Pacific Insects Monograph 10: 10-124 November 30, 1966

THE GENUS *ORNITHOICA* RONDANI

(Diptera: Hippoboscidae)[1]

By T. C. Maa[2]

Abstract: The genus *Ornithoica* Rndn. of the world is here revised on the basis of examination of over 3,000 specimens in 20 different institutes and personal collections. It is divided into *Ornithoica* s. s. and *Lobolepis* n. subgen., with the former subdivided into 5 species-groups. Totally 22 species are recognized, with *zamicra* (New Guinea), *rabori* (Philippines), *bistativa* (Borneo etc.), *tridens* (Taiwan), *simplicis* (New Guinea etc.), *hovana* (Madagascar), *podargi* (New Guinea), *aequisenta* (New Britain etc.), and *punctatissima* (Solomon Is.), described as new. Each species is fully characterized and illustrated and its distribution, host preference and systematic affinities, discussed and analysed. A synoptic key, a short history of studies on the genus as well as selected bibliographies for different species are incorporated. In addition to 108 gynandromorphs (of 11 different species), also recorded are 17 new cases of sclerital and venational abnormalities; 36, of phoresy of Mallophaga; 126, of *Trenomyces* infections; and 190, of mite infestations. The gynandromorphism is apparently connected with the scarcity of males of the species in question and provides excellent specific characters. All gynandromorphs examined, except 1, are bilaterally symmetrical. The genus is primarily tropical and its occurrence in temperate countries is more or less seasonal. The distributional range is determined by both available, suitable hosts and microecology. The distributional center of Recent forms is in the Oriental Region, particularly the Papuan Subregion. The host range covers 17 orders, 59 families and 285 genera of birds, insofar as they have been determined. Of these, only about 11 orders and 24 families probably serve as true breeding hosts. Examples are given for a possible means to measure the host relationship of a certain species by computing the frequency and density of infestation by the fly. The theory of host-parasite evolutionary parallelism is not applicable here since many of the species are poly- or pleioxenous and the phenomena of multiple infestation of flies on same individual birds are frequent. The genus is closest to, but quite distinctive from, *Ornithophila* and *Ornithomya* and most probably has had a long evolutionary history. It represents the most generalized form of the Recent Hippoboscidae. Within the genus, the evolutionary trend is chiefly with the decreasing extent of chaetotaxy, sclerotization, and pigmentation which are clearly adaptative devices for the parasitic life.

A review of the literature on the genus *Ornithoica* Rondani 1878 in coordination to re-examinations of nearly all types had made it quite obvious that there exists much confusion regarding the nomenclature, distribution, and host preference as well as interrelationships of the various species. The latest revision, by Bau (1929), being hardly more than a compilation of inadequate published descriptions, proved to be not only outdated but also misleading. Therefore, it seems worthwhile to present my views on this subject so as to facilitate future workers, to stimulate more intensive collecting

1. Partial results of grants to Bishop Museum from the U. S. Public Health Service, National Institutes of Health (AI 01723-08), and USAMRDC DA-MD-49-193-62-G47 & G65.

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and to invite criticism and suggestions. The genus is apparently the most primitive in Recent Hippoboscidae and is the dominant group of this family in many tropical and subtropical countries. But owing to their minute body size, these louseflies generally have been overlooked by collectors and are consequently uncommon in collections. For instance, in 1962, I was able to find only a few dozen specimens each at the British Museum (Nat. Hist.) and U. S. National Museum, and not more than 10 each at the Genova, Paris, Stockholm and Wien Museums. Thanks to the cooperation of many correspondents and particularly to efforts of field collectors in recent years under the able supervision of Dr. J. L. Gressitt, the collection of the genus in Bishop Museum now constitutes the largest ever assembled. This collection formed one of the chief bases for my report. Other sources of materials for the study were from the Am. Mus. Nat. Hist. (AMNH), Brit. Mus. Nat. Hist. (BMNH), Calif. Acad. Sci. (CAS), Mus. Comp. Zool. Harvard (MCZ), U. S. Nat. Mus. (USNM), and the Amsterdam (AMS), Canberra (CSIRO), Chicago (CNHM), Firenze (FRZ), Genova (GNV), Køben havn (KBH), Leiden (LDN), Milano (MLN), Paris (PRS), Stanford (STF), Stockholm (STK) and Wien (WNM) museums and Kyushu Univ. (KU). Altogether over 3,000 specimens were studied. In the list of material examined under each species, all specimens are understood to be from Bishop Museum unless otherwise indicated. However, paratypes, as available, will be distributed to BMNH, CAS, MCZ, USNM and CSIRO. For brevity, the 2nd code symbols Bo, NG, PI and SI for BBM field numbers collected in Borneo, New Guinea, Philippines and Solomon Is. respectively are omitted, thus BBM 24525 stands for BBM-NG 24525 from New Guinea, and the like. For the same reason, the years of different collections are understood to be of this century unless the contrary is indicated, for instance X. 59 stands for Oct. 1959. In the descriptions, identical characters mentioned under genus, subgenus or species-group are not repeated under species. With few exceptions, the drawings were made from microscopic slides by using a camera lucida or microprojector. The prepuparia were described from those dissected out of mother flies. The bibliographies under different species are admittedly incomplete. Names, limits and arrangement of orders and families of birds are adopted from Mayr & Amadon (1951). In part of the New Guinean material, only vernacular names were available for host birds. To facilitate analysis of host data, guesswork of such names was undertaken, chiefly by consulting T. Iredale's "Birds of New Guinea" (1956. 280+261 pp., in 2 vols. Georgian House, Melbourne). Thus:

"Bower-bird": Ptilinorhynchidae. "Broadbill": Muscicapinae, Muscicapidae, probably *Peltops* sp., although the term generally refers to Eurylaimidae which are unknown in New Guinea. "Butcher-bird": Cracticidae, most probably *Cracticus cassicus*; the term butcher-bird is often applied in other countries for *Lanius*, Laniidae. "Cat-bird": Ptilinorhynchidae, most probably an *Ailuroedus*. "Cougal", or "Coucal" or "Couckle": Cuculidae, most probably *Centropus* sp. "Cuckoo-Shrike": Campephagidae. "Dollarbird": almost certainly *Eurystomus orientalis*, the only known Coraciid in New Guinea. "Echong": Pachycephalinae, Muscicapidae, probably a *Pachycephala*. "Friar-bird": Meliphagidae, probably a *Philemon*. "Frogmouth" or "Frogmouth-owl": Podargidae, perhaps including Aegothelidae. "Gracal" or "Grackle": Sturnidae, probably *Mino dumontii*, although the term is often used in other countries for *Coracina* (=*Graucalus*), Campephagidae. "Honeysucker": Meliphagidae. "Kokomo": almost certainly *Rhyticeros*

plicatus, the only Bucerotid known in New Guinea. "Kookaburra": Alcedinidae, probably *Dacelo leachii*. "Leatherneck": Oriolidae, probably *Oriolus szalayi*. "Lorikeet": Psittacidae; the "Rainbow Lorikeet" probably refers to *Trichoglossus haematodus*. "Nightjar": Caprimulgidae, probably a *Caprimulgus*. "Peewee": (?) a certain passerine bird. "Riflebird": Paradisaeidae, probably *Craspedophora* or its relative. "Satin-bird": Ptilinorhynchidae. "Shrike": most probably *Lanius schah*, the only Laniid known in New Guinea. "Wood-shrike": Pachycephalinae, Muscicapidae, probably a *Pitohui*; the term wood-shrike, however, generally refers to Prionopidae which are unknown in New Guinea.

Other common names in association with specimens, such as hawk, kestrel, falcon, kingfisher, plover, owl, dove, pigeon, cockatoo, crow, jay, flycatcher, sunbird, robin, thrush, warbler, wren, wagtail, honeyeater and bird-of-paradise, hardly need any explanation.

Acknowledgements: Without the most generous assistance I have received everywhere, the completion of this report would have been almost impossible. For the privilege of studying the material contained in the above-mentioned museums, my sincere thanks are due to V. Baldasseroni (Firenze), M. Beier (Wien), C. Conci (Milano), P. J. Darlington, Jr. (Cambridge, Mass.), P. R. Ehrlich (Stanford), J. L. Gressitt (Honolulu), D. Guiglia (Genova), D. S. Hill (London), E. Kjellander (Stockholm), G. Kruseman (Amsterdam), H. B. Leech (San Francisco), M. A. Lieftinck (Leiden), H. Oldroyd (London), S. J. Paramonov (Canberra), J. G. Rozen, Jr. (New York), E. Séguy (Paris), A. Stone (Washington, D. C.) and R. L. Wenzel (Chicago). I am also deeply indebted to Miss S. Nakata for her endless help with the handling of the material and manuscript, to R. Traub, R. E. Elbel and many others for material, information etc., to Miss M. F. Tan for her extraordinary patience in preparing the illustrations and to J. S. Kuo who has painstakingly counted and measured the body setae of various species.

HISTORICAL RESUME

Insofar as the systematics is concerned, more important events in the history of the genus are:

1812. Latreille described the first species of the genus, *turdi*, which was then placed under *Ornithomya*.

1823–68. Under *Ornithomya* again, the following *Ornithoica* spp. were described: *confluenta* Say 1823, *vicina* Walker 1849, *exilis* Walker 1861, *pusilla* Schiner 1868, *stipituri* Schiner 1868; and under *Stenepteryx*, *pygmaea* Macquart 1835.

1878. Rondani proposed the genus *Ornithoica* for n. sp. *beccariina*.

1892. von Röder described *podicipis*.

1900. Speiser reviewed the genus, redescribed the type species, described *unicolor* and compiled a key to 7 spp. but *pygmaea*, *vicina* and *exilis* were set aside.

1902. Speiser (1902 a) modified his earlier key to include n. sp. *distenta*. He (1902 c) also described n. var. *peroneura* (of *confluenta*).

1903. Austen suggested the synonymy of *beccariina* with *exilis* and possibly with *confluenta* and *vicina* too.

1908. Speiser assigned the genus to Ornithomyinae and provided a world checklist including *confluenta*, *exilis*, *podicipis*, *pusilla*, *stipituri* and *unicolor* (*pygmaea* remained

under *Stenepteryx*; for unknown reason, *turdi* was omitted). No synonymy was given but apparently he considered *distenta*=*stipituri*, *beccariina*=*exilis*, and *vicina*=*confluenta*.

1922. Bau compiled a new key to include n. sp. *melaleuca* and the following old ones: *turdi*, *confluenta* (plus var. *peroneura*), *pusilla*, *stipituri* (=*distenta*), *beccariina*, *podicipis*, *unicolor*; and as Speiser did, left out *pygmaea*, *vicina* and *exilis*. Meanwhile Ferris & Cole described *promiscua* and improved the study method by using microscopic preparations.

1927. Ferris described *philippinensis*.

1929. Bau revised his key and divided the genus into 2 groups, one solely for *unicolor* and another, for *confluenta* and *stipituri* (=*distenta*). The 2nd species was subdivided into 7 varr.: *turdi*, *confluenta* s.s. (=*vicina*), *exilis* (=*beccariina*), *pusilla*, *podicipis*, *peroneura*, *melaleuca*, leaving *pygmaea*, *promiscua* and *philippinensis* unmentioned. In the same year, Ferris redescribed the type species and on discovering strong sexual dimorphism in the genus, rectified his earlier determinations.

1932. Kishida described 5 n. spp. *momiyamai*, *distincta*, *nipponensis*, *kibitaki* and *diomedeae*, all under *Ornithoica* but actually only the first 2 spp. were correctly placed.

1941. Bequaert synonymized *peroneura* with *pusilla*.

1942. Bequaert established Ornithoicinae solely for the genus.

1953–54. Bequaert summarized and analysed host records of the genus, listed 7 spp.: *turdi*, *confluenta*, *vicina*, *pusilla*, *stipituri*, *unicolor*, *philippinensis* (*pygmaea*, *exilis*, *momiyamai* and *distincta* were left out); recharacterized in detail the subfamily and genus and monographed the American spp.: *confluenta* (=*beccariina*, =*podicipis*), *vicina* (=*promiscua*, =*melaleuca*), and described puparium of *vicina*.

1962. Maa synonymized *momiyamai* and *distincta* with *exilis*.

1963. Maa re-examined type specimens of almost all species, suppressed *pygmaea* and *philippinensis* as synonyms of *turdi* and *exilis* respectively and presented a synonymic list for the world. The genus was divided into 2 groups, one for n. spp. *curvata*, *hirtisternum* and *submicans*, and another, for all 9 old ones. In the same year, Theodor described ♂♀ terminalia and gynandromoiphs (⚤) of *turdi*.

1964. Theodor & Oldroyd placed the genus under Hippoboscinae, Ornithomyini.

In short, altogether 20 nominal species (incl. 1 var.) for the genus have been described: By Bau (1922; 1 sp.), Ferris (1927 c; 1), Ferris & Cole (1922; 1), Kishida (1932; 2), Latreille (1812; 1), Maa (1963; 3), Macquart (1835; 1), von Röder (1892; 1), Rondani (1878; 1), Say (1823; 1), Schiner (1868; 2), Speiser (1900, 1902 a, 1902 c; 3) and Walker (1849, 1861; 2). Species published prior to erection of the genus (1878) were originally placed under *Ornithomya* and *Stenepteryx*. On the other hand, there were 3 nominal species originally assigned to but later removed from *Ornithoica*. The genus was first placed in the Ornithomyinae; then, made the sole representative of the Ornithoicinae; and more recently, placed under Hippoboscinae, Ornithomyini. Synopses of the species for the world have been provided by Speiser (1900, 1902 a) and Bau (1922, 1929); checklists by Speiser (1908) and Maa (1963); and summation of host records, by Bequaert (1953 a). Recent regional revisions were by Bequaert (1954) and Theodor & Oldroyd (1964) for American and Palaearctic forms respectively, and by Maa (1963) for the *O. curvata*-group (Oriental). The puparium was first described by Bequaert (1954)

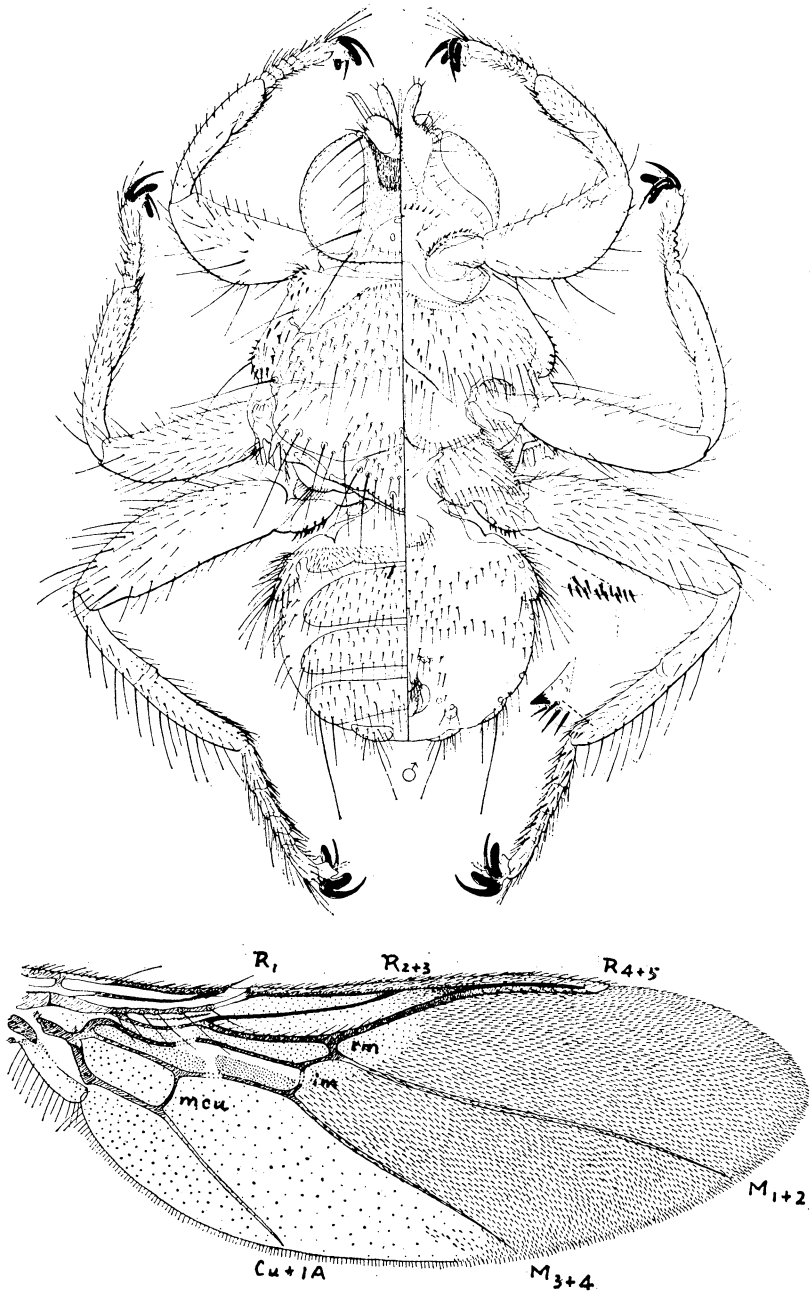


Fig. 1. *Ornithoica exilis* Wk., ♂ (New Hebrides), with left and right halves of upper figure representing dorsal and ventral aspects respectively. (After Ferris 1927 Ins. Samoa **6** (1): 12–13, originally labeled as *O. pusilla* Schin.) (Venational notations are mine).

for 1 species. Sexual dimorphism was first discovered by Ferris (1929); gynandromorphism, noted independently by Theodor (1963) and Maa (1963), and the importance of microscopic preparations for study stressed by Ferris & Cole (1922).

MORPHOLOGY

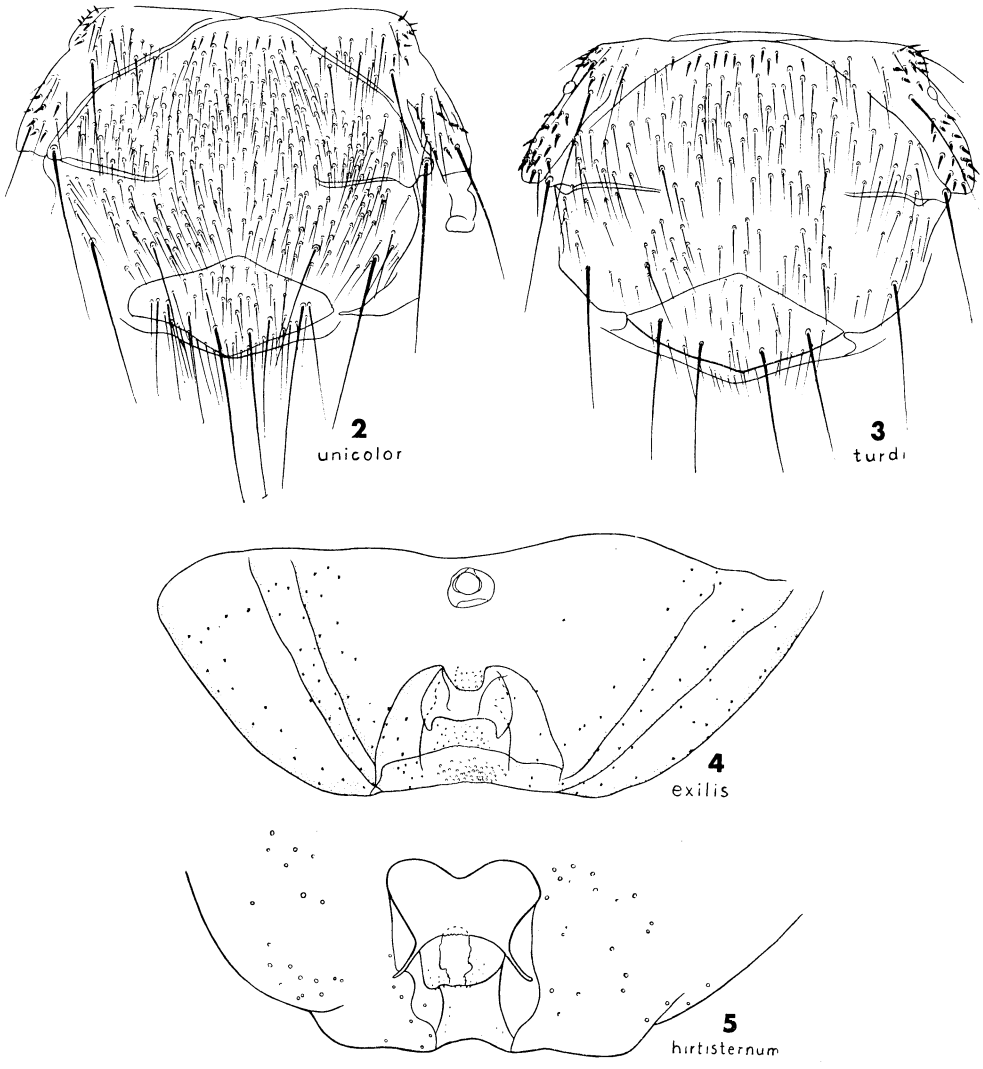
The generic characters of *Ornithoica* have recently been enumerated by Bequaert (1954: 86–89) and Theodor & Oldroyd (1964: 30–31). They are repeated here to make this paper more complete and to offer explanations to the terminology (largely modified from Bequaert *l. c.*) used in the paper. The internal anatomy of the genus is unstudied.

Body small (head+thorax 1.3–3.3 mm long, wing 1.9–4.5 mm long), moderately flattened, moderately setose, rarely with metallic luster, with relatively large head and ample wings, moderately long legs, and large abdominal tergal plates. Membranous area of abdomen without striae and other dermal micro-ornamentation.

Head in front view transversely elliptical, in lateral view almost as high as long and with upper margin anteriorly gently curved downward; hind margin almost vertical and lower margin almost horizontal. Eye large, strongly convex, reaching hind margin of head (in dorsal view). Ocelli well developed. Postvertex widely separated from inner orbit. Vertical bristle arising from short erect tubercle. Inner orbits very narrow, subparallel. Frons short, anteriorly truncate; interantennal area very small. Antennal segment 1 large, separated from lunula by complete suture, with its inner margin of left antenna touching that of right antenna; arista flattened, apically slightly widened and spatulate; antennal pit open, single, not paired. Palpus short, about as long as antenna.

Thorax in dorsal view transverse and with anterior margin gently concavely curved, in lateral view slightly longer than high and with surface only slightly hollowed out lengthwise for receiving femur 1 in repose. Pronotum not or hardly visible from above; humeral callus hardly projecting; anterior spiracle roundish, dorsolateral. Transverse mesonotal suture situated before hind 1/3 of mesonotum, broadly interrupted at middle; no median notal suture. Notopleurum separated from prescutum by complete suture; anepisternum in dorsal view broadly rounded posterolaterally. Scutellum large, lozenge-shaped. Metathoracic pleurotergite (=metanotal callus) weakly swollen. Prosternum long, trapezoid, anteriorly truncate or very weakly emarginate, very seldom acute or subacute, never clearly bilobed; no prothoracic presternum. Metasternum with no posterolateral lobe projecting over coxa 3.

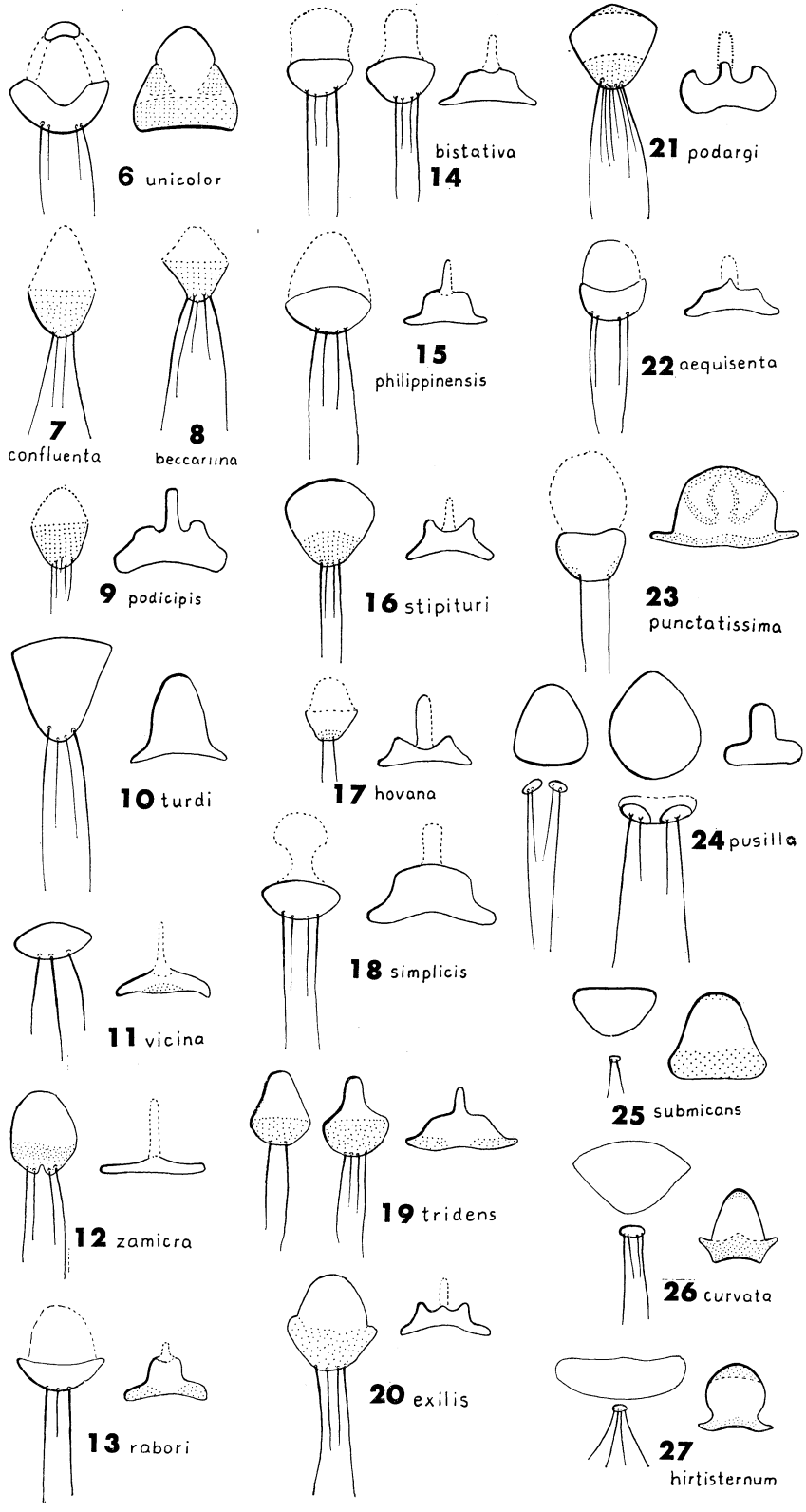
Wing non-caducous, setulose apically, densely ciliate along full length of anal margin; venation (Figs. 1, 60) almost complete (for the family), with R-branches and basal sections of M-branches crowded together toward costal margin and with apex of M_{3+4} almost equidistant to apices of M_{1+2} and Cu+1A; R_{2+3} not much longer than R_1; apical section of R_{4+5} bent forward, almost contingent with C; M_{1+2}, *im* and M_{3+4} with bullae; 3 crossveins (*rm*, *im*, *mcu*); 2A not definable; anal cell long, with its anal margin very gently curved; alula well developed, fringed with long setae; both upper and lower calypteres rudimentary.



Figs. 2–5. *Ornithoica* species, density and distribution of dorsal thoracic setae of adults (2, *unicolor* Speis. ♂; 3, *turdi* Latr. ♀) and posterior part of larvae in ♀ uteri (4, *exilis* Wk.; 5, *hirtisternum* Maa).

Legs moderately robust. Femur 1 swollen; 2 slightly longer than 1 but distinctly shorter than 3. Tibiae scarcely flattened, each ventrally with a longitudinal series of large pores bearing very short fine sensory setae. Tarsus 3 much longer than 1 and 2, with segments 1 and 5 subequal in length, and with inner apical lobe of segment 4 much more produced than outer one. Claws simple; pulvilli large; empodia feather-like.

♀ *Abdomen* with 4, very seldom 3 undivided (not medially interrupted) median tergal plates (here termed tergites 3–6 or 3–5). Tergites 1 and 2 fused together (here termed

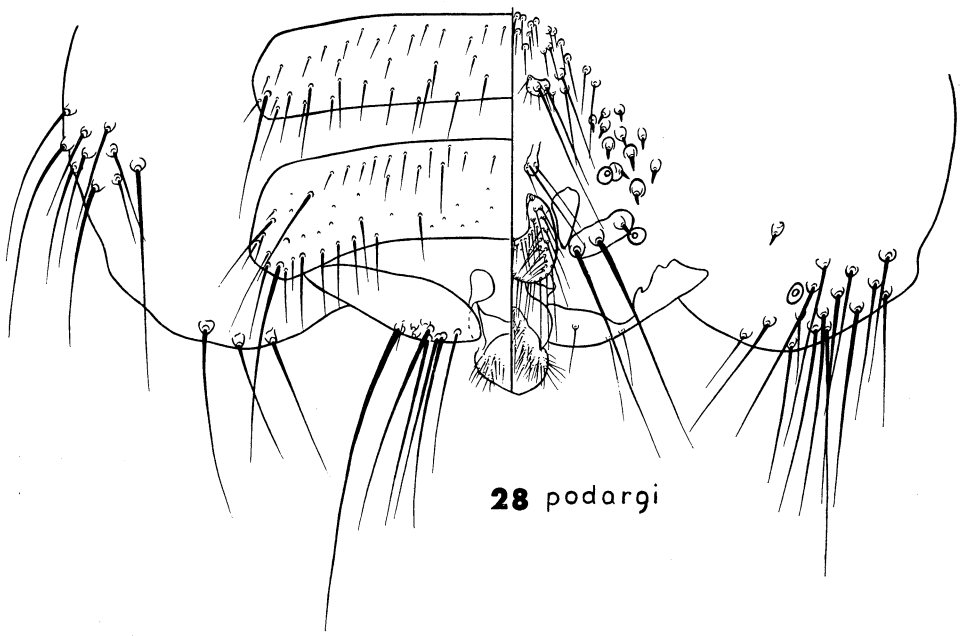


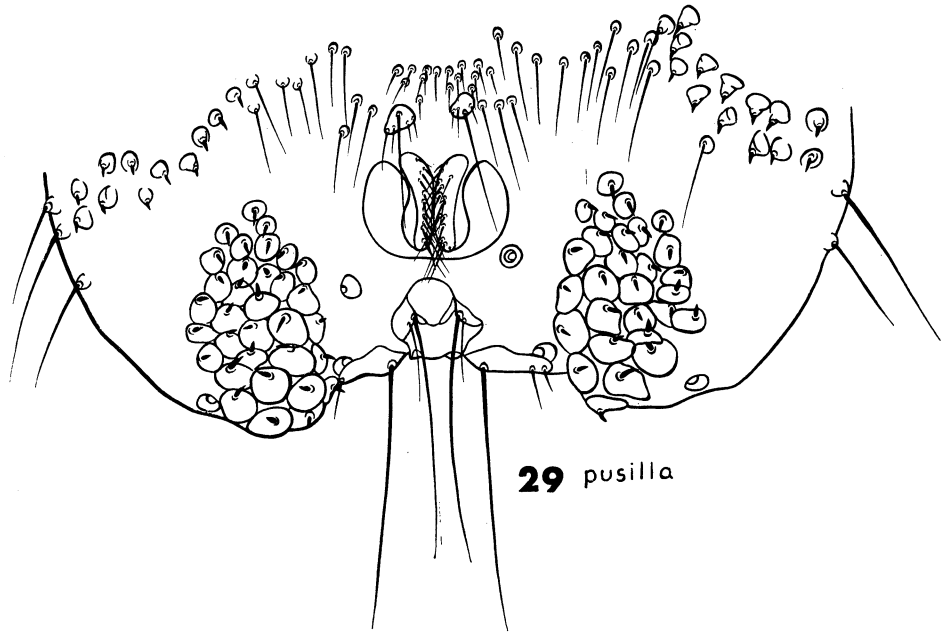
Figs. 6–27. *Ornithoica* species, ♀ supra-anal and pregenital plates. Drawn to different scales, darkened and more sclerotized areas represented by dotting.

syntergite 1+2), less sclerotized than laterites 1–2, posteriorly always weakly trilobed; laterite 2 moderately large, broadly rounded posteriorly, fused together with syntergite 1+2 and laterite 1 but definable from them by deep sinus and by degree of sclerotization and hairiness respectively. Tergites 3–5 almost as wide as head; tergite 3 generally shorter than but about as wide as 4 and 5, rarely anteriorly bilobed; tergite 6 longer but narrower than preceding ones, rarely posteriorly produced at middle, very seldom broadly interrupted at middle. Supra-anal plate (? tergite 7) well developed, composed of 2 pieces which are either fused together or set widely apart. Laterites 3–6 all absent, but often indicated each by a small group of setae on lateral membranous area near corresponding spiracles, very seldom (in laterite 6 only) by a very tiny plate bearing 2 or 3 setae. Laterite 7 (perhaps more appropriately termed pleurotergite 7) large, transverse, lying at side of anus, bearing spiracle 7 (of abdomen) near posterolateral corner. Anal ring well developed, uniformly narrow, interrupted dorsally by supra-anal plate and ventrally by infra-anal plate. Sternite 1 well sclerotized; sternites 2–4 each represented by 2–3, rarely 4 rows of fine setae largely uniform in length and robustness; sternites 5–6 entirely undefinable, but in certain specimens and species, a pair of small multisetose tubercles before pregenital tubercles perhaps representing sternite 6. Pregenital tubercles (probably representing sternite 7) paired, pregenital plate (sternite 8) single and usually ⊥-shaped, both always present and well sclerotized, latter often partly concealed inside genital orifice. Postgenital and infra-anal plates tightly fused together, latter small, less sclerotized and posteriorly 2 (very seldom 3) lobed.

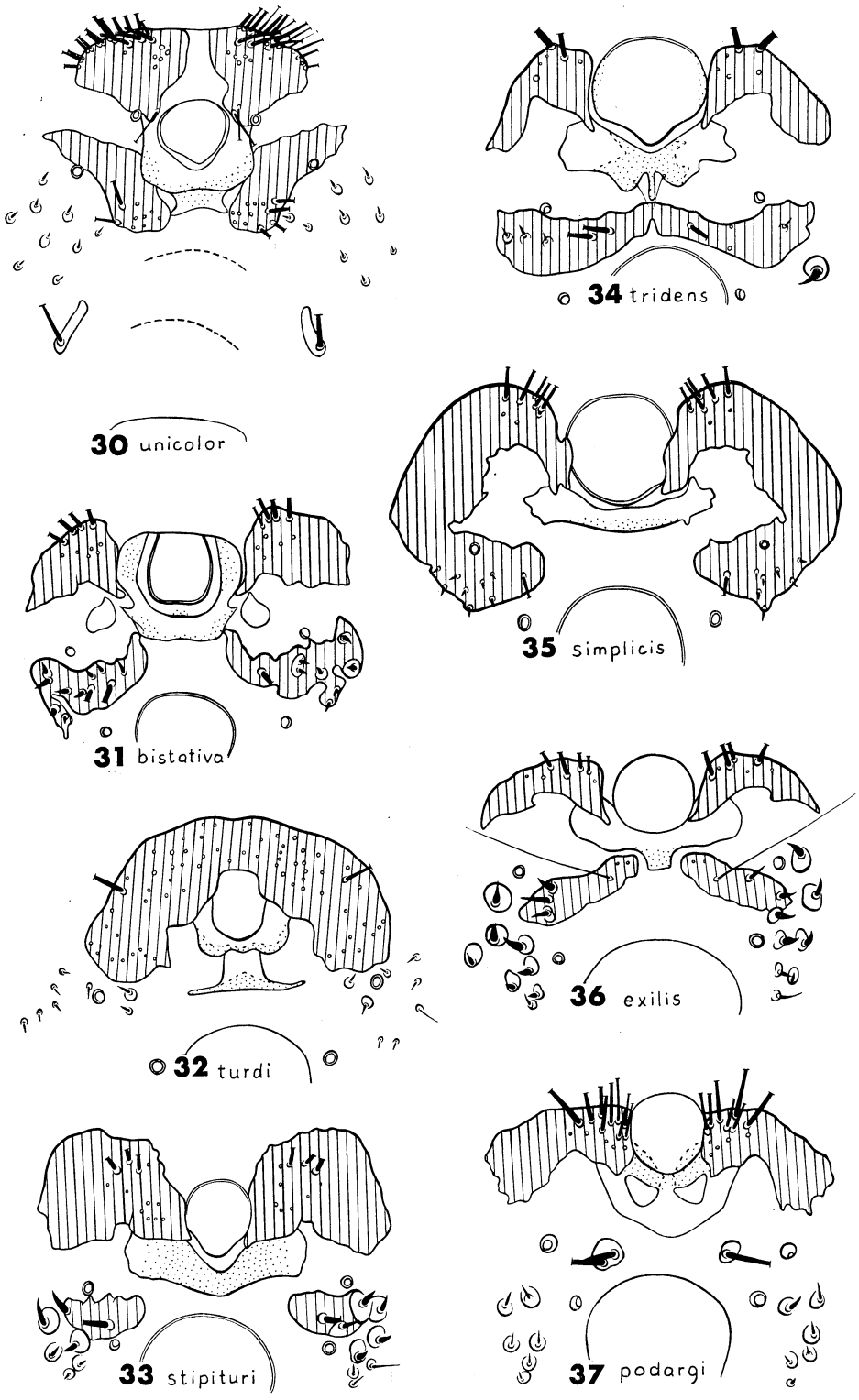
♂ *Abdomen* with 3, rarely 4 undivided median tergal plates. Syntergite 1+2 and laterites 1–2 as in ♀; tergites 3–5 longer in proportion than in ♀; tergite 3 never bilobed anteriorly; tergite 6 generally widely divided into a pair of side pieces, never posteriorly produced at middle; when (rarely) undivided, then attenuate at middle. No supra- and infra-anal plates. Laterites 3–5 as in ♀, 6 usually present, 7 absent, hence spiracle 7 lying on membranous area. Anal ring not uniform in breadth and in sclerotization, ventrally much wider and slightly interrupted at middle. Sternites as in ♀, but immediately before pregenital tubercles usually lying a small transverse patch (seldom 1 pair of roundish patches) of dense extra-fine setae, possibly representing sternite 6. Pregenital tubercle also paired, but weakly sclerotized. Pregenital plate lunate, fairly large. Gonocoxite small, weakly sclerotized too. Aedeagus gently curved in profile, laterally sclerotized; paramere setose, in profile elongate-triangular and generally weakly curved near apex.

Abdomen of Gynandromorph (⚥). Rather similar to that of ♂ (but tergite 5 very seldom narrowly interrupted at middle), with at least 3 urogenital openings. ♀ anal ring often strongly protruded, greatly widened and very densely microsetose; no ♀ supra-anal plate; ♀ infra-anal plate usually large, rarely with 1 or 3 strongly sclerotized anterior lobes (? ♀ pregenital plate); side piece of tergite 6 more or less strongly tuberculate near inner end. Laterite 6 either entirely absent and leaving ♀ pregenital tubercle and spiracle 6 free, or developed into large transverse sclerite enclosing above-mentioned tubercle and spiracle, and bearing anchor-like spines; ♂ anus, genitalia and pregenital tubercle as in normal ♂.





Figs. 28–29. *Ornithoica podargi* Maa (28, dorsal and ventral aspects) and *O. pusilla* Schin. (29, ventral aspect), ♀ abdominal apices.



Figs. 30–37. *Ornithoica* species, caudoventral aspect of ♀ abdominal apices. Drawn to different scales; fine pale setae on anuses omitted, ordinary ones represented by setigerous punctures; moderately sclerotized areas dotted, heavily sclerotized areas vertically lined.

Chaetotaxy differing from that in related genera in having many spines (here referring to short, very robust, shining black, pointed modified setae) on various parts of body, those near base and apex of abdominal venter more or less curved and with unusually large, prominent, anchor-like basal papillae or tubercles. Inner orbit with 2–3 bristles (here referring to very long and robust modified setae) and some ordinary short fine setae in 1 or more irregular series; postvertex generally setose; jugular bristles 3–4 pairs; antenna apically with only 2–3 long bristles; no spines lining postgenal margin; gula with 1 pair of spines on anterior margin of occipital foramen and a group of 10–20 spines in front of that margin and arranged in 1 complete, rarely 2–3 complete, or incomplete rows. Mesonotum rarely uniformly setose, often bare at and near anterior

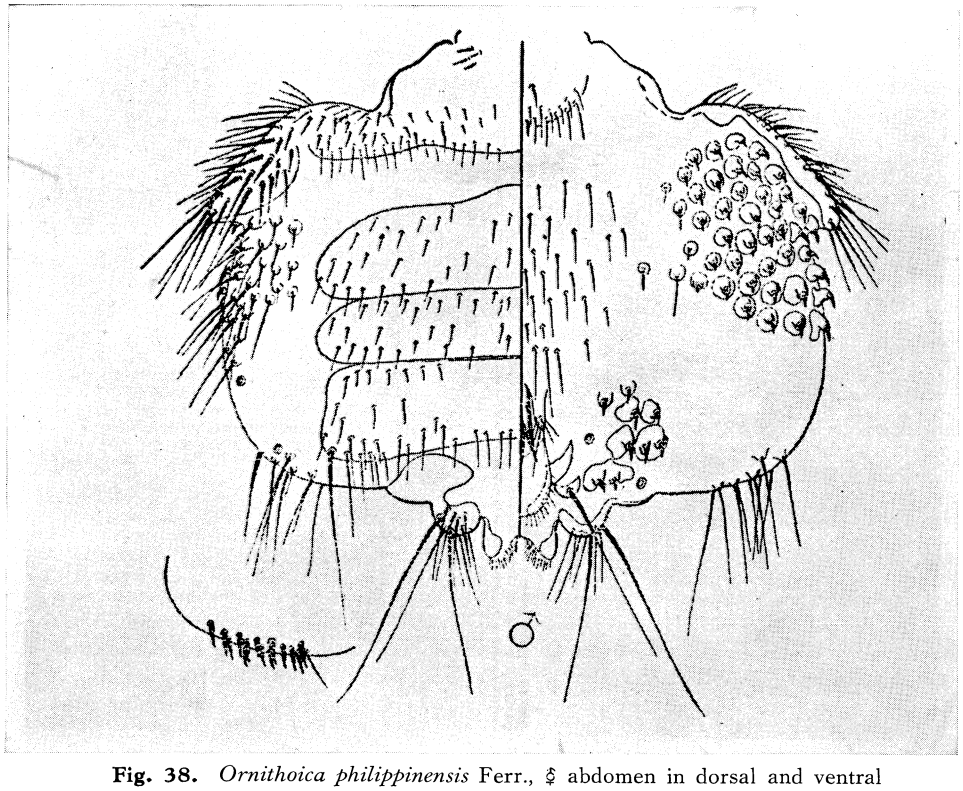


Fig. 38. *Ornithoica philippinensis* Ferr., ♀ abdomen in dorsal and ventral aspects. (After Ferris 1927 Philip. J. Sci. 34: 210, originally labeled as ♂).

part of scutum; 3–4 humeral, 1 notopleural, 1 mesopleural, 2–3 postalar, and 1 posterior dorsocentral bristles; prescutum with 1 anterior row of spines and generally with pale recumbent setae uniform in fineness and length but those of hindmost row darker and longer; setae lying between posterior dorsocentral bristles usually fine and short. Scutellum usually with similar fine setae as on prescutum, and with 2 pairs of very long preapical bristles in alignment of which there are often 2–4 pairs of slightly or much shorter minor bristles. Humeral callus and anepisternum, as in related genera, with some strong spines. Metathoracic pleurotergite with single series of long dense bristles.

Prosternum bare; meso- and metasterna with scattered spines in addition to setae of varied length and robustness. Coxa 1 anteriorly with many spines; trochanter 3 in ♂ and ♀ of *Ornithoica* s.s. with 1–15 spines on hind inner margin; femora all thinly and unevenly setose; tibiae 1 and 2 each with 1 strong apical spur; tibia 3 with 3–9 spines in alignment with and not well differentiated from apical spur, and in ♀, usually with several preapical spines on inner surface; tarsi 1 and 2 each with 3–5 irregularly arranged moderately strong spines under segment 1, and 1 pair of weak spines under each of segments 2–4; segments 1–4 of tarsus 3 ventrally each with 3 (2 inner, 1 outer) strong spines near apex, in addition, segment 1 with 2–3 spines near base. Abdominal syntergite 1+2 with only ordinary setae; laterite 2 with strong setae in addition to some apical bristles; tergites 3–6 sparsely setose, generally with 1–3 bristles near posterolateral corner; tergite 6 in ♀ often with a dense tuft of strong bristles on above-described

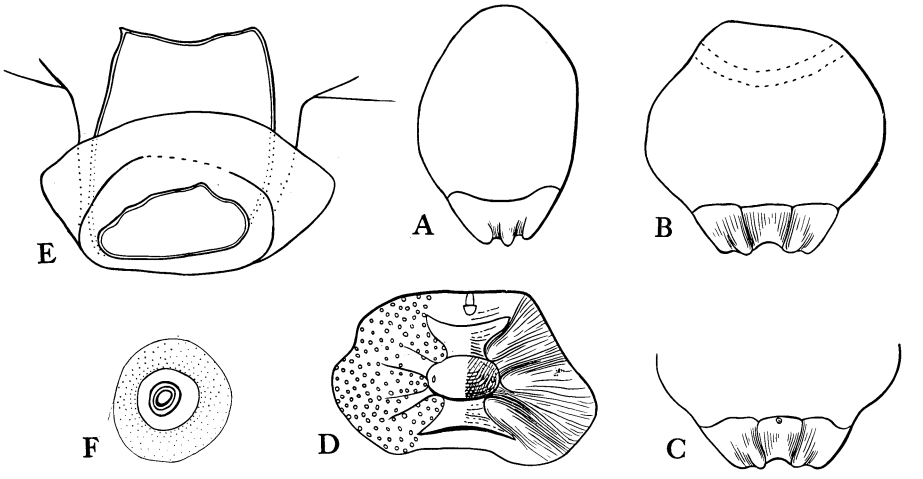


Fig. 39. *Ornithoica exilis* Wk., prepuparium dissected out from ♀ uterus. A, lateral aspect; B, dorsal aspect; C, ventral aspect of posterior part; D, caudal aspect of "cap" with left half showing distribution of spiracular pores and right half showing concavities and convexities; E, ventral orifice; F, spiracular pore. A, B and C drawn to same scale; E, F more enlarged, also drawn to same scale.

side-piece. Lateral membranous area entirely or largely bare, usually with a conspicuous setal tuft (here termed para-anal setal tuft) near spiracle 6 (♀) or 5 (♂, ♀). Sternite 1 setose, with several irregularly arranged spines; ventral membranous area in ♀ and ♀ with 3 groups of anchor-like spines, 2 (1+1) near spiracles 2–3 at both sides and another near urogenital openings; spines of latter group varying in number, size and arrangement according to species, part of them often merged to form multispinose warts; disc of venter with only ordinary recumbent setae (often pale and fine); pregenital tubercle almost always with 1 or more strong bristles and some short setae, rarely also bearing spines.

Color Pattern fairly uniform in the genus. Head pale, darkest at antenna, palpus and postvertex. Thorax dorsally dark, in *Lobolepis* with metallic luster; humeral callus

and anepisternum pale; lateral surface also pale, with a broad dark longitudinal stripe below anepisternum; ventral surface pale. Wing pale. Tibiae 1 and 2 ventrally each with an inconspicuous whitish cross band; tibia 3 and tarsus 3 each with 2 whitish rings. Abdominal tergites usually slightly paler than mesonotum, in *Lobolepis* with metallic luster.

Puparium slightly flattened, bare, in dorsal view broadly elliptical, hardly widened posteriorly, lateral margin not or scarcely keeled. Posterior "cap" with broad deep median groove and very deep central pit; each side of median groove divided into 3 sectors by rather shallow grooves; median groove and central pit very heavily sclerotized and deeply pigmented, former either microalutaceous or microspinose, latter with a pair of lateral pores; sectors each covered with 15–50 scattered spiracular pores; grooves separating sectors deeper and with fewer pores at inner ends.

Sexual Dimorphism. Before the discovery by Ferris (1929) of sexual dimorphism in the genus, most authors did not even care to distinguish the sexes, chiefly due to the difficulty of examining such characters in pinned specimens. In comparison with other hippoboscids, dimorphism in *Ornithoica* is remarkably strong. The body size (in terms of wing length) and color pattern are alike in both sexes. The interocular face in ♂ is often slightly narrower, in proportion to width of eye, than in ♀. The trochanter 3 in ♂ *Ornithoica* s.s. almost always has a patch of spines on inner hind margin, and tibia 3 in ♀ of the same subgenus has 1 series of preapical spines on inner surface. However, the more important and conspicuous sexual characters in the genus are on the abdomen, *i.e.*, the number, size and shape of sclerites and presence or absence of anchor-like spines. Apart from the terminalia, the ♂ has no tergite 7, supra-anal plate, infra-anal plate, and anchor-like spines, but often has laterite 6, a patch of extra-fine setae before pregenital tubercles, and an arcuate series of setae near spiracles 6 and 7. Its tergite 3 is always similar in size and shape to 4 and 5, tergite 6 never strongly produced caudad, but either attenuate or broadly interrupted at middle. On the contrary, the ♀ has tergite 7 etc. but no laterite 6 etc. and its tergite 3 (in subgen. *Lobolepis*) anteriorly strongly bilobed and tergite 6 usually entire and rarely posteriorly strongly produced at middle. The function of these sexual characters is not clear, although their possible connection with mating and pre-mating behaviors of these flies cannot be ruled out.

Gynandromorphism. The first gynandromorphic *Ornithoica* was described and illustrated by Ferris (1927c: 210, fig. 3, as *O. philippinensis*) who nevertheless failed to realize the existence of gynandromorphism in the genus. Obviously, this phenomenon is fairly common in *Ornithoica* s.s. although unknown in other hippoboscids and I have at hand 108 gynandromorphs (⚥) belonging to 11 different species (Theodor had 3 ⚥ of *O. turdi* from Uganda). All but 1 ⚥ are symmetric with normal ♂ genitalia and ♂ characters in trochanter 3 and in tergal plates, and ♀ characters in anchor-like spines. They differ from normal ♀♀ and ♂♂ in having both ♀ and ♂ anuses and pregenital tubercles, and usually a pair of large strong tubercles each bearing a dense tuft of long bristles, and often in having a pair of unusually enlarged laterite 6, which may embody the ♀ pregenital tubercles as well as part of the anchor-like spines. The ♀ anus has no supra-anal plate but its infra-anal plate and anal ring are often enlarged or length-

ened. I am uncertain as to whether the ♀ anus is functional, and the ♀ genital orifice, existing. But the ♂ anus and ♂ genitalia are apparently normal and functional (excrements were noted on ♂, but not ♀ anus in some ⚥⚥). I believe that the ⚥⚥ are closer to normal ♂♂ and presume they were originally destined to be ♂♂. The cause of such symmetric gynandromorphism is unknown but it is apparently connected with the sex ratio and perhaps with certain genetic abnormality. In the subgenus *Lobolepis*, the sex ratio is nearly balanced and no ⚥⚥ are known. But in *Ornithoica* s.s., the ⚥ ratio of the various species is more or less in reverse proportion to ♂ ratio (Table 1).

Table 1. Sex ratio of *Ornithoica* species

	Specimens Examined			Sex Ratio (%)[1]	
	♂♂	♀♀	⚥⚥	♂	⚥
Subgenus *Ornithoica* s.s.	859+	1709+	107+	32.3	4.5
unicolor Speis.	8	28	1	22.5	3.2
confluenta Say	—	4	—		
podicipis Röd.	1	9	—		
beccariina Rndn.	—	6	—		
turdi Latr.	35	61	3	30.5	3.0
vicina Wk.[2]					
zamicra n. sp.	24	36	—	40.0	0
rabori n. sp.	3	7	—	30.0	0
bistativa n. sp.	40	80	4	32.2	3.6
philippinensis Ferr.	13	23	1	35.1	2.7
stipituri Schin.	169	297	10	28.3	2.1
tridens n. sp.	69	109	11	39.2	6.2
simplicis n. sp.	9	39	4	17.3	7.7
hovana n. sp.	1	3	—		
exilis Wk.	462	854	84	35.1	3.7
podargi n. sp.	21	134	23	11.8	12.9
aequisenta n. sp.	1	6	—		
punctatissima n. sp.	1	1	—		
pusilla Schin.	3	12	2	17.6	11.7
Subgenus *Lobolepis*	66	77	—	47.1	0
submicans Maa	9	12	—	45.0	0
curvata Maa	47	52	—	47.4	0
hirtisternum Maa	10	13	—	40.9	0
Total (not incl. *vicina*)	925	1786	107		

1. Sex ratios for species with less than 10 available specimens are not given.
2. Ca. 400 specimens of *vicina* Wk. have been briefly examined by me at MCZ and other collections but the exact numbers of the different sexes were not recorded. The sex ratio is therefore not given here.

