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The Hippoboscidae of Oceania (Diptera)[1]

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INTRODUCTION

In the present taxonomic study of the Hippoboscidae, Oceania covers, rather arbitrarily, the many archipelagos and isolated islands scattered throughout the Pacific Ocean, from the Marianas and Caroline Islands, the Bismarck Archipelago, the Solomon Islands and New Caledonia to the Hawaiian islands and the Galapagos.

So far, I have seen material from the Carolines, Marianas, Marquesas, Gilberts, Bismarck Archipelago, Solomons, Loyalty Islands, New Caledonia, Fiji, Samoa, New Hebrides, Hawaiian Archipelago, and Galapagos. This was obtained mainly from the following sources: the British Museum (Natural History), the Paris Museum, the American Museum of Natural History, the Field Museum of Natural History, the California Academy of Sciences, the Academy of Natural Sciences of Philadelphia, the Kyushiu Imperial University, Fukuoka, U. S. National Museum, and Bernice P. Bishop Museum. I am under obligation to G. F. Ferris for the loan of type specimens from the collections of Stanford University.

The bibliography of each species covers all references to records from Pacific islands; but only localities of specimens actually seen by the several authors are quoted. I have added a full synonymy, with references to the original descriptions, type localities, and type hosts.

FAUNAL CHARACTERISTICS

The family Hippoboscidae, never a conspicuous element of any fauna, is particularly scanty in Oceania. Only 20 species are listed

[1] This is number 15 of my "Notes on Hippoboscidae."

in the present paper and one of these may prove to be a synonym upon further investigation. Biogeographically the species fall into three groups:

A. Species foreign to the fauna, obviously introduced by man. This group includes the few parasites of mammals (*Hippobosca equina* and *Melophagus ovinus*), as well as the cosmopolitan parasite of domestic pigeon (*Pseudolynchia canariensis*). I am also inclined to regard *Ornithoica vicina* as a recent introduction into Hawaii from the New World.

B. Species apparently indigenous, but widely distributed beyond the boundaries of our territory. The group consists of 12 species. Four, found in the Galapagos (one of them also extending to Hawaii), are New World forms of wide distribution: *Olfersia sordida, Lynchia nigra, L. albipennis,* and *Microlynchia pusilla.* Three are parasites of marine birds and nearly cosmopolitan: *Olfersia fossulata, O. spinifera,* and *O. aenescens.* The remaining five are more or less widely spread in the Old World: *Ornitheza metallica, Ornithoctona plicata, Lynchia pollicipes* (in East Indies only), *Myophthiria reduvioides* (in East Indies only), and *Ornithoica pusilla* (in East Indies and Australia).

C. Species imperfectly known. Two of these, *Lynchia suvaënsis* (Fiji) and *Lynchia samoana* (Samoa), being known only from the types, it is impossible to decide whether or not they are peculiar to Oceania. A third, *Ornithoica stipituri,* originally described from Australia, has been reported from the Bismarck Archipelago; but I suspect that this record, at any rate, was based upon a specimen of *O. pusilla.* The fourth, *Ornithoctona australasiae,* although described from the "Islands of the Pacific", and known from the East Indies, has not been taken again in Oceania.

A further consideration of the fauna should, I think, disregard not only the four introduced species, but also the four species of the Galapagos (which are hardly part of Oceania) and the three cosmopolitan parasites of marine birds. This would leave only six or seven species, mostly widely distributed and of decided Old World affinities. Furthermore, it should be kept in mind that, with few exceptions (*Myophthiria reduvioides,* a specific parasite of cave-dwelling swifts; and possibly *Lynchia samoana*), these Old World flies show little host specificity, a fact which undoubtedly explains in part their range over a wide territory. The more species of birds a parasite is adapted to, the better are the chances of its being carried by a stray host into new territory and of its settling there on a new host species.

In view of the lack of individuality of the hippoboscid fauna of Oceania, little can be expected from a comparison of the several archipelagos. Except in the case of the Galapagos, the few differences shown in the subjoined grouping are probably purely accidental and due to imperfect collecting.

SURVEY OF DISTRIBUTION

Galapagos: *Olfersia sordida, Olfersia fossulata, Olfersia spinifera, Olfersia aenescens, Lynchia nigra, Lynchia albipennis, Microlynchia pusilla.*

Cocos Island: *Olfersia aenescens.*

Hawaiian islands: *Melophagus ovinus* (introduced), *Ornitheza metallica* (?), *Olfersia spinifera, Olfersia aenescens, Lynchia nigra, Pseudolynchia canariensis* (introduced), *Ornithoica pusilla; Ornithoica vicina* (introduced).

Marquesas: *Olfersia spinifera, Olfersia aenescens.*

Low Archipelago [Tuamotus]: *Olfersia spinifera, Olfersia aenescens.*

Fiji: *Hippobosca equina* (introduced), *Ornitheza metallica, Ornithoctona plicata, Olfersia spinifera, Olfersia aenescens, Lynchia suvaënsis, Myophthiria reduvioides, Ornithoica pusilla.*

Austral Islands: *Olfersia aenescens.*

Society Islands: *Olfersia aenescens, Ornithoica pusilla.*

Ducie Island: *Olfersia aenescens.*

Tonga: *Ornithoctona plicata, Ornitheza metallica.*

Samoa: *Ornitheza metallica, Ornithoctona plicata, Lynchia samoana, Ornithoica pusilla.*

Gilbert Islands: *Olfersia spinifera.*

New Hebrides: *Hippobosca equina* (introduced), *Ornitheza metallica, Ornithoctona plicata, Myophthiria reduvioides, Ornithoica pusilla.*

Loyalty Islands: *Ornitheza metallica, Ornithoica pusilla, Ornithoctona plicata, Hippobosca equina* (introduced).

New Caledonia: *Hippobosca equina* (introduced), *Ornitheza metallica, Ornithoctona plicata, Olfersia aenescens.*

Solomon Islands: *Ornitheza metallica, Ornithoctona plicata, Olfersia spinifera, Lynchia pollicipes, Ornithoica pusilla.*

Bismarck Archipelago: *Ornitheza metallica, Ornithoctona plicata, Lynchia pollicipes, Ornithoica pusilla, Ornithoica stipituri* (?).

Caroline Islands: *Ornithoctona plicata, Olfersia aenescens, Ornithoica pusilla.*

Marianas: *Ornithoica pusilla.*

HOST-PARASITE RELATIONS

One of the most interesting aspects of ectoparasitism is the study of the relations between parasite and host and of the factors that con-

dition host specificity. We are as yet inadequately informed as to the nature of these relations and of the factors involved. No doubt the physical properties of the skin and fur or feather cover of the host play some role, as they offer specific conditions of temperature, humidity, light, body-odor, and protection. The nesting and migratory habits of the host, and even its feeding habits (particularly in predatory mammals and birds), should likewise be of some importance. Nevertheless, the food preference of the parasite itself is usually the chief determining factor in host selection. Particularly in Hippoboscidae, where (as in the other Pupipara) the rate of reproduction is slow and determined primarily by the conditions under which the adult flies live, the nature of the diet should be of paramount importance for the survival of the species.

In the absence of experiments one must rely solely upon the empirical method of gathering and estimating host records. Since collecting ectoparasites does not usually come within the scope of the professional entomologist, he has to depend for material and observations on the student of vertebrates. Such cooperation is not a common practice, and, in Hippoboscidae, is readily discouraged by the quick and elusive habits of the flies. Moreover, the second-hand data obtained from the ornithologist must be used with caution, since the flies soon leave the body of the dead host and may wander onto other birds carried in the same box or bag. As far as possible, the normal occurrence of each species of fly on each host species should be based on several captures. Unusual host records should always be distrusted. In my study of the Hippoboscidae of Oceania, I have been particularly fortunate in having before me two large collections of flies brought together with unusual care by W. F. Coultas and James P. Chapin. The cooperation of these two ornithologists is greatly to be commended.

A study of several hundred Hippoboscidae from all parts of the world, carried on for the past 20 years, clearly shows that, on the whole, host specificity is much less pronounced in this family of flies than in most other ectoparasitic arthropods. Obviously this is due, in the first place, to the presence of functional wings in most species and to the fact that pupation usually takes place away from the host. It appears that these flies are usually not restricted to a blood diet of a specific nature, since the species that have been kept in captivity can usually be fed on different types of warm-blooded vertebrates.

The Hippoboscidae of mammals are perhaps more restricted in

their choice of host than those of birds, although there are often various accidental or temporary hosts, in addition to the normal ones. As might be expected, specificity is narrowest for the wingless species, such as *Melophagus ovinus,* which is a true specific parasite of sheep. On the other hand, the winged *Hippobosca equina,* although normally a parasite of equines, occurs freely on cattle in certain regions.

A discussion of the host-parasite relations of the avian Hippoboscidae, should, I believe, disregard all species known only from one or a few specimens (in our territory: *Lynchia pollicipes, L. samoana,* and *Ornithoica stipituri;* the host of *Lynchia suvaënsis* is unknown). The remaining species seem to fall into three groups.

(1) Strictly specific parasites. In our territory, this contains only *Myophthiria reduvioides,* a specific parasite, so far as known, of the cave-dwelling salangane swifts (several species of *Collocalia*). The wings of this fly are reduced to functionless stumps.

(2) Parasites restricted to fairly well-defined taxonomic or ecological bird groups. This is the usual type of host specificity among avian Hippoboscidae, as shown by the following examples:

Olfersia sordida: known from pelicans and cormorants.

Olfersia fossulata: on tropical marine birds: cormorants, gulls, gannets, pelicans, and terns.

Olfersia spinifera: normally a parasite of man-of-war birds, occasionally on pelicans and cormorants.

Olfersia aenescens: on tropical marine birds: albatrosses, tropic birds, boobies, petrels, shearwaters, and terns.

Lynchia nigra: normally on diurnal birds of prey, occasionally on owls.

Lynchia albipennis: a normal parasite of wading birds: herons, bitterns, and egrets; accidentally on ducks and gulls.

Pseudolynchia canariensis: a cosmopolitan parasite of several genera and species of wild and domestic pigeons (Columbidae), straying occasionally onto birds of prey and others.

Microlynchia pusilla: the host specificity is the same as that of *Pseudolynchia canariensis,* but the species is rarer and not as widely distributed.

(3) Species found on many unrelated groups of birds. The three most common bird-flies of our territory belong here:

Ornitheza metallica: reported in our territory from birds of nine families, in seven orders. Its usual hosts are probably small, arboreal, non-marine birds, from which it strays onto diurnal and nocturnal birds of prey. It is particularly common on kingfishers. It has not been taken on marine birds or wading birds.

Ornithoctona plicata: known in our territory from birds of seven families (in six orders). It is most commonly found on the larger terrestrial birds (pigeons, fowl, megapodes). From these it strays occasionally onto diurnal and nocturnal birds of prey. The isolated records from a wading bird (*Demigretta*) and a kingfisher (*Halcyon chloris*) are perhaps not trustworthy. There are no records from marine and passerine birds.

Ornithoica pusilla: this has the widest range of hosts of all the bird-flies in

our territory, being reported from birds of 14 families (in nine orders). It appears to be primarily a parasite of the smaller terrestrial birds, from which it strays onto diurnal and nocturnal birds of prey. The one record from a wading bird (*Demigretta*) is probably accidental.

From the foregoing discussion and the subjoined host distribution list, the conclusion seems warranted that, on the whole, there is a certain correlation between the size of the host and that of the bird-fly. The large flies (*Olfersia* and *Ornithoctona*) usually prefer large birds; very small flies (*Ornitheza* and *Ornithoica*) are more often found on small birds. Exceptions are the small *Lynchia albipennis* of large wading birds and the large *Pseudolynchia* and small *Microlynchia* of pigeons. It should also be noted that, while diurnal and nocturnal birds of prey are often infested with stray parasites of other birds (probably acquired from captured prey), they have also their own specific fly parasites (*Lynchia nigra* in our territory; other species elsewhere). It is also significant, I believe, that the Hawaiian honey creepers (Drepanididae), a strictly endemic family of birds, have no specific hippoboscid parasites. The only two records from this family relate to the common and widespread *Ornithoica pusilla,* which shows no host specificity. I am inclined to believe that the Hawaiian islands originally had no Hippoboscidae, apart from the species peculiar to tropical marine birds. Of the other Hawaiian species, three are recent introductions by man (*Melophagus ovinus, Ornithoica vicina,* and *Pseudolynchia canariensis*), one is of doubtful occurrence (*Ornitheza metallica,* based on the doubtful synonymy of the fly from Molokai reported as *Ornithomyia varipes* by Speiser), one is a New World species (*Lynchia nigra*) not found elsewhere in Oceania, and the last is the common *Ornithoica pusilla* mentioned above. Whether *Lynchia nigra* and *Ornithoica pusilla* reached Hawaii by natural means or were introduced with birds by man is open to question.

DISTRIBUTION ACCORDING TO HOSTS

MAMMALS

Domestic horse: *Hippobosca equina* (New Caledonia; New Hebrides; Fiji).
Domestic sheep: *Melophagus ovinus* (Hawaiian islands).

BIRDS[2]

[2] The limits and sequence of orders and families are those of E. Stresemann [in Kükenthal and Krombach, Handbuch der Zoologie, 7, 2d Half, (7 and 8), 1933-34]. The nomenclature is that of J. L. Peters, Check-List of Birds of the World, as far as issued (1-4, 1931-1940). In matters of nomenclature I have received much valuable assistance from J. L. Peters and J. C. Greenway, Jr., of the Museum of Comparative Zoology.

ORDER GALLI

MEGAPODIIDAE (MEGAPODES)

Megapodius eremita eremita Hartlaub: *Ornithoctona plicata* (Bismarck Archipelago).

PHASIANIDAE (PHEASANTS, PEACOCKS, FOWL)

Gallus gallus (Linnaeus), wild fowl: *Ornithoctona plicata* (Fiji; Carolines).
Domestic pheasant: *Ornithoica vicina* (Hawaiian islands).

ORDER COLUMBAE

COLUMBIDAE (PIGEONS)

Ptilinopus ponapensis (Finsch): *Ornithoctona plicata* and *Ornithoica pusilla* (Carolines).
Ptilinopus perousii Peale: *Ornithoctona plicata* (Samoa).
Ducula oceanica oceanica (Lesson and Garnot): *Ornithoctona plicata* (Carolines).
Ducula oceanica townsendi (Wetmore): *Ornithoctona plicata* and *Ornithoica pusilla* (Carolines).
Ducula rubricera rubricera (Bonaparte): *Ornithoctona plicata* (Bismarck Archipelago).
Ducula melanochroa (Sclater): *Ornithoctona plicata* (Bismarck Archipelago).
Columba livia Gmelin, domestic pigeon: *Pseudolynchia canariensis* (Hawaiian islands).
Macropygia amboinensis carteretia Bonaparte: *Ornithoctona plicata* (Bismarck Archipelago).
Reinwardtoena browni (Sclater): *Ornithoctona plicata* (Bismarck Archipelago).
Nesopelia galapagoensis (Gould): *Microlynchia pusilla* (Galapagos).
Gallicolumba beccarii johannae (Sclater): *Ornitheza metallica* and *Ornithoica pusilla* (Bismarck Archipelago).
Gallicolumba kubaryi (Finsch): *Ornithoctona plicata* (Carolines).
Caloenas nicobarica nicobarica (Linnaeus): *Lynchia pollicipes* (Bismarck Archipelago).
Didunculus strigirostris (Jardine): *Ornithoctona plicata* (Samoa).

