

A Review of the Hawaiian Diptera, with Descriptions of New Species

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The order Diptera has probably been the most neglected major order of insects in Hawaii. The only general account of Hawaiian two-winged flies is that which appears in the *Fauna Hawaiiensis*, except for brief discussion of some of the groups by Williams (1931). A few excellent papers and numerous notes, dealing with individual families, genera, or species, have appeared, but no recent general summary of the whole order has been published. The *Fauna Hawaiiensis* recorded 135 endemic and 57 immigrant species; the former in 27 genera, the latter in 46. At present there are known to occur in these islands about 325 described species, belonging to 130 genera, and representing 42 families. (Compare Perkins, 1913, p. clxxx).

In 1919, at the suggestion of Professor D. L. Crawford, the writer began to compile a card catalog of the species of Diptera recorded from Hawaii and references to them. In 1924 a manuscript on the "Diptera of Hawaii" was submitted to the University of Hawaii as a thesis toward the degree of Master of Science. The present paper attempts to summarize the information which has been accumulated; to present a list of the species now known to occur in Hawaii, together with a bibliography and discussion of the principal references to them; and to describe new species, descriptions of which appear in the author's thesis and other unpublished manuscripts.

EARLY REFERENCES TO HAWAIIAN DIPTERA

The early references to Hawaiian entomology were discussed by J. F. Illingworth (1923). He cited several early accounts which indicate that domestic flies were troublesome at a very early date. David Malo (1903, p. 65), a native Hawaiian, writing about 1832, mentioned as native the common house fly or *nalo*, but included the mosquito (*makika*) among "the creatures recently imported

from foreign lands," as did Jarves (1843, p. 10). Charles Pickering, in the report of the U. S. Exploring Expedition (1848, p. 333) discussed the connection between house flies and man, stating that such flies are absent on uninhabited islands, but present where man has been. He also discussed the introduction of mosquitoes, as did Cheever (1850, p. 105).

The earliest systematic descriptions of Hawaiian Diptera were written by Thomson (1868), in working up the specimens collected on the voyage of the Swedish frigate "Eugenie," which visited Hawaii in August, 1852.

Rev. Thomas Blackburn, who came to Hawaii in 1877, made extensive collections which added much to the knowledge of most orders of insects in these islands. But apparently he did not care for flies, for he said little about them, except that there were "too many Diptera of the mosquito type," (1877, p. 227).

THE FAUNA HAWAIIENSIS

It was not until the arrival of R. C. L. Perkins in 1892 that Diptera were carefully collected. A rather large percent of the native flies known today were described, from Perkins' material, in the Fauna Hawaiiensis. Also, quite a number of the immigrant species were recorded in that monumental work. Grimshaw (1901 and 1902) recorded 185 species, 111 of which were described as new. Speiser (1902) described two new species and one new variety of Hippoboscid flies. And Perkins (1910) described six species and recorded five more which he had already described. In the "Introduction," Perkins (1913) gave a careful résumé of all the families of Diptera known in Hawaii at that time.

Just prior to the appearance of Grimshaw's first paper, L. O. Howard (1901) presented to the Entomological Society of Washington a list of the Diptera collected in Hawaii by H. W. Henshaw. This contained mention of 19 species, 5 of which were not specifically determined. The records were repeated by Grimshaw.

MORE RECENT CONTRIBUTIONS

More recent work on Hawaiian Diptera has been largely of an economic nature, although some taxonomic papers have been published. In 1906, F. W. Terry produced a preliminary account of

the Diptera of economic importance, in which he noted several injurious and beneficial species. Although Terry carried on extensive research and breeding, most of his work was lost at the time of his sudden death in November, 1911. In 1910 he presented as a presidential address before the Hawaiian Entomological Society a paper entitled "Biological Notes on Hawaiian Diptera," but only a few items and the description of a new genus and two new species of Chironomidae were published (1913).

The most serious dipterous pests are the two fruit flies: *Chaetodacus cucurbitae*, the melon fly, and *Ceratitidis capitata*, the Mediterranean fruit fly. A large number of papers and notes have appeared concerning these. There are several references to Diptera attacking or annoying cattle, horses, and other live stock, especially one paper by Van Dine and Norgaard (1908) and one by Bridwell (1918). Several papers and notes have appeared on mosquitoes, and there are numerous references to beneficial Diptera, such as certain Syrphidae, Pipunculidae, Tachinidae, and Drosophilidae. The principal recent papers and most of the notes have appeared in the Proceedings of the Hawaiian Entomological Society, with a few in publications of the local experiment stations. Papers on individual families, genera, and species will be referred to in the discussion of these groups, given below.

ACKNOWLEDGMENTS

J. F. Illingworth has done much to obtain identifications of Diptera, especially muscoid flies. F. X. Williams gave an excellent, well-illustrated summary of numerous species found in sugar cane fields (1931), and has helped to advance the knowledge of flies associated with water. Otto H. Swezey and other entomologists have assisted greatly by collecting and breeding specimens, which have been made available to the writer by the experiment stations and institutions with which these entomologists were associated.

The writer is greatly indebted to J. M. Aldrich, Charles P. Alexander, E. T. Cresson, Jr., C. Howard Curran, O. A. Johannsen, J. R. Malloch, the late M. Bezzi, and others, for helpful assistance in obtaining correct identifications of numerous species.

The following species are described as new in this paper :

Calliphoridae: *Dyscritomyia terryi* n. sp.

Drosophilidae: *Idiomyia grimshawi* n. sp.

Drosophila z-notata n. sp.

Drosophila fuscoamoeba n. sp.

Drosophila punalua n. sp.

Drosophila nigra Grimshaw variety *iki*
n. var.

Drosophila kauluai n. sp.

RÉSUMÉ OF THE FAMILIES OF DIPTERA FOUND IN HAWAII

Family LIMONIIDAE (Limnobiidae)

Fifteen species of craneflies have been identified from Hawaii. These are now placed in four genera, and all belong to the subfamily Limoniinae.

Grimshaw (1901, pp. 6-7) described *Libnotes perkinsi*, six species of *Dicranomyia*, *Trimicra lateralis*, and *Styringomyia didyma*. Alexander found two of these species of *Dicranomyia* preoccupied (1911 and 1919). He renamed them and described two new species in 1919, one in 1923, and one in 1924 (see bibliography under these dates). Swezey (1915) described *D. foliocuniculator*, with leaf-mining larvae.

Perkins (1913, p. clxxxii) suspected that *S. didyma* was an immigrant species; and this was substantiated when Edwards (1911) synonymized *Idiophlebia pallida* of Grünberg (1903) with it, and noted a wide distribution in his revision of the genus (1914). Alexander (1919, p. 30) noted it as "apparently well distributed throughout parts of Australasia;" (see also Alexander, 1923, p. 251).

Edwards (1921) synonymized *Trimicra lateralis* with *Trimicra pilipes* (Fabricius); (see also Alexander, V: 251, 1923).

Alexander (1919) described *Gonomyia (Lipophleps) hawaiiensis*. In a check list (1932), he considered both *Libnotes* and *Dicranomyia* as subgenera of *Limonia*.

One of the most interesting features of Hawaiian craneflies is the leaf-mining habit of *L. foliocuniculator* and possibly other related species. The native species are found along streams in the

mountains, some locally abundant, "dancing" against rocks and tree trunks. The immigrant species are mainly found in the lowlands. Craneflies are preyed upon by Mimesid wasps. (Perkins, 1913, p. clxxxii and Williams, VI: 435, 1927).

Family PSYCHODIDAE

Grimshaw (1901, p. 6) described *Psychoda inornata* and recorded *P. alternata* Say. Mrs. O. H. Swezey (I: 116-118, 1907) published life-history notes on *P. inornata* "or an undescribed species." *P. alternata* was found breeding in a house drain on Molokai (Illingworth, VI: 394, 1927).

Bridwell (IV: 248, 1920) reported a "black species" at Waikiki, which may be the same as a dark-winged species taken very abundantly about the lighthouse on Sand Island, Honolulu harbor, 1923, and as yet undetermined. Various other undetermined species have been noted.

Telmatoscopus albipunctatus was reported by Williams (VIII: 18, 1932), and has since become fairly abundant on Oahu, being found about sinks and on windows, and breeding in small puddles with mosquito larvae. This is the species recorded by Illingworth (VII: 378, 1931) as having been collected in Makiki, Honolulu, by G. P. Wilder. Specimens were also determined by Aldrich for Bryan (VIII: 230, 1933).

Family CULICIDAE

There are but three species of mosquitoes known in Hawaii, two day-flying, and one night-flying, although it may be possible that other species may occur here (see Ehrhorn, V: 194, 1923). All are immigrants, having arrived since about 1825, for none was known prior to that date according to various accounts (Montgomery, 1831; David Malo, 1903; Bryan, VIII: 3, 1932). Several theories are given as to their mode of arrival (Osten Sacken, 1861 and 1884; Van Dine, 1904; Kirkaldy, I: 121, 1907). The night-mosquito, *Culex quinquefasciatus*, (also called *Culex fatigans*) apparently arrived in water casks on a ship from Mexico about 1826; the two day-mosquitoes, *Aedes albopictus* and *A. aegypti*, at a later date. Perkins (1913, p. clxxxii) noted *A. albopictus* ("*Stegomyia scutellaris*") as not having been at all abundant when he began collecting in 1892-3. Both day-mosquitoes are so

widespread in the Pacific that their origin cannot be determined; they doubtless arrived in commerce. "*Stegomyia scutellaris*" var. *samarensis* was described from Oahu by Ludlow (1903).

There are numerous references to mosquitoes in Hawaii, the principal ones being: Smith (1904), Van Dine (1904), Terry (1906, pp. 36-37), Knab (1906), Fullaway (1913), Warren (1915), Bridwell (1918), Bryan (V: 291, 1923), Swezey (VII: 12, 1928), Williams (1931, p. 275), and the Anti-Mosquito League (1931). Illingworth (VII: 414, 1931) suggests control with arsenic spray.

All three species are widespread in Hawaii, principally in the lowlands; *A. aegypti*, the yellow-fever mosquito (which apparently transmits neither yellow fever nor dengue fever in these islands) being distinctly domestic, and *A. albopictus*, more a "forest day-mosquito" in the lower forest and valleys. *A. albopictus* has been known here as *Aedes* and *Stegomyia scutellaris* (see Edwards, 1916-1917, p. 209, fig. 5; and 1926, p. 101).

Megarhinus inornatus Walker, a large mosquito from New Britain, the adults of which are harmless, and the larvae of which prey upon the larvae of other mosquitoes, was introduced by Pemberton in 1929 (VII: 360, 1931), but it apparently has not become established (Williams, 1931, p. 279).

Family CHIRONOMIDAE

An endemic genus, *Charadromyia*, and two species, which fly and breed about wet rocks in mountain streams, were described and figured by Terry (II: 291-5, 1913); see also Perkins (1913, p. clxxxi). Illingworth (VII, 408, 1931) recorded one of these, *C. torrenticola*, from Oahu. Williams (1931, p. 275) gave a note concerning these flies.

Grimshaw (1901, p. 4) described and figured *Chironomus hawaiiensis*, which Warren (1915) listed as a favorite food of dragonflies, and Williams (1931, p. 275) as eaten by lizards. This species is sometimes common in the lowlands, the larvae ("blood-worms") breeding in standing water (see Terry, 1906, p. 37; and Perkins, 1913, p. clxxx).

Grimshaw (1901, p. 5) noted an unnamed species of *Orthocladius*. Another undescribed species has been referred by Johannsen to the subgenus *Psectrocladius*.

Grimshaw (1901, p. 5) described *Tanytarsus lacteiclavus* from Kauai. Swezey and Williams (VIII: 187, 1932) also recorded it from Hawaii. Dragonflies and other enemies of this midge were noted by Williams (July 6, 1933).

Aldrich determined specimens collected by Illingworth on water, in 1928, as *Metriocnemus* sp.

Family CERATOPOGONIDAE

Grimshaw (1905, p. 5) noted and figured *Ceratopogon* sp. from Oahu; and Bridwell (IV: 284, 1920) recorded another species of this genus. Related specimens, sent to Johannsen, were referred to the subgenus *Prohelea*. Perkins (1913, p. clxxx) stated that more species probably exist in the mountains. At times small clouds of these gnats are to be seen.

Apelma brevis, described by Johannsen (1927), was reported as abundant in pineapple fields, where the larvae and pupae are active in water in the axils of the leaves (Illingworth, VII: 206, 255, 1929). Illingworth (December 7, 1933) presented a paper on its life history.

Family MYCETOPHILIDAE

Three large, dark, endemic species of *Platyura* were described by Grimshaw (1901, pp. 2-4, pl. I:2-5). Perkins (1913, p. clxxx) noted: "It is probable that the truly endemic forms are numerous, the larvae being very plentiful in decaying vegetation, where they are preyed upon by the small carabid beetles, and, if they have been exposed, are also seized upon by minute carnivorous flies belonging to the Dolichopodidae. A number of species [Sciaridae ?] have been imported with foreign plants and have become very abundant, so that it may not be easy to discriminate the foreign from the native species in these obscure flies."

Family SCIARIDAE

Many small fungus gnats have been referred to *Neosciara molokaiensis*, described (as *Sciara*) by Grimshaw (1901, p. 2, pl. I: 1). This group needs extensive collecting and critical study. From a large series Professor O. A. Johannsen distinguished specimens of two other species of *Neosciara* which still remain

undescribed. These gnats are widely distributed in Hawaii and are seasonally very abundant. The larvae are said by Illingworth (1926, p. 30 and VII: 254, 1929) to gnaw tender young pineapple roots. Williams (1931, p. 275) gave notes on them. This or a closely related species was collected on Midway and Cure Islands (Bryan, 1926, p. 67). Illingworth (December 7, 1933) presented a paper on their life history.

Family SCATOPSIDAE

Bridwell (IV: 284, 1920) reported an "additional species of Bibionid fly" belonging probably to *Scatopsis*, captured in a salt marsh at Waikiki, May 30, 1919. The other species, which Bridwell says is "referred to a different genus" is not known to the writer.

Rhegmoclema atrata was captured in a parasite cage from California in 1915. It is not known to be established.

Family CECIDOMYIIDAE (or Itonidae)

Gall midges are so frail and delicate that they have been largely overlooked and their determination neglected. Swezey (I: 79, 1907) reported that *Contarinia* or *Diplosis sorghicola* was bred from sorghum tops, *Contarinia solani* from tomato buds, and an undetermined species from larvae feeding on the spores of rust on sorghum leaves. *Contarinia maculipennis* was described by Felt (VIII: 247, 1933) from specimens reared from hibiscus buds by Swezey (VII: 370, 1931 and VIII: 212, 1933). Illingworth had noted it about 1928; and Fullaway reported (January 5, 1933) breeding it from buds of "pikaki," *Jasminum sambac*.