The only asymmetric ♀ before me is an example of *O. stipituri* from Queensland ex *Craspedophora*. The trochanter 3 is spineless on left and spined on right leg; tergite 6 narrowly interrupted at middle, with left side-piece more weakly setose than right one; abdomen at left side with para-anal setal tuft, anchor-like spines, multispinose wart, laterite 7 and pregenital tubercle as in normal ♀; abdomen at right side with no para-anal setal tuft, anchor-like spines, multispinose wart and laterite 7, but ♂ genital tubercle, laterite 6 and arcuate series of setae near spiracles 6 and 7 as in normal ♂; on the other hand, the anus and genitalia are normal for ♂. Thus even in this asymmetric example, it was apparently originally destined to be ♂ sex.

Specific Characters. Specific characters in the genus are chiefly in the chaetotaxy and sclerotization of the abdomen. Aside from these, the wing length, venation and thoracic chaetotaxy are useful although slightly variable. The extent of wing-setulae is hardly more than a subgeneric character. In the following descriptions, all relative measurements are at the magnification 50 micrometric units to 1 mm; the width of face *vs* eye is understood to be the minimum width of interocular face (incl. inner orbits) *vs* maximum width of eye, both measured in front view of head; the cell *3bc* is termed narrowed basad when its anterior and posterior margins, *i.e.*, M_{3+4} and Cu+1A excluding oblique sections at their extreme bases, are convergent toward wing-base; the countings of setal rows are admittedly arbitrary. For convenience, the center of anus (in ♀, of ♀ anus) is considered the hypothetical demarcation point of abdominal dorsum and venter. Consequently, abdominal spiracle 7, laterite 7, infra-anal and postgenital plates in ♀, spiracles 6 and 7 in ♂, and the same spiracles, laterite 6, infra-anal plate and ♂ anus in ♀ are considered as if on the ventral surface; and, the terms "anterior" and "posterior" of such structures in the descriptions are not in a morphological sense. To avoid confusion, the ♀ anus, ♀ pregenital tubercle and ♂ pregenital tubercle in ♀♀ are termed, in the specific descriptions as well as synoptic key, as posterior anus, posterior pregenital plate and anterior pregenital plate respectively (infra-anal plate is associated only with posterior anus, hence it is not prefixed with "posterior"). As a rule, ♀ characters in the various species are most distinctive, and the ♂ ones, least distinctive. In a number of species, particularly those of the *exilis* groups, ♂♂ are hardly distinguishable from one another except slight differences in body size, chaetotaxy and genitalia.

Teratology. Bequaert (1954: 96, fig. 23 C–E) has illustrated venational abnormalities in *O. vicina*. To these, I am adding 17 cases of both sclerital and venational teratology to be described under their respective species.

TAXONOMIC ACCOUNT

Ornithoica is divided here into 2 subgenera, 6 species-groups and 22 species. Further intensive collecting probably will reveal several more species. No subspecies are recognized here since our knowledge of this genus is still too fragmentary.

KEY TO SUBGENERA, SPECIES-GROUPS AND SPECIES OF ORNITHOICA

1. Wing-setulae practically covering entirety of cells *3r* and *1m* and forming small to medium-sized patch (-es) at apex of cell *2m*; 1st and last median tergal plates (tergites 3 and 5 in *pusilla*, 3 and 6 in all other species) in ♀ both normal, transversely straight and similar to others in shape and size; trochanter 3 in ♂ and ♀ almost always with cluster of spines on hind inner surface; thoracic dorsum with no metallic luster. Gynandromorphism strong. (Subgenus *Ornithoica* s. s.). 2

Wing-setulae confined to apical 1/2 of cell *3r* and forming very small patches in cells *1m* and *2m*; 1st and last median tergal plates (tergites 3 and 6) in ♀ much larger and different from others, with 1st plate strongly produced into 2 anterior lobes and last plate, into posterior median lobe; trochanter 3 in ♂ without spines; thoracic dorsum with strong metallic luster. Gynandromorphism unknown. (Subgenus *Lobolepis*). 20

2(1). Supra-anal plate in ♀ with anterior and posterior pieces clearly separated and both crescent in outline, leaving large roundish membranous interspace; prosternum anteriorly acute or subacute; anchor-like spines near abdominal apex in ♀ and ♀ scattered and all markedly smaller than those near abdominal base, no multispinose warts; wing 3.9–4.4 mm long, cell *3bc* ca. 3 × as long as wide and distinctly narrowed sub-basad (*unicolor*-group). . . . . **unicolor**

Supra-anal plate in ♀ never as above described, anterior and posterior pieces tightly fused together, seldom separated by linear membranous interspace; prosternum anteriorly truncate or weakly emarginate; anchor-like spines not as above, generally not or hardly smaller than those near abdominal base (when very seldom markedly so, then entirely or mostly clustering together to form multispinose wart at a side), multispinose warts often present; wing varied in length, cell *3bc* ca. 2–3 × as long as wide, not or hardly narrowed sub-basad. 3

3(2). Abdominal tergite 6 in ♀ widely divided into side pieces (hence only 3 undivided median tergal plates); tergite 5 in ♀ narrowly so; anchor-like spines near abdominal apex in ♀ and ♀ more than 45 in number and forming at each side, a large roundish compact cluster, their basal papillae unusually enlarged and almost touching one another; abdominal spiracle 7 in ♂ markedly larger than 6; laterite 6 in ♂ longitudinally linear. (*pusilla*-group). . . . . **pusilla**

Abdominal tergite 6 in ♀ entire (hence 4 undivided median tergal plates); tergite 5 in ♀ entire; anchor-like spines near abdominal apex in ♀ and ♀ usually less than 35 in number, never forming compact cluster as above described, their basal papillae normal, not distinctly larger than those near abdominal base but either far from touching one another or (as in *turdi*) forming together large multispinose warts; abdominal spiracles 6 and 7 in ♂ of similar size; laterite 6 in ♂, when present, roundish. 4

4(3). Wing-setulae covering more than 1/2 of cell *2m* and extending to apical 1/2 or more of *2r* and to apical margin of *a*; mesoscutum except small areas at its anterolateral corners, as densely setose as prescutum and scutellum. (*confluenta*-group). 5

Wing-setulae covering much less than 1/2 of cell *2m*, generally forming very small patch near its antero-apical corner; cell *2r* (except in *podargi*) at most setulose at extreme apex; cell *a* entirely bare; disc of mesonotum including anterior part of scutum largely bare, in contrast to surrounding areas. 7

5(4). Bare area of cell *2r* extending apicad at most to level of vein *rm*; bulla of M_{1+2} much closer to base than to apex of *2bc*; posterolateral margin of supra-anal plate in ♀ obliquely straight. Oriental and Australian Regions. . . . . **beccariina**

Bare area of cell *2r* extending apicad much beyond level of vein *rm*; bulla of M_{1+2} equidistant or almost equidistant to base and to apex of *2bc*; posterolateral margin of supra-

anal plate in ♀ distinctly curved. 6

6(5). Bare area at base of cell *3r* more than 3× as large as that of *1m*; longest setae on tergites 3 and 4 much longer than tergites themselves; supra-anal plate in ♀ with latero-apical setae 2× as long as its greatest width; tergite 6 in ♂ (*teste* Bequaert 1954) entire. New World. . . . . **confluenta**

Bare area at base of cell *3r* much less than 2× as that of *1m*; longest setae on tergites 3 and 4 not longer than tergites themselves; supra-anal plate in ♀ with latero-apical setae only as long as its greatest width; tergite 6 in ♂ widely separated into side pieces. Ethiopian Region. . . . . **podicipis**

7(4). Setulose area in cell *2m* large, extending basad very closely along vein M_{3+4} and to or beyond midlength of apical abscissa of that vein; setae of ♀ para-anal tuft not or hardly longer than anchor-like spines near spiracle 3; tergite 6 in ♂ and ♀ undivided. (*turdi*-group). 8

Setulose area in cell *2m* small, confined to antero-apical corner, never as described above; setae of ♀ para-anal tuft much longer than anchor-like spines near spiracle 3; tergite 6 in ♂ and ♀ widely interrupted at middle. (*exilis*-group) 9

8(7). Anchor-like spines near abdominal apex in ♀ much smaller than those near spiracle 3, and mostly or entirely originating from a common multispinose wart at side of urogenital openings; ♂ without laterite 6; cell *3bc* ca. 2× as long as wide. . . . . **turdi**

Anchor-like spines near abdominal apex in ♀ scattered, about as large as those near spiracle 3; ♂ with laterite 6; cell *3bc* ca. 2.5× as long as wide. . . . . **vicina**

9(7). Prescutum exceedingly densely setose, average interspace of setiferous punctures in same row ca. 1.0–1.5× punctural diameter; ♀ with only ca. 15 anchor-like spines at each side near abdominal base; anchor-like spines near abdominal apex fairly uniform in size and distribution; ♂ with side piece of tergite 6 ca. 3× as wide as long. . . **punctatissima**

Prescutum sparsely or moderately densely setose, average interspace of setiferous punctures in same row 2 or more times punctural diameter; ♀ with not less than 30 anchor-like spines at each side near abdominal base; anchor-like spines near abdominal apex (except in *aequisenta*) not uniform in size and distribution; ♂ with side piece of tergite 6 less than 2.5× as wide as long. 10

10(9). ♀ with supra-anal plate clearly separated into anterior and posterior pieces, with anchor-like spines near abdominal apex fairly uniform in size and distribution, none of them smaller than such spines near abdominal base, no multispinose warts; ♂ with side piece of tergite 6 ca. 2× as wide as long, lacking laterite 6; sternite 1 spineless. . . . . **aequisenta**

♀ with anterior and posterior pieces of supra-anal plate tightly soldered together, and with anchor-like spines near abdominal apex quite uneven in size and distribution and at least part of them distinctly smaller than such spines near abdominal base, multispinose warts often present; ♂ with side piece of tergite 6 ca. 1.5× or less as wide as long, laterite 6 always present; sternite 1 generally with spines. 11

11(10). Minor scutellar bristles when present, not longer, nor more robust than longest prescutal setae; ♀ supra-anal plate much smaller than pregentital tubercle; ♀ para-anal tuft conspicuous, of 4–6 setae which are as long and robust as longest bristle on tergite 6; ♀ pregenital plate ⊥-shaped; ♂ with only 3–4 setae arcuately lining between pregenital tubercle and spiracle 6, and ca. 12 extra-fine setae transversely arranged immediately before urogenital area. Malagasy species. . . . . **hovana**

Not in combination of characters as above. Oriental species 12

12(11). Spines on thoracic sterna hardly longer than wide at base and markedly shorter and finer than those on anterior prescutal margin and on abdominal sternite 1; abdomen always with conspicuous tuft of long setae near each of spiracles 3–5 (♀) or 4 (♂♀); wing 3.5–4 mm long; ♀ supra-anal plate generally with 6–8 apical setae . . . . . **podargi**

Spines on thoracic sterna distinctly longer than wide at base and not or hardly weaker than with those on anterior prescutal margin and on abdominal sternite 1; abdomen very seldom with tufts of long setae near spiracles 3–5 (♀) or 4 (♂, ⚧); wing not more than 3.5 mm long; ♀ supra-anal plate with generally 4, seldom 5–6 apical setae. 13

13 (12). Minor scutellar bristles not less than 2/3 as long as major ones; setae of ♀ para-anal tuft numerous: all or almost all as robust as and not shorter than longest bristles on tergite 6; ♀ pregenital plate always anteriorly strongly trilobed; wing 2.8–3.5 mm long . . . . . **exilis**

Minor scutellar bristles, when present, not more than 1/2 as long as major ones; setae of ♀ para-anal tuft few, mostly much finer and shorter than longest bristles on tergite 6; ♀ pregenital plate rarely trilobed; wing not longer than 3 mm. 14

14 (13). Wing only 1.9–2.3 mm long, ♀ pregenital plate anteriorly unilobed, cell *3bc* ca. 3× as long as wide, ♀ laterite 7 with only 1 major and 2–3 minor bristles; ⚧ unknown. Species of New Guinea and the Philippines. 15

Wing-length etc. not in above-described combination; ⚧ known. 16

15 (14). Posterior bar of ♀ pregenital plate linear, with no lateral appendices, ca. 5–6 × as wide as long and about as wide (transversely) as anterior median lobe; ♀ pregenital tubercle bearing no setae, its bristle much finer and usually distinctly paler than that on tergite 6; ♂ lacking extra-fine setae immediately before pregenital tubercle. . . . . **zamicra**

Posterior bar of ♀ pregenital plate trapezoidal, with posterolateral appendices, ca. 2 × as wide as long and markedly wider (transversely) than anterior median lobe; ♀ pregenital tubercle with 6–8 fine setae, its bristle as robust as and never distinctly paler than that on tergite 6; ♂ with small patch of extra-fine setae immediately before pregenital tubercles. . . . . **rabori**

16 (14). Laterite 6 in ⚧ with outer end broadly fused to side piece of tergite 6, thus jointly forming large sclerite like transverse letter U, no free anchor-like spines on membrane near that sclerite; wing 2.7–3.0 mm long, cell *3bc* ca 2.2 × as long as wide, bulla of M_{3+4} in ♀♂ inconspicuous and almost equidistant to *mcu* and *im*.. . . . . **simplicis**

Laterite 6 in ⚧ either undefinable or widely separated from side piece of tergite 6; ⚧ urogenital area usually with a number of free anchor-like spines on membrane; wing shorter, cell *3bc* and bulla of M_{3+4} usually not as above. 17

17 (16). Laterite 6 in ⚧ always present, ca. 3 × as wide as long, larger or slightly wider than side piece of tergite 6 and with bristle arising from its center; anchor-like spines at ⚧ urogenital area entirely or almost entirely arising from laterite 6; ♀ pregenital plate anteriorly always unilobed; species of Malaysian and Indo-Chinese Subregions. . . 18

Laterite 6 in ⚧, when present, very seldom more than 2 × as wide as long, never larger or wider than side piece of tergite 6, with bristle arising from very near its inner end; anchor-like spines at ⚧ urogenital area partly replaced by multispinose warts and either entirely or about half free; ♀ pregenital plate anteriorly uni- or weakly trilobed; species of Papuan and Philippine Subregions. 19

18 (17). Infra-anal plate in ⚧ anteriorly trilobed; side piece of ⚧ tergite 6 with no petiolate appendix at side of posterior anus; vein M_{3+4} with abscissa 1 scarcely shorter than 2 and with bulla equidistant to *mcu* and *im* or nearly so. . . . . **tridens**

Infra-anal plate in ⚧ anteriorly straight, not trilobed; side piece of ⚧ tergite 6 posteriorly with a pale petiolate roundish appendix at side of posterior anus; vein M_{3+4} with abscissa 1 ca. 2/3 as long as 2 and with bulla distinctly closer to *mcu* than to *im*. . . **bistativa**

19 (17). Inner margin of side piece of ⚧ tergite 6 longitudinally straight; base of ⚧ posterior pregenital tubercle fused to that of some anchor-like spines and thus jointly forming laterite 6 which is about 1/2 as large as side piece of tergite 6; bulla on vein M_{3+4} ca. 2 × closer to *mcu* than to *im*; ♀ pregenital plate anteriorly weakly trilobed. . . . . **stipituri**

Inner margin of side piece of ♀ tergite 6 deeply concave; ♀ posterior pregenital tubercle free from anchor-like spines, no laterite 6; bulla on vein M_{3+4} almost equidistant to *mcu* and *im*; ♀ pregenital plate anteriorly unilobed. . . . . **philippinensis**

20(1). Metabasisternum and discal area of mesosternum with only fine setae, no spines; anterolateral lobe of ♀ tergite 3 very strongly raised and in side view, ca. 1/2 as deep as greatest length of that sclerite; mesonotum, scutellum and abdominal tergal plates black, with strong metallic luster. . . . . **hirtisternum**

Metabasisternum and discal area of mesosternum with both fine setae and spines; anterolateral lobe of ♀ tergite 3 weakly raised and in side view, with depth only a fraction of greatest length. 21

21(20). Scutellum and abdominal tergal plates with strong metallic luster, not paler than mesonotum; abdominal venter in ♀ with pregenital tubercles dark and strongly sclerotized, in ♂ rather extensively setose immediately ental and posterior to spiracle 2. . . **curvata**

Scutellum and abdominal tergal plates without metallic luster, distinctly paler than mesonotum; abdominal venter in ♀ with pregenital tubercle pale and weakly sclerotized, in ♂ rather extensively bare in area immediately ental and posterior to spiracle 2. . . . . **submicans**

Subgenus **Ornithoica** s. s.

Type: Same as genus, i.e., *Ornithoica beccariina* Rndn.

Body of small to large size (for the genus), wing 1.9–4.5 mm long. Postvertex setose. Thoracic dorsum never with strong metallic luster, never longitudinally striate but extensively setose-punctate, often bare at disc. Wing extensively setulose, with setulae covering entirety of cells *3r* and *1m* (except their extreme bases), and forming small to large apical patch (-es) in *2r* and *2m* and seldom in *1r* and *a* too; vein *rm* slightly closer to M-furcation than to R_{4+5}-apex; M_{1+2} gently curved forward at vicinity of bulla, hence rather far from touching R_5-furcation; cell *3bc* 2 or more times as long as wide, seldom narrowed sub-basad. Trochanter 3 in ♂ and ♀ almost always with patch of short spines on hind inner surface; tibia 3 in ♀ with 1 series of preapical spines on inner surface. Abdomen with syntergite 1+2 almost as strongly sclerotized as median tergal plates; tergite 3 in ♀ of similar shape as 4 and 5; tergite 6 in ♀ usually entire and of similar shape as 4 and 5, at most slightly produced caudad at middle, very seldom widely interrupted at middle; that in ♂ and ♀ usually widely divided into side pieces; posterior piece of supra-anal plate in ♀ fairly large, transverse, usually tightly soldered with, seldom clearly separated from anterior piece; lateral membranous area of abdomen hardly spinose and setose; urogenital area in ♀ as a rule with 1 pair of pregenital tubercles, usually with multispinose warts; ♂ generally with laterite 6. Gynandromorphism fairly common.

DISTRIBUTION. Pantropical. Of the 19 species here recognized as distinct, 2 are found in the Neotropical, 3 in the Ethiopian and the remaining in the Oriental Region. Most of the species are rather localized, a few are widely spread and seasonally penetrate to temperate countries.

HOST PREFERENCE. Most species are oligo- or pleioxenous, some polyxenous. Pre-

ferred hosts are Ciconii-, Falconi-, Columbi-, Psittaci-, Cuculi-, Strigi-, Caprimulgi-, Coracii-, Pici- and Passeriformes, but there are stray records ex Tinami-, Podicipi-, Galli-, Grui-, Charadrii- and Apodiformes.

Systematics: This subgenus, formerly all placed under the *O. turdi* group (Maa 1963), is here divided into 5 species-groups. Among these the *confluenta*-group contains 3 very closely related species, 1 each found in the Neotropical, Ethiopian and Oriental Regions, and apparently representing the most generalized forms of the genus; the *unicolor*- and *pusilla*-groups, each represented by a single Oriental species, are highly specialized in certain respects but the former has some affinities to the *confluenta*-group; the *exilis*-group contains 1 Malagasy and 11 Oriental species, some fairly generalized and with wide host range and some fairly specialized and with restricted host range; the *turdi*-group, as here re-defined, contains 1 Neotropical and 1 Ethiopian species, is very closely related to the *exilis*-group but has some affinities to the *confluenta*-group too.

Ornithoica unicolor GROUP

Setae on mesonotum almost as dense and uniform in distribution as that on scutellum which bears 3–5 pairs of preapical bristles of varied length. Prosternum anteriorly acute or subacute. Wing setulae covering extreme apex of cell *1r*, more than apical 1/2 of *2r*, most of *3r* and *1m* and forming very tiny oblique patch near antero-apical corner of *2m*; cell *a* bare; cell *3bc* about 3 × as long as wide, distinctly narrowed basad. Abdomen normal for subgenus; ♀ tergite 6 always entire, in ♂ and ⚥ widely interrupted at middle, and in ⚥ strongly convex and very richly setose; urogenital area in ♀ and ⚥ with but few exceedingly small spines which are hardly anchor-like; no multispinose warts; ♀ with para-anal tuft of long setae; supra-anal plate in ♀ widely separated into small anterior and large posterior pieces, both crescent in outline, leaving their roundish interspace membranous; spiracles 6 and 7 in ♂ subequal in size, in ⚥ situated widely apart; posterior pregenital tubercle in ⚥ widely apart from laterite 6 and almost touching spiracle 7.

This species-group is solely represented by *O. unicolor* of the Indo-Chinese and Malaysian Subregion. It can immediately be recognized by the anteriorly acute prosternum, the strong reduction in size and number of anchor-like spines near abdominal apex (♀, ⚥), and the shape and position of posterior pregenital tubercle (⚥).

Ornithoica unicolor Speiser Figs. 2, 6, 30, 40.

unicolor Speis. 1900: 556.—Bau 1922: 278 (key); 1929a: 247 (key).—Maa 1963: 72, 88 (notes on type). nec *unicolor* of Ferr. 1927c, Beq. 1953.

MATERIAL EXAMINED. 8♂♂, 28♀♀, 1⚥.

BURMA: 1♀ (MCZ), Myitkyina, ex *Ketupa zeylanensis*, X. 45, J. E. Stager & W. Jellison, det. Bequaert as *Ornithoica* sp.

THAILAND: 1♀, Chieng Khong, ex *Otus bakkamoena* (H 934), IV. 64, Migr. Anim. Path. Surv.; 2♀♀, same data but ex *Phodilus badius* (H 967). 1♂, Chieng Saan, Chiengmai, ex *O. bakkamoena* (5E 1502), I.65, M.A.P.S. 2♀♀ (USNM), Loei, Tha Li, Tha Li, Ban Muang Khai, ex *O. bakkamoena lettia* (B 31160), I.55, R. E. Elbel.

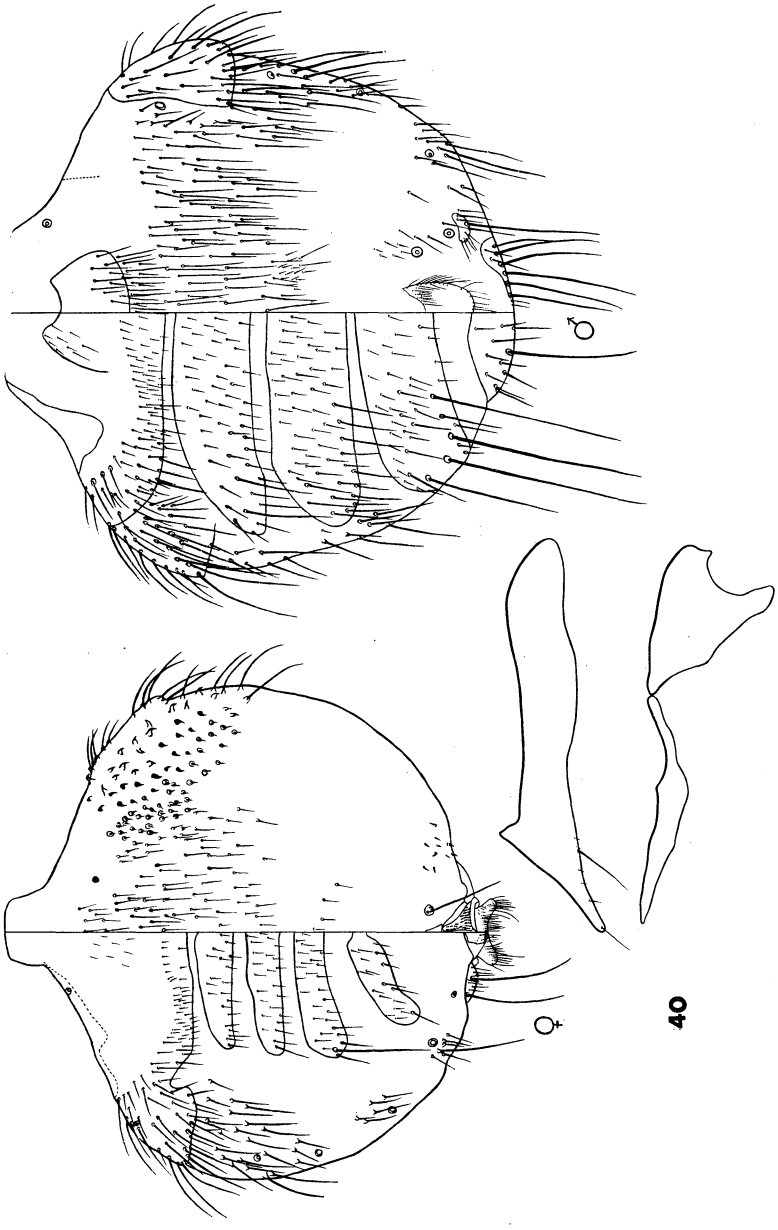


Fig. 40. *Ornithoica unicolor* Speis., ♀♂ abdomen in dorsal and ventral aspects and ♂ genitalia in lateral aspect.

MALAYA: 1♂, 3♀♀, Meru, Selangor, ex *Otus bakkamoena* (M 2179, 2201, 2202), I.63, H. E. McClure; 2♂♂, 5♀♀, Selangor, same host (M 1540, 1675, 1748, 1881, 1883), 62, McClure; 1♀, same data but ex *Stachyris maculata* (M 1679); 2♀♀ (1 w. fungus), Subang, Selangor, ex *O. bakkamoena* (M 986, 1303), III.62, McClure..

SUMATRA: 1♀ (AMS), Fort de Kock, Pad. Bovenl., ex bird #3533, I.13, E. Jacobson; 1♂ (AMS), Kalung (Tilatang), Pad. Bovenl., ex bird #3400, XII.13, Jacobson; 1♂ (AMS), same data but ex bird #3341; 1♀ (GNV), holotype, no host record.

BORNEO: 2♂♂, 5♀♀, 1♀, Tenom, 200 m, Sabah ex *O. bakkamoena* (BBM 10780), I.63, M. Thompson; 3♀♀, same data but ex *Ninox scutulata* (BBM 10799).

♀. Gula generally with 2–3 rows of spines. Spines on mesosternum subequal in number as black setae, and not weaker than spines on anterior prescutal margin. Wing 3.9–4.4 mm long; basal bare areas of cells *3r* and *1m* small; bulla of M_{1+2} much closer to base than to apex of cell *2bc*; M_{3+4} with abscissae 1 and 2 subequal in length, with bulla more than 2× closer to *mcu* than to *im*. Setae on submedian lobe of syntergite 1+2 similar to those on tergite 3; longest setae on tergites 3 and 4 not or hardly longer than tergites themselves; tergite 6 with 2–3 pairs of long bristles, generally sinuate posteriorly, often constricted at middle; supra-anal plate very seldom with pair of weakly sclerotized ribbon-like appendices extending from ends of anterior piece. Hind marginal setae on laterite 2 almost 2× as long as longest setae on tergites 3 and 4; vicinity of abdominal spiracle 3 with, in addition to anchor-like spines, 40–50 fine setae of uniform length; that of spiracles 4 and 5 with 2–5 and 4–10 short fine setae respectively; para-anal tuft of ca. 10 setae which vary in length (longest ones not noticeably longer than those on tergite 5) and are so close to one another that some of their basal papillae often merge to form small tubercles; laterite 7 about as long as wide, irregularly tetragonal, with 3–4 bristles and some ordinary setae. Sternite 1 with rows of strong setae, very seldom also with 2 or 3 spines; disc of venter with 7–9 rows of very fine black setae of varied length, hindmost row situated far apart from others and composed of only 5–10 exceedingly short setae; no setae lying immediately before pregenital tubercle which is small, roundish, with 1 bristle and 3–5 spines; anchor-like spines at urogenital area not larger than spines on pregenital tubercle, their basal papillae not larger than those of fine setae on ventral disc; pregenital plate large, triangular.

♂. Similar to ♀. Wing 3.8–4.0 mm long. Abdominal setae stronger, more uniform in length; side piece of tergite 6 more than 2× as long as wide, strongly setose; laterite 6 roundish, with about 10 setae of varied length; pregenital tubercle fairly large, with 4–5 setae; lateral to spiracle 7 a longitudinal patch of about 10 fine setae, and immediately before pregenital tubercles, a pair of widely separated roundish patches of dense extra fine setae which are hardly longer than their basal papillae. Genitalia as figured.

⚥. Abdominal tergite 5 much longer than 3 and 4, posteriorly deeply sinuate and with 1–2 pairs of bristles and some ordinary setae; side piece of tergite 6 strongly convex, hardly longer than wide, with straight inner margin and numerous irregularly distributed bristles, posteriorly narrowed, produced and partially embracing posterior anus; laterite 6 small, slender, oblique, posteriorly bare, in contact with tergite 6, an-

teriorly strongly tuberculate and with tuft of dense setae and bristles; posterior anus strongly exserted, heavily covered with pale microsetae; infra-anal plate trapezoid, anteriorly weakly sclerotized and with moderately long (transversely), dark, strong sclerotized rim; 8–9 minute spines ectal to laterite 6; spiracle 6 partially embraced by laterite 6; posterior pregenital tubercle longitudinally linear, bearing 1 strong bristle, situated far anterior to laterite 6, posteriorly almost in contact with spiracle 7.

DISTRIBUTION. Indo-Chinese and Malaysian Subregions, lowlands, at present known from Burma, Thailand, Malaya, Sumatra and Borneo.

HOST PREFERENCE. Probably oligoxenous and confined to the Strigidae (Strigiformes). Of the 19 available records, 14 ex *Otus bakkamoena*, 1 each ex *O. spilocephalus*, *Ketupa*, *Ninox*, *Pholidus*, and *Stachyris*. The former 4 genera all belong to the Strigidae; the last one belongs to Timaliinae, Muscicapidae (Passeriformes) and is obviously a stray record.

Systematics. By omitting the passage on integumental color pattern, the original description of this species is as follows: "Länge des trocken aufbewahrten Tieres 3.5 mm., der Flügel 4 mm. Thorax mit feiner gelber Behaarung und einzelnen grösseren langen Borsten, auf den Schulterschwielen und den Episternen des Mesothorax noch mit kurzen schwarzen Borsten undicht besetst. An der hinteren oberen Ecke des Episternum mesothoracis eine einzelne lange Borste. Stigma des Mesothorax kreisrund. Naht zwischen Praescutum und Scutum mesonoti nur an den Seiten deutlich, mitten grösstenteils verstrichen. Praescutum fast doppelt so lang als das Scutum. Dessen Hinterrand buchtig, in der Bucht liegt das Scutellum. Vom Abdomen ist infolge der Schrumpfung nicht viel zu sehen, es scheint keine besondern Merkmale zu bieten. Vorderbeine mit ein wenig spindelförmig aufgetriebenen Schenkeln, ohne besonderheiten. Das Flügelgeader stimmt mit *O. beccariina* Rnd. überein." Since first published, the species has never been correctly recorded in literature. As pointed out by me (1963: 149), the "*unicolor* Speis." of Ferris (1927 c: 209, fig. 2) and Bequaert (1953: 271, 314, 319) is referable to *submicans*, which is about as large in size as Speiser's species. The color pattern is normal for the subgenus, although Speiser wrongly described "alle Beine ganz gelb" and inappropriately named the species *unicolor*. Bau (1929), without seeing any specimens, used the same character as well as the body size to establish a species-group for its own, whereas Ferris (1927 c), solely on basis of body size, referred an entirely different species to *unicolor*. Actually the size of *podargi*, in addition to members of subgenus *Lobolepis*, approaches that of Speiser's species too.

In 1♀ examined, tergite 6 is virtually narrowly interrupted at middle, whereas 1♂ has side pieces of the same tergite connected by a narrow "bridge". The preapical spines on tibia 3 (♀) in this species are less developed than in *O. exilis* group. And, from the shape and relative position against laterite 6 and spiracle 7, the posterior pregenital tubercle in the ♀ described above perhaps represents laterite 7.

Ornithoica confluenta GROUP

Setae on mesonotum almost as dense and evenly distributed as that on scutellum,

leaving only a small bare area at anterolateral scutal corner. Scutellum usually with 3–4 pairs of preapical bristles. Prosternum anteriorly subtruncate. Wing-setulae covering apical 1/2 or more of cell *2r* (seldom apex of *1r* too), more than apical 1/2 of *2m*, as well as anal margin of *a*, in addition to most of *3r* and *1m*; cell *3bc* about 2.5× as long as wide, not or hardly narrowed basad. Abdomen normal for the subgenus; tergite 6 in ♀ always undivided, that in ♂ either divided at middle or not; urogenital area in ♀ always with both multispinose warts and normal anchor-like spines, latter never more than 25 in number and never forming together a pair of large compact roundish clusters; lateral membranous area in ♀ always with para-anal tuft of long strong setae; supra-anal plate in ♀ with anterior and posterior pieces tightly fused together, generally with 4 apical setae; spiracles 6 and 7 in ♂ subequal in size. Gynandromorphism not yet known.

Assignable to this group are 1 New and 2 Old World species. All of them normally breed on the Ardeidae (Ciconiiformes: herons and bitterns), but none has been collected extensively. There are thus wide gaps in both their inter- and intraspecific distributional ranges. The 3 species are so difficult to separate that earlier authors generally considered them synonymous. The key and description in this paper were based largely on a few dry shriveled specimens and are far from my satisfaction. Only by dissecting and clearing of fresh material, will the true affinities of the species more properly be clarified.

Ornithoica confluenta (Say) Fig. 7.

confluenta Say 1823: 103 (*Ornithomyia*).—Coquillett 1899 b: 335 (*Anthoica* ?) (key).—Speis. 1900: 558 in pt. (key).—Bau 1922: 278 in pt. (key); 1929 a: 247 in pt. (key).—Beq. 1954: 107–114, figs. 25–26 in pt. (bibliogr., synonymy, records etc.)—Maa 1963: 87 (list).

nec *confluenta* of authors.

MATERIAL EXAMINED. 4♀♀. BAHAMA IS.: 4♀♀ (MCZ), Booby Cay, Mariguana I., ex green heron [*Butorides virescens bahamensis*], VII.30, H. S. Peters.

♀. Wing 3.0–3.2 mm long; setulose area in cell *1r* not or hardly discernible, that in *2r* situated far apicad to level of vein *rm*; vein R_1 at level of *rm* about as wide as distance to C; bare area at base of cell *3r* very large, more than 3× as large as that of *1m*; bulla of M_{1+2} practically equidistant to base and apex of cell *1bc*. Posterior marginal setae on submedian lobe of syntergite 1+2 not or hardly longer than longest setae on tergite 3; longest setae on tergites 3 and 4 much longer than tergites themselves; supra-anal plate with greatest width only about 1/2 as its postero-apical setae are long, posterolateral margin gently curved; laterite 7 with ca. 3 long bristles. Marginal bristles on laterite 2 very few, much shorter than major scutellar bristles; lateral membranous area of abdomen with a number of moderately long setae near spiracles 3–5, para-anal tuft of 6–7 setae. Abdominal apex with 5 or 6 anchor-like spines near laterite 7, and with 1–3 such spines as well as 2–3 multispinose warts at a side near genital orifice; pregenital tubercle large, with many setae; no extra-fine setae lying immediately before pregenital tubercle; pregenital plate with median lobe moderately long, as strongly sclerotized as lateral lobe. ♂ unknown to me.

DISTRIBUTION. Neotropical Subregion, hitherto known from lowlands at Florida, Bahama Is., Venezuela and Brazil. No precise type locality was given in the original

description, Wiedemann (1830) surmised it to be Pennsylvania where T. Say then resided. The occurrence of *confluenta* (as here understood) in that State is improbable.

HOST PREFERENCE. Apparently confined to Ardeidae. Up to the present, recorded from *Bubulcus*, *Butorides*, *Casmerodius* and *Leucophoyx*.

Systematics. Bequaert (1940 b, 1954) first successfully demonstrated that there are in the Americas 2, instead of 1, distinct species of *Ornithoica*. His selection of the name *confluenta* for the more extensively setose form was solely on the basis of the type host, *Ardea candidissima* [*Leucophoyx t. thula*], since the type specimen is not traceable, the original description provided characters only of generic importance and the type locality was vaguely given as "the United States" (in the title of Say's article). Bequaert's interpretation is here accepted although 2 somewhat contradictory points should be mentioned. Firstly, the American Ardeidae are known as hosts of both the more and the less extensively setose forms, here termed *confluenta* and *vicina*, although about 75% of Bequaert's 198 Nearctic records for *vicina* were from the Passeriformes and 16% from the Strigiformes. Secondly, *confluenta* is so rare in collections (and perhaps in nature too) that Bequaert was able to verify only 5 individual records of capture (3♂♂, 33♀♀) whereas for *vicina*, there were 254 records. And as listed by Bequaert, only 2♀ *confluenta* appear to have been definitely recorded from the U.S. Hence it seems possible that Say's specimen (-s) was the much commoner *vicina*.

The excellent bibliographies for *vicina* and *confluenta* provided by Bequaert (1954: 90–93, 107–108) clearly showed that *vicina* has more often been recorded in literature under "*confluenta*" rather than under its own name. It is hardly necessary to mention the unadvisability of his synonymy of *confluenta* with *beccariina* and *podicipis*, and of the system outlined by Bau (1929) in combining together all forms (except *unicolor*) of the subgenus *Ornithoica* s. s. as varieties of *confluenta*. In Bequaert's (1954: 90) key, the cell *2bc* was wrongly stated to be partly setulose, and in his fig. 25 (as in contrast to fig. 24 for *vicina*), the posterior part of that cell was so drawn. Actually the cell is entirely bare with anterior part colorless and posterior part tinted brownish. In this respect, the 2 species are indistinguishble.

Ornithoica podicipis von Röder Fig. 8.

podicipis v. Röder 1892: 206.—Speis. 1900: 550 (key).—Bau 1922: 278 (key); 1929 a: 247, 248 (*confluenta* var.) (key, notes on types); 1929 b: 11 (*confluenta* var.) (redes. of types).—Maa 1963: 59, 87 (notes on types).

MATERIAL EXAMINED. 1♂, 9♀♀. EGYPT: 4♀♀ (CNHM), nr. Mersa Matruh, W. Desert, ex *Ardeola ralloides* (HH 5101), IV. 59, H. Hoogstraal & M. Traylor.

UGANDA: 2♀♀ (MCZ), Butiaba, ex *Ixobrychus minutus payesi*.

CONGO: 1 ex. (? ♀ sex) (MCZ ex Mus. Congo), Leopoldville, ex heron, I. 39, van Delft.

ZANZIBAR: 1♂ (MCZ), ex buff-backed heron, VI.14, W. M. Aders; 2♀♀ (DEI, ZMB), type series, ex *Podiceps* sp.

♀. Wing (in ♀♀ from Uganda) 3.3–3.5 mm long. (Both v. Röder and Bau gave 3 mm as wing length in the type). Bare area at base of cell *3r* moderately large, less

than 2× as large as that of *1m*. Longest setae on tergites 3 and 4 not or hardly longer than tergites themselves; greatest width of supra-anal plate subequal to length of its latero-apical setae. Laterite 2 posteriorly with few bristles; lateral membranous area with 1–2 fine short setae near each of spiracles 4 and 5. Sternite 1 with ca. 14 spines arranged in 3 rows and with a number of ordinary setae; ventral membranous area discally with ca. 7 setal rows, 1st, 2nd, 4th and 6th of which are of short pale setae whereas remaining 3 rows, of distinctly longer ones; 1 or 2 pairs of extra-fine setae lying immediately before pregenital tubercles; sides of genital orifice with a pair of multispinose warts which are about as large as pregenital tubercles. Other characters as in *confluenta*.

♂. Similar to ♂ *confluenta* as figured by Bequaert (1954: 111, fig. 26 B) but tergite 6 widely interrupted at middle, its side piece with longitudinal, gently curved inner margin, and besides soft setae, with 4–5 long preapical bristles and 5–6 shorter apical ones; laterite 6 distinct, roundish, bearing 1 long bristle and 3–5 erect setae. Genitalia not studied. Wing 3.2 mm long.

DISTRIBUTION. W & E African Subregions, lowlands, spreading (? seasonally) to W Egypt. Besides Uganda, Congo and Zanzibar, Bequaert (1954: 110) also listed this species from Tanganyika and Nyasaland, but his record from Madagascar ex *Bubulcus* needs verification. At the British Museum, I briefly examined several Tanganyikan specimens which are almost certainly referable to *podicipis*. Apparently by oversight, Ferris (1929: 285) wrongly listed Australia as the type locality.

HOST PREFERENCE. Probably confined to Ardeidae, thus far recorded from *Ardeola* and *Ixobrychus* as well as undetermined egrets and herons. The record of *Podiceps* (Podicipidae, Podicipiformes) as the type host apparently represented straggler or contamination.

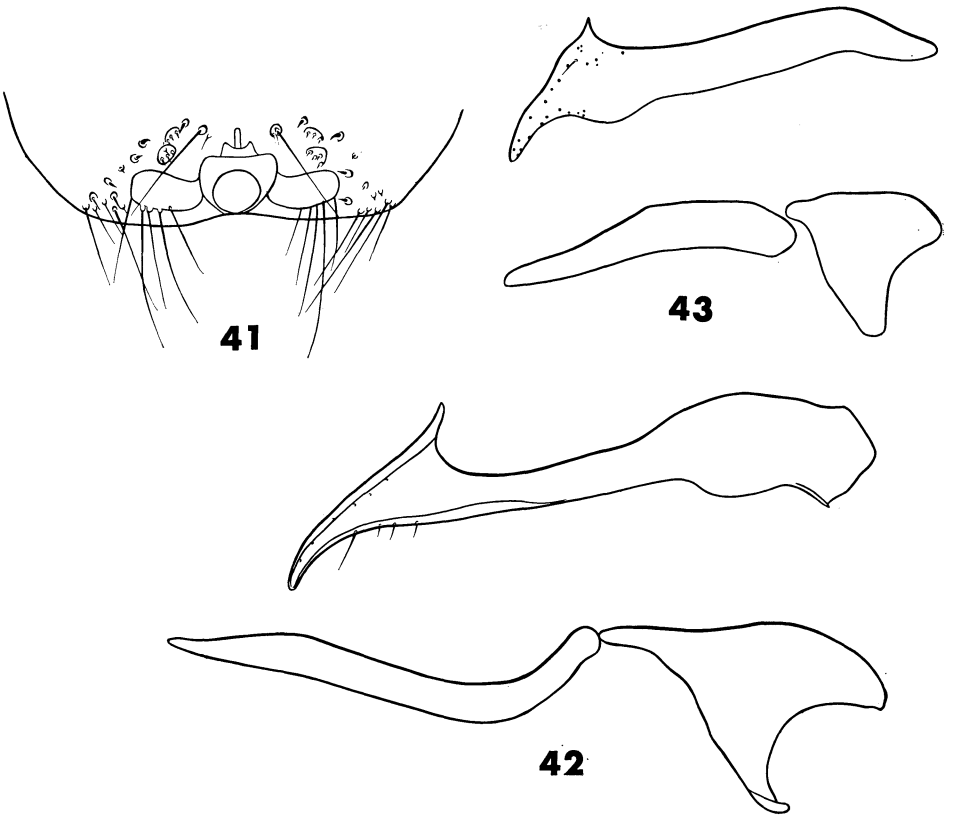
Systematics. *Podicipis* and *confluenta* are so closely related that I should have followed Bequaert (1954: 113) in considering them synonymous, or Bau (1929 a: 247; 1929 b: 13) in treating the former as a geographical race of the latter. It is here recognized as a distinct species partly for geographical reasons and partly because of the inadequacy of available material of both.

The type of this species was redescribed by Bau (1929 b) and a bibliography plus translations of descriptions by v. Röder and Bau, was provided by Bequaert (1954: 108, 113–114) under *confluenta*. Strictly speaking, Bau's description of the parallel-sided ("gleichbreit") face and cell *1bc* is not quite correct. The former is distinctly narrowed at midlength and slightly so at anterior end, whereas the latter is widest at level of vein *im*, and more or less narrowed at both ends and at midlength.

Ornithoica beccariina Rondani Figs. 9, 41, 44.

beccariina Rndn. 1878: 160, fig.—Speis. 1900: 557, fig. (redes. of types, key).—Bau 1922: 278 (key).—Ferr. 1929: 281, figs. 1, 2A, ♀ (redes. of type).—Maa 1963: 18, 87 (notes on types).
confluenta (nec Rndn.), Beq. 1954: 109, fig. 25A (not 25B) (wing of cotype).
nec *beccariina* of Ferr. 1926 *et al.*

MATERIAL EXAMINED. 6♀♀. These are the only specimens of this species known



Figs. 41–43. *Ornithoica beccariina* Rndn., ♀ abdominal apex in ventral aspect (drawn from dry specimen, W. Australia) (41); *O. vicina* Wk. (Kauai, Hawaii) (42) and *O. exilis* Wk. (NE New Guinea) (43), ♂ genitalia in lateral aspects.

in collections. AMBOINA: 5♀♀ (GNV, FRN), type series, ex *Casmerodius albus modestus*.

AUSTRALIA: 1♀ (CSIRO), Carlisle, W Australia, ex *Ardetta pusilla*, 17. IX. 51. Dr Serventy, det. S. J. Paramonov as n. sp.

♀. Wing 3.6–4.0 mm long; setulose area in cell *1r* extensive and conspicuous, that in *2r* extending basad at least to level of vein *rm*; vein R_1 at level of *rm* much narrower than distance to C; bare area at base of cell *3r* small, not larger than that of *1m*; bulla of M_{1+2} distinctly closer to base than to apex of cell *1bc*. Posterior marginal setae on submedian lobe of syntergite 1+2 not less than 1.5× as long as longest setae on tergite 3; longest setae on tergites 3 and 4 much longer than tergites themselves; supra-anal plate with virtually straight posterolateral margin and exceedingly long latero-apical setae (about 3× as long as greatest width of plate); laterite 7 with ca. 4 long bristles. Bristles on hind margin of laterite 2 numerous and about as long as major scutellar bristles; lateral membranous area with 0–2 fine setae near each of spiracles 4 and 5; para-anal tuft of 5–6 setae. Abdominal apex with ca. 6 anchor-like spines near

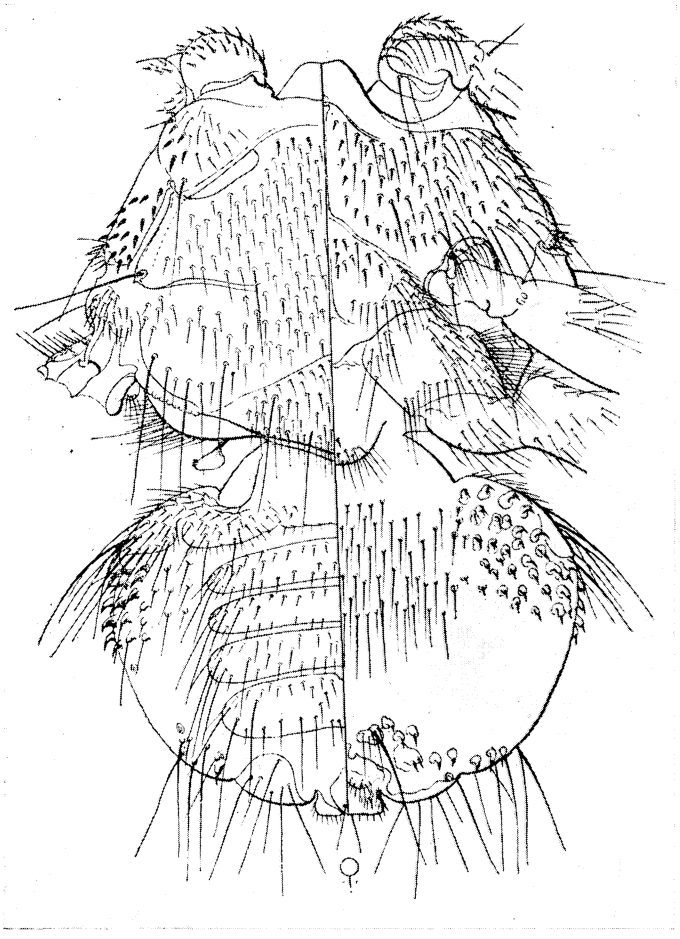


Fig. 44. *Ornithoica beccariina* Rndn., ♀ syntype, thorax and abdomen in dorsal and ventral aspects. Compare figs. 2–3 for density and distribution of dorsal thoracic setae. (After Ferris, 1929, Canad. Ent. 61 : 281).

laterite 7, and 1–2 such spines as well as 2 multispinose warts (or, 4–5 such spines and 1 such wart, as in Ferris' figure) at a side near genital orifice; pregenital tubercle small, with few setae; no extra-fine setae immediately before pregenital tubercle; pregenital plate with median anterior lobe long and less sclerotized than lateral lobe. ♂ unknown.

DISTRIBUTION. At present known only from lowlands in Amboina and W Australia. It may eventually prove to be fairly widely spread in the Oriental Region.

HOST PREFERENCE. Probably confined to Ardeidae, up to now only recorded from *Casmerodius* and *Ardetta*.

Systematics. This species is rather distinct although the ♀ abdominal apex hardly offers any clearly cut character distinguishable from *confluenta* and *podicipis*. In size,

it is slightly larger and in vestiture, with setae and bristles longer in average. The criteria for its identity are the extent of wing setulae, the position of the bulla on vein M_{1+2} and the longer setae and bristles on abdominal segments 1+2. The ♂, when discovered, may also provide distinguishing characters in the genitalia. Notwithstanding the type specimens have been redescribed by Speiser (1900: 557, 1 fig.) and Ferris (1929: 281, figs. 1, 2 A) and figured by them as well as Bequaert (1954: 1909, fig. 25 A), this species has often been wrongly interpreted. Austen (1903: 263), followed by Speiser (1908: 302) and Bau (1929: 247), suppressed *beccariina* as a synonym of *exilis*, whereas Bequaert (1954: 113), as that of *confluenta*. On the other hand, the "*beccariina* Rndn." recorded by Speiser (1900, 1902) from New Guinea and by Ferris (1924 c, as *becariina*; 1926) from Borneo obviously referred to *O. exilis* and/or its allies, and therefore had nothing to do with Rondani's species.

Bequaert (1954: 108, 112–113) gave, under the synonymy of *confluenta*, a bibliography of *beccariina*, translated Rondani's and Speiser's descriptions and quoted Ferris' in full. It is quite obvious that the explanations of his figs. 25 A and 25 B have wrongly been interchanged, *i.e.*, fig. A, was actually from ♀ cotype of *beccariina*; and fig. B, ♀ *confluenta*, Booby Cay, Bahama Is. The cell *3bc* in Rondani's figure (and to a less extent, in Bequaert's) was drawn as if distinctly narrowed basally. This led to v. Röder's (1892) wrong presumption that the shape of that cell was a character to distinguish *beccariina* from *podicipis*.

Ornithoica turdi GROUP

Mesonotum quite unevenly setose; prescutal setae either sparser than or as sparse as scutellar ones; scutum anteriorly extensively bare. Scutellum almost always with only 2 pairs of preapical bristles. Prosternum anteriorly truncate or very weakly emarginate. Wing-setulae covering extreme apex of cell *2r* and most of *3r* and *1m*, and forming, at antero-apical corner of *2m*, a fairly large triangular patch of which anterior margin is largely in contact with apical 1/2–2/3 of abscissa 3 of vein M_{3+4}; cells *1r* and *a* entirely bare; *3bc* 2–2.5× as long as wide, not narrowed basad. Spines on trochanter 3 in ♂ and ♀ very few, sometimes entirely wanting. Abdomen normal; tergite 6 in ♀ similarly shaped as 4 and 5, in ♂ and ♀ very slightly constricted at middle; urogenital area in ♀ either with many medium-sized scattered anchor-like spines and small (or no) multispinose warts, or, with none or very few tiny anchor-like spines and large multispinose warts; at most 1–3 anchor-like spines at a side near abdominal apex in ♀; 2 pairs of pregenital tubercles in ♀; lateral membranous area near spiracles 4–6 with few small setae, none of which noticeably longer than setae on tergite 3; no conspicuous para-anal setal tuft; supra-anal plate in ♀ oboval or rhomboid, entire, with 3, sometimes 4 apical setae; spiracles 6 and 7 in ♂ subequal in size.

This species-group is represented by 2 tiny, polyxenous, widely spread species, *O. turdi* of Continental Africa and *O. vicina* of the New World. It stands closely to the *O. exilis* group and is chiefly characterized by the undivided tergite 6 in ♂ and ♀ and by the comparatively shorter cell *2bc*, more extensively setulose cell *2m* and weaker abdominal setation.

Ornithoica turdi (Latreille) Figs. 3, 10, 31, 45.

turdi Latr 1812: 544 (*Ornithomyia*).—Röder 1890: 311 (redes.).—Speis. 1900: 55 (key).—Bau⊥ 922: 278 (key); 1929 a: 247 (*confluenta* var.) (key).—Maa 1963: 61, 88 (synonymy).
pygmaea Mcq. 1835: 644 (*Stenopteryx*).

MATERIAL EXAMINED. 35♂♂, 61♀♀, 3⚲⚲. EUROPE: 1♀ (PRS), holotype of *Stenopteryx pygmaea* Mcq., no host record.