ORDER RALLI

RALLIDAE (RAILS)

Rallus species (? *philippinensis goodsoni* Mathews): *Ornithoica pusilla* (Samoa).

ORDER LARO-LIMICOLAE

LARIDAE (GULLS AND TERNS)

Larus fuliginosus Gould, dusky or lava gull: *Lynchia albipennis* (Galapagos).
Sterna fuscata Linnaeus, sooty tern: *Olfersia aenescens* (Marquesas).
Anous minutus Boie, black noddy: *Olfersia aenescens* (Carolines).

ORDER TUBINARES

DIOMEDEIDAE (ALBATROSSES)

Diomedea irrorata Salvin, Galapagos albatross: *Olfersia aenescens* (Galapagos).

PROCELLARIIDAE (SHEARWATERS AND PETRELS)

Pterodroma phillipii (G. R. Gray), Kermadec petrel: *Olfersia aenescens* (Ducie Island).

Puffinus pacificus cuneatus Salvin, wedge-tailed shear-water: *Olfersia aenescens* (Hawaiian islands).

ORDER STEGANOPODES

PHAËTONTIDAE (TROPIC BIRDS)

Phaëton lepturus dorotheae Mathews, white-tailed tropic bird: *Olfersia aenescens* (Tuamotus).

Phaëton rubricauda melanorhynchos Gmelin, red-tailed tropic bird: *Olfersia aenescens* (Australs, Society Islands).

PELECANIDAE (PELICANS)

Pelecanus occidentalis californicus Ridgway, brown pelican: *Olfersia fossulata* (Galapagos).

SULIDAE (BOOBIES AND GANNETS)

Sula leucogaster brewsteri Goss, Brewster's brown booby: *Olfersia aenescens* (Cocos Island).

Sula sula rubripes Gould, red-footed booby: *Olfersia aenescens* (Galapagos, Tuamotus).

FREGATIDAE (MAN-OF-WAR BIRDS)

Fregata aquila Linnaeus, man-of-war bird: the Pacific records of *Olfersia spinifera* refer to *F. ariel* Gray, *F. minor* Gmelin, or *F. magnificens* Mathews.

Fregata minor minor Gmelin: *Olfersia spinifera* (Marquesas, Solomons).

Fregata minor ridgwayi Mathews: *Olfersia spinifera* (Galapagos).

Fregata magnificens magnificens Mathews: *Olfersia spinifera* (Galapagos).

ORDER GRESSORES

ARDEIDAE (HERONS AND BITTERNS)

Ardea herodias cognata Bangs: *Lynchia albipennis* (Galapagos).

Butorides sundevalli Reichenow: *Lynchia albipennis* (Galapagos).

Demigretta sacra (Gmelin): *Ornithoctona plicata* (Carolines), *Ornithoica pusilla* (Samoa).

Nyctanassa violacea pauper (Sclater and Salvin): *Lynchia albipennis* (Galapagos).

ORDER ACCIPITRES

ACCIPITRIDAE (HAWKS, VULTURES, FALCONS)

Hecinopernis longicauda infuscatus Gurney: *Ornithoctona plicata* (Bismarck Archipelago).

Aviceda subcristata bismarckii (Sharpe): *Ornitheza metallica* and *Ornithoica pusilla* (Bismarck Archipelago).

Accipiter novaehollandiae dampieri (Gurney): *Ornitheza metallica, Ornithoctona plicata, Lynchia pollicipes,* and *Ornithoica pusilla* (Bismarck Archipelago).

Accipiter novaehollandiae malaitae Mayr: *Ornithoica pusilla* (Solomons).
Accipiter brachyurus (Ramsay): *Ornithoica pusilla* (Bismarck Archipelago).
Accipiter albogularis G. R. Gray: *Ornithoctona plicata* (Solomons).
Buteo galapagoensis (Gould): *Lynchia nigra* and *Microlynchia pusilla* (Galapagos).
Circus approximans wolfi Gurney: *Ornithoctona plicata* (New Hebrides).

ORDER CUCULI

CUCULIDAE (CUCKOOS)

Centropus violaceus Quoy and Gaimard: *Lynchia pollicipes* and *Ornithoica pusilla* (Bismarck Archipelago).

ORDER PSITTACI

PSITTACIDAE (PARROTS)

Kakatoe ducrops Bonaparte (= *Cacatua ducorpsii* Pucheran): *Lynchia pollicipes* (Solomons).
Lorius roratus solomonensis (Rothschild and Hartert): *Lynchia pollicipes* (Solomons).
Melopsittacus undulatus (Shaw) (Australian, introduced into Hawaiian islands): *Ornithoica pusilla* (Hawaiian islands).

ORDER STRIGES

STRIGIDAE (OWLS)

Asio flammeus sandwichensis (Bloxam), Hawaiian short-eared owl: *Lynchia nigra* and *Ornithoica pusilla* (Hawaiian islands).
Ninox odiosa Sclater: *Ornitheza metallica* and *Ornithoica pusilla* (Bismarck Archipelago).
Ninox jacquinoti malaitae Mayr: *Ornithoica pusilla* (Solomons).

TYTONIDAE (BARN OWLS)

Tyto aurantia (Salvadori): *Ornithoica pusilla* (Bismarck Archipelago).
Tyto alba lulu (Peale): *Ornithoctona plicata* (New Hebrides).

ORDER CORACIAE

CORACIIDAE (ROLLERS)

Eurystomus orientalis crassirostris Sclater: *Ornitheza metallica* (Bismarck Archipelago).

ORDER HALCYONES

ALCEDINIDAE (KINGFISHERS)

Todiramphus veneratus (Gmelin): *Ornithoica pusilla* (Society Islands).
Halcyon juliae Heine: *Ornitheza metallica* (New Hebrides), *Ornithoica pusilla* (New Hebrides, Solomons).
Halcyon chloris teraokai Kuroda: *Ornithoica pusilla* (Carolines).

Halcyon chloris tristrami Layard: *Ornitheza metallica* and *Ornithoica pusilla* (Bismarck Archipelago).
Halcyon chloris santoensis Mayr: *Ornitheza metallica* (New Hebrides).
Halcyon chloris tannensis Sharpe: *Ornitheza metallica* and *Ornithoctona plicata* (New Hebrides).
Halcyon tutuilae Sharpe: *Ornithoica pusilla* (Samoa).
Halcyon cinnamomina reichenbachi (Hartlaub): *Ornithoica pusilla* (Carolines).
Halcyon sanctus sanctus Vigors and Horsfield: *Ornitheza metallica* and *Ornithoica pusilla* (Bismarck Archipelago)
Halcyon albonotatus Ramsay: *Ornitheza metallica* (Bismarck Archipelago).
Sauromarptis tyro (Gray): *Ornithoica stipituri* (?) (Bismarck Archipelago).

ORDER MACROCHIRES

MICROPODIDAE (SWIFTS)

Collocalia spodiopyga assimilis Stresemann: *Myophthiria reduvioides* (Fiji).
Collocalia vanikorensis (Quoy and Gaimard): *Myophthiria reduvioides* (Fiji, New Hebrides).

HEMIPROCNIDAE (FAIRY SWIFTS)

Hemiprocne mystacea aëroplanes Stresemann: *Ornitheza metallica* (Bismarck Archipelago).

ORDER PASSERES

PITTIDAE (PITTAS)

Pitta macklotii gazellae Neumann: *Ornitheza metallica* (Bismarck Archipelago).

TURDIDAE (THRUSHES)

Turdus samoensis Tristram: *Lynchia samoana* (Samoa).

MUSCICAPIDAE (FLYCATCHERS)

Myiagra ferrocyanea malaitae Mayr: *Ornitheza metallica* (Solomons).
Myiagra vanikorensis (Quoy and Gaimard): *Lynchia samoana* and *Ornithoica pusilla* (Samoa).
Piezorhynchus verticalis (Sclater): *Ornithoica pusilla* (Bismarck Archipelago).

STURNIDAE (STARLINGS)

Aplonis brevirostris (Peale): *Ornitheza metallica* (Samoa).
Aplonis atrofusca (Peale): *Ornithoica pusilla* (Samoa).
Aplonis pelzelni Finsch: *Ornithoica pusilla* (Carolines).

DICRURIDAE (DRONGOS)

Dicrurus bracteatus laemostictus Sclater: *Ornithoica pusilla* (Bismarck Archipelago).

DREPANIDIDAE (HAWAIIAN HONEY CREEPERS)

Himatione stejnegeri Wilson (= *Chlorodrepanis virens stejnegeri* Wilson): *Ornithoica pusilla* (Hawaiian islands).
Vestiaria coccinea (Forster): *Ornithoica pusilla* (Hawaiian islands).

Key to the Genera of Hippoboscidae of Oceania

1. Wings absent or much reduced in size and non-functional. Ocelli absent 2
   Wings functional, broad, of normal shape 4

2(1). Wings and halteres entirely absent. Claws seemingly bidentate. Parasites of mammals ..... **Melophagus.**
   Wings present but short and non-functional. Halteres present. Claws seemingly tridentate. Parasites of birds 3

3(2). Wings very short and broadly rounded at apex, at most as long as thorax, with only two longitudinal veins behind costa. Eyes short, placed on sides of head ..... **Myophthiria.**
   Wings at least as long as thorax and more or less pointed at apex, always with more than two longitudinal veins behind costa. Eyes long, extending over dorsal face of head ..... **Crataerina.**

4(1). Head convexly rounded posteriorly and entirely free from the thorax. Wings with open anal cell, the membrane bare, with many fine parallel wrinkles. Ocelli absent. Claws seemingly bidentate. Parasites of mammals (in Oceania) ..... **Hippobosca.**
   Occipital margin of head more or less truncate or slightly concave, fitted into an emargination of the anterior margin of thorax; if free, wings with closed anal cell. Wing membrane not wrinkled. Parasites of birds 5

5(4). A closed anal cell; three cross-veins present in wing. Ocelli present, sometimes quite small 6
   Anal cell open; posterior basal cross-vein (Cu_2) absent 9

6(5). Third longitudinal vein (R_{4+5}) confluent with costa over its apical portion. Claws seemingly bidentate ..... **Ornithoica.**
   Third longitudinal vein not confluent, but ending in costa at a distinct angle. Claws seemingly tridentate 7

7(6). Second longitudinal vein (R_{2+3}) running parallel to costa and more or less fused with it beyond apex of first longitudinal vein. Antennal processes small, not leaflike ..... **Ornitheza.**
   Second longitudinal vein running throughout far from costa 8

8(7). Antennal processes small, narrow, their inner margins diverging ..... **Ornithomyia.**
   Processes of antennae broad, leaflike, their inner margins parallel to each other ..... **Ornithoctona.**

9(5). Posterior basal cell at least partly closed; two cross-veins present in wings 10
   Posterior basal cell open; wings with only one cross-vein (the anterior cross-vein, r-m). Ocelli absent or vestigial 12

10(9). Ocelli present. Frons and face as in *Lynchia* ..... **Ornithophila.**
   Ocelli absent 11

11(10). Frons and face about evenly divided by ptilinal suture, the long lower portion (fronto-clypeus) touching the long vertical plate (postvertex) ..... **Olfersia.**
   Lower portion of face (fronto-clypeus, below ptilinal suture) much shorter than upper portion; vertical plate (postvertex) also short; the two separated by a long mediovertex ..... **Lynchia.**

12(9). Scutellum with straight hind margin and square lateral angles. Ocelli absent ..... **Pseudolynchia.**
Scutellum convex or truncate behind, with broadly rounded lateral angles. Ocelli vestigial..... **Microlynchia.**

Subfamily HIPPOBOSCINAE

Genus **HIPPOBOSCA** Linnaeus

1. **Hippobosca equina** Linnaeus, Syst. Nat., 10th ed. **1**: 607, 1758 (no sex, off horses and cattle; "Europe and North America"). Froggatt, Agr. Gaz. New South Wales **11**: 1089, pl. 1, figs. 5-6, 1900 (erroneously labelled "wallaby fly, *Olfersia macleayi*": found at Noumea, New Caledonia in 1895). Austen, Ann. Mag. Nat. Hist. VII, **12**: 246, 1903 (male, Noumea, New Caledonia); Illustr. British Blood-sucking Flies, 63, pl. 31, 1906 (Fiji; New Caledonia). Bryan, Haw. Ent. Soc., Proc. **5**: 346, 1924 (Tanna Island, New Hebrides). Buxton, Researches in Polynesia and Melanesia **1-4**: 56, 1927 (Vila, New Hebrides; New Caledonia). Falcoz, Encycl. Entom., Diptera **5** (1929): 42, 1930 (New Caledonia). J. Bequaert, Psyche **37** (4): 310, 1931 (Plum Farm, New Caledonia). G. B. Thompson, Ent. Mo. Mag. **74**: 15, 1938.
Hippobosca species, Curran, Am. Mus. Nov. (375): 15, 1929 (female; Plum Farm, New Caledonia).

Specimens Examined

New Caledonia: Plum Farm (T. D. A. Cockerell).
Loyalty Islands: Ouvea (L. Macmillan).
New Hebrides: Vila, Efate (or Sandwich Island), very common on horses (P. A. Buxton); Tanna Island (E. Robertson, Macmillan).

At present *H. equina* is known in Oceania only from New Caledonia, Loyalty Islands, Fiji, and New Hebrides. In New Caledonia it was common in 1895 and believed by Froggatt in 1900 to have been introduced some six years earlier from Algeria. Austen records it in 1906 from Fiji. Robertson found it in 1923 in the New Hebrides, where, according to Buxton, it had been introduced a few years earlier from New Caledonia. Although accidentally imported into Australia, from time to time, it has apparently not become established there. There are records of its occurrence in India (Austen), Burma (Austen), Tonkin (Falcoz), Singapore (J. Bequaert),

the Sunda Islands (Java, Madura, Bali, Lombok, Flores, Sumbawa and Salayar, according to Schuurmans-Stekhoven), Amboina (Bequaert), the Philippines (Bezzi, Bequaert), and Celebes (Austen). In Europe and Oceania, equines, particularly horses, seem to be the preferred hosts; but in the Sunda Islands this species is taken more frequently on cattle.

Subfamily MELOPHAGINAE

Genus **MELOPHAGUS** Latreille

2. **Melophagus ovinus** (Linnaeus).