Phaenabremia meridionalis was reported by Williams (VII: 372, 1931), identified by Barnes, in 1929, as the "Itonidid," the orange larvae of which feed on sugar cane aphids, as noted by Osborn (IV: 329, 339, 1920); see also Williams (1931, p. 274). Timberlake also recorded a native "Itonidid" in *Pelea clusiaefolia*, on Oahu (III: 380, 1918).

Lobodiplosis pseudococci was described by Felt (1933) for a midge enemy of *Pseudococcus brevipes*, which had been introduced to Oahu from Mexico by Fullaway in 1930. It was recovered on

Oahu, August 23, 1932, by Chock (VIII: 237, 1933). Schmidt reported (January 5, 1933) that it was well established in some pineapple fields.

Bridwell (IV: 42, 1919) bred a Cecidomyid from the remains of *Livistona* palm seeds which had been partly destroyed by a Scolytid beetle.

Swezey (November 2, 1933) reported breeding an undetermined species from mango seed refuse.

Family STRATIOMYIIDAE

Four species of "soldier flies," all immigrants, have been recorded.

Neosexaireta spinigera, an Australasian species, is recorded by Grimshaw (1902, p. 79). Perkins (1913, p. clxxxii) says that it was not noticed in 1897, but was common about Honolulu in 1900. It is at present widespread, even up into the lower forest zone, probably on all the main islands. Notes concerning it were given by Pemberton (III: 285, 1917), and Williams (1931, p. 280) gave a good figure. Illingworth (VII: 252, 1929) noted it as doing minor injury to a papaya trunk. The larvae breed beneath decaying bark in the forests, and the flies are preyed upon by Crabronid wasps.

Evaza javanensis was first reported (undetermined) by Grimshaw (1902, p. 79). It was known to Terry as "*Acanthina* sp."; and finally determined by Brunetti (Bryan, V: 349, 1924). It is a native of the Malay region, and not uncommon in parts of Hawaii, having probably arrived about 1900.

Hermetia illucens, a widespread tropical and subtropical American species, was first reported by Williams (VIII: 232, 1933), having been noticed near Hilo, Hawaii in 1930, and bred from filter-press mud in 1932. It is also in Samoa (Ricardo, 1929, p. 109).

Microchrysa hovas, recorded as "Sargus sp." by Howard (1901), Grimshaw (1901), and Terry (1906, p. 37) who gave life-history notes, was determined by Brunetti (Bryan, VI: 369, 1927) as *Cephalochrysa hovas*. Ricardo (1929, p. 116) in recording it from Samoa, changed the genus to *Microchrysa*. It is wide-

spread, but rather rare, in Hawaii. Perkins (1913, p. clxxxii) stated that it was known in Honolulu in the early '80s. It is a south Asiatic species.

A quite distinct, undetermined species is known from Laysan (Bryan, 1926, p. 67).

Family SCENOPINIDAE

Grimshaw (1901, p. 11) recorded *Scenopinus niger*. The occurrence of *S. fenestralis* in Hawaii was noted by Brunetti (1920, p. 312). Bryan (V: 365 and 368) gave notes on these two species, and (VIII: 245, 1933) recorded *S. fenestralis* on Kaula Islet. The records of *S. fenestralis* are probably misidentifications of *S. lucidus*, found on windows, which was identified by Aldrich (Illingworth, VII: 233, 1929), from specimens collected on ripe pineapples on Lanai. (See also Bryan VII: 335, 1931, and Williams 1931, pp. 280-281).

Family DOLICHOPODIDAE

A very complete summary of the Hawaiian Dolichopodidae is given by Van Duzee (VIII: 307-348, 1933), in which he describes two new genera and 32 new species and gives keys and figures. An introduction, by Williams, gives ecological notes, as does also his "Handbook" (1931, pp. 281-283). Preliminary studies were made of this group by Timberlake (V: 190, 1923). At present the family is represented in Hawaii by 48 species, divided among 12 genera. If the native species continue to be split as finely as in Van Duzee's recent paper, future collecting will bring to light a great many more. This is the largest family of Orthorhapha, and also one of the largest groups of native flies in these islands. Perkins (1913, p. clxxxiii) stated that "at least 100 species of this family might be procured in the islands."

Van Duzee (VIII: 310, 1933) described *Chrysosoma fraternum* for the species known by Grimshaw (1901, p. 11; 1902, p. 80) and others as *Gnamptopsilopus* or *Psilopus patellifer*, Bezzi (1928, p. 66) having pointed out that the Hawaiian species was different from the Guam species described by Thomson (1868). It is common in parts of the main islands, and was also collected on Midway and Cure Islands (Bryan, 1926, p. 67). A related species,

Chrysosoma pallidicornis, was described by Grimshaw (1901, p. 12, pl. I: 20-21) in the genus *Gnamptopsilopus*, the change of genus being given by Bezzi (1928). Van Duzee (1933) gave a key for separating these and related species. A good figure of *C. fraternum* (née "*patellifer*") was given by Williams (1931, p. 282). Perkins (1913, p. clxxxiii) said that "*patellifer*" had been long established, but that *pallidicornis* was first noticed in 1896, more common in 1902, and still more common in 1913. At present it is only occasionally seen, although at times specimens come into houses and may be caught on windows. Both species breed in soil in which plants are being propagated.

An Australian species, *Sciapus pachygyna*, which is found in the lowlands and in sugar cane fields, was determined by Knab (Swezey, III: 272, 1917).

Campsicnemus is represented by 27 species: three described and figured by Grimshaw in 1901 (pp. 13-14) and one in 1902 (p. 80); three by Malloch (1932); and twenty by Van Duzee (1933). Grimshaw (1901, pp. 15-16) also described three species of *Chrysotus*, and Van Duzee (1933) two other new species.

A small, flightless species was described and figured by Grimshaw (1902, p. 81) as *Emperoptera mirabilis*, new genus and species. Perkins (I: 49, 1906 and 1913, p. xlviii) stated that it was "locally common" on Tantalus, Oahu, but specimens are seldom collected.

Van Duzee (1933) described a species of *Syntormon*; three of *Medetera*; three species of the new genus *Eurynogaster*; one of the new genus *Sweziella*; and one of *Hydrophorus*, which is close to *H. praecox*, a name given by Aldrich to specimens collected on Laysan (Bryan, 1926, p. 67). On the main islands *Hydrophorus* breeds in mud flats and feeds on bloodworms (Williams, VIII: 213, 1933). *Medetera femoralis* Becker was thought to occur in Hawaii (Bryan, VII: 401, 1931). *Lianculus metallicus*, a large metallic green species described by Grimshaw (1901, p. 13) is occasionally collected. Williams (December 7, 1933) reported it from Molokai.

Dolichopus exsul, described by Aldrich (1922) and noted by him as the "only tropical species of the genus" (Bryan, V: 285, 1923), is exceedingly abundant locally in moist places in valleys

and the lower rain forest. It will probably be found on all the main islands of the group.

P. H. Timberlake (V: 190, 1923) and F. X. Williams have done much to advance the knowledge of these interesting "long-legged" flies, many of which are water skaters or found associated with water in both lowlands and native forest. Perkins (1913, p. clxxxiii) gave interesting observations on their habits.

Aldrich gave the name *Paraphrosylus* sp. to specimens from pools of salt or brackish water on Nihoa, Necker, French Frigates Shoal, Lisiansky and Wake Islands (Bryan, 1926, p. 68).

Family PHORIDAE

This family is much in need of investigation. Some undetermined species have been sent to Professor Brues for identification, and still others are being caught from time to time. The following have been recorded:

"*Phora* sp." of Grimshaw (1901, p. 76), Pemberton (IV: 1, 1919), and Bryan (IV: 489, 1921), bred from decaying pineapples and landshells, was determined by Knab (Bryan, V: p. 291, 1923) as the American species, *Aphiochaeta scalaris* (Loew). Bezzi (1928) stated that the cosmopolitan *A. xanthina* had been bred from diseased pineapple suckers from Hawaii. These may or may not be the same species. It was reported by Illingworth (V: 268, 277, 1923) as "bred abundantly from cutworm material;" and what was considered to be this species was collected on Lisiansky Island and Pearl and Hermes Reef (Bryan, 1926, p. 67).

Malloch (1912) described *Aphiochaeta setaria* from a single female collected on Maui.

Specimens bred from rotten potatoes by Illingworth were determined by Knab as *Conicera atra*, (Bryan, V: p. 290, 1923) although they do not seem to agree with Brue's description and figure (1906, p. 7, pl. I: 4).

An undetermined species of *Puliciphora* was also found (Bryan, V: 292, 1923).

Family LONCHOPTERIDAE

A specimen of *Lonchoptera* collected by W. M. Giffard near Kilauea, Hawaii, in 1922 (Bryan, V: 347, 1924); a series col-

lected on Molokai (Swezey and Bryan, VI: 415, 1927); and 14 specimens from Hawaii (Swezey and Williams, VIII: 188, 1932) may belong to *Lonchoptera furcata* or a new species.

Family PIPUNCULIDAE

Species of *Pipunculus* have attracted attention in Hawaii, not only because of their striking appearance, the heads being large and nearly covered with the eyes, but also because of their economic importance. They are parasites on delphacid leafhoppers, including the sugar cane leafhopper, *Perkinsiella saccharicida*, which has been one of Hawaii's major sugar cane pests.

Grimshaw (1901, pp. 17-18) described three species. Perkins (1905) described five more, with an account of their habits; later (1910) he described four more; and 1913 (p. clxxxiii) he gave further notes on habits. Accounts of the relation between these flies and the sugar cane leafhopper were given by Perkins (1903, p. 23 and 1905), Swezey (I: 17, 1906), Rosa and Timberlake (IV: 7, 12, 38, 1919), and Williams (IV: 68, 1919, fig.). Swezey (II: 160, 1912) suggested that *P. swezeyi* is a parasite of *Nesosydne pipturi*, a native leafhopper on *Pipturus albidus*, the "mamake" tree. Williams (VI: 446, 1927) noted that they are preyed upon by Crabronidae.

Family SYRPHIDAE

Several species of "drone" or "hover" flies are known in Hawaii, all believed to be immigrants, and, according to Perkins (1913, p. clxxxiv) of rather recent introduction.

Volucella obesa was recorded by Grimshaw (1901, p. 19), and was called "abundant everywhere" on the island of Hawaii in 1905 by Swezey (I: 17, 1906). Today this brilliant metallic green hovering fly is among the most abundant lowland species in Hawaii, and is widespread in the Pacific. Its larvae feed on decaying vegetable matter. Weinrich (I: 25, 1906) recorded the larvae breeding in sisal juice; Illingworth (III: 83, 1915 and VII: 252, 1929) in a papaya trunk; and Williams (VIII: 233, 1933) in filter-press mud. An illustration and description were given by Williams (1931, pp. 284-6).

Volucella pusilla was first collected on Oahu in the fall of 1930 (Swezey, VII: 393, 1931), and soon became abundant on that island. It will doubtless find its way to the lowlands of all the islands. It has been found breeding in cactus stems (Swezey, VIII: 28, 1932). It, like *V. obesa*, is attracted to opening buds and blossoms.

Ischiodon scutellaris was recorded (as *Xanthogramma grandicornis*) by Howard (1901) and Grimshaw (1901, p. 19, pl. 2: 7-10). Its value as a predator on aphids has been discussed by Swezey (I: 17, 1906), Kirkaldy (I: 100, 1907), Kotinsky (1907, p. 77), Fullaway (1909, p. 25), and Timberlake (VI: 530, 1927, pl. XIX, fig. 3). Life-history notes were given by Terry (1906, p. 39). It is parasitized by *Pachyneuron allograptae* (Ashmead) (see Timberlake, III: 403, 1918 and V: 424, 1924), and by *Diplazon laetatorius* (Fabricius) (see Swezey, VII: 282, 1929). The name *Simosyrphus grandicornis* was suggested by Curran; and *Ischiodon scutellaris* by Bezzi (1928) in recording it from Fiji, (see Bryan, VII: 401, 1931) and Hull (1929) from Samoa. It is abundant in the lowlands of Hawaii; found on Johnston and Wake Islands (Bryan, 1926, p. 68); and is widespread in the Orient, Australasia, and Oceania.

Allograptia obliqua was first collected on corn infested with *Aphis maidis* in 1920 (see Timberlake, IV: 456, 1921), and on Kauai the same year (Swezey, IV: 521, 1921). By 1922 it had spread to both ends of the main Hawaiian group, which suggests that the date of its first arrival may have been several years earlier, (see Swezey, V: 186, 1923, and Giffard, V: 196, 1923). It is a valuable predator on aphids, and has also been bred from a mass of *Pseudococcus virgatus* (see Swezey, VI: 226, 1926, and VII: 181, 1928). It becomes locally abundant throughout the islands, especially in corn patches infested with *Aphis maidis*. It is parasitized by *Diplazon lactatorius* (Fabricius) (see Swezey, VII: 282, 1929).

Toxomerus marginatus was first recorded by Swezey (April 6, 1933), specimens having been collected March 20, 1933, at flowers in Kalihi, Oahu; and on Kauai, June, 1932.

Eristalis tenax was recorded by Howard (1901) and Grimshaw (1901, p. 19), and has been mentioned in several notes and lists. It is comparatively rare, except at higher elevations on the island of Hawaii. The larvae, popularly known as "rat-tailed maggots," have been bred from decaying organic matter. The species is nearly cosmopolitan, and has probably been in Hawaii for many years.

Lathyrrophthalmus arvorum (formerly called *Eristalis punctulatus*) was recorded by Grimshaw (1902, p. 82). Swezey (I: 17, 1906) called it "very abundant" on the island of Hawaii in 1905. It has been mentioned in several notes and lists. The larva was described by Terry (1906, p. 39). Bridwell (IV: 360, 1919) recorded it as breeding in pineapple and sisal refuse; Illingworth (V: 280, 1923) stated that the adults were attracted to carrion; and Williams (VIII: 233, 1933) bred it from filter-press mud. Synonymy was suggested to the writer by C. Howard Curran. This species is widely distributed in the Indo-Malayan and Australasian regions, and it is one of the most common lowland flies in Hawaii.

Lathyrrophthalmus aeneus was first collected in Honolulu in the fall of 1919, and was reported (as *Eristalis aeneus*) by Osborn (IV: 329 and 339, 1920) and Bryan (IV: 360, 1920). It is thought to have immigrated here from the Pacific Coast of America about 1918 or 1919, for it became suddenly very abundant on Oahu, hibernating during the winter of 1919-20 in out of the way places. Swezey (VIII: 10, 1932) reported it from Molokai. Illingworth (V: 280, 1923) noted it as attracted to carrion. It is widespread in Europe and North America.

Eumerus marginatus was described by Grimshaw (1902, p. 82). His suspicion that it might not be endemic was strengthened by the capture of specimens thought to be this species in 1907 in South China and 1909 in Amboina by Muir (Terry, II: 91, 1910). Curran, however, thought that these Asiatic specimens may belong to a closely related species, of which there are several. This species is found in many parts of Hawaii, but nowhere abundant. Another species of *Eumerus* was reported taken in Honolulu by Swezey (January 5, 1933). Pemberton (July 6, 1933) reported the col-

lection of a new *Eumerus* sp. with conspicuous white posterior tarsi in Honolulu, June 10, 1933.