MOROCCO: 2♀♀ (MCZ), Mogador, X.38, R. Meinertzhagen.

LIBYA: 1♂, 2♀♀ (CNHM), Wadi el Ahmer, 50 km SW of Benghazi, Cyrenaica, ex shrike [Laniidae].

LIBERIA: 4♂♂, 1♀, Banga, ex *Melittophagus g. gularis*, X. 26; 1 ♂, Camp #3, Du River, ex *Turacus* [*Tauraco*] *m. macrorhynchus*, VII. 26; 1♀, Gbanga, ex *Centropus s. senegalensis*, IX. 26; 1♂, same data but ex *Halcyon senegalensis fuscopeleus*; 1♂, 1♀ (♀ w. 2 mites on humeri), Kakatown, ex *Gypohierax angolensis*, VIII. 26; 1♀, same data but ex *Lophoceros* [*Tockus*] *semifasciatus*. All from MCZ.

CAMEROONS: 1♀, ex *Scotopelia peli*, III. 58.

GABON: 1♀ (CNHM), M'Bigou, Mt du Chaillu, ex *Oriolus brachyrhynchus* (fld. #653), VI. 51, H. A. Beatty (W. Afr. Zool. Exped. #210782); 1♀ (CNHM), same data but no host record (fld. #654).

CONGO: 2♀♀ (1 w. 4 mites on abd. dorsum), Avakubi, ex *Machaerhamphus anderssoni*, I. 14; 1♀, Bambili, ex *Passer griseus*, J. Rodhain; 1♀, Bumba, ex *Eurystomus a. afer*, XII. 26; 1♀, Coquilhatville, ex *Strix woodfordi nuchalis*, VII. 26, J. De Reimaecker; 2♀♀, Elisabethville, VI–X. 12, Mission Agric.; 2♀♀, Likimi, ex bird #1, VIII. 27, A. Collart; 1♀, Lisala, "trouvé par Bruchide recoltis dans graines de *Vigna sinensis* d'Amerique", VII. 27, Lt. Ghesquière. All from MCZ.

UGANDA: 1♂, 1♀, Bubandi Bwamba, Toro, ex *Dryoscopus gambiensis nyanzae* (#600), IV. 40; 1♂, 1♀, Bukinda, Kigezi, ex *Oriolus auratus notatus* (#670), VII. 40; 1♀, Buruli, ex *Bubo africanus cinerascens*; 1♂, 1♀, Busana, ex *Corvus albus*; 1♀, Busanza, Kigezi, ex *Buteo rufofuscus augur*; 1♀ (w. 2 mites on abd.), Businzera, ex *Circus macrourus*; 2♂♂, 7♀♀, 1⚲, Butiaba, ex *Asio capensis*; 2♂♂, 1⚲, Kampala, ex *Accipiter ovampoensis*; 1♂, same data but ex *Accipiter tachiro sparangensis*; 1♂, same data but ex *Clamator afer*; 1♂ (w. mite on abd.), same data but ex *Crinifer zonurus*; 1♂, same data but ex *Lophoceros* [*Tockus*] *fasciatus*; 1♂, same data but ex *Musophaga rossae*; 1♂, same data but II. 38; 1♂, Kasokwe, Buruyoro, ex *Oriolus brachyrhynchus laetior*; 3♀♀, same data but ex *Prionops cristatus omoensis*; 2♀♀, Katwe, Toro, ex *Laniarius erythrogaster*; 2♀♀, Kayonza, Kigezi Distr., ex *Laniarius ferrugineus major* (#752), XI. 40; 1⚲, same data but ex *Stilbopsar stuhlmanni*, X. 40; 1♂, Kinkinza, Kigezi, ex *Accipiter ovampoensis*; 1♂, same data but ex *Dendropicos fuscescens lepidus* (#665), VII. 40; 2♂♂, 5♀♀, same data but ex *Oriolus auratus notatus* (#658–659); 1♂ (w. mite on mid femur), Kwagimba, Toro, ex *Dioptrornis toroensis* (#579), III. 40; 1♀, Maizi-meru forest, Kigezi, ex *Oriolus percivali* (#738), X. 40; 2♂♂, same data but ex *Ruwenzorius johnstoni kivuensis* (#737); 1♂, Mile 70, Kampala—Fort Portal Road, ex *Coracias c. caudatus*, I. 39; 5♀♀, same data but Mile 80, ex *Gymnoschizorhis leopoldi centralis*; 1♀, Namawe nr. Kampala, ex *Oriolus brachyrhynchus laetior*; 1♂, Toro, ex *Accipiter m. melanoleucus*

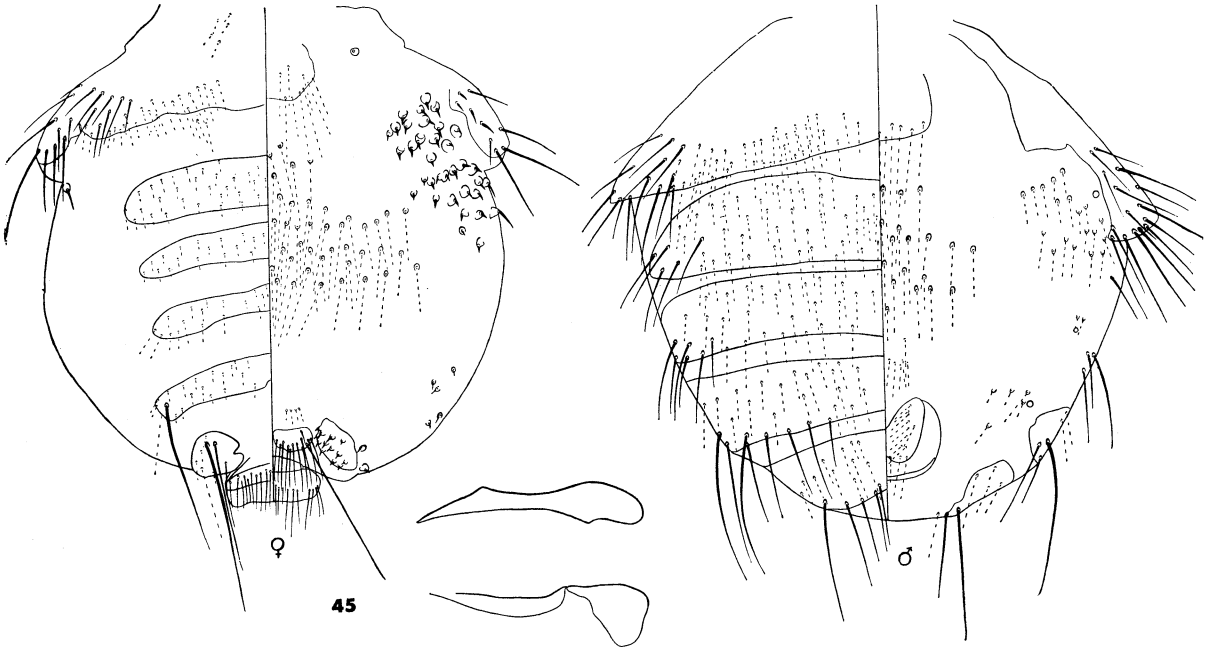


Fig. 45. *Ornithoica turdi* Latr., ♀♂ (Libya), abdomen in dorsal and ventral aspects and ♂ genitalia in lateral aspect. Pale setae in broken lines.

(#589), IV. 40; 1♂, same data but ex *Stelgidocichla* [*Pycnonotus*] *latirostris eugenia* (#571), V. 40; 1♀, West Nile Distr., ex *Bubo africanus cinerascens*, VI. 37; 1♂, same data but *Campephaga phoenicea*; 1♀ Victoria Nyanza, ex *Falco subbuteo cuvieri* (#7563), R. Meinertzhagen; 1♂, "Uganda", ex *Kaupifalco m. monogrammicus* (#7672), Meinertzhagen. All from MCZ, and all except last 2 samples, collected by G. H. E. Hopkins.

KENYA: 1♂, 1♀ (MCZ), "Kenya", ex *Serinus sulphuratus sharpei* (#18917), R. Meinertzhagen; 1♀ (MCZ) (w. 3 mites on abd.), same data but ex *Tchagra s. senegala* (#18860).

TANGANYIKA: 1♀ (MCZ), Nyingwa, Uluguru Mts., ex *Alseonax subadusta*, X. 26, A. Loveridge.

S. AFRICA: 2♀♀ (STK), Cap B. Spei [Cape of Good Hope], J. F. Victorin.

♀. Gular spines largely lined in single transverse series. Mesosternum with fewer pale setae than black spines which are distinctly weaker than those on anterior prescutal margin. Wing 2.0–2.5 mm long; cell *3bc* ca. 2× as long as wide; bulla of M_{1+2} equidistant to base and apex of *2bc*; M_{3+4} with abscissa 1 distinctly shorter (5 : 7) than 2, with bulla poorly defined and slightly or distinctly closer to *mcu* than to *im*. Abdomen weakly setose; setae on submedian lobe of syntergite 1+2 similar in length and robustness to those on tergites 3 and 4; longest setae on tergites 3 and 4 not or hardly shorter than tergites themselves; tergite 6 generally with 1 pair of long bristles and some ordinary setae, rarely very weakly constricted at middle or sinuate posteriorly; supra-anal plate oboval, its anterior part smaller and paler than posterior part, posterolateral margin almost straight, latero-apical setae not or hardly longer than plate itself. Laterite 2 with hind marginal bristles less than 1/2 as long as bristles on tergite 6 and ca. 1.5× as long as tergite 3; anchor-like spines near abdominal base at each side only ca. 30–40 in number, ca. 1/3 of them lying immediately ventral to laterite 2, remaining 2/3 around spiracle 3; basal papillae of these spines almost uniform in size; membranous area near each of spiracles 4–6 with 1–5 fine setae which are not longer than anchor-like spines near laterite 2; laterite 7 oblique, elongate-oboval, 2× or more as long as wide, bearing 2–3 bristles and some ordinary setae. Sternite 1 with, in addition to ordinary setae, ca. 6–10 small spines arranged in 2–3 rows; disc of ventral membranous area usually with 3 rows of short and 3 rows of long fine pale setae, with rows of short and long setae arranged alternately; no extra-fine setae lined immediately before pregenital tubercles; urogenital area at each side with a large multispinose wart and 0–3 very small anchor-like spines lying exteriorly to that wart; pregenital tubercles in 2 pairs, anterior pair each with 1–2, sometimes 3 setae, posterior pair almost always smaller than multispinose wart, each with 1 long bristle and 5–14 setae largely or entirely lined along or near posterior margin; multispinose wart oblique, oblong, generally bearing 6–12 small spines arranged in 1–2 rows; pregenital plate large, isogonally triangular, rarely with lateral margin concavely curved; infra-anal plate posteriorly weakly sinuate.

♂. Similar to ♀. Setae in general darker and stronger. Abdominal tergite 6 with 2–3 pairs of long bristles and some strong setae; laterite 6 absent; 1–4 fine setae near spiracle 7; pregenital tubercle roundish or triangular, with 2–6 setae; a few extra-fine setae transversely lined before that tubercle; genitalia as figured.

⚥. Tergite 6 with 2–3 pairs of bristles and numerous strong setae, its anterior

margin weakly sinuate at middle, posterior margin weakly trisinuate and curved, lateral lobe slightly convex and produced, with ca. 10 strong spines and 2–3 pale soft setae, submedian lobe bare and partially embracing posterior anus; posterior anus strongly exserted, densely microsetose; infra-anal plate pale, transverse, subquadrate, anteriorly with long (transversely), dark, strongly sclerotized rim; no laterite 6 and posterior pregenital tubercle; venter with at most 1–3 small anchor-like spines at a side before lateral lobe of tergite 6.

DISTRIBUTION. Widely spread in W. & E. Africa, occasionally found in Mediterranean and S. Africa, but not yet known from Malagasy Subregion. In Europe, it was once taken as far north as 46°N. The record of its occurrence in Kiangsu, E. China ex an unknown host (Schuurmans Stekhoven 1934: 1) is probably incorrect. The listing of *turdi* from Japan ex *Lanius* by Bequaert (1953: 277) is possibly on basis of Kishida's (1932) record for *momiyamai* as I failed to find such a Japanese specimen in Bequaert's collection at Harvard. Instead, I have at hand, from that collection, 2♀ *O. tridens* ex *Urocissa caerulea*, Arisan, Taiwan, wrongly determined by Bequaert as *turdi*.

HOST PREFERENCE. Polyxenous, probably normally breeding on the Passeri-, Falconi-, Coracii-, Cuculi- and Strigiformes, with stray records from Pici-, Columbi- and Galliformes. An analysis of above-listed records follows: Falconiformes 10 (*Accipiter* 4, *Buteo* 1, *Circus* 1, *Falco* 1, *Gypohierax* 1, *Kaupifalco* 1, *Machaerhamphus* 1); Cuculiformes 8 (*Centropus* 1, *Clamator* 1, *Crinifer* 1, *Gymnoschizorhis* 1, *Musophaga* 2, *Ruwenzorius* 1, *Tauraco* 1); Strigiformes 6 (*Asio* 2, *Bubo* 2, *Scotopelia* 1, *Strix* 1); Coraciiformes 6 (*Coracias* 1, *Eurystomus* 1, *Halcyon* 1, *Melittophagus* 1, *Tockus* 2); Piciformes 1 (*Dendropicos*); Passeriformes 20 (*Alseonax* 1, *Campephaga* 1, *Corvus* 1, *Dioptrornis* 2, *Laniarius* 2, *Oriolus* 6, *Passer* 1, *Prionops* 1, *Pycnonotus* 1, *Serinus* 1, *Stilbopsar* 1, *Tchagra* 1, "shrike" 1). As hosts of this species, Bequaert (1953), partly from literature, listed 44 genera of birds. Among them, I am unable to verify the following: *Elanus*, *Lophaetus* (Falconiformes); *Guttera* (Galliformes), *Treron* (Columbiformes); *Ciccaba*, *Otus* (Strigiformes); *Alethe*, *Andropadus*, *Batis*, *Cossypha*, *Delichon*, *Malaconotus*, *Mirafra*, *Monticola*, *Muscicapa* (Passeriformes). Meanwhile, Dr. Zumpt (*in litt.*) kindly informed me that he had 2♀♀ ex *Oriolus larvatus* and 1 ex *Accipiter tachiro*, Congo, and 1 ex *Asio capensis*, Durban, Natal. By combining these 3 sources of information, the breakdown in the 5 preferred orders of birds, in sequence of relative frequency, is as follows: Accipitridae 12, Strigidae 9, Muscicapidae 8, Laniidae 7, Oriolidae 7, Musophagidae 6, Cuculidae 2, Bucerotidae 2, Coraciidae 2, Pycnonotidae 2, and Falconidae, Alcedinidae, Meropidae, Campephagidae, Fringillidae, Alaudidae, Hirundinidae, Ploceidae, Sturnidae and Corvidae, 1 each. Insofar as these records are concerned, *turdi* differs from *vicina* in having much lower frequency ex Fringillidae and higher one ex Accipitridae and Strigidae, and from *exilis* in having little preference to Alcedinidae.

Systematics. The type of *turdi* Latr. is apparently lost. The Latin text in its original description reads "Ornithomyia ocellis distinctis, proboscide exserta, corpore fusco-brunneo, ore, thoracis angulis anticis pedibusque flavido-pallidis"; the French text added nothing except that the insect was said to have been ex Merle solitaire [*Monticola cyanea* Linn.] from the Levant. The species is so rare in European collections that

nearly 80 years elapsed before von Röder (1890) assigned it to *Ornithoica* and redescribed it on basis of a single Corsican specimen ex the type host. Since then this interpretation has been accepted by most authors except Bau (1929 a, 1929 b) who without following ordinary practice in nomenclature, even termed v. Röder's specimen the type and degraded *turdi* as a variety of *confluenta* although the latter name is 11 years later than the former. On the other hand, Speiser's (1908) omission of *turdi* in his checklist is unexplainable since it was included in his 1900 key.

The original description of *pygmaea* Mcq. reads "Long. 1 lig. Semblable a l'*hirundinis*. Corps brun. Pieds fauves. Du cabinet de M. Percheron." The name has since been neglected, even not included in Bezzi's (1905) catalog of Palearctic Diptera. No locality nor host were mentioned by Macquart but the systematic status is now quite clear following the rediscovery of the type (Maa 1963).

The affinities of *turdi* with *vicina* were first correctly pointed out by Ferris & Cole (1922: 204). Bequaert (1954: 106) distinguished them by the wing length and relative length×width of cell *3bc*. For the latter character, he gave 3×2 in *turdi* and 2×1 in *vicina* (apparently the extreme base of that cell was not counted in). However, the fundamental difference lies in the setation and tuberculation near ♀ abdominal apex (cf. key, and description of *vicina*) and the shape of ♀ pregenital plate. The multispinose warts in ♀ *turdi* are incomparable in size with those in other species of the genus. They are clearly an amalgamation of basal papillae of the spines situated immediately exteriorly to urogenital openings. These spines are of similar size as those (when present) near spiracle 6 and quite distinctly smaller than those near spiracle 3 which is a feature analogous to that in *unicolor*. The further reduction in size and number of those warts or spines in ♀ provides not only additional proof of this tendency, but also another character to distinguish ♀ *turdi* from ♀ *vicina*. The size of ♀ pregenital tubercles and the arrangement of their setae are also unique characters of *turdi*. This is particularly true in the Moroccan and Libyan ♀♀, where they are unusually large and their setae, of uniform length and arranged very like a comb. Whether or not those ♀♀ represent a geographical race is uncertain since the material from those countries is too scanty.

Ornithoica vicina (Walker) Figs. 11, 42, 46.

vicina Wk. 1849: 1144 (*Ornithomyia*).—Aust. 1903: 263 (synonymy).—Aldrich 1905: 654 (*Ornithoctona*) (list).—Beq. 1954: 90-107, figs. 22-24 (key, bibliogr., records, synonymy etc.).—Maa 1963: 73, 88 (notes on types, synonymy).

peroneura Speis. 1902c: 91 (*confluenta* var.).—Bau 1922: 278 (*confluenta* var.) (key); 1929a: 247 (*confluenta* var.) (key).

promiscua Ferr. & Cole 1922: 203, figs. 19-20, ♀.

melaleuca Bau 1922: 276, 278, ♀; 1929a: 247 (*confluenta* var.) (key).

MATERIAL EXAMINED. About 400 specimens of this species from various American countries in the Brit. Mus. Nat. Hist. (incl. types of *vicina* and *peroneura*), Mus. Comp. Zool. Harvard, Stanford Univ. (incl. type of *promiscua*) and U. S. Nat. Mus. were briefly examined by me in early 1962. Their collection data are not here repeated since already published in detail by Bequaert (*l. c.*). I also saw the type of *melaleuca*, at Berlin Mus. The following few specimens are listed simply because some have been misidentified

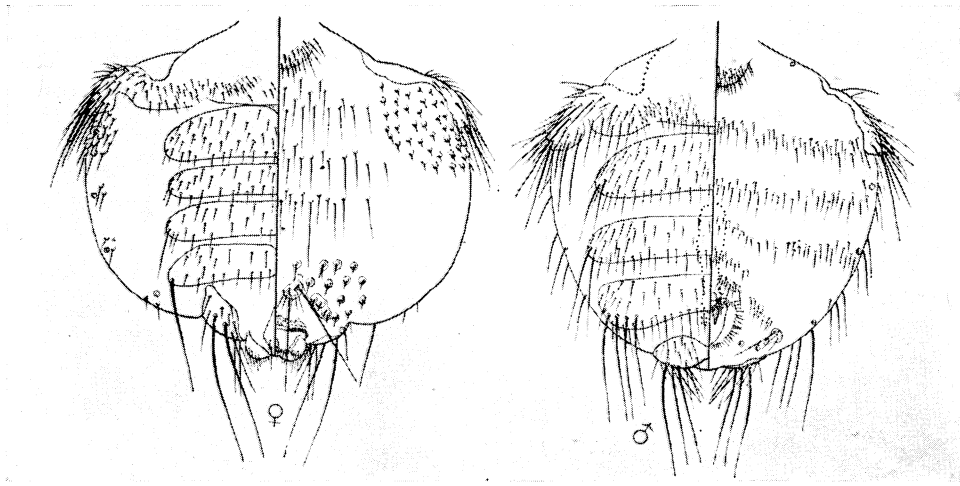


Fig. 46. *Ornithoica vicina* Wk., ♀ (California,), ♂ (Massachusetts), abdomen in dorsal and ventral aspects. (After Ferris, 1929, Canad. Ent. 61: 283).

and wrongly recorded under "*pusilla* Schin." whereas others, not seen by Bequaert.

HAWAIIAN IS: 1♂, 4♀♀ (USNM), Koloa, Kauai I., ex pheasant (F. C. Bishop 18387), XII. 31, det. Aldrich as *pusilla*; 2♂♂, 2♀♀, Kauai I., ex barn owl [*Asio flammeus sandwichensis*], XI. 63, S. Ou; 7♀♀, (all w. mites under wings), Oahu, ex *A. flammeus sandwichensis*, XII. 47, E. C. Zimmerman; 1♀, 1 damaged ex (Univ. Hawaii), ex parrakeet [*Melopsittacus undulatus*], XI. 61; 1♂, Honolulu, Oahu I., ex sick young *Passer domesticus*, VII. 47, F. X. Williams; 1♀, Niuiko, Nuuanu, Oahu I., ex love bird [*M. undulatus*], XI. 30, Caum coll., det. Bequaert as *pusilla*.

BRAZIL: 1♂ (KBH), Scte. Lagoas, ex *Penelope superciliaris*, J. T. Reinhardt.

♀ Similar to *turdi*; but setae stronger; gular spines generally in 2–3 rows; wing 2.7–3.3 mm long; cell *3bc* ca. 2.5× as long as wide; bulla on vein M_{3+4} distinctly closer to *mcu* than to *im*; supra-anal plate rhomboid, not or hardly longer than wide; hind marginal bristles on laterite 2 ca. 2× as long as tergite 3; anchor-like spines near abdominal base at each side about 55–90 in number, those lying above level of spiracle 3 largely long and seta-like; membranous area near each of spiracles 4–6 often with as many as 8–12 small setae; laterite 7 transverse, with oblique subtriangular appendix at inner posterior corner; urogenital area with 8–14 anchor-like spines which are about as large as those near spiracle 3; multispinose wart usually not larger than hind pair of pregenital tubercles, bearing 2–3 spines, very seldom large and with 4 or 5 spines; pregenital plate ⊥-shaped, its longitudinal arm linear, distinctly more slender than transverse arm.

♂. Similar to ♂ *turdi*, but size larger, cell *3bc* longer, setae and bristles stronger and more numerous; tergite 5 with 2 pairs, 6 with 4–5 pairs of bristles; lateral membranous area with moderately strong setae at vicinities of spiracles 3–5, those near spiracle 5 often with some of their basal papillae fused together to form small multisetose tubercles; laterite 6 distinct, with 1 bristle and 4–7 setae; vicinity of spiracle 7 with

2–3 fairly strong setae; genitalia as figured.

♀. Para-anal tuft composed of 4–5 setae of varied length and robustness. Tergite 6 widely interrupted medially; inner end of its side piece tuberculate, bearing 2–3 bristles and very numerous long fine setae (elsewhere of side piece almost bare), posteriorly produced, thus partly embracing posterior anus. Posterior anus strongly exserted, densely microsetose. Infra-anal plate rather pale, transverse, subquadrate, laterally in contact with side piece of tergite 6 and with posterior pregenital tubercle, its anterior transverse rim poorly definable. Laterite 6 entirely merged into tergite 6. Posterior pregenital tubercle with ca. 3 setae of varied length. Urogenital area with *ca.* 3–5 anchor-like spines at a side, basal papillae of 1 or 2 of those spines in contact with side piece of tergite 6. (Described from a dried specimen in Canadian Nat. Coll. from Wenham, Essex Co., Massachusetts, ex *Bubo v. virginianus*, IX. 28, J. C. Phillips).

Puparium. According to Bequaert (1954: 105, fig. 23 F–G), ca. 2.3 mm long, 2 mm wide, 1 mm thick, roundly keeled along lateral margins; each sector of posterior "cap" bearing 15–20 spiracular pores; integument bare, very smooth.

DISTRIBUTION. Widespread throughout the New World, though there are only sporadic records from the W Indies and tropical continental America and none from the Galapagos and other Pacific islands except Hawaii. It has been taken as far north as 50°N at Vancouver I. and as far south as 41° 30′ S in Chile. Its occurrence in the Hawaiian Is. is probably a result of rather recent introduction.

HOST PREFERENCE. According to Bequaert (1954: 93–105; 1957: 574–75), *O. vicina* was known from 117 species of native birds in the Americas; and individual records verified by him for various bird orders were: Tinamiformes 2, Ciconiiformes 2, Falconiformes 14, Galliformes 5, Columbiformes 1, Psittaciformes 2, Cuculiformes 1, Strigiformes 46, Piciformes 8, Passeriformes 170. Verified records for the passerine families were: Formicariidae 1 record, Furnariidae 2, Tyrannidae 3, Cotingidae 2, Muscicapidae 41, Laniidae 1, Sittidae 1, Paridae 2, Thraupidae 3, Fringillidae 72, Icteridae 14, Ploceidae 5, Corvidae 22. Therefore, it appears that among the 10 orders of birds involved, only Passeri- and Strigiformes, which constituted 68% and 18% respectively of the records, serve as true breeding hosts; Falconiformes are possibly breeding hosts too; among the 13 passerine families, only Muscicapidae, Fringillidae and Corvidae are obviously preferred. In the Hawaiian Is., *vicina* has been found ex both native (*Asio*, *Himatione* [*Loxops*], *Vestiaria* [*Loxops*]) and introduced birds (*Columba*, *Melopsittacus*, *Coturnix*, *Phasianus*, *Passer*).

Systematics. This species obviously serves as a bridge between *turdi* and members of the *exilis* group particularly *stipituri* Schin. and allies. In fact, *vicina* and members of *exilis*-group are not or hardly separable in the shape of cell *3bc* and the size and arrangement of anchor-like spines near abdominal apex.

Original descriptions of *vicina*, *promiscua* and *melaleuca* have been fully quoted and, supplemented with annotations, by Bequaert (1954: 106–107), who also provided an excellent bibliography and detailed host and distribution records. It may be noted that in all his (1954: figs. 22–24) figures of the wings, the cell *3bc* was drawn as if distinctly narrowed basad.

O. confluenta var. *peroneura*, as suggested by its name, was based upon Hawaiian specimens with apically abbreviated vein M_{1+2}. The original description is entirely superficial except this venational abnormality. In this connection, I noted in one of the ♀♀ from Kauai I., the posterior 1/2 of vein *mcu* in both wings is entirely missing (the anterior 1/2, as usual, largely whitish and hardly sclerotized), and Bequaert (1954: 96, fig. 23 C–E) recorded, in 3♀♀, Quinsam Lake, Vancouver I., the existence of an extra crossvein basad to *im* in cell *2bc*.

Ornithoica exilis GROUP

Similar to *O. turdi* group, but prescutum varying in setal density, scutellum varying in number of preapical bristles; setular patch (-es) at antero-apical corner of cell *2m* usually tiny or very tiny, often absent, when (seldom) large, then never with its longer axis running parallel to vein M_{3+4} and not its anterior margin entirely or largely in contact with that vein; cell *3bc* ca. 2.5–3.0× as long as wide, not or hardly narrowed basad; spines on trochanter 3 in ♂ and ⚲ almost always present, sometimes very many; abdominal tergite 6 in ♀ undivided, in ♂ and ⚲ always widely interrupted at middle; urogenital area in ♀ almost always with moderate-size scattered anchor-like spines and small multispinose warts, in ⚲ varying in spinoseness and sclerotization; usually 1 pair of pregenital tubercles in ♀; ♀ always with well definable para-anal tuft of long or moderately long setae; supra-anal plate in ♀ very seldom clearly separated into 2 pieces, generally with 4, sometimes as many as 8 or 9 apical setae.

Characters of minor importance in this species-group are: gular spines largely arranged in a single row; scutellum with 2 pairs of major preapical bristles; setae on submedian lobe of syntergite 1+2 about as long and robust as those on tergites 3 and 4; longest setae on tergites 3–5 in ♀ and 3–4 in ♂ and ⚲ not or hardly longer than tergites themselves; posterior margin of tergite 6 in ♀ nearly straight; anterior piece of ♀ supra-anal plate longer, narrower and less sclerotized than posterior piece; ♀ infra-anal plate strongly bilobed, seldom with very small extra median lobe; ♂ laterite 6, when present, always roundish; spiracles 6 and 7 in ♂ subequal in size, with 6 situated only slightly posteriorly to 7.

This species-group is the Oriental counterpart of the *O. turdi* group with one of the species occurring in Madagascar. Twelve species are here recognized, among which 9 are believed to be new to science. They are so closely similar to one another in ♀ and particularly ♂ sexes that their distinctiveness is chiefly on the basis of ⚲ characters so many earlier authors simply combined them under the misused name "*pusilla* Schin." The body size of the species varies, with *podargi* and *zamicra* respectively representing one of the largest and smallest in the entire genus. The host and distributional ranges also vary, with some of the species pleio- or polyxenous and widely distributed whereas others, apparently oligoxenous and localized.

Ornithoica zamicra Maa, n. sp. Figs. 12, 47.

TYPE SERIES. 24♂♂, 36♀♀. Holotype ♀ (BISHOP 6854), allotype ♂ and paratypes in Bishop Mus.; paratypes in BMNH, CAS, CNHM, MCZ, USNM.

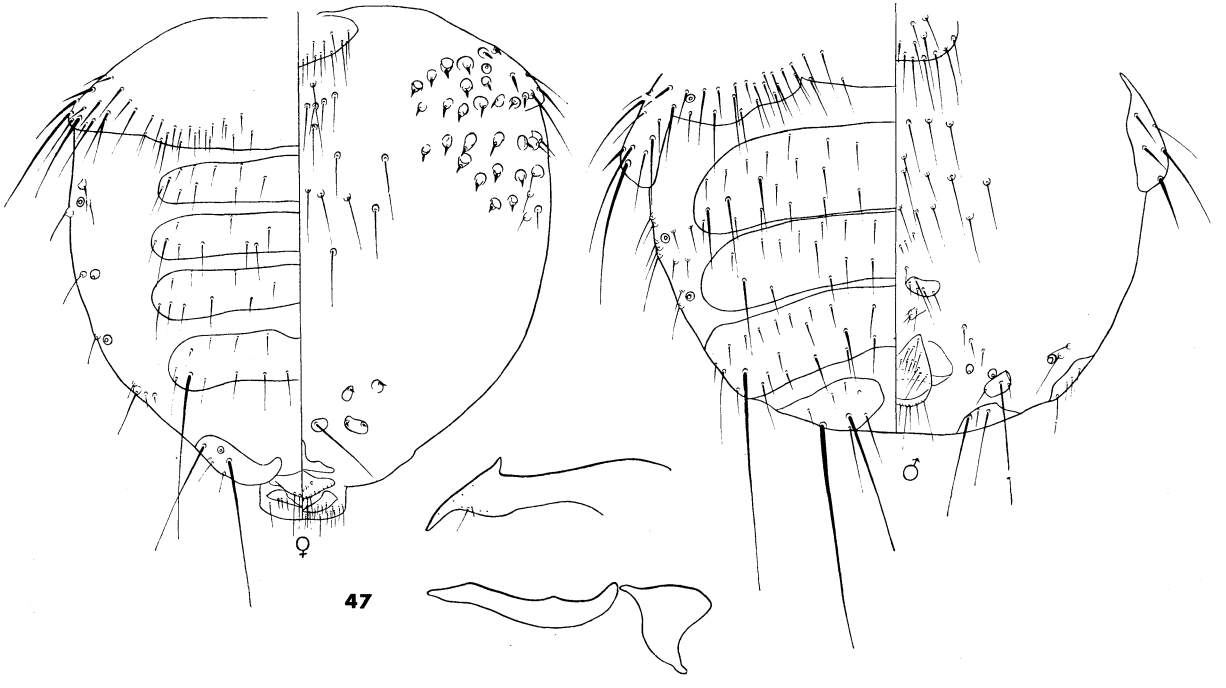


Fig. 47. *Ornithoica zamicra* Maa, ♀ ♂ abdomen in dorsal and ventral aspects and ♂ genitalia in lateral aspects.

NW NEW GUINEA: Holotype ♂, allotype ♀, Kebar Valley, 550 m, Vogelkop Penin., ex *Rhipidura l. leucothorax* (BM-NG, 849), I.62, L. & S. Quate; 1♀, same data but ex *Poecilodryas h. hypoleuca* (BM-NG 848); 1♂, same data but ex *Melilestes m. megarhynchus* (BM-NG 757); 1♂, same data but ex *Xanthotis ch. chrysotis* (BM-NG 802). 1♂, Archbold Lake, 760 m, Snow Mts., ex *Pachycephala aurea* (BM-NG 431), XII. 61, L. & S. Quate. 1♀, Biak, Biak I., ex *Cracticus cassicus* (BBM 22497), III. 63, P. Temple & M. C. Thompson. 1♀, Bodem, nr Sarmi, 100 m, ex corvid (TMP 40), VII. 59, T. C. Maa. 1♀, Oransbari, sea level, NW Geelvink Bay, ex *Paradisaea minor* (BBM 22401), II. 63, L. P. Richards & M. C. Thompson; 1♂, same data but ex *Meliphaga* sp. (BBM 22338). NE NEW GUINEA: 1♀, Ambunti, ±130 m, Sepik Distr., ex *Meliphaga* sp. (BBM 22546), V. 63, P. Temple. 2♂♂, 1♀, Bulolo, 700 m, ex leatherneck (HC 112), III.62, H. Clissold. 1♀, Bulolo Rv., Wau area, 900 m, ex New Guinea "Peewee" (BBM 28454), VI.63, P. Shanahan. 1♀, Coviak, Wau area, 1300 m, ex Lesser Wood Shrike [*Pitohui dichrous*] (BBM 27831), V. 63, Shanahan. 1♀, Forestry, 1200 m, Morobe Distr., ex honeyeater (BBM 28642), VIII. 63, Clissold. 1♀, Koibuga, 1700 m, W Highlands, ex wagtail (BBM 28296), VII. 63, Clissold. 1♀, Korgua or Papugana, 1600 m, W Highlands, ex flycatcher (BBM 28234), VI. 63, Clissold. 1♂, May Rv., 130 m, Sepik Distr., ex *Cicinnurus regius* (BBM 22644), VI. 63, Temple. 1♂, Nakata Ridge, 1600 m, Wau area, ex Grey Yellow Flycatcher [*Pachycare flavogrisea*] (BBM 27784), V. 63, Shanahan; 1♂, same place but ex honeyeater (BBM 27771), V. 63, Clissold; 1♂, same place but ex honeysucker (BBM 28577), VII. 63, Shanahan. 1♀, Slate Creek, ex butcher-bird (BBM 20376), III. 63, Clissold. 1♀, Songarin, ex bird of paradise (BBM 27741), IV. 63, Shanahan; 1♀, same data but ex leatherneck (BBM 27743); 1♂, Telefomin, 1500 m, Sepik Distr., ex *Paradisaea minor* (BBM 22962), IX. 63, Temple. 1♂, 1♀ (♀ w. mite under wing), Watut, 800 m, ex bird (BBM 20217), III. 63, J. H. Sedlacek. 1♀, Wau, 1100 m, ex *Paradisaea raggiana* (S 177), II. 62, G. Monteith; 1♂, same place but ex leatherneck (HC 254), V. 62, Clissold; 1♂, same data but BBM 20400, III. 63. SE NEW GUINEA: 1♀, w. 2 mites under wings, Ahola, 50 m, ex bird (BBM 29907), X. 63, H. Clissold. 1♀, Amboga, 110 m, ex leatherneck (BBM 28802), IX. 63, Clissold. 1♀, w. mite on abd., Azarita, 30 m, ex grackle (BBM 29916), X. 63, Clissold. 2♀♀, Balimo, ex honeyeater (BBM 50286, 50401), III-IV. 64, Clissold; 1♀, same data but ex robin (BBM 50318); 1♂, same data but ex shrike (BBM 50427); 1♂, w. mite on abd, same data but ex wren (BBM 50396); 1♀, same data but ex undet. bird (BBM 50431). 1♀, w. mite on abd., Cape Kileton, sea level, ex wagtail (BBM 29289), X. 63, Clissold. 1♂, 2♀♀, Jumbora, 70 m, ex honeyeater (BBM 28846, 29705), IX., XI. 63, Clissold; 1♂, same data but ex drongo (BBM 28856), IX. 63. 1♂, Oriomo, ex butcher-bird (BBM 29567), II. 64, Clissold; 1♀, same data but ex friar bird (BBM 50045); 2♂♂, 1♀ (1♂ w. mite on abd.), same data but ex honeyeater (BBM 50429, 50459, 50483); 1♀, same data but ex fantail warbler (BBM 50008). 1♂, 2♀♀, Soputa, 30 m, ex honeyeater (BBM 29776, 29805, 29814), X. 63, Clissold; 1♂, 2♀♀, same data but ex flycatcher (BBM 29808, 29834, 29843); 2♀♀, same data but ex undet. birds (BBM 29779, 29839).

♀. Face wider (9 : 7) than eye. Mesonotum darker than abdominal tergal plates; prescutum with ca. 5–6 setal rows; no minor scutellar bristles. Spines on thoracic sterna slightly stronger than on abdominal sternite 1. Wing 1.9–2.1 mm long; cell *3bc* ca. 3× as long as wide; bulla of vein M_{1+2} equidistant to base and apex of *2bc*; M_{3+4} with

abscissa 1 ca. 3/4 as long as 2, bulla slightly closer to *mcu* than to *im*. Abdomen weakly setose; tergite 6 with sinuate anterior margin, with 1 pair of bristles; supra-anal plate large, longer than wide, with 4, rarely 2–3 apical setae; lateral membranous area with 3–5 exceedingly fine setae of varied length near each of spiracles 4–6; laterite 7 ca. 2× as wide as long, weakly narrowed mesad, with 3–4 bristles. Abdominal venter with 30–40 anchor-like spines near base at a side, and usually with 1, rarely 2 rows of spines on sternite 1; disc of venter with 6 setal rows; urogenital area at each side with 1 multispinose wart and 0–5, usually 3 anchor-like spines which are small and all or largely lined closely to pregenital tubercle rather than to spiracle 6; pregenital tubercle slightly wider than long, smaller and less sclerotized than multispinose wart, lacking ordinary setae, its bristle much finer and usually much paler than that on tergite 6; pregenital plate ⊥-shaped.

♂. Similar to ♀. Side piece of tergite 6 ca. 1.5–2× as wide as long, with 2 bristles; pregenital tubercle and its anterior fence of extra-fine setae poorly developed; laterite 6 with 1 short and 1 moderately long setae, no strong bristles. Genitalia as figured. ♀ unknown.

DISTRIBUTION. Papuan Subregion, at present known from NW, NE and SE New Guinea, from sea level to 1700 m, apparently more abundant at higher altitudes and probably to be found all over the Island. Highest catch per infested bird was 3 flies.

HOST PREFERENCE. Probably pleioxenous on Passeriformes, particularly Meliphagidae and Muscicapidae. Of the 47 available records, all were from Passeriformes (but I do not know what "Peewee" means), 22 from Meliphagidae (*Melilestes* 1 record, *Meliphaga* 2, *Xanthotis* 1, genera indet. 18); 11 from Muscicapidae (*Pachycare* 1, *Pachycephala* 1, *Pitohui* 1, *Poecilodryas* 1, *Rhipidura* 1, genera indet. 6); 4 from Paradisaeidae (*Cicinnurus* 1, *Paradisaea* 3); 3 from Oriolidae (leatherneck); 2 from Cracticidae (butcherbird); 2 from Motacillidae (wagtail); 1 each from Dicruridae (drongo), Laniidae (shrike), Sturnidae (grackle) and Corvidae.

Systematics. As suggested by its name (*za-micra*, Greek, very minute), this is the tiniest species of the family, even smaller in average than *turdi* Latr. of Africa. In structure, *zamicra* is one of the close relatives of *stipituri* Schin. with which it often associates itself on same individual host-birds. From the latter species, it can easily be recognized by much smaller size, fewer and weaker setae and bristles and differently shaped laterite 7, supra-anal plate and pregenital tubercle in ♀ and genitalia in ♂. From *tridens* and *bistativa* n. spp., which occur west to the Wallace Line and are a trifle larger, similar characters can be used for its recognition although to a lesser degree. From *rabori* n. sp. of the Philippines, see comparative notes under that species.

Apart from structural characters, *zamicra* (as in *rabori*) differs from *stipituri* and other relatives in having very low population density and hyperparasitism rate as well as nearly balanced sex ratio. In the 55 lots of specimens, the average catch per infested bird was 1.1 flies (maximum 3 flies) and only 4 lots revealed more than 1 fly each. And, when found in association with other *Ornithoica* species on same individual host birds, it was always the rarest of all. Among the 60 flies, only 6 were parasitized by mites and about 40% were ♂♂. Gynandromorphism, fungal infestation and mallophagan phoresy are therefore rather unlikely in this very tiny species.

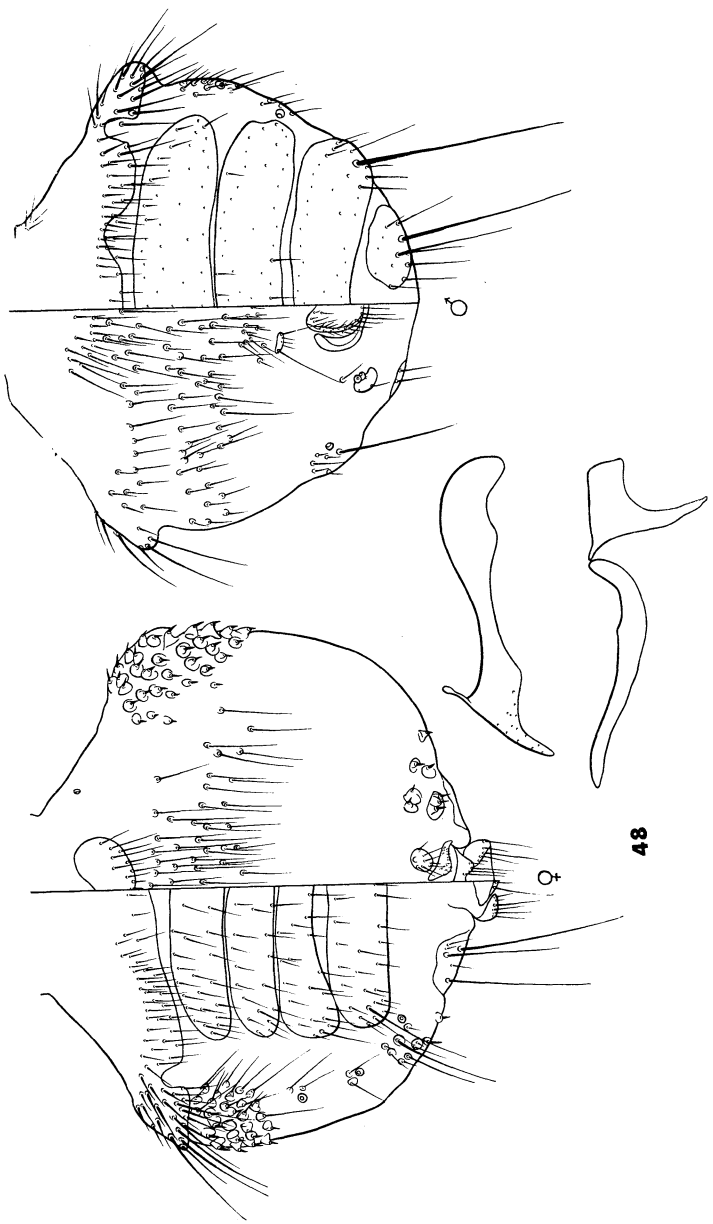


Fig. 48. *Ornithoica rabori* Maa, ♀♂ abomen in dorsal and ventral aspects and ♂ genitalia in lateral aspect.

Ornithoica rabori Maa, n. sp. Figs. 13, 48.

TYPE SERIES. 3♂♂, 7♀♀. Holotype ♀ (BISHOP 6855), allotype ♂ and paratypes all in Bishop Mus.

PHILIPPINES: 1♂, 2♀♀ incl. holotype ♀ and allotype ♂ (♂ w. mallophagan on wing-margin), Macagua, Brooke's Point, Palawan, ex *Copsychus minor* (BBM 1086), 3. IV. M. C. Thompson; 1♀, same data but ex *Macronus flavicollis* (BBM 1094). 1♀, Pinigisan, Mantalingajan Range, Brooke's Point, Palawan, ex bird (BBM 1544), 11. IV. 62, Thompson. 1♂, Balisong, Mt Matutum, Tupi, Cotabato, Mindanao, ex *Centropus toulou javanensis* (SU-BBM 1334), 12. II. 64, D. S. Rabor. 1♀ Tambis, Burauen, Mt Lobi Range, Leyte I., ex *Oriolus ch. chinensis* (B 397), 7. V. 64, Rabor. 1♀, Paniniklan, Mt Kabalanti-an, Mahaplag, Leyte I., ex *O. ch. chinensis* (BBM 2767), 25. VI. 64, N. Wilson; 1♀, same data but ex *Hypsipetes everetti samarensis* (BBM 2932), 28. VI. 64. 1♂, Pasi Oriental, Mindoro, ex *Pycnonotus goiavier* (5E 1610), XI. 64, Migr. Anim. Path. Surv.

♀, ♂. Closely similar to *zamicra* n. sp. but slightly larger, wing 2.1–2.3 mm long; ♀ with supra-anal plate smaller in proportion; bristles on tergite 6 and pregenital tubercle similar in length, robustness and color; pregenital tubercle multisetose; and posterior bar of pregenital plate larger in proportion (cf. key); ♂ abdominal chaetotaxy stronger, with well developed patch of extra-fine setae before pregenital tubercles. Genitalia as figured. ♀ unknown.

DISTRIBUTION. Philippine Subregion, at present known from Leyte, Mindanao and Palawan, lowland. Apparently the rarest *Ornithoica* species in the Archipelago. The highest catch per infested bird was 3 flies.

HOST PREFERENCE. Possibly as in *zamicra* n. sp., pleioxenous on Passeriformes. Available records are 2 ex *Oriolus* (Oriolidae), 1 each ex *Copsychus*, *Macronus* (both of Muscicapidae) and *Hypsipetes*, *Pycnonotus* (Pycnonotidae); besides these, 1 ex *Centropus* (Cuculidae, Cuculiformes).

Systematics. This species is closely similar to *zamicra* n. sp. as well as *philippinensis* Ferr. From the last species, it differs in being slightly smaller, and having cell *3bc* longer and narrower in proportion, bristles on ♀ laterite 7 fewer and ♀ supra-anal plate slightly larger in proportion. The differences in the ♀ and ♂ from those 2 species are so slight (though reasonably constant) that I have had much hesitation in recognizing it distinct, and am awaiting for the discovery of the ♀. In one of the ♀ paratypes, there is an extra pregenital tubercle at one side. The species is named after Prof. D. S. Rabor of the Silliman University.

Ornithoica bistativa Maa, n. sp. Figs. 14, 32, 49.

TYPES SERIES. 40♂♂, 80 ♀♀, 4♀♀. Holotype ♀ (BISHOP 6856), allotype ♂ in Bishop Mus.; paratypes in Bishop Mus., Chicago Nat. Hist. Mus.

BORNEO: Holotype ♀, allotype ♂, paratype ♀, Tenom, Sabah, 200 m, ex *Lonchura malacca* (BBM 10800), I. 63, M. C. Thompson; 1♀, w. abnormal tergal pls., same data but ex *Pycnonotus goiavier* (BBM 10788); 1♀, 1♀, same data but ex *Pitta brachyura* (BBM 10766), XII. 62. 1♂, mile 12, Kalabakan, Sabah, 180 m, ex *Alcippe brunneicauda* (BBM 10625), X–XI. 62, Thompson; 2♀♀, same data but ex *Copsychus malabaricus*

(BBM 10697); 2♂♂, 7♀♀ (1♀ w. mite under wing), same data but ex *Cop. pyrrhopygus* (BBM 10370, 10623, 10643); 1♂, w. mallophagan, same data but ex *Criniger bres* (BBM 10558); 1♀, same data but ex *Cr. phaeocephalus* (BBM 10432); 1♀, same data but ex *Enicurus leschenaulti* (BBM 10440); 1♀, same data but ex *E. ruficapillus* (BBM 10597); 1♀, same data but ex *Hypothymis azurea* (BBM 10611); 1♂, 1♀, same data but ex *Halcyon concreta* (BBM 10590); 2♀♀ (1 w. mite under wing), same data but ex *Hypsipetes criniger* (BBM 10354, 10645); 1♂, 2♀♀, same data but ex *Muscicapa caerulea* (BBM 10365, 10466, 10595); 2♂♂, 3♀♀, same data but ex *Musc. concreta* (BBM 10374, 10543, 10596); 1♀, same data but ex *Malacopteron affine* (BBM 10341); 1♂, 3♀♀, same data but ex *Mal. cinereum* (BBM 10392, 10457, 10636, 10642); 1♂, 3♀♀, same data but ex *Mal. magnirostre* (BBM 10402, 10614, 10624); 4♀♀ (1 w. mite on neck), same data but ex *Pitta baudi* (BBM 10400, 10519, 10580); 1♂, 3♀♀, same data but ex *Pityriasis gymnocephala* (BBM 10591, 10592); 1♂, 3♀♀, 1♀, same data but ex *Platylophus galericulatus* (BBM 10401); 4♂♂, 7♀♀ (1♀ w. mite under wing), same data but ex *Rhinomyias umbratilis* (BBM 10383, 10391, 10408, 10455, 10499, 10517), 1♂, same data but ex *Rhipidura perlata* (BBM 10641); 1♀, same data but ex *Terpsiphone paradisi* (BBM 10420); 2♂♂, 1♀, same data but birds indet. (BBM 10512, 10568). 1♂, Road to Kota Balud, Sabah, ex *Centropus toulou javanensis* (PJ 8927), IX. 60, R. E. Kuntz. 1♀, Kuching, Sarawak, ex *Copsychus saularis* (BL 667), V. 64, B. L. Lim; 1♀, same data but ex *Criniger phaeocephalus diardi* (BL 811).