Hippobosca ovina Linnaeus, Syst. Nat., 10th ed., **1**: 607, 1758 (no sex, off domestic sheep; no locality given, but evidently from Europe).

Melophagus ovinus Muir, Haw. Ent. Soc., Proc. **7**: 4, 1928 (Honohina, Hawaii). Swezey and Williams, Haw. Ent. Soc., Proc. **8**: 188, 1932 (Keanakolu, Hawaii). Bryan, Haw. Ent. Soc., Proc. **8**: 444, 458, 1934. G. B. Thompson, Ent. Mo. Mag. **74**: 16, 1938.

The sheep-ked, a specific parasite of domestic sheep has been carried with its host over much of the world. In Oceania it is reported thus far only from the Hawaiian islands, but it occurs no doubt elsewhere. According to Froggatt and Tillyard, it is common in Australia, Tasmania, and New Zealand.

Subfamily ORNITHOMYINAE

Genus **ORNITHOMYIA** Latreille

There appears to be no reliable record of this genus from Oceania. Since it is common in Australia and New Zealand, it may yet turn up in some of the larger islands of the western Pacific.

I have provisionally listed Speiser's record of *Ornithomyia varipes,* from Molokai, Hawaiian islands, under *Ornitheza metallica,* where it is discussed. Yet it may have been a true *Ornithomyia,* either the common North American *O. fringillina* Curtis or one of the species of Australia and New Zealand. I have been unable to trace the whereabouts of Speiser's specimen.

Genus **ORNITHEZA** Speiser

3. **Ornitheza metallica** (Schiner) (fig. 1, *a-c*).

Ornithomyia metallica Schiner, Fauna Austriaca, Die Fliegen **2**: 646, 1864 (no sex, no host; Austria).

Ornitheza metallica Ferris, Insects of Samoa **6** (1): 14, figs. 3-4, 1927 (male, off *Aplonis brevirostris,* Upolu, Vailima, Samoa; off *Halcyon juliae,* Espiritu Santo Island, Tanna Island, New Hebrides). Falcoz, Encycl. Ent., Diptera **5** (1929): 30, 1930 (male, female; Netche, Mare Island, Loyalty Islands; Oubatche, New Caledonia). G. B. Thompson, Ent. Mo. Mag. **74**: 47, 1938.

Ornithomyia gestroi Rondani, Mus. civ. stor. nat. Genova, Ann. **12**: 156, 1878 (female, off *Falco eleonorae;* Galita Island near Tunis).

Ornithomyia andajensis Rondani, Mus. civ. stor. nat. Genova, Ann. **12**: 155, 1878 (no sex, no host; Andai, New Guinea).

Ornitheza andaiensis Speiser, Zeitschr. Syst. Hym. Dipt. **2**: 165, 170, 1902 (off *Halcyon sanctus,* New Lauenburg [Duke of York], Bismarck Archipelago).

Olfersia noumeana Bigot, Soc. Ent. France, Ann. VI, **5**: 240, 1885 (no sex; off *"Alcedo",* New Caledonia). [Speiser, Zeitschr. Syst. Hym. Dipt. **2**: 170, 1902, saw the type, which he synonymized with *Ornitheza andajensis*].

Ornithomyia aenescens Bigot, Soc. Ent. France, Ann. VI, **5**: 245, 1885 (no sex, no host; New Caledonia). [Speiser, Zeitschr. Syst. Hym. Dipt. **2**: 170, 1902, saw the type, which he synonymized with *Ornitheza andajensis*].

? *Ornithomyia varipes* Speiser, Fauna Haw. **3**: 89, 1902 (Molokai, Hawaiian islands, 3,000 ft.). Austen, Ann. Mag. Nat. Hist. VII, **12**: 262, 1903 (in part: female, Molokai). Bryan, Haw. Ent. Soc., Proc. **8**: 443, 458, 1934. Not of Walker, 1849.

Specimens Examined

Bismarck Archipelago: New Britain, off *Hemiprocne mystacea aëroplanes, Eurystomus orientalis crassirostris, Aviceda subcristata bismarckii, Accipiter novaehollandiae dampieri, Gallicolumba beccarii johannae, Halcyon albonotatus, Halcyon chloris tristami, Pitta macklotii gazellae,* and *Ninox odiosa* (W. F. Coultas); Lihir Island, Lihir group, off *Halcyon chloris* (subspecies ?) and *Ptilinopus insolitus*

(Coultas); Mali Island, Lihir group, off *Halcyon chloris* (Coultas); Boang Island, Tanga group, off *Halcyon chloris* (Coultas).

Solomons: Lunga, Guadalcanar, off *Acridotheres tristis,* introduced (R. A. Lever); Tatamba, Isabel Island (Lever); Malaita Island, off *Eurystomus orientalis solomonensis* and *Myiagra ferrocyanea malaitae* (Coultas).

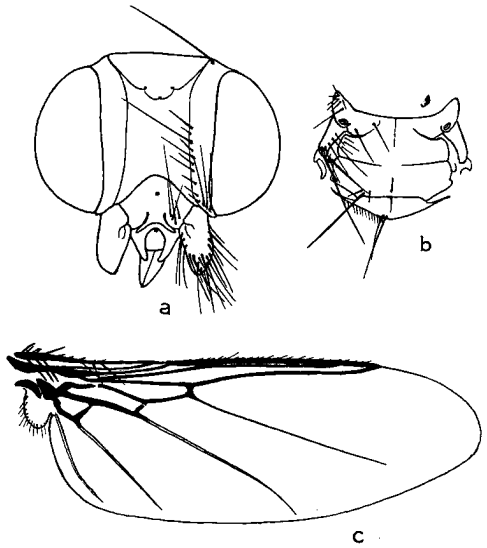

FIGURE 1.—*Ornitheza metallica* (Schiner), female: **a,** head seen in front; **b,** thorax from above; **c,** wing.

New Hebrides: off *Halcyon chloris santoensis,* without more definite locality (Coultas); Gaua, Banks Islands (T. T. Barnard); Espiritu Santo, off *Halcyon juliae* (P. A. Buxton) and off *Halcyon chloris tannensis,* at Hog Harbor (Crane Pacific Exp.); east Tanna Island, off *Halcyon chloris tannensis* (L. Macmillan).

Loyalty Islands: Lifu (British Museum).

New Caledonia: Poampai [Mount Paompai ?], off a kingfisher (P. D. Montague); Isle of Pines (MacGillivray).

Tonga: Nomuka Iki, off a kingfisher (U. S. Nat. Mus.).

Fiji: Lau Islands, Munia Island, off kingfisher; Ongea; Savu Island, off kingfisher; Kimbombo. (All E. H. Bryan, Jr.)

After studying many specimens of *Ornitheza* from Europe, Asia, Africa, and Oceania, I am unable to recognize more than one species

in the genus and I regard the five names listed above as synonyms. Moreover, Falcoz in 1930 also united *andajensis* Rondani, *gestroi* Rondani, *noumeana* Bigot and *aenescens* Bigot with *metallica.* In the case of Rondani's species, he based his conclusion on a study of the types. The specimen recorded by Speiser as *Ornithomyia varipes* from Molokai [P. H. Grimshaw's second species of Hippoboscidae, Fauna Haw. **3** (1): 77, 1901], was probably *Ornitheza,* since he says: "Die Mediastinalis ist ganz an die Subcostalis angelegt." If this surmise be correct, the Molokai fly could not have been *Ornithomyia varipes* Walker (List Dipt. Brit. Mus. **4**: 1146, 1849. Colombia). Walker's type, at the British Museum, although poorly preserved, is an *Ornithomyia,* not an *Ornitheza.* I have as yet seen no true *Ornitheza* from the New World. Coquillett's *Ornithomyia butalis,* which appears to be identical with *Ornitheza metallica,* came from Bering Island off the coast of Kamchatka.

According to Schiner, 1864, *Hippobosca metallica* Schummel (Uebersicht d. Arbeiten Veränd. Schles. Ges. Vaterl. Cultur, 71, 1832), from Silesia, Germany, was either *Lynchia ardeae* (Macquart) or *Ornitheza metallica* (Schiner). The name has, however, no standing in nomenclature, not being validated by a description. It was used merely in the following sentence: "Aus der Familie der Coriaceae entdeckte Herr Rotermund eine neue Art von *Hippobosca,* die er *metallica* nannte, an *Ardea stellaris.*"

Hippobosca strigis Scopoli (Annus V. Historico-Naturalis, 124, 1772) is listed in 1930 by Falcoz among the synonyms of *O. metallica.* If it were shown that Scopoli's fly was beyond doubt an *Ornitheza,* his name would take precedence over all others. Since the type no longer exists, we must rely solely on the brief description:

> Diagn. Major *H. equina;* abdomine emarginato caeruleo. Bis vidi in *Strigo bubone.* Rostrum pilis duobus divaricatis terminatum. Os setulis barbatum. Oculi castanei. Macula cervicalis fusca. Antennae rufae, pilosae. Corpus subtus abdomini concolor. Abdomen setis nigris pubescens. Alae excolores, lineas 3 1/2 longae. Pedes sordide lutei, villosuli. Ungues in singulo pede quatuor nigri.

No locality is given, but the insect probably was taken near Kremnitz (now in Czechoslovakia). Bergroth (Medd. Fauna Flora Fennica **27**: 149, 1901) referred it to *Olfersia* (= *Lynchia*). Speiser (Termesz. Füzetek **25**: 335, 1902), on the other hand, claimed that it was more likely *Ornitheza gestroi,* but left the matter undecided. I believe that the size (larger than *Hippobosca equina;* wing length 3.5

lines = 7.7 mm.) makes Bergroth's opinion more probable. *Ornitheza metallica* is much too small.

O. metallica occurs over most of the Old World. I have seen it from Europe, Africa, Asia, New Guinea, and Australia. In Oceania it is known from the Bismarck Archipelago, Solomons, New Hebrides, Loyalty Islands, New Caledonia, Fiji, Samoa and (doubtfully) Hawaiian islands. It is found on a variety of hosts, as shown by my host list; but it is particularly common on kingfishers. Both Macmillan and Mayr noted, in the New Hebrides, that nine out of ten specimens of *Halcyon chloris* were parasitized by this fly.

Genus **ORNITHOCTONA** Speiser

Only two species of this genus are known to me from the Orient, the East Indies, Australia, and the Pacific. One of these, *O. plicata* (v. Olfers), is definitely known from the territory covered by this paper. The other *O. australasiae* (Fabricius), is included only on the basis of Fabricius' original reference, but no doubt will eventually be taken in the Bismarck Archipelago or Solomons.

Bau's record of the American *Ornithoctona haitiensis* (Bigot) (a synonym of *O. erythrocephala* Leach), from New Caledonia (Zool. Anzeiger **85**: 11, 1929) must be due to some error, either of identification or of locality.

Key to the Species of Ornithoctona

1. Apex of fore tibiae produced beneath into a bluntly rounded plate in female, bearing a tuft of setulae in male. Appendage of second antennal segment somewhat compressed (vertically) at apex, where it is spatulate and broadly rounded. Scutellum with four to six pairs of preapical bristles. Abdomen without tergal plates in female, with three large tergal plates in male. Wing membrane entirely bare. Larger species, the forewing 9.5 to 11 mm. long.....**O. plicata.**

   Apex of fore tibiae normal, not produced into a plate in female, without tuft of setulae in male. Appendage of second antennal segment depressed throughout and narrowed into a point at apex. Scutellum with one to three pairs of preapical bristles. Abdomen with three small, median tergal plates in female and three large tergal plates in male. Wing membrane with patches of setulae in apical third. Smaller species, the forewing 6.5 to 7.5 mm. long.....**O. australasiae.**

4. **Ornithoctona plicata** (v. Olfers).

   Ornithomyia plicata v. Olfers, De Vegetativis et Animatis Corporibus 1: 102, 1816 (no sex, no host; Mauritius).

Ornithoctona plicata Speiser, Zeitschr. Syst. Hym. Dipt. **2**: 176, 1902 (type at Berlin Mus.). Austen, Insects of Samoa **6** (1): 20, 1927 (in footnote, *nigricans* Leach is a synonym). Bau, Zool. Anzeiger **85**: 10, 1929 (Fiji). Falcoz, Encycl. Entom., Diptera **5** (1929) :34, 1930 (New Caledonia; Vavau, Tonga). G. B. Thompson, Ent. Mo. Mag. **74**: 16, 1938. J. Bequaert, Mushi **12**(2): 81, 1939 (Carolines, Ponape, off *Ducula oceanica townsendi*).

Ornithomyia nigricans "Latreille" Leach, Gen. Spec. Eprobosc. Ins., 12, pl. 27, figs. 7-10, 1817 (no sex, no host; Bengal, India); Mem. Werner. Soc. Edinburgh **2**: 558, pl. 27, figs. 7-10, 1818.[3]

Ornithoctona nigricans Austen, Ann. Mag. Nat. Hist. VII, **12**: 263, 1903 (type at British Mus.). Speiser, Mus. civ. stor. nat. Genova, Ann. **41**: 338, 1904. Ferris, Insects of Samoa **6** (1): 20, 1927 (female, off *Ptilinopus perousii,* Samoa, Upolu: Vailima, Malololelei); Philippine Jour. Sci. **34**: 215, figs. 7-8, 1927 (male, female, off *Circus approximans wolfi,* Tanna Island, New Hebrides). Curran, Am. Mus. Nov. (375): 15, 1929 (female, off small hawk; Plum Farm, New Caledonia).

Ornithomyia columbae Wiedemann, Analecta Entom., 60, 1824 (no sex, no host; Java); Aussereurop. Zweifl. Ins. **2**: 609, 1830 (no sex, off a pigeon; Java).

Hippobosca australis Guérin-Méneville, in Duperrey, Voy. Coquille, Zool., Atlas, Insectes, pl. 21, fig. 12, 1831; Text, Zool. 2(2), div. 1: 302, 1838 (no sex, no host; Port Jackson, Australia).

Ornithomyia batchianica Walker, Linn. Soc. London, Jour. Proc., Zool. **5**: 300, 1861 (no sex, no host; Batjan).

Ornithomyia batchiana "Bell." Rondani, Mus. civ. stor. nat. Genova, Ann. **12**: 158, 1878 (described as a new species; no sex, no host; Grafton, Australia; Philippines).

Ornithoctona batschiana Bau, Zool. Anzeiger **85**: 10, 1929.

Ornithomyia doreica Walker, Linn. Soc. London, Jour. Proc., Zool. **5**: 254, 1861 (female, no host; Dorey, New Guinea).