Syrpitta oceanica was recorded by Howard (1901) and Grimshaw (1901, p. 19). Terry (II: 96, 1910) gave notes on its life-history. It is found throughout Hawaii, especially about Compositae, but nowhere very abundant. It also occurs in Fiji (Bezzi, 1928).

Euplodes volucris, *Syrphus americanus* and "possibly other species" were introduced and liberated in 1919 (Osborn, IV: 333, 1920), but apparently they did not become established. *Eumerus strigatus* and *Mirodon equestris* were bred from daffodil bulbs imported from California (Whitney, IV: 606, 1921), but apparently have not become established. *Melanostoma stegnum* (Say) was intercepted in Quarantine, in 1921 (Whitney, V: 3, 1922). *Syrphus opinator* Osten Sacken was bred, December 31, 1924 (Swezey VI: 220, 1926), from a puparium found in celery imported from California, but it is not known to be established.

Family OESTRIDAE

The "sheep head-maggot" or "bot fly," *Oestrus ovis*, was recorded by Grimshaw (1901, p. 20), and subsequently noted by Terry (1906, p. 43), and Van Dine (1908, p. 47 and 1909, p. 36). Van Dine and Norgaard (1908, p. 62) gave an account of its habits and control. The viviparate larvae, deposited within the nostrils of sheep, work up into the frontal sinuses where they attach themselves, feed upon mucous membrane and secretions, and cause great irritation. The full fed larvae are sneezed out and pupate in the soil. Maggots have also been found in the sinus of a goat, killed on Kauai (Fullaway, V: 365, 1924). This cosmopolitan sheep pest seems to be definitely established in Hawaii, although not abundant.

Hypoderma lineata was first recorded (as *Hypoderma* sp.) by Terry (1906, p. 43) and subsequently noted by Van Dine (1908, p. 47 and 1909, p. 36), and Swezey (V: 10, 1922). Van Dine and Norgaard (1908, p. 40) gave notes on habits and control. Ehrhorn (III: 113, 1916) thought the flies were controlled on Molokai by ants (*Pheidole magacephala*) which destroy the

larvae as they fall to the ground to pupate. This "heel fly" has doubtless been imported several times with shipments of cattle. There are occasional outbreaks on ranches on Kauai, Molokai, and Hawaii, but the species is not abundant. (See Swezey, VI: 360, 1927; Illingworth, VI: 373, 1927; and Pemberton, VIII: 242, 1933).

There are no specimens or definite records to prove the presence of the "warble fly," *Hypoderma bovis* De Geer. It was doubtfully recorded by Van Dine (1908, p. 47) and this record has been repeated.

Family TACHINIDAE

Seven exotic, immigrant species are known in Hawaii, all of which are useful parasites.

Chactogaedia monticola was recorded from Hawaii (as *Blepharipeza*) by Bigot (1888, p. 91), with records by Coquillett (1897, p. 137), Grimshaw (1901, p. 20, and 1902, p. 83), Terry (1906, p. 40) and numerous later records. Notes on its interesting and peculiar habits and life-history are given by Swezey (I: 49, 56, 1907; I: 163, 1908; II: 7-9, 1908; 1909, p. 25; II: 160, 162, 1912), and Illingworth (V: 277, 1923). It is a valuable parasite on cutworms and armyworms, a list of its many hosts being given by Swezey (1909, pp. 25-30, and VI: 356, 1927). It is parasitized by *Chalcis obscurata* Walker, and is a "favorite prey of the larger Hawaiian Crabronidae" (Perkins, 1913, p. clxxxv). This North American species is generally distributed throughout the main islands of the group, even occurring in the native forest. Like certain other abundant flies, it has been blown to the tops of the high mountains (Bryan, VI: 282, 1926, and Swezey and Williams, VIII: 191, 1932). Swezey (September 7, 1933) recorded it from Haleakala, Maui, 7000 feet.

Frontina archippivora is said to have been introduced from North America by Koebele to help control armyworms. Notes on its life-history, habits, hosts, and distribution are given by Swezey (1907, pp. 46, 56; 1909, p. 25; V: 8, 1922; V: 184, 303, 1923). It, also, has been found on top of the high mountains (Bryan, VI: 282, 1926); is widespread in the lowlands of the main islands; and a single specimen was captured on the summit peak of Nihoa Island (Bryan, 1926, p. 68).

Archytas cirphis was described by Curran (VI: 497, 1927) for a species introduced by the Hawaiian Sugar Planters' Association from Los Mochis, Mexico, in February, 1924 (see Swezey VI: 226, 1926, and 499-503, 1927). It quickly became established on all the larger islands of the group, and is rapidly becoming one of the most abundant flies in the lowlands. It is a valuable parasite on caterpillars, being known as the "Mexican tachinid armyworm parasite." (See: Muir, VI: 354, 1927; Swezey, VI: 359, 1927; Illingworth, VI: 395, 1927; Williams, VII: 10, 1928; Swezey, VII: 11, 1928; Pemberton, VII: 210, 1929; and Swezey, VII: 340, 1931).

Leucostoma aterrима was recorded (unidentified) by Bridwell (IV: 339, 1920) as bred from *Corizus hyalinus* on Ewa Coral Plain, Oahu, October, 1919; and by Swezey (IV: 467, 1921) as bred from the same host at Puuloa, Oahu, March 24, 1920. In 1921 it was determined by Aldrich as *Leucostoma atra* Townsend, a common American species. In 1932 Aldrich corrected this identification to *L. aterrима*, and stated that the *Leucostoma analis* (Meigen), doubtfully recorded by Grimshaw (1901, p. 20) was a synonym, (see also Illingworth, V: 268-9, 1923). The "small unidentified littoral species" of Perkins (1913, p. clxxxiv) may also be *L. aterrима*.

Leucostoma atra was also identified by Aldrich from specimens collected on Oahu in 1920 by Williams. Characters are given by which this species and *L. aterrима* may be separated (Swezey, VIII: 242, 1933.)

Microceromasia sphenophori was described (as *Ceromasia*) by Villeneuve (1911, p. 81) for a New Guinea species, introduced into Hawaii by F. Muir in 1910, and later into Fiji (Illingworth, 1913, and 1914, p. 390) and into Samoa from Hawaii, as a parasite on the sugar cane beetle borer, *Rhabdocnemis obscura*. Good accounts of the dramatic introduction of this fly, and its habits, are given by Muir and Swezey (1916, and VIII: 143, 1932); Timberlake (VI: 540 ff. pl. XXI, 1927); and Williams (1931, pp. 294-6); with numerous other references in the publications of the Hawaiian Sugar Planters' Association. It attacks the grub of the beetle, both in sugar cane and in coconut palms (Swezey,

III: 380, 1918). The puparium is parasitized by *Pachycrepoides dubius* Ashmead (Timberlake, V: 424, 1924), and the ant, *Pheidole megacephala*, attacks the maggots (Illingworth, 1914, p. 396). Bezzi (1928, p. 209) records it from Fiji as *Microceromasia*.

Ochremeigenia ormioides was introduced from Formosa several times between October, 1926 and 1930, as a parasite on *Adoretus sinicus*, and liberated on Oahu, (Fullaway, Reports of the Entomologist, Hawaii Board of Agriculture and Forestry, 1926 to 1930), but, as none has been recovered, its establishment is doubtful.

Family SARCOPHAGIDAE

Six species of *Sarcophaga*, all immigrants and widespread, if not cosmopolitan, occur in Hawaii. Timberlake (III: 371-2, 1918) gave a key for their identification.

The largest species is *S. barbata*, originally described from Oahu by Thomson (1868, p. 533), but widespread in Europe and America. Grimshaw (1901, p. 26) reprinted the original description. Muir (V: 353, 1924) compared specimens with the type. Illingworth (V: 280, 1923) noted it as one of the first insects to approach dead animals. It and *S. dux* are parasitized by *Mormoniella brevicornis* Ashmead and perhaps other wasps (Timberlake, V: 421, 1924). It is widespread throughout the main Hawaiian islands, and was collected on Kaula Islet (Bryan, VIII: 245, 1933.)

Sarcophaga dux, also described from Honolulu by Thomson (1868), and listed by Grimshaw (1901, p. 27), has been shown by Parker (1919, pp. 41-46) to be almost cosmopolitan. He divided the species into seven subspecies, of which two (*dux* and *harpax*) were said to occur in Hawaii. *Dux* is the more common here, occurring also in Guam and the Philippines; *harpax*, which is widespread in Europe, Japan, Formosa, the Philippines, and the United States, is here rarely seen. Muir (V: 353, 1924) compared specimens with the type in Stockholm. Bezzi (1928, p. 190) reported it from Fiji and Buxton (1929) from Samoa. Its maggots were found in carrion (Illingworth, V: 280, 1923).

Sarcophaga fuscicauda was first collected by Terry in 1905, and was determined for Timberlake (IV: 256, 1920) by R. R.

Parker. It is the "Sarcophaga sp." of Timberlake's key (III: 371, 1918). It was shown by Illingworth (VI: 262-5, 1926) to have been widespread by commerce from a center somewhere in south-eastern Asia, having been described by Böttcher (1912, p. 168) from Formosa. Bezzi (1928, p. 191) recorded it from Fiji and Buxton (1929) from Samoa. Illingworth (V: 266, 1923) noted it as the most abundant fly in hen manure, and one closely associated with man in the tropics. He recorded its pupa being parasitized by *Eucolia impatiens* Say, a wasp introduced from Arizona in 1906 (see Swezey, V: 303, 1923).

Sarcophaga haemorrhoidalis is comparatively rare in Hawaii, breeding in human excrement. It occurs in Europe, Asia, and Africa, and is a common scavenger in North America, whence it probably came to Hawaii. On Kauai it was reported by Swezey (III: 379, 1918) as attracted to sugar cane juice. On Molokai it was found about excrement in pineapple fields (Illingworth, VI: 395, 1927).

Sarcophaga pallinervis, described by Thomson (1868, p. 535) and listed by Grimshaw (1901, p. 26), is probably the most common sarcophagid in Hawaii, breeding in cow dung and dead animals on all the main islands (see Van Dine, 1908, p. 47). It is frequently mentioned in notes and lists in these "Proceedings." It is widely distributed throughout the United States, where it is a common scavenger, formerly known as *S. communis* Aldrich. Its anatomy was exhaustively discussed by Parker (1914, p. 55). It is parasitized in Hawaii by *Aphaereta muscae* Ashmead (Bridwell, IV: 178, 1919). Williams (VI: 445, 1927) also noted that *Xenocrabro hawaiiensis* provisions its nests with it. It has been caught on the summits of Mauna Loa and Mauna Kea, Hawaii, (Bryan, VI: 282, 1926).

Sarcophaga plinthopyga (formerly known as *S. robusta* Aldrich) is a large North American species, somewhat rare in Hawaii. It breeds in meat (Illingworth, III: 383, 1918 and VI: 239, 1926).

A good résumé of Hawaiian sarcophagids is given by Williams (1931, pp. 297-9).

An entirely distinct species (still undetermined) was found abundant and widespread on islets to the northwest of Kauai (Bryan, 1926, p. 68).

The two endemic genera, *Dyscritomyia* and *Prostheochaeta*, placed by Grimshaw (1901) in the family Sarcophagidae, are here considered under Calliphoridae (below).

Family CALLIPHORIDAE

In 1901 Grimshaw described two new genera, *Dyscritomyia* and *Prostheochaeta*, for a group of endemic, robust, metallic blue-green, flies, found in the native forests of Hawaii. They produce living maggots and are thought to breed in the large land and tree snails (Perkins, I: 98, 1907; 1913, p. clxxxv; Terry, II: 179, 1912). Grimshaw placed them in the family Sarcophagidae. Following the limitation of the Sarcophagidae, as given by Aldrich (1916, p. 7), these two genera do not fall within that family. Their morphology and habits, rather, include them in the Calliphoridae, subfamily Calliphorinae, in which group the writer proposes that they be placed. Grimshaw based the genus *Dyscritomyia* on *limbipennis* which Thomson (1868, p. 541) described in the genus *Catapicephala*. *Prostheochaeta* is distinguished from *Dyscritomyia* by characters so minor and so variable (some having intergradations) that it may seem desirable to combine the two. Grimshaw (1901, pp. 21-26) described four new species of *Dyscritomyia* and four of *Prostheochaeta*. These flies are parasitized by *Aspilota konae* Ashmead (Bridwell, IV: 388, 1920); and they are preyed upon by Crabronidae (Perkins, 1913, p. clxxxvi, and Williams VI: 444, 1927). The following species is described as new:—

Dyscritomyia terryi n. sp.

Robust, bright metallic green species, with silvery pubescence on the orbits of the eyes. It resembles *D. hawaiiensis* and *D. limbipennis* in having the costal margin of the wing strongly infuscated; but it differs from them in being bright metallic green, with only the hind margins of the abdominal segments and parts of the head darkened, the other two species being dark bluish-green.

Head as broad or a little broader than the thorax, the front of the male $\frac{3}{4}$, of the female $\frac{1}{4}$, the width of the head; eyes bare, the orbits more or less distinctly covered with silvery pubescence. Antennae dark brown, decumbent, nearly as long as the face, the third segment about four times as long as the second, covered with fine, golden pubescence; the second with a strong apical bristle and black hairs; the arista long, slender, plumose, with the hairs longer on the dorsal side, bare only on the apical $\frac{1}{4}$ or less.

The chaetotaxy agrees with that of the generic description, as follows:—
In the male: 2 vertical bristles, parallel and pointing backward; and on each

side of the front a single row of fronto-orbital bristles, reaching from the vertex to base of antennae, the 3 or 4 nearest the vertex parallel and pointing backward, the others decussating in front view, erect when seen laterally. In the female: two inner vertical bristles, like those of the male, and two outer, shorter ones, pointing backward and outward; and fewer fronto-orbital bristles, with, near the vertex, two in an outer row, pointing forward. The vibrissae are very strong, crossing in front, located at the corners of a somewhat projecting oral margin. Below them, the sides of the mouth opening have a row of a dozen moderate bristles. Above them, the facial ridges on their lower half have a few small bristles, diminishing in size upwards.

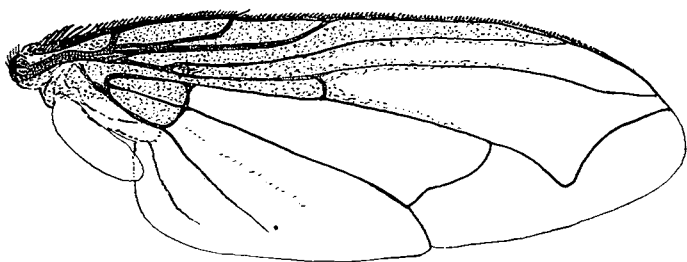


FIG. 1. *Dyscritomyia terryi* n. sp., wing.

