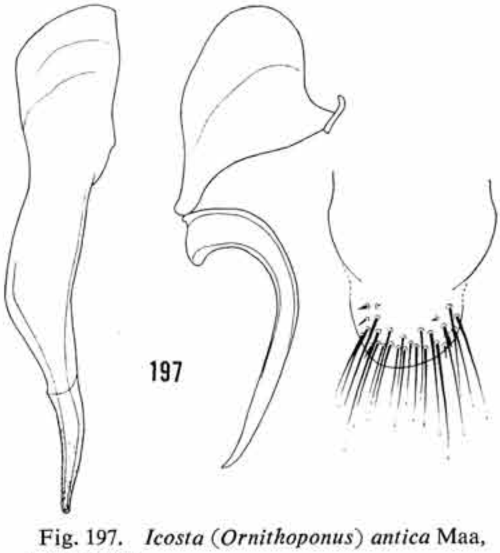

Fig. 197. *Icosta (Ornithoponus) antica* Maa, ♂ genitalia.