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[3] Speiser (Mus. civ. stor. nat. Genova, Ann. **41**: 345, 1904) claims that Leach's figures of *O. australasiae* and *O. nigricans* should be transposed, but I cannot follow him in this. Plate 25, figures 6 and 7 show the "caput testaceum", as described for his *O. australasiae;* and plate 27, figures 7 and 9, the "caput fuscum" as described for *O. nigricans.* The figure of *australasiae* is also smaller than that of *nigricans* (both supposedly natural size), and the size of plate 27, figure 7 is correct for *nigricans.*

Ornithomyia hatamensis Rondani, Mus. civ. stor. nat. Genova, Ann. **12**: 158, 1878 (no sex, no host; Hatam, New Guinea).

Ornithomyia hova Bigot, Soc. Ent. France, Ann. VI, **5**: 241, 1885 (no sex, no host; Madagascar). [Speiser, Zeitschr. Syst. Hym. Dipt. **2**: 166, 1902, saw the type, which he synonymized with *Ornithoctona plicata*.]

Ornithoctona nigricornis Speiser, Term. Füzetek **25**: 329, 1902 (error for *nigricans*).

Ornithoctona melaena Speiser, Mus. civ. stor. nat. Genova, Ann. **41**: 347, 1904 (no sex, no host; Si Rambé, Sumatra).

Ornithomyia asiatica Macquart, Soc. Sci. Lille, Mém. (1850), 282, pl. 28, fig. 14, 1851 (no sex, no host; Asia); Dipt. Exot., Suppl. **4** (2): 309, pl. 28, fig. 14, 1851.

Hippobosca viridipes Walker, Ent. Soc. London, Trans. (n.s.) **4** (6): 235, 1858 (no sex, no host; New South Wales).

Hippobosca sitiens Boisduval, Voy. Astrolabe, Zool. Faune Entom. Océan Pacifique **2**: 667, pl. 12, fig. 16, 1835 (no sex, no host; Vanikoro, Fiji).

Ornithoctona sitiens Speiser, Term. Füzetek **25**: 329, 1902; Mus. civ. stor. nat. Genova, Ann. **41**: 339, 1904.

Ornithomyia kanakorum Bigot, Soc. Ent. France, Ann. VI, **5**: 244, 1885 (no sex, no host; New Caledonia).

Ornithoctona kanakorum Speiser, Zeitschr. Syst. Hym. Dipt. **2**: 170, 1902 (saw the type).

Ornithomyia australasiae Latreille, Encycl. Méth. Insectes **8**(2): 544, 1812 ("îles de l'Océan austral; île de France"). Macquart, Hist. Nat. Ins. Dipt. **2**: 642, 1835. Not *Hippobosca australasiae* Fabricius, 1805.

Ornithoctona australasiae Speiser, Mus. civ. stor. nat. Genova, Ann. **41**: 345, 1904 (Viti Levu, Fiji). Jepson, Rept. Econ. Entom., Dept. Agric., Fiji, Council Paper **25**: 27, 1911 (off wild fowl, Fiji). Bau, Zool. Anzeiger **85**: 10, 1929 (Mioko, Duke of York; Ponape, Carolines; Samoa, off *Didunculus strigirostris*).

Ornithoctona vitrina Speiser, Mus. civ. stor. nat. Genova, Ann. **41**: 343, 1904 (female, no host; Vavau [Wawao], Tonga).

Ornithoctona magna Ferris, Philippine Jour. Sci. **22**: 339, 1925 (cited from various localities and hosts in the Philippines, but

without description); Sarawak Mus. Jour. 3 (3), no. 10: 285, pl. 11, fig. 2, *e-h,* 1926 (male, female, off *Spilopelia tigrina;* Kalabit District, Borneo).

Ornithomyia tropica Kishida, Iconogr. Insect. Japon., 244, fig. 473, 1932 (female, off "ōchū", probably *Dicrurus macrocercus harterti* S. Baker, and "sanshokūi", probably *Pericrocotus roseus divaricatus* Raffles; Formosa and Philippines).

Specimens Examined

Carolines: Ponape, off *Gallicolumba kubaryi, Ducula oceanica townsendi,* and *Ptilinopus ponapensis* (Coultas); Kusaie, off *Gallus gallus, Demiegretta sacra,* and *Ducula oceanica oceanica* (Coultas); Ponape, Nampir-Nanalaut, off *Ducula oceanica townsendi* (T. Esaki); Ponape, Nipit-Ninoani, off *Ducula oceanica townsendi* (Esaki).

New Britain: off *Accipiter novaehollandiae dampieri, Megapodius eremita eremita, Macropygia amboinensis carteretia, Reinwardtoena browni,* and *Hecinopernis longicauda infuscatus;* Nakanai Mts., alt. 5,000 ft., off *Ducula melanochroa* (Coultas). Lihir, Lihir Islands, off *Ducula rubricera rubricera* (Coultas).

Solomons: Malaita Island, off *Accipiter albogularis* (V. H. Hamlin).

New Hebrides: east Tanna Island, off *Halcyon chloris tannensis, Tyto alba lulu,* and *Circus approximans* (Macmillan); Tataru, alt. 4,000 ft., west Espiritu Santo, off *Circus approximans* (J. R. Baker); Tanna Island (Robertson).

New Caledonia: Plum Farm, off a small hawk (Cockerell).

Loyalty Islands: Ouvea, without host (Macmillan).

Fiji: Lau, Ongea (Bryan), Tuvutha (Bryan), Vanau Vatu [Vanua Vatu], off a pigeon (Bryan), Olorua, off a pigeon (R. H. Beck), Moala, off a pigeon (Beck, Bryan).

O. plicata is widely distributed, being known with certainty from Korea, Formosa, India, Ceylon, Siam, Sumatra, Borneo, the Philippines, Java, Australia, New Guinea, the Comoros, Mauritius, Madagascar, the Carolines, Bismarck Archipelago, Solomons, New Hebrides, New Caledonia, Samoa, Fiji, and Tonga. I have not yet seen it from the African continent. The only published record from Africa by C. W. Johnson (Acad. Nat. Sci., Proc. Philadelphia, 164, 1898; Dada, Somaliland), was based upon a misidentification as *O. nigricans*

Leach. I have seen these specimens, which are *Lynchia dukei* Austen. The range of hosts is large (see list in introduction) and none seems to be particularly preferred.

The type of *O. plicata* v. Olfers, at the Berlin Museum, was studied and redescribed by Speiser in 1902. In 1903, Austen recognized the type of *O. nigricans* Leach at the British Museum as an *Ornithoctona* and in 1927 synonymized it with *plicata.* The type of *O. batchianica* Walker, at the British Museum, was recognized by Austen (1903) as *O. nigricans* Leach. The types of *O. batchiana* Rondani and *O. hatamensis* Rondani, at the Genoa Museum, were studied by Speiser (1904), who stated that they are only color variants of *O. nigricans.* Speiser, 1902, also studied the type of *O. hova* Bigot and *O. kanakorum* Bigot, now in the collection of James E. Collin, Newmarket, England; the first he synonymized with *O. plicata,* the second he regarded in 1904 as a color variant of *O. nigricans.*

Latreille's *O. australasiae* (1812) was certainly *O. plicata,* not Fabricius' *Hippobosca australasiae,* since he says that it is the largest species known to him, "ayant un peu plus de six lignes [= 13.2 mm.] de longueur, depuis la tête jusqu'au bout des ailes." His description was evidently based on the specimen from "île de France" [Mauritius], collected by M. Mathieu, and he probably did not see Fabricius' type. All references in the literature to supposed *O. australasiae* from the Pacific Islands refer to *O. plicata.* Speiser (1904), for instance, mentions expressly the flattened plate at the tip of the fore tibiae of his specimen from Viti Levu, which was 9 mm. long. Macquart's (1830) *O. australasiae* from Australasia was 4 French lines [= 9 mm.] long.

Guérin's *H. australis* was recognized by Speiser as *O. plicata,* and the size given evidently could refer only to this species: length, 11 mm.; wing spread, 25 mm. I also regard *O. asiatica* Macquart as a synonym of *O. plicata,* the size (3.5 French lines = 8 mm.) being too large for *O. australasiae.* Speiser (Mus. civ. stor. nat. Genova, Ann. 41 : 341, 1904) regarded *O. asiatica* as distinct from *O. plicata,* because he read in Macquart's description: "cellule basilaire interne *insensiblement* plus courte que l'externe." But Macquart actually wrote: "cellule basilaire interne *sensiblement* plus courte que l'externe," which is true of *plicata.* Macquart's figure of the wing is worthless.

I have seen the type of *O. columbae* Wiedemann in the Wester-

mann Collection at the University Museum, Copenhagen. It is not separable from *O. plicata.* The size given was 3.5 Danish lines [= 7.7 mm.].

O. doreica Walker, *H. sitiens* Boisduval, and *H. viridipes* Walker were included by Speiser under *O. plicata,* and I have no reason to disagree with this conclusion. Ferris in 1927 recognized the identity of his *O. magna* with *O. nigricans* (= *O. plicata*).

I feel confident that *O. melaena* Speiser and *O. vitrina* Speiser are not separable from *O. plicata.* For *O. melaena,* the author gives the size (in dry condition) as 7.6 mm., with the wing 9.5 mm. long, and mentions the presence of the plate at the apex of the fore tibiae. The length of *O. vitrina* is about the same (7.5 mm. in dry condition); unfortunately the shape of the fore tibiae is not mentioned, but, since it is compared with the several color variations of *O. plicata,* I assume that the apex ended in the plate characteristic of this species (unless the specimen was a male). As I have seen no specimens as yet of *Ornithoctona* from Tonga, it may be useful to transcribe the original description of *O. vitrina:*

Länge des trocken aufbewahrten Tieres 7.5 mm., Mundrand-Scutellarrand 4.5 mm. Kopf kastanienbraun, sehr lebhaft bunt gezeichnet. Die Augenränder und das Scheiteldreieck schwarzbraun, auf dem Scheiteldreieck entspringen zwei breite ockergelbe Striemen, welche divergierend nach vorn zum äusseren Rande der Antennengruben verlaufen. Clypeus weissgelb mit schwarzbraunem oberen Rande, Antennenfortsätze weissgelb mit schwarzbraunem Aussen- und Innenrande, Maxillarpalpen auf der Wurzelhälfte weiss, auf der distalen braun. Thorax stark glänzend, ebenfalls bunt; Grundfarbe oben dunkelbraun, die Ventralflache, die Brustseiten, Schulterecken und eine von vorn bis etwas hinter die Mitte reichende Längsstrieme heller, gelbbraun in verschiedenen Tonen. Die Schulterecken z. B. werden nach innen und hinten von den weissen Mesothorakalstigmen allmählich dunkler braun und gehen fast unmerklich über in den Grundton des Thorax. Scutellum kastanienbraun mit gelbbraunem Streifen längs dem Vorderrande; in seiner Mitte ein nach hinten breiter werdender Streifen kurzer Querfurchen, in der Furche vor dem Hinterande etwa 10 ziemlich dünne Borsten. Beine hell und bunt. Schenkel hinten fast ganz und vorne bis zur Mitte weissgelb, dann dunkler braun werdend, die Kniee schwarzbraun. Tibien und Tarsen beingelb mit schwarzbrauner Innen und Aussenkante. Flügel glasshell, bei gewisse Beleuchtung sogar etwas milchig erscheinend, ohne Spur von Bräunung; die Adern tiefbraun mit den gewöhnlichen weissen Stellen. Letzter Abschnitt der Costalis halb so lang als der vorletzte, wie bei der Type von *O. hatamensis* Rond.; hintere Basalzelle ein Stück kürzer als die vordere. Das Flügelgeäder bietet bei diesem Stück noch eine interessante Asymmetrie dadurch, dass auf dem rechten Flügel das blasse von der kleinen Querader zum Rande verlaufende Stück der Discoidalis leicht S-förmig geschwungen ist, während es links vollkommen gerade verläuft.

Ornithomyia tropica Kishida is clearly the common large Oriental *O. plicata* (v. Olfers), as may be gathered from the figure as well as from the following translation of the original Japanese description:

Size large, the female over 10 mm. Frons broad forming a ridge with the margins of the eyes, narrow anteriorly and broad posteriorly, with 5 pairs of bristles on the anterior half of the lateral margin and 5 pairs near the mouth; posterior margin with long hairs. Ocelli three, the anterior one smaller and distinctly transversely ellipsoid, the posterior ones larger, separated by two straight lines; the distance between the anterior and posterior ocelli short. Pronotum with 4 pairs of bristles; mesonotum with 2 pairs on the sublateral areas and numerous hairs on the posterior lateral areas; metanotum with 4 pairs of bristles near the posterior margin (9 on the anterior margin and 3 or 4 on the disk). Numerous bristles around the spiracles of the prothorax. Abdomen above with paired plates and numerous fine hairs and with bristles on the lateral and posterior margins. Wings large, with 7 longitudinal veins and a closed anal cell. Legs with the femora large and hairy. Tarsal claws with auxiliary teeth. Head beneath and abdomen pale brownish yellow; abdomen above pale grayish white; anterior half of frons, ocellar area and posterior margin of frons, an inversed T-shaped marking on dorsum of thorax, spiracles, inner side of tibiae and last segment of tarsi, dark brown.

5. **Ornithoctona australasiae** (Fabricius).

Hippobosca australasiae Fabricius, Syst. Antliat., 337, 1805 (no sex, no host; "in insulis Oceani pacifici", collected by Labillardière).

Ornithomyia australasiae Leach, Gen. Spec. Eprobosc. Ins., 12, pl. 25, figs. 6-8, 1817; Werner. Soc. Edinburgh Mem. **2**: 558, pl. 25, figs. 6-8, 1818; Wiedemann, Aussereurop. Zweifl. Ins. **2**: 608, 1830.

Ornithomyia javana Jaennicke, Abh. Senckenberg. Naturf. Ges. **6**: 406, pl. 44, fig. 14, 1867 (female, no host; Java).

Ornithoctona javana Speiser, Term. Füzetek **25**: 329, 1902; Mus. civ. stor. nat. Genova, Ann. **41**: 340, 1904.

Ornithoctona javanica Bau, Zool. Anzeiger **85**: 11.

Ornithoctona soror Ferris, Sarawak Mus. Jour. **3** (3), no. 10: 284, pl. 11, figs. 2, *a-d* and 4, 1926 (female, off *Buchanga stigmatops;* Mt. Murud, Borneo).

Ornithomyia aobatonis Matsumura, Thousand Insects of Japan **2**: 119, no. 377, pl. 28, fig. 12, 1905 (male, female, off a green pigeon [possibly *Sphenurus sieboldii* Temminck]; Hokkaido and Honshu, Japan); 6000 Illustr. Insects Japan Empire, 390, fig., Kishida, Iconogr. Insect. Japon., 244, fig. 472, 1932 (female, not male as marked).

Apart from Fabricius' statement in the original description, which may have referred equally well to the East Indies or to Australia, there is no evidence as yet that *O. australasiae* occurs in Oceania although it may be expected there.

It is known at present from Japan, Borneo, Sumatra, Java, and New Guinea (several specimens seen from Mount Misim, Morobe District, off *Edalisoma m. montanum* Meyer, *Zonophops chalconota smaragdina* Mayr, and *Falco severus papuanus*).