The proboscis and palpi are a dark purplish brown, some parts with a golden pubescence or sheen, with numerous short black bristles and fine hairs; tip of the proboscis with whitish hairs. Cheeks dark shining brown, or in some specimens, dark blue or greenish, with numerous stiff black hairs and slender bristles. Posterior orbits with silvery pubescence, edged with a single continuous row of uniform short black bristles, behind which are scattered rows of similar bristles on the more or less silvery surface, continuous with the longer hairs and bristles of the cheeks.

Dorsum of the thorax bright metallic green, with small black bristles and, as prescribed for the genus, the following macrochaetae on each side: 2 humeral, 1 posthumeral, 1 weak and 2 strong dorsocentral before the suture, and 3 behind the suture, 2 acrostichal before the suture and 1 between the hindmost dorsocentrals, 2 intra-alar, 3 supra-alar, and 1 presutural, which lies lower than the posthumeral. The scutellum is concolorous with the thorax, with the following bristles: 3 strong pairs of lateral, 1 pair of dorsal, and 1 pair of smaller apical, which cross.

Sides of the thorax concolorous, with the following macrochaetae: 7 strong mesopleural, 1 strong notopleural in line with them, 2 very strong and 1 moderate sternopleural, a row of 7 moderately strong hypopleural, and numerous other small bristles and stiff hairs, especially near the coxae.

Abdomen concolorous with the thorax, except that the hind margin of each segment (about 1/5th the width of each) is dark, shining steel blue. The median dorsal line is marked by pairs of bristles as follows: on the margin of the 1st segment (small), disc and margin of 2nd, disc and margin of 3rd, disc and margin of 4th, reaching their greatest size on the margin of the 3rd, and diminishing both ways. The margins of the 3rd and 4th

have a continuous row of strong bristles, and there are also bristles on the sides of the 1st and 2nd segments. The terminal segments also are crowned with smaller bristles.

Legs slender, blackish-brown, the femora with greenish reflections; covered with small black bristles, and with moderately strong macrochaetae, especially tufts of them on the apicocephalic aspect of the coxae, rows on the femora, scattered bristles on the tibia, and an apical cirlet on each segment. Claws and pulvilli are fairly strong.

Wings with venation as shown in figure 1. Costal margin, as far as the tip of vein R_{2+3} and as deep as the media, to the r-m crossvein and the basal cells, strongly infuscated; not so strongly as in specimens of *D. hawaiiensis*, but fully as strongly as in *D. limbipennis*, with somewhat its yellowish tinge toward the base. Halteres and alulae lacy white, with yellowish margin fringed with fine, short, golden hairs.

Length:—9 to 11 mm.; wing, 7 to 9 mm.

Type: (male) Mt. Olympus, Oahu, V-18-1919 (J. A. Kusche); (female) Opaepala, Oahu, 3-30-13, (O. H. Swezey). Paratypes: 20 males and 9 females, all from Oahu, the distribution being from Palolo on the east to Opaepala on the west, and the earliest specimens having been collected by Terry in 1906.

Phormia regina was recorded by Howard (1901), repeated by Grimshaw (1901), the specimens having been collected on the island of Hawaii (see Bryan, V: 347, 1924). It has been collected only twice since, both on Hawaii (Swezey and Williams, VIII: 188, 192, 1932).

One of the most abundant species of this family in Hawaii is the "sheep maggot fly," *Chrysomya megacephala*. It was formerly known here as *Lucilia*, *Pycnosoma*, or *Chrysomyia dux*, a determination made by Townsend (see Swezey, III: 272, 1917). It was considered to be of some economic importance and has been discussed by Van Dine and Norgaard (1908, p. 43), Van Dine (1908, p. 47 and 1909, pp. 21, 36), Kuhns (III: 267, 1917), Bridwell (1918), and Illingworth (III: 429, 1918; V: 280, 1923 and 377, 1924; VII: 252, 1929). Illingworth (V: 266, 1923) gave the synonymy, distribution, and habits of this species, and (VI: 254-5 and 266, 1926) a bibliography of references to it in Hawaii, and further notes on distribution. Timberlake (V: 421, 1924) noted *Mormoniella brevicornis* Ashmead as a pupal parasite. Bezzi (1928, p. 187) recorded it from Fiji.

Chrysomyia rufifacies was first reported by Illingworth (III: 429, 1918), being called by him the "common sheep maggot fly of

Australia." It has been reported here as *C. albiceps*, but the careful study of Holdaway (1933) seems to indicate *rufifacies* as the correct name. Bezzi (1928, p. 187), recording it from Fiji, also gives preference to this name. The maggots dominate carcasses in which they breed (Illingworth, V: 280, 1923).

The "English bluebottle fly," *Lucilia sericata*, was recorded and considered of economic importance by Van Dine and Norgaard (1908); Van Dine (1908, p. 47 and 1909, p. 36); Swezey (III: 273, 1917) for whom it was determined by Townsend; Bridwell (1918); and Illingworth (III: 370, 1918; V: 272 and 280, 1923). It has been fairly common locally in parts of the main group, and was found abundant on Kaula Islet (Bryan, VIII: 245, 1933) and Nihoa Island (Bryan, 1926, p. 69). The pupae are parasitized by *Mormoniella brevicornis* Ashmead (Timberlake, V: 421, 1924), and the adults captured and stored in the nests of Crabronidae (Williams, VI: 446, 1927).

Although listed by Howard (1901), which record was repeated by Grimshaw (1901), Van Dine (1908) and others, *Lucilia caesar* probably does not occur in Hawaii, as has been pointed out by Illingworth (V: 267, 1923), these records probably being based on a misidentification of *Lucilia sericata*.

An endemic species of *Lucilia*, *L. graphita*, was described by Shannon from the small islets to the northwest of Laysan (Bryan, 1926, pp. 69, 72; VI: 236, 1926; VIII: 3, 1932).

Calliphora or *Protocalliphora azurea* was reported by Grimshaw (1901, p. 27). Illingworth (V: 268-9, 1923) pointed out that this may have been a misidentification of *Chrysomya megacephala*, for no specimens have been collected since.

Howard (1901) and Grimshaw (1901, p. 27) record *Calliphora vomitoria*. This large bluish blowfly is occasionally seen, especially at higher elevations (Swezey and Williams, VIII: 191, 1932). The closely related, smaller blowfly, *Calliphora latifrons*, was reported by Illingworth (V: 277, 1923) and Bryan (V: 290, 1923), the determinations having been made by Aldrich. This may be the species to which belong two damaged specimens referred to by Grimshaw (1901, p. 28).

Rhinia testacea, an Oriental species, was recorded by Grimshaw (1902, p. 83), which record was questioned by Illingworth

(V: 268, 1923). Bezzi (1928, p. 188) recorded it from Fiji. (See Malloch, 1926).

Stomorhina pleuralis, described as *Idia* by Thomson (1868), is locally abundant in dry localities in the lowlands. It was recorded by Howard (1901), repeated by Grimshaw (1901, p. 28). Bridwell (III: 12, 1914) recorded its egg-laying habit.

Perkins (1913, p. clxxxvii) stated that *Chrysomyia megacephala* ("*Pycnosoma dux*"), *Lucilia sericata*, and *Rhinia testacea* first appeared in Hawaii about 1900.

Family GASTROPHILIDAE

Gastrophilus intestinalis has been recorded (as *G. equi*) by Terry (1906, p. 43), and Van Dine (1908, p. 47 and 1909, p. 36). Swezey and Williams (VIII: 188, 1932) bred a specimen on Hawaii. Life-history notes were given by Van Dine and Norgaard (1908, pp. 66-69). A good account of habits, life-history, synonymy, and control was given by Dove (1918). At certain times this "horse bot-fly" has and may become locally abundant about stables and ranches throughout the islands.

The "chin fly," *Gastrophilus nasalis*, was recorded by Van Dine (1908, p. 47 and 1909, p. 36), with a note by Van Dine and Norgaard (1908, p. 69). A good account of its synonymy, habits, life-history, and control was given by Dove (1918). This species has been confused with the larger and more common *G. intestinalis*, but a few specimens have been found on ranches throughout the islands. Bezzi (1928, p. 185) recorded it from Fiji.

Family MUSCIDAE

The four representatives of this family in Hawaii are immigrants, three of them being very undesirable ones.

The horn fly, *Lyperosia irritans*, (also called *Haematobia serrata* or other combinations of these four names) was first recorded in Hawaii by Koebele, in 1898, (see Swezey, VII: 360, 1931). Perkins (1913, p. clxxxvii) believed that it arrived about 1896. It was recorded or discussed by Howard (1901), Grimshaw (1901), Kirkaldy (1905), Terry (1906, p. 41), Van Dine and Norgaard (1908), Terry (II: 193, 1913), Bridwell (1918), Wil-

liams (1931, p. 300), and various other notes in publications of the Hawaii Agricultural Experiment Station and Board of Agriculture and Forestry. It is abundant in the lowlands, especially about cattle, and even occurs at high elevations (Bryan, VI: 282, 1926). Several parasites have been found or introduced to control it: *Spalangia hirta* Haliday (Kotinsky, I: 31, 1906); *Eucolia impatiens*, (Kotinsky, I: 83, 1907 and 171, 1908, Craw, 1907, figure); *Spalangia philippinensis* Fullaway (III: 292, 1917, fig.); *S. cameroni* Perkins, and *S. sp.* (Timberlake, V: 426, 1924).

The stable fly, *Stomoxys calcitrans*, first reported by Howard (1901) and Grimshaw (1901), but noticed in numbers as early as 1892 (Perkins, 1913, p. clxxxvii), has also been of some little economic importance to cattlemen. Notes concerning this cosmopolitan species have been given by the same writers as concerning the horn fly, above. Bezzi (1928, p. 184) records it from Fiji, and Malloch (1929, p. 175) from Samoa.

The house fly, *Musca domestica*, is present, although seldom sufficiently abundant to be much of a nuisance. It was first reported by name by Howard (1901) and Grimshaw (1901), who also reprinted Thomson's description of *Musca flavinervis*, a variety of which was credited to Hawaii (1868, p. 547). It has been noted in the same references with the horn fly and stable fly (above). Males of this species found in Hawaii have the front narrower than those of typical *M. domestica*, which led Illingworth (V: 275, 1923, pl. ix and VI: 238, 1926) to regard it as the "oriental house fly," *Musca vicina* (= *M. flavinervis*), the synonymy after Patton (see Bryan, V: 364, 1924 and Patton and Senior-White, 1924). More recent authorities regard *M. vicina* as only a variety (Bezzi, 1928, p. 183) and Malloch (1932, p. 203), or as not at all distinct from *M. domestica* (Malloch, 1929, p. 174) (see Bryan, VII: 403, 1931). The adults are preyed upon by *Xenocrabro* (Williams, VI: 444, 1927); and Illingworth (1913 and III: 24, 1914) suggested that *Pheidole megacephala*, the common brown ant, is a large factor in controlling house flies in Hawaii. It is parasitized by *Spalangia cameroni* Perkins (Timberlake, V: 426, 1924). Other parasites are suggested by Illingworth (V: 273, 1923).

Synthesiomyia nudiseta was first recorded (as the "red-tailed Sarcophaga") by Bridwell (III: 15, 1914), who noted the interest-

ing habit of the larvae of making cocoons in the sand in which to pupate. Terry had reared it on meat as early as 1910. Illingworth (V: 180, 1923) in commenting on how the larvae make masses of pupal cases from rat hair, when breeding in dead rats, called the species *S. brasiliiana*. This was corrected to *S. nudiseta* on the authority of Major W. S. Patton (see Illingworth, V: 265, and 280, 1923; and Bryan, V: 292, 1923). Bridwell (1918) gave notes on its habits. It was fairly common for a time, but is at present rare in Hawaii. Bezzi (1928, p. 179) recorded it from Fiji, Malloch (1929, p. 174) from Samoa, and Bryan (1926, p. 68) from Wake Island.

Family ANTHOMYIIDAE

This is one of the largest families of Hawaiian flies, containing besides the 37 native species of *Lispocephala* (formerly *Coenosia*) about 16 species, most of which are immigrants.

Hydrotaea houghi was identified by Malloch from specimens collected, 1919 and 1922, on Hawaii (see Bryan, V: 290, 1923). An undescribed species was listed by Grimshaw (1901, p. 29).

Ophyra nigra was identified for Swezey (III: 272, 1917) by Knab. Illingworth bred it from dead rats (V: 266 and 280, 1923), and from hen manure (V: 271, 1923). Bezzi (1928, p. 176) recorded it from Fiji, Malloch (1929, p. 169) from Samoa, and Illingworth (VI: 260, 1926 and VI: 401, 1927) from Japan and California. Williams (1931, p. 301) gives a brief description and note. *Ophyra chalcogaster* was determined by Aldrich (see Bryan, VI: 353, 1927). It was also recorded from Cure Island (Bryan, 1926, p. 69); from Samoa (Malloch, 1929) and from the Marquesas and Society Islands (Malloch, 1932, p. 196). *Ophyra aenescens* (Wiedemann), recorded by Grimshaw (1901, p. 30), may not occur in Hawaii (see Illingworth, V: 268, 277, 1923). *Ophyra leucostoma* (Wiedemann), recorded by Howard (1901) and Grimshaw (1901, p. 30), has also not been seen since, and may not occur here (see Illingworth, V: 268, 1923). Malloch (1929, pp. 169-170) gave a note on the separation of these species.

Limnophora arcuata was recorded by Illingworth (V: 188, 1923) as first collected in April, 1922, in Kaimuki, Oahu, and was

determined by Aldrich (see Bryan, V: 286, 1923). It is now very abundant in the lowlands, hovering in shady places. Malloch (1920) made this species the type of a new genus, *Eulimnophora*. Willaims (1931, p. 302) gave a brief note, stating that it is parasitized by a tiny wasp, *Spalangia cameroni* Perkins, (see Swezey, V: 356, 1924; Timberlake, V: 426, 1924). It was collected on the summit of Mauna Loa (Bryan, VI: 282, 1926).

Fannia canicularis was reported by Howard (1901) and Grimshaw (1901, p. 30), both as *Homalomyia*. Illingworth (V: 276, 277, 1923) found this "little housefly" abundant at Waimea, Hawaii, and it has been collected at various places since, including Cure Island (Bryan, 1926, p. 69). It occurs in North America and Australia. *Fannia pusio* was recorded and its life-history discussed by Illingworth (III: 271, 1917); and he also recorded it from hen manure (V: 271, 1923) and dead rat (V: 280, 1923). Malloch (1929, p. 156) recorded it from Samoa. Both these species were mentioned by Williams (1931, p. 301). *Fannia (Homalomyia) femorata*, recorded by Grimshaw (1902, p. 84), has not been seen since, and Illingworth (V: 268, 1923) considered it a possible misidentification.

Euryomma peregrinum (Meigen) was determined by Malloch, specimens from Oahu.