THAILAND: 1♂, Chiengmai, Huai Mae Sanam, ex *Copsychus malabaricus* (SMRL 1759), XI. 62. 1♂ (CNHM), w. mite on abd., Kanchanaburi, Trakhanun, Hinlaem, left bank, ex *Cop. malabaricus* (RTB 15800), X–XI. 52, R. E. Elbel; 2♀♀ (CNHM) (1♀ w. mite on abd.), same data but ex *Cyornis* sp. (RTB 15833); 1♀ (CNHM), same data but ex *Garrulax leucolophus* (RTB 17049); 1♀ (CNHM), same data but ex *Muscicapa* sp. (RTB 17073); 1♀ (CNHM), same data but ex *Myiophoneus coerulax*? (RTB 17086); 1♀ (CNHM), w. mite on abd., same data but ex *Lacedo pulchella* (RTB 17009); 2♂♂, 1♀ (CNHM) (1♂ w. 4 Mallophaga), same data but ex *Pitta cyanea* (RTB 17072); 2♀♀ (CNHM), same data but ex *P. cyanoptera* (RTB 15805). 1♀ (USNM), Loei, Tha Li, Tha Li, Ban Muang Khai, ex *Criniger pallidus isani* (B 31106), I. 55, Elbel; 1♀ (USNM), same data but ex *Picus flavinucha pierrei* (B 31109). 2♂♂ (USNM), Loei, Dan Sai, Na Phung, Ban Nong Wai, ex *Hypsipetes flavala bourdellei* (B 31035), XI. 54, Elbel. 1♂, Nan, Ban Pha Hang, ex *Copsychus malabaricus* (SMRL 192), XII. 61, Kitta Thonglongya. 1♀ (CNHM), w. mite on abd., Muang Chiang Rai, Chiang Saen Khao, ex *Cyornis* sp. (RTB 17808), II. 53, H. G. Deignan; 1♂ (CNHM), same data but ex *Garrulax leucolophus* (RTB 17819); 1♀ (CNHM), w. mite on wing, same data but ex *Mino coronatus* (RTB 17818). 1♂ (CNHM), Prachuap Khiri Khan, Ban Khlua Klang, ex *Garrulax pectoralis* (RTB 17678), XII. 52, Deignan. 1♀ (CNHM), Sakon Nakhon Distr., Sakon Nakhon, Khok Phu, Ban Sang Kho, ex *Garrulax leucolophus diardi* (RE 3357), I. 54, R. E. Elbel & Bonsong Lekagul. 2♂♂, Chong, Muang Trang, ex *Surniculus lugubris* (RE 7105), II. 63, Elbel. 1♂, Phattalung, Pakphayun, Kofai, ex *Ducula aenea polia* (RE 6224), III. 62, Wanit; 1♀, Phattalung, Pakphayun, Thadindang, ex *Centropus sinensis eurycercus* (WS 279), VI. 63, Wanit; 1♂, same data but ex *Platysmurus leucopterus* (RE 6336–7), VI. 62, Wanit; 1♂, same data but ex *Dissemurus* [*Dicrurus*] *paradiseus malayensis* (RE 6191), III. 62, Wanit. 1♂, 1♀, Nakhonsithammarat, Lansaka, Khao Kaeo, ex *D. paradiseus*

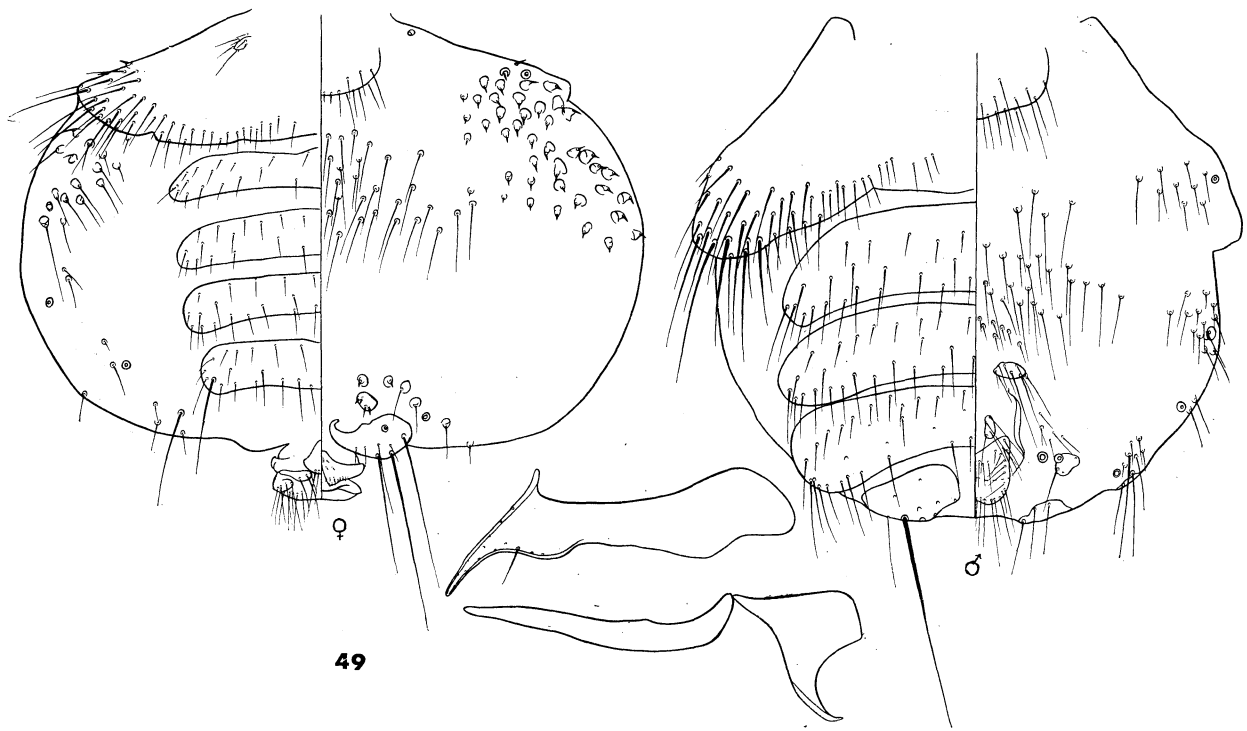


Fig. 49. *Ornithoica bistativa* Maa, ♀ ♂ (Borneo), abdomen in dorsal and ventral aspects and ♂ genitalia in lateral aspect.

malayensis (WS 065), IV. 63, Wanit. 1♀, Ranong, Kapoe, Thungkha, ex *Geokichla citrina gibson-hilli* (RE 7055), I. 63, Elbel. 1♂, Ranong, Kapoe, Muang Kluang, ex *G. citrina gibson-hilli* (RE 6906), XII. 62, Elbel. 1♀, Phangnga, Ko Kho Khao, Khrua, ex *Pitta guajana* (WS 826), III. 64, Wanit & Wichit; 1♂, same data but ex *Dicrurus macrocercus* (WS 843).

MALAYA: 1♀, Mt Brinchang, Cameron Highlands, ex *Alcippe castaneiceps* (M 1123), III. 62, H. E. McClure. 1♀, w. mites under wings, Gombak, Selangor, ex *Trichastoma malaccensis* (M 2812), IV. 63, McClure; 1♀, same data but ex *Platylophus galericulatus* (M 2397), II. 63. 2♂♂, 5♀♀ (CNHM) (1♀ w. mites on neck), Klang, Selangor, ex *Pitta brachyura cyanoptera* (RTB 45108), IV. 56, Inst. Med. Res. Malaya. 1 ♀, Selangor, ex *Rhinomyias umbratilis* (M 1844), 1962, McClure; 1♀, same data but ex *Stachyris maculata* (M 1830). 1♂ w. mallophagan on wing, Gunong Bunga Buah, ex *Garrulax mitratus* (5E 013), VIII. 64, Migr. Anim. Path. Surv. 1♀, Ulu Gombak, Selangor, ex *Ceyx erithacus* (H 984), I. 64, Migr. Anim. Path. Surv.; 1♀, same data but ex undet. bird (H 983).

♀. Face as wide as eye. Prescutum with ca. 7–8 setal rows. Wing 2.2–2.4 mm long. Supra-anal plate anteriorly much narrower than posteriorly; lateral membranous area of abdomen usually with 1–2 extra-fine setae near each of spiracles 4 and 5; para-anal tuft composed of 3–8, generally 4–6 setae of varied length and fineness and 1 or 2 of them nearly as long as bristles on tergite 6; bristles on tergite 6 and pregenital tubercle similar in robustness and color; urogenital area at each side with 0–2, usually 1 multispinose wart and 1–8, usually 3–5 anchor-like spines; posterior bar of pregenital plate large. Other characters as in *zamicra* n. sp.

♂. Similar to ♂ *zamicra* but slightly larger, abdominal chaetotaxy stronger, with bristles on laterite 6 and of para-anal tuft fairly long and strong, patch of extra-fine setae before pregenital tubercles well developed. Genitalia as figured.

♀. Side piece of tergite 6 ca. 1/2 wider than long, well separated from laterite 6, its inner 2/3 very strongly tuberculate and with ca. 3 long bristles, some setae of varied length, and a long large petiolate posterior appendix which is smooth, moderately tuberculate, less sclerotized and pigmented than side piece proper and lies at side of posterior anus; outer 1/3 of side piece proper also smooth, less pigmented than inner 2/3; infra-anal plate simple, narrower than posterior anus, with virtually straight anterior margin, laterally almost touching above-described appendix; laterite 6 large, transverse, narrowed mesad, bearing 1 bristle near center and 4–8 spines on remaining area (quite seldom 1 or 2 of such spines replaced by very strong setae), inner end almost touching anterolateral corner of infra-anal plate; no anchor-like spines lying outside of laterite 6. Other characters similar to ♀♀ *simplicis* and *stipituri*.

DISTRIBUTION. Indo-Chinese and Malaysian Subregions, at present known from Thailand, Malaya and N Borneo, up to ca. 1000 m, apparently commoner in lowlands. Highest catch per infested bird was 3 flies, very often 1 bird with only 1 fly.

HOST PREFERENCE. Apparently pleioxenous on Passeriformes (particularly Muscicapidae), with stragglers on Columbi-, Cuculi-, Coracii- and Piciformes. Analysis of available records follows: Columbiformes (*Ducula*) 1 record; Cuculiformes 3 (*Centropus*

2, *Surniculus* 1); Coraciiformes 3 (*Ceyx* 1, *Halcyon* 1, *Lacedo* 1); Piciformes 1 (*Picus*); Passeriformes 74 (*Alcippe* 2, *Copsychus* 8, *Criniger* 4, *Cyornis* 2, *Dicrurus* 3, *Enicurus* 2, *Garrulax* 5, *Hypothymis* 1, *Hypsipetes* 3, *Lonchura* 1, *Malacopteron* 8, *Mino* 1, *Muscicapa* 8, *Myiophoneus* 1, *Pitta* 7, *Pityriasis* 2, *Platylophus* 1, *Platysmurus* 1, *Pycnonotus* 1, *Rhinomyias* 7, *Rhipidura* 1, *Stachyris* 1, *Terpsiphone* 1, *Trichastoma* 1, *Zoothera* (= *Geokichla*) 2). Breakdown of records on Passeriformes is Pittidae 7, Pycnonotidae 8, Muscicapidae 49, Prionopidae 2, Ploceidae 1, Sturnidae 1, Dicruridae 3, Corvidae 2.

Systematics. The most outstanding character of this species is the pair of posterior appendices of ♀ tergite 6. They are situated at sides of posterior anus as if standing as guards at the orifice. In allusion to this, the specific name is suggested (*bi-*, two; *statio*, a post, a guard; *stativa*, standing still). Both in other structure and host preference, *bistativa* is closely similar to *zamicra* n. sp. of New Guinea and *rabori* n. sp. of the Philippines. The 3 species are so alike in both sexes that their real distinction can be revealed only when ♀♀ of the latter 2 are discovered. The only abnormality noted in this species is the medially interrupted tergite 5 in a Bornean ♀ (BBM 10788).

Ornithoica philippinensis Ferris Figs. 15, 38, 50.

philippinensis Ferr. 1927 c: 210, fig. 3, ♀.—Maa 1963: 57 (notes on type).

MATERIAL EXAMINED. 13♂♂, 23♀♀, 1♀. PHILIPPINES: 1♀ (STF), type, Alabat I. off N coast of Tayabas Prov., Luzon, ex *Ceyx melanura*. 1♀ (USNM), Sibuyan I., possibly ex *Pitta erythrogaster*; 1♀ (USNM), Sibuyan I., ex *Spilornis panayensis*, VI. 04. 3♀♀ (CNHM) (1♀ w. mite on abd. apex), Mt McKinley, E slope, 1900–2100 m, Davao Prov., Mindanao, ex *Prioniturus discurus waterstradti* (fld. #811, 812, 866), IX. 46, M. Celestino, H. Hoogstraal & D. Heyneman. 1♂, Balisong, Mt Matutum, Tupi, Cotabato, Mindanao, ex *Coracina morio mindanaensis* (SU-BBM 1236), I. 64, D. S. Rabor. 4♂♂, 5♀♀, Hilong-hilong Peak, 1600–2100 m, Agusan Prov., Mindanao, ex *Turdus poliocephalus* (SU 5692, 5701, 5705), IV. 63, Rabor; 1♀, same data but ex *Rhipidura n. nigrocinnamomea* (SU 5695). 1♂, Hanggos, Hilong-hilong Peak, 1300–1600 m, Agusan Prov., Mindanao, ex *Brachypteryx montana* (SU 5584), IV. 63, Rabor; 1♀, seme data but ex *Pachycephala philippinensis apoensis* (SU 5559); 1♂, same data but ex *Rhabdornis inornatus* (SU 5586); 1♀, w. mites on neck & under wing, same data but ex *Turdus poliocephalus* (SU 5585). 1♂, 1♀ (♀ w. mite on abd. apex), Dapitan Peak, 1700–2300 m, Mt Malindang, Misamis occident., Mindanao, ex *T. poliocephalus malindangensis* (BBM 518), I. 63, Rabor. 2♂♂, 4♀♀ (1♂ w. 2 mites on abd. apex, 1♀ w. mite under wing, 1♀ w. abnormal tergal pls.), Masawan, 1400–1600 m, Mt Malindang, Zamboanga del Norte, Mindanao, ex same host (BBM 46, 47, 62), XII.62–I.63, Rabor; 1♂, 1♀, same data but ex *Anthus h. hodgsoni* (BBM 93, 181); 1♂, same data but ex *Lanius cristatus lucionensis* (BBM 30); 1♀, w. 2 mites under wings, same data but ex *Pachycephala philippinensis apoensis* (BBM 84). 1♂, Mt Katanglad, 1600–1800 m, Malabay, Bukidnon, Mindanao, ex same host (BBM 575), II. 63, Rabor; 1♀, same data but ex *Lanius cristatus lucionensis* (BBM 551); 2♀♀, same data but ex *Zosterops m. montana* (BBM 574, 648).

♀, ♂. Closely similar to *simplicis* n. sp. Size slightly smaller; wing 2.6–2.8 mm long; ♀ with supra-anal plate usually much smaller, laterite 7 narrower in proportion, usually hardly wider than long; ♂ with much weaker spines on thoracic sterna, fewer

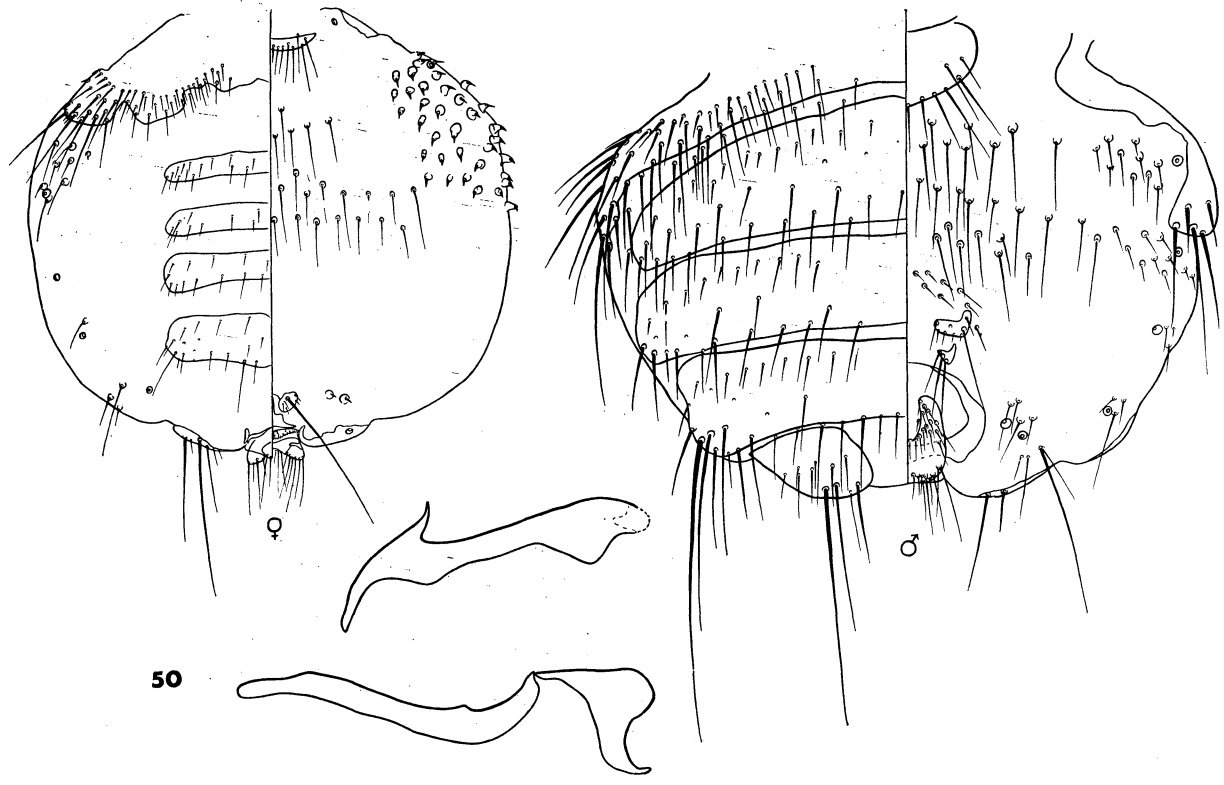


Fig. 50. *Ornithoica philippinensis* Ferr., ♀ ♂ abdomen in dorsal and ventral aspects and ♂ genitalia in lateral aspect.

weaker setae and bristles on terga 4–6; genitalia as figured.

♀. As shown in Ferris' figure (here reproduced), side piece of tergite 6 somewhat like a transverse letter U, anterior arm of which bare. Posterior arm tuberculate, with strong bristles and lying outside anterolateral corner of posterior anus; laterite 6 not definable, but some of anchor-like spines between spiracles 6 and 7 forming together small multispinose warts.

DISTRIBUTION. Philippine Subregion. Known from Alabat I. nr. Luzon, Sibuyan and Mindanao, largely in mountains at 1500–2000 m. Much rarer than *exilis* Wk. in the same country. Highest catch per infested bird was 7 flies.

HOST PREFERENCE. Apparently pleioxenous on Passeriformes, with stray records on Falconi-, Psittaci-, Cuculi- and Coraciiformes. Analysis of available records follows: Psittaciformes (*Prioniturus*) 3 records; Falconiformes (*Spilornis*) 1; Coraciiformes (*Ceyx*) 1; Passeriformes 22 (*Anthus* 2, *Brachypteryx* 1, *Coracina* 1, *Lanius* 2, *Pachycephala* 3, *Pitta* 1, *Rhabdornis* 1, *Rhipidura* 1, *Turdus* 8, *Zosterops* 2), Breakdown of records on Passeriformes is Pittidae 1, Campephagidae 1, Muscicapidae 13, Motacillidae 2, Laniidae 2, Certhiidae 1, Zosteropidae 2.

Ornithoica stipituri (Schiner) Figs. 16, 33, 51.

stipituri Schin. 1868: 374 (*Ornithomyia*.)—Speis. 1900: 559 (key); 1904 b: 86 (redes. of type.)—Bau 1922: 278 (key, synonymy); 1929 a: 247 (*confluenta* var.) (key.)—Maa 1963: 66, 88 (notes on type, synonymy).

distenta Speis. 1902 a: 332.—Maa 1963: 29 (notes on type).

MATERIAL EXAMINED. 172♂♂, 313♀♀, 10♂♀. All specimens from MCZ (except the series from Dobadura) have been determined by Bequaert as "*pusilla* Schin." "LIBERIA": 1♀ (MCZ), Banga, ex *Melittophagus g. gularis*, X. 26. [Found in same vial containing typical *turdi*, 4♂♂, 1♀. Apparently having been mixed up.]

NW NEW GUINEA: 1♂ (MCZ), Hollandia, ex *Aplonis* sp., IV. 45, S. G. Jewett Jr. 5♀♀ (4 w. 4 mites on fore coxal cavities), Archbold Lake, 760 m, Snow Mts, ex *Corvus* sp. (?*orru*) (BM-NG 424), XI. 61, L. & S. Quate; 1♂, same data but ex *Pitohui kirhocephalus* (BM-NG 475), XII. 61. 2♀♀, Bodem nr Sarmi, ex corvid (TMP 40), VII. 59, T. C. Maa. 1♀, Kebar Valley, 500 m, Vogelkop Penin., ex *Gymnocorvus tristis* (BM-NG 804), I. 62, L. & S. Quate; 1♂, 4♀♀, same data but ex *Paradisaea m. minor* (BM-NG 742, 810); 2♂♂, 1♀ (♀ w. mites on abd.), same data but ex *Phonygammus k. keraudrenii* (BM-NG 750); 3♀♀, same data but ex *Pitohui d. dichrous* (BM-NG 755); 2♂♂, 2♀♀, same data but ex *P. f. ferruginea* (BM-NG 727, 845); 1♂, 2♀♀, same data but ex *Pitta erythrogaster* (BM-NG 789). 3♀♀, Oransbari, 3 m, NW Geelvink Bay, ex *Centropus menbeki* (BBM 22166), XII. 62, L. P. Richards; 4♂♂, 2♀♀, same data but ex *Cicinnurus regius* (BBM 22379), II. 63, L. P. Richards & M. C. Thompson; 2♀♀, same data but ex *Cracticus quoyi* (BBM 22424); 4♂♂, 1♀ same data but ex *C. cassicus* (BBM 22309, 22310, 22332, 22370), I. 63; 1♀, same data but ex *Dacelo* sp. (BBM 22326); 1♂, 1♀, same data but ex *Dacelo* (?) sp. (BBM 22359), II. 63; 3♂♂, 5♀♀, same data but ex *Halcyon azurea* (BBM 22312, 22315), I. 63; 1♀, same data but ex *H. nigrocyanea* (BBM 22311); 2♂♂, 5♀♀, 1♂, same data but ex *Pitohui ferruginea* (BBM 22314, 22317); 4♀♀, all w. mites, same data but ex *P. kirhocephalus* (BBM 22307); 2♀♀, same data but ex *Mino dumontii*

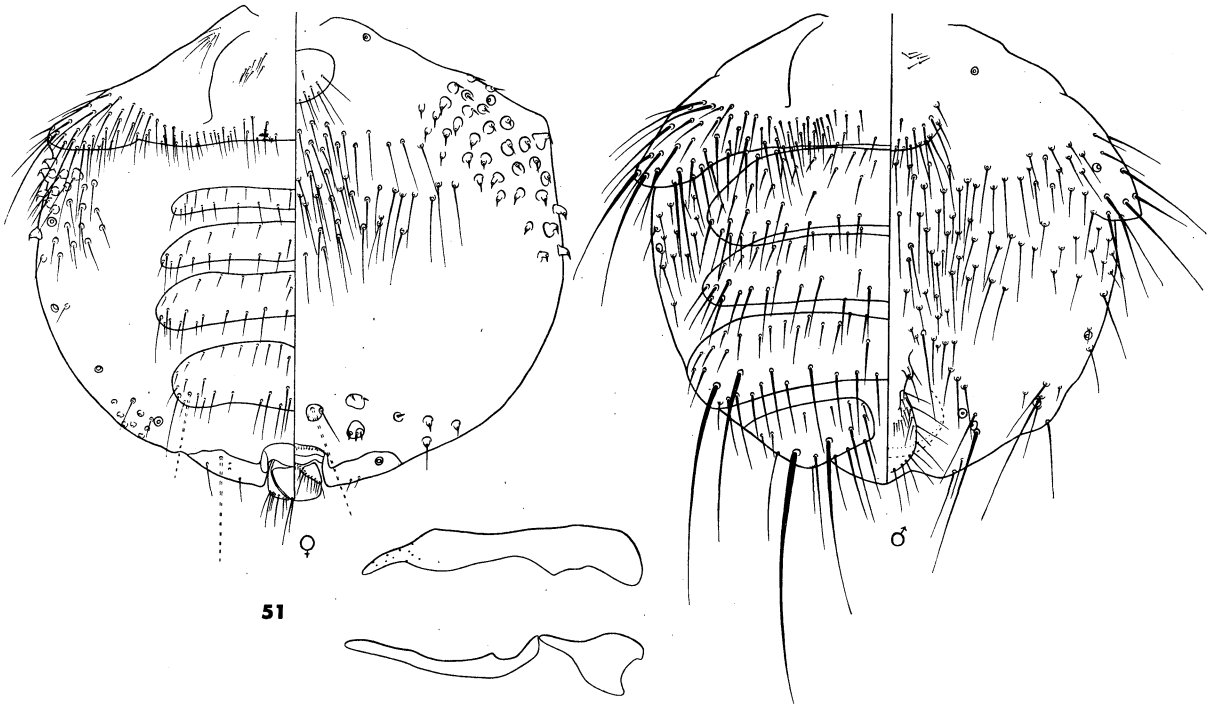


Fig. 51. *Ornithoica stipituri* Schin., ♀ ♂ (NE New Guinea), abdomen in dorsal and ventral aspects and ♂ genitalia in lateral aspect.

(BBM 22343); 1♂, same data but ex *Paradisaea minor* (BBM 22401), II. 63; 1♀, same data but ex rifle bird (BBM 22212), XII. 62, L. P. Richards. SW NEW GUINEA: 1♀, Bomberi, nr Fak Fak, 700–900 m, ex crow (?), VI. 59, T. C. Maa; 2♂♂, 13 ♀♀, same data but ex undet. birds. NE NEW GUINEA: 1♀, Ambunti, 70 m, Sepik Distr., ex *Cracticus cassicus* (BBM 22543), V. 63, P. Temple; 1♀, same data but ex *Meliphaga* sp. (BBM 22546); 2♂♂, same data but ex *Mino dumontii* (BBM 22559, 22560); 2♂♂, 2♀♀, same data but ex *Sauromarptis gaudichaud* (BBM 22542); 1♂, 1♀, same data but ex *Cracticus cassicus* (BBM 22557). 2♂♂, 1♀, Bulolo, 700 m, ex *Cracticus cassicus* (S 224, 225), II. 62, G. Monteith; 2♂♂, 3♀♀, same data but ex *Paradisaea raggiana* (S 170), I. 62; 1♀, same place, ex Black-headed Blue Jay (HC 111), III. 62, H. Clissold; 2♂♂, 5♀♀, same data but ex bird of paradise (HC 72); 1♂, same data but ex leatherneck (HC 112); 1♂, same data but ex Forest Kingfisher (HC 120). 1♂, 2♀♀, Bulolo R., Wau area, 700 m, ex *Pitta erythrogaster* (BBM 27847), V–VI. 63, P. Shanahan; 3♀♀, same data but ex Blue-grey Cuckoo-Shrike [*Coracina caeruleogrisea*] (BBM 27885, 28430, 28431); 2♂♂, 5♀♀ (1♀ w. 4 mites on abd.), same data but ex Black-eared Catbird [*Ailuroedus melanotis*] (BBM 27879); 3♂♂, 4♀♀, same data but ex White-eared Catbird [*A. buccoides*] (BBM 27840, 27846); 1♀, same data but ex "python" [apparently wrong] (BBM 28997). 1♂, Coviak, Wau area, 1300 m, ex bird of paradise (BBM 20335), II. 63, Clissold; 1♀ w. mite on abd., same data but ex Rainbow Lorikeet [*Trichoglossus haematodus*] (BBM 27829), P. Shanahan; 1♀, same data but ex Lesser Wood Shrike [*Pitohui dichrous*] (BBM 27831). 1♀, Finschhafen, ex *Cracticus cassicus* (BBM 27659), IV. 63, Clissold; 1♀, same data but grackle (BBM 27648); 1♀, same data but *Sauromarptis gaudichaud* (BBM 27568); 1♀ w. mite under wing, same data but BBM 27663, P. Shanahan. 1♀, Green R., 160 m, Sepik Distr, ex *Philemon corniculatus* (BBM 22712), VI. 63, Temple. 1♀ (CSIRO), Hayfield, Sepik Distr. ex *Melidora macrorhina*, V. 62, W. B. Hitchcock. 1♂, Mt Kaindi, ex *Melipotes fumigatus* (BBM 20623), II. 63, Clissold; 2♀♀, 2⚲⚲, same data but ex bird of paradise (BBM 21238); 1♂, same data but ex crow (BBM 21237). 1♂, Kauli Creek, ex rifle-bird (BBM 21128), I. 63, Clissold. 1♂, Koibuga, 2000 m, W Highlands, ex shrike (BBM 28310), VII. 63, Clissold. 1♂, May R., 130 m, Sepik Distr., ex *Cicinnurus regius* (BBM 22644), VI. 63, Temple; 1♀, same data but ex *Sauromarptis gaudichaud* (BBM 22620). 1♀, Mt Missim, ex butcher-bird (BBM 21084), I. 63, Temple. 1♂, 2♀♀, Pindiu, ex *Cracticus cassicus* (BBM 27715, 27720), IV. 63, Clissold; 3♂♂, 1♀, same data but (BBM 27727, P. Shanahan; 1⚲, same data but ex dollar-bird (BBM 27728); 6♀♀, same data but ex *Oriolus szalayi* (BBM 27721). 1♀, w. 2 mites under wings, Nakata Ridge, 1700 m, Wau area, ex honeyeater (BBM 27771), V–VII. 63, Clissold; 1♂, 1♀, same data but ex blue jay (BBM 27783), Shanahan; 1♂, 1♀, same data but ex *Syma megarhyncha* (BBM 27792, 27807); 2♂♂, 1♀, same data but ex Blue-grey Cuckoo-shrike [*Coracina caeruleogrisea*] (BBM 28495); 4♂♂, same data but ex bird of paradise (BBM 28493); 1♀, same data but ex Lawes Six-plumed Bird of Paradise [*Parotia lawesi*] (BBM 27833); 1♂, 1♀, same data but ex butcher bird (BBM 29000); 1♀, same data but ex Magnificent Fruit Dove [*Megaloprepia magnifica*] (BBM 28530); 2♂♂, 1♀, same data but ex Giant Forest Cuckoo (BBM 28529). 2♂♂, 8♀♀ (1♀ w. mite under wing), Slate Creek, ex butcher bird (BBM 20376, 20382, 20383), III. 63, Clissold; 2♀♀, same data but ex Fan-tailed Warbler [*Cisticola exilis*] (BBM 20388, 20389). 1♂, 1⚲, Songarin, ex bird of paradise (BBM 27741), IV. 63, Shanahan; 1♂, same data but ex *Manucodia chalybatus* (BBM 27739). 1♀, Wagu, 150

m, Sepik Distr, ex *Cacatua galerita triton* (BBM 22671), VI. 63, Temple. 2♂♂, 4♀♀, Wau, 1200 m, Morobe Distr, ex bird of paradise (BBM 29008), VIII. 63, Clissold; 1♂, 1♀ (♀ w. mite on abd.), same data but ex *Pitta* (BBM 20416), III. 63; 1♂, 5♀♀, same data but ex *Oriolus szalayi* (HC 149), V. 62; 1♂, 2♀♀ (1♀ w. mite on abd.), same data but ex leatherneck (HC 150, 254); 1♀, same data but ex *Merops ornatus* (HC 171); 1♂, w. 2 Mallophaga, same data but ex Sacred Kingfisher [*Halcyon sancta*] (HC 127); 1♂, same data but ex Red Wattled Honeyeater (HC 192); 1♀, same data but ex New Guinea Crow (HC 199); 2♂♂, same data but ex satin-bird "M" (BBM 21261), VI. 62; 1♀, same locality ex *Oriolus szalayi* (S 62), X. 61, J. Sedlacek; 1♂, 1♀, same data but ex kingfisher (BBM 20152), VII. 62; 1♀, same locality, ex *Amaurornis violaceus* (S 84), XII. 61, G. Monteith; 1♀, same locality, Malaise trap, VII. 61, J. Sedlacek. 4♀♀, Wau Creek, ex *Pitohui dichrous* (BBM 20582), III. 63, Clissold; 1♂, same data but ex leatherneck (BBM 20400); 1♂, 1♀, same data but ex bird of paradise (BBM 27570). 1♀ (MLN), lectotype of *distenta* Speis., Simbang, Huon Penin., no host record. SE NEW GUINEA: 1♂, 6♀♀, Ahola, 45 m, ex kingfishers (BBM 29897, 29904), X. 63, H. Clissold; 1♂, same data but ex undet.-bird (BBM 29901). 2♂♂, 1♀, Amboga, 60–110 m, ex butcher-bird (BBM 28799), IX–X. 63, Clissold; 1♀, same data but ex grackle (BBM 28801); 1♀, same data but ex *Sauromarptis gaudichaud* (BBM 28808); 1♂, 1♀, same data but ex leatherneck (BBM 28802); 1♀, same data but ex shrike (BBM 28806); 1♂, same data but ex drongo (BBM 29920); 1♂, 3♀♀, same data but ex cougal (BBM 29291). 1♂, 1♀, Balimo, ex *Manucodia ater* (BBM 50191), III–IV. 64, Clissold; 2♂♂, 5♀♀, same data but ex shrike (BBM 50402, 50422, 50427); 2♂♂, 1♀, same data but ex kingfishers (BBM 50315, 50423). 1♀, Daru, ex plover (BBM 50120), III. 64, Clissold. 1♂, 3♀♀, Buka Bara, sea level, ex *Centropus bernsteini* (BBM 28819), IX. 63, Clissold. 1♂ (MCZ), Dobadura, ex bird #537, U. S. Typhus Comm.; 1♀ (MCZ), same data but ex *Coracina* (?) sp. (#573); 1♂, 3♀♀, same data but ex *Dacelo leachi* (#571); 1♂ (MCZ), same data but ex *Eurystomus orientalis* (#349); 2♂♂, 1♀ (1♂ w. fungus), same data but ex kingfisher (#43), XI. 43, G. M. Kohls. 5♂♂, 7♀♀, Jumbora, 60 m, ex *Sauromarptis gaudichaud* (BBM 28773, 28844, 28853, 29668, 29670, 29674, 29679), IX–X. 63, Clissold; 1♂, 3♀♀, 1♀ (♂ w. 2 mites on neck), same data but ex*Cracticus cassicus* (BBM 28782, 29334, 29700); 1♂, 2♀♀ same data but ex *Centropus bernsteini* (BBM 28749, 29706); 1♂, 2♀♀ (1♀ w. abnorm. terg. pls.), same data but ex drongo (BBM 29696); 2♀♀, same data but ex *Mino dumontii* (BBM 28739); 1♂, same data but ex *Henicopernis longicauda* (BBM 28852); 1♂, 3♀♀, 1♀, same data but ex *Oriolus szalayi* (BBM 28710, 29331); 1♀, same data but ex leatherneck or grackle (BBM 29669); 2♂♂, 2♀♀ (1♀ w. mite under wing, 1♀ w. mite on abd.), same data but ex undet. birds (BBM 29339, 29355). 1♂, 2♀♀, Cape Kileton, sea level, ex kingfishers (BBM 29245, 29291), X. 63, Clissold; 1♂, 1♀ same data but ex *Centropus bernsteini* (BBM 29239, 29275). 1♂, 3♀♀ (1♀ w. mite on abd.), Oriomo, ex bird of paradise (BBM 29392, 29613, 29660) II. 64, Clissold; 1♂, same data but ex *Paradisaea raggiana* (BBM 29435); 1♂, same data but ex *Craspedophora magnifica* (BBM 29620); 4♂♂, 4♀♀ (1♀ w. mites under wings), same data but ex butcher-bird (BBM 29567, 29569, 29570, 29649, 29650); 3♂♂, 1♀, same data but ex *Ailuroedus crassirostris* (BBM 29577); 1♂, same data but ex catbird (BBM 29622); 1♀, same data but ex drongo (BBM 29651); 1♀, same data but ex friar bird (BBM 29408); 4♂♂, 4♀♀, same data but ex kingfishers (BBM 29389, 29520); 2♂♂, 2♀♀, same data but ex *Pitta* (BBM 29528); 1♂, same data but ex *Oriolus szalayi* (BBM 29433);

1♀, same data but ex bower bird (BBM 29419); 1♂, 3♀♀, ex undet. birds (BBM 29557, 29641). 2♂♂, w. mallophagan, Popondetta, 60 m, N Distr., ex bower bird (BBM 28662), VIII. 63, P. Shanahan; 1♀, same data but ex *Accipiter cirrocephalus* (BBM 28697); 3♀♀, same data but ex kingfisher (BBM 28658). 1♂, Sangara, 80 m, ex *Oriolus szalayi* (BBM 29982), X. 63, Clissold. 2♂♂, 3♀♀, 1♀, Soputa, 30 m, ex kingfishers (BBM 29714, 29820); 1♀, same data but ex *Tanysiptera danae* (BBM 29828); 1♀, same data but ex honeyeater (BBM 29822); 2♀♀ (1 w. 2 mites under wings), same data but ex wagtail (BBM 29827). 2♀♀, Zenani, 130 m, ex butcher-bird (BBM 29948), X. 63, Clissold.

NEW BRITAIN: 1♀ (MCZ), "New Britain", ex *Accipiter rubricollis brachyurus* (P 97), W. F. Coultas; 1♂ (MCZ), same data but ex *Halcyon s. sancta* (P 93); 2♂♂, 3♀♀ (MCZ), same data but ex *H. chloris tristrami* (P 106, 109); 1♂, 15♀♀ (MCZ) (1♀ w. mite on fore coxal cavity, 6♀♀ w. fungi), same data but ex *Ninox odiosa* (P 136); 2♀♀ (MCZ) (1♀ w. mite on abd. dorsum), same data but ex *Pitta macklotii gazellae* (P 124); 2♂♂, 5♀♀ (MCZ) (1♀ w. mite on abd. dorsum, 1♀ w. fungus), same data but ex *Tyto novaehollandiae aurantia* (P 86 & 98). 1♂, 1♀, Gaulim, ex *Corvus orru* (BBM 20691), X. 62, H. Clissold; 1♂, 1♀, same data but ex *Accipiter luteoschistaceus* (BBM 20689); 4♂♂, 2♀♀, same data but ex *Philemon novaeguineae* (BBM 20677, 20678, 20679); 1♂ same data but ex *Mino dumontii* (BBM 20698); 1♀, same data but ex "*Pteropus* sp." (BBM 20680) [evidently mislabeled or contaminated]. 1♀, Mt Sinewet, ex *Habropteryx insignis* (BBM 20781), XI. 62, Clissold; 1♂, same data but ex *Centropus violaceus* (BBM 20782); 2♂♂, same data but ex *Philemon novaeguineae* (BBM 20777, 20791). 1♂, 1♀, Riaet, ex *Centropus* sp. (BBM 20743), XI. 62, Clissold; 1♂, same data but ex *Ph. novaeguineae* (BBM 20710); 1♂, 4♀♀, same data but ex *Mino dumontii* (BBM 20706, 20707, 20709). 1♀ (KBH), w. mite on abd., Kawalakessi, VII. 62, Noona Dan Exped. 61–62.

SOLOMON IS.: 1♂, Malangona, sea level, Choiseul, *Accipiter novaehollandiae* (BBM 23675), III. 64, Temple; 2♀♀, same data but *Aplonis grandis* (BBM 23545, 23562); 3♀♀, same data but ex *Corvus woodfordi* (BBM23555, 23602); 1♂, 2♀♀ (1♂, 1♀ w. 7 mites on abd.), same data but ex *Halcyon chloris* (BBM 23560); 2♂♂, 1♀, same data but ex *H. leucopygia* (BBM 23584); 1♂, 4♀♀, same data but ex *Pachycephala pectoralis* (BBM 23559, 23561, 23604); 2♀♀, same data but no host record (BBM 23629). 1♀, Pusisama, sea level, Vella Lavella, ex Muscicapinae (BBM 23133), XI. 63, Temple. 1♂, 4♀♀, 1♀ (MCZ), Malaita, ex *Ninox jacquinoti malaitae* (P 7), W. F. Coultas. 1♂, Gollifer's Camp, 700 m, Kolombangara ex *Pachycephala pectoralis* (BBM 23344), I. 64, Temple; 1♀, same data but ex *Monarcha barbata* (BBM 23377). 1♂, Pepele, sea level, Kolombangara ex *Mino dumontii* (BBM 23469). II. 64, Temple. 1♂, Tabalia, 20 m, Guadalcanal, ex *Accipiter novaehollandiae* (BBM 23860), V. 64, P. Temple & P. Shanahan. 1♀, Haleta, 10 ± m, Florida I., ex *Aplonis metallicus* (BBM 24468), X. 64, Shanahan.

AUSTRALIA: 1♂, 2♀♀, 1♀ (MCZ) (1♀ w. mallophagan), McIlluraith Ranges, "Rocky Scrub", Queensland, ex *Craspedophora alberti*, P. J. Darlington Jr.; 1♀, same data but ex *Pitta versicolor simillima*; 1♀ (MCZ), Nelson, Queensland, ex *Ailuroedus viridis*; 1♂, 1♀ (MCZ) (♀ w. mite under wing), ex catbird (H 3), F. H. Taylor. 1♀ (MCZ), Burragorang, N. S. Wales, ex *Philemon corniculatus* (H 2), I. 33. 1♀ (WNM), type of *stipituri* Schin., Sydney, N. S. Wales, ex *Stipiturus malachurus*.

KERMADEC IS.: 1♀, Raoul I., N slopes, 100 m, ex *Turdus merula* (#207 A), X.

62, G. A. Samuelson.

Besides the above listed, 1 shriveled ♂ (KBH), Massau I. (Bismarck Archip.), Talumalaus, ex "Alcididae" [? Alcedinidae], II. 62, Noona Dan Exped. 61–62, is left unnamed. Its genitalia is unexamined but the site of bulla on vein M_{3+4} and the chaetotaxy on femora 3 are atypical for *stipituri*.

♀. Body color generally paler than in *exilis* Wk.; prescutal and scutellar setae pale, soft; minor scutellar bristles distinctly finer and either much paler than or less than 1/2 as long as major ones; spines on thoracic sterna distinctly finer than those on anterior prescutal margin. Wing 2.4–2.8 mm long; cell *3bc* ca. 3× as long as wide; bulla of M_{1+2} almost equidistant to base and apex of *2bc*. Abdomen thinly setose; supra-anal plate hardly longer than wide, its anterior piece darker and not or hardly narrower than posterior one; para-anal tuft conspicuous, its setae uneven in length and robustness, almost always markedly shorter and finer than bristles on tergite 6; laterite 7 tetragonal, longer and narrower in proportion than in *exilis*; anchor-like spines at urogenital area often much reduced in size and number; 0–2 pairs of multispinose warts; pregenital tubercle roundish; lateral lobe of pregenital plate small, triangular. Other characters as in *exilis*.

♂. Similar to ♀ in size, color and in chaetotaxy on scutellum and tergites 5–6. Genitalia as figured.

⚲. Side piece of tergite 6 slightly longer than wide, embracing lateral side of posterior anus, with anterior margin strongly convex, posterior margin strongly concave, outer margin nearly straight, posterior inner corner (*i.e.*, at side of posterior anus) strongly tuberculate and bearing ca. 3 bristles and some stiff setae, elsewhere with pale soft hairs; infra-anal plate simple, very wide, uniformly pigmented and sclerotized, with posterior margin laterally meeting side piece of tergite 6, anterior margin nearly straight; laterite 6 usually transverse, very seldom slightly longer than wide, smaller than and apart from side piece of tergite 6 (in 1 of the ⚲⚲ examined, narrowly connected with that tergite at one side), bearing 1, very seldom 2 bristles and 1–5 spines near inner and outer ends respectively; spiracle 6 generally lying outside, seldom inside of laterite 6; 1–6 and 0–2 free anchor-like spines lying near laterite 6 and spiracle 5 respectively. Other characters as in ⚲ *exilis*. (For the bilaterally asymmetrical ⚲ from Australia, see description under the caption "Morphology".)

DISTRIBUTION. Probably confined to the Papuan, Torresian and Melanesian Subregions; at present known from New Guinea, New Britain, coastal Queensland, NE New South Wales, Kermadec and Solomon Is., to 1700 m, commoner in lowlands. My earlier statement (1963: 88) that it spread from Japan to Australotasmanian Subregion was wrong as a result of confusion with closely related forms. In New Guinea and neighboring islands, *stipituri* is much rarer than *exilis*, and the highest catch per infested bird was only 7 flies (BBM-NG 27879). When the 2 species were found on same individual birds, the population of *stipituri* was almost always much smaller. On the other hand, *stipituri* is far commoner than *zamicra* and *simplicis* of the same area.

HOST PREFERENCE. Apparently polyxenous, on Passeri- and Coraciiformes, with strays on Falconi-, Grui-, Charadrii-, Columbi-, Psittaci-, Cuculi- and Strigiformes. Analysis of available records follows (genera not listed by Bequaert 1953 as for this species and

"*pusilla*" are each marked with an asterisk): Falconiformes 7 records (*Accipiter* 5, **Henicopernis* 1, Accipitridae indet. 1); Gruiformes 2 (**Amaurornis* 1, **Habropteryx* 1); Charadriiformes (Charadriidae indet.) 1; Columbiformes (Columbidae indet.) 1; Psittaciformes 2 (**Cacatua* 1, **Trichoglossus* 1); Cuculiformes 10 (*Centropus* 8, Cuculidae indet. 2); Strigiformes 4 (*Ninox* 2, *Tyto* 2); Coraciiformes 44 (*Dacelo* 5, *Eurystomus* 2, *Halcyon* 10, **Melidora* 1, **Merops* 1, *Sauromarptis* 4, **Syma* 1, **Tanysiptera* 1, Alcedinidae indet, 19); Passeriformes 144 (*Ailuroedus* 5, *Aplonis* 4, **Cicinnurus* 2, *Cisticola* 1, *Coracina* 3, **Corvus* 4, **Cracticus* 28, **Craspedophora* 2, **Gymnocorvus* 1, *Lanius* 9, **Manucodia* 2, *Meliphaga* 1, **Melipotes* 1, **Mino* 8, **Monarcha* 1, **Oriolus* 2, **Pachycephala* 4, **Paradisaea* 5, **Parotia* 1, *Philemon* 8, **Phonygammus* 1, *Pitohui* 9, **Pitta* 6, *Stipiturus* 1, *Turdus* 1, Meliphagidae indet. 4, Sturnidae indet. 2, Dicruridae indet. 3, Corvidae indet. 6, Oriolidae indet. 5, Ptilinorhynchidae indet. 6, Paradisaeidae indet. 11). All except 2 records on Coraciiformes pertained to Alcedinidae. And for Passeriformes, the breakdown is: Pittidae 6, Campephagidae 9, Muscicapidae 14, Laniidae 9, Meliphagidae 7, Sturnidae 8, Oriolidae 7, Dicruridae 3, Corvidae 11, Cracticidae 28, Ptilinorhynchidae 11, Paradisaeidae 24. Thus to most of these passerine families, *stipituri* is really "polyxenous" and shows no particular preference. This is a feature unknown to other *Ornithoica* species.

Systematics. The original description of this species reads: "Die Art gleicht ganz der *Ornithomyia pusilla*, ist aber kleiner und heller gefärbt, die Beine sind schmutzig gelb, die Hinterschienen verdunkelt und vor der Mitte mit einem hellgelben Ring; auch die Fühler sind gelb und die kleine Flügelquerader so kurz, dass sich die beiden Adern, welche sie verbindet, beinahe unmittelbar tangiren und daselbst schwielenartig erweitern. Alles sonst wie bei der genannten Art. 3/4'''. Ein Stück aus Sydney, welche auf *Stipiturus malachurus* Lath. gefangen wurde." In Speiser's (1904) redescription of the type, besides brief remarks on the color pattern, only the venational character is further emphasized: "Die kleine Querader doch nicht so rein schwielenartig ist, wie Schiner darstellt, sondern eine zwar kurze aber deutliche Querader ist···in der einen wichtigen Stelle, der Lage des Knies in der Discoidalis, mit *O. exilis* Walk. übereinstimmt, indem die gedachte Fortsetzung der Analquerader vorwärts dieses Knie fast genau trifft."

Aside from the type, this species has been recorded only by Speiser (*l. c.*) from New Britain ex "*Macropygia* (*Dicruropsis*) *cacomantis*" and by Bequaert (1953: 140) from New Guinea ex *Coracina*. I am unable to confirm Speiser's determination. Since his host record is a combination of *Macropygia* (Columbidae), *Dicruropsis* (Dicruridae) and *Cacomantis* (Psittacidae), and since *exilis* Wk., *stipituri* Schin. and *aequisenta* n. sp. are all found in New Britain, it is not impossible that the material was composite.

This species is closest to *simplicis* n. sp. both in superficial appearance and structural characters. But their supra-anal and pregenital plates as well as laterite 7 in the ♀, and side piece of tergite 6 as well as laterite 6 in the ♀ are quite different; ♂♂ of the 2 species are less distinguishable, and besides the genitalia, can only be separated for convenience, by the position of bulla on vein M_{3+4}, and by the size and color (smaller and paler in *stipituri*) of setigerous papillae on the disc of the abdominal venter. From *exilis* Wk., with which it is also easily confused, it can be recognized by similar characters in ♀♀ and ♂♂ and by size of body and chaetotaxy of tergites in ♂♂. As in other cases

in the genus, ♂♂ of these 3 species are sharply distinctive and they can be separated at ease by merely a glance over the infra-anal plate, laterite 6 and anchor-like spines near abdominal apex.

The Solomon Is. ♀♀ are slightly different from the New Guinean ones in generally having roundish pregenital tubercles and more conspicuous para-anal setal tufts. The ♂♂ of New Guinea and Australia differ from those of the Bismarck Archip. and Solomon Is. (and from ♂♂ of other *Ornithoica* species) in having a longitudinal series of 1–6, usually 3–4 small spines on basal 1/2 of venter of femur 3. However, ♂♂ of these countries are identical in every detail, and comparisons of ♂ genitalia also failed to reveal any distinction. In one of the ♀♀ examined, the abdominal tergite 6 is medially interrupted, with inner end of its right side piece touching hind margin of tergite 5; and in a second one, tergites 3 and 4 join together through an oblique "bridge".

Ornithoica tridens Maa, n. sp. Figs. 17, 34, 52.

TYPES SERIES. 66♂♂, 106♀♀, 11♂♂. Holotype ♀ (BISHOP 6857), allotype ♂ and 183 paratypes in Bishop Mus.; 2♀ paratypes in Mus. Comp. Zool. Harvard.

TAIWAN: 2♀♀ (MCZ) (1♀ w. mite on abd.), Arisan, ex *Urocissa caerulea*, V. 37, N. Yamada, det. Bequaert as *turdi* Latr.! 1♀, Sintien, Taipei hsien, ex *Alcippe m. morrisonia*, XI. 63, T. C. Maa & K. S. Lin. 1♀, Taipei, ex *Muscicapa* sp. (? *sibirica*), X. 60, K. S. Lin. 1♀, Wan Ta, Nantou hsien, 950 m, ex *Alcippe m. morrisonia* (BBM 116), I. 62, C. M. Yoshimoto & M. C. Thompson. 1♂, 1♀, Puli, Nantou hsien, ex *Alcippe m. morrisonia* (TMT 626, 834), XII. 63–I. 64, T. C. Maa & J. S. Kuo; 1♀, same data but Liukuei, Kaohsiung hsien, TMT 1785. 1♀, Puli, ex *Amaurornis phoenicurus chinensis* (TMT 124), XII. 63–I. 64, Maa & Kuo; 1♂, 1♀, same data but ex *Brachypteryx montana goodfellowi* (TMT 600, 726). 1♀, Liukuei, ex *Cinclidium l. leucurum* (TMT 2006), III–IV. 64, Maa & Kuo. 17♂♂, 22♀♀, 4♂♂ incl. holo- and allotypes (1♂ w. abnormal tergal pls.), Puli, ex *Dendrocitta f. formosae* (TMT 73, 223, 262, 263, 291, 292, 329, 381, 388, 433, 439, 455, 456, 457, 479, 484, 545, 546, 553, 620, 628, 654, 675, 676, 750, 751, 776, 778–782, 783, 808), XII. 63–I.64, Maa & Kuo; 1♂, 2♀♀, 1♂ (♂ w. mallophagan), Tzepeng, Taitung hsien, same host (TMT 854, 967, 968, 1013), I–II. 64, Maa & Kuo; 17♂♂, 21♀♀, 1♂ (3♂♂, 1♀ each w. 1 mallophagan, 2♀♀ each w. 2 mites on abd. dorsum), Liukuei, same host (TMT 1499, 1547, 1548, 1577, 1579, 1601, 1614, 1775, 1780, 1797, 1800, 1879, 1899, 1904, 1938, 1963, 1967, 1974, 2002, 2060, 2114, 2128), III–IV. 64, Maa & Kuo; 1♂, same data but ex *Dendrocopos nanus kaleensis* (TMT 2131). 1♀, Puli, ex *Dicrurus macrocercus harterti* (TMT 11), XII.63–I. 64, Maa & Kuo; 2♂♂, 4♀♀, 1♂, same data but ex *Garrulax canorus taewanus* (TMT 4, 70, 72, 96); 7♂♂, 18♀♀, 1♂ (1♀ w. mallophagan; 2♂♂, 5♀♀ w. mites under wings, 2♂♂, 1♀ w. mites on abd.), same data but ex *Heterophasia auricularis* (TMT 113, 114, 115, 278, 282, 301, 330, 384, 419, 425, 426, 519, 677, 738, 748, 758, 759, 793); 1♂, Tzepeng, same host (TMT 875), I–II. 64, Maa & Kuo. 1♀, Puli, ex *Hypsipetes madagascarensis nigerrimus* (TMT 799), I. 64, Maa & Kuo; 2♂♂, 2♀♀ (1♀ w. mite under wing), Liukuei, same host (TMT 1713, 1759, 1866), III–IV. 64, Maa & Kuo; 1♀, Puli, ex *Lanius s. schach* (TMT 51), XII. 63, Maa & Kuo. 2♂♂, 2♀♀, Tzepeng, ex *Megalaima oorti nuchalis* (TMT 950, 1046, 1130, 1230), I–II. 64, Maa & Kuo; 1♂, 1♀ (♂ w. 2 Mallophaga), Liukuei, same host (TMT 1924, 1997), III–IV. 64, Maa & Kuo; 3♂♂, 4♀♀, 1♂ (♂ w. mallophagan), same data but ex *Myiophoneus insularis* (TMT

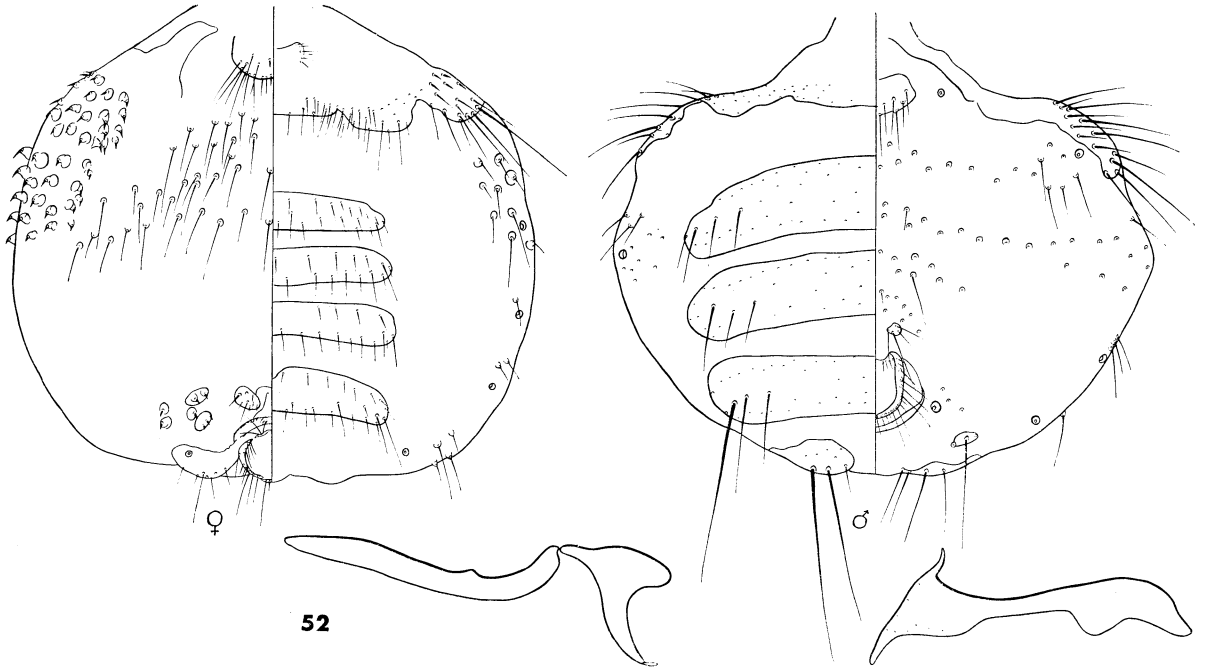


Fig. 52. *Ornithoica tridens* Maa, ♀ ♂ abdomen in dorsal and ventral aspects and ♂ genitalia in lateral aspect.