Fabricius' original description was very brief: "H. alis obtusis obscure testacea, abdomine fusco. —Paullo major *H. equina.* Caput, thorax, pedes obscure testacea. Abdomen depressum, obscurum." I believe, however, that the statement about the size (a little larger than *H. equina*) can apply only to the smaller of the two Indo-Pacific species of *Ornithoctona.* The other species, *O. plicata,* is about twice the size of *H. equina,* while the species of *Ornithomyia, Ornitheza,* and *Ornithoica* are much smaller. In 1830, Wiedemann gave the length of his *O. australasiae* as 3 Danish lines [= 6.5 mm.], but it is not certain that he saw Fabricius' type. In any case, there can be no doubt that in 1817 Leach described and figured the smaller Indo-Pacific *Ornithoctona* as *O. australasiae.* Most references to *australasiae* by other authors refer to *O. plicata* and are listed under that species.

What is here called *O. australasiae* is certainly Jaennicke's *O. javana,* and that name will have to be used if Fabricius' name is shown to be another species. The remaining synonymy proposed here is based on the descriptions only and on the assumption that there is only one small Indo-Pacific species of *Ornithoctona,* lacking the protuberant plate at the apex of the fore tibiae in the female. Ferris gives the total length (on a slide) of his *O. soror* as 6.5 mm. *O. aobatonis* is said by Matsumura to be in the male one *fien* and five *li* (about 4 mm.) and in the female one *fien* and seven *li* (about 5 mm.) long; Kishida gives the length of *O. aobatonis* as 4 to 5.5 mm.

Genus **OLFERSIA** Wiedemann

(*Feronia* Leach; *Pseudolfersia* Coquillett).

Key to the Species of Olfersia

1. First basal cell (R) short and wide, distinctly bulging before the apex. Fourth longitudinal vein (M_{1+2}) partly setulose. Upper

surface of anal cell (Cu+1st An) covered with setulae. Postvertex forming one undivided, smooth plate from occiput to frontoclypeus. First tergal plate of abdomen triangularly excised at apex in male, divided into two broad median lobes in female.....**O. sordida.**

First basal cell (R) long and narrow, its apical half parallel-sided or nearly so. Fourth longitudinal vein (M_{1+2}) bare. Upper surface of posterior third of anal cell (Cu+1st An) without setulae. Apical margin of first tergal plate straight or slightly curved inward 2

2(1). Posterior orbits (above eyes) much shorter than the greatest width of the inner orbits; occipital margins of posterior orbits and of postvertex slightly produced and separated by shallow curves. Second basal cell (M) long, the second section of the fourth longitudinal vein (M_{1+2}) equal to or at most one and one third times the length of the first section of the fifth vein (M_3+Cu_1). Third longitudinal vein (R_{4+5}) bare or at most with a few minute setae on apical portion. Postvertex forming one, undivided smooth plate from occiput to frontoclypeus.....**O. fossulata.**

Posterior orbits nearly as long as the greatest width of the inner orbits; occipital margins of posterior orbits and of postvertex strongly produced behind and separated from one another by deep, curved notches. Postvertex divided by a slight transverse depression into two areas..... 3

3(2). Occipital margin of postvertex somewhat more produced behind than the posterior orbits. Third longitudinal vein (R_{4+5}) setulose. Upper and under surfaces of posterior third of anal cell and of axillary cell bare. Cross-vein closing second basal cell (M) very oblique, the upper outer angle of the cell acute.....**O. spinifera.**

Occipital margins of postvertex and posterior orbits about equally produced behind. Upper surface of posterior third of anal cell and of axillary cell bare, but the under surface of these areas covered with setulae. Third longitudinal vein (R_{4+5}) bare or at most with a few setae toward apex. Crossvein closing second basal cell (M) nearly vertical, the upper outer angle of the cell almost square .....**O. aenescens.**

6. Olfersia sordida Bigot, Soc. Ent. France, Ann. VI, **5**: 239, 1885 (no sex, no host; Guatemala). Bequaert, Psyche **40**: 101, 103, 1933. (See fig. 2, *a-c.*)

Pseudolfersia sordida Speiser, Zeitschr. Syst. Hym. Dipt. **2**: 164, 1902 (type).

Specimens examined. Galapagos: James Island, Indefatigable Island, without host (E. Cheesman, St. George Expedition, at British Museum).

The usual host of this fly is the brown pelican, *Pelecanus occidentalis* Linnaeus; but it has also been taken on the cormorant, *Phalacrocorax auritus floridanus* (Audubon). It is a New World species, which I have seen also from Oregon, Louisiana, Florida, the Bahamas,

Cuba, Hispaniola, St. Thomas (West Indies), Jamaica, Trinidad, Mexico, Guatemala, Panama, and Venezuela.

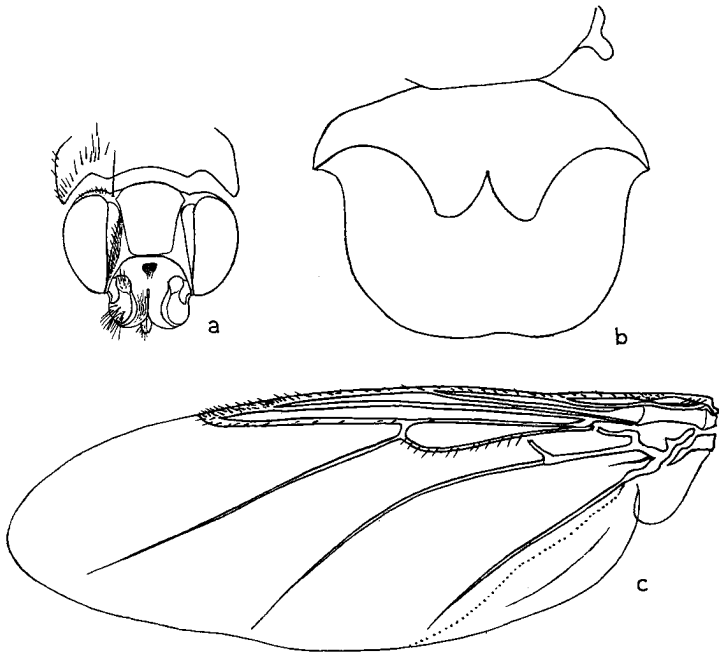

FIGURE 2.—*Olfersia sordida* Bigot, female: **a**, head seen in front; **b**, outline of abdomen from above; **c**, wing, the dotted line marking the outer limit of the area covered with setulae.

Bigot's type is now in J. E. Collin's collection. At my request, Mr. Collin examined it carefully and wrote me that it shows all the characters attributed to the species in my key. In particular, he states that the type is a male and that "the first tergal plate has an open Λ-shaped excision in hind margin." I have also seen a male, from Jamaica, which was compared with Bigot's type by Mr. Collin some years ago. Speiser saw the type in 1902, but some of his statements are misleading, particularly his description of the second basal cell (hintere Basalzelle). In this species the microscopic setulae extend beyond the sixth longitudinal vein (An) over a narrow strip of the axillary cell (2d An) on the upper surface of the wing.

7. Olfersia fossulata Macquart, Soc. Sci. Lille, Mém. (1842), 434, 1843 (no sex, no host; Brazil); Dipt. Exot. 2 (3): 277, 1843.

C. W. Johnson, Zoologica, New York **5** (8) : 91, 1924 (off *Pelecanus occidentalis californicus,* Daphne Major Island, Galapagos). Curran, 1932, Nyt Mag. Naturvidenskab. **71**: 366, 1932. Bequaert, Psyche **40** : 102, 105, 1933; California Acad. Sci., Proc. IV, **21** : 132, 1933. G. B. Thompson, Ent. Mo. Mag. **74** : 43, 1938.

Pseudolfersia fossulata Coquillett, Washington Acad. Sci., Proc. **31** : 379, 1901 (Wenman Island, Galapagos).

The only records thus far from our area are the specimens from Daphne Major Island and Wenman Island, Galapagos, listed by Coquillett and C. W. Johnson. I have not seen them.

The species is widely distributed. I know it from Panama, Desecheo Island (near Puerto Rico), Peru (Cruz de Husco near Lima and on several of the guano islands: Lobos de Afuera, Mezorca, Chinchas, and Pescadores), Chile (Tofo; Santiago), the Philippines, and Wetter Island, Dutch East Indies. It is a parasite of tropical marine birds, such as the Peruvian cormorant or guanay, *Phalacrocorax bougainvillii* (Lesson) ; Belcher's gull, *Larus belcheri* Vigors; white gannet, *Sula variegata* (Tschudi) ; pelicans, *Pelecanus occidentalis* Linnaeus and *Pelecanus thagus* Molina ; and Inca tern, *Larosterna inca* (Lesson).

O. fossulata is often confused with other species. R. C. Murphy (Compania Administradora del Guano, 12ª Mem. del Directorio, Lima, 112, 1921; Bird Islands of Peru, 250, 1925) records it from the Peruvian guano islands, as *Pseudolfersia maculata.* Murphy published a photograph of a guanay carrying several *Olfersia fossulata,* in the National Geographic Magazine for September, 294, 1924. On the other hand, H. S. Peters' record of *O. fossulata* from Virginia—off osprey, *Pandion haliaetus carolinensis* (Bird-banding **7** (1) :13, 1936)— refers to *Olfersia fumipennis* (Sahlberg).

8. Olfersia spinifera (Leach) (fig. 3, *a, b*).

Feronia spinifera Leach, Gen. Spec. Eprobosc. Ins., 11, pl. 26, figs. 1-3, 1817 (no sex, no host, no locality) ;[4] Mem. Werner. Soc., Edinburgh **2** : 557, pl. 26, figs. 1-3, 1818.

Pseudolfersia spinifera Speiser, Zeitschr. Syst. Hym. Dipt. **2** : 146, 179, 1902 (off *Fregata* [*Atagen*] *aquila,* Laysan). Alfken, Zool. Jahrb., Abt. Syst. **19** : 581, 1904 (Laysan).

[4] Speiser (Zeitschr. Syst. Hym. Dipt. **2**: 146, 1902) claims that Leach described the species from Java, but I do not know on what evidence he based this statement.

Olfersia spinifera C. W. Johnson, Zoologica, New York **5** (8) : 91, 1924 (off *"Fregata aquila"*, Tower Island, Galapagos). Bryan, B. P. Bishop Mus., Bull. **31** : 71, 1926 (Hawaii: Laysan, Lisiansky, Nihoa, Necker, French Frigate Shoal, Johnston, Wake; all off frigate birds) ; Haw. Ent. Soc., Proc. **6** : 236, 1926 (same records and also Hawaiian islands: Kauai, Pearl and Hermes Reef, Ocean, Midway). Falcoz, Encycl. Ent. Diptera **5** (1929) : 45, 1930 (in part: specimen from Honolulu, Hawaiian islands). Curran, Nyt Mag. Naturvidenskab. **71** : 366, 1932 (off frigate bird, Charles or Floreana Island, Galapagos). Bequaert, Psyche **49** : 102, 103, 1933 (Galapagos; Hawaiian islands, Nihoa; Solomons) ; California Acad. Sci., Proc. IV, **21** : 132, 1933 (off *Fregata minor ridgwayi,* Darwin Bay, Tower Island, Galapagos). Bryan, Haw. Ent. Soc., Proc. **8**: 443, 458, 1934; **9** : 42, 1935 (Hawaiian islands: Oahu, Manana). G. B. Thompson, Ent. Mo. Mag. **74** : 44, 1938.

Ornithomyia unicolor Walker, List Dipt. British Mus. **4** : 1144, 1849 (no sex, in part: specimens off *"Fregata aquilus"* from Jamaica).

Olfersia courtilleri "Fairmaire" Courtiller, Soc. Linn. Dépt. Maine et Loire, Ann. **1** : 196, pl. 15, 1853 (no sex, off *Fregata* [*Tachypetes*] *minor;* Saumur, France).

Olfersia curtilleri Rondani, Soc. Ent. Italiana, Bull. **11** : 23, 1879.

Olfersia sulcifrons C. G. Thomson, Eugenies Resa **2,** Zool. (1), Insekter: 611, 1868 (no sex, no host; Panama).

Pseudofersia spinifera var. *sulcifrons* Speiser, Zeitschr. Syst. Hym. Dipt. **4** : 83 (type).

Specimens Examined

Galapagos: Darwin Bay, Tower Island (M. Willows, Jr.) ; Tower Island, off *Fregata minor ridgwayi* (J. P. Chapin) ; Post Office Bay, Charles Island (A. Wollebaek) ; Conway Bay, Indefatigable Island, off greater frigate bird, *Fregata magnificens magnificens* (Chapin, Templeton Crocker Exp., 1935) ; Kicker Rock, off frigate bird (H. A. Pilsbry).

Hawaiian islands: Nihoa, off frigate bird (A. Wetmore) ; Laysan (Fletschmann) ; Johnston, off frigate bird (Bryan) ; Necker, off frigate bird (Bryan) ; Wake (Bryan).[5]

[5] The large hippoboscid fly taken on Oahu, Moku Manu Islet, off a man-of-war bird by Bryan (Haw. Ent. Soc., Proc. **3**: 15, 1914; **3**: 273, 1917) was almost certainly *O. spinifera.*

Tuamotus: Nengo Nengo Island, off young frigate birds (Chapin, Templeton Crocker Exp., 1935).

Gilbert Islands: Canton Island, off frigate bird (F. Rositer).

Marquesas: Mohotani Island, off *Fregata minor* (Le Bronnec and H. Tauraa); Tahuata Island, off *Fregata minor* (Le Bronnec and Tauraa).

Fiji: Lau, Naiambo (Bryan).

Solomons: Ontong Java, off *Fregata minor* (Coultas).

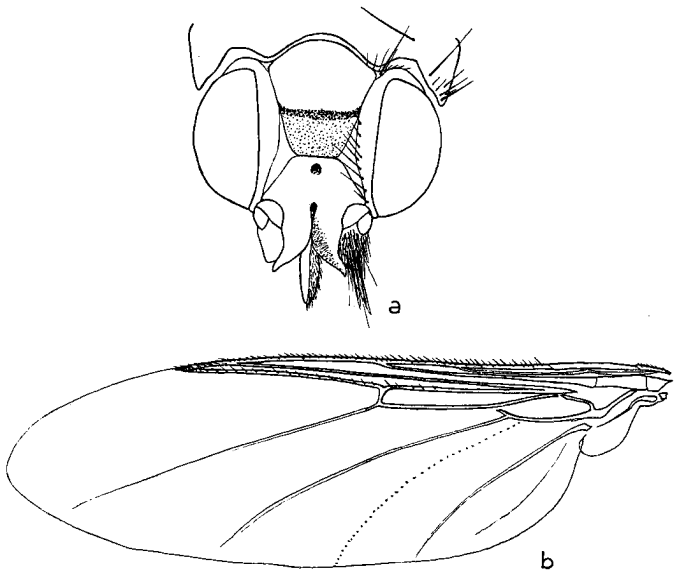

FIGURE 3.—*Olfersia spinifera* (Leach), male: **a**, head seen in front and humeral margin of thorax; **b**, wing, the dotted line marking the outer limit of the area covered with setulae.