Two species of *Lispe* were described by Grimshaw (1901, pp. 30-31). These frequent the forest and are preyed upon by Carabidae (Perkins, 1913, p. clxxxvii); and neither has been recaptured. A single specimen of *Lispa metatarsalis*, described by Thomson (1868, p. 562), was captured by Illingworth (identification by Aldrich), and other specimens collected by Ashmead at Kilauea, Hawaii, were also determined by Aldrich as this species (see Illingworth, VI: 224, 1926).

Grimshaw (1901, p. 42 and 1902, p. 84) described *Acritochaeta pulvinata*, which has been known locally as *Charadrella* sp. In 1922 Malloch synonymized this with *Atherigona excisa* (see Bryan, V: 291, 1923). Swezey (III: 3, 1914 and October 5, 1933) bred it from various decaying fruits. Illingworth (V: 280, 1923) noted it attracted to dead rat; and he (VII: 255, 1929) considered it to be a minor pest of pineapples, through its spreading rot in the fruits. Bezzi (1928, p. 171) considered the Hawaiian form to

be variety *trilineata* Stein (see Bryan, VII: 403, 1931). It was briefly discussed by Williams (1931, p. 301). Malloch (1929, pp. 157-8) suggested that it had been introduced into America and the Pacific Islands from the tropics of the Eastern hemisphere. Malloch (1932, p. 201) recorded it from the Marquesas.

Hoplogaster (?) *dubia*, described by Grimshaw (1901, p. 43) has not been retaken.

Of the 37 species of *Lispocephala*, 13 were described (as *Coenosia*) by Grimshaw (1901, pp. 32-40), and 24 by Malloch, together with a key (VII: 67-89, 1928). Perkins (1913, p. clxxxvii) thought that there might be as many as 100 species of these native anthomyiids in the wet forest, where they are carnivorous and are preyed upon by Carabidae. *L. dexioides* was reported by Williams (VI: 445, 1927) found in the nest of *Xenocrabro*, (see Swezey and Williams, VIII: 188, 1932).

Anthomyia bisetosa, conspicuous because of the black band across the grey thorax, was first recorded by Timberlake (IV: 266, 1920, and IV: 468, 1921). It was recorded on the island of Hawaii in 1927 (Swezey, VII: 13, 1928) and on Kauai in 1928 (Swezey, VII: 272, 1929). Whitney (V: 37, 1922) referred this species to *A. vicariens* Schiner, on the authority of Aldrich, but the determination as given by Illingworth and Bryan, following Indian literature, seems to be accepted. A good figure was given by Williams (1931, p. 302, fig. 136).

Hylemyia cilicrura was the identification given by Aldrich to the "corn seed maggot" or "root maggot," formerly known in Hawaii as *Phorbia fusciceps* (Zettersted) (II: 297, 1913 and Bryan, V: 291, 1923). It was bred from beetles by Illingworth, and the larvae have been found in vegetable matter.

The "cabbage maggot," *Hylemyia brassicae* (Bouché) has not been found in Hawaii, its reported presence being due to a misidentification of *H. cilicrura*.

Family SAPROMYZIDAE

Malloch (VI: 383, 1927) described *Homoneura hawaiiensis* for specimens collected on Kauai, Oahu, Maui, and Hawaii. He thought that this might have been the species referred to by

Grimshaw (1902, p. 85) as *Sapromyza* species. It is the *Sapromyza* sp. collected by Illingworth at Waimea, Hawaii (Bryan, V: 291, 1923), and may be that collected by Swezey and Bryan (VI: 415, 1927) on Molokai. There may also be other species of Sapromyzidae in Hawaiian lowlands.

Family SCIOMYZIDAE

Sciomyza hawaiiensis, described by Grimshaw (1901, p. 43; 1902, p. 84) was thought by Perkins (1913, p. clxxxviii) to have been possibly an immigrant species. Aldrich determined specimens from Oahu and Hawaii as this species (see Bryan, VII: 336, 1931 and VIII: 27, 1932). This species is not related to *Chiromyia (Scyphella) flava*, as mistakenly suggested by the Editor in a footnote (VIII: 27, 1932). It is locally abundant in parts of Kauai, Oahu, Maui, and Hawaii, and may occur on all the main islands.

Family BORBORIDAE

Leptocera ferruginata was identified by Knab (see Bryan, V: 292, 1923) from material previously called *Borborus* sp. It is widespread in Hawaiian lowlands and very common about manure and decaying vegetable matter. Bezzi (1928, p. 161) recorded it from Fiji. It (or a related species) was found on Laysan, Lisiansky, and Midway Islands in 1923 (Bryan, 1926, p. 69).

Grimshaw (1901, p. 76) described *Limosina aequalis* and (p. 75) recorded *L. venalicia*. The latter species seems to be widespread in the lowlands, even getting up into the native forest, and being found on Laysan Island (Bryan, 1926, p. 69).

Borborus bilineatus was described by Grimshaw (1901, p. 75). Aldrich identified specimens from Kahoolawe as this species (Bryan, VIII: 230, 1933).

Family TETHINIDAE

Tethina insularis was described by Aldrich (VII: 395, 1931) for specimens collected on Pearl and Hermes Reef and Wake Island (Bryan, VII: 336, 1931). It will probably be found on other islands in this region.

Family ORTALIDAE

Seven species are known to occur in Hawaii, all of which are probably immigrants. Six are briefly discussed by Williams (1931, pp. 303-305, figs. 137, 138). Three of the genera are separated in a key given by Malloch (1932, p. 207). One species is as yet undetermined (see Swezey, VII: 236, 1929).

Chrysomyza aenea is a cosmopolitan, bright metallic green species with clear wings, fairly common in various parts of Hawaii. It was first recorded (as *Chrysomyza* sp.) by Grimshaw (1902, p. 85). Perkins (1913, p. clxxxviii) stated that it first appeared about 1900. Swezey (III: 12, 1914) recorded rearing it from maggots in cow manure. Fullaway (III: 142, 1916) reported finding a mass of the larvae breeding in horse and cow manure, and that about 50 per cent proved to be parasitized by *Spalangia*. Swezey (VI: 48, 1925) reported breeding it in filter-press cake on Maui. Williams (1931, p. 304, fig. 138) gave a good figure.

Grimshaw (1901, p. 44; 1902, p. 85) recorded *Euxesta anonae*, an American species. This "four-banded fly" was noted among the pests of sugar cane (Perkins, 1903, p. 27; etc.) because it bred in the galleries made by the sugar cane beetle borer, *Rhabdocnemis obscura*. But Williams (1931, p. 303, fig. 137) pointed out that it was there only as a scavenger. Severin and Hartung (1912) bred it from rotting bananas. Illingworth (V: 272, 1923) bred it from hen manure, and (V: 280, 1923) noted that it is attracted to carrion. He regarded it as a minor pest of pineapples, because it carries rot to abrasions on the fruits (VI: 385, 1927; VII: 255, 1929). Bezzi (1928, p. 88), in recording this species from Fiji, called it *Euxesta quadrivittata*. It is widespread in the lowlands of Hawaii, but is seldom common.

A single specimen of *Euxesta semifasciata*, described from the Ellice Islands by Malloch (1930, p. 216, fig. 1) was collected on Kauai by Dr. Hachiro Yuasa in 1932, the identification having been verified by Malloch.

Notogramma stigma, an American species, was first taken and recorded about 1912 by Severin and Hartung (1912), bred from decaying bananas. It was bred by Swezey (III: 4, 1914) from decaying fruits. It is collected occasionally in the lowlands.

Acrosticta pallipes, described by Grimshaw (1901, p. 44; 1902, p. 85) is now thought to be the same as *A. apicalis* (see Malloch, 1932, p. 206). Perkins (1913, p. clxxxviii) regarded it as a comparatively recent immigrant; Handel (1909) recorded it from South America; and Bezzi (1928, p. 89) from Fiji (see Bryan, VII: 402, 1931). Malloch (1930, p. 217) recorded it from Samoa and (1932, p. 205) from the Marquesas.

Scholastes bimaculatus was noted by Swezey (III: 272, 1917) as a coconut fly, described from Fiji, and occasionally found in Hawaii. It has been known here as *Paragorgopsis* sp. (Swezey, III: 70, 1915), the first specimens having been secured by Terry in 1904. The maggots, which breed in partly decayed, fallen coconuts, are whitish when young and deep blue when full-fed (Wilder, V: 365, 1924). This species is widespread in Polynesia (Swezey, V: 389, 1924; Bezzi, 1928; Malloch, 1930, p. 223).

Family TRYPETIDAE

The fruit and gall flies include two immigrant species of considerable economic importance, the melon fly, and the Mediterranean fruit fly; one large brown species, introduced from Mexico to help control the Lantana; and a very interesting group of two or more genera of endemic species on native Compositae.

The melon fly was described (as *Dacus cucurbitae*) by Coquillett (1899) from Hawaii, although it is an immigrant from the Asiatic tropics, thought to have arrived here about 1895. The first report of its presence was made by Clarke (1898); some publicity was given to it by Howard (1900 and 1901) and its description was reprinted by Grimshaw (1901, p. 45). Bezzi (1919) recorded it in the genus *Chaetodacus*. There exists a long series of accounts of its habits, activities, and control in Hawaii, of which the most important are two bulletins by Back and Pemberton (1917 and 1918), in which is a bibliography of earlier references. There are also accounts of its parasites by Pemberton and Willard (1918), Willard (1920), and Timberlake (V: 426, 1924). While still a pest of cucumbers, melons, gourds, and other cucurbitaceous plants, the melon fly is much less abundant than it was a few years ago, due to the activity of its parasites.

The Mediterranean fruit fly, *Ceratitis capitata*, was first reported in Hawaii in June, 1910 (Ehrhorn, 1910, p. 336; 1912). There is an even longer bibliography of accounts of the habits, depredations, and control of this fruit pest, good summaries of which may be found in Back and Pemberton (1918); Pemberton and Willard (1918, pp. 103-8); Willard (VI: 505-515, 1927); Timberlake (VI: 544, 1927); and Mason (VIII: 163-178, 1932). Introduction of parasites, begun in 1913 by Silvestri (1914), has been successfully accomplished. At present the United States Department of Agriculture, Bureau of Entomology, has a laboratory in Honolulu which is carrying on active researches on this fly. It has been found on all the main Hawaiian islands, as high as 6,000 feet elevation.

The Lantana gall fly, *Eutreta xanthochaeta*, was introduced from Mexico in 1902 by Koebele to help control the spread of *Lantana camara* Linnaeus (see Perkins and Swezey, 1924). Until about 1922 this species was confused with the North American "Solidago gall fly," *Eutreta sparsa* Wiedemann (see Bryan, V: 182, 1923 and VI: 364, 1927; Muir, V: 184, 1923). Aldrich (V: p. 261, 1923), described the distinct species. Its larvae make globular swellings, frequently seen on the spiny stems of the plant, but the fly is not often captured. It, like other gall flies, is used by native Crabronidae to provision their nests (Williams, VI: 445-446, 1926).

Phaeogramma vittipennis was described by Grimshaw (1901, p. 48), both genus and species being new. But one specimen has been taken since the original capture by Perkins. Williams (1931, pp. 305-6) gave a brief note.

Thomson (1868, p. 543) described *Trypeta crassipes*. Grimshaw (1901, pp. 45-48) placed this in the genus *Tephritis*, and described two new species, *T. cratericola* and *T. limpidapex*. *T. cratericola* has been collected from "silversword" and "greensword" (species of the endemic composit genus, *Argyroxiphium*) on Haleakala, Maui. *T. limpidapex* has not since been recognized.

In 1920 Bryan (IV: 475-480, 1921) reviewed these species and described two more, *T. dubautiae* (Terry's unpublished manuscript name) for a very small species found on *Dubautia*, and *T. swezeyi* for larger, quite distinct specimens, more like *T. limpidapex*. He also gave a key to these five species.

In 1922, at the suggestion of Aldrich, Bryan (V: 285, 1923) referred the three species with the star-shaped fuscous spot toward the apex of the wing (*crassipes*, *cratericola*, and *dubautiae*) to the genus *Trypanea* Shrank. After some correspondence with Bezzi regarding the correct genus for these species, Bryan (V: 367, 1924) decided to leave them in *Tephritis*, but in order to distinguish them from the more typical *Tephritis*, to place them in a subgenus, *Trypanoidea*, characterized by having both the reticulate fuscous wing pattern of *Tephritis* and the star-shaped apical wing spot of *Trypanea*.

Considerable more material belonging to this group, most of it bred from native composites by O. H. Swezey, will necessitate further revision and descriptions of new species.

Family PIOPHILIDAE

The "cheese skipper," *Piophila casei*, was first recorded in Hawaii by Grimshaw (1901, p. 48), with subsequent notes by Van Dine (1908, p. 48) and Swezey and Williams (VIII: 192, 1932). It is quite uncommon in Hawaii. The collecting of a specimen by Swezey and Williams at Lake Waiau, 13,000 feet, on Mauna Kea, Hawaii, is quite remarkable. Bezzi (1928, p. 119) recorded it from Fiji, and Malloch (1932, p. 215) from the Marquesas Islands.

Family CHIROMYIIDAE

Chiromyia (*Scyphella*) *flava* was listed by Giffard (IV: 181, 1919) as a fly common to Hawaii and Samoa. A specimen obtained from Aldrich showed that Hawaiian specimens belong to this species, but not those from Samoa (Bryan, VI: 228, 1926). The species is very rare in Hawaii.

Family CANACIDAE

Cresson (1926, p. 257) described *Canace nudata*, specimens of which were recorded from Oahu, Lisiansky, and Wake Islands by Bryan, (1926, p. 69, and VII: 336, 1931). Cresson (VI: 277, 1926) described *Procanace nigroviridis* for specimens collected on Kauai.

Family EPHYDRIDAE

In 1925 Cresson determined as the cosmopolitan tropical species *Discomyza maculipennis* some strikingly marked flies bred at Bishop Museum from improperly cleaned sea shells (Bryan, VI: 236, 1926). K. O. Moe also bred this species from dead sea shells (Swezey, October 5, 1933 and Bryan November 2, 1933).

Atissa antennalis was described by Aldrich (VII: 395, 1931) for specimens collected in salt pools on Necker Island (Bryan, VII: 336, 1931).

Hecamede albicans, a European immigrant species, was identified by Aldrich from flies swept from salt bush on Kahoolawe (Bryan, VIII: 230, 1933).

Notophila insularis, described by Grimshaw (1901, p. 49) was referred by Malloch to the genus *Paralimna*, which agrees with Jones' (1906) key.

Grimshaw (1901, p. 49 and 1902, p. 85) recorded *Brachydeutera argentata* (Walker). Cresson (VI: 277, 1926) described this Hawaiian fly as a new species, *B. hebes*. Illingworth (III: 270, 1917 and V: 280, 1923) gave notes on its life history and habits. Swezey and Williams (VIII: 188, 1932) noted it as common about puddles on Hawaii. It is well distributed on the main islands. (See Williams, VIII: 29, 1932).