1557, 1558, 1796, 1849, 1857); 1 ♀, Puli, same host (TMT 395), XII. 63, Maa & Kuo. 1♂, Liukuei, ex *Oriolus chinensis diffusus* (TMT 1590), III–IV. 64, Maa & Kuo. 1♂, 2♀♀, 1♀, Puli, ex *Urocissa caerulea* (TMT 791, 792), I. 64, Maa & Kuo; 7♂♂, 3♀♀ (1♂ w. mallophagan), Liukuei, same host (TMT 1633, 1753, 1890, 1930, 1955, 1964, 1988), III–IV. 64, Maa & Kuo; 3♀♀, same data but ex *Zoothera dauma dauma* (TMT 1529, 1781, 1977); 1♂, 4♀♀ (♀ w. abnormal tergal pls.), Puli, same host (TMT 164, 436), XII. 63–I. 64, Maa & Kuo. 1♀, w. mite under wing, Kweilin nr Chushan, Nantou hsien, ex *Zoothera dauma dauma*, III. 64, H. M. Lin, P. Y. Hsieh & J. K. Ni. 1♂, Peiyuan, Tungho, Taitung hsien, ex *Dendrocitta f. formosae*, III. 65, S. Y. Lin.

BOTEL TOBAGO I.: 1♀, w. mite under wing & mallophagan, Hungtaotsung, Lanyü (Botel Tobago) I., Bashi Strait, ex *Hypsipetes amaurotis nagamichii* (PF 5738), III. 59, R. E. Kuntz; 2♀♀, same data but collected along beach (PF 5702), VIII. 59.

♀. Hardly separable from *simplicis* n. sp. Scutellum with no black setae and minor preapical bristles. Wing 2.4–2.7 mm long; bulla of M_{3+4} generally slightly closer to *mcu* than to *im*, sometimes equidistant to those crossveins; setular area at cell *2m* usually very small. Anterior piece of supra-anal plate much longer or much narrower than posterior piece; pregenital tubercle usually not larger than multispinose wart; posterior bar of pregenital plate slightly larger than in *simplicis*, often subtriangular or trapezoid in outline; laterite 7 narrower in proportion and less narrowed mesad than in that species.

♂. Scutellum as in ♀, when rarely with black setae interstitial to major preapical bristles, then they are always shorter and finer than longest prescutal setae. Wing as in ♀. Abdominal tergite 5 usually with 1 pair, 6 with 2 pairs of bristles. Genitalia as figured. Other characters as in ♂ *simplicis*.

♀. Side piece of tergite 6 slender, well separated from laterite 6, strongly curved like an inverted letter U, at top of which weakly tuberculate and with ca. 3 long bristles and 4–6 setae of varied length, inner arm of this U-letter lying ectad to posterior anus; infra-anal plate laterally slightly narrowed, anteriorly 3-dentate, with median dent much longer and slenderer than lateral ones and apically gently decurved, lateral dents triangular, apically sharp, seldom blunt, generally as deeply pigmented as median one; laterites 6 unusually large, transverse, their inner ends suddenly or gradually narrowed and almost meeting each other, each of these sclerites bearing 1, very seldom 2 bristles near center and 1–6 spines (rarely 1–2 of them replaced by short strong setae) near outer end; 0–3 anchor-like spines lying ectad to laterite 6; other characters similar to ♀♀ of *simplicis* and *stipituri*.

DISTRIBUTION. At present definitely known only from Taiwan (Indo-Chinese Subregion), up to 1300 m; spread to Botel Tobago I. (Philippine Subregion); fairly common in lowlands; much more abundant than *exilis* Wk. and *simplicis* n.sp. on the Island. The population density is generally low, and highest catch per infested bird was 5 flies (TMT 1904).

HOST PREFERENCE. Apparently pleioxenous on Passeriformes (Corvidae and Muscicapidae in particular), with stray records from Grui- and Piciformes. Analysis of available records follows: Gruiformes (*Amaurornis*) 1 record; Piciformes 7 (*Dendrocopos* 1, *Megalaima* 6); Passeriformes 125 (*Alcippe* 5, *Brachypteryx* 2, *Cinclidium* 1, *Dendrocitta*

60, *Dicrurus* 1, *Garrulax* 5, *Heterophasia* 19, *Hypsipetes* 6, *Lanius* 1, *Muscicapa* 1, *Myiophoneus* 6, *Oriolus* 1, *Urocissa* 10, *Zoothera* 7). Breakdown of records on Passeriformes is Pycnonotidae 6, Muscicapidae 46, Corvidae 69; Laniidae, Oriolidae and Dicruridae 1 each.

Systematics. This species is so closely similar to *simplicis* n. sp. of New Guinea etc. that in ♂ and ♀, it is difficult to draw a clear-cut line from the latter. The ♂ genitalia is hardly separable in the 2 species, but the ♀ terminalia is decidedly dissimilar. The name *tridens* refers to the outline of ♀ infra-anal plate, by which the species can readily be recognized from any other member of the genus. Vein *im* in 2♂♂ of the type series is almost entirely colorless and is represented by a small pale dot at middle; the tergite 4 in 1♂ (TMT 456) and 1♀ (TMT 164) is medially interrupted.

This new species may prove to be identical with *momiyamai* Kishida (1932: 245, fig. 474, ♀; translation: Maa 1962: 587) known from Japan (?) ex "hachizokkoko" [? *Turdus naumanni*] and "mozu" [? *Lanius b. bucephalus*]. Merely as a guesswork of the original description, *momiyamai* was synonymized by Bequaert (1953: 277) with *turdi* Latr. and by Maa at first (*l. c.*) with *exilis* Wk. and then (1963: 48), with *stipituri* Schin. Very recently, 2♀♀ collected at Asahigaoka, Yamanashi-ken, Honshu, Japan ex *Zoothera sibirica davidsoni* (H 120), VII. 1964 and ex *Turdus cardis* (H 121), VIII. 1964 respectively were sent by the U. S. Army Migratory Animals Pathological Survey. They well fit Kishida's description and illustration and are quite closely simiar to *tridens*. But their spines on thoracic venter are markedly longer and more robust, and their setae of para-anal tuft, comparatively stronger. In one of these specimens, the scutellum bears 5 bristles in other, the setulae on cell *2m*, as figured by Kishida, are more extensive than in *tridens*. No type locality and no scientific names of host were given in the original description of *momiyamai*. Meanwhile, *T. cardis* and *Z. sibirica* are unknown in Taiwan whereas *L. bucephala* and *T. naumanni*, are either stragglers or very rare winter visitors there. It seems therefore advisable to consider *tridens* as a distinct species before more material (♂♂ and ♀♀ in particular) from Japan and the Ryukyu Is. is available.

Ornithoica simplicis Maa, n. sp. Figs. 18, 35, 53.

TYPE SERIES. 9♂♂, 39♀♀, 4♀♀ examined. Holotype ♀ (Bishop 6858), allotype ♂ and 21 paratypes in Bishop Mus.; paratypes in Bishop Mus. and Chicago Nat. Hist. Mus. Specimens from Borneo, Malaya, Vietnam and Taiwan are not included in type series.

NW NEW GUINEA: 4♀♀ incl. holotype (1♀ w. 3 Mallophaga), Wissel Lakes, ex *Poecilodryas albonotata* (BBM 21385, 21414), VII. 62, H. Clissold; 1♂ (allotype), 1♀ (♂ w. mite under wing), same data but ex *Paradigalla brevicauda* (BBM 21428); 1♂, same data but ex *Lophorina superba* (BBM 21426); 2♂♂, 1♀ (1♂ w. 2 Mallophaga, ♀ w. 2 mites under wing), same data but ex *Pachycephala soror* (BBM 21437, 21458). 1♀, Lake Anggi Gidji, Kampong Sururai, ex *Pachycephala schlegelii* (BBM 22473), 6. III. 33, P. Temple & M. C. Thompson. NE NEW GUINEA: 1♂, Ambunti, 60 m, Sepik Distr., ex *Mino dumontii* (BBM 22559), V. 63, P. Temple. 1♀, Edie Ck, 1300 m, 16 km SW Wau, ex honeyeater, II. 62, G. Monteith. 1♀, Mt Kaindi, 1600 m, Morobe Distr., ex *Melipotes fumigatus* (BBM 21238), II. 63, H. Clissold; 1♀, same data but ex *Parotia lawesi* (BBM 20622). 3♀♀, Nakata Ridge, 1600 m, Wau area, ex *P. lawesi* (BBM 27832, 27834),

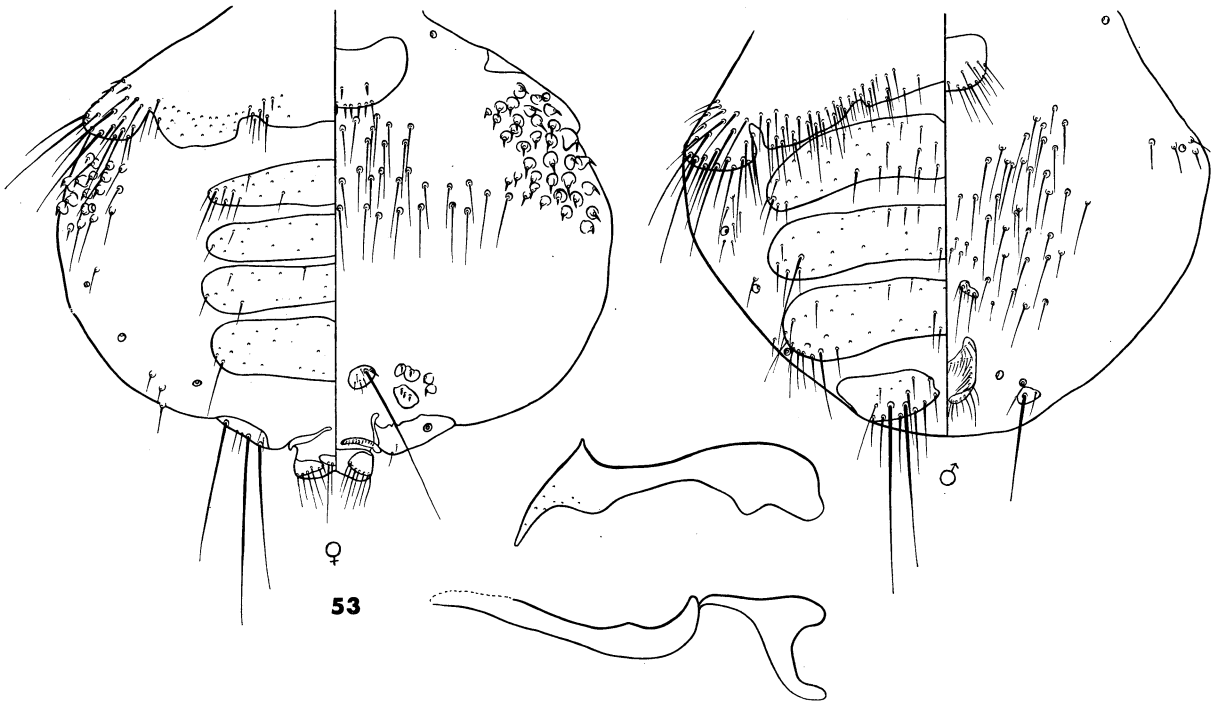


Fig. 53. *Ornithoica simplicis* Maa, ♀♂ (SE New Guinea), abdomen in dorsal and ventral aspects and ♂ genitalia in lateral aspect.

V. 63, P. Shanahan; 1♀, w. mite on abd., same data but ex *Macropygia amboinensis* (BBM 28621), VII. 63. 2♂♂, Slate Creek, ex Fan-tailed Warbler [*Cisticola exilis*] (BBM 20389), III.63, Clissold. 1♀, Songarin, ex bird of paradise (BBM 27741), IV. 63, Shanahan. 1♀, Wau, 1200 m, ex Red-Wattled Honeyeater (HC 192), V. 62, Clissold; ♀, same data but ex Yellow-eyed Honeyeater (BBM 21262), VI. 62. 1♀, Wau Creek, ex kingfisher (BBM 20477), III. 62, Clissold. SE NEW GUINEA: 1♂, Buka Bara, sea level, ex *Centropus bernsteini* (BBM 28819), IX. 63, P. Shanahan. 1♀, Tari, 1700 m, S. Highlands, ex *Ninox theomacha* (BBM 23097), IX. 63, P. Temple.

SABAH (N BORNEO): 1♀ (CNHM), Trus Madi, Pampang, Ulu Kaingaran, 1300 m, ex bird (RTB 19688), VII. 53, Colonial Off. Med. Res. Unit; 1♀ (CNHM), same data but ex *Psarisomus dalhousiae borneensis* (RTB 19700). 1♀, no data, probably N Borneo, 63, M. C. Thompson.

MALAYA: 1♂, Mt Brinchang, Cameron Highlands, ex *Alcippe nipalensis* (M 769), XII. 61, H. E. McClure; 1♂, same data but ex *Megalaima franklini* (♯712184), XI. 61, McClure. 9♀♀, 1♂ (CNHM), Kuala Lumpur, Selangor, ex *Centropus bengalensis javanicus* (RT 8030), IV. 48, R. Traub & C. B. Philip. 1♀, Selangor, ex *C. bengalensis* (M 2068), 1962, McClure; 1♀, same data but ex *C. sinensis* (M 1562); 1♀, same data but ex *Rallus striatus* (M 1511).

VIETNAM: 1♀, Plateau Gi, 63 km NE Kontum, 1200 m, ex Red-tailed Thrush (♯79), VI. 60, R. Leech; 1♂, same data but ex Nun Thrush (R 70023), X. 60.

TAIWAN: 1♀, Puli, Nantou hsien, ex *Zosterops palpebrosa taivaniana* (TMT 159), XII. 63, T. C. Maa & J. S. Kuo. 4♀♀, Liukuei, Kaohsiung hsien, ex *Zoothera dauma aurea* (TMT 1977), III. 64, Maa & Kuo.

♀. Face hardly wider (21 : 19) than eye. Mesonotum much darker than abdominal tergal plates; prescutum with ca. 9–10 setal rows; scutellum with 2 pairs of minor preapical bristles which are scarcely longer and more robust than longest prescutal setae and are sometimes entirely pale; spines on thoracic sterna and abdominal sternite 1 equally strong. Wing 2.7–3.0 mm long; cell *3bc* ca. 2.2× as long as wide; bulla of M_{1+2} nearly equidistant to base and apex of *2bc*; M_{3+4} with abscissa 1 shorter (18 : 23) than 2, bulla inconspicuous, not or hardly closer to *mcu* than to *im*. Abdomen poorly setose; tergite 6 with 1–2 pairs of bristles, its anterior margin usually sinuate; supra-anal plate with anterior piece much narrower than posterior one; lateral membranous area with 0–3 extra-fine setae near each of spiracles 4 and 5; para-anal tuft composed of 5–8 fine and extra-fine setae which are all much shorter and finer than bristles on tergite 6; laterite 7 subtriangular, wider and more strongly transversely narrowed mesad than in *stipituri* Schin. Abdominal venter with few spines on sternite 1, ca. 60–70 anchor-like spines at each side near base, and 5, seldom 6 setal rows at disc; urogenital area at each side with 1, seldom 2 multispinose warts and 1–7, usually 4–6 small anchor-like spines, all or most of these spines arranged near warts rather than spiracles 6–7; peregnital tubercle hardly longer than wide, usually larger than multispinose wart; pregenital plate ⊥-shaped.

♂. Similar to ♀. Thoracic sterna with black (in ♀ pale) setae. Abdomen with 1–2 and 3–5 pairs of bristles on tergites 5 and 6 respectively; para-anal tuft of 2–6 setae;

side piece of tergite 6 ca. 1.5 × as wide as long; laterite 6 much smaller than in *stipituri*, generally with 1 bristle and 2 setae. Genitalia as figured.

⚧. Cell *3bc* longer and bulla of M_{3+4} closer to *mcu* than in ♀ and ♂. Side piece of tergite 6 and laterite 6 jointly forming large transversely U-shaped sclerite, anterior lobe of which tuberculate, embracing posterior anus and bearing tuft of 3–4 strong bristles and 4–6 short setae on that tuberculation, posterior lobe bearing 1 long bristle and 6–10 spines, elsewhere on that sclerite with pale soft setae; infra-anal plate simple, not medially interrupted, laterally extending beyond curved posterior end of U-shaped sclerite, both anterior and posterior margins almost straight; no anchor-like spines lying outside U-shaped sclerite; anterior pregenital tubercle and transverse patch of extra-fine setae very small. Other characters as in ⚧⚧ of *exilis* and *stipituri*.

DISTRIBUTION. Widely spread in the Oriental Region, at present known from Malaya, N Borneo, Vietnam, Taiwan and New Guinea, from sea level to 1700 m, probably commoner at higher altitudes. Being generally rare, the highest catch per infested bird was 10 flies in Malaya, and 4 flies in New Guinea.

HOST PREFERENCE. Not quite clear, presumably breeding on Passeriformes, with stragglers on Grui-, Columbi-, Cuculi- Strigi-, Coracii-, and Piciformes. Analysis of available records follows: Gruiformes (*Rallus*) 1 record; Columbiformes (*Macropygia*) 1; Cuculiformes (*Centropus*) 4, Strigiformes (*Ninox*) 1; Coraciiformes (Alcedinidae indet.) 1; Piciformes (*Megalaima*) 1; Passeriformes 22 (*Alcippe* 1, *Cisticola* 1, *Lophorina* 1, *Melipotes* 1, *Mino* 1, *Pachycephala* 3, *Paradigalla* 1, *Parotia* 3, *Poecilodryas* 2, *Psarisomus* 1, *Zoothera* 1, *Zosterops* 1, Muscicapidae indet. 1, Meliphagidae indet. 3, Paradisaeidae indet. 1). Breakdown of records on Passeriformes is: Eurylaimidae 1, Muscicapidae 9, Sturnidae 1, Meliphagidae 3, Zosteropidae 1, Paradisaeidae 6.

Systematics. As mentioned elsewhere in this paper, *simplicis* n. sp. and *stipituri* Schin. are not only similar in body size and structure, but in New Guinea, also have similar host range and host preference. The recognition of the former as a distinct species is largely on the basis of ⚧ characters. The infra-anal plate in that sex is little differentiated but the laterite 6 is amalgamated with tergite 6 and not sided by anchor-like spines in *simplicis* but situated widely apart from that tergite and accompanied by series of anchor-like spines in *stipituri*. In ♀♀, the para-anal setal tufts and the anchor-like spines near abdominal apex are less developed in *simplicis* than in *stipituri*. The broadening of the cell *3bc* in *simplicis* is linked with the shifting-basad of vein *mcu* and also affects the relative position of the bulla on M_{3+4}. It serves merely as a convenient character for the ♀♀ and ♂♂, but not ⚧⚧, and probably does not have much evolutionary bearing. Still another convenient yet less reliable character is the setulose area in cell *2m*. In *simplicis*, it is often nearly as extensive as in *turdi* Latr. and *vicina* Wk. but there is always a very narrow bare strip between it and M_{3+4}, except its extreme apex. In *stipituri*, this setulose area is never so extensive. The affinities of *simplicis* with *tridens* and *bistativa* are more remote than that with *stipituri* particularly because the ⚧ infra-anal plate in those more localized species is markedly different both in shape and texture. The name *simplicis* refers to the reduction of para-anal setal tufts (♀), anchor-like spines near abdominal apex (♀, ⚧) and to the amalgamation of tergite 6 and laterite 6 (⚧).

Ornithoica hovana Maa, n. sp. Figs. 19, 54.

TYPE SERIES. 1♂, 3♀♀. Holotype ♀, allotype ♂ and 1♀ paratype in Mus. Comp. Zool. Harvard; 1♀ paratype in Bishop Mus.

MADAGASCAR: 1♂, 3♀♀ (MCZ), Tanosy, Fort Dauphin Distr., ex *Lophotibis c. cristata* Bodd. (♯3356), 18.XI. 48, H. Hoogstraal.

♀. Face subequal (13 : 12) in width to eye. Mesonotum hardly darker than abdominal tergal plates; prescutum with ca. 7 setal rows, with setae of posterior rows slightly sparser; scutellum with 2–3 pairs of minor preapical bristles which are not longer and robuster than longest prescutal setae. Spines on thoracic sterna as strong as those on abdominal sternite 1. Wing 2.5–2.8 mm long; cell *3bc* ca. 2.5× as long as wide; bulla of M_{1+2} much closer to base than to apex of *2bc*; M_{3+4} with abscissa 1 ca. 2/3 as long as 2, with bulla 1.5× closer to *mcu* than to *im*. Abdomen moderately setose; tergite 6 with 1 pair of bristles; supra-anal plate smaller than pregenital tubercle, with 2–3 apical setae, its anterior piece hardly narrower than posterior one; lateral membranous area with 0–1 small setae near each of spiracles 4 and 5; para-anal tuft composed of 4–6 bristles, all or most of which about as long and robust as those on tergite 6; laterite 7 subtriangular, with 2–3 bristles. Abdominal venter with few spines on sternite 1, with 7–8 setal rows at disc; urogenital area at each side with 1 multispinose wart and ca. 10 anchor-like spines, these spines rather evenly distributed between pregenital tubercle and para-anal setal tuft; pregenital plate somewhat ⊥-shaped.

♂. Similar to ♀, but prescutal and abdominal setae stronger. Wing 2.8 mm long; side piece of tergite 6 ca. 1.5× as wide as long, with 2 bristles; laterite 6 with 1 bristle and 3–4 setae; patch of extra-fine setae before pregenital tubercles well developed. Genitalia as figured. ♀ unknown.

Puparium. Similar to that of *exilis* Wk. (fig. 39) but less flattened; posterior "cap" in caudal view slightly wider (21 : 18) than high; central pit squarish, with both upper and lower margins sharply edged; median groove short, not reaching anterior margin of cup, with numerous microspines; sectors each with ca. 20 spiracular pores which are very unevenly distributed and largely situated near anterior margin of cup.

DISTRIBUTION. Malagasy Subregion, probably a lowland species.

HOST PREFERENCE. Probably polyxenous, at present known only from *Lophotibis* (Ardeidae, Ciconiiformes).

Systematics. Both in size and structure, this new species stands intermediate of *stipituri* Schin and *exilis* Wk. From the former species, it differs in ♀ in having much more conspicuous para-anal setal tuft and stronger and more extensive anchor-like spines near abdominal apex, and in ♂, in having fewer setae at urogenital area, and slightly differently shaped genitalia. And from the latter species, it is paler, with wider face, weaker scutellar bristles, and in ♀, with much smaller supra-anal plate, ⊥-shaped pregenital plate, longer but narrower laterite 7 and more uniformly distributed anchor-like spines near abdominal apex. The specific name is derived from Hova, a native Malagasy tribe who ruled the island in the 19th century.

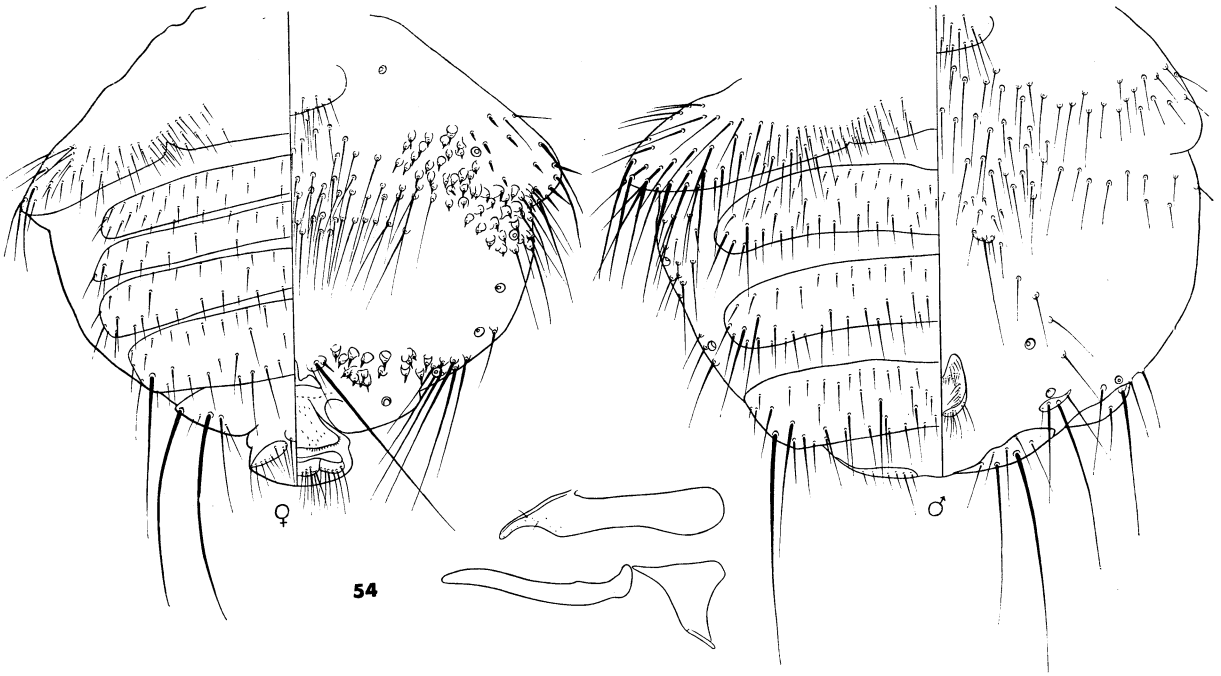


Fig. 54. *Ornithoica hovana* Maa, ♀♂ abdomen in dorsal and ventral aspects and ♂ genitalia in lateral aspect.

Ornithoica exilis (Walker) Figs. 1, 4, 20, 36, 39, 43, 55.

exilis Wk. 1861: 254 (*Ornithomyia*).—Aust. 1903: 263 (notes on type).—Bau 1929 a: 247 in pt. (*confluenta* var.) (key).—Beq. 1954: 114 (notes on type).—Maa 1963: 31, 87 (notes on type, synonymy).
distincta Kishida 1932: 245, fig. 475, ♀—Maa 1962: 588 (translation of orig. des., synonymy).

MATERIAL EXAMINED. 462♂♂, 854♀♀, 48⚤⚤, 1 puparium. All MCZ specimens were determined by Bequaert as "*pusilla* Schin." THAILAND: 1 ♂, 1♀, Chiengmai, Ban Tham, Amphoe Chiengdao, ex *Dicrurus leucophaeus* (SMRL 1869), XI. 62. 1♂ (CNHM), Kamphaeng Phet, Khanu, ex *Elanus caeruleus* (RTB 21057), IV. 53, H. G. Deignan. 1♀ (CNHM), Kamphaeng Phet, Khanu, Ban Hua Thanon, ex *Eurystomus orientalis* (RTB 17879), IV. 53, Deignan. 2♀♀ (CNHM), Kanchanaburi, Trakhanun, Hinlaem, left bank ex *Accipiter* sp. (RTB 17057), XI. 52, R. E. Elbel; 1♂, 1♀ (CNHM), same data but ex

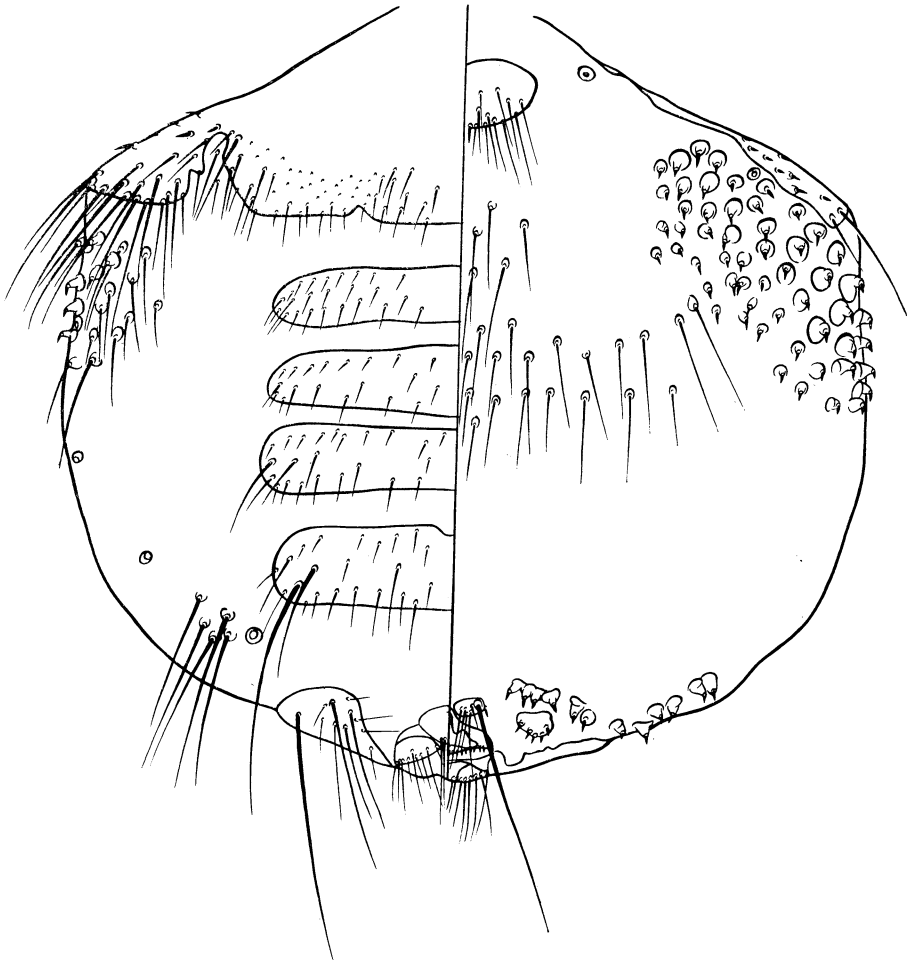


Fig. 55. *Ornithoica exilis* Wk., ♀ (Vogelkop Penin., New Guinea) dorsal and ventral aspects.

Glaucidium cuculoides (RTB 15855); 1♂, 2♀♀ (CNHM), same data but ex *Myiophoneus coerulax* (RTB 17048, 17086); 1♀ (CNHM), same data but ex *Lacedo pulchella* (RTB 15821) X. 52. 3♀♀ (CNHM), Loei, Dan Sai, Kok Sathon, Dhu Lom Lo Mt, 2100 m, ex *Gallus gallus spadicus* (RTB 22708, 22713), III. 54, Elbel & Boonsong Lekagul. 1♀ (CNHM), Loei, Wungsapueng, Sretahn, ex *G. gallus spadicus* (RTB 22642), I. 54, Elbel & Boonsong. 1♀ (USNM), Loei, Ban Sai, Koksathon, Lomloe Mt, 1600 m, ex *Dicrurus paradiseus rangoonensis* (B 31215), II. 55, Elbel. 1♀ (USNM), Loei, Dan Sai, Na Haeo, Ban Na Muang, ex *D. p. rangoonensis* (B 30958), X. 54, Elbel; 1♀ (USNM), same data but ex *Ducula badia griseicapilla* (B 30951). 1♂ (USNM), Loei, ex *Gallus gallus* (B 22637), XII. 53, Elbel. 1♂, 1♀ (USNM), Loei, Dan Sai, Na Phung, Ban Nong Wai, ex *Garrulus glandarius leucotis* (B 31050), XI. 54, Elbel. 1♀ (CNHM), Muang Chiang Rai, Chiang Saenkhao, Ban Sop Luak, ex *Nyctiornis athertoni* (RTB 17841), III. 53, Deignan. 2♀♀ (CNHM), Muang Lampang, Pang La, ex *Dicrurus paradiseus* (RTB 17755), II. 53, Deignan. 1♂ (CNHM), w. mite on abd., Muang Nan, Pang Nam Un, ex *D. paradiseus* (RTB 17712), I. 53, Deignan. 1♀, Nakhonsithammarat, Lansaka, Khao Kaeo, ex *Ketupa zeylonensis leschenaulti* (WS 174), V. 63, Wanit Songprakob. 1♀, 1♂ (CNHM), Prachuap Khiri Khan, 4 km N of Ban Klua Klang, ex *Goisakius* sp. (RTB 17639), XII. 52, Deignan; 1♂ (CNHM), same data but ex *Nyctiornis amicta* (?) (RTB 17681). 1♀ (CNHM), Sakon Nakhon, Sakon Nakhon Distr., Khok Phu, Ban Sang Kho, ex *Garrulax leucolophus diardi* (RTB 22671), I. 54, Elbel & Boonsong; 1♂ (CNHM), same data but ex *Myiophoneus caeruleus eugenei* (RTB 22687); 1♀ (CNHM), w. mite on abd., same data but ex *Streptopelia chinensis tigrina* (RTB 22670); 1♂ (CNHM), same data but ex *Sturnus nigricollis* (RTB 22684). 1♂, 1♀, Phangngna, Ko Kho Khao, Khrua, ex *Gallus gallus* (WS 825, 830), III. 63, Wanit & Wichit.

RYUKYU IS.: 2♀♀, Ishigaki I., ex crow, XI–XII. 52, G. E. Bohart.

TAIWAN: 1♂, 1♀ (♀ w. mite on abd.), Lintou, Penghu hsien, Pescadores Is., ex *Accipiter nisoides* (PF 10675), IV. 61, R. E. Kuntz. 1♀, Puli, Nantou hsien, ex *Turdus o. obscurus* (TMT 201), XII. 63, T. C. Maa & J. S. Kuo. 1♂, 1♀, Liukuei, Kaohsiung hsien, ex *Goisakius m. melanolophus* (TMT 1934), III. 64, Maa & Kuo; 1♀, same data but ex *Zoothera dauma aurea* (TMT 1977).

SUMATRA: 1♀ (USNM), Aur Kumanis, II. 14, E. Jacobson, det. de Meijere as *O. beccariina*, det. J. Bequaert as *O. pusilla* !

CHRISTMAS I.: 4♂♂, 2♀♀ (MCZ), Christmas I., Indian Ocean, R 8, X. 03, Cambridge Univ. Exped.

BORNEO: 1♀, Simil I. off Semperna, Sabah, ex *Tanygnathus lucionensis* (BBM 10273), IX. 62, M. C. Thompson.

PHILIPPINES: 5♂♂, 2♀♀ (CNHM) (1♀ w. mite on abd.), Puerto Princesa, Palawan, sea level, ex *Corvus enca pusillus* (fld. #2614, 2641, 2661, 2663, 2750), III–V. 47, F. Werner & H. Hoogstraal; 4♀♀ (CNHM) (1 w. mite on abd.), same data but ex *Centropus sinensis bubutus* (fld. #2438, 2466). 2♀♀ (CNHM), Puerto Princesa, Palawan, sea level, ex *C. sinensis bubutus* (fld. #2516), III. 47, Hoogstraal. 1♀, Macagua, Brooke's Point, Palawan, ex *Accipiter trivirgatus* (BBM 962), III–IV. 62, M. C. Thompson; 1♂, same data but ex *Aethopyga shelleyi* (BBM 966); 1♀, same data but ex *Chrysocolaptes lucidus* (BBM 535); 1♀, same data but ex *Coracina striata* (BBM 953); 2♂♂, same data but ex *Corvus enca*

(BBM 699); 1♂, same data but ex *Dicrurus leucophaeus* (BBM 1158); 1♀, same data but *Treron vernans* (BBM 1079). 1♀, Malabusog, Timitian Roxas, Palawan, bird (BBM 2143) IV. 62, Thompson. 1♂, 3♀♀, (1♂, 1♀ w. Mallophaga), Minagas Point, Palawan Bay, Balabac Is., ex *Centropus sinensis* (BBM 2747, 2891), IV. 62, Thompson. 1♂, 1♀, Pinigisan, Mantalingajan Range, Brooke's Pt., Palawan, ex *Chrysocolaptes lucidus* (BBM 1296), IV–V. 62, Thompson; 1♂, 1♀, (♀ w. mite on abd.), same data but ex *Corvus enca* (BBM 1217, 1227); 1♂, same data but ex *Gracula religiosa* (BBM 1254). 1♂, Canon, Mutya, Mt Malindang, 1100 m, Zamboanga del Norte, Mindanao, ex *Chrysocolaptes lucidus*, D. S. Rabor & Gonzales. 1♂, Canon, Mutya, 1000 m, ex *Aceros leucocephalus*, XII. 61, Rabor & Gonzales. 1♂, Masawan, 1460–1600 m, Mt Malindang, ex *Pernis ptilorhynchus* (BBM 157), I. 63, Rabor. 1♀ (CNHM 184915), Dimaniang, Busuanga Is., Calamianes Group, nr. sea level, ex *Corvus enca pusillus* (fld. #3038), III. 47, H. Hoogstraal. 1♂ (CNHM 184203), Bugasang, Parang, Cotabato, nr. sea level, Mindanao, ex *Buceros hydrocorax mindanaensis* (fld. #1861), XII. 46, F. Werner. 1♀ (CNHM), E slope, Mt McKinley, 2000 m, Davao Prov., Mindanao, ex *Prioniturus discurus waterstradti* (fld. #809), IX. 46, M. Celestino. 2♂♂ (CNHM 184199), Madaum, Tagum, Davao Prov., Mindanao, nr. sea level, ex *Penelopides panini affinis* (fld. # 950, 953), X. 46, Werner. 1♀ (USNM), w. fungus, Loquilocon, Samar, ex *Accipiter virgatus gularis*, VI. 48, A. P. Castro & P. Añonuevo. 1♀ (USNM ex Bur. Sci. Philipp.), no precise locality, ex *Halcyon chloris*. 1♀, Palo Leyte, ex domestic chicken (PHIL 279), XII. 59, R. E. Kuntz. 1♂, Masawan, 1460–1600 m, Mt Malindang, Zamboanga del Norte, Mindanao, ex *Pernis ptilorhynchus philippensis* (BBM 157), I. 63, D. S. Rabor. 1♂, 1♀, Balisong, Mt Matutum, Tupi, Cotabato, Mindanao, ex *Accipiter trivirgatus extimus* (SU-BBM 1221), I–II. 64, D. S. Rabor; 1♀, same data but ex *Centropus melanops* (SU-BBM 1142); 2♀♀ (1 w. mite under wing), same data but ex *C. v. viridis* (SU-BBM 1205); 1♀, w. mallophagan attached on wing, same data but ex *Coracina striata kochii* (SU-BBM 1162); 1♀, same data but ex *Dryocopus javensis multilunatus* (SU-BBM 1135); 1♂, same data but ex *Eurystomus orientalis cyanocollis* (SU-BBM 1229); 1♀, same data but ex *Halcyon hombroni* (SU-BBM 1319); 1♀, same data but ex *Haliastur indus intermedius* (SU-BBM 1227); 1♂, same data but ex *Pernis ptilorhynchus orientalis* (SU-BBM 1158). 2♀♀, Kibawalan, Malalag, Davao Prov., Mindanao, ex *Halcyon hombroni* (SU-BBM 134), XII. 63, Rabor; 2♀♀, same data but ex *Harpactes a. ardens* (SU-BBM 166), I. 64; 1♂, same data but ex *Pernis ptilorhynchus orientalis* (SU-BBM 73), XI. 63; 1♀, same data but ex *Spilornis cheela holospilus* (SU-BBM 1). 1♂, 2♀♀, Talagutong, Malita, Davao Prov., Mindanao, ex *Accipiter trivirgatus extimus* (SU-BBM 1009, 1021), XII. 63, Rabor; 1♂, w. mite under wing, same data but ex *Centropus melanops* (SU-BBM 1115), I. 64; 1♂, same data but ex *Corvus macrorhynchus philippinus* (SU-BBM 1016), XII. 63; 1♀, same data but ex *Penelopides panini affinis* (SU-BBM 1053); 1♀, same data but ex *Pernis celebensis steerei* (SU-BBM 1061); 1♂, 1♀, Tucay, E-el, Mt Matutum, Tupi, Cotabato, Mindanao, *Halcyon hombroni* (SU-BBM1511), I. 64, Rabor. 2♀♀, same data but *Harpactes a. ardens* (SU-BBM 1507); 2♀♀, same data but ex *Spizaetus philippensis* (SU-BBM 1552). 3♀♀ (2 w. mites under wings) Balang-balang, 160–330 m, Mt Hilong-hilong, Cabadbaran, Agusan Prov., Mindanao, ex *Accipiter trivirgatus extimus* (SU 4299), IV. 63, Rabor; 1♂, 5♀♀ (2♀♀ w. mites on abd. & under wing respectively), same data but ex *Chrysocolaptes l. lucidus* (SU 4075, 4302, 4349, 4354, 4362); 1♂, w. mite on thorax, same data but ex *Penelopides panini affinis*

(SU 4021); 1♀, same data but ex *Dicrurus h. striatus* (SU 4210); 2♂♂, same data but ex *Dryocopus javensis multilunatus* (SU 4231, 4305); 1♂, 2♀♀, same data but ex *Halcyon hombroni* (SU 4228, 4325). 1♀ (USNM ex Brooklyn Mus.), Calayan, ex *H. coromandus*, III. 10; 1♀ (USNM), Calayan, ex *Scops* sp. 1♀ (MCZ), Manila, ex *Accipiter* sp. (? *gularis*), XII. 45, Amadon & Jewett. 1♂, 1♀ (♀ w. mallophagan), Siaton, 10 km N, 330 m, Negros Oriental, ex *Oriolus chinensis suluensis* (BBM 6199, 6458), VII. 64, N. Wilson; 1♀, same data but ex *Coracina striata panayensis* (BBM 6494). 1♂, 1♀, Tambis, Burauen, Mt Lobi Range, Leyte I., ex *Bubo philippensis mindanaensis* (B 622), V. 64, D. S. Rabor; 2♀♀, same data but ex *Centropus v. viridis* (B 008); 1♀, same data but ex *Chalcophaps i. indica* (B 1044); 1♀, same data but ex *Dicrurus hottentottus striatus* (B 066); 1♀, same data but ex *Halcyon chloris collaris* (B 091); 1♀, same data but ex *Harpactes ardens linae* (B 870); 1♀, same data but ex *Ninox ph. philippensis* (B 1042); 1♀, same data but ex *Phapitreron leucotis brevirostris* (B 165); 1♀, same data but ex *Sarcops calvus melanotus* (B 021). 1♀, Ma-alngon, Buri, Burauen, Mt Lobi Range, Leyte I., ex *Centropus melanops* (B 1536), V. 64, Rabor; 2♂♂, 4♀♀, same data but ex *Chrysocolaptes lucidus rufopunctatus* (B 1529, 1538); 1♂, 1♀, same data but ex *Halcyon smyrnensis gularis* (B 1504); 1♀, same data but ex *Sarcops calvus melanotus* (B 1502). 1♀, Sancta Cruz, Mahaplag, Leyte I., ex *Aplonis p. panayensis* (BBM 2373), VI. 64, N. Wilson; 1♀, same data but ex *Chrysocolaptes lucidus rufopunctatus* (B 1930), D. S. Rabor; 1♀, same data but ex *Eurystomus orientalis cyanocollis* (B 1882); 2♀♀, same data but ex *Halcyon smyrnensis gularis* (B 1814, 1880); 2♀♀, same data but BBM 2358 & 2384, N. Wilson; 1♂, same data but ex *Oriolus ch. chinensis* (BBM 2422). 2♀♀, both w. mites on abd., Mt Kabalantian, Mahaplag, Leyte I., ex *Accipiter virgatus confusus* (BBM 2650), VI. 64, N. Wilson & D. S. Rabor; 1♀, w. mites on abd., same data but ex *Halcyon smyrnensis gularis* (BBM 3532); 1♂, 1♀, same data but ex *H. winchelli* (BBM 3598); 1♀, same data but ex *Harpactes ardens linae* (BBM 2960). 1♀ w. mallophagan, Mt Makiling, Luzon, ex *Halcyon lindsayi* (H 009), VIII. 64, Migr. Anim. Path. Surv. 1♀, Dalton Pass, Nueva Viscaya, Luzon, ex *Pitta erythrogaster* (5E 1611), XI. 64, Migr. Anim. Path. Surv.

WAIGEO I.: ♂ (AMS), Waigeoe, ex Doode (? Dooae) vogel, 1910, de Beaufort, specimen seriously damaged, only 2 hindlegs and right wing left, determination doubtful.