O. spinifera is a widespread fly of the Pacific and Atlantic Oceans. I have seen it also from Florida, Louisiana, the Bahamas, the coast of Brazil (Rio de Janeiro, Abrolhos Island), Trinidad Islet (in the South Atlantic), Lower California (Cape San Lucas), Panama (Taboguillo Island), and New South Wales.

The most frequent hosts are the tropical frigate or man-of-war birds, of which there appear to be five species, with several races: *Fregata aquila* Linnaeus (apparently confined to Ascension Island); *F. magnificens* Mathews (in the Atlantic, on the Pacific coast of America and in the Galapagos); *F. minor* Gmelin (in the Indian and

Pacific Oceans and the South Atlantic); *F. ariel* Gray (in the Indian and Pacific Oceans and the South Atlantic); and *F. andrewsi* Mathews (restricted to Christmas Island in the Indian Ocean). I have seen a few specimens taken off pelican, *Pelecanus occidentalis* Linnaeus; and cormorant, *Phalacrocorax auritus floridanus* (Audubon). The species is also recorded in the literature from other hosts; but most authors having failed to distinguish between *spinifera* and its close relatives, these records are open to question.

The earliest reference to the frigate bird fly is by Osbeck in 1757 (Dagbok öfver en Ostindisk Resa, 297), where he mentions an insect found on *"Pelecanus aquilus"* at Ascension Island, as *"Hippobosca nigra."* The name is pre-Linnaean, hence without standing in nomenclature. In 1816, v. Olfers (De Vegetat. et Animat. Corpor. **1**: 103) listed Osbeck's name as a synonym of his *"Ornithomyia pelecani liscatoris",* but did not see the species and gave no description.

I have followed Speiser (1902) in referring the common fly of frigate birds to *Feronia spinifera* Leach, although Leach's original figures agree better with *O.aenescens* Thomson. The occipital margins of the posterior orbits and postvertex are drawn about equally produced behind, while the cross-vein closing the second basal cell is shown vertical. So far as I know, Leach's type has not been examined by Speiser or later authors. It was described from MacLeay's collection and may be lost.

Ornithomyia unicolor Walker, the types of which are at the British Museum, was a composite species. The specimen from Jamaica, off a frigate bird, was *O. spinifera;* that from the same locality, off *"Ephialtes grammicus",* was *Lynchia nigra* (Perty).

The type of *Olfersia courtilleri* is in J. E. Collin's collection. It was seen by Speiser (1902), who recognized in it the cosmopolitan parasite of frigate birds. In his notes on *O. erythropsis,* quoted below under *O. aenescens,* Collin compares that species with the type of *O. courtilleri.*

I have recently examined the type of *Olfersia sulcifrons* Thomson, at the Stockholm Museum, and can find no structural characters to separate it from *O. spinifera.* Speiser in 1904 reached the same conclusion, but retained the name for a color variety, because the main color is not shiny black but more dark pitchbrown ("fuscus"). I attach no importance to such characters in Hippoboscidae.

9. Olfersia aenescens C. G. Thomson, Eugenies Resa, **2,** Zool. (1), Insekter: 610, 1868 (no sex, no host; Keeling Island in the Indian Ocean). Bequaert, Psyche **40**: 105, 1933. G. B. Thompson, Ent. Mo. Mag. **74**: 43, 1938. Bequaert, Mushi **12** (2): 82, 1939 (Carolines: Palau, Akarokuru, Peleliu). (See fig. 4, *a-b.*)

Pseudolfersia aenescens Speiser, Zeitschr. Syst. Hym. Dipt. **4**: 83, 1904 (type).

Olfersia erythropsis Bigot, Soc. Ent. France Ann. VI, **5**: 239, 1885 (no sex, no host; New Caledonia). Bequaert, Psyche **40**: 102, 103, 1933 (Galapagos; Society Islands, Moorea; Carolines, Ponape); California Acad. Sci., Proc. IV, **21**: 132, 133, 1933 (Galapagos; Indefatigable Island; Hood Island, off *Diomedea irrorata;* Marquesas).

Pseudolfersia erythropsis Speiser, Zeitschr. Syst. Hym. Dipt. **2**: 165, 1902 (type).

Pseudolfersia diomedeae Coquillett, Washington Acad. Sci., Proc. **3**: 379, 1901 (no sex, off *Diomedea irrorata,* Galapagos, Albemarle Island).

Olfersia diomedeae Curran, Nyt Mag. Naturvidenskab. **71**: 366, 1932.

Pseudolfersia spinifera Ferris and Cole, Parasitology **14** (2): 196 (in part), figs. 13, 14 A-C (drawn from male paratype of *P. diomedeae* Coquillett), 1922. Not of Leach, 1817.

Olfersia spinifera Falcoz, Encycl. Ent., Diptera **5** (1929): 45, 1930 (in part: specimen off *Phaëton rubricauda melanorhynchos,* Society Islands, Moorea). Ferris, Philippine Jour. Sci. **34**: 220, 1927 (in part: specimens off wedge-tailed shearwater, *Puffinus pacificus cuneatus,* Hawaiian islands: Laysan; not the figures).

Specimens Examined

Galapagos: Albermarle Island, off *Diomedea irrorata* (types of *P. diomedeae* Coquillett); Indefatigable Island (M. Willows, Jr.); Hood Island, off *Diomedea irrorata* (F. X. Williams); Tower Island, off red-footed booby, *Sula sula rubripes* (W. Beebe).

Cocos Island: off *Sula leucogaster brewsteri* (Beebe).

Marquesas: Tahuata Island, off *Sterna fuscata* (Le Bronnec and Tauraa); Uahuka, Teiaua Island, off *Sterna fuscata* (Adamson); Uahuka, Haavei Valley, off *Sterna fuscata* (Le Bronnec and Tauraa).

Carolines: Ponape, two females and one male, off *Anous minutus* (Coultas); Palau, Akarokuru, Peleliu (T. Esaki).

Hawaiian islands: Laysan, off *Puffinus pacificus cuneatus* (Ferris coll.); Lisiansky, without host (S. C. Ball).

Society Islands: Moorea, Temoe, off *Phaëton rubricauda melanorhynchos* (E. Seurat. Paris Mus.; specimen recorded by Falcoz as *O. spinifera*).

Ducie Island: off *Pterodroma phillipii* (Chapin, Templeton Crocker Exp., 1935).

Tuamotus: Nengo Nengo, off young *Sula sula rubripes* (Chapin, Templeton Crocker Exp., 1935).

Mangareva: off young *Phaëton lepturus dorotheae* (Chapin, Templeton Crocker Exp., 1935).

Australs: Rapa Island, off *Phaëton rubricauda melanorhynchos* (Chapin, Templeton Crocker Exp., 1935).

Fiji: Lau, Vanua Masi (Bryan); Latei Tonga (Bryan); Latei Viti (Bryan).

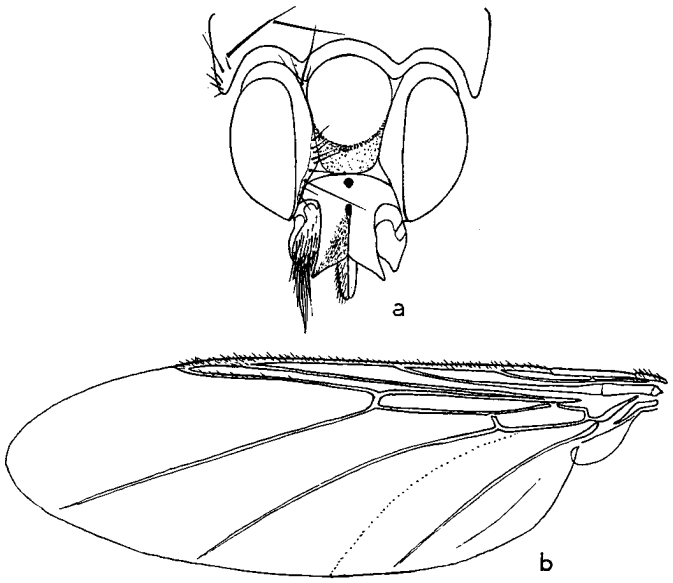

FIGURE 4.—*Olfersia aenescens* Thomson, female: **a,** head seen in front and humeral margin of thorax; **b,** wing, the dotted line marking the outer limit of the area covered with setulae on the upper surface.

O. aenescens appears to be widely distributed over all tropical seas. I have also seen specimens from the Bahamas, Desecheo Island (near Puerto Rico), Panama, Clarion Island (off the west coast of Mexico), northeast Australia, Sokotra, and St. Pauls Rocks (Indian Ocean). It parasitizes many different marine birds, the hosts known to me being the albatross, *Diomedea irrorata* Salvin; the red-tailed tropic bird, *Phaëton rubricauda* Boddaert; the white tropic bird, *Phaëton lepturus* Daudin; the white-bellied booby, *Sula leucogaster* (Boddaert); the red-footed booby, *Sula sula rubripes* Gould; Brewster's brown booby, *Sula leucogaster brewsteri* Gosse; the blue-footed booby, *Sula nebouxi* Milne-Edwards, the Kermadec petrel, *Pterodroma phillipii* (G. R. Gray) (= *neglecta* Schlegel); the small noddy, *Anous minutus* Boie; the wedge-tailed shearwater, *Puffinus pacificus cuneatus* Salvin; and the sooty tern, *Sterna fuscata* Linnaeus.

In November 1933, I examined the type of *O. aenescens* at the Stockholm Museum, and found that it has all the structural characters which I attributed in my 1933 paper to *O. erythropsis* Bigot. Speiser (1904) also saw this type; but, although he recognized that it was closely related to *O. erythropsis,* he thought there were some structural differences between the two. In the type of *O. aenescens,* the postvertex is divided by a transverse depression into a short, anterior, alutaceous portion, and a much longer, posterior, smooth and shiny plate, exactly as in *O. erythropsis.* The shape of the occiput and of the second basal cell are also as in *erythropsis.*

Bigot's type of *O. erythropsis,* now in J. E. Collin's collection, was studied by Speiser in 1902. At my request, Mr. Collin kindly examined it again and sent me the following note, together with some sketches:

> *O. erythropsis* appears to be the same as *diomedeae* of your Table. There is a specimen of *spinifera* in the [Bigot] collection (the type of *O. courtilleri* Fairm.). Compared with this, *erythropsis* is smaller, and, in addition to the differences mentioned by you, *erythropsis* has base of 2nd basal cell broader and more rounded, and apex squarer than in *spinifera;* in *spinifera* the upper outer angle of 2nd basal cell is acute owing to slope of cross-vein. The apical arms of fronto-clypeus in *erythropsis* are not quite so broad as in *spinifera,* but are turned outwards at tip and finely sculptured on inner margin very much as in *spinifera.* Palpi not very noticeably shorter. The postvertex is divided as in *spinifera.*

I have studied the holotype and two paratypes of *P. diomedeae* at the U. S. National Museum. There can be no doubt that they are cospecific with Bigot's *O. erythropsis* and Thomson's *O. aenescens.*

Genus **ORNITHOPHILA** Rondani

This genus was established by Rondani for a European species, *O. vagans* Rondani. No specimens referable to it are as yet known from Oceania. It possibly occurs there, nevertheless, since Ferris has described a second species from the Philippines which is closely related to *Lynchia,* agreeing in every generic character except the presence of ocelli.

Genus **LYNCHIA** Weyenbergh

(*Olfersia* of authors; *Icosta* Speiser; *Ornithoponus* Aldrich.)

Key to the Species of Lynchia

1. Large species (wing 7.5 to 8.5 mm. long). Wing membrane covered with setulae except for posterior fourth to third of anal cell (Cu+1st An) and entire axillary cell (2d An). Frontal bristles many, in several irregular rows ..... **L. nigra.**
   Small species (wing 4.5 to 6.5 mm. long) 2

2(1). Wing membrane covered with setulae except for part or most of the axillary cell (2d An). Frontal bristles moderately numerous, in two irregular rows. Lateral arms of fronto-clypeus not pronglike, not or scarcely extending beyond tips of antennal processes. Palpi much shorter than half the height of head. Fourth tarsal segment of fore legs not produced on one side into a thumblike process ..... **L. albipennis.**
   Wing membrane covered with setulae except for entire axillary cell (2d An), most of anal cell (Cu+1st An), entire second basal cell (M) and part of base of second posterior cell (M_2). Frontal bristles few, in one row 3

3(2). Wing long (6.5 mm.). Second basal cell (M) much less than half the length of first (R). Costa moderately thick apically. Basal third of second posterior cell (M_2) with a central bare patch, the extreme base and upper margins bearing setulae. Lateral arms of fronto-clypeus not pronglike. Fourth tarsal segment of fore legs not produced on one side into a thumblike process ..... **L. suvaënsis.**
   Wing shorter (4.5 to 5.5 mm.). Lateral arms of fronto-clypeus very sharp, compressed, pronglike, extending beyond tips of antennal processes. Fourth tarsal segment of fore legs more or less produced and thumblike on one side 4

4(3). Basal third of second posterior cell (M_2) almost devoid of setulae. Second basal cell (M) much less than half the length of first (R). Costa conspicuously swollen over apical third. Thumblike process of fourth tarsal segment short, inconspicuous ..... **L. samoana.**
   Basal third of second posterior cell (M_2) with a central bare patch, the extreme base and margins bearing setulae. Second basal cell (M) nearly half the length of first (R). Costa moderately thick apically. Thumblike process of fourth tarsal segment long and conspicuous ..... **L. pollicipes.**

10. Lynchia nigra (Perty).

Hippobosca nigra Perty, Delectus Anim. Artic. per Brasiliam **3**: 190, pl. 37, fig. 15, 1833 (no sex, no host; State of Piauhy, Brazil).

Lynchia nigra J. Bequaert, Psyche **40**: 70, 79, 1933 (type; seen also from Indefatigable Island, Galapagos, off *Buteo galapagoensis;* and Hawaiian islands: Kanai [Kauai], off an owl); California Acad. Sci., Proc. IV, **21**: 46, 1933. G. B. Thompson, Ent. Mo. Mag. **74**: 46, 1938.

Ornithoponus americanus C. W. Johnson, Zoologica, New York **5** (8): 91, 1924 (Galapagos: Seymour Bay, Indefatigable Island, off *Buteo galapagoensis*). Curran, Nyt Mag. Naturvidenskab. **71**: 366, 1932 (Galapagos: Santa Cruz, Indefatigable Island). Not of Leach, 1817.

Ornithomyia intertropica Walker, List Dipt. British Mus. **4**: 1144, 1849 (no sex, no host; Galapagos).