Grimshaw (1901, p. 49 and 1902, p. 85) described as *Scatella hawaiiensis* a little black fly with hyaline spots on grayish wing, found in moist places, such as at the bases of waterfalls. Terry gave the manuscript name, "var. *sexnotata*" of this species to a similar but more opaque form, which is also found in drier, low-land localities. This name was used by Fullaway (III: 21, 1914) for specimens from Laysan island, and by Osborn (III: 90, 112, 1915) for specimens observed at Waikiki, Oahu. Cresson (VI: 275, 1926) described this as *Scatella sexnotata*. Bryan (1926, p. 69 and VIII: 3, 1932) recorded it from brackish pools on islands to the northwest of Kauai. (See Swezey and Williams, VIII: 188, 1932).

Warren (III: 25, 1913) described the life history and habits of a fly which he called "*Ilythea* sp." This was described by Cresson

(VI: 276, 1926) as *Scatella warreni*. In this same paper Cresson (pp. 275-276) described *S. terryi* and *S. bryani*.

Family DIASTATIDAE

Pseudiasata nebulosa Coquillett was introduced from Panama several times between 1924 and 1932, as a predator on pineapple mealybugs (*Pseudococcus brevipes*), but it is not known if this species has become established in Hawaii. (See Reports of the Entomologist, Hawaii Board of Agriculture and Forestry, 1924 to 1930; colored plate (figure 4) opposite page 34 in Report for 1923-1924, 1925).

Family DROSOPHILIDAE

This family of flies, most of which are distinguished by the branched arista on the third segment of the antennae, is the largest family of flies in Hawaii, being represented by four immigrant species which are extremely abundant in the lowlands, and by a number of endemic species, some of which have strikingly pictured wings. To this family belong the little brownish flies, some with pink eyes, which swarm about decaying fruit and garbage pails. There are also species which parasitize spiders' eggs and prey on mealybugs. Five genera are represented by 58 named species, including those described as new below. According to Perkins (1913, p. clxxxix) there remain many more forms to be described, for he estimated that there are fully 250 different species in Hawaii, and (p. xxxvii) stated that "300 would be a moderate estimate" of the existing species in Hawaii. He also gave notes on habits and parasites.

Sturtevant (1921) in his monograph on the North American species, mentioned and briefly discussed many of the native and all of the immigrant species.

Gitonides perspicax, new genus and species, was described by Knab (1914, p. 166). (See Swezey, V: 185, 1923). After seeing the type, Sturtevant (1921, pp. 54, 131) considered *Gitonides* to be a synonym of *Gitona*. (See Bryan, V: 291, 1923). Timberlake (V: 4, 1922) recorded it from Queensland, Manila, Java, and Pusa, India. Fullaway (IV: 241, 1920 and V: 319, 1924) mentioned it as a predator on *Pseudococcus filamentosus* (Cockerell). Swezey (VII: 182, 1928) found it associated with *Trionymus*

(*Pseudococcus*) *insularis* (Ehrhorn) on *Panicum torridum*, and (VIII: 12, 1932) bred it from *Cenchrus* grass infested with this mealybug from Molokai. It seems to be a widespread predator on mealybugs.

Titanochaeta ichneumon was described by Knab (1914, p. 168) the genus also being described as new. (See Swezey, V: 185, 1923). Swezey (VII: 292, 1929) recorded it as having been reared from spider egg cases on Hawaii and Oahu, since 1908. Another drosophilid, as yet undetermined, was also reported from spider eggs.

The genus *Idiomyia*, described by Grimshaw (1901, p. 50) and briefly discussed by Sturtevant (1921, pp. 55, 116, 131) is distinct from all other known Drosophilidae in having an additional cross-vein connecting the third and fourth longitudinal veins, near the posterior cross-vein. Four species were described by Grimshaw (1901, pp. 51-53), two by Perkins (1910, pp. 699-700), and one is here described as new.

***Idiomyia grimshawi* new species.**

Shiny yellow-brown and dark brown fly; wings brown, with small hyaline spots, much resembling the pattern of *Drosophila picticornis* Grimshaw.

Front light reddish-brown, orbits lighter, and the area between the three amber, bead-like ocellae dark and shining; the usual frontal and vertical bristles, strong, with fine dark hairs on the orbits, external to the three fronto-orbital bristles. Oral margin yellow-brown, somewhat protruding; vibrissae, a row of five or six bristles, the second moderately large, those below diminishing in size. Proboscis and palpi light brown; Antennae light reddish brown, third segment a little darker; arista long plumose, with seven or eight hairs above and three or four below. Back of head below vertex with a broad brown stripe, distinctly lighter on the sides.

Thorax light brown, with a broad central dark brown stripe, which is broader behind, and with an interrupted lateral brown stripe on each side, laterally displaced at the suture; humeral angles yellowish; pleurae light brown with a narrow dark brown stripe extending cephalad from the base of the wing, and two spots between base of wing and middle coxa. Scutellum dark brown, sides lighter. Abdomen shining dark brown. Female ovipositor pointed, pick-shaped, clear yellow-brown.

Legs yellow-brown, parts of one specimen's obscurely darker; rather bare of large bristles except on front femora and apex of tibiae.

Wings marked with brown in such a way as to give one the impression that they are brown with hyaline spots. The spots differ somewhat in size and number, but are as follows: Five or seven in a row in the marginal cell, six or seven in the submarginal cell, two in the first posterior cell before the extra cross-vein and three distad from it, three in discal cell, two or

three in second posterior cell, and two in the distal half of the third posterior cell, the basal half of it being nearly clear. The extra cross-vein is about half its own length basad from the posterior cross-vein.

Length 6 mm.; wing, 5.5 mm.

Type (female), Punaluu, Oahu, 6-11-16 (O. H. Swezey). Type in Bishop Museum. Paratype (female), Mt. Kalena, Wai-anae Mts., Oahu, April 19, 1931 (F. X. Williams), in Experiment Station H.S.P.A. collection; paratype (female) Mt. Kaala, Oahu, July 4, 1916 (P. H. Timberlake), in Bishop Museum.

Grimshaw (1901, p. 53, pl. III: 5 and 6) described the new genus *Hyphenomyia*. Sturtevant (1921, p. 117) places this as "a synonym of *Drosophila*, in the absence of a satisfactory description." As there are no specimens in Hawaii of the single species which Grimshaw (1901, p. 54) described, we can but leave this record as it stands.

Of *Drosophila*, 40 native species were described by Grimshaw (1901, pp. 57-73; 1902, p. 86), many of them based upon one or two specimens. With such generalized descriptions, few identified specimens at hand for comparison, and the variable nature of so many of the species, these are difficult to positively determine. There are in local collections a number of specimens which cannot certainly be assigned to any species at present known to be present in Hawaii. The writer is here describing only the most distinctive of these as new.

Drosophila immigrans, *D. repleta*, *D. mulleri*, and *D. melanogaster* are regarded as the only immigrant species, although it may be possible that some of those described as native may be widespread. These four species were recorded from Hawaii by Sturtevant (1921, pp. 126, 127). Hadden (VI: 386, 1927) reported two of them eaten by the mantis *Paratenodera sinensis*. *D. melanogaster* (under the name *D. ampelophila*) was recorded on overripe fruit in lists of economic insects by Van Dine (1908, p. 44; 1909, p. 32). Illingworth (VII: 256, 1929) regarded *D. repleta* as a minor pest of ripening pineapples, because it helps to spread rot. (See also Bryan, V: 291, 1923). Bezzi (1928) recorded this species from Fiji. All four species are common in the lowlands and lower forests of all the main islands, with *D. immigrans* perhaps the most abundant, although other species may be locally dominant.

Of the native species, Grimshaw's *D. variegata* (1901, p. 57), being preoccupied by *D. variegata* Fallen, was renamed *Drosophila grimshawi* by Oldenberg (1914, p. 23). *D. picticornis* was bred from decayed bananas on Oahu by Terry (I: 126, 1908). *D. molo-kaiensis* was collected on Molokai by Swezey and Bryan (VII: p. 302, 1929). What may be *D. xanthosoma* was captured at Parker Ranch, Waimea, Hawaii, by Illingworth (V: 277, 1923). *D. crucigera* was bred by Swezey (October 5, 1933) from fruits of *Alectryon macrococcus*, on Oahu, September 17, 1933.

Species of *Drosophila* were reported by Bridwell (IV: 331; 1919) as being stored in *Crabro* nests. Undetermined species appear in various lists. Timberlake (V: 424, 1924) reported a puparium parasitized by *Pachycrepoides dubius* Ashmead.

***Drosophila z-notata* new species.**

Dark reddish-brown, with lighter lines on the dorsum and sides of the thorax; wings with anterior and apical margins infuscated and a Z-shaped fuscous mark on the disc, from anterior to posterior cross-veins.

Front dark brown, orbits and narrow median line, lighter; face dark brown with a distinct keel, and the lower lateral ridges set with black bristles. Antennae dark brown, apical part of second segment lighter; arista dark brown, long plumose. Proboscis and palpi brown.

Thorax and scutellum dark reddish-brown; dorsum with three obscure lighter lines, which are broader in front, the median line ending at base of scutellum, the two lateral ones continuing onto its antero-lateral angles. Pleurae dark brown with a narrow yellow stripe cephalad from base of wing, and another horizontal yellow line above the bases of the coxae.

Abdomen dark reddish-brown, the posterior margins of the segments very narrowly yellowish.

Legs dark reddish-brown, the extreme tips of the femora lighter and shining. Coxae, especially the middle pair, with long curved black bristles on the anterior distal surface.

Wings dusky, with the marginal cell and second longitudinal vein broadly infuscated; apical part of second, third, and fourth longitudinal veins so broadly infuscated that only two small triangles remain uncolored at the tips of the submarginal and first posterior cells. Disc of wing with a broad Z-shaped fuscous mark, extending along the fourth longitudinal vein from anterior to posterior cross-veins, across the latter, and on the adjacent portions of the third and fifth veins.

Length: 4 mm.; wing, 4.5 mm.

Type and two paratypes from Waiahole, Oahu, March 28, 1915 (O. H. Swezey); two paratypes from Punaluu, Oahu, June 11, 1911, and August 9, 1914 (O. H. Swezey). Type in Bishop Museum.

***Drosophila fuscoamoeba* new species.**

Small, dark brown, with two lateral cinereous stripes on the dorsum; wings with two connected star-shaped fuscous patches, suggesting conventionalized amoeba, with pseudopodia extended.

Front dark brown, orbits broadly light cinereous, with a short, faint, narrow median light line; face yellow-ochraceous. Antennae, proboscis and palpi brown.

Thorax dark brown; dorsum with two lateral cinereous stripes, not reaching the posterior margin; pleurae light at base of wing, on propleura, and an obscure line cephalad from base of wing. Scutellum dark brown, tip lighter; metanotum and halteres brown.

Abdomen entirely dark brown. Legs yellow-brown, posterior femora darker in some specimens; coxae and anterior femora with bristles.

Wings hyaline, with two fuscous blotches: apical patch between 3rd and 4th longitudinal veins, with branches extending to the apex of each vein, to the costal and posterior wing margins, and to the basal patch, which lies between the 2nd and 5th longitudinal veins; this has two arms to the costal margin, one over the tip of the 5th longitudinal vein, and a broad, dividing branch toward the base of the wing. Second longitudinal vein short, entering the costa nearly opposite the posterior cross-vein. Last section of the 4th longitudinal vein 1.3 to 1.5 times the penultimate.

Length: 3 to 3.5 mm.; wing, 3.5 mm.

Type and one paratype, Tantalus, Oahu, September 8, 1907 (Terry); one paratype each: Palolo, Oahu, October 13, 1907 (Terry), Waiahole, Oahu, August 13, 1916 (Swezey), Waiawa, Oahu, August 13, 1916 (Timberlake), Mt. Olympus, Oahu, July 2, 1916 (Timberlake). Type in Bishop Museum.

***Drosophila punalua* new species.**

Ochraceous and brown, with four narrow dark stripes on the dorsum of the lighter thorax; wing with seven fuscous spots along the veins, including an H-shaped spot over the posterior cross-vein.

Front ochraceous, silvery white along the orbits, at bases of fronto-orbital bristles, and about ocellar triangle; face ochraceous with silvery pubescence, without a distinct keel; vertical and ocellar bristles large. Antennae light brown, arista long plumose; proboscis and palpi ochraceous.

Thorax ochraceous, with four narrow, somewhat darker brown stripes on the dorsum, the middle pair extending the entire length from behind head to scutellum, the lateral pair from suture to near posterior margin. Pleurae ochraceous, with obscure darker markings behind the humeri and near the base of the wing in one specimen. Scutellum, metanotum and halteres ochraceous. Sternopleural and two pairs of scutellar bristles, strong.

Abdomen brown, the anterior margins of segments a little darker. Legs ochraceous; the coxae, especially the middle pair, with long black bristles; front femora with two rows of about four black bristles each; middle tibiae with two apical bristles.

Wings hyaline, with rather pale fuscous spots as follows: on the apical part of the 1st longitudinal vein; middle and tip of 2nd longitudinal vein; tips of third and fourth longitudinal veins; anterior cross-vein; and a broad

H-shaped mark over the posterior cross-vein and adjacent portions of fourth and fifth longitudinal veins. Last section of fourth longitudinal vein a little longer than penultimate, slightly wavy.

Length: 4 mm.; wing, 4 mm.

Type and one paratype, Punaluu, Oahu, June 11, 1916, (Swezey); one paratype, unlabeled in Terry collection. Type in Bishop Museum.

***Drosophila nigra* Grimshaw, variety *iki* new variety.**

Shining black, wings tinged with brown, apex darker, and the posterior cross-vein infuscated.

Similar to *D. nigra*, but smaller; the front without a reddish cross-band; the orbits dull, not shining black; proboscis dark, not yellow; antennae dark reddish brown, not black; legs brownish, not yellow, but with femora shining black, as in *D. nigra*; the infuscation at the tip of the wing and over posterior cross-vein, variable in intensity, one specimen being cloudy, the other quite black. Thorax and abdomen uniform shining black.

Length: 4 mm.; wing, 4 mm.

Type, Kilauea, Hawaii, VI, '08, (W. M. Giffard); paratype, Kilauea, Hawaii, dry forest, 4000 feet, 9-1-19 (W. M. Giffard).

***Drosophila kauluai* new species.**

Moderate size, shining light brown; long, pale brownish wings, faintly infuscated on the posterior cross-vein and at the tips of the 2nd and 3rd longitudinal veins.

Front with purplish tinge, orbits and vertical triangle brown; face dark cinereous, with a distinct keel, the lateral depressions darker. Antennae light chocolate brown, third segment rather small, little longer than the second; arista long pubescent. Vibrissae present as a row of six short bristles along the large oral margin, a strong bristle at the lower angle, and a row along the cheek margin, continuing around the posterior orbits.