NW NEW GUINEA: 1♀, 1♀ (♀ w. mite on fore coxal cavity), Archbold Lake, Snow Mts, 860 m, ex bird (BM-NG 424), XI. 61, L. & S. Quate. 3♂♂, 4♀♀, Mangrowawa, Biak I., ex pigeon (TMP 004), X. 59, T. C. Maa. 1♂, 3♀♀, Biak, Biak I., ex *Accipiter novaehollandiae* (BBM 22495), III. 63, M. C. Thompson & P. Temple; 4♂♂, 4♀♀ (1♀ w. mite on abd.), same data but ex *Cracticus cassicus* (BBM 22497, 22499, 22506); 3♀♀, same data but ex *Dicrurus hottentottus* (BBM 22504); 1♀, same data but ex *Geoffroyus geoffroyi mysorensis* (BBM 22507). 1♀, Sorido, Biak I., ex *G. geoffroyi mysorensis* (BBM 22505), III. 63, Thompson & Temple. 1♀, Kebar Valley, Vogelkop, 550 m, W of Manokwari, ex *Accipiter novaehollandiae leucosomus* (BM-NG 813) I. 62, L. & S. Quate; 2♂♂, 2♀♀, same data but ex *Ardea s. sumatrana* (BM-NG 776); 1♂, same data but ex *Cacatua galerita triton* (BM-NG 722); 1♂, same data but ex *Chlamydera cerviniventris* (BM-NG 801); 3♀♀, same data but ex *Dicrurus hottentottus carbonarius* (BM-NG 811); 1♂, same data but ex *Oriolus szalayi* (BM-NG 840); 1♂, same data but ex *Paradisaea m. minor* (BM-NG 810); 1♀, same data but ex *Phonygammus k. keraudrenii* (BM-NG

750); 1♀, same data but ex *Pitohui f. ferrugineus* (BM-NG 845); 1♂, w. fungus, same data but ex *Rhyticeros plicatus ruficollis* (BM-NG 832); 1♂, 2♀♀ (MCZ), Dotomena [? Doromena], Hollandia area, ex corvids (BC 3, 4, 5), II. 45, H. Hoogstraal & Jewett; 1♂ (MCZ), same data but ex parrots (BC 12, 13). 2♀♀ (MCZ) (1 w. fungus, 1 w. mites under wings), Hollandia, ex *Sauromarptis gaudichaud* (#509), Hoogstraal & Jewett; 1♀, same data but ex *Trichoglossus haematodus berauensis* (BBM 764); 1♀, same data but ex cuckatoo (BBM 819). 2♂♂, 1♀ (♀ w. mallophagan & mite), Mangrowawa, 50–100 m, Biak I., ex crow, X. 59, T. C. Maa. 2♀♀, Nabire, ex *Halcyon chloris* (BBM 21869), X. 62, N. Wilson; 1♀, same data but ex *Uroglaux dimorpha* (BBM 21884); 1♀, same locality, ex hawk, VII. 62, J. Sedlacek. 5♂♂, 7♀♀ (1♀ w. mallophagan), Oransbari, 3 m, NW Geelvink Bay, ex *Alisterus amboinensis* (BBM 22358, 22414, 22415), II. 63, L. P. Richards & M. C. Thompson; 1♀, same data but ex *Eudynamis scolopacea* (BBM 22394); 1♂, same data but ex *Cracticus cassicus* (BBM 22370); 1♂, 4♀♀, same data but ex *C. quoyi* (BBM 22376, 22377, 22424); 2♂♂, 3♀♀, 1⚲, same data but ex *Dacelo* sp. (BBM 22326, 22359), 1♂, 1♀, same data but ex *Haliastur sphenurus* (BBM 22416); 1♀, w. mite on leg, same data but ex *Larius roratus* (BBM 22374); 1♀, w. mite on abd., same data but ex *Pitohui kirhocephalus* (BBM 22307); 1♀, same data but ex *Ptilinopus perlatus* (BBM 22407); 1♀, same data but ex *Talegalla cuvieri* (BBM 22398); 1♀, same data but ex *Tanysiptera galatea* (BBM 22345); 1♀, same data but ex *Halcyon nigrocyanea* (BBM 22311); 1♂, 1♀ same data but ex *Aviceda subcristata* (BBM 22419); 7♂♂, 9♀♀, 1⚲ (1♂ w. fungus, 1♀ w. mite under wing), same locality, ex *Centropus menbeki* (BBM 22166), XII. 62, L. P. Richards; 1♀, same data but ex *Chalcophaps stephani* (BBM 22216); 1♀, same data but ex *Aviceda subcristata* (BBM 22222); 5♀♀, 1⚲ (3♀♀ w. fungi, 2♀♀ & 1⚲ w. Mallophaga), same data but ex kingfisher (BBM 22280), I. 63. NE NEW GUINEA: 4♂♂, 19♀♀, 1⚲ (3♂♂, 6♀♀ w. fungi), Ambunti, 160 m, Sepik Distr., ex *Centropus m. menbeki* (BBM 22549, 22582), V. 63, P. Temple; 1♂, same data but ex *Cracticus cassicus* (BBM 22543); 1♀, same data but ex *Ducula rufigaster* (BBM 22547); 1♀, same data but ex *Eurystomus orientalis* (*pacificus* ?) (BBM 22538); 1⚲, same data but ex *Megapodius freycinet affinis* (BBM 22579); 1♀, same data but ex *Merops ornatus* (BBM 22567); 1♂, 1♀, same data but ex *Mino dumontii* (BBM 22559, 22560); 8♂♂, 8♀♀, 2⚲⚲ (1♂ w. mallophagan, 1♀ w. fungus, 1♂ w. mite on neck), same data but ex *Sauromarptis gaudichaud* (BBM 22542, 22572). 2♂♂, 1⚲ (1♂ w. mallophagan), Brugnowi, 60 m, Sepik Distr., ex *Cracticus cassicus* (BBM 22600), V. 63, Temple. 2♂♂, 3♀♀, Bulolo, 700 m, ex *Accipiter novaehollandiae* (HC 110), II–V. 62, H. Clissold; 1♀, same data but ex *Alisterus chloropterus* (HC 41); 1♀, same data but ex *Ptilinopus perlatus* (HC 23); 1♂, 1♀, 1 puparium, same data but ex Black-headed Blue Jay (HC 111); 1♀, same data but ex Sacred Kingfisher (HC 114); 1♂, same place, ex *Paradisaea raggiana* (S 170), I. 62, G. Monteith; 1♂, same place, ex *Centropus bernsteinii* (S 183), II. 62, J. Sedlacek; 1♀, Bulolo R., 1000 m, Wau area, ex kingfisher (BBM 28433), VI. 63, P. Shanahan; 1 ♂, same data but ex King Parrot [*Halcyon sancta*] (BBM 27884); 1♂, same data but ex cuckoo-shrike (BBM 28429). 1♂, Enarotali, ex *Lophorina superba* (BBM 21426), IV. 63, Clissold; 3♀♀, Finschhafen, ex *Sauromarptis gaudichaud* (BBM 27568), III–IV. 63, Clissold; 2♀♀ (1 w. mite under wing), same data but ex grackle (BBM 27648); 1♂, 1♀ (♀ w. mites under wings), same data but ex dollar-bird (BBM 27655); 1♀, w. mallophagan, same data but ex leatherneck (BBM 27690); 1♂, 2♀♀ (all w. mites on abd., 1♀ w. fungus), same data

but ex *Corvus orru* (BBM 27697); 2♀♀ (1 w. mallophagan), same place, ex black crow [*Corvus orru*] (BBM 27703), IV. 63, P. Shanahan; 1♀, same data but ex *Ieracidea berigora* (BBM 27702); 5♂♂, 8♀♀ (1♂, 1♀ w. fungi), same data but ex *Sauromarptis gaudichaud* (BBM 27663); 1♂, 1♀ (CSIRO), Hayfield, Sepik Distr., ex *Melidora macrorhina*, V. 62, W. B. Hitchcock; 3♂♂, 2♀♀ (CSIRO) (1♂, 2♀♀ w. fungi, 1♀ w. mallophagan), same data but ex *Sauromarptis gaudichaud*; 2♂♂, 1♀ (CSIRO) (♀ w. fungus), same data but XI. 62; 2♀♀ (CSIRO), Japanaut, Sepik Distr., ex same host, VI. 63, K. Keith. 1♀, Kassam nr Kainantu, ex pigeon (TMP 2124), XI. 59, H. M. Van Deusen & T. C. Maa. 1♂, Karimui, 1100 m, ex pigeon (BBM 20077), VII. 63, Shanahan. 1♂, Lower Water nr Bulolo, 650 m, ex *Alisterus chloropterus* (HC 96), IV. 62, Clissold. 1♂, May R., 130 m, Sepik Distr., ex *Ducula zoeae* (BBM 22638), VI. 63, Temple; 1♂, 1♀, same data but ex *Halcyon sanctus* (BBM 22657); 3♀♀, same data but ex *Larius roratus* (BBM 22658); 5♂♂, 12♀♀, 1♀ (♀ w. fungus), same data but ex *Sauromarptis gaudichaud* (BBM 22620, 22622). 1♀, Mt Missim, ex butcher-bird (BBM 21084), I. 63, P. Temple. 1♀, Pindiu, ex dollar-bird (BBM 27728), IV. 63, P.Shanahan. 1♂, Nakata Ridge, 1600 m, Wau area, ex king parrot [*Alisterus* sp.] (BBM 28496), VI. 63, Shanahan. 1♂, 1♀ (♂ w. fungus), Slate Creek, ex butcher-bird (BBM 20376, 20383), III. 63, Clissold. 2♂♂, Wagu, 150 m, Sepik Distr., ex *Cacatua galerita triton* (BBM 22671), VI. 63, Temple; 1♀, same data but ex *Melanopyrrhus anais* (BBM 22672). 1♀, w. mite on neck, Lake Wanum, 300 m, Morobe Distr., ex *Geoffroyus geoffroyi* (BBM 28609), VII. 63, Shanahan. 1♂, Wau, 700 m, Morobe Distr., ex "Phabalen" bird of paradise (BBM 29008), VIII. 63, Clissold; 1♀, same place, ex New Guinea Crow [*Corvus orru*] (HC 199), V. 62, Clissold; 1♂, same place, ex bird (S 219), II. 62, G. Monteith; 1♀, same place, ex *Accipiter fasciatus* (S 175), II. 62, J. Sedlacek. 1♂, 2♀♀, Zemm River, ex *Probosciger aterrimus* (BBM 27751, 27753), IV. 63, P. Shanahan. SE NEW GUINEA: 1♂, Ahola, 50 m, ex grackle (BBM 29915), X. 63, Clissold; 1♂, same data but ex *Accipiter novaehollandiae* (BBM 29903); 16♂♂, 22♀♀ (1♂ w. mallophagan; 1♂, 11♀♀ w. fungi; 1♀ w. mite on abd.; 1♂, 7♀♀ w. mites under wings), same data but ex kingfishers (BBM 29896, 29897, 29904); 1♂, same data but ex parrot (BBM 29898). 1♂, 6♀♀, Amboga, 120 m, ex butcher-bird (BBM 28799), IX–X. 63, Clissold; 1♂, 2♀♀, same data but ex *Centropus menbeki* (BBM 29943); 1♂, same data but ex *Ptilinopus coronulatus* (BBM 28800); 1♀, same data but ex drongo (BBM 29920); 4♂♂, 1♀ (1♂ w. mallophagan on palpi), same data but ex grackle (BBM 28791, 28798, 28801, 28807); 9♂♂, 13♀♀ (4♂♂, 2♀♀ w. fungi; 1♂ w. mite under wing), same data but ex *Sauromarptis gaudichaud* (BBM 28808); 1♂, w. fungus, same data but ex leatherneck (BBM 28803). 1♂ (MCZ), Dobadura, ex bird (#537), U. S. Typhus Comm.; 3♂♂, 1♀ (MCZ), same data but ex *Coracina* (?) sp. (#573); 2♂♂, 3♀♀ (MCZ) (1♀ w. fungus), same data but ex *Dacelo leachi* (#571); 1♂ (MCZ), same data but ex *Cacatua galerita* (#387). 1♀ (MCZ), Morobe Distr., ex Stephen Large Black Gracal [*Coracina p. papuensis*]. 2♂♂, Embi Lakes, 100 m, ex butcherbird (BBM 29323), X. 63, Clissold; 2♂♂, same data but ex cockatoo (BBM 29318); 1♀, w. mite on abd., same data but ex drongo (BBM 29329); 2♂♂, 1♀ (1♂ w. mite on abd.), same data but ex *Sauromarptis gaudichaud* (BBM 29321). 3♂♂, 4♀♀, Jumbora, 60 m, ex *Cracticus cassicus* (BBM 28782, 29334, 29700), IX. 63, Clissold; 4♂♂, 2♀♀ (1♀ w. fungus), same data but ex cockatoo (BBM 29336, 29351, 29353); 3♂♂, 2♀♀ (1♀ w. fungus & w. mites on neck & under wing), same data but ex *Centropus bernsteini* (BBM 28749, 28349, 29671, 29706); 2♂♂, 1♀ (♀ w. mite on abd.), same data

but ex crows (BBM 28747, 28770); 4♂♂, 8♀♀ (1♀ w. mite on abd.), same data but ex dollar-bird (BBM 28744, 28757, 28761, 28762, 28769); 1♂, same data but ex dove (BBM 28772); 3♀♀, (1 w. mite on abd.), same data but ex drongo (BBM 29352, 29692, 29696); 4♂♂, 3♀♀ (1♀ w. mite on abd.), same data but ex *Mino dumonti* (BBM 28739, 28745, 29712); 3♂♂, 2♀♀, same data but ex *Accipiter novaehollandiae* (BBM 28746, 28850); 17♂♂, 34♀♀ (4♂♂, 4♀♀ w. fungi; 1♀ w. mite on abd.; 1♂ w. abnormal tergal pls.), same data but ex kingfishers (BBM 28773, 28844, 28853, 29674, 29679); 1♀, same data but ex *Sauromarptis gaudichaud* (BBM 29670); 1♀, same data but ex leatherneck (BBM 29688); 1♀, same data but ex nightjar (BBM 28858); 2♂♂, 2♀♀, same data but ex *Ninox rufa* (BBM 28836); 1♂, 2♀♀, same data but ex *Larius roratus* (BBM 28775, 28776, 29690); 1♂, same data but ex pigeon (BBM 29362); 1♀, same data but ex sunbird (BBM 29685); 2♂♂, same data but ex bird (BBM 29355). 1♂, 2♀♀, Cape Kileton, sea level, ex cougal (BBM 29274, 29275), X. 63, Clissold; 1♂, 1♀, same data but ex *Haliastur indus* (BBM 29263); 19♂♂, 27♀♀ (4♀♀ w. fungi; 1♂, 2♀♀ w. mites on neck; 1♂, 3♀♀ w. mites under wing; 2♀♀ w. mites on abd.), same data but ex kingfishers (BBM 29225, 29229, 29245, 29250, 29287, 29291, 29294, 29301); 1♀, same data but ex *Ducula spilorrhoa* (BBM 29265); 2♀♀, same data but ex *Zonerodius heliosylus* (BBM 29227). 1♂, 1♀ (♀ w. fungus), Milne Bay, Sinaeada, ±10 m, ex undet. bird (BBM 24544), IV. 65, Shanahan; 1♀, same data but ex *Dicrurus bracteatus* (BBM 24525). 2♂♂, Popondetta, 60 m, N. Distr., ex bowerbird (BBM 38662) VIII–IX. 63, Shanahan; 1♂, same data but ex Magnificent Fruit Dove [*Megaloprepia magnifica*] (BBM 28693); 1♀, same data but ex Pheasant tailed Dove [*Reinwardtoena reinwardtsi*] (BBM 28663); 1♂, 1♀, same data but ex *Accipiter cirrocephalus* (BBM 28697); 1♂, same data but ex *Accipiter* sp. (BBM 28695); 5♂♂, 7♀♀ (1♂ w. mite under wing, 1♂ w. mite on abd.), same data but ex kingfisher (BBM 28658); 2♂♂, 1♀♀ (♀ w. fungus), same data but ex *Larius roratus* (BBM 28683, 28690); 1♂, same data but ex Bronze-winged Pigeon [*Chalcophaps indica*] (BBM 28664). 1♂, Saha, 80 m, ex *Eurystomus orientalis* (BBM 29968), X. 63, Clissold. 1♂, Sangara, 80 m, ex *Oriolus szalayi* (BBM 29982), X. 63, Clissold. 2♀♀, Simburu, 70 m, N. Distr., ex dove (BBM 28130), IX. 63, Clissold; 1♀, same data but ex *Accipiter novaehollandiae* (BBM 28727). 1♀, Soputa, 60 m, ex New Guinea Broadbill [*Peltops blainvillii*] (BBM 29772), X. 63, Clissold; 1♂, 2♀♀, same data but ex bird of paradise (BBM 29869); 3♀♀, same data but ex dove (BBM 29823); 2♂♂, 1♀, same data but ex *Dicrurus bracteatus* (BBM 29777, 29778); 1♂, same data but ex Fan-tailed Warbler [*Cisticola exilis*] (BBM 29751); 2♂♂, 1♀, same data but ex hawk (BBM 29773, 29852, 29998); 1♂, 9♀♀ (1♀ w. fungus; 3♀♀ w. mites on abd.), same data but ex *Accipiter novaehollandiae* (BBM 29867); 45♂♂, 52♀♀, 2♀♀ (1♂ w. mallophagan; 5♂♂, 8♀♀ w. fungi; 2♀♀ w. mites on neck; 4♀♀ w. mites on abd.), same data but ex kingfishers (BBM 29714, 29742, 29750, 29769, 29811, 29820, 20833); 1♀, same data but ex *Tanysiptera danae* (BBM 29828); 1♀, same data but ex *Geoffroyus geoffroyi* (BBM 29858); 1♀, same data but ex parrot (BBM 29846); 1♂, 2♀♀ (♂ w. fungus), same data but ex *Larius roratus* (BBM 29832, 29866); 1♀, same data but ex undet. bird (BBM 29839). 1♀, Zenani, 130 m, ex butcher bird (BBM 29948), X. 63, Clissold. 2♂♂, Balimo, ex cockatoo (BBM 50404, 50405), III–IV. 64, Clissold; 1♀, same data but ex *Probosciger aterrimus* (BBM 50323); 1♀, same data but ex cougal (BBM 50516); 1♀, same data but ex fantail [? *Rhipidura* sp.] (BBM 50317); 2♂♂, same data but ex *Haliastur indus* (BBM 50461); 1♀, same data but ex *Accipiter* sp. (BBM 50283);

2♂♂, 3♀♀, same data but ex kookaburra (BBM 50327, 50425); 2♂♂, 12♀♀, same data but ex kingfishers (BBM 50315, 50423, 50476); 1♂, same data but ex *Probosciger aterrimus* (BBM 50261); 1♀, same data but ex pigeon (BBM 50474); 1♀, same data but ex robin (BBM 50357). 1♀, Daru, ex drongo (BBM 50111), III. 64, Clissold. 1♀, Oriomo, ex *Manucodia ater* (BBM 29646), II. 64, Clissold; 1♀, same data but ex *Cracticus cassicus* (BBM 29425); 1♂, 6♀♀ (1♀ w. abnorm. abd. terg.), same data but ex butcherbirds (BBM 29567, 29569, 29570, 29631); 2♀♀ (1 w. mites on abd. & under wing), same data but ex *Ailuroedus crassirostris* (BBM 29577); 2♀♀ (1 w. mite under wing), same data but ex cougal (BBM 50033); 1♂, same data but ex dove (BBM 29509); 2♂♂, 2♀♀, same data but ex drongo (BBM 20507, 29651); 1♂, 1♀, same data but ex frogmouth (BBM 50034); 8♂♂, 25♀♀ (1♀ w. abnorm. abd. terg.), same data but ex kingfishers (BBM 29414, 29503, 29506, 29508, 29518, 29520); 4♀♀, same data but ex *Syma torotoro* (BBM 29523); 1♂, 2♀♀, same data but ex *Probosciger aterrimus* (BBM 50061, 50062); 2♂♂, 1♀, same data but ex parrots (BBM 29589, 50064); 1♂, 1♀, same data but ex pigeons (BBM 29491, 29504); 1♂, 2♀♀, same data but ex shrike (BBM 29497, 50052). 1♀, Tegona, ex parrot (BBM 50481), IV. 64, Clissold.

KEI IS.: 1♀ (MCZ), "Kei Eil. 1922 Elat 164", H. C. Siebers.

NEW BRITAIN: 1♂, 1♀ (MCZ), "New Britain", ex *Caloenas n. nicobarica* (P 107), III. 32, W. F. Coultas; 1♀ (MCZ) (w. mites under wing and on abd.), same data but ex *Dicrurus bracteatus laemostictus* (P105); 2♀♀ (MCZ), same data but ex *Halcyon chloris tristrami* (P 106); 1♂ (MCZ), w. mite under wing, same data but ♯P 109. 1♂, 4♀♀ (1♀ w. mites on abd.), Gaulim, ex *Corvus orru* (BBM 20691), X. 62, H. Clissold; 1♂, w. mite under wing, same data but ex *Accipiter leucoschistaceus* (BBM 20689); 6♂♂, 5♀♀, same data but ex *Larius roratu* (BBM 20681, 20682, 20873). 1♂, 2♀♀ (1♀ w. mite under wing), Ilugi, ex *Cacatua galerita* (BBM 20938), XII. 62, Clissold. 4♂♂, 3♀♀, Riaet, ex *Centropus* sp. (BBM 20743), XI. 62, Clissold; 1♀, same data but ex *Artamus insignis* (BBM 20711). 1♂, 4♀♀ (1♀ w. fungus, 2♀♀ w. mites under wings), Mt Sinewet, ex *Centropus violaceus* (BBM 20714, 20782), XI. 62, Clissold; 1♀, same data but ex *Aviceda jerdoni* (BBM 20742); 1♂, same data but ex kokomo (BBM 20767); 1♀, same data but ex *Mino dumontii* (BBM 20755). 2♂♂, 2♀♀, Taliligap, *Larius roratus* (BBM 20664, 20667), X. 62, Clissold; 1♀, same data but ex *Corvus orru* (BBM 20675); 1♂, Keravat, ex *Larius roratus* (TMP 1265), XI. 59, T. C. Maa. 1♂, 4♀♀ (KBH), Credres I. nr Rabaul, VII. 62, Noona Dan Exped. 61–62. 2♂♂, 1♀ (KBH) (1 ♂, 1♀ w. mites on metathorax & under wing respectively), same data but from Kawalakessi. 1♀ (KBH), Sancta Credue I. nr Rabaul, ex "Halc", VII. 62, Noona Dan Exped.

SOLOMON IS.: 2♀♀, Pusisama, Vella Lavella, sea level, ex *Centropus phasianinus* (BBM 23186, 23247), XI. 63, P. Temple; 2♂♂, 6♀♀, 1♀, same data but ex *Larius roratus* (BBM 23204, 23206, 23246). 1♂, Ulo Crater, Vella Lavella, 10 m, ex *Centropus phasianinus* (BBM 23332), XII. 63, Temple; 4♀♀, 1♀, same data but ex *Demigretta sacra* (BBM 23324); 1♀, same data but ex *Mino dumontii* (BBM 23255). 1♂, 4♀♀, Gollifer's Camp, Kolombangara, 720 m, ex *Centropus milo* (BBM 23360, 23412), I. 64, Temple. 1♀, Pepele, Kolombangara, sea level, ex *Haliastur indus* (BBM 23490), II. 64, Temple; 6♀♀ (1 w. abnormal tergal pls.), same data but ex *Nycticorax caledonicus* (BBM 23521). 2♂♂, 7♀♀ (1♀ w. mite on abd.), Malangona, Choiseul, 10 m, ex *Accipiter novaehollandiae* (BBM 23675), II–III. 64, Temple; 1♂, 3♀♀, same data but ex *Corvus woodfordi* (BBM 23555,

23602); 1♂, 1♀ (♀ w. mites on abd.), same data but ex *Eos cardinalis* (BBM 23590); 1♀, same data but ex *Eurystomus orientalis* (BBM 23599); 1♀, same data but ex *Halcyon leucopygia* (BBM 23584); 1♀, w. mite on abd., same data but ex *Larius roratus* (BBM 23554). 4♀♀, Toumoa, Fauro, 10 m, ex *Nycticorax caledonicus* (BBM 23747), IV. 64, Temple; 3♂♂, 1♀, same data but ex *Rhyticeros plicatus* (BBM 23773, 23806). 1♀, Nini Creek, Roroni, Guadalcanal, 20 m, ex *Eurystomus orientalis* (BBM 23841), V. 64, Temple. 3♂♂, 13♀♀, Tabalia, Guadalcanal, 20m, ex *Accipiter novaehollandiae* (BBM 23860, 23913), V. 64, Temple; 2♀♀, same data but ex *A. albogularis* (BBM 23913); 2♀♀, 1⚲, same data but ex *Butorides striatus* (BBM 23930); 1♀, same data but ex *Cacatua ducorpsi* (BBM 23881); 1♂, 2♀♀, same data but ex *Eurystomus orientalis* (BBM 23858); 1♂, 4♀♀, same data but ex *Halcyon sanctus* (BBM 23934); 2♂♂, 3♀♀, same data but ex *Haliastur indus* (BBM 23900); 1♀, same data but ex *Hemiprocne mystacea* (BBM 23937); 3♀♀, same data but ex*Larius roratus* (BBM 23910); 1♀, same data but ex *Ninox jacquinoti* (BBM 23905); 3♂♂, 20♀♀, 2⚲⚲, same data but ex *Nycticorax caledonicus* (BBM 23959, 23960); 2♀♀, 1⚲, Dala, 20± m, Malaita, ex *Accipiter novaehollandiae* (BBM 24111, 24124), VII. 64, Shanahan; 1♀, same data but ex *Halcyon chloris* (BBM 24091), VI. 64. 1♂, 5♀♀, 1⚲, Boala, 20± m, St. Ysabel I., ex *H. chloris* (BBM 24218), VIII. 64, Shanahan; 2♀♀, same data but ex *Haliastur indus* (BBM 24250); 16♂♂, 34♀♀, 5⚲⚲ (4♂♂, 11♀♀, 1⚲ w. fungi), same data but ex *Nycticorax caledonicus* (BBM 24278). 3♂♂ (1 w. mite on abd. sternum 1), Tatamba, 20± m, St. Ysabel I., ex *Corvus woodfordi* (BBM 24321), IX. 64, Shanahan; 4♂♂, 7♀♀, same data but ex *N. caledonicus* (BBM 24320, 24330).

NEW HEBRIDES: 1♂, 1♀ (CAS), Efate, ex kingfisher, VI. 44, W. O. Murray. 1♂ (STF), Espiritu Santo I., ex *Halcyon juliae*, VII. 23. 4♂♂, 3♀♀ (CNHM), same place, ex *H. chloris* (P 5), XI. 43, R. E. Kuntz; 12♂♂, 19♀♀ (CNHM) (1♂, 3♀♀ w. fungi; 1♂, 1♀ w. mites under wings), same data but #PV 129, 152, 153, 156, 158, VII. 44. 2♂♂ (STF), Tanna, ex *Halcyon*, IX. 25. 1♂, 1♀ (AMNH), "New Hebrides" (no other details).

MARIANA IS.: 1♂ (CNHM), Guam I., Fadang, ex *Corvus kubaryi* (lot #2133), V. 45, H. S. Dybas. 1♂, 2♀♀ (CNHM), Guam I., ex *Aplonis opacus guami* (lot #2088), V. 45, Dybas; 27♂♂, 49♀♀, 2⚲⚲ (CNHM) (1♀ w. mite under wing), same data but ex *Halcyon c. cinnamomina* (lot #2041, 2042, 2045); 1♀ (CNHM), same data but no host record (lot #2271). 1♀ (CNHM), Rota I., Sosan Isthmus, X. 45, W. L. Necker. 1♀ (USNM), Saipan I., J. T. Marshall (#3061); 1♂ (CNHM), same place, ex *Aplonis opacus guami* (lot #531), I. 45, Marshall & Dybas; 2♂♂, 5♀♀, 2⚲⚲ (CNHM), same data but ex *Halcyon chloris albicilla* (lot #530, 658, 676, 1054), XII. 44–II. 45. 1♀, 1⚲ (KU), same place, ex pigeon, VII. 39, H. Fujishima. 2♂♂, 4♀♀, 2⚲⚲ (KU), Saipan I., Garapan, IX. 39, T. Esaki. 11♀♀, 5⚲⚲ (MCZ), Tinian I., ex *Halcyon*, V. 44, E. Cott Bailey. 1♂ (CNHM), same place, ex *Aplonis opacus guami* (lot #924), IV. 45, Marshall & Dybas; 3♂♂, 6♀♀, 2⚲⚲ (CNHM), same data but ex *Halcyon chloris albicilla* (lot #925, 968, 980).

CAROLINE IS.: 1♀ (USNM) Colonia, Ponape I., I. 48, H. S. Hurlbut; 1♀, same locality, VIII. 59, M. R. Wheeler & M. Wasserman. 1♀ (MCZ,) Not Dist., slopes of Mts Tamatamansakir, Ponape I., ex *Gallus gallus*, L. P. Richards. 1♀ (MCZ), w. mites on abd., same data but ex *Halcyon cinnamomina reichenbachi*. 5♀♀ (MCZ), all w. mites on abd. (1♀ also w. mite under wing), Ponape I., ex *H. cinn. reichenbachi* (P 45), W. F. Coultas; 1♂, 1♀ (MCZ), same data but ex *Ptilinopus ponapensis* (P 43). 1♂, 3♀♀ (USNM)

(1♀ w. mite on abd.), Sokas I., I. 48, Hurlbut.

LOYALTY IS.: 1♀ (AMNH), Uvea I., VI. 38, L. MacMillan.

FIJI IS.: 1♀, Lau, Sovu, ex kingfisher, IX. 24, E. H. Bryan, Jr. 1♀, Mt Victoria, Tholo North, Viti Levu, 1100 m, ex native owl, IX. 38, E. C. Zimmerman.

SAMOA IS.: 1♀ (STF), Apia, ex *Demigretta sacra*, IX. 24, G. S. Armstrong. 1♀, Tutuila, Nuuuli, in car, II. 54, C. P. Hoyt. 1♂, 10♀♀ (MCZ, USNM), (1♀ w. mite on abd.), Tutuila, ex *Halcyon tutuilae*, E. C. Reed. 1♂, 1♀ (MCZ), Upolu, Lefanga Rd., ex kingfisher, II. 55, N. L. H. Krauss.

♀. Face narrower (14 : 15.5) than eye. Mesonotum distinctly darker than abdominal tergal plates; prescutum with ca. 7-10 rows of scattered setae; scutellum generally with 2-4 pairs of minor preapical bristles slightly shorter and finer than, but seldom as long and robust as major ones; spines on thoracic sterna about as strong as those on anterior prescutal margin. Wing 3–3.5 mm long; cell *3bc* ca. 2.7–3 × as long as wide; bulla of M_{1+2} much closer (12 : 21) to base than to apex of *2bc*; M_{3+4} with abscissa 1 ca. 2/3 as long as 2, with bulla 2× closer to *mcu* than to *im*. Abdomen moderately setose; tergite 6 an- teriorly often shallowly incised at middle, posteriorly with 1–2 pairs of bristles; supra- anal plate generally rhomboid or elliptical and its posterior piece slightly wider than anterior one, with 4–6 apical setae; lateral membranous area near each of spiracles 4 and 5 generally bare, rarely with 1–6 small setae; para-anal tuft conspicuous, composed of 3–12 (usually 5–8) setae which are entirely or mostly uniform in length and robustness, and as long as bristles on tergite 6; laterite 7 subtriangular, with 2–3 bristles and some pale fine setae. Abdominal venter generally with 3–15 scattered spines on sternite 1, with 6–8 setal rows at disc; urogenital area at each side with 1–2 multispinose warts and 4–18 (usually 8–12) anchor-like spines; anterior wart, when present, much smaller and less spinose than posterior one; anchor-like spines uneven in size and largely situated near spiracles 6 and 7 rather than pregenital tubercle; pregenital tubercle roundish; pregenital plate anteriorly trilobed, with median lobe much longer but often less sclerotized than lateral ones.

♂. Similar to ♀. Wing 2.8–3.4 mm long. Abdomen richly setose; tergite 5 with 1–3 pairs of bristles; side piece of tergite 6 ca. 1.5–2 × as wide as long, with some setae and 1 long and several shorter bristles; spiracle 3 surrounded by 20–28, 4 by 3–10 setae which are about as strong as those on ventral disc; para-anal tuft composed of 4–8 setae of varied length and often 1–2 rather long bristles; laterite 6 with 1–2 bristles and some ordinary setae; patch of extra-fine setae lining immediately before pregenital tubercles well developed. Genitalia as figured.

⚥. Side pieces of tergite 6 embracing anterior (dorsal) part of posterior anus, each about 2/3 as long as wide, its anterior margin strongly curved, posterior margin nearly straight, inner anterior corner bearing 3–4 very strong bristles, elsewhere with few slender setae; posterior anus weakly exserted, bare except moderately long soft setae densely fringing apical margin; infra-anal plate ⊥-shaped, with anterior lobe apically truncate or weakly emarginate; laterite 6 slightly shorter but wider than side piece of tergite 6, with 1–2 bristles and 4–6 short strong spines near inner and outer corners respectively; anchor-like spines at urogential area arranged in 2 groups, one situated anterior to

laterite 6 and composed of ca. 3–6 stout spines, another anterior to spiracle 5 and composed of 4–8 finer spines; anterior pregenital tubercle and patch of extra-fine setae as in normal ♂; setal tufts around spiracles 4–5 respectively similar to those around spiracles 5–6 in normal ♀.

Puparium. As in fig. 39. Median groove of "cap" microalutaceous, no microspines.

DISTRIBUTION. Widespread in the Oriental and Australian Regions, at present known from Thailand and Sumatra in the west, Samoa Is. in the east, Japan (?), Ryukyus Is. and Micronesia in the north, and Fiji and Kei Is. in the south; possibly occurring in Indian and Ceylonese Subregions. The lack of records from Australia, Molucca Is. and Malaya are perhaps due to insufficient collecting. The original distributional center was probably in the eastern part of the Oriental Region. The species is at present the sole representative of the genus in the New Hebrides, Loyalty Is., Fiji, Samoa, Caroline and Mariana Is. Its ancestral stock probably has diversified into several related forms with more restricted habitats, such as *podargi* n. sp. in New Guinea, *aequisenta* n. sp. in New Britain and Solomon Is. and *punctatissima* n. sp. in Solomon Is. Further eastward, the species is replaced by *pusilla* Schin. in the Marshall Is., Tokelau Is., Society Is. and Tuamotu Arch. and by *vicina* Wk. in the Hawaiian Is. In New Guinea, it is the overall predominant species of the genus and even entire family. Westward, this predominance becomes less and less significant, and in N Borneo and Taiwan, *exilis* is a very rare species. Further westward and across the Indian Ocean, it is replaced by *hovana* n. sp. in Madagascar. Among the preferred orders of birds, the highest catch per infested bird was 55 flies ex a *Nycticorax* (BBM 24278), Ciconiiformes; 30 flies ex *Tanysiptera* (BBM 29828), Coraciiformes; 23 flies ex *Centropus* (BBM 22549), Cuculiformes; 17 flies ex *Alisterus* (BBM 22414), Psittaciformes; 14 flies ex an *Accipiter* (BBM 23860), Falconiformes; and 7 flies ex *Cracticus* (BBM 28799), Passeriformes.

HOST PREFERENCE. Polyxenous, obviously normally breeding on Coracii-, Passeri-, Psittaci-, Cuculi- and Falconiformes, less frequently on Cuculi- and Columbiformes, with stray records from Ciconii-, Galli-, Grui-, Strigi-, Caprimulgi-, Apodi-, Trogonii- and Piciformes. Analysis of available records follows (genera not listed by Bequaert 1953 as for "*pusilla* Schin." are each marked with an asterisk): Ciconiiformes 14 records (**Ardea* 1, **Butorides* 1, *Demigretta* 2, **Goisakius* 2, **Nycticorax* 7, **Zonerodius* 1); Falconiformes 53 (*Accipiter* 27, *Aviceda* 3, **Elanus* 1, **Haliastur* 7, **Ieracidea* 1, **Pernis* 5, **Spilornis* 1, **Spizaetus* 1, Accipitridae indet. 7); Galliformes 10 (**Gallus* 8, **Megapodius* 1, **Talegalla* 1); Columbiformes 28 (*Caloenas* 1, **Chalcophaps* 3, *Ducula* 4, **Phapitreron* 1, *Ptilinopus* 4, **Reinwardtoena* 1, **Treron* 1, Columbidae indet. 13); Psittaciformes 58 (**Alisterus* 5, **Bolbpsittacus* 1, **Cacatua* 5, **Eos* 1, **Geoffroyus* 3, **Larius* 16, **Prioniturus* 1, **Probosciger* 4, **Tanygnathus* 1, **Trichoglossus* 1, Psittacidae indet. 21); Cuculiformes 32 (*Centropus* 24, **Eudynamis* 1, Cuculidae indet. 7); Strigiformes 9, (**Bubo* 1, **Glaucidium* 1, **Ketupa* 1, **Ninox* 3, **Scops* 1, **Uroglaux* 1, Strigidae indet. 1); Trogoniformes (**Harpactes*) 4; Caprimulgiformes (genus indet.) 2; Apodiformes (**Hemiprocne*) 1; Coraciiformes 131 (**Aceros* 1, **Buceros* 1, *Dacelo* 4, **Eurystomus* 13, *Halcyon* 48, **Lacedo* 1, **Melidora* 1, **Merops* 1, **Nyctiornis* 2, **Penelopides* 4, **Rhyticeros* 3, **Sauromarptis* 12, **Syma* 1, **Tanysiptera* 2, Alcedinidae indet. 39); Piciformes 14 (*Chrysocolaptes* 11, **Dryocopus* 3); Passeriformes 124 (**Aethopyga* 1, **Ailuroedus* 1,

Aplonis 4, **Artamus* 1, **Chlamydera* 1, **Cisticola* 2, **Coracina* 1, **Corvus* 18, **Cracticus* 12, *Dicrurus* 14, **Garrulus* 1, **Gracula* 1, **Lanius* 14, **Lophorina* 1, **Manucodia* 1, **Melanopyrrhus* 1, **Mino* 6, **Myiophoneus* 1, **Oriolus* 7, **Paradisaea* 2, *Philemon* 1, **Phonygammus* 1, **Pitohui* 2, *Pitta* 1, *Rhipidura* 1, **Sarcops* 2, **Turdus* 1, **Zoothera* 1, Corvidae indet. 4, Dicruridae indet. 8, Nectariniidae indet. 2, Paradisaeidae indet. 2, Ptilinorhynchidae indet. 1, Sturnidae indet. 8). Among the Coraciiformes, 97 records pertained to Alcedinidae, 13 to Coraciidae, 9 to Bucerotidae and 3 to Meropidae. Meanwhile, the average catch per infested bird in the first 2 families was higher than in Cuculidae (Cuculiformes) and very significantly higher than in any other families. All except 1 record of the Falconiformes pertained to Accipitridae; whereas all Cuculi- and Psittaciformes, to Cuculidae and Psittacidae respectively. The breakdown of records from Passeriformes is: Nectariniidae 2, Pittidae 1, Campephagidae 7, Muscicapidae 8, Laniidae 14, Artamidae 1, Meliphagidae 1, Sturnidae 16, Oriolidae 7, Dicruridae 22, Corvidae 23, Cracticidae 12, Ptilinorhynchidae 3, Paradisaeidae 7. The average catch per infested bird was low for the latter Order. Besides Corvidae, Dicruridae and Sturnidae, none of these 13 families appear to a have been particularly preferred. Therefore insofar as available records are concerned, *exilis* Wk. obviously prefers Alcedinidae, Coraciidae, Accipitridae, Cuculidae, and to less extent, to Psittacidae and the above-mentioned passerine families. It differs markedly from *zamicra* n. sp. and other related forms in having very low frequency on Muscicapidae, Meliphagidae and other tiny passerine birds. This conclusion does not agree with that reached by Bequaert (l. c.) since the latter was based upon the number of host species rather than individual records. Under "*pusilla* Schin." which represented a mixture of *vicina* Wk. (from Hawaii), several members of *exilis* group and true *pusilla*, he listed as hosts 32 genera (46 species) of birds, a few of which I am unable to verify. He also commented that the Passeriformes led the list, with 14 species (4 Pittidae, 2 Drepanidae, 2 Muscicapidae, 2 Sturnidae, and 1 each of Corvidae etc.); Coraciiformes (9 Alcedinidae) next, then Strigiformes (6 Strigidae), Falconiformes (5 Falconidae), Columbiformes (5 Columbidae), Psittaciformes (2 Psittacidae), and 1 species each in Grui-, Ciconii-, Cuculi-, Caprimulgi- and Piciformes.

Systematics. The original description of *exilis* Wk. reads: "Picea, capite pedibusque obscure viridibus, alis cinereis. Piceous, shining; head and legs dull green; wings cinereous; veins black. Length of body $1\frac{1}{4}$ line; of the wing 3 lines." Since first published more than a century ago, the name *exilis* has been almost entirely neglected and its true identity long disputed, but unsettled: Austen (1903) considered it inseparable from *beccariina* Rndn.; Bau (1929 a) accepted Austen's view and degraded *exilis* as a variety of *confluenta* Say, and Bequaert (1954) noted its similarity to *vicina* Wk. in the extent of wing setulae but did not go any further. On the other hand, supplemented with beautiful drawings, Ferris (1925 b: 331, figs. 1–2, ♀; 1926: 280, pl. 11 (1), text-fig. 1, ♂; 1927 b: 11, figs. 1–2, ♂) wrongly referred most of his specimens of *exilis* from the Philippines, Borneo, New Hebrides and Samoa to *promiscua* Ferr. & Cole, *beccariina* Rnd. and *pusilla* Schin. Finally, he (1929: 284) concluded all those specimens to be *pusilla*, on the basis that the latter species has originally been recorded from *Halcyon vulnerata* (now known as *Todiramphus vulneratus*) in Tahiti and that his specimens included some from the same bird-genus *Halcyon* and from the same "general" region. This reasoning was seemingly sound although Ferris had neither access to the types of

exilis and *pusilla*, nor any topotypes of the latter. And quite unfortunately, his incorrect conclusion was accepted by Bequaert and other authors and serious confusion in the literature resulted. Aldrich's (1923: 79 in pt.) record of "*confluens* Say" from *Halcyon tutuilae*, Tutuila, Samoa is referable to *exilis* too.

The type of *distincta* Kishida is unavailable to me but there is no doubt that it is identical to *exilis*. The original description has been translated by me (1962: 588) and the more important characters mentioned therein are: "♀. Small, even in largest individuals only about 3 mm long; scutellar bristles 6 pairs of which, 2 inner pairs longer; abdomen with 4 median tergal plates, with many denticles and spiniform setae on anterolateral margin, with many bristles and few denticles on posterior margin. Off kingfishers; rare." No type locality was given but it is possible that the insect was not from Japan but from Micronesia or Philippines where Japanese collectors were fairly active in those days. In fact, some evidently exotic, rather than truely Japanese species, such as "*Brachypteromyia*" *nakamurai* Kishida were included in that same article.

O. exilis and *stipituri* have similar host and distributional ranges and are so closely related that the 2 species were often confused in collections and literature. In *exilis*, body size is larger, scutellar bristles stronger and more numerous, abdominal chaetotaxy (particularly setal tuft and anchor-like spines near ♀ abdominal apex) longer and more robust, and laterite 6 in ♀ more widely separated from side piece of tergite 6. Affinity of *exilis* with *podargi* is comparatively weaker and probably their differentiation has a longer evolutionary history than that with *stipituri*. The structural details are more generalized and host and distributional ranges much wider in *exilis* than in *podargi*. Thus the former appears to have been less subjected to isolation than the latter. For differences of the 2 species, see discussion under *podargi*.

Although *exilis* is widely spread in many Pacific islands, I am unable to find any clear-cut characters to recognize geographical races. Specimens from the New Hebrides and Solomon Is. are on the average slightly larger; and those from Christmas I. are smaller (wing 2.5–3.0 mm long), whereas those from the Philippines, New Britain and the Solomon Is., often have richer setae near abdominal spiracles 4 and 5. Countings of anchor-like spines near ♀ abdominal apex also failed to show any host or geographical significance. The low and high percentage of gynandromorphism among the Thailand and Micronesian specimens respectively is notable, but I can offer no explanation.

Among the material examined, the following abnormalities (probably caused by somatic mutation) were noted: 1♀, Philippines, cell *3bc* in both wings widely open behind (i.e., abscissa 1 of vein Cu+1A represented only by curved base and vestigial apex); 1 ♀, Thailand, tergite 6 normal at left 1/2, narrowly linear at right 1/2; 1♂, Guam, tergite 3 widely interrupted at middle, 6 with a narrow "bridge" between its side pieces; 1♂, Philippines, tergite 3 widely separated into 2 side pieces of which, left one transverse, right one oblique and joining tergite 4; 1♂, Thailand, tergite 3 represented by single small piece at right side; 1♂, NE New Guinea, tergite 4 represented by single piece at right side; 1♂, NE New Guinea, tergites 4 and 5 joined by short longitudinal "bridge" at middle; 1♂, SE New Guinea, tergite 5 widely interrupted at middle; 1♂, NW New Guinea, each side piece of tergite 6 joined by a narrow "bridge" with corresponding laterite 6; 1♀, Solomon Is., tergite 5 broadly interrupted at middle, with right part lying

obliquely and joining tergite 4; 1♀, SE New Guinea, similar but left part of tergite 5 entirely wanting; 1♀, SE New Guinea, tergite 3 represented only by its left 1/2, tergite 3 with right 1/2 abnormally thickened, ectally curved cephalad and meeting syntergite 1+2; 1♀, SE New Guinea, tergite 4 medially interrupted, with right side piece medially shifted cephalad and joining tergite 3.

Ornithoica podargi Maa, n. sp. Figs. 21, 28, 37, 56.

TYPE SERIES. 21♂♂, 134♀♀, 23⚲⚲. Holotype ♀ (BISHOP 6859), allotype ♂ and most paratypes in Bishop Mus.; 1♀ paratype in Chicago Nat. Hist. Mus.

NE NEW GUINEA: Holotype ♀, allotype ♂, 8 paratypes (1♂, 7♀♀), Bulolo, 800 m, ex *Podargus papuensis* (S 157), I. 62, J. Sedlacek; 25♀♀, 4⚲⚲, same data but S. 158, 195, 196, I–II. 62. 1♀ (CNHM), Bulolo, no host record, III–VI. 37, G. Rio. 1♂, Bulolo R., Wau area, 950 m, ex King Parrot [*Alisterus* sp.] (BBM 27884), VI. 63, P. Shanahan. 11♀♀, 2⚲⚲((all except 4♀♀ w. fungi; 1♀ w. mite on abd.), Cooranga Creek, ex *P. papuensis* (BBM 20637), I. 63, H. Clissold. 3♂♂, 16♀♀ (1♀ w. mite under wing), Finschhafen, ex *P. papuensis* (BBM 27686), IV. 63, Shanahan. 3♂♂, 15♀♀, 2⚲⚲, Kauli Creek, ex *P. papuensis* (BBM 20612), I. 63, Clissold. 2♂♂, 6♀♀, 5⚲⚲, Koibuga, 1900 m, W Highlands, ex frogmouth (BBM 28313, 28314), VII. 63, Clissold. 3♀♀, Slate Creek, 800 m, ex owl [? "frogmouth owl"] (BBM 20392), III. 63, Shanahan. 1♀, Watut, 600 m, ex *Chlamydera cerviniventris* (HC 87), III. 62, Clissold. 1♂, 8♀♀, 3⚲⚲, Wau Creek, ex *Podargus papuensis* (BBM 27517), III. 63, Shanahan. SE NEW GUINEA: 1♀, Cape Kileton, sea level, ex *Zonerodius heliosylus* (BBM 29227), X. 63, H. Clissold. 8♂♂, 36♀♀, 6⚲⚲, (1♀ w. mite on abd.), Jumbora, 60 m, ex frogmouth (BBM 29335, 29375), X. 63, Clissold; 1♂, same data but ex nightjar (BBM 28754), IX. 63; ♀, same data but ex *Ninox rufa* (BBM 28836). 1♀, 1⚲ (♀ w. fungus), Popondetta, 60 m, N. Distr., ex *Podargus ocellatus* (BBM 28659), VIII. 63, P. Shanahan. 1♀, Soputa, 30 m, ex *Machaerhamphus alcinus* (BBM 29824), X. 63, Clissold.

♀. Face slightly narrower (17 : 19) than eye. Mesonotum distinctly darker than abdominal tergal plates; prescutum with *ca* 6–7 rows of scattered setae; scutellum with 3–4 pairs of minor preapical bristles much finer, and shorter (generally 1/2 or less as long) than major ones. Spines on thoracic sterna distinctly weaker than those on anterior prescutal margin, hardly longer than thick at base. Wing 3.6–4.0 mm long; cell *3bc* ca. 2.5× as long as wide; bulla of M_{1+2} much closer (19 : 24) to base than to apex of *2bc*; M_{3+4} with abscissa 1 ca. 2/3 as long as 2, with bulla more than 2× closer to *mcu* than to *im*. Abdomen strongly setose; tergite 6 anteriorly almost straight, with 1–2 pairs of bristles; supra-anal plate rhomboid, large, with 5–8 apical setae; lateral membranous area near spiracles 4, 5 and 6 respectively with 5–8, 5–11 and 10–18 strong setae which are virtually uniform in length and robustness and about as long as strongest setae on tergite 5; laterite 7 subtriangular, about as long as wide, with 2–3 bristles. Abdominal venter with 9–10 setal rows at disc, seldom with 2–4 extra setae lining immediately before pregenital tubercles; usually no spines on sternite 1; urogenital area at each side generally with 1 multispinose wart and 8–15 anchor-like spines; pregenital plate anteriorly trilobed, with lateral lobe broader, more strongly sclerotized and not or hardly shorter than median lobe; infra-anal plate often 3-lobed, with median lobe exceedingly small.

Fig. 56. *Ornithoica podargi* Maa, ♀ ♂ abdomen in dorsal and ventral aspects and ♂ genitalia in lateral aspect.

♂. Similar to ♀, but abdomen more finely setose. Wing 3.5–4.0 mm long. Side piece of tergite 6 ca. 1.5–2× as wide as long, usually with 1 bristle; setae surrounding spiracles 3–5 quite varied in length and robustness; laterite 6 bearing 1 bristle and 0–5 setae; patch of extra-fine setae before pregenital tubercles well developed. Genitalia as figured.

♀. Side pieces of tergite 6 fused with infra-anal plate and almost entirely embracing posterior anus, each piece ca. 2/3 as long as wide, its inner side with large strong tubercle bearing 2 bristles and numerous strong setae; posterior anus strongly exserted, entirely covered with pale dense microsetae; infra-anal plate paler and less sclerotized than tergite 6, posterolaterally (*i.e.* on border of posterior anus) with a pair of very pale roundish membranous areas, anteriorly almost straight; laterite 6 absent; posterior pregenital tubercle very small, roundish, bearing 1, seldom 2, bristles and often 1 small seta; 6–13, generally 8–10 anchor-like spines at urogenital area forming 1 small longitudinal patch at a side immediately before spiracle 6 and ectad to 7.

Puparium. Similar to that of *exilis* Wk., but median groove of "cap" distinctly microspinose.

DISTRIBUTION. Papuan Subregion, at present known only from NE and SE New Guinea, up to ca. 2000 m, apparently commoner in lowlands. Population density on infested birds unusually high (*infra*).

HOST PREFERENCE. Apparently monoxenous, on *Podargus* (Podargidae, Caprimulgiformes). Of the 21 available host records, 9 ex *P. papuensis*, 1 ex *P. ocellatus*, 4 ex undet. frogmouths and "frogmouth owls", 1 each ex *Zonerodius* (Ardeidae, Ciconiiformes), *Ninox*, "owl" (Strigidae, Strigiformes), *Machaerhamphus* (Accipitridae, Falconiformes), *Alisterus* (Psittacidae, Psittaciformes), nightjar (Caprimulgidae, Caprimulgiformes), and *Chlamydera* (Ptilinorhynchidae, Passeriformes). The last 6 records are obviously strays or contaminations. According to Mayr (1941: 79–80) there are in the Papuan Subregion only 2 species of frogmouths or Podargidae, both belonging to the genus *Podargus*. The unusually heavy infestation of these birds by this fly is noteworthy; in one case (BBM 29335), not less than 40 flies were found on a single bird. The average of 14 cases was 12.8 flies per bird. In strong contrast, the remaining 8 cases (incl. 1 ex undetermined bird), only 10 flies altogether (average 1.25 flies) were collected.

Systematics. This species is the largest and most richly setose in the *exilis*-group and is about as large as *unicolor* Speis. and members of the subgenus *Lobolepis*. Evidently it has little affinity to the next 2 species which have specialized in different directions, but has derived directly from a common stock with *exilis* Wk. From the last it can easily be recognized by host preference, body size, sparseness of prescutal setae, minuteness of thoracic sternal spines, robustness and abundance of lateral abdominal setae as well as characteristic shape of ♀ supra-anal and pregenital plates. The ♂♀ of the 2 species are still more distinctive. In addition to thoracic and abdominal chaetotaxy mentioned above, they can readily be separated by the posterior anus (strongly exserted and entirely microsetose in *podargi*, hardly exserted and basally extensively bare in *exilis*), infra-anal plate (transversely subquadrate and weakly sclerotized in *podargi*, ⊥-shaped and strongly sclerotized in *exilis*), laterite 6 (absent in *podargi*, well developed in *exilis*), as well as spiracle 6 and posterior pregenital tubercle (both free in *podargi*, both

embodied by laterite 6 in *exilis*). The very high percentage of gynandromorphism (⚣⚣ being as numerous as ♂♂) and *Trenomyces* infection in this species is also noteworthy.

Among the ♀♀ examined, one has 2 pairs of pregenital tubercles with the anterior pair smaller and bearing fewer setae; in another, some of the anchor-like spines near abdominal apex unusually lengthened, about 5–6× as long as ordinary ones; and in a third, both tergites 3 and 4 are medially interrupted while right 1/2 of tergite 3 and left 1/2 of tergite 4, joined by an oblique "bridge", resulting in a transversely S-shaped plate together and leaving free left and right side-pieces of tergites 3 and 4 respectively.

Ornithoica aequisenta Maa, n. sp. Figs. 22, 57.

TYPE SERIES. 1♂, 6♀♀. Holotype ♀ (BISHOP 6860), allotype ♂ and all paratypes in Bishop Mus.

NEW BRITAIN: Holotype ♀ and 2♀ paratypes, Keravat, ex *Ducula spilorrhoa* (TMP 1264), 23. XI. 59, T. C. Maa.

SOLOMON IS.: 1♀, Gollifer's Camp, Kolombangara, 820 m, ex *Ptilinopus solomonensis* (BBM 23372), 17. I. 64, P. Temple. 1♂ (allotype), 2♀♀, Takari I., Fauro (Guadalcanal), sea level, ex *Ducula* sp. (? *pistrinarta*) (BBM 23799), 11. IV. 64, Temple.

♀. Face slightly wider (21 : 19) than eye. Mesonotum darker than abdominal tergal plates; prescutal setae sparse, scattered, in ca. 6 rows; scutellum with 2–3 pairs of minor preapical bristles which are nearly as long and robust as major ones. Spines on thoracic sterna as strong as those on abdominal sternite 1. Wing 2.6–2.8 mm long; cell *3bc* ca. 2.5× as long as wide; bulla of M_{1+2} equidistant to base and apex of *2bc*; M_{3+4} with abscissa ca. 2/3 to 3/4 as long as 2, with bulla slightly closer to *mcu* than to *im*. Abdomen thinly setose; tergite 6 similar in shape to 5, with 1 pair of bristles; supra-anal plate clearly separated into long anterior and short posterior pieces; lateral membranous area with 0–3 short strong setae near each of spiracles 4 and 5; para-anal tuft composed of 3–5 strong setae of varied length; laterite 7 subtriangular, hardly wider than long. Abdominal venter with some spines on sternite 1, ca. 40 anchor-like spines near base at a side, and 4–5 setal rows at disc; urogenital area at each side with 15–20 anchor-like spines which are rather uniform in size and distributed before spiracles 6 and 7; multispinose wart, when occasionally present, very small; pregenital plate anteriorly weakly trilobed, with median lobe longer and wider than lateral ones.

♂. Similar to ♀. Wing 2.5 mm long. Side piece of tergite 6 ca. 2× as wide as long, transversely narrowed mesad, with 2 bristles; sternite 1 spineless (? constantly so); disc of abdominal venter with 6 setal rows; para-anal tuft in allotype represented by only 2 setae; laterite 6 entirely undefinable. Genitalia as figured. ⚣ unknown.

DISTRIBUTION. Papuan and Melanesian Subregions, at present known only from lowlands in New Britain and the Solomon Is. Quite noteworthy is its absence in New Guinea which has recently been explored rather extensively.

HOST PREFERENCE. Presumably confined to the Columbidae, Columbiformes. Of the 3 available records, 2 ex *Ducula* and 1 ex *Ptilinopus*. In New Guinea, these 2 and other genera of Columbidae are known as hosts of *exilis* Wk.

Systematics. In the number of scutellar bristles, pregenital plate (♀) and other general features, *aequisenta* n. sp. stands closest to *exilis* Wk. although the body size

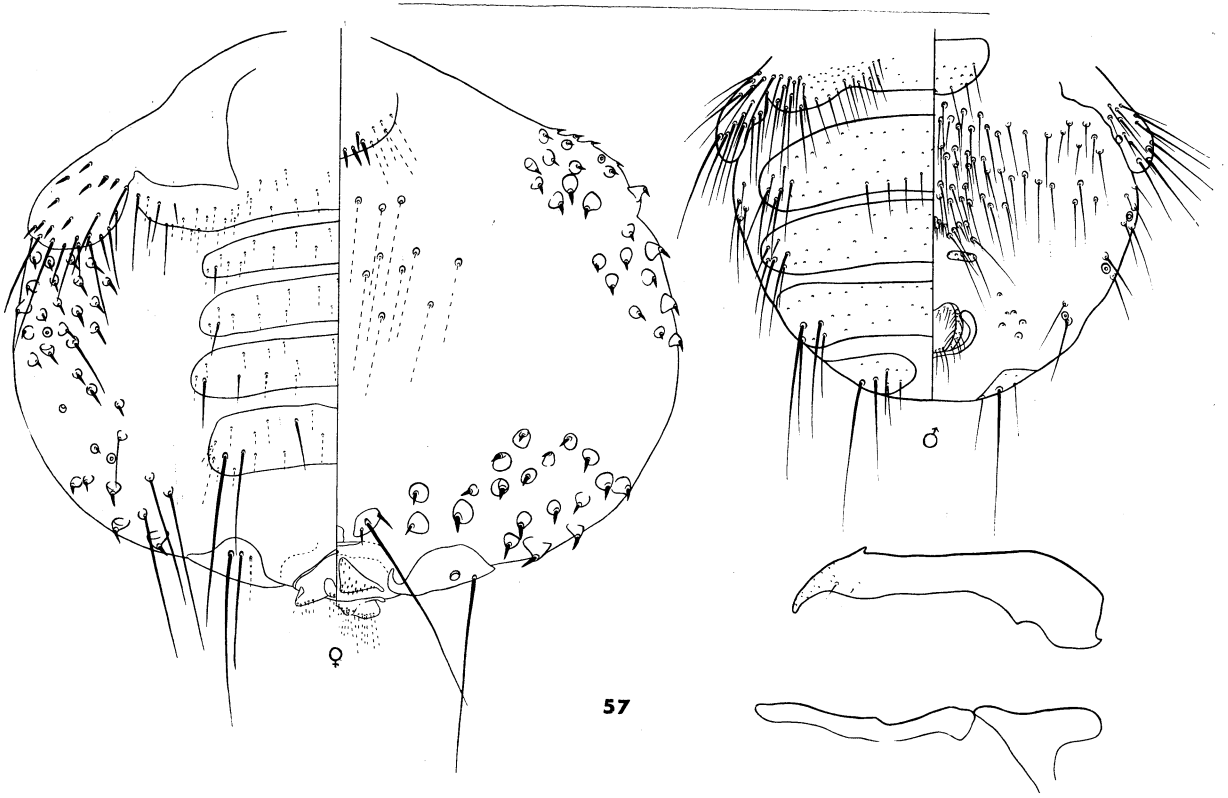


Fig. 57. *Ornithoica aequisenta* Maa, ♀ ♂ abdomen in dorsal and ventral aspects and ♂ genitalia in lateral aspect.

and para-anal setal tuft somewhat approach that in *stipituri* Schin. From all other members of the species-group, it can immediately be distinguished by the widely divided ♀ supra-anal plate as well as the absence of ♂ laterite 6. The latter character is probably connected with the unusual widening of side pieces of tergite 6. The scarcity of discal setae on abdominal venter (coupled with its medium-sized body) is uncommon for the entire genus, and the number, size and distribution of anchor-like spines near ♀ abdominal apex is shared by *punctatissima* n. sp. only. The name (*aequa*, even, uniform; *senta*, thorny) refers to the nature of those spines.