Olfersia intertropica Austen, Ann. Mag. Nat. Hist. VII, **12**: 264, 1903 (types: also male, female, Hawaiian islands: Oahu, Honolulu, off an owl); Bull. Ent. Res. **2**: 172 (footnote), 1911.

Olfersia acarta Speiser, Zeitschr. Syst. Hym. Dipt. **2**: 149, 1902 (no sex; Hawaiian islands: Molokai; Hawaii, Kona, off "short-eared species of owl"; Lanai); Fauna Haw. **3** (2): 87, 1902 (states here by oversight that the specimen from Molokai came off *Fregata* [as *Atagen*] *aquila*). Austen, Ann. Mag. Nat. Hist. VII, **12**: 264, 1903. Alfken, Zool. Jahrb., Abt. Syst. **19**: 572, 1904. Bryan, Haw. Ent. Soc., Proc. **8**: 443, 458, 1934.

Specimens Examined

Galapagos: without more definite locality (type of *O. intertropica* Walker, British Museum); Indefatigable Island, off *Buteo galapagoensis* (Chapin, Astor Exp.); Academy Bay, Indefatigable Island off *Buteo galapagoensis* (Chapin, Templeton Crocker Exp., 1935); head of Tagus Cove, Albemarle Island (Crane Pacific Exp., Field Mus. Nat. Hist.); James Island, without host (E. Cheesman, British Museum).

Hawaiian islands: Kauai, off an owl (Knudsen); Hawaii, Hilo, off *Asio* (E. Y. Hosaka); Kau [Kauai?], off *"Brachyotis cassinii"* (probably *Asio flammeus sandwichensis*); Kona, off "short-eared owl" (paratypes of *O. acarta* Speiser).

L. nigra is mainly an American species, known to occur from Quebec and British Columbia to Brazil and Bolivia. Outside the New World it has been reported only from the Hawaiian islands. It appears to be restricted to birds of prey, both diurnal and nocturnal. The "short-eared species of owl" from which it was taken in Kona, Hawaii, and the "owl" from Kauai and Honolulu, Oahu, were probably *Asio flammeus sandwichensis*. Speiser's statement in the Fauna Hawaiiensis that his *O. acarta* was obtained from a frigate bird, is clearly due to some oversight. He did not mention that host when he first described *O. acarta*.

I have examined Perty's type of *H. nigra,* kindly sent to me by O. Engel, of the Bavarian Zoological Museum at Munich. At the British Museum I have seen the type of *O. intertropica* Walker and also three specimens from Kona, Hawaii, off short-eared owl, labelled *"O. acarta"* by Speiser. The latter are evidently part of the original lot; but the true holotype of *O. acarta,* from Molokai, is at the Bremen Museum. Austen (1903) recognized that *O. acarta* Speiser was identical with *O. intertropica* Walker. The types of *O. acarta* were the specimens listed as the largest of the three Hawaiian Hippoboscidae by P. H. Grimshaw [Fauna Haw. 3 (1) : 77, 1901].

11. Lynchia albipennis (Say).

Olfersia albipennis Say, Acad. Nat. Sci. Philadelphia, Jour. 3: 101, 1823 (no sex; off great blue heron, *Ardea herodias;* no locality given, but from North America).

Lynchia albipennis J. Bequaert, California Acad. Sci., Proc. IV, **21** : 134, 1933 (off *Ardea herodias cognata,* Narborough Island; off *Nyctanassa violacea pauper,* Galapagos: Tower Island, James Island, and North Seymour Island).

Ornithoponus intertropicus C. W. Johnson, Zoologica, New York, **5** (8) : 91, 1924 (off *Butorides sundevalli,* Seymour Bay, Indefatigable Island, Galapagos). Curran, Nyt Mag. Naturvidensk. **71** : 366, 1932. Not of Walker, 1849.

Specimens examined. Galapagos: Narborough Island, off *Ardea herodias cognata* (M. Willows, Jr.); James Island (Willows); North Seymour Island (Willows); Tower Island, off *Nyctanassa violacea pauper* (W. S. Brooks); Albemarle Island, off *Butorides sundevalli* (British Museum); 10 miles southwest of Elizabeth Bay, Albemarle Island, off *Nyctanassa violacea pauper* (Chapin, Templeton Crocker

Exp., 1935); Conway Bay, Indefatigable Island, off *Butorides sundevalli* and *Larus fuliginosus* (Chapin, Templeton Crocker Exp., 1935); Seymour Bay, Indefatigable Island, off *Butorides sundevalli* (W. Beebe).

L. albipennis, as here recognized, is a strictly New World species, closely allied to the Old World *L. ardeae* (Macquart). It is common in the United States from Massachusetts, New York, and Ohio southward. I have also seen it from Mexico, Honduras, Panama, and Brazil. It is primarily a parasite of wading birds (Gressores). I have seen a specimen taken on a Brazilian duck, *Nettion brasiliense;* but this and the lava gull (*Larus fuliginosus*) are probably accidental hosts.

As Say's type is lost, the interpretation of his *O. albipennis* is rather arbitrary. I have followed Swenk (New York Ent. Soc., Jour. 24: 126, 1916), who redescribed the species from specimens taken at Lincoln, Nebraska, off *Nycticorax nycticorax naevius* and *Butorides v. virescens.* It may be noted that the specimen taken in the Galapagos, off *Ardea herodias* (Say's type host), agrees with Swenk's concept of *albipennis.*

12. Lynchia suvaënsis, new species (fig. 5, *a-e*).

Male. Head (fig. 5, *a*) seen in front about one and one quarter times as wide as high; frons at its narrowest about as wide as the eye, measured along inner orbits only slightly longer than its greatest width at the vertex, with the sides markedly convergent toward lower fifth, below which they diverge slightly; inner orbits (parafrontalia) moderately wide, about one third of the width of the mediovertex (frontalia); frontal bristles few: a group of three (one very long) on the gena near lower edge of eye; one, very long, near upper third; and an irregular row of 6 to 8 short, soft bristles near inner edge of lower two thirds; one very long vertical bristle; postvertex (vertical triangle) wider than long, the slightly convex anterior margin shorter than the sides, barely depressed medially, but with a distinct, minute, rounded pit in the middle some distance from the apex; occipital margin straight; fronto-clypeus narrowly and deeply emarginate medially, the antero-lateral angles moderately produced, not pronglike. Palpi (fig. 5, *b*) moderately long, slightly less than half the height of the head. Thorax (fig. 5, *c*): anterior margin straight in the middle; humeral lobes slightly longer than wide, moderately prominent, bluntly rounded at apex, with one very long and six to ten short setae; mesonotum with a few soft hairs; one long prealar and one similar postalar bristle on each side; dorsal portion of mesopleura (notopleura) with a few short setae. Scutellum semi-elliptical, the hind margin evenly convex, weakly fringed and in each corner with a long scutellar bristle; metepimeron with 5 or 6 strong, short bristles and a few softer setae. Legs, fourth tarsal segment of fore legs (fig. 5, *d*) not produced on one side into a thumblike process. Wing (fig. 5, *e*) long and rather narrow; setulae

covering the membrane except for the following areas: entire axillary cell (2d An), basal two thirds of anal cell (Cu+1st An) (irregularly limited), a narrow basal patch in second posterior cell (M_2), entire second basal cell (M), and most of base of wing; costa moderately thickened, but not swollen beyond tip of first longitudinal vein; first basal cell (R) long, narrow, parallel-sided; second basal cell (M) less than half the length of the first, closed by a nearly vertical anterior basal cross-vein (M_3); subcosta (Sc) incomplete, not reaching costa; costa densely setulose; all other veins bare. Abdomen (as far as can be ascertained on the dry specimen) with the usual broad, short, transversely lozenge-shaped, sclerotized basal tergite, bearing numerous short, stiff setae on the sides and a few soft hairs in the middle; preanal (dorsal) sclerite consisting of two elliptical plates, broadly connected medially and each bearing a group of six long, prominent bristles; the remainder of the dorsum forms one shiny sclerotized area, apparently without plates and devoid of hairs or setae; soft sides and venter uniformly covered with many short setae, each arising from a sclerotized papule.

Total length, from notch of fronto-clypeus to apex of abdomen (dry pinned specimen), 4.5 mm.; length of wing, 6.5 mm.; width of wing, 2.2 mm.

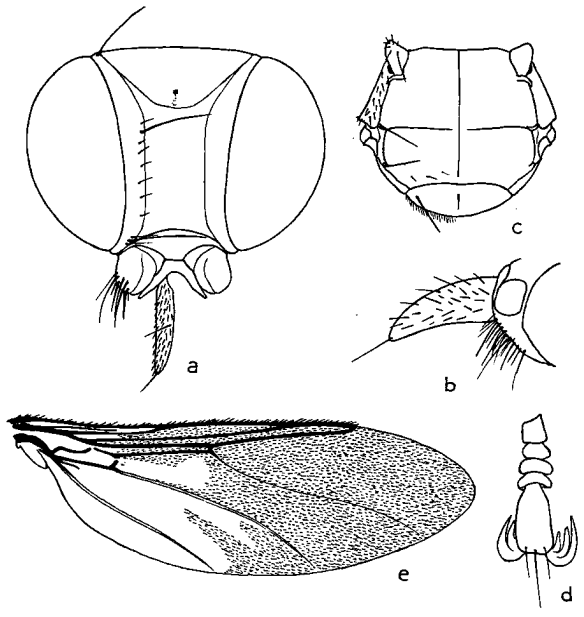

FIGURE 5.—*Lynchia suvaënsis* Bequaert, male: **a,** head seen in front; **b,** palp in profile; **c,** thorax from above; **d,** tarsus of fore leg; **e,** wing.

Specimen examined. Fiji: Suva, one male, holotype, without host, Nov. 3, 1910 (P. H. Bahr, British Museum).

The differences from the other Oceanic species are indicated in the key. In addition, *L. bicorna* Ferris (Philippines) has shorter wings

(5.5 mm.), with the second posterior cell bare at the apex and setulose at the base, the subcosta complete, a slightly concave occipital margin, and the arms of the fronto-clypeus pronglike. *L. dioxyrhina* (Speiser) (New Guinea) is very close to *L. bicorna* and differs from *L. suvaënsis* in most of the same characters. *L. longipalpis* (Macquart) (Ceylon) has much longer palpi and pronglike arms of the fronto-clypeus. *L. papuana* (Rondani) and *L. parallelifrons* (Speiser) (both of New Guinea) have much shorter wings (4.5 mm.), with the costa conspicuously swollen beyond the tip of the first longitudinal vein. *L. sarta* (Ferris) (Philippines) has small eyes, the hind margin of the wing strongly concave beyond tip of axillary cell, and the subcosta complete. *L. setosa* Ferris (Philippines) has the costa swollen beyond tip of first longitudinal vein, a much wider frons, and the wing membrane setulose except for part of the axillary cell. *L. tuberculata* Ferris (Philippines) has a broader frons, pronglike arms to the fronto-clypeus, only the axillary cell devoid of setulae and the subcosta complete. The following Indo-Malayan species cannot be compared, as the descriptions mention none of the characters now of specific value in this genus: *L. acromialis* (Speiser), *L. chalcolampra* (Speiser), *L. nigrita* (Speiser), *L. plana* (Walker), and *L. trita* (Speiser).

13. **Lynchia pollicipes** Ferris, Philippine Jour. Sci. **34**: 228, figs. 16-17, *a-d,* 1927 (male holotype and female allotype off *Astur* sp., and female paratype off *Prioniturus cyaneiceps;* Philippines; Puerto Princesa, Palawan).

SPECIMENS EXAMINED

Bismarck Archipelago: New Britain, off *Caloenas n. nicobarica* and off *Accipiter novaehollandiae dampieri* (Coultas); Nakanai Mts., off *Centropus violaceus* (Coultas).

Solomons: Malaita Island, off *Kakatoe ducrops* and *Lorius roratus salomonensis* (Coultas); Lunga, Guadalcanar Island (R. A. Lever).

This species is known only from the Philippines, New Britain, and Solomons. It apparently shows no very decided host specificity.

Through the courtesy of G. F. Ferris, I was able to compare my material with the female allotype (off *Astur* sp.), a male paratype (off *Astur* sp.), and a female paratype (off *Prioniturus cyaneiceps*), from the Philippines, now in the collection of Stanford University. The specimens from New Britain and the Solomons, Malaita, five in all, agree with these types in every particular. The characteristic thumb-

like process of the fourth segment of the fore tarsi is equally developed in both sexes. The wing measures 4.8 to 5.2 mm. in length.

14. Lynchia samoana Ferris, Insects of Samoa **6** (1) : 17, figs. 5, 6, *a-c,* 1927 (female off *Merula samoensis,* male and female off *Myiagra vanikorensis;* Malololelei, Upolu Island, Samoa). G. B. Thompson, Ent. Mo. Mag. **74** : 47, 1938.

G. F. Ferris has kindly sent me for study a female paratype, off *Myiagra vanikorensis,* from Samoa, belonging to Stanford University. The species is close to *L. pollicipes,* from which it differs in the characters noted in the key. Some other features, indicated by the description and figures, are perhaps not entirely reliable. On the slide examined there is evidence that the row of frontal bristles was more complete than drawn. A short thumblike process is discernible on one side of the fourth segment of the fore tarsi. This is one of the smallest species of the genus, the wing measuring only 4.5 mm. in length. I have seen another specimen of *L. samoana,* unfortunately without locality and host.

Genus **PSEUDOLYNCHIA** Bequaert

15. Pseudolynchia canariensis (Macquart).

Olfersia canariensis Macquart, Webb and Berthelot, Hist. Nat. Canaries, Entomologie, 119, 1840 (no sex, no host; Canary Islands).

Pseudolynchia canariensis Bequaert, Rev. Zool. Bot. Afric. **27** : 397, fig. 1D-E, 1935 (male, female) ; Ent. News **49** : 42, 1938; Science **89** : 268, 1939.

Olfersia maura Bigot, Soc. Ent. France, Ann. VI, **5** : 237, 1885 (no sex, no host; Algeria).

Lynchia maura Swezey, Haw. Ent. Soc., Proc. **3** : 272, 1917 (off domestic pigeons; Hawaiian islands, Oahu, Honolulu). Bryan, Haw. Ent. Soc., Proc. **8** : 443, 458, 1934.

Pseudolynchia maura Bequaert, Psyche **32** (1925) : 273, 277, 1926 (Hawaiian islands, Oahu, Kawailoa) ; Rev. Zool. Bot. Afric. **27** : 396, fig. 1F, 1935. G. B. Thompson, Ent. Mo. Mag. **74** : 45, 1938.

Olfersia garzettae Rondani, Soc. Ent. Italiana, Bull. **11** : 23, 1879 (no sex, no host; Insubria, Italy).

Olfersia lividicolor Bigot, Soc. Ent. France, Ann. VI, **5**: 238, 1885 (no sex, no host; Brazil).