Thorax yellow-brown, shining; dorsum with numerous small black bristles, and last two dorsocentrals, 2 post-alars, supra-alars, presuteral, 2 humeral, and 2 notopleural bristles strong; pleurae concolorous, with 2 long, outward-pointing sternopleural and 2 hypopleural bristles. Scutellum concolorous, but dull; with 2 strong pairs of bristles, the apical pair crossing; halteres yellow-brown.

Abdomen smoky-brown, posterior margins and lateral edges lighter, thickly covered with black bristles, longest along the margins.

Legs yellow-brown, with numerous short black bristles; front femora with five or six bristles on the outer side; two apical bristles on the tibiae.

Wings long, somewhat cloudy, with iridescent reflections; the posterior cross-vein, and the tips of the 2nd and 3rd, and in some specimens, the 4th longitudinal veins indistinctly infuscated; the last two sections of the 4th longitudinal vein about equal.

Length: 3 to 3.5 mm.; wing, 4 mm.

Type and 12 paratypes, Pacific Heights, Oahu, March 3, 1912 (O. H. Swezey), bred from the fruit of *Sideroxylon* (native name, "kaulu," + "ai," to eat). Type in Bishop Museum.

Family ASTEIIDAE

Two species of *Asteia* were described by Grimshaw (1901, p. 73). Both are very rare.

Stenomicro angustata ? Coquillett was reported by Williams (VIII: 223, 1933) as sometimes to be seen in sugar cane fields. He described the larvae.

Bryania bipunctata (new genus and species) was described by Aldrich (VII: 395, 1931) for specimens from Nihoa Island. (See Bryan, VII: 336, 1931). The relationship of this new genus was noted by Malloch (1932).

Family CHLOROPIDAE (Oscinidae)

Malloch (1930 and 1932, p. 216) gives *Prohippelates pallidus* (Loew) as the latest name for the species which was recorded from Oahu and islands to the northwest of Kauai as *Hippelates nigricornis* (Bryan, 1926, p. 70, and VII: 235, 1929). It is the same as *Hippelates* sp., recorded from Palmyra Island by Swezey (III: 16, 1914), and is a species widespread in the Pacific.

Siphunculina signata was determined by Aldrich from specimens collected on Oahu and the islands to the northwest of Kauai (Bryan, VII: 335, 1931). Specimens were also collected on Kaula Islet (Bryan, VIII: 245, 1933). Bezzi (1928, p. 153) recorded it from Fiji and as almost cosmopolitan.

Family CARNIDAE

Illingworth (V: 277, 1923) and Bryan (V: 290-1, 1923) recorded two species of small, black, bristly flies, determined by Aldrich as *Rhodesiella elegantula* and *R. tarsalis*, collected by Illingworth at Waimea, Hawaii, in 1922. Both were also found to occur on Oahu, specimens of *R. tarsalis* having been caught as early as 1914 (see Bryan, V: 344, 347, 1924; Wilder, VII: 215, 1929). *R. elegantula* was reported as having been frequently caught in

fruit fly traps (Bryan, VIII: 228, 1933). Bezzi (1928, p. 141) recorded *R. nitidifrons* Becker from Fiji, which may be the same as *R. tarsalis*.

Family MILICHIIDAE

Milichiella lacteipennis, a very abundant shiny black fly with whitish wings, was first recorded (as *Ophthalmomyia*) by Grimshaw (1901, p. 74, pl. III: 21). Knab suggested the change of genus (Bryan, V: 292, 1923). Illingworth (V: 271, 1923) recorded it swarming about tins of hen manure, and (VI: 395, 1927) about droppings of animals in Molokai pineapple fields. It is especially abundant in the lowlands about decaying vegetable matter and resting on green leaves. It was collected on Midway and Pearl and Hermes Reef (Bryan, 1926, p. 70); and was recorded by Bezzi (1928, p. 162) from Fiji and as being widespread.

A related species, *M. circularis*, was described by Aldrich (VII: 397, 1931), the flies having been first found about a "compost heap" at the H.S.P.A. Experiment Station, Honolulu (Swezey, VI: 378, 1926), and later more widespread on Oahu (Illingworth, VII: 29, 1928; 234, 1929; 336, 1931; and Bryan, VII: 335, 1931).

Milichia orientalis is the name given by Aldrich to specimens bred by Illingworth from barley seed (see Bryan V: 290, 1923), and also found on Nihoa, Necker, and Gardner Islands in 1923 (Bryan VII: 336, 1931).

A species of fly bred from hen manure by Illingworth in March, 1916, was determined by Aldrich in 1925 as *Desmometopa m-nigrum*, (see Illingworth, VI: 224, 1926). Additional specimens sent to Aldrich were identified as *D. tarsalis* (Illingworth, VII: 233, 1929). Aldrich stated that he found them quite distinct from European specimens of *D. m-nigrum*, and concluded that he had misidentified the first specimens. Bezzi (1928, pp. 162-3) stated that *D. tarsalis* is distinguished by its entirely black palpi and reddish tarsi; and that *D. m-nigrum* is distinguished by the whitish base of the palpi, which are broadly black at the tips, and by the entirely black tarsi. Either both species occur in Hawaii or else these characters are not reliable, for in series from the same locality specimens occur with black, and black and white, palpi; and the tarsi of none are black, but rather dirty white or light

reddish-brown, the black coloration being due to the thickly set small black bristles. The eyes certainly bear a distinct "black M". Specimens have been bred abundantly from rotting mollusks.

Family OCHTHIPHILIDAE

Leucopis nigricornis has been known in Hawaii since before 1907. Its maggots are predacious on certain aphids and scale insects (see Fullaway, 1909, p. 25), and it is thought to be of European origin, and is fairly common in Hawaiian lowlands (Williams, 1931, p. 307). Timberlake (IV: 330, 1920) recorded *Pachyneuron anthomyiae* Howard as a parasite on it, but (V: 425, 1924) he showed this to be a species quite distinct from that North American *Leucopis* parasite. Later (VI: 309, 1926) he recorded *Pacynneuron eros* Girault from this species.

Family AGROMYZIDAE

Agromyza virens was reported by Illingworth (VII: 359, 1931) as bred from cornflower (*Centaurea*), determination by Aldrich. Swezey (VII: 374, 381, 483, 1931) reported breeding it from stems of *Gnaphalium*, *Bidens pilosa*, *Ageratum conyzoides*, and sunflowers. This is the *Agromyza* sp. reported by Swezey (VII: 343, 1931) as bred from *Zinnia* stems. He also bred it from a *Wilkesia* plant which he had brought from Kauai in July, 1932, and growing at his residence in Honolulu (reported January 5, 1933).

Liriomyza pusilla (formerly *Agromyza pusilla*), the "serpentine leafminer," had been known in Hawaii for many years, but not reported until 1917, when Timberlake (III: 404, 1918) recorded *Eucoilidea micromorpha* Perkins as its pupal parasite. He also noted as its parasites (V: 440, 1924) *Chrysocharis parksi* Crawford and *Achrysocharis fullawayi* (Crawford); and (V: 444, 1924) *Diaulinus* sp. as reared from it by Bridwell in 1918. It appears in the list of common names of insects (IV: 609, 1921); was recorded from the summit of Mauna Loa (Bryan VI: 281, 1926); as a pest of cabbages in Kona (Illingworth, VII: 251, 1929); from Molokai (Swezey & Bryan, VII: 302, 1929); near the summit of Mauna Kea (Swezey & Williams, VIII, 191, 1932); and

about the blossoms of *Tribulus* on Nihoa and Johnston Islands (Bryan, 1926, p. 70). The change of genus is on the authority of Bezzi (1928, p. 167) (see Bryan, VII: 403, 1931). This is the species called *A. diminuta* (Walker) by Swezey (II: 226, 1913), which he records as a leafminer of beans, peas, radish, melon, *Bidens*, *Nasturtium*, *Sida*, *Datura*, *Indigofera*, *Solanum*, *Sonchus*, etc.

Ophiomyia lantanae is the latest name for the "lantana seed fly," introduced by Koebele in 1902 from Mexico to help control the spread of *Lantana camara* Linnaeus by attacking the berries. (See Perkins and Swezey, 1924). Swezey (V: 187, 1923) showed that its work was not very efficient; although Illingworth (VII: 253, 1929) considered it an effective check. Froggatt is considered the author as he (1919, pp. 665-8) referred to it as "*Agromyza lantanae*," with a brief description, not knowing that it was undescribed. A technical description was published by Aldrich (V: 262, 1923). Bridwell (IV: 170-171, 1919) stated that it was parasitized by *Opius lantanae*. Timberlake (V: 361 and 422, 1924) noted it parasitized by *Zatropis tortricidis* Crawford. Bezzi (1928, p. 164) recording it from Fiji, where it was introduced, is the authority for the change of genus (see Bryan, VII: 403, 1931). It was noted by Swezey (September 7, 1933).

Other species of Agromyzidae have been bred (see Swezey, IV: 10, 1919, and Grimshaw, 1901, p. 74).

Family HIPPOBOSCIDAE

The "pigeon fly," *Lynchia maura*, was recorded by Swezey (II: 188, 1912), who received two specimens from a Honolulu pigeon fancier. In December, 1911, Ehrhorn (II: 206, 1913) called attention to the great abundance of this fly about pigeons. In 1916, Knab identified the species for Swezey (III: 272, 1917).

Grimshaw (1901, p. 77) recorded three species of Hippoboscidae, but none by name. Speiser (1902, pp. 87-91) from this same material described *Olfersia acarta* from a short-eared owl, *Ornithoica confluenta* Say var. *peroneura*, from short-eared owl, the *iiwi*, *Vestiaria coccinea*, and "*Himatione*" = *Chlorodrepanis stejnegeri*, and *Ornithomyia varipes*.

The common large black louse fly on frigate birds, *Olfersia*

spinifera, was recorded by Alfken (1903-4, p. 581), determination by Speiser, and by Bryan (1926, p. 71; VI: 236, 1921), for whom it had been determined by Malloch. This may be the species recorded by W. A. Bryan, (III: 273, 1917). Notes and a figure were given by Ferris and Cole (1922), by whom it was placed in the genus *Pseudofersia*.

Bryan (IV: 454, 1921) recorded a species which may belong to *Ornithoica* from a pheasant on Kauai.

The "sheep tick," *Melophagus ovinus*, has been twice recorded from the island of Hawaii, (Muir, VII: 4, 1929; Swezey and Williams, VIII: 188, 1932). (See also Ferris and Cole, 1922, pp. 192-3, figs. 8-9).

CHECK LIST OF THE DIPTERA FOUND IN HAWAII

Suborder NEMATOCERA

Superfamily TIPULOIDEA

Family LIMONIIDAE (Limnobiidae)

Subfamily Limoniinae

Limonia (Libnotes) perkinsi (Grimshaw)	Oahu, Maui, (probably general).
(<i>Limnobia perkinsi</i> Grimshaw)	
Limonia (Dicranomyia) bryani Alexander	Hawaii.
“ “ foliocuniculator (Swezey)	Kauai, Oahu, Maui (mines leaves)
“ “ grimshawi (Alexander)	General.*
(<i>Dicranomyia apicalis</i> Grimshaw)	
“ “ hawaiiensis (Grimshaw)	General.
“ “ jacobus (Alexander)	Maui, (may also mine leaves).
“ “ kauaiensis (Grimshaw)	Kauai.
“ “ latifrons (Grimshaw)	Oahu.
“ “ nigropolita (Alexander)	Oahu, Maui.
“ “ stygiennis (Alexander)	Maui, Hawaii (perhaps gen'l).
(<i>Dicranomyia brunnea</i> Grimshaw not Doane)	
“ “ swezeyi (Alexander)	Oahu.
“ “ variabilis (Grimshaw)	Maui.

Subfamily Eriopterinae

Gonomyia (Lipophleps) hawaiiensis Alexander	Oahu.
Trimicra pilipes (Fabricius)	Probably general, lowlands.
(<i>Trimicra lateralis</i> Grimshaw)	
Styngomyia didyma Grimshaw	General, lowlands.

Superfamily CULICOIDEA

Family PSYCHODIDAE

Psychoda alternata Say	Oahu, Molokai, Hawaii (probably general in lowlands).
“ inornata Grimshaw	Oahu, Hawaii.
“ spp.	Oahu.
Telmatoscopus albipunctatus (Williston)	Oahu.

* "General" means found or likely to be found on all the main Hawaiian islands.

Family CULICIDAE

Subfamily Culicinae

- Culex quinquefasciatus** Say General ("Night mosquito".)
(Culex fatigans [Wiedemann])
- Aedes albopictus** (Skuse) General ("Forest day mosquito".)
(Stegomyia scutellaris) locally. Oahu.
 variety *samarensis* Ludlow
- Aedes aegypti** (Linnaeus) General, domestic ("Yellow fever mosquito").
(Aedes argenteus (Poiret))
(Stegomyia fasciata (Fabricius)).

Subfamily Megarhininae

- Megarhinis inornatus** Walker Oahu, introduced from New Britain, 1929, but probably is not established.

Family CHIRONOMIDAE

Subfamily Chironominae

- Chironomus hawaiiensis** Grimshaw General, lowlands.
Tanytarsus lacteiclavus Grimshaw Oahu, Hawaii, (probably general).

Subfamily Orthoclaadiinae

- Orthocladius** sp. Maui.
Orthocladius sp. (subgenus *Psectrocladius*) Oahu.
Metriocnemus sp. Oahu, ex water.

Subfamily Clunioninae

- Charadromyia torrenticola** Terry Oahu, Maui, Hawaii.
Charadromyia abnormis Terry Kauai.

Family CERATOPOGONIDAE

- Ceratopogon** sp. General.
Ceratopogon sp. Oahu.
Ceratopogon sp. (subgenus *Prohelea*) Oahu, Maui, Hawaii.
Apelma brevis Johannsen Oahu, Lanai (perhaps general in pineapple fields).

Superfamily MYCETOPHILOIDEA

Family MYCETOPHILIDAE

- Platyura fuscocostata** Grimshaw Maui, Hawaii.
Platyura hawaiiensis Grimshaw Oahu, Maui, Hawaii.
Platyura insularis Grimshaw General (Kauai, Oahu, Molokai, Hawaii).

Family SCIARIDAE

- Neosciara molokaiensis** (Grimshaw) General, abundant in lowlands;
Midway, Cure.
Neosciara spp.

Superfamily BIBIONOIDEA

Family SCATOPSIDAE

- Scatopse** spp. ? Oahu.

Superfamily CECIDOMYIOIDEA

Family CECIDOMYIIDAE

- Diplosis (Contarinia) sorghicola** (Coquillett) Oahu, Maui, (ex sorghum and
Johnson grass).
Diplosis sp. Oahu, (ex rust on sorghum
leaves).
Contarinia solani (Rubsaaenen) Oahu, (ex tomato buds).
Contarinia maculipennis Felt Oahu, (ex Hibiscus buds).
Phaenabremia meridionalis (Felt) Oahu, Hawaii (ex sugar cane
aphis)
(*"Itonidid* sp.")
Lobodiplosis pseudococci Felt Oahu, (ex *Pseudococcus*
brevipes).