Ornithoica punctatissima Maa, n. sp. Figs. 23, 58.

TYPE SERIES. Holotype ♀ (BISHOP 6861), allotype ♂, both in Bishop Mus.

SOLOMON IS.: 1♀ (holotype), 1♂ (allotype), Toumoa, Fauro I., 10 m, ex *Megapodius freycinet* (BBM 23770), 7. IV. 64, P. Temple.

♀. Face wider (16.5: 13) than eye. Mesonotum distinctly darker than abdominal tergal plates; prescutum with exceedingly dense black setae, average interspace of setigerous punctures of same row ca. 1.0–1.5× punctural diameter; scutellum with relatively sparser black setae and 3–4 pairs of minor preapical bristles which are hardly shorter and finer than 4 major bristles. Meso- and metasterna with spines stronger than those on anterior prescutal margin. Wing 2.9 mm long; cell *3bc* ca. 2.7× as long as wide; bulla of vein M_{1+2} slightly closer to apex than to base of cell *2bc*; M_{3+4} with abscissae 1 and 2 subequal in length, with bulla distinctly closer to *mcu* than to *im*. Abdomen moderately setose; tergite 6 anteriorly weakly sinuate at middle, posteriorly with 1 pair of bristles; supra-anal plate small, unusually long, with 4 apical setae, its anterior piece ca. 4× as long as posterior one; lateral membranous area with long, sparse, rather evenly distributed setae between spiracles 4 and 7; laterite 7 triangular, nearly as long as wide, with 2 bristles. Abdominal venter with no spines on sternite 1, with only ca. 15 anchor-like spines near base at each side, and ca. 9 rows of fairly strong setae at disc; urogenital area at each side with 35–40 anchor-like spines which are large and fairly uniform in size and distribution; no multispinose warts; pregenital plate unusually large, anteriorly strongly trilobed.

♂. Similar to ♀. Trochanter 3 lacking spines (? constantly so). Abdomen with very wide tergal plates; side piece of tergite 6 ca. 3× as wide as long, with 3–5 bristles; lateral membranous area with tuft of long setae of varied robustness near each of spiracles 4 and 5; no extra-fine setae lining before pregenital tubercles. Genitalia as figured. ♀ unknown.

DISTRIBUTION. Melanesian Subregion, at present known from the Solomon Is. near sea level. Like *aequisenta* n. sp., it is probably not to be found in New Guinea, notwithstanding same or closely related hosts occurring there.

HOST PREFERENCE. Possibly monoxenous on *Megapodius* (Megapodiidae, Galliformes).

Systematics. As suggested by its name, *punctatissima* n. sp. can easily be recognized by exceedingly dense setigerous punctures on prescutum. A rather remote relative of *exilis* Wk. and unique for the genus in having anchor-like spines in ♀ more numerous near apex rather than near base of abdomen. Very wide tergal plates, strong setae on

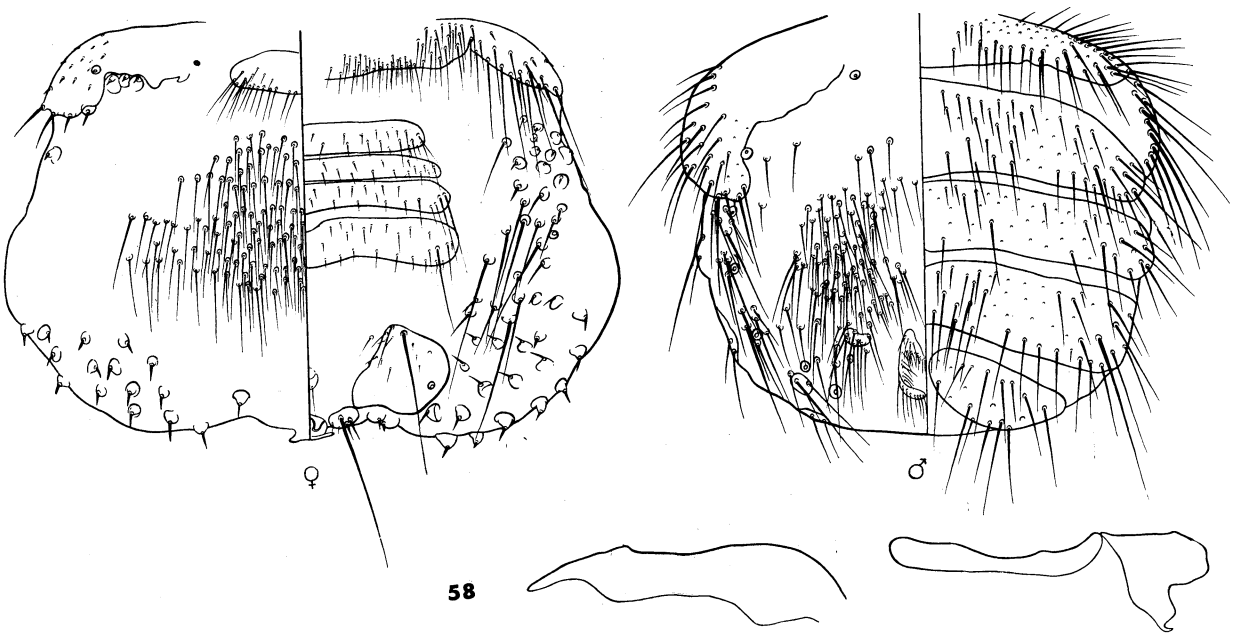


Fig. 58. *Ornithoica punctatissima* Maa, ♀♂ abdomen in dorsal and ventral aspects and ♂ genitalia in lateral aspect.

♂ abdominal venter, merging of setal tufts in ♀ lateral abdominal membrane, small ♀ supra-anal plate as well as large pregenital plate all unusual for the *exilis*-group. In arrangement of anchor-like spines near ♀ abdominal apex, *punctatissima* and *aequisenta* n. spp. are similar, but otherwise the 2 species are quite different.

Ornithoica pusilla GROUP

Prescutum about as densely setose as scutellum; scutum largely bare, with a transverse setal patch near posterior margin at middle and 2 pairs of small roundish patches, 1 near lateral margin, another before posterior dorsocentral bristle. Scutellum with 2–3 long and 1–3 shorter pairs of preapical bristles. Prosternum anteriorly truncate or very weakly emarginate. Wing setulae covering only extreme apex of cell *2r* and most part of *3r* and *1m*, and forming a very tiny oblique patch (often absent) near antero-apical corner of *2m*; cell *3bc* about 2.5× as long as wide, not narrowed basad. Abdomen abnormal; tergite 6 widely interrupted at middle in ♀, ♂ and ♀; tergite 5 in ♀ narrowly interrupted at middle; urogenital area in ♀ and ♀ at each side with a large roundish compact cluster of anchor-like spines, their basal papillae exceptionally large, almost touching one another and quite markedly larger than those near abdominal base; no multispinose warts; lateral membranous area in ♀ rather evenly setose, para-anal setal tuft very conspicuous; supra-anal plate in ♀ narrowly divided into large anterior and small posterior pieces, leaving their transversely linear interspace membranous; spiracle 7 in ♂ noticeably larger than 6; ♀ abdomen lacking strong tubercle and bristle-tuft at each side of posterior anus, no laterite 7, and no posterior pregenital tubercle.

This species-group is known only from the Polynesian Subregion and is solely represented by *O. pusilla*. The ♀ is unique for the genus in having medially interrupted tergite 6 (thus there are only 3, rather than 4 undivided median tergal plates) and by clusters of unusually enlarged anchor-like spines near abdominal apex; whereas the ♀, in having tergite 5 medially interrupted and having no tubercles and bristle-tufts at sides of posterior anus. The ♂ is less distinctive but can conveniently be recognized by dense setae on prescutum and lateral abdominal area.

Ornithoica pusilla (Schiner) Figs. 24, 29, 59.

pusilla Schin. 1868: 384 (*Ornithomyia*).—Speis. 1900: 559 (key); 1904b: 86 (redes. of type).—Bau 1922: 278 (key); 1929a: 247 (*confluenta* var.) (key).—Maa 1963: 60 (notes on types).

nec *pusilla* of Ferr., Beq., *et al.*

MATERIAL EXAMINED. 3♂♂, 12♀♀, 2♀♀. MARSHALL IS.: 2♂♂, 3♀♀ (MCZ), Arno Atoll, ex *Demigretta sacra*, VII. 50, J. T. Marshall, det. B. Bequaert.

TOKELAU IS.: 3♀♀, 1♀, Nukunona, ex *Anous stolidus*, VI. 60, M. Laird.

TUAMOTU ARCHIP.: 1♀ (USNM), Kahongi I., Raroia Atoll, ex *Gygis alba* (=2110), VIII. 52. 1♀, 1♀ (USNM), N. Garumasa I., Raroia Atoll, ex *Demigretta sacra* (=1827), VII. 52. SOCIETY IS.: 1♂, 4♀♀ (WN), type series, Tahiti, ex *Halcyon vulnerata* [*Todiramphus vulneratus*].

♀. Gular spines largely in 1 transverse series. Mesosternal spines more numerous than black setae and stronger than those on anterior prescutal margin. Wing 3.1–3.5 mm

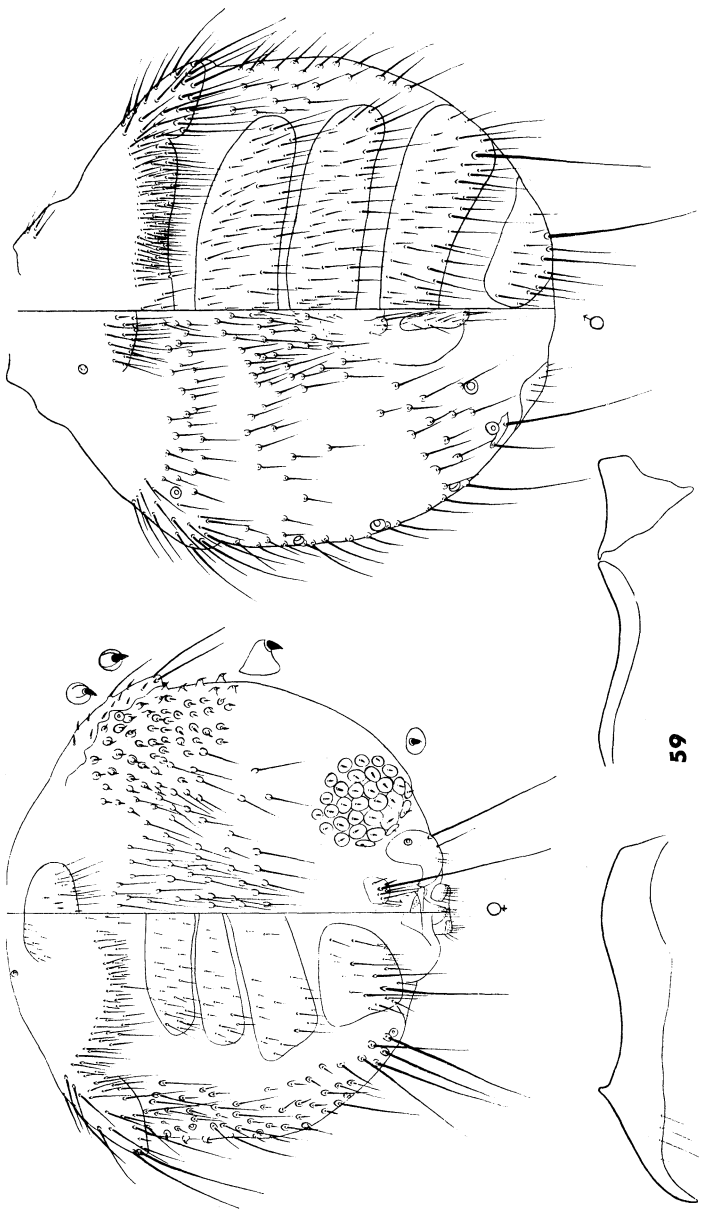


Fig. 59. *Ornithoica pusilla* Schin., ♀ (Tokelau Is.), ♂ (Marshall Is.), abdomen in dorsal and ventral aspects and ♂ genitalia in lateral aspect.

long; bulla of M_{1+2} much closer to base than to apex of cell *2bc*; M_{3+4} with abscissa 1 ca. 2/3 as long as 2, with bulla almost 2× closer to *mcu* than to *im*. Abdomen richly setose; setae on submedian lobe of syntergite 1+2 not so long and robust as longest setae on tergite 3; setae on tergites 3 and 4 not longer than tergites themselves; tergite 5 larger than 3 and 4, posteriorly sinuate at middle; side piece of tergite 6 not or hardly shorter than wide, with 2–4 long bristles and some strong setae; posterior piece of supra-anal plate transverse, linear (often medially interrupted), more strongly sclerotized than anterior piece, with 4–5 setae. Laterite 2 with posterior marginal setae about as long as tergite 3; lateral membranous area above level of spiracles rather evenly covered with sparse strong setae; laterite 7 small, L-shaped, hardly longer than wide, with only 1–2 strong bristles and 1–2 pale setae. Sternite 1 with 3–6 irregularly arranged spines and some short setae; disc of venter with 8–9 rows of black fine setae of varied length, hindmost rows with 6–8 stiff setae at middle; no fine setae lining immediately before pregenital tubercle; pregenital tubercle large, bearing 1 long bristle and 6–10 strong setae; pregenital plate also large, ⊥-shaped; no anchor-like spines in immediate vicinity of genital orifice.

♂. Similar to ♀. Wing 3.0 mm long. Side piece of tergite 6 ca. 2/3 as long as wide, inner margin short, outer margin with 1 bristle and some strong setae; laterite 6 very small, slender, bearing 1 bristle and 1 seta; spiracle 7 lying very slightly before 6; immediately before pregenital tubercles, a single patch of ca. 15 extra-fine setae originating from fairly large basal papillae; pregenital tubercle bearing 2–5 setae. Genitalia as figured.

⚢. Side piece of tergite 5 with 3–4 long bristles and some strong setae; side piece of tergite 6 small, anteriorly rounded, strongly setose, posteriorly narrowed, produced, and at inner hind corner with 1 strong bristle, no spines; posterior anus as in ⚢ *unicolor*; infra-anal plate roundish, well sclerotized, slightly narrower than posterior anus; no laterite 6 and posterior pregenital tubercle; anchor-like spines near abdominal apex as in normal ♀; anterior pregenital tubercle very small, unisetose.

DISTRIBUTION. Polynesian Subregion, apparently confined to the chain of atolls and small low islets in the Central Pacific from the Marshall Is. to Tuamotu Archip. Wrongly recorded from Madagascar, Malaysian Archip. (Sumatra, Christmas I. nr Java, Borneo), Philippine Is., New Guinea, Australia (Queensland, N. S. Wales), Oceania (Carolines, Bismarck Archip., Solomons, New Hebrides, Samoa) and even Hawaiian Is. At present definitely known from Marshall Is., Tokelau Is., Society Is. and Tuamotu Archip.

HOST PREFERENCE. Not quite clear, apparently polyxenous and restricted by habitat rather than by taxonomic affinities of host-birds. Of the 5 available records, 1 each ex *Anous* and *Gygis* (Laridae, Charadriiformes), 2 ex *Demigretta* (Ardeidae, Ciconiiformes) and 1 ex *Todiramphus* (Alcedinidae, Coraciiformes). All these birds nest in a damp environment and are fish-eaters. Bequaert's (1953: 252, 257, 260, 262, 263, 264, 266, 270, 272, 274, 277, 278, 280, 281) long list of host records (except that for *Demigretta* and *Todiramphus*) for "*pusilla* Schin." is entirely incorrect.

Systematics. By omitting the passage on color pattern, Schiner's original description of this species may be quoted as follows: "Der Rückenschild stark glänzend, vor dem

Schildchen beiderseits symmetrisch eingedrückt, die Beborstung ziemlich lang und dicht. Die sehr schmalen Augenränder gleichfalls glänzend und wie punktirt, die Mitte matt; das Scheiteldreieck glänzend, die Punktaugen deutlich. Fühler sehr kurz, das Endglied rund; die borstenartige Behaarung des Kopfes zerstreut. Flügel länger als der Hinterleib, fast glashell, von der Mitt an, in Folge der mikroskopischen Behaarung etwas dunkler sich darstellend; Cubitalader gleich jenseits der kleinen Querader steil zum Rande aufbiegend und mit den übrigen Adern knapp an den Vorderrand zusammengedrängt in diesen mündend; untere Basalzelle um die doppelte Länge der kleinen Querader kurzer als die obere; analzelle vorne gerade abgestuzt. 1‴. Sechs Stücke aus Taiti, auf *Halcyon venerata* Gmel. gesammelt." Speiser (1904 b: 87), basing upon the types, added comments on the color pattern and remarked: "die gedachte Fortsetzung der Analquerader auf dem Flügelvorderrand zu die Discoidalis schon ein Stück trifft". This is all we heretofore knew about the structure of *pusilla*. The species is so rare in collections and so localized in distribution that no additional specimens have been correctly recorded in literature for nearly a century. All previous records under "*pusilla* Schin." by various authors from other countries are incorrect. The chief source of this misinterpretation dated back to the work by Ferris (1929: 284), see discussions under *exilis*.

Subgenus **Lobolepis** Maa, n. subg.

Type: *Ornithoica curvata* Maa.

Body of medium to large size (for the genus), wing 3.2–4.0 mm long. Postvertex bare. Thoracic dorsum particularly mesonotal disc extensively bare, feebly longitudinally striate, anteriorly or entirely with strong metallic lustre; scutellum rather sparsely setose. Wing partially setulose at apical 1/2, with setulae covering only ca. apical 1/2 to 2/3 of cell *3r*, forming 2–3 isolated strips or patches near apical margin and sometimes also a tiny patch at antero-apical corner of *1m*, other cells all bare; vein *rm* about equidistant to R_{4+5}-apex and M-furcation; M_{1+2} strongly curved forward at vicinity of its bulla where it touches or almost touches R_s-furcation; cell *3bc* large, ca. 2× as long as wide, not narrowed basad. Trochanter 3 in ♂ without patch of spines on hind inner margin. Abdomen with syntergite 1+2 far less sclerotized than median tergal plates (terga 3–6 in ♀, 3–5 in ♂); tergite 3 in ♀ somewhat U-shaped, with anterolateral lobe strongly raised and thickened; tergite 6 in ♀ always entire, subtriangular, strongly produced caudad at middle; that in ♂ always widely interrupted at middle; supra-anal plate in ♀ narrowly separated into 2 pieces, anterior one large and transversely elliptical, posterior one exceedingly small and roundish; abdominal venter laterally extensively spinose-setose; urogenital area in ♀ with 1, more often 2 pairs of pregenital tubercles, lacking multispinose warts; pregenital plate in ♀ rectangular, never ⊥shaped or trilobed; ♂ always lacking laterite 6. Gynandromorphism unknown.

DISTRIBUTION. Confined to Oriental Region, found in lowlands, up to 1300 m. Besides the species enumerated below from Thailand, Borneo, Philippines and New Guinea, I have briefly examined at the Brit. Mus. an undetermined form (2♂♂, 1♀) ex *Accipiter trivirgatus*, 600 m, Uva Hills, Ceylon.

HOST PREFERENCE. Most probably breeding on Bucerotidae or hornbills (Coraciiformes) and Picidae or woodpeckers (Piciformes), possibly on Cuculidae (Cuculiformes) too. Since birds of the first 2 families generally nest in hollowed trees, this peculiar ecological niche, rather than phylogenetic affinities of the 2 families, obviously affects the host range and host preference. Stray records were from Ardeidae, Falconidae, Strigidae, Alcedinidae, Dicruridae, Corvidae and Paradisaeidae.

Systematics. This subgenus has recently been revised, under the name *O. curvata*-group, by Maa (1963: 147–56, figs. 9–22). In addition to some new distributional and host records, the 3 species included are here briefly redescribed. The name *Lobolepis* (feminine gender), a lobate scale, implies the abdominal tergites 3 and 6 in ♀.

Ornithoica (Lobolepis) submicans Maa Figs. 25, 60, 61, 64.

unicolor Ferr. (nec Speis.) 1927: 209, fig. 2, ♂.
submicans Maa 1963: 148, figs. 14, 15, 20, ♀♂.

MATERIAL EXAMINED. 9♂♂, 12♀♀. PHILIPPINES: 1♀, Kibawalan, Malalag, Davao Prov., Mindanao, ex *Aceros l. leucocephalus* (SU-BBM 128), XII. 63, D. S. Rabor. 2♂♂, 1♀, Balisong, Mt Matutum, Tupi, Cotabato, Mindanao, ex same host (SU-BBM 1157), I. 64, Rabor. 1♂, Masawan, 1460–1600 m, Mt Malindang, ex same host (BBM 18), XII.

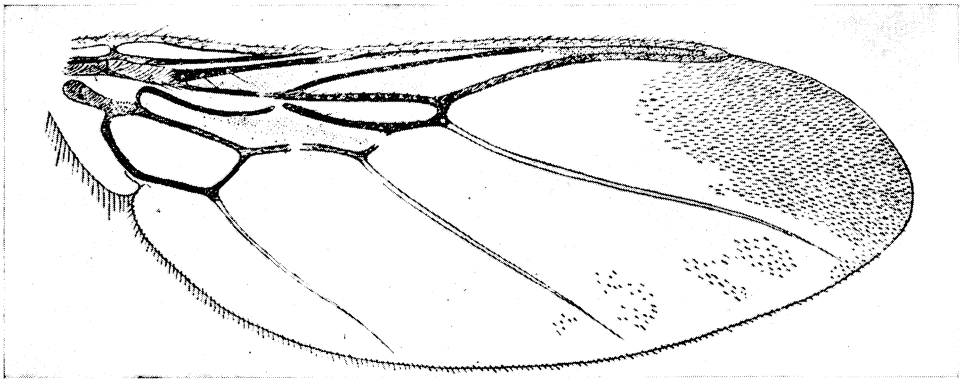


Fig. 60. *Ornithoica submicans* Maa, ♂ right wing. (After Ferris, 1927, Philip. J. Sci. **34**: 209, originally labeled as *O. unicolor* Speis.).

62, Rabor. 1♂, 1 ♀, Balang-balang, Mt Hilong-hilong, 170–330 m, Cabadbaran, Agusan Prov., Mindanao, ex same host (SU 4047, 4174), IV. 63, Rabor; 1♀ (w. mite on abd.), same data but ex *Penelopides panini affinis* (SU 4031), III. 63. 1♀, Sibahay, Lanuza, Surigao del Sur, 0–170 m, Mindanao, ex same host (SU 5756), V. 63, Rabor. 1♀, Siwod, Mt Hilong-hilong, 1000–1300 m, Agusan Prov., Mindanao, ex *Buceros hydrocorax mindanaensis* (SU 5027), IV. 63, Rabor. 1♀, Kibawalan, Malalag, Davao Prov., Mindanao, ex bird (SU-BBM 210), I. 64, Rabor. 5♂♂, 5♀♀ (BBM, CNHM, STF), type series, ex various hosts. Since first described, Dr Wenzel very kindly supplied host names of the holo- and other types: CNHM 184203 (fld. #1046), *Buceros hydrocorax mindanaensis*; CNHM 184199 (fld. #953), *Penelopides panini affinis*.

♀. Prescutum and anterior 2/3 of scutum black with strong metallic luster, humeral

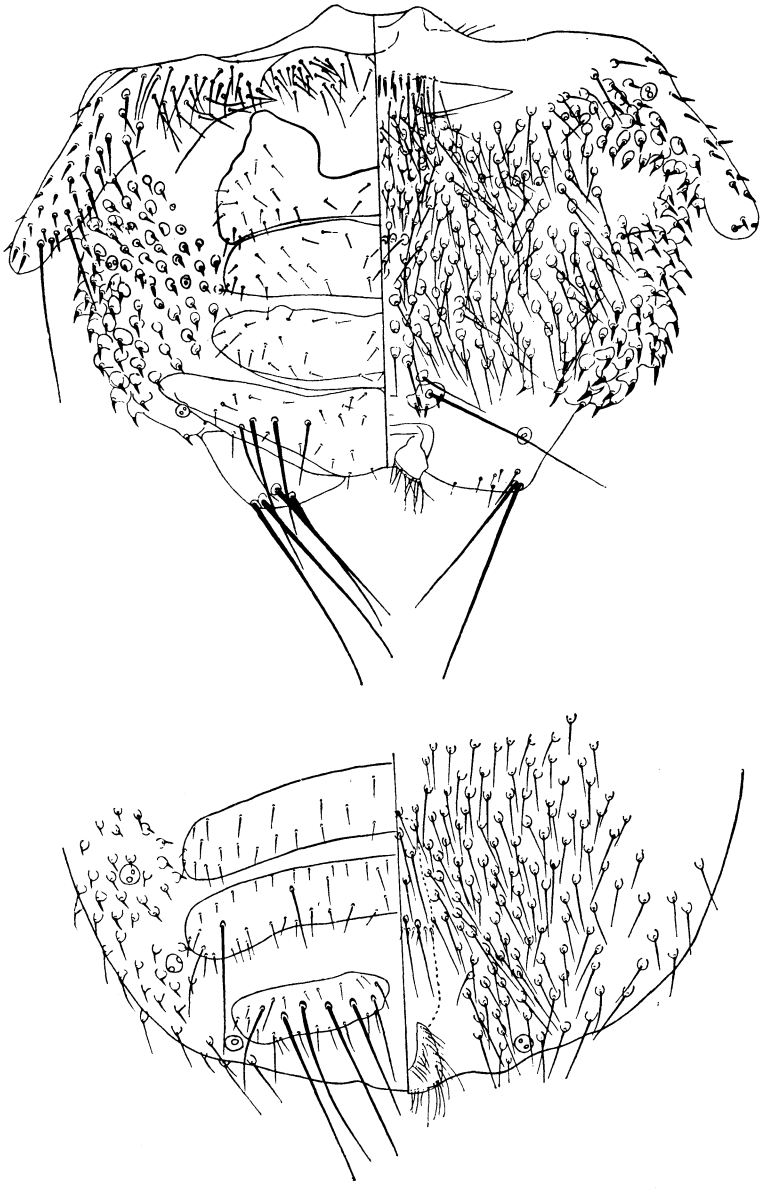


Fig. 61. *Ornithoica submicans* Maa, ♀ (upper) ♂ (lower), abdomen in dorsal and ventral aspects. (Reproduced from Maa, 1963, Pacif. Insects Monogr. **6**: 150).

callus, remaining part of scutum, scutellum as well as abdominal plates not so. Prosternum anteriorly broadly rounded, meso- and metasterna discally with both spines and ordinary setae. Wing 3.4–3.6 mm long. Abdominal syntergite 1+2 posteriorly almost straight; anterolateral lobes of tergite 3 convergent cephalad, anteriorly obliquely truncate, relatively moderately raised and in lateral view, only ca. 1/8 as deep as greatest length of that sclerite; tergite 6 medially paler than laterally, without longitudinal slit; laterite 7 much paler and less sclerotized than tergites 3–6; anchor-like spines small, those near spiracle 2 hardly larger than ordinary spines on laterite 2; 1–2 pairs of pregenital tubercles, pale and weakly sclerotized.

♂. Wing 3.4–3.6 mm long. Abdominal tergite 5 with 1–2 pairs, 6 with 3–5 (usually 4) pairs of bristles; spiracles all large, with diameter ca. 3× that of neighboring setigerous papillae; venter rather extensively bare near spiracle 2; paramere in profile slender and apically long and strongly curved; aedeagus in profile gently narrowed apicad.

DISTRIBUTION. Probably all-over the Philippine Subregion, at present known from Luzon, Samar and Mindanao, up to ca. 1300 m. Population density per infested bird (highest catch 3 flies) appears to be much lower than in next 2 species, most probably due to method of collecting employed.

HOST PREFERENCE. Obviously oligoxenous and confined to the Bucerotidae. Of the 14 available records, 6 ex *Aceros* (=*Craniorhinus*), 3 ex *Buceros*, 5 ex *Penelopides*.

Ornithoica (Lobolepis) curvata Maa Figs. 26, 62, 64.

curvata Maa 1963: 151, figs. 9, 10, 12, 16, 17, 21, ♂♀.

MATERIAL EXAMINED. 47♂♂, 52♀♀. THAILAND: 1♂, 1♀, Chong, Muang Trang, ex *Anorrhinus galeritus* (RE 7112), III. 63, R. E. Elbel. 1♂, Lamo, Muang Trang, ex *Aceros undulatus* (RE 7122), III. 63, Elbel; 1♂, 2♀♀, same data but ex *Berenicornis comatus* (RE 7127). 1♂, Nakhonsithammarat, Lansaka, Khao Kaeo, ex *Ketupa zeylonensis leschenaulti* (WS 174), V. 63, Wanit Songprakob; 1♂, same data but ex *Rhamphococcyx curvirostris erythrognathus* (WS 147). 1♀, Phattalung, Pakphayun, Thadindang, ex *Anthracoceros malabaricus leucogaster* (RE 6356), VI. 62, Wanit; 1♂, same data but ex *Platysmurus leucopterus* (RE 6336–7); 2♂♂, 1♀, same data but ex *Centropus sinensis eurycercus* (WS 279), VI. 63. 1♂, Ranong, Khraburi, Pakohan, ex *Chrysocolaptes lucidus* (WS 926), V. 64, Wanit. 1♂, Ranong, Krapher, Khumphuen, ex *Picus vittatus* (WS 946), V. 64, Wanit. 1♂, Ranong, Kapoe, Thungkha, ex *Rhyticeros plicatus subruficollis* (RE 7043), I. 63, Wanit. 4♀♀, Ranong, Kapoe, Banghin, ex *Centropus sinensis intermedius* (RE 7082), II. 63, Elbel. 1♂, 4♀♀, Ranong, Kapoe, Muang Kluang, ex *C. sinensis intermedius* (RE 6947), XII. 62, Elbel; 1♂, 4♀♀, same data but ♯RE 7066, II. 63. 1♀, Satun, Muang Thungnui, ex *Megalaima zeylanicus hodgsoni* (WS 514), IX. 63, Wanit; 1♂, 2♀♀, same data but ex *Spizaetus cirrhatus limnaeetus* (RE 6281). 1♂, 1♀, Trang, Muang Khao Chong, ex *Berenicornis comatus* (WS 189), V. 63. 1♂, Thailand, ex bird (WS 787), Wanit. 31♂♂, 27♀♀ (CNHM, BBM, USNM), type series, ex various hosts. Since first described, Dr Elbel very kindly provided the following collection data of the type series: RE 3006 (=B 22553), Khorat (not Nakhon Ratchasima), Sikhiu, Pakchong, ex *Accipiter trivirgatus indicus*, 25. IX. 53, Elbel & Boonsong; B 30905, Sakon Nakhon, Phu Phan Mt ex *Micropternus brachyurus phaioceps* Blyth, 25. VI. 54; B 30936, Loei, Dan Sai,

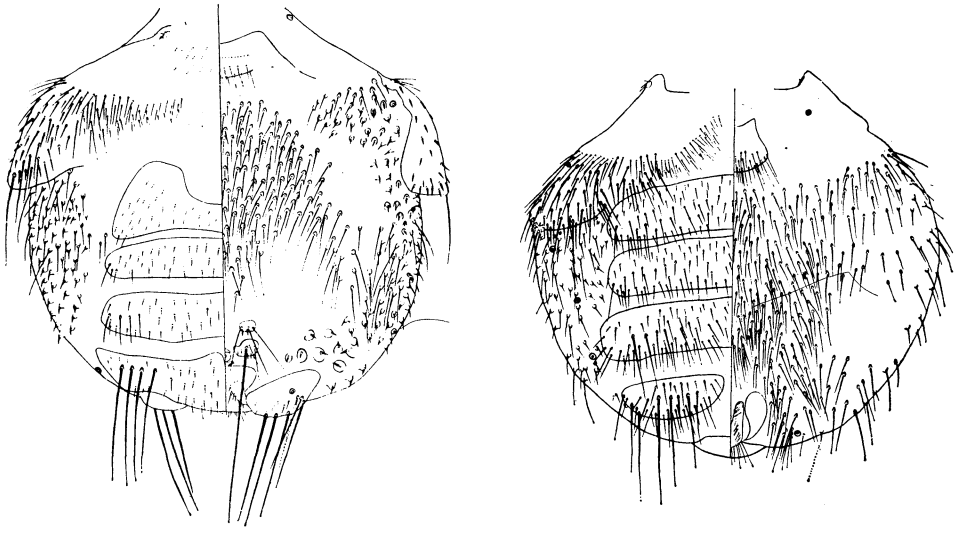


Fig. 62. *Ornithoica curvata* Maa, ♀ (left) ♂ (right), abdomen in dorsal and ventral aspects. (Reproduced from Maa, 1963, Pacif. Insects Monogr. **6**: 152).

Na Haeo, Ban Na Muang, ex *Chrysocolaptes lucidus guttacristatus* Tickell, 29. IX. 54; B 30939, same data but ex *Picus canus hessei* Gyldenstolpe; B 30954, same data but ex *Halcyon pileata* Boddaert, 1. X. 54; B 30981, same data but *Anthracoceros albirostris leucogaster* Blyth; B 31009, Loei, Tha Li, Tha Li, Ban Muang Khai, ex *A. alb. leucogaster*, 14. I. 55; B 31201, Loei, Dan Sai, Kok Sathon, Phu Lom Lo Mt, 2600 m, ex *Picus flavinucha pierrei*, Oustalet, 15. II. 55. It may be added that among the type series, 1♂, 2♀♀ ex *Centropus sinensis* (RTB 17013, 17889), are w. mites on thorax, abd. and under wing, 1♀ ex bird indet. (RTB 17889), w. mite on abd., and 1♂ ex *Anthracoceros* (RTB 17554), w. fungus; and that the 2 *Anthracoceros* records (on p. 151 in the original description) both referred to *A. albirostris leucogaster*.

BORNEO: 1♀ (CNHM), w. mites on neck & abd., Tinjar, Fort Leju, Sarawak, ex *Centropus sinensis*.

♀. Mesonotum and scutellum, not including humeral calli, entirely black and with strong metallic lustre; abdominal tergites 3–6 and laterite 7 similar but sometimes basal tergites slightly weakly so. Prosternum anteriorly broadly rounded, meso- and metasterna discally with both spines and ordinary setae. Wing 3.2–3.6 mm long. Syntergite 1+2 posteriorly almost straight; anterolateral lobes of tergite 3 parallel, relatively moderately raised, anteriorly rounded; tergite 6 anteriorly with short median slit; laterite 7 as strongly sclerotized as tergites 3–6; anchor-like spines large, all distinctly larger than ordinary spines on laterite 2; 2 pairs of pregenital tubercles, both dark and strongly sclerotized.

♂. Wing 3.1–3.7 mm long. Abdominal tergite 5 with 1–3 (usually 2) pairs, 6 with 2–5 (usually 4) pairs of bristles; spiracles all small, with diameter ca. 1.5× that of neighboring setigerous papillae; venter extensively setose near spiracle 2; paramere in

profile preapically moderately broad and apically short and weakly curved; aedeagus in profile strongly narrowed apicad.

DISTRIBUTION. Indo-Chinese and Malaysian Subregions, known only from Thailand and Borneo, up to ca. 1000 m, apparently commoner in lowlands. Highest catch per infested bird was 6 flies.

HOST PREFERENCE. Apparently polyxenous on Coraciiformes (particularly Bucerotidae) and Piciformes (particularly Picidae), possibly Cuculiformes serving as breeding hosts as well. Records of its occurrence on Falconi-, Strigi- and Passeriformes were probably stragglers or contaminations. Analysis of available records follows: Falconiformes (*Accipiter* 1, *Spizaetus* 1) 2 records; Cuculiformes 12 (*Centropus* 11, *Rhamphococcyx* 1); Strigiformes (*Ketupa*) 1; Coraciiformes 12 (*Aceros* 1, *Anorrhinus* 1, *Anthracoceros* 5, *Berenicornis* 2, *Halcyon* 1, *Nyctiornis* 1, *Rhyticeros* 1); Piciformes 20 (*Chrysocolaptes* 4, *Megalaima* 1, *Micropternus* 2, *Picus* 13); Passeriformes 2 (*Dicrurus* 1, *Platysmurus* 1).

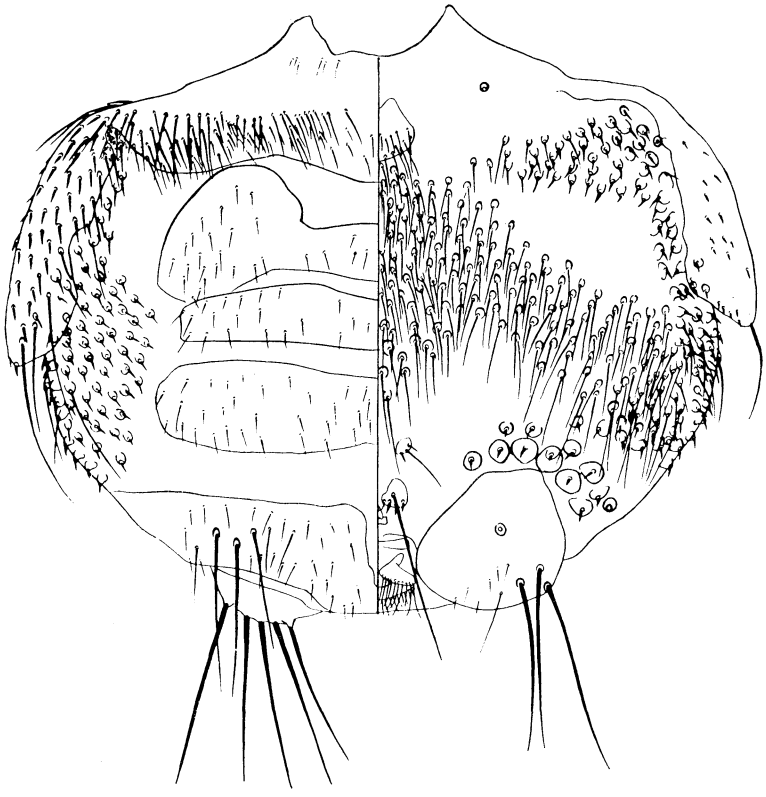


Fig. 63. *Ornithoica hirtisternum* Maa, ♀ abdomen in dorsal and ventral aspects. (Reproduced from Maa, 1963, Pacif. Insects Monogr. **6**: 155).

Ornithoica (Lobolepis) hirtisternum Maa Figs. 5, 27, 63, 64.

hirtisternum Maa 1963: 153, figs. 11, 13, 18, 19, 22, ♀♂.

MATERIAL EXAMINED: 10♂♂, 13♀♀. NW NEW GUINEA: 1♂, 1♀ (MCZ), Hollandia,

ex hornbill [*Rhyticeros plicatus jungei*], XI. 44, Jewett & Hoogstraal, det. Bequaert as *O. unicolor*. 1♂, Bomberi nr Fak Fak, 700–900 m, SW New Guinea, ex undet. bird (TMP 22), V. 59, T. C. Maa. 8♂♂, 12♀♀ (BBM), type series, ex various hosts.

♀. Color pattern as in *O. curvata*. Prosternum anteriorly acute; mesosternal disc and metasternum with only ordinary setae, no spines. Wing 3.8–4.0 mm long. Syntergite 1+2 produced caudad at middle; anterolateral lobes of tergite 3 parallel, anteriorly rounded, very strongly raised, nipple-like, in side view, almost 1/2 as deep as greatest length of that sclerite; tergite 6 anteriorly with short median slit; laterite 7 as strongly

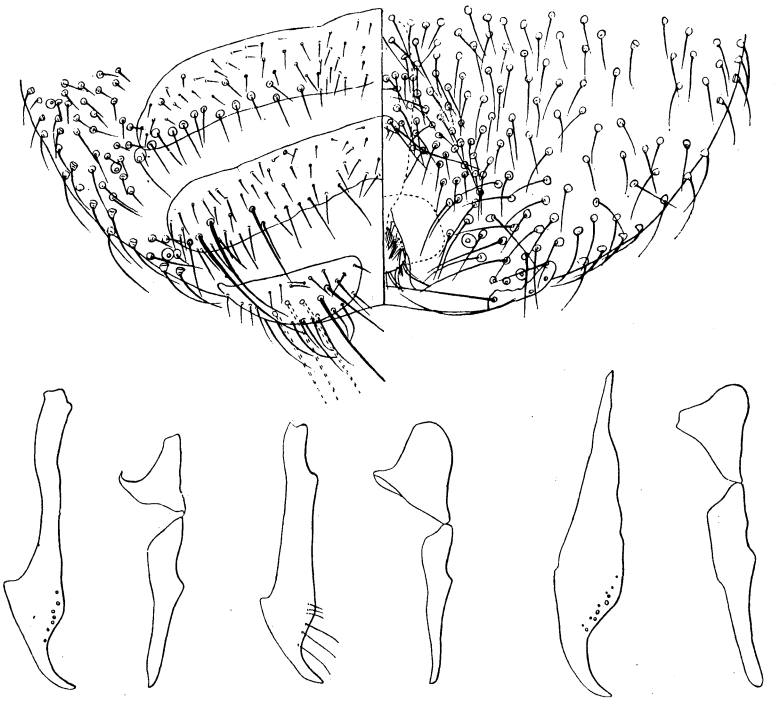


Fig. 64. *Ornithoica* (*Lobolepis*) species, ♂ abdomen in dorsal and ventral aspects (upper, *hirtisternum* Maa) and ♂ genitalia in lateral aspect (lower left, *submicans* Maa; lower middle, *curvata* Maa; lower right, *hirtisternum* Maa). (Reproduced from Maa, 1963, Pacif. Insects Monogr. **6**: 155).

sclerotized as tergites 3–6; anchor-like spines all distinctly larger than ordinary spines on laterite 2; 2 pairs of pregenital tubercles, both dark and strongly sclerotized.

♂. Wing 3.8 mm long. Abdominal tergite 5 with 1–2 pairs, 6 with 2–4 pairs of bristles; spiracles small, similar to these in *curvata*; venter extensively bare near spiracle 2; paramere in profile preapically very broad and apically short and strongly curved; aedeagus in profile gently narrowed apicad.

DISTRIBUTION. Papuan Subregion, W New Guinea, up to 550 m. Highest catch per infested bird was 8 flies.

HOST PREFERENCE. Probably confined to *Rhyticeros plicatus* (Bucerotidae), the only hornbill in New Guinea. Of the 5 available records, 3 were ex this bird, 1 each ex *Ardea* (Ardeidae, Ciconiiformes) and *Phonygammus* (Paradisaeidae, Passeriformes). The last 2 records most probably represented stragglers or contaminations.

Note. Fig. 18 B in the original description should be corrected to "apical part of larva found in uterus".

GEOGRAPHICAL DISTRIBUTION

Ornithologists generally classify birds of a certain country into residents (breeding in that country), migrants (seasonal visitors) and stragglers. Likewise, the bird louseflies may fall into the same categories. The genus *Ornithoica* is primarily tropical in distribution. In temperate countries there are no endemic species, and the flies may breed on local resident birds in warmer seasons and may, as suggested by Bequaert (1953a: 237), utilize certain such birds as temporary reservoirs in winter. In such cases, the main population of the fly species involved is still left behind in the tropics and such species in temperate countries may safely be termed migrants. Obviously microclimate is by far a more important limiting factor of hippoboscid distribution than the availability of suitable host birds, and distributional ranges of a host bird and its parasitic fly by no means always coincide. When the bird in question is a migrant, its distributional range is naturally much wider that of its parasitic fly. The odd records of *O. turdi* in central Europe, *O. vicina* in southern Canada and central Chile, and *O. exilis* in Taiwan and Ryukyu Is. may well be considered stragglers. The ordinary practice for deciding whether or not a given fly species is a "resident" in a certain country, is to count the number of positive records. Evaluation of ample and complete collection data is also helpful for this purpose. In *Ornithoica*, if the infestation rate by a fly species is over 10% in 500+ birds collected at random and handled properly, or if the average infestation density for 50+ birds of any one species in the area is over 2 flies per bird, it would be fairly safe to presume the fly species in question to be a "resident".

The distributional pattern of the various *Ornithoica* species is not uniform. Generally, more widely distributed ones such as *O. turdi*, *vicina* and *exilis*, have wider host ranges, higher population density and probably greater flexibility in environmental adaptability. In less widely distributed ones such as *O. aequisenta*, *podargi* and members of the subgenus *Lobolepis*, the ranges, density and adaptability are noticeably narrower or smaller. The *O. vicina* in Hawaii, generally believed to have been introduced recently from the Americas, breeds on the so-called acquired hosts and has a rather narrow host range and low population density.

As in most other hippoboscids, the dispersal of *Ornithoica* depends almost entirely on passive transport by birds. Since numerous migrant birds visit or temporarily rest at certain islands during their long journey, it is interesting to note that the genus is entirely unknown from many tropical islands such as Cape Verde, Ascension, St Helena in the Atlantic Ocean; Mauritius, Seychelles, Maldive, Laccadive in the Indian Ocean; and Galapagos, Revillagigedo, Borodino in the Pacific. Quite possibly this is due to insufficient collecting, but *O. pusilla* apparently has adapted itself to very tiny islets and

atolls and avoids larger and higher islands in the same general area.

The world fauna of *Ornithoica* may be summarized as: 1 subgenus and 2 species in the Neotropical Region; 1 subgenus, 3 species, Ethiopian; 2 subgenera, 17 species, Oriental. Only 4 of the species, *beccariina*, *turdi*, *vicina* and *exilis*, largely as seasonal visitors, spread from the tropics to temperate countries. Insofar as the *Ornithoica* faunae are concerned, the Neotropical and Ethiopian Regions are quite closely related. The 2 pairs of their endemic species, *confluenta* vs. *podicipis* and *vicina* vs. *turdi*, each bear strong similarities in structure, host relationship and distributional pattern. The only difference of the 2 Regions is the presence of *hovana* (as representative of Oriental elements) in Madagascar. The present day distributional center of the genus is obviously in the Papuan Subregion which is the home of not less than 7 species (4 endemic) representing both subgenera. In the 5 species-groups of *Ornithoica* s. s., the *confluenta*-group is known from all 3 tropical Regions; *turdi*-group from Neotropical and Ethiopian; *unicolor*-group confined to Malaysian Subregion (spreading to southern part of Indo-Chinese Subregion); *pusilla*-group to Polynesian Subregion; and *exilis*-group widely distributed over the entire Oriental Region and spreading to Madagascar. The subgenus *Lobolepis* is confined to the Oriental Region.

The disharmony of *Ornithoica* faunae in the Old *vs* New Worlds and in the continents *vs* islands is quite apparent. This might have been a combined result from (1) relative faunal antiquity of different countries, (2) relative capacity of territorial progression and speciation-deviation in different species-ancestors, (3) relative effectiveness of land, sea and other barriers against population waves of these flies, as well as (4) relative distance of different countries to the primary distributional center of the species or species-groups. There the availability of appropriate hosts and habitats played a role of minor importance. The extraordinary richness of *Ornithoica* species in New Guinea can probably be explained in part by the peculiar faunal composition of Hippoboscidae in that huge subcontinent. Among the 2,078 hippoboscid flies collected by the Bishop Mus. field teams in last 6 years, *Ornithoica* comprises 86% of the population. The breakdown of this extensive collection is: *Ornithoica zamicra* Maa 60 specimens, *O. stipituri* Schin. 369, *O. simplicis* Maa 27, *O. exilis* Wk. 1,111, *O. podargi* Maa 178, *O. hirtisternum* Maa 23, *Ornithophila metallica* Schin. 65, *Ornithomya fuscipennis* Bigot 20, *Myophthiria* sp. aff. *reduvioides* Rndn. 4, *Ornithoctona australasiae* Fabr. 18, *O. plicata* Olf. 18, *Lynchia* sp. aff. *albipennis* Say 3, *L. simplex* Wk. 14, *L. plana* Wk. 33, *L.* sp. aff. *plana* Wk. 22, *L. chalcolampra* Speis. 99, *L. acromialis* Speis. 4, *L. parallelifrons* Speis. 3, *L. dioxyrhina* Speis. 7, *Pseudolynchia* sp. aff. *brunnea* Latr. 1. Of course these specimens have been collected at random and results of further collecting may well affect percentages of the various species. However, quite unlikely it would affect the significant predominance of *Ornithoica* species. The Papuan Subregion was described by Mayr (1941: vii) "the exclusive home of entire families [of birds] and the number and percentage of endemic genera are not reached anywhere else in the world within an area of similar size" and the bird fauna of New Guinea is "in many respects, richer than that of all of North America and almost as rich as that of entire Australian continent." This unusually rich bird fauna, together with extremely high bird populations apparently contributes to the richness of *Ornithoica* fauna and facilitates and speeds up the propagation of these tiny

flies. For instance, the families Podargidae, Meliphagidae, Ptilinorhynchidae and Paradisaeidae are scarcely known outside New Guinea, but there they serve as preferred hosts of *O. zamicra*, *simplicis*, *stipituri* and *podargi*. Even in the very widely distributed species *exilis*, the average and maximum population density per infested bird (in the preferred orders) is here markedly higher than in other countries except the Bismarck Archip. and Solomon Is. (cf. Table 3). A complete list of members of the genus in different zoogeogaphical divisions follows:

PALAEARCTIC REGION: *turdi* Latr. (Mediterranean and Manchurian Subregions, seasonal visitor and straggler), *exilis* Wk. (Manchurian Subregion, straggler), *momiyamai* Kishida.

NEARCTIC REGION: *vicina* Wk. (largely seasonal visitor, sporadic).

NEOTROPICAL REGION: *confluenta* Say, *vicina* Wk.

ETHIOPIAN REGION: *podicipis* Röder, *turdi* Latr.; *hovana* Maa (confined to Madagascar).

ORIENTAL REGION: No definite records for Ceylonese and Indian Subregions. The Brit. Mus. Nat. Hist. has a Ceylonese species possibly referable to *curvata* Maa. The undetermined Indian species ex *Acridotheres* recorded by Ansari (1949 Indian J. Ent. 11: 216) is perhaps referable to *exilis* Wk.

INDO-CHINESE SUBREGION: *unicolor* Speis., *tridens* Maa, *bistativa* Maa, *simplicis* Maa (seasonal visitor), *exilis* Wk. (seasonal visitor or straggler), *curvata* Maa.

MALAYSIAN SUBREGION: *unicolor* Speis., *bistativa* Maa, *simplicis* Maa (seasonal visitor), *exilis* Wk. (seasonal visitor or straggler), *curvata* Maa.

PHILIPPINE SUBREGION: *rabori* Maa, *philippinensis* Ferr., *exilis* Wk., *submicans* Maa.

WALLACEA SUBREGION: *beccariina* Rndn, *exilis* Wk.

PAPUAN SUBREGION: *zamicra* Maa, *simplicis* Maa, *stipituri* Schin., *exilis* Wk., *podargi* Maa, *aequisenta* Maa, *hirtisternum* Maa.

MELANESIAN SUBREGION: *stipituri* Schin., *exilis* Wk., *punctatissima* Maa, *aequisenta* Maa.

POLYNESIAN SUBREGION: *exilis* Wk., *pusilla* Schin.

HAWAIIAN SUBREGION: *vicina* Wk. (introduced).

AUSTRALIAN REGION: *beccariina* Rndn. (seasonal visitor or straggler), *exilis*, *stipituri*. Wk.

In the above list, it may be noted that species of one Region or Subregion may often be replaced in another by a closely related form (*cf* discussion on evolutionary trends) and that some of the species are "residents" of 2 or more Subregions. The distributional center of such resident species is often connected with its higher percentage in the local *Ornithoica* population. For example *O. exilis* comprises 63.1% of the total *Ornithoica* population in New Guinea; 44.9% in New Britain; 75.7% in Solomon Is.; 59.4% in Philippine Is.; 3.1% in Taiwan; 1.1% in Borneo. The Solomon Is., New Guinea and New Britain percentages are markedly higher than elsewhere and therefore suggest that the center is in that area. However this method is not or hardly applicable when the available specimens are too few and the *Ornithoica* fauna involved too simple. Relative populations (in number of specimens examined) of different *Ornithoica* species in several selected places are as follows: New Britain, *stipituri* 57, *exilis* 48, *aequisenta* 3; Solomon Is., *exilis* 121, *stipituri* 31, *aequisenta* 4, *punctatissima* 2; Philippines, *exilis* 140, *philippinensis* 37, *submicans* 20, *rabori* 9; Borneo, *bistativa* 77, *unicolor* 11, *simplicis*

3, *exilis* 1, *curvata* 1; Taiwan, *tridens* 184, *exilis* 6, *simplicis* 5.