Olfersia capensis Bigot, Soc. Ent. France, Ann. VI, **5**: 240, 1885 (male, no host; Cape of Good Hope).

Olfersia exornata Speiser, Mus. civ. stor. nat. Genova, Ann. **40**: 562, 1900 (no sex, no host; Doloc Tolong, western Sumatra).

Lynchia simillima Speiser, Mus. civ. stor. nat. Genova, Ann. **41**: 337, 1904 (no sex, no host; Java).

Specimens examined. Hawaiian islands: Oahu, off domestic pigeon (J. F. Illingworth, C. E. Fronk); Kawailoa (H. T. Osborn); Kaimuki (Illingworth).

This common parasite of domestic pigeons is now nearly cosmopolitan in tropical and warm temperate regions, the puparia being often found in large numbers in pigeon coops. Several Old World species of wild pigeons (Columbidae) are also known as hosts, and more rarely it occurs on other wild birds. It is the carrier and intermediate host of a blood parasite of pigeons, *Haemoproteus columbae* Kruse, causing so-called pigeon malaria. The flies are often infested with mites of the genus *Myialges*.

Swezey (Haw. Ent. Soc., Proc. **2**: 188, 1912) and Ehrhorn (Haw. Ent. Soc., Proc. **2**: 206, 1913) first recorded the pigeon fly from Hawaii. It will probably be found elsewhere in Oceania.

I have now concluded (1937) that it is not possible to separate consistently *P. maura* and *P. canariensis* as distinct species. The older name, *canariensis* Macquart, should therefore be adopted for the pigeon fly.

Genus **MICROLYNCHIA** Lutz, Neiva and da Costa Lima

16. Microlynchia pusilla (Speiser).

Lynchia pusilla Speiser, Zeitschr. Syst. Hym. Dipt. **2**: 157, 1902 (no sex, no host; Cuba).

Microlynchia pusilla Bequaert, California Acad. Sci., Proc. IV, **21**: 135, 1933 (off *Buteo galapagoensis,* Hood Island, Galapagos); Science **89**: 267, 1939. G. B. Thompson, Ent. Mo. Mag. **74**: 46, 1938.

Specimens examined. Galapagos: Hood Island, off *Buteo galapagoensis* (W. S. Brooks); Academy Bay, Indefatigable Island, off

Nesopelia galapagoensis (Crane Pacific Exp., Field Museum Nat. Hist.).

M. pusilla is restricted to the New World, where it is known from the United States (Idaho, California, Nebraska, Arizona, Texas), Cuba, the Virgin Islands (St. Croix), Grenada, Venezuela, Brazil, and Paraguay (San Bernardino). It is usually a parasite of domestic and wild pigeons, occasionally of other birds.

Genus **MYOPHTHIRIA** Rondani

17. Myophthiria reduvioides Rondani, Mus. civ. stor. nat. Genova, Ann. **7**: 464, fig., 1875 (no sex, no host; Sarawak, Borneo). Austen, Parasitology **18** (3): 360, 1926 (male, female; off *Collocalia spodiopyga assimilis;* in a cave near Suva, Fiji).

Myiophthiria reduvioides Rondani, Mus. civ. stor. nat. Genova, Ann. **12**: 154, 1878 (off *Collocalia vanikorensis,* Fiji). Speiser, Mus. civ. stor. nat. Genova, Ann. **41**: 349, 1904 (type). Ferris, Philippine Jour. Sci. **34**: 218, fig. 9, 1927 (male, female; off *Collocalia vanikorensis;* Hog Harbor, New Hebrides). Bezzi, Diptera of Fiji, 185, 1928. Bau, Zool. Anzeiger **85**: 11, 1929 (off *Collocalia vanikorensis,* without locality). G. B. Thompson, Ent. Mo. Mag. **74**: 45, 1938.

Myiophthiria capsoides Rondani, Mus. civ. stor. nat. Genova, Ann. **12**: 154, 1878 (no sex, no host; Philippines).

Specimens examined. Fiji: Lau, Ongea (Bryan).

This remarkable parasite of cave-dwelling swifts (*Collocalia*) is at present known from Borneo, the Philippines, Lombok, New Hebrides, and Fiji. It is probably more widely distributed in Oceania. I have also seen a specimen from Rockingham Bay, Queensland, without host, at the British Museum.

Genus **CRATAERINA** v. Olfers

This genus has not yet been recorded from Oceania. It includes a few species parasitic on swifts (Micropodidae).

Subfamily ORNITHOICINAE

Genus **ORNITHOICA** Rondani

This genus is as yet imperfectly known. The involved synonymy will be discussed in a forthcoming revision of the species of the world.

KEY TO THE SPECIES OF ORNITHOICA

1. Wing with the patch of setulae at tip of fifth posterior cell extensive, covering apical fourth to third of the cell. Scutellum with only four or five long preapical bristles. Frons of female wider than an eye, of male as wide as an eye. Tip of abdomen of female with only a few short setae dorsally and laterally near the subapical tergal plates. ..... **O. vicina.**

   Wing with the patch of setulae at tip of fifth posterior cell very small, often barely indicated. Scutellum with from two to six shorter, stiff preapical bristles, in addition to the two pairs of very long ones. Frons of female at most as wide as an eye, of male narrower than an eye. Tip of abdomen of female dorsally with a lateral patch of long setae near the subapical tergal plates..... **O. pusilla.**

18. Ornithoica vicina (Walker).

Ornithomyia vicina Walker, List Dipt. British Mus. **4**: 1144, 1849 (no sex, off *Pseudoscops grammicus,* Jamaica).

Ornithoica vicina Ferris, Canadian Ent. **61**: 285, 1929. Bequaert, Soc. Cubana Hist. Nat., Mem. **14**: 327, 1940.

Ornithoica species ? Bryan, Haw. Ent. Soc., Proc. **4**: 454, 1921 (off pheasant, Hawaiian islands, Kauai); **8**: 444, 458, 1934. Fullaway, Haw. Ent. Soc., Proc. **8**: 6, 1932. G. B. Thompson, Ent. Mo. Mag. **74**: 49, 1938.

Specimens examined: Hawaiian islands: Kauai, Koloa, three specimens off pheasant (U. S. National Museum). These flies are evidently part of the material taken by Bryan in 1921. He recorded having bred a specimen from a puparium found in the neck feathers of a pheasant.

The Hawaiian specimens cannot be separated from the common North American species which has been called thus far *Ornithoica confluenta.* I have pointed out recently that the true *Ornithoica confluenta* (Say) is a rare North American species, apparently found only on wading birds. *Ornithoica promiscua* Ferris and Cole (1922) and *Ornithoica melaleuca* Bau (1922) I regard as synonyms of *O. vicina.*

O. vicina is one of the most common louse-flies in Canada and the United States, and is also known from Cuba, Jamaica, Panama, Brazil and Chile. It is no doubt a recent introduction by man into the Hawaiian islands. In America it is found on a variety of land birds, particularly Passerines, as well as on diurnal and nocturnal birds of prey.

19. Ornithoica pusilla (Schiner).

Ornithomyia pusilla Schiner, Reise der Novara, Zool. 2 (1) B, Dipt.: 374, 1868 (no sex, off *Todiramphus veneratus;* Society Islands).

Ornithoica pusilla Speiser, Mus. civ. stor. nat. Genova, Ann. **40**: 559, 1900. Jepson, Rept. Entom., Dept. Agric. Fiji, Council Paper **25**: 27, 1911 (off hawk, Fiji). Bau, Centralbl. Bakt. Parasitenk. Abt. 2, **57**: 278, 1922. Ferris, Insects of Samoa **6** (1): 11, figs. 1-2, 1927 (male; off *Aplonis atrofusca,* Apia, Samoa; off *Halcyon juliae,* Espiritu Santo and Tanna, New Hebrides); Canadian Ent. **61**: 284, figs. 2D, 4A, 1929 (male, female; New Hebrides, off *Halcyon juliae;* Samoa, off *Myiagra vanikorensis, Demigretta sacra,* and *Aplonis atrofusca*). G. B. Thompson, Ent. Mo. Mag. **74**: 48, 1938. Bequaert, Mushi **12**: 82, 1939.

Ornithoeca pusilla Speiser, Zeitschr. Syst. Hym. Dipt. **4**: 86, 1904 (types; also Samoa).

Ornithoica confluenta Speiser, Fauna Haw. **3** (2): 91, 1902 (off *Himatione stejnegeri* and *Vestiaria coccinea,* Hawaiian islands, Hawaii, Kona). Not of Say, 1823.

Ornithoica promiscua Ferris, Canadian Ent. **59**: 251, 1927 (in part: records from the Philippines and Samoa); Insects of Samoa **6** (1): 11, 1927 (female; Apia, Samoa; off *Myiagra vanikorensis,* Malololelei, Upolu Island, Samoa; off *Demigretta sacra,* Apia, Upolu, Samoa). Not of Ferris and Cole, 1922.

Ornithoica confluenta variety or aberration *peroneura* Speiser, Fauna Haw. **3** (2): 91, 1902 (no sex; off "short-eared owl", *Asio flammeus sandwichensis;* Hawaiian islands, Hawaii, Kona, 3,000 ft.). Bau, Centralbl. Bakt. Parasitenk. Abt. 2, **57**: 278, 1922. Bryan, Haw. Ent. Soc., Proc. **8**: 443, 458, 1934.

Ornithoica confluens Aldrich, Insec. Inscit. Mens. **11**: 79, 1923 (in part: specimens off *Halcyon tutuilae,* Tutuila, Samoa). Not of Say, 1823.

Specimens Examined

Carolines: Ponape Island, off *Ptilinopus ponapensis, Halcyon cinnamomina reichenbachi, Aplonis pelzelni,* and *Ducula oceanica townsendi* (Coultas); Palau Island, off *Halcyon chloris teraokai,* (Coultas).

Marianas: Garapan, Saipan Island (T. Esaki).

Bismarck Archipelago: New Britain, off *Tyto novaehollandiae aurantia, Dicrurus bracteatus laemostictus, Ninox odiosa, Pitta macklotii gazellae, Halcyon chloris tristrami, Halcyon sanctus sanctus, Accipiter brachyurus, Accipiter novaehollandiae dampieri, Piezorhynchus verticalis, Gallicolumba beccarii johannae, Aviceda subcristata bismarckii,* and *Caloenas nicobarica nicobarica* (Coultas); Nakanai Mts., off *Centropus violaceus* (Coultas); Tabar Islands, Tabar, off *Halcyon chloris* (subspecies?) (Coultas).

Solomons: Malaita Island, off *Accipiter novaehollandiae malaitae* and *Ninox jacquinoti malaitae* (Coultas); British Solomons, off a shrike (R. J. A. W. Lever); Lunga, Guadalcanar Island, off black and white flycatcher (R. A. Lever); Popanu, Guadalcanar, off *Rhitidoceros* (Lever); Kirakira, San Cristobal Island, off red honey-eater (Lever).

New Hebrides: Espiritu Santo, off *Halcyon juliae* (P. A. Buxton); Banks Island (or Santa Maria Island, Gaua, Nombur) (T. T. Barnard).

Loyalty Islands: Ouvea, without host (L. Macmillan).

Samoa: Apia, Upolu Island, off *Rallus* species (Buxton and Hopkins); Tutuila, off *Halcyon tutuilae* (E. C. Reed; specimens recorded by Aldrich in 1928 as *O. confluens*).

Hawaiian islands: Oahu, Honolulu, Nuuanu Valley, off love bird, *Melopsittacus undulatus* (Caum); also without more definite locality, off *Himatione stejnegeri,* apparently one of the specimens from Kona, Hawaii, first recorded by P. H. Grimshaw (Fauna Haw. 3 (1): 77, 1901) as his third species of Hippoboscidae and later referred by Speiser to *Ornithoica confluenta.*

The small *O. pusilla* is a common parasite of many apparently unrelated species of birds throughout the Malay Archipelago (Philippines, Borneo, Sumatra, Christmas Island near Java), Australia (Queensland, New South Wales) and Oceania (Carolines, Bismarck Archipelago, Solomons, New Hebrides, Society Islands, Samoa, and the Hawaiian islands).

Ferris (1927) at first thought *O. pusilla* identical with the North American *O. confluenta* (Say) (synonym, *O. promiscua* Ferris and Cole). In 1929 he stated that *O. pusilla* was definitely separable from *O. confluenta* "by the constant presence of a tuft of slender setae on each side of the abdomen just cephalad of the sub-apical dorsal plates."

In this same paper, Ferris also studied the type of *Ornithoica beccariina* Rondani (Mus. civ. stor. nat. Genova, Ann. **12**: 160, fig. 1878; no sex; off *"Ardea alba"*; Amboina) and concluded that it differed from *O. pusilla* in the distribution of the setulae of the wing. In *O. pusilla* these enter the anal cell (Cu + 1st An) only at its extreme apex and do not reach the axillary cell (2d An) at all. In *O. beccariina* they cover more than half of the anal cell and even extend into the apex of the axillary cell.

It must be left undecided whether *Ornithomyia exilis* Walker (Linn. Soc. London, Zool. Jour., Proc. **5**: 254, 1861; no sex, no host; Dorey, New Guinea) was *O. pusilla* or *O. beccariina*. Austen (Ann. Mag. Nat. Hist. VII, **12**: 263, 1903) saw Walker's type and stated that it was identical with *O. beccariina*.

Speiser's *peroneura* was based upon an abnormal specimen of *O. pusilla*. In the same paper (1902) he referred to typical *O. confluenta*, three other flies from Kona, Hawaii.

20. Ornithoica stipituri (Schiner).

Ornithomyia stipituri Schiner, Reise Novara, Zool. **2** (1) B, Dipt.: 374, 1868 (no sex; off *Stipiturus malachurus;* Sydney, New South Wales).

Ornithoeca stipituri Speiser, Zeitschr. Syst. Hym. Dipt. **4**: 86, 1904 [type; also off *Sauromarptis tyro* and *"Macropygia (Dicruropsis) cacomantis"*, Ralum, New Britain].

Ornithoica stipituri G. B. Thompson, Ent. Mo. Mag. **74**: 49, 1938.

I have not recognized this species. Speiser's (1904) observations on the type are inadequate to decide whether or not it is specifically distinct from *O. pusilla*. The slight difference in the venation, which he notes, is hardly a reliable character. The specimens from New Britain, which he saw, were, however, in all probability *O. pusilla*. In my large collection from the Bismarck Archipelago I have been unable to distinguish more than one species of *Ornithoica* on structural characters. The fantastic host record, *Macropygia (Dicruropsis) cacomantis*, should be disregarded. It is a combination of three generic names, of a pigeon (*Macropygia*), a drongo (*Dicruropsis*), and a cuckoo (*Cacomantis*). Probably the collector's note meant that the fly might have come from one of three different hosts.

The author is responsible for all statements in this paper.