HOST RELATIONSHIPS

By summing up previously published records and those verified by myself, the genus *Ornithoica* is now known from birds (so far determined) belonging to 17 orders, 59 families and 285 genera, of which 3 orders, 14 families and 112 genera have not heretofore been recorded as hosts(*). In the following list, the number of known species for each bird family is taken from Mayr & Amadon (1951) and is placed in parenthesis following the family name. For brevity, specific names of the flies given after familial and generic names of birds are in abbreviations. Species which probably normally breed on certain bird families are in capital letters following names of such families, thus BCR and CFL under Ardeidae indicate the 2 species, *beccariina* and *confluenta*, probably normally breeding on Ardeidae. Previously published records not verified by myself are in parentheses, for instance, (vcn) following *Crypturellus* indicates that the record of occurrence of *vicina* on that bird genus is taken merely from literature. Synonyms of bird genera are given only when the name here employed is different from that in literature, thus *Loxops* here used is the same as *Himatione* and *Vestiaria* in Bequaert's (1953 a) list.

(1) Tinamiformes, Tinamidae (33): vcn. *Crypturellus*: vcn.

(2) Podicipiformes, Podicipidae (20): pdc. *Podiceps*: pdc.

(3) Ciconiiformes: Ardeidae (59): BCR, CFL, exl, hts, HVN, PDC, pdg, PSL, vcn. *Ardea*: exl, hts. **Ardeola*: pdc. **Ardetta*: bcr. *Bubulcus*: (cfl). *Butorides*: cfl, exl, (vcn). *Casmerodius*: bcr, (cfl). *Demigretta*: exl, psl. **Goisakius*: exl. *Ixobrychus*: pdc. *Leucophoyx*: (cfl) *Lophotibis*: hvn **Nycticorax*: exl, pdg **Zenerodius*: exl, pdg.

(4) Falconiformes, Accipitridae (205): cvt, EXL, pdg, phl, stp, TRD, vcn. *Accipiter*: cvt, exl, stp, trd, (vcn). *Aviceda*: exl. *Busarellus*: (vcn). *Buteo*: trd, (vcn). **Circus*: trd. *Elanus*: exl, (trd). *Gypohierax*: trd. **Haliastur*: exl. **Henicopernis*: stp *Hypomorphus*: (vcn). *Kaupifalco*: trd. *Lophaetus*: (trd). *Machaerhamphus*: pdg, trd. **Pernis*: exl. **Spilornis*: exl, phl. **Spizaetus*: cvt, exl. "hawk": pdg.

(5) Falconiformes, Falconidae (58): exl, trd, vcn. *Falco*: trd, (vcn). **Ieracidea*: exl. *Micrastur*: (vcn).

(6) Galliformes, *Megapodiidae (10): exl, pnt. **Megapodius*: exl, pnt. **Talegalla*: exl.

(7) Galliformes, Phasianidae (190): exl, trd, vcn. *Bonasa*: (vcn). *Coturnix* (Hawaii Is., introduced): (vcn). *Dendragapus*: (vcn). *Gallus*: exl, (vcn). *Guttera*: (trd). *Lophortyx*: (vcn). *Phasianus* (Hawaii Is., introduced): (vcn).

(8) Gruiformes, Rallidae (132): exl, smp, stp, tdn. **Amaurornis*: smp, tdn. **Habropteryx*: stp, *Rallus*: (exl), smp.

(9) *Charadriiformes, *Charadriidae (152): stp. "Plover": stp.

(10) *Charadriiformes, *Laridae (89): PSL. **Anous*: psl. **Gygis*: psl.

(11) Columbiformes, Columbidae (289): AEQ, bst, exl, smp, trd, vcn. *Caloenas*: exl. **Chalcophaps*: exl. *Columba* (Americas, introduced): (vcn). *Ducula*: aeq, bst, exl, *Gallicolumba*: (exl). *Leucotreron*: (exl). **Macropygia*: smp. *Oreopeleia*: (vcn). **Phapi-*

treron: exl. *Ptilinopus*: aeq, exl. **Reinwardtoena*: exl. *Treron*: exl, (trd).

(12) Psittaciformes, Psittacidae (316): EXL, pdg, phl, stp, vcn. **Alisterus*: exl, pdg. *Amazona*: (vcn). *Bolbopsittacus*: exl. **Cacatua* (=*Kakatoe*): exl, stp. **Eos*: exl. **Geoffroyus*: exl. **Larius*: exl. *Loriculus*: (exl). *Melopsittacus* (Hawaii Is., introduced): vcn. **Prioniturus*: exl, phl. **Probosciger*: exl. **Tanygnathus*: exl. **Trichoglossus*: exl, stp.

(13) Cuculiformes, Musophagidae (19): TRD. *Crinifer*: trd. **Gymnoschizorhis*: trd. *Musophaga*: trd. *Ruwenzorius*: trd. *Tauraco*: trd.

(14) Cuculiformes, Cuculidae (128): bst, CVT, EXL, rbr, smp, stp, trd, vcn. *Centropus*: bst, cvt, exl, rbr, smp, stp, trd. *Clamator*: trd. **Eudynamis*: exl. *Piaya*: (vcn). **Rhamphococcyx*: cvt. **Surniculus*: bst.

(15) Strigiformes, Strigidae: (134): cvt, exl, pdg phl, stp, TRD, UNC, VCN. *Aegolius*: (vcn). *Asio*: (exl), trd, (vcn). *Bubo*: exl, trd, (vcn). *Ciccaba*: (trd). *Glaucidium*: exl, (vcn). **Ketupa*: cvt, exl, unc. *Ninox*: exl, pdg, stp, unc. *Otus*: (trd), unc, (vcn). **Phodilus*: unc. *Pseudoptynx*: (exl). *Pseudoscops*: (vcn). **Scops*: exl. **Scotopelia*: trd. *Strix:* trd, (vcn.). *Tyto*: stp, (vcn). **Uroglaux*: exl.

(16) Caprimulgiformes, Podargidae (12): exl, PDG. *Batrachostomus*: (exl). **Podargus*: pdg.

(17) Caprimulgiformes, *Caprimulgidae (67): exl, pdg. "Nightjar": exl, pdg.

(18) *Apodiformes, *Apodidae (79): exl. **Hemiprocne*: exl.

(19) *Trogoniformes, *Trogonidae (35): exl. **Harpactes*: exl.

(20) Coraciiformes, Coraciidae (17): EXL, stp, trd. *Coracias*: trd. *Eurystomus*: exl, stp, trd.

(21) Coraciiformes, Alcedinidae (87): bst, cvt, EXL, phl, psl, smp, STP, trd. *Ceyx*: bst, phl. *Dacelo*: exl, stp. *Halcyon*: bst, cvt, exl, stp, trd. **Lacedo*: bst, exl. **Melidora*: exl, stp. **Sauromarptis*: exl, stp. **Syma*: *exl, stp. **Tanysiptera*: exl, stp *Todiramphus*: psl. "kingfisher": smp.

(22) Coraciiformes, Meropidae (25): cvt, exl, stp, trd. *Melittophagus*: trd. **Merops*: exl, stp. **Nyctiornis*: cvt, exl.

(23) Coraciiformes, Bucerotidae (45): CVT, exl, HTS, SBM, trd. *Aceros*: cvt, exl, sbm. **Anorrhinus*: cvt. *Anthracoceros*: cvt. **Berenicornis*: cvt. *Buceros*: exl, sbm. *Penelopides*: exl, sbm. *Rhyticeros*: cvt, exl, hts. *Tockus*: trd.

(24) Piciformes, Picidae (210): bst, CVT, exl, tdn, trd, vcn. *Chrysocolaptes*: cvt, exl. *Colaptes*: (vcn). *Dendrocopos*: exl, tdn, (vcn). *Dendropicos*: trd. **Micropternus*: cvt. *Picus*: bst, cvt.

(25) Piciformes, Ramphastidae (37): vcn. *Ramphastos*: (vcn).

(26) Piciformes, *Capitonidae (76): cvt, smp, tdn. **Megalaima*: cvt, smp, tdn.

(27) Passeriformes, *Eurylaimidae (14): smp. **Psarisomus*: smp.

(28) Passeriformes, *Nectariniidae (104): exl. **Aethopyga*: exl.

(29) Passeriformes, Formicariidae (221): vcn. *Drymophila*: (vcn).

(30) Passeriformes, Furnariidae (259): vcn. *Syndactyla*: (vcn). *Thripadectes*: (vcn).

(31) Passeriformes, Pittidae (23): bst, exl, PHL, stp. *Pitta*: bst, exl, phl, stp.

(32) Passeriformes, Tyrannidae (366): vcn. *Myiodynastes*: (vcn). *Pitangus*: (vcn). *Pyrocephalus*: (vcn). *Tyrannus*: (vcn).

(33) Passeriformes, Cotingidae (90): vcn. *Cephalopterux*: (vcn). *Pyroderus*: (vcn).

(34) Passeriformes, Alaudidae (75): trd. *Mirafra*: (trd).

(35) Passeriformes, Hirundinidae (75): trd. *Delichon*: (trd).

(36) Passeriformes, Pycnonotidae (109): bst, rbr, tdn, trd. *Andropadus*: (trd). **Criniger*: bst. **Hypsipetes*: bst, rbr, tdn. **Pycnonotus*: bst, rbr, trd.

(37) Passeriformes, Campephagidae (72): exl, stp, trd. *Campephaga*: trd. *Coracina*: exl, phl, stp. "grackle": zmc.

(38) Passeriformes, Muscicapidae (1460): BST, exl, PHL, rbr, SMP, STP, TDN, trd, unc, VCN, ZMC. **Alcippe*: bst, smp, tdn. *Aletha*: (trd). *Alseonax*: (trd). *Batis*: (trd). **Brachypteryx*: phl, tdn. *Chamaea*: (vcn). **Cinclidium*: tdn. *Cinclus*: (vcn). **Cisticola*: exl, smp, stp. **Copsychus*: bst, rbr. *Corthylio*: (vcn.) *Cossypha*: trd. **Cyornis*: bst. *Dendroica*: (vcn). *Dioptrornis*: trd. *Dumetella*: (vcn). **Enicurus*: bst. **Garrulax*: bst, tdn. *Geothlypis*: (vcn). **Heterophasia*: tdn. *Hylocichla*: (vcn). **Hypothymis*: bst. **Macronus*: rbr. **Malacopteron*: bst. *Mimus*: (vcn). *Mniotilta*: (vcn). *Monarcha* (=*Piezorhynchus*): stp. *Monticola*: (trd). *Muscicapa*: bst, tdn, (trd). *Myiagra*: (exl). **Myiophoneus*: bst, exl, tdn. **Pachycare*: zmc. **Pachycephala*: phl, smp, stp, zmc. **Pitohui*: exl, stp, zmc. **Poecilodryas*: smp, zmc. *Regulus*: (vcn). **Rhinomyias*: bst. **Rhipidura*: bst, exl, zmc. *Seiurus*: (vcn). **Stachyris*: bst, unc. *Stipiturus*: stp. **Terpsiphone*: bst. *Toxostoma*: (vcn). **Trichastoma*: bst. *Troglodytes*: (vcn). *Turdus*: exl, phl, trd, (vcn). *Wilsonia*: (vcn). **Zoothera* (=*Geokichla*): bst, exl, smp.

(39) Passeriformes, *Motacillidae (48): phl, zmc. **Anthus*: phl. "Wagtail": zmc.

(40) Passeriformes, Laniidae (67): exl, phl, STP, tdn, TRD, vcn, zmc. *Dryoscopus*: trd. *Laniarius*: trd. *Lanius*: exl, phl, stp, tdn, (trd), (vcn), zmc. *Malaconotus*: (trd). *Tchagra*: trd.

(41) Passeriformes, Prionopidae: (14): bst, trd. **Pityriasis*: bst. *Prionops*: trd.

(42) Passeriformes, *Artamidae (10): exl. **Artamus*: exl.

(43) Passeriformes, *Certhiidae (6): phl. **Rhabdornis*: phl.

(44) Passeriformes, Sittidae (29): vcn. *Sitta*: (vcn).

(45) Passeriformes, Paridae (64): vcn. *Baeolophus*: (vcn). *Penthestes*: (vcn).

(46) Passeriformes, Meliphagidae (160): exl, SMP, stp, ZMC. **Melilestes*: zmc. **Meliphaga*: stp, zmc. **Melipotes*: smp, stp. *Philemon*: exl, stp. **Xanthotis*: zmc.

(47) Passeriformes, *Zosteropidae (80): phl, smp. **Zosterops*: phl, smp.

(48) Passeriformes, Drepaniidae (22): vcn. *Loxops* (=*Himatione*, =*Vestiaria*): (vcn).

(49) Passeriformes, Thraupidae (474): vcn. *Piranga*: (vcn). *Ramphocelus*: (vcn).

(50) Passeriformes, Fringillidae (293): trd, VCN. *Ammodramus*: (vcn). *Carpodacus*: (vcn). *Hedymeles*: (vcn). *Junco*: (vcn). *Melospiza*: (vcn). *Passerculus*: (vcn). *Passerella*: (vcn). *Pipilo*: (vcn). *Pooecetes*: (vcn). *Richmondena*: (vcn). *Serinus*: trd. *Spizella*: (vcn). *Zonotrichia*: (vcn).

(51) Passeriformes, Icteridae (88): VCN. *Agelaius*: (vcn). *Euphagus*: (vcn). *Icterus*: (vcn). *Molothrus*: (vcn). *Quinscalus*: (vcn).

(52) Passeriformes, Ploceidae (263): bst, trd, vcn. **Lonchura*: bst. *Passer*: trd, vcn.

(53) Passeriformes, Sturnidae (103): bst, EXL, smp, STP, trd, zmc. *Acridotheres*:

[*Ornithoica* sp. indet. (India)]. *Aplonis*: exl, stp. **Gracula*: exl. *Lamprotornis*: (trd). **Melanopyrrhus*: exl. **Mino*: bst, exl, smp, stp. **Sarcops*: exl. *Stilbopsar*: trd. "Grackle": zmc.

(54) Passeriformes, Oriolidae (34): exl, rbr, stp, tdn, TRD. *Oriolus*: exl, rbr, stp, tdn, trd.

(55) Passeriformes, Dicruridae (20): bst, cvt, EXL, tdn, zmc. *Dicrurus*: bst, cvt, exl, tdn, zmc.

(56) Passeriformes, Corvidae (100): bst, cvt, EXL, stp, TDN, trd. VCN, zmc. *Aphelocoma*: (vcn). *Corvus*: exl, stp, trd, (vcn). *Cyanocitta*: (vcn). *Cyanocorax*: (vcn). **Dendrocitta*: tdn. **Garrulus*: exl. **Gymnocorvus*: stp. *Perisoreus*: (vcn). *Pica*: (vcn). **Platylophus*: bst. **Platysmurus*: bst, cvt. *Urocissa* (=*Kitta*): tdn. *Uroleuca*: (vcn). "Corvid": zmc.

(57) Passeriformes, *Cracticidae (11): exl, stp, zmc. **Cracticus*: exl, stp, zmc.

(58) Passeriformes, Ptilinorhynchidae (17): exl, pdg, STP. *Ailuroedus*: exl, stp. **Chlamydera*: exl, pdg.

(59) Passeriformes, Paradisaeidae (43): exl, htc, smp, STP, zmc. **Cicinnurus*: stp, zmc. **Craspedophorus*: stp. *Diphyllodes*: (exl). **Lophorina*: exl, smp. **Manucodia*: exl, stp. **Paradigalla*: smp. **Paradisaea*: exl, stp, zmc. **Parotia*: smp, stp. **Phonygammus*: exl, hts, stp.

As shown above, only about 11 orders and 24 families appear to be true breeding hosts of *Ornithoica*. The remaining orders and families probably serve as either "acquired" (or "secondary") breeding hosts or accidental hosts. A few of the records might have resulted from contamination or mislabeling. Summary of host ranges and preferences at ordinal-level of various species is in Table 2. True breeding hosts (at familial-level) of the same, arranged in order of relative frequency, are as follows:

confluenta, *podicipis* & *beccariina*: Ardeidae.
turdi: Accipitridae, Strigidae, Laniidae, Oriolidae, Musophagidae.
vicina: Fringillidae, Strigidae, Muscicapidae, Corvidae, Icteridae.
zamicra: Meliphagidae, Muscicapidae.
rabori: (?) Muscicapidae.
bistativa: Muscicapidae.
tridens: Muscicapidae, Corvidae.
simplicis: Muscicapidae, Meliphagidae.
philippinensis: Muscicapidae, Pittidae.
stipituri: Alcedinidae, Ptilinorhynchidae, Laniidae, Paradisaeidae, Muscicapidae, Sturnidae.
hovana: (?) Ardeidae.
exilis: Alcedinidae, Psittacidae, Accipitridae, Cuculidae, Corvidae, Sturnidae, Dicruridae, Coraciidae.
podargi: Podargidae.
aequisenta: Columbidae.
punctatissima: (?) Megapodiidae.
unicolor: Strigidae.
pusilla: Ardeidae, (?) Laridae.
curvata: Picidae, Bucerotidae, Cuculidae.
submicans & *hirtisternum*: Bucerotidae.

Table 2. Host ranges and preference of Ornithoica species

	Ciconiiformes	Falconiformes	Galliformes	Gruiformes	Charadriiformes	Columbiformes	Psittaciformes	Cuculiformes	Strigiformes	Caprimulgiformes	Coraciiformes	Piciformes	Passeriformes
unicolor									B				s
confluenta	B												
podicipis	B												
beccariina	B												
turdi		B	s			s		B	B		B	s	B
vicina	s	s	s			s	s	s	B			s	B
zamicra													B
rabori								s					B
bistativa						s		s			s	s	B
philippinensis		s					s				s		B
stipituri		s		s	s		s	s	s		B		B
tridens				s								s	B
simplicis				s				s	s		s	s	B
hovana	B?												
exilis	s	B	s	s		s	B	B	s	s	B	s	B
podargi		s					s		s	B			s
aequisenta						B							
punctatissima			B?										
pusilla	B				B?						s		
submicans											B		
curvata		s						B	s		B	B	s
hirtisternum	s										B		s

Note: Not included are Tinami-, Podicipi-, Apodi- and Trogoniformes which have been recorded once each as hosts of vicina, podicipis, exilis and exilis respectively. The symbol "B" represents true breeding host (most probably); "s", acquired breeding host, accidental host or doubtful record.

Following Bequaert's (1953 a: 315) scheme for illustrating the type of quantitative evidence, the various species may be placed under 4 categories: monoxenous: *podargi*; oligoxenous: *confluenta*, *podicipis*, *beccariina*, (?) *punctatissima*, *aequisenta*, *unicolor*, *submicans*, *hirtisternum*; pleioxenous: *zamicra*, *rabori*, *tridens*, *bistativa*, *simplicis*, *philippinensis*; polyxenous: *turdi*, *vicina*, *stipituri*, (?) *hovana*, *exilis*, (?) *pusilla*, *curvata*. All the above summarization was derived entirely from the number of positive records which do not represent, in a strict sense, the true frequency of infestation, or the proportion of infested individuals for the local population of the host genus (or species) in question. Unfortunately most collectors do not keep negative records, and it is generally impossible to compute the percentage of infestation. Besides the frequency, the density of infestation, or the maximum and average numbers of the parasite present on infested individuals of a host species, is also important and useful in determining the status of host-parasite relationship. As a rule, the Passeriformes harbor few flies, and even when acting as true breeding hosts, the average density is usually less than 2 flies per bird. An exceptional case was an *Agelaius p. phoeniceus* (Icteridae) which harbored 19 flies of *O. vicina* (Bequaert 1953 a: 229). In other orders of birds, the densities on infested true hosts are very often significantly higher than on other kinds of hosts. An analysis of the New Guinea records of *O. exilis* is given Table 3. To illustrate the importance of

Table 3. Density* of infestation by *O. exilis* in New Guinea

	No. of records	Maximum density	Average density	True host or not (by presumption)
Ciconiiformes	1	5 flies		? yes
Falconiformes	20	10	2.2 flies	yes
Galliformes	2	1		no
Columbiformes	21	3	1.3	no
Psittaciformes	42	5	1.5	yes
Cuculiformes	11	23	3.6	yes
Strigiformes	1	4		? no
Caprimulgiformes	2	1		no
Coraciiformes	63	30	6.8	yes
Passeriformes	72	17	2.0	yes

* The term "density" here implies the number of flies per infested bird. (When the available records were 2 or less, the average has not been given.)

recording negative results by collectors, the frequency and density of infestation by *O. tridens* in Taiwan (Maa & Kuo 1964: 399–401, as *O.* sp. "M") are in Table 4. In connection with these, there are several records of *Ornithoica* ex introduced species of birds, such as *O. vicina* ex *Passer domesticus* and *Gallus gallus* (domestic fowl) in America and Hawaiian Is., and ex *Phasianus colchicus*, *Coturnix coturnix* and *Melopsittacus undulatus* in Hawaii. The population density on such "acquired" hosts is generally low and it is doubtful if the fly breeds regularly on them.

Since the Hippoboscidae do not entirely complete their life cycle on the host body,

Table 4. Frequency and density of infestation by *O. tridens* in Taiwan*

	Birds examined	Positive cases	Frequency	Maximum density	Average density	True host or not (by presumption)
Rallidae (3 spp.)	27	1	3.7%	1		no
Amaurornis	24	1	5.0	1		no
Picidae: *Dendrocopos* (2 spp.)	13	1	7.7	1		no
Capitonidae: *Megalaima*	259	6	2.3	1	1.0	no
Pycnonotidae (4 spp.)	150	4	2.1	2	1.3	no
Hypsipetes	119	4	3.4	2	1.3	no
Muscicapidae: Turdinae (8 spp.)	71	13	18.2	4	1.5	yes
Brachypteryx	6	2	33.3	1	2.0	yes
Cinclidium	3	1	33.3	1		yes
Myiophoneus	14	6	42.9	3	1.5	yes
Zoothera	21	4	19.0	4	1.6	yes
Muscic.: Timaliinae (9 spp.)	141	27	19.1	4	1.0	yes
Alcippe	13	3	23.1	1	1.0	yes
Garrulax	18	5	27.8	2	1.4	yes
Heterophasia	67	19	28.4	4	1.4	yes
Laniidae: *Lanius* (2 spp.)	29	1	3.4	1		no
Oriolidae: *Oriolus* (2 spp.)	15	1	6.7	1		no
Dicruridae: *Dicrurus* (2 spp.)	38	1	2.6	1		no
Corvidae (3 spp.)	261	68	26.1	3	1.5	yes
Dendrocitta	234	59	25.2	3	1.4	yes
Urocissa	26	9	34.6	3	1.6	yes

* The term "frequency" here implies the infestation percentage of the birds examined; and "density", the number of flies per infested bird. Average density has not been given when there was only 1 positive record. A total of 1561 birds comprising 105 species were examined.

their host specificity is determined not only by the nature of blood and feathers (or fur) of a host, but also by ecological environments of the nesting site of that host, and by geographical isolation of a host-group such as Meliphagidae. Consequently the host-parasite evolutionary parallelism in this group of parasites is much less significant than in lice and other groups. In the genus *Ornithoica*, closely related forms, such as *turdi* vs. *vicina*, *zamicra* vs. *bistativa*, *stipituri* vs. *exilis*, *submicans* vc. *hirtisternum*, have similar patterns in host specificity and host preference. More primitive forms generally have a wider host range. However, one bird-group may harbor 2 or more unrelated forms of flies. The Falconi-, Cuculi- and Passeriformes are preferred hosts of the *turdi*- and *exilis*-groups, whereas the Ciconiiformes, that of the *confluenta*- and *pusilla*-groups; the Strigiformes, that of the *turdi*- and *unicolor*-groups (cf. Table 2). The occurrence of *O. pusilla* on Ardeidae and Laridae and of *O. curvata* on Bucerotidae and Picidae may be attributed to ecological similarities of nesting sites in these birds. On the other

hand, one bird-species may have different true parasites in different countries or under different environments. For instance, *Rhyticeros plicatus* (Bucerotidae) usually carries *O. curvata* in Thailand, *O. hirtisternum* in New Guinea and *O. exilis* in the Solomon Is.; and *Demigretta sacra* (Ardeidae) carries *O. exilis* in the Solomon Is. and *O. pusilla* in Marshall Is. and Tuamotu Archip.

Our information regarding the host relationship of *Ornithoica* is still too fragmentary to warrant much discussion and generalization, but some remarks on the intergeneric and interspecific competition (cf. Maa & Kuo 1964: 400) on same individual birds may be added. In a recent shipment of 261 field numbers of New Guinea Hippoboscidae, 203 contained *Ornithoica*; 48 (*ca* 18%) containing 2 or more *Ornithoica* species; 71 containing 2 or more species either entirely of *Ornithoica* or both of *Ornithoica* and some other genus (or genera). In one exceptional case (BBM-NG 22559, ex *Mino dumontii*), found together on the same individual bird were 1 fly each of 5 species belonging to 3 genera: *O. simplicis*, *O. stipituri*, *O. exilis*, *Ornithophila metallica* Schin. and *Ornithomya fuscipennis* Bigot; and in another case (BBM-NG 29567, ex butcher bird), were 2♀ *O. exilis* plus 1 fly each of *O. zamicra*, *O. stipituri*, *Ornithophila metallica* and *Lynchin plana* Wk. Aside from these exceptional ones, the remaining cases of multiple hippoboscid infestation in connection with *Ornithoica* may be analysed as follows:

O. zamicra: 22 field numbers; associated with *O. exilis*, 1 case; with *O. stipituri*, 4; with *Lynchia chalcolampra* Speis., 1.

O. simplicis: 5 field numbers; associated with *O. stipituri*, 1 case; with *O. exilis*, 1; with *Ornithophila metallica*, 1; with *Ornithomya fuscipennis*, 2.

O. stipituri: 73 field numbers; associated with *O. zamicra*, 4 cases; with *O. simplicis*, 1; with *O. exilis*, 39; with *O. exilis*+*Ornithophila metallica*, 5; with *O. exilis*+*L. chalcolampra*, 1; with *O. exilis*+*L. plana* Wk., 1; with *Ornithophila metallica*, 6; with *Ornithomya fuscipennis*, 1; with *L. chalcolampra*, 3; with *L. plana*, 3.

O. exilis: 135 field numbers; associated with *O. zamicra*, 1 case; with *O. simplicis*, 1; with *O. stipituri*, 39; with *O. stipituri*+*Ornithophila metallica*, 5; with *O. stipituri*+*L. chalcolampra*, 1; with *O. stipituri* + *L. plana*, 1; with *O. podargi*, 3; with *Ornithophila metallica*, 8; with *Ornithomya fuscipennis*, 1; with *L. chalcolampra*, 11; with *L. plana*, 1; with *L. simplex* Wk., 1; with *L.* sp. "C", 3; with *Ornithophila metallica*+*L. chalcolampra*, 1.

O. podargi: 10 field numbers; associated with *O. exilis*, 3 cases.

Obviously, the competition of flies in multiple infestation in New Guinea was largely intra- rather than intergeneric, and the density of polyxenous species was generally higher than in pleioxenous ones. But in Taiwan (Maa & Kuo 1964: 400–1), the competition was largely intergeneric and the polyxenous species were exceeded by mono- or oligoxenous ones. These contrasting phenomena may well be attributed to the much different composition of the hippoboscid faunae in the 2 islands. The effect of such competition is hard to evaluate but the average density per involved species is much lower in multiple than in simple infestation.

Table 5. Summary of Mallophaga - *Ornithoica* phoresy. (Unless otherwise stated, site of attachment is abdomen of fly. Bequaert's records in square brackets).

Host Bird	Hippoboscid	Country
PSITTACIFORMES: Psittacidae		
Alisterus amboinensis	*O. exilis*, 1♀	NW New Guinea
CUCULIFORMES: Cuculidae		
Centropus sinensis	*O. exilis*, 1♂, 1♀	Philippines
CORACIIFORMES: Alcedinidae		
Halcyon lindsayi	*O. exilis*, 1♀	Philippines
Sauromarptis gaudichaud	do, 1♀, 1♀	NE New Guinea
kingfisher	*O. stipituri*, 1♂	do.
do.	*O. exilis*, 2♂♂, 1♀	NW New Guinea
do.	do, 1♂	SE New Guinea
PICIFORMES: Capitonidae		
Megalaima oorti	*O. tridens*, 1♂	Taiwan
PASSERIFORMES		
bower-bird (Ptilinorhynchidae)	*O. stipituri*, 1♂	SE New Guinea
Copsychus minor (Turdinae)	*O. rabori*, 1♂	Philippines
Coracina striata (Campephagidae)	*O. exilis*, 1♀ (wing)	do.
Corvus orru (Corvidae)	do, 1♀	NE New Guinea
Cracticus cassicus (Cracticidae)	do, 1♂	do.
Craspedophora alberti (Paradisaeidae)	*O. stipituri*, 1♀	Queensland
Criniger bres (Pycnonotidae)	*O. bistativa*, 1♂	Borneo
crow (Corvidae)	*O. exilis*, 1♀	NE New Guinea
Dendrocitta formosae (Corvidae)	*O. tridens*, 4♂♂, 1♀	Taiwan
Garrulax mitratus (Timaliinae)	*O. bistativa*, 1♂ (wing)	Malaya
Heterophasia auricularis (Timaliinae)	*O. tridens*, 1♀	Taiwan
Hypsipetes amaurotis (Pycnonotidae)	do, 1♀	do.
Mino dumontii (Sturnidae)	*O. exilis*, 1♂ (palpi)	SE New Guinea
Myiophoneus insularis (Muscicapinae)	*O. tridens*, 1♀	Taiwan
Oriolus chinensis (Oriolidae)	*O. exilis*, 1♀	Philippines
Oriolus szalayi	*O. exilis*. 1♀	NE New Guinea
Pachycephala soror (Muscicapinae)	*O. simplicis*, 1♂	NW New Guinea
Pitta cyanea (Pittidae)	*O. bistativa*, 1♂	Thailand
Poecilodryas albonotata (Muscicapinae)	*O. simplicis*, 1♂	NW New Guinea
Urocissa caerulea (Corvidae)	*O. tridens*, 1♂	Taiwan
[*Aphelocoma californica* (Corvidae)	*O. vicina*, 1 fly, sex (?) (wing)	California]
[*Cyanocitta cristata* (Corvidae)	do, 1♂ (wing & abd.)	New Jersey]
[*Pipilo maculatus* (Fringillidae)	do, 1 fly, sex (?)	California]
[*Pyroderus scutatus* (Cotingidae)	do, 1 fly, sex (?)	Brazil]
[thrushes (Turdinae)	do, 2 flies, sex (?), site (?)	Ecuador]
[*Turdus migratorius* (Turdinae)	do, 1♂, site (?)	New Jersey]
[*Uroleuca cristella* (Corvidae)	do, 3 flies, sex (?)	Brazil]

PHORESY, HYPERPARASITISM

Probably largely because of their tiny size, *Ornithoica* less frequently carry Mallophaga Ischnocera or bird lice than do *Ornithomya*, and the average number of such lice per fly is fewer than in the latter genus. By incorporating Bequaert's (1953 a: 167–68) summary with my own findings, there are 46 cases of "phoresy" now known for *Ornithoica* (Table 5). Altogether 29 species of birds and 7 of flies are involved. The lice are mostly unstudied and only in 2 cases have they been named to genus—*Bruelia*. The birds belong to 17 different families (mostly Corvidae and Muscicapidae) in 5 orders, and all flies to subgenus *Ornithoica* s. s. The flies are composed of 19♂♂, 15♀♀, 4⚥⚥ (plus 8 flies not determined to sex). Since ♀♀ greatly outnumber ♂♂ in *Ornithoica* s. s., the preference of the latter sex by lice is interesting when comparing with the known phoresy cases in American *Ornithomya* for which Bequaert (*l. c.*) listed 10♂♂ *vs* 28♀♀. Most of the lice were found attaching to apical and more often lateral margins of abdomen of the fly. In 5 cases, they attached to wing-veins, and in 1 case, to palpi (in 2 of the cases recorded by Bequaert, the attachment site was not mentioned). Generally 1 fly carries only 1 louse, but in 2 cases (1 ex *Pachycephala*, 1 ex *Cyanocitta*) they carried 3 lice each. The lice found on my specimens are largely ♀♀, apparently no nymphs; and their heads were in the same or almost same direction as those of host-flies.

The parasitic fungi (*Trenomyces*, Peyritschiellaceae, Laboulbeniales) and mites (*Microlichus* and *Myialges*, Myialgidae, Astigmata) on hippoboscid flies have been termed "hyperparasites" by some authors. Bequaert (1953 a: 140–41) first reported 6 cases (5 on *O. "pusilla"*, 1 on *O. stipituri*) of the fungi infecting *Ornithoica*. Besides re-examining those specimens, I have added new records thus bringing the total to 130 (Table 6). A total of 25± species of birds and 6 species (36♂♂, 91♀♀, 3⚥⚥) of flies are involved. The birds belong to 12 families in 8 orders, mostly to Alcedinidae. Very surprising is the scarcity on flies from Passeriformes which include many preferred hosts of *Ornithoica*. The flies belong to 5 species (in both subgenera) among which *O. podargi* had the highest percentage of infection. None of the fungi have been identified to species. They were usually attached to the membranous area of the abdomen and at the base of the tegula, sometimes to the neck and intersegmental membrane of the legs.

Although Bequaert (1953 a: 151–52) listed only 15 cases of mite infestation in *Ornithoica*, these minute parasites are nevertheless rather common for these flies, and I have added 190 new cases (Table 7). The mites are at present known from 12 species of flies ex 82± species of birds. The flies belong to both subgenera and consist of 31♂♂, 167♀♀, 1⚥ (plus 3 flies of undetermined sex). Thus the sex ratio in infested flies is more disproportional than that for the genus as a whole. The birds belong to 10 orders which nearly cover the entire host range of these flies. In the new cases, breakdown of sites of mite-attachment is: abdomen, 48.4%; wing, 36.3%; neck, 10.2%; thorax, 3.8%; legs, 1.3%. In a few cases, mites (? of same species) may be found at 2 or more places on the same fly. All mites on wings attach themselves to the deep concavity under cell *3bc* and have their head directed to base of that cell. Those on abdomen and elsewhere, however, do not restrict themselves to such a minute peculiar niche and usually

Table 6. Summary of parasitism by *Trenomyces* in *Ornithoica*

Host Bird	Hippoboscid	Country
CICONIIFORMES: Ardeidae		
Nycticorax caledonicus	*O. exilis*, 4♂♂, 11♀♀, 1⚥	Solomon Is.
FALCONIFORMES: Accipitridae		
Accipiter virgatus	*O. exilis*, 1♀	Philippines
Accipiter novaehollandiae	do, 1♀	SE New Guinea
PSITTACIFORMES: Psittacidae		
Larius roratus	*O. exilis*, 1♂, 1♀	SE New Guinea
cockatoo	do, 1♀	do.
CUCULIFORMES: Cuculidae		
Centropus bernsteini	*O. exilis*, 1♀	SE New Guinea
Centropus menbeki	do, 1♂	NW New Guinea
do	do, 3♂♂, 6♀♀	NE New Guinea
Centropus violaceus	do, 1♀	New Britain
STRIGIFORMES: Strigidae		
Ninox odiosa	*O. stipituri*, 6♀♀	New Britain
Otus bakkamoena	*O. unicolor*, 1♀	Malaya
Tyto novaehollandiae aurantia	*O. stipituri*, 1♀	New Britain
CAPRIMULGIFORMES: Podargidae		
Podargus papuensis	*O. podargi*, 7♀♀, 2⚥⚥	NE New Guinea
do	do, 1♀	SE New Guinea
CORACIIFORMES		
Anthracoceros malabaricus (Bucerotidae)	*O. curvata*, 1♂	Thailand
Centropus menbeki (Alcedinidae)	*O. exilis*, 1♂	NW New Guinea
Dacelo leachi (Alcedinidae)	do, 2♂♂, 6♀♀	SE New Guinea
Halcyon chloris (Alcedinidae)	do, 1♂, 3♀♀	New Hebrides
Rhyticeros plicatus (Bucerotidae)	do, 1♂	NW New Guinea
Sauromarptis gaudichaud (Alcedinidae)	do, 1♂, 4♀♀	do.
do	do, 2♂♂, 5♀♀	NE New Guinea
do	do, 4♂♂, 2♀♀	SE New Guinea
kingfishers (Alcedinidae)	do, 3♀♀	NW New Guinea
do	do, 10♂♂, 27♀♀	SE New Guinea
do	*O. stipituri*, 1♂	do.
PASSERIFORMES		
Cracticus cassicus (Cracticidae)	*O. exilis*, 1♂	NE New Guinea
Coracina sp. (Campephagidae)	*O. stipituri*, 1♂	SE New Guinea
Corvus orru (Corvidae)	*O. exilis*, 1♀	NE New Guinea
crow (Corvidae)	do, 1♀	NW New Guinea
Oriolus szalayi (Oriolidae)	do, 1♂	SE New Guinea

Table 7. Summary of mite infestation in *Ornithoica* (Cases quoted from Bequaert are in square brackets)

Host Bird	Hippoboscid	Country
FALCONIFORMES		
Accipiter leucoschistaceus	*O. exilis*, 1♂	New Britain
Accipiter nisoides	do, 1♀	Taiwan
Accipiter novaehollandiae	do, 1♀	Solomon Is.
do	do, 3♀♀	SE New Guinea
Accipiter trivirgatus	do, 2♀♀	Philippines
Accipiter virgatus	do, 2♀♀	do.
Circus macrourus	*O. turdi*, 1♀	Uganda
Gypohierax angolensis	do, 1♀	Liberia
Machaerhamphus anderssoni	do, 1♀	Congo
COLUMBIFORMES		
Streptopelia chinensis	*O. exilis*, 1♀	Philippines
Macropygia amboinensis	*O. simplicis*, 1♀	NE New Guinea
PSITTACIFORMES		
Cacatua galerita	*O. exilis*, 1♀	New Britain
Eos cardinalis	do, 1♀	Solomon Is.
Geoffroyus geoffroyi	do, 1♀	NE New Guinea
Larius roratus	do, 1♀	NW New Guinea
do	do, 1♀	Solomon Is.
Prioniturus discurus	*O. philippinensis*, 1♀	Philippines
lorikeet (Psittacid)	*O. stipituri*, 1♀	NE New Guinea
CUCULIFORMES		
Centropus bernsteini	*O. exilis*, 1♀	SE New Guinea
Centropus melanops	do, 1♀	Philippines
Centropus menbeki	do, 1♀	NW New Guinea
Centropus sinensis	*O. curvata*, 1♂, 1♀	Thailand
do	do, 1♀	Borneo
do	*O. exilis*, 1♀	Philippines
Centropus violaceus	do, 2♀♀	New Britain
Centropus viridis	do, 1♀	Philippines
Crinifer zonurus	*O. turdi*, 1♂	Uganda
cougal (Cuculid)	*O. exilis*, 1♀	SE New Guinea
do	*O. stipituri*, 1♀	do.
STRIGIFORMES		
Asio flammeus	*O. vicina*, 7♀♀	Hawaii Is.
Ninox odiosa	*O. stipituri*, 1♀	New Britain
Tyto novaehollandiae	do, 1♀	do.
CAPRIMULGIFORMES		
Podargus papuensis	*O. podargi*, 2♀♀	NE New Guinea

Table 7 (cont'd)

Podargus papuensis	*O. podargi*, 1♀	SE New Guinea
CORACIIFORMES		
Halcyon chloris	*O. stipituri*, 1♂, 1♀	Solomon Is.
do	*O. exilis*, 1♂, 1♀	New Hebrides
do	do, 1♂	New Britain
Halcyon cinnamomina	do, 6♀♀	Caroline Is.
do	do, 1♀	Mariana Is.
Halcyon smyrnensis	do, 1♀	Philippines
Halcyon tutuilae	do, 1♀	Samoa Is.
Lacedo pulchella	*O. bistativa*, 1♀	Thailand
Penelopides panini	*O. exilis*, 1♂	Philippines
do	*O. submicans*, 1♀	do.
Sauromarptis gaudichaud	*O. exilis*, 1♀	NW New Guinea
do	do, 3♂♂, 1♀	NE New Guinea
dollar-bird (*Eurystomus*)	do, 1♀	do.
do	do, 1♀	SE New Guinea
kingfishers (Alcedinid)	*O. stipituri*, 1♀	NE New Guinea
do	*O. exilis*, 6♂♂, 22♀♀	SE New Guinea
PICIFORMES		
Chrysocolaptes lucidus	*O. exilis*, 2♀♀	Philippines
PASSERIFORMES		
Ailuroedus crassirostris	*O. exilis*, 1♀	SE New Guinea
Copsychus malabaricus	*O. bistativa*, 1♂	Thailand
Copsychus pyrrhopygus	do, 1♀	Borneo
Corvus enca	*O. exilis*, 3♀♀	Philippines
Corvus orru	do, 1♀	New Britain
do	do, 1♂, 2♀♀	SE New Guinea
Corvus woodfordi	do, 1♂	Solomon Is.
Cracticus cassicus	do, 1♀	NW New Guinea
do	*O. stipituri*, 1♂	SE New Guinea
Cyornis sp.	*O. bistativa*, 2♀♀	Thailand
Dendrocitta formosae	*O. tridens*, 2♀♀	Taiwan
Dicrurus bracteatus	*O. exilis*, 1♀	New Britain
Dicrurus paradiseus	do, 1♂	Thailand
Dioptrornis toroensis	*O. turdi*, 1♂	Uganda
Heterophasia auricularis	*O. tridens*, 4♂♂, 6♀♀	Taiwan
Hypsipetes amaurotis	do, 1♀	do.
Hypsipetes criniger	*O. bistativa*, 1♀	Borneo
Hypsipetes madagascarensis	*O. tridens*, 1♀	Taiwan
Mino coronatus	*O. bistativa*, 1♀	Thailand
Mino dumontii	*O. exilis*, 1♀	NE New Guinea
do	do, 1♀	SE New Guinea

Table 7 (cont'd)

Pachycephala philippinensis	*O. philippinensis*, 1♀	Philippines
Pachycephala soror	*O. simplicis*, 1♀	NW New Guinea
Paradigalla brevicauda	do, 1♂	do
Phonygammus keraudrenii	*O. stipituri*, 1♀	do
Pitohui kirhocephalus	do, 4♀♀	do
do	*O. exilis*, 1♀	do
Pitta baudi	*O. bistativa*, 1♀	Borneo
Pitta brachyura	do, 1♀	Malaya
Pitta macklotii	*O. stipituri*, 1♀	New Britain
Pitta sp.	do, 1♀	NE New Guinea
Rhinomyias umbratilis	*O. bistativa*, 1♀	Borneo
Tchagra senegala	*O. turdi*, 1♀	Kenya
Trichastoma malaccensis	*O. bistativa*, 1♀	Malaya
Turdus poliocephalus	*O. philippinensis*, 1♂, 3♀♀	Philippines
Urocissa caerulea	*O. tridens*, 1♀	Taiwan
Zoothera dauma	do, 1♀	do
bird of paradise (Paradisaeid)	*O. stipituri*, 1♀	SE New Guinea
butcher-bird (Cracticid)	do, 1♀	NE New Guinea
do	do, 1♀	SE New Guinea
catbird (Ptilinorhynchid)	do, 1♀	NE New Guinea
do	*O. stipituri*, 1♀	Queensland
crow (Corvid)	*O. exilis*, 1♀	NW New Guinea
do	do, 1♀	SE New Guinea
drongo (Dicrurid)	do, 2♀♀	do
grackle (Sturnid)	*O. zamicra*, 1♀	SE New Guinea
honeyeater (Meliphagid)	*O. stipituri*, 1♀	NE New Guinea
do	*O. zamicra*, 1♂	SE New Guinea
leatherneck (Oriolid)	*O. stipituri*, 1♀	NE New Guinea
wagtail (Motacillid)	*O. zamicra*, 1♀	SE New Guinea
do	*O. stipituri*, 1♀	do
wren (Muscicapid)	*O. zamicra*, 1♂	do
"bird"	do, 1♀	NE New Guinea
do	do, 1♀	SE New Guinea
do	*O. stipituri*, 4♀♀	NW New Guinea
do	do, 2♀♀	SE New Guinea
do	do, 1♀	New Britain
do	*O. exilis*, 1♀	Thailand
do	do, 1♀	NW New Guinea
do	do, 1♂, 1♀	New Britain
do	do, 1♀	Caroline Is.
do	*O. curvata*, 1♀	Thailand
FALCONIFORMES		
[*Buteo magnirostris*	*O. vicina*, 1♀	Brazil]

Table 7 (cont'd)

GALLIFORMES		
[*Gallus gallus* (introduced)	*O. vicina*, 1♀	Virginia]
PASSERIFORMES		
[*Junco phaeonotus*	*O. vicina*, 5♀♀	Arizona]
[*Passer domesticus* (introduced)	do, 1♀	Maryland]
[*Pipilo fuscus*	do, 1♀	California]
[*Turdus magellanicus*	do, 2♀♀	Chile]
[*Turdus migratorius*	do, 1♀	New Jersey]
["bird"	do, 1 fly, sex (?)	California]
[do	do, 1 fly, sex (?)	Chile]
[do	do, 1 fly, sex (?)	Massachusetts]

but not always, have their head directed to anterior end of the fly body. Only 1 of the mites has been referred to *Myialges ancora* Sergent & Trouessart.

Since few of the Mallophaga, fungi and mites found on *Ornithoica* are determined, I shall not go further into these phenomena. The disproportional sex ratio in the host flies and the orientation of the body of lice and mites were unnoticed by earlier workers and need further explanation.

TRENDS OF EVOLUTION

Intergeneric Relationship. In Bequaert's (1954) and Maa's (1963) classificatory system of Hippoboscidae, *Ornithoica* stood at the very beginning of the entire family and represented an independent subfamily Ornithoicinae, whereas in Speiser's (1908), it was placed under Ornithomyinae; in Theodor & Oldroyd's (1964), under Hippoboscinae Ornithomyini, following Hippoboscini. It is beyond the scope of this paper to argue whether or not the genus deserves to have a subfamily or tribe of its own and whether or not bird-louseflies are more primitive than mammal ones, particularly because the lumping or splitting of such taxonomic categories depends entirely upon one's subjective choice of diagnostic characters and subjective appraisal of importance and meaningfulness of such characters. However, all those authors agreed that *Ornithoica* is the most primitive of Recent bird-louseflies. Evidences of its primitiveness, as mentioned by Bequaert and Maa, are the completely separated antennal segment 1 and notopleura, short simple frons, complete ocelli, concealed interantennal area, slightly flattened thorax, weak humeral calli, weak lateral thoracic grooves for receiving femora 1, undivided prosternum, non-caducous wings, extensive wing-cilia, large alula, almost complete (for the family) venation, slight dissimilarity in length and shape of 3 pairs of legs, simple tarsal claws, non-reduced (for the family) tergal plates (in both sexes), relatively more complete ventral sclerotization of abdomen and wide host and distributional ranges. Bequaert believed that the Hippoboscidae had acquired most or all of their characteristics in structure, physiology and behavior before the close of the Mesozoic or early in the Cenozoic. He also suggested that the splitting of the ancestral hippoboscid stock into subfamilies,

tribes and genera had occurred during the latter half of the Eocene. These assumptions are probably correct as evidenced by the fossil "*Ornithoponus*" *rottensis* Statz. Apparently the genus *Ornithoica* had nevertheless undergone specialization in several directions from the hypothetical Proto-Hippoboscidae, such as nipple-like tubercles bearing vertical bristles, crowding of apical sections of R-branches toward C, modification of setae into various types of spines, disappearance of prothoracic presternum, mesothoracic furcasternum (? fused with basisternum), metasternal furcal suture and vein 2A, the abundance of puparial spiracular pores as well as the acquiring of strong gynandromorphism and sexual dimorphism.

Although *Ornithoica* and mammal-louseflies share several characters in common, such as the weak humeral calli and simple tarsal claws, they do not have any close affinities. Among the bird-louseflies, *Ornithoica* stood next to *Ornithophila* in Maa's and Theodor & Oldroyd's systems, and next to *Ornithomya* in Speiser's and Bequaert's. The 2 latter genera differ from *Ornithoica* in having interantennal area well developed, frons long and apically bilobed, antennal pits paired, antennal segment 1 small and not or incompletely separated from sides of lunula, vertical bristles not arising from nipple-like tubercles, postvertex laterally touching inner orbits, thorax and tibiae much flattened, humeral calli strongly produced forward, prosternum anteriorly bilobed, prothoracic presternum (in *Ornithophila*) well defined, vein R_{2+3} either short and with much of its apical part coalescent with C (in *Ornithophila*) or long (in *Ornithomya*), *im* either much shifted basad (in *Ornithophila*) or much lengthened (in *Ornithomya*), M_{3+4} lacking bulla, 2A (in *Ornithophila*) well developed, segment 4 of tarsus 3 apically almost symmetrical, abdominal syntergite 1+2 posteriorly bilobed, laterites 1—2 small; and in ♀, tergites 3—5 much reduced in size (often entirely wanting) than in ♂, tergite 6 always medially interrupted, laterite 7 (in *Ornithomya*) wanting, supra-anal plate (in *Ornithomya*) poorly definable, pregenital tubercle wanting, pregenital plates (in *Ornithophila*) paired; in ♂, both laterite 6 and pregenital tubercles wanting; both parameres and aedeagus more elongate; gynandromorphism unknown; sexual difference in chaetotaxy quite slight. Hence even from nearest Recent relatives, *Ornithoica* distinguishes itself in many respects. Furthermore, several of its characters are unknown to any other Hippoboscidae. Of course, some characters in *Ornithophila* and *Ornithomya*, such as the well definable prothoracic presternum and vein 2A and the paired ♀ pregenital plates, are apparently more primitive than those in *Ornithoica*, but in the main, the latter genus obviously has more primitive characters than do the 2 former.

Intrageneric Relationship. The evolutionary trends within the genus are somewhat obscure in certain respects largely because *Ornithoica* is an archaic group. During the long past, characters in different species had specialized at different times, toward different directions and at different speeds and therefore had often attained secondary convergence. The general tendency of the intrageneric evolution is as in Table 8, basing upon which, the subgenus *Lobolepis* is here placed at the end and the *O. unicolor* and *O. confluenta*-groups of *Ornithoica* s. s. at the beginning of the genus. It may be added that the pale color pattern and weaker sclerotization and chaetotaxy are most probably connected with the permanency of parasitic life and with the weaker mobility of the adult fly in locating suitable hosts in open-air. The very dark and metallic color in *Lobolepis*, incidentally

Table. 8. Presumably generalized and specialized characters in *Ornithoica*

Generalized	Specialized
Postvertex and thoracic dorsum densely and uniformly setose.	Postvertex and thoracic dorsum bare or largely bare.
Wings extensively setulose; vein M_{1+2} well separated from R_{4+5}; cell *3bc* long.	Wings scatteredly setulose; vein M_{1+2} strongly approaching R_{4+5} near base; cell *3bc* shorter.
Abdomen sparsely setose at lateral membrane, weakly so at ventral disc; anchor-like spines at ♀ urogenital area uniform in size and distribution, no multispinose warts.	Abdomen densely setose at lateral membrane, strongly so at ventral disc; anchor-like spines at ♀ urogenital area not uniform in size and distribution, some replaced by multispinose warts.
Tergite 6 undivided, ♂ laterite 6 present.	Tergite 6 widely divided at middle, ♂ laterite 6 absent.
Anterior and posterior pieces of ♀ supra-anal plate widely separated and subequal in size.	Anterior and posterior pieces of ♀ either soldered together and with posterior piece slightly smaller than anterior, or slightly separated and with posterior piece greatly reduced.
♂ genitalia less elongate.	♂ genitalia more elongate.
Color dark, sclerotization strong.	Color pale, sclerotization weak.
Sexual dimorphism weaker.	Sexual dimorphism stronger.
Pupation taking place at any open place.	Pupation taking place in special ecological niche such as hollowed trees.

similar to that in *Ornithophila*, has perhaps resulted from its very strict host specificity and the solitary habits of its hosts. As mentioned under the section on host relationships, the theory of host-parasite evolutionary parallelism is not applicable to explain the evolution within the genus, pleio- and polyxenous species are not necessarily more primitive than related mono- or oligoxenous ones, and distributional ranges of a host and its parasite do not always coincide. Geographical isolation has obviously played a more important role than has ecological isolation in the deviation and establishment of related species from a common ancestor. Evidences supporting this assumption are: (1) the replacement, in geographically widely separated countries, of 1 fly species by its close relatives with similar habits and habitats, such as *O. turdi* vs *vicina*, *O. zamicra* vs *rabori*, *O. tridens* vs *bistativa* vs *philippinensis*, *O. confluenta* vs *podicipis* vs *beccariina*, *O. curvata* vs *submicans* vs *hirtisternum*; (2) the disharmonious host-parasite distributional pattern, such as the presence of *O. aequisenta* and *O. punctatissima* in New Britain and Solomon Is vs their absence in New Guinea although their host birds do occur in all 3 countries; (3) the non-uniformity of *Ornithoica*-faunae of ecologically similar countries as evidenced by the faunal paucity in the W. Indies and NE Australia vs the richness in the E. Indies and New Guinea respectively.

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