Suborder BRACHYCERA

Division ORTHORRHAPHA

Superfamily TABANOIDEA

Family STRATIOMYIIDAE

Subfamily Actiniinae

- Neoxaireta spinigera** (Wiedemann) General, lowlands and lower
forest.

Subfamily Pachygastrinae

- Evaza javanensis** Meigen Oahu, Hawaii.

Subfamily Hermetiinae (or Clitellarinae)

- Hermetia illucens** (Linnaeus) Hawaii.

Subfamily Geosarginae

- Microchrysa hovas** Bigot General, lowlands.
(*Cephalochrysa hovas* (Bigot))
(*"Sargus* sp.")

Superfamily ASILOIDEA

Family SCENOPINIDAE

- Scenopinus niger** Meigen Oahu.
Scenopinus fenestralis (Linnaeus) Oahu, Kaula Islet (?)
Scenopinus lucidus Kröber Oahu, Molokai, Lanai (prob-
ably general).

Superfamily EMPIDOIDEA

Family DOLICHOPODIDAE

Subfamily Chrysosomatinae (or Sciapinae)

Sciapus pachygyna Macquart	Lowlands, probably general.
Chrysosoma fraternum Van Duzee (<i>Psilopus patellifer</i> , not Thomson)	General; Midway, Cure.
Chrysosoma pallidicornis (Grimshaw) (<i>Gnamptopsilopus pallidicornis</i> Grimshaw)	Oahu.

Subfamily Diaphorinae

Chrysotus spiniger Grimshaw	Maui.
“ saxatilis Grimshaw	Oahu.
“ pallidipalpus Van Duzee	Oahu.
“ hawaiiensis Grimshaw	Hawaii.
“ vulgaris Van Duzee	Oahu.

Subfamily Campsicneminae

Campsicnemus nigricollis Van Duzee	Kauai.
“ miritibialis Van Duzee	Oahu.
“ williamsi Van Duzee	Oahu.
“ gloriosus Van Duzee	Oahu.
“ sinuatus Van Duzee	Hawaii.
“ grimshawi Van Duzee	Hawaii.
“ crinitibia Van Duzee	Oahu.
“ bellulus Van Duzee	Oahu.
“ ciliatus Van Duzee	Oahu.
“ brevipes Van Duzee	Oahu.
“ distortipes Grimshaw	Hawaii.
“ strigosus Van Duzee	Oahu.
“ congregatus Malloch	Oahu.
“ tibialis Van Duzee	Hawaii.
“ calcaratus Grimshaw	Molokai.
“ fimbriatus Grimshaw	Hawaii.
“ divergens Van Duzee	Hawaii.
“ inermipes Malloch	Oahu.
“ rectus Malloch	Oahu.
“ ornatus Van Duzee	Oahu?
“ flavicornis Van Duzee	Oahu.
“ concauus Van Duzee	Oahu.
“ spinitibia Van Duzee	Hawaii.
“ octosetosus Van Duzee	Oahu.
“ obtusus Van Duzee	Oahu.
“ patellifer Grimshaw	Oahu.
“ nudifemorata Van Duzee	Oahu.
Emperopectera mirabilis Grimshaw	Oahu.

Subfamily Rhapsiinae

Syntormon distortitarsis Van Duzee Oahu.

Subfamily Medeterinae

Medetera hawaiiensis Van Duzee Hawaii.
 " *atrata* Van Duzee Oahu.
 " *cilifemorata* Van Duzee Oahu.
 " *femoralis* Becker ?

Subfamily Sympycninae

Eurynogaster nitida Van Duzee Hawaii.
Eurynogaster clavicauda Van Duzee Oahu.
Eurynogaster virida Van Duzee Oahu.

Subfamily Thinophilinae

Sweziella albifacies Van Duzee Oahu.

Subfamily Hydrophorinae

Hydrophorus pacificus Van Duzee Oahu, Laysan(?)
Liancalus metallicus Grimshaw Molokai, Maui, Hawaii
 (perhaps general).

Subfamily Dolichopodinae

Dolichopus exsul Aldrich Probably general.
Paraphrosylus sp. Nihoa, Necker, French Frigates Shoal, Lisiansky, Wake.

Division CYCLORRHAPHA

Series ATHERICERA

Superfamily SYRPHOIDEA

Family PHORIDAE

Conicera atra (Meigen) Oahu.
Aphiochaeta xanthina Speiser ? Oahu.
Aphiochaeta scalaris (Loew) General lowlands, and Lisiansky, Pearl and Hermes Reef.
Aphiochaeta setaria Malloch Maui.
Puliciphora sp. Oahu.

Family LONCHOPTERIDAE

? *Lonchoptera furcata* (Fallen) Molokai, Hawaii.

Family PIPUNCULIDAE

Pipunculus acrothrix Perkins	Hawaii.
“ hawaiiensis Perkins	Hawaii.
“ holomelas Perkins	Molokai.
“ juvator Perkins	Hawaii.
“ molokaiensis Grimshaw	Molokai.
“ nigrotarsatus Grimshaw	Hawaii.
“ oahuensis Perkins	Oahu.
“ pyrophilus Perkins	Hawaii.
“ rotundipennis Grimshaw	Hawaii.
“ swezeyi Perkins	Oahu.
“ terryi Perkins	Kauai.
“ vulcanus Perkins	Hawaii.
“ spp.	Oahu, Lanai, Hawaii.

Family SYRPHIDAE

Subfamily Volucellinae

Volucella obesa (Fabricius)	General (abundant in lowlands).
Volucella pusilla (Macquart)	Oahu, Molokai (arrived from America, 1930.)

Subfamily Syrphinae

Ischiodon scutellaris (Fabricius)	General (abundant in lowlands), Johnston, Wake Is.
(<i>Xanthogramma grandicornis</i> (Macquart))	
(<i>Simosyrphus grandicornis</i> (Macquart))	
Allograpta obliqua (Say)	General, lowland.
Toxomerus marginatus (Say)	Kauai, Oahu.

Subfamily Eristalinae

Eristalis tenax (Linnaeus)	General (at higher elevations) (Hawaii, numerous; other islands, scarce or local).
Lathyrrophthalmus arvorum (Fabricius)	Oahu, Molokai (may become general).
(<i>Eristalis punctulatus</i> Macquart)	
Lathyrrophthalmus aeneus (Scopoli)	Oahu, Molokai, (may become general) (arrived about 1919)
(<i>Eristalis aeneus</i> (Scopoli))	

Subfamily Eumerinae

Eumerus marginatus Grimshaw	General.
Eumerus sp.	Oahu.

Subfamily Xylotinae

Syritta oceanica Macquart	General, lowland.
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Series SCHIZOPHORA

Superfamily MUSCOIDEA (or MYODARIA)

Group Calyptratae (or Myodaria superioria)

Family OESTRIDAE

Oestrus ovis Linnaeus	Widespread, but rare. ("Sheep head-maggot.")
Hypoderma lineata (DeVillers)	Kauai, Molokai, Hawaii. ("Heel fly.")

Family TACHINIDAE

Chaetogaedia monticola (Bigot)	General.
Frontina archippivora Williston	General.
Archytas cirphis Curran	General. ("Mexican tachinid armyworm parasite.")
Leucostoma aterrima Williston	Kauai, Oahu, Hawaii (probably general).
Leucostoma atra Townsend	Oahu.
Microceromasia sphenophori (Villeneuve) (<i>Ceromasia</i>)	General in sugar cane fields; introduced, 1910. ("Cane-borer parasite.")
Ochroemeigenia ormioides Townsend	Introduced, 1926-30, from Formosa. Established?

Family SARCOPHAGIDAE

Sarcophaga barbata Thomson	General, lowland.
" dux Thomson	General, lowland.
" fuscicauda Böttcher	General, lowland.
" haemorrhoidalis Fallen	Oahu, Molokai, Hawaii? (local). ("Dung sarcophaga.")
" pallinervis Thomson	General, abundant. ("Cow-dung sarcophaga.")
" plinthopyga Wiedemann (<i>S. robusta</i> Aldrich)	General.

Family CALLIPHORIDAE

Subfamily Phormiinae

Phormia regina (Meigen)	Hawaii.
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Subfamily Chrysomyiinae

Chrysomyia megacephala (Fabricius)	General. ("Sheep blow-fly.")
Chrysomyia rufifacies (Macquart) (<i>C. albiceps</i> , locally)	General. ("Australian sheep maggot fly.")

Subfamily Calliphoriinae

<i>Calliphora vomitoria</i> (Linnaeus)	General, especially at higher elevations.
<i>Calliphora latifrons</i> Hough	General (?)
<i>Lucilia sericata</i> (Meigen)	General, Nihoa. ("English bluebottle.")
<i>Lucilia graphita</i> Shannon	Laysan, Midway, Pearl and Hermes, Cure.
<i>Dyscritomyia affinis</i> Grimshaw	Oahu.
" <i>claripennis</i> Grimshaw	Hawaii.
" <i>fulgens</i> Grimshaw	Lanai.
" <i>hawaiiensis</i> Grimshaw	Hawaii.
" <i>limbipennis</i> (Thomson)	Oahu, Molokai.
" <i>terryi</i> Bryan	Oahu.
<i>Prostethochaeta robusta</i> Grimshaw	Kauai, Molokai, Lanai.
" <i>fasciata</i> Grimshaw	Kauai, Oahu, Lanai.
" <i>lucilioides</i> Grimshaw	Hawaii.
" <i>obscura</i> Grimshaw	Hawaii.

Subfamily Rhiniinae

<i>Rhinia testacea</i> Desvoidy	Oahu.
<i>Stomorphina pleuralis</i> (Thomson)	General, in lowlands.

(Group *Myodaria media*)

Family GASTROPHILIDAE

<i>Gastrophilus intestinalis</i> (De Geer)	Hawaii. ("Horse bot-fly.")
(<i>G. equi</i> (Clark))	
<i>Gastrophilus nasalis</i> (Linnaeus)	General, on ranches. ("Chin fly.")

Family MUSCIDAE

Subfamily Stomoxydinae

<i>Lyperosia irritans</i> (Linnaeus)	General. ("Hornfly.")
(<i>Haematobia serrata</i> , etc.)	
<i>Stomoxys calcitrans</i> (Linnaeus)	General. ("Stablefly.")

Subfamily Muscinae

<i>Musca domestica</i> Linnaeus	General. ("Housefly.")
(<i>Musca vicina</i> , as determined locally is probably not distinct)	
<i>Synthesiomyla nudisetata</i> Van der Wulp	General (not abundant.)
(<i>S. brasiliana</i> , locally)	

Family ANTHOMYIIDAE

Subfamily Hydrotaeinae

<i>Hydrotaea houghi</i> Malloch	Hawaii.
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Subfamily Phaoniinae

Ophyra nigra (Wiedemann)	General.
“ aenescens (Wiedemann)	(Probably not in Hawaii.)
“ leucostoma (Wiedemann)	(Probably not in Hawaii.)
“ chalcogaster Wiedemann	General, Midway, Cure.

Subfamily Linnophorinae

Limnophora arcuata Stein (or <i>Eulimnophora</i>)	General, abundant at lower elevations.
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Subfamily Fanniinae

Fannia canicularis (Linnaeus)	Hawaii, Cure. (“Little house-fly.”)
Fannia pusio (Wiedemann) (<i>F. femorata</i> , locally)	Oahu, Lanai, Hawaii.
Euryomma peregrinum (Meigen)	Oahu.

Subfamily Lispinae

Lispe argentifacies Grimshaw	Kauai?, Lanai.
Lispe cupreigena Grimshaw	Oahu.
Lispa metatarsalis Thomson	Oahu, Hawaii.

Subfamily Coenosiinae

Atherigona excisa (Thomson) var. trilineata Stein (<i>Acritochaeta pulvinata</i> Grimshaw)	General.
Hoplogaster ? dubia Grimshaw	Hawaii.
Lispocephala atratipes Malloch	Hawaii, Molokai.
“ bispina Malloch	Loc.?
“ biseta (Grimshaw)	Hawaii.
“ brevispina Malloch	Oahu.
“ confluens Malloch	Maui.
“ crassifemur Malloch	Oahu.
“ dexioides (Grimshaw)	Hawaii.
“ dilatata Malloch	Hawaii.
“ dispar (Grimshaw)	Molokai.
“ fasciculata Malloch	Hawaii.
“ flavobasalis (Grimshaw)	Hawaii.
“ fusca Malloch	Oahu.
“ fusciseta Malloch	Oahu.
“ fuscobrunnea Malloch	Hawaii.
“ fuscifacies Malloch	Oahu.
“ hirtifemur Malloch	Kauai.
“ inconstans Malloch	Oahu.
“ ingens (Grimshaw)	Molokai, Maui, Hawaii.
“ kauaiensis (Grimshaw)	Kauai.
“ latimana (Grimshaw)	Lanai.
“ longipes (Grimshaw)	Kauai.
“ oahuae Malloch	Oahu.
“ orbitalis Malloch	Oahu.
“ pallida Malloch	Oahu.

Subfamily Coenosiinae (Continued)

<i>Lispocephala pallidibasis</i> Malloch	Oahu, Molokai.
“ <i>paloloae</i> Malloch	Oahu.
“ <i>pollinosa</i> Malloch	Maui.
“ <i>plumiseta</i> Malloch	Hawaii.
“ <i>rudis</i> (Grimshaw) ?	Maui.
“ <i>rufibasis</i> Malloch	• Molokai, Hawaii.
“ <i>seminigra</i> (Grimshaw)	Hawaii.
“ <i>seminitida</i> Malloch	Oahu.
“ <i>striata</i> (Grimshaw)	Oahu.
“ <i>subvittata</i> Malloch	Hawaii.
“ <i>triangulifera</i> (Grimshaw)	Hawaii.
“ <i>valida</i> (Grimshaw)	Maui.
“ <i>xenina</i> Malloch	Hawaii.

Subfamily Anthomyiinae

<i>Anthomyia bisetosa</i> Thomson	General, lowlands. (“Black-banded anthomyiid.”)
(<i>A. vicariens</i> , locally)	
<i>Hylemyia cilicrura</i> (Rondani)	General, lowlands. (“Root maggot,” or “Corn seed maggot.”)
(<i>Phorbia fusciceps</i> (Zetterstedt))	

Group Acalyptratae (Myodaria inferiora)

Family SAPROMYZIDAE

<i>Homoneura hawaiiensis</i> Malloch	Kauai, Oahu, Maui, Hawaii, (probably general). Molokai?
<i>Sapromyza</i> sp.	

Family SCIOMYZIDAE

<i>Sciomyza hawaiiensis</i> Grimshaw	Kauai, Oahu, Maui, Hawaii, (probably general).
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Family BORBORIDAE

<i>Leptocera ferruginata</i> Stenhammer	General, lowlands.
<i>Limosina venalicia</i> (Osten-Saken)	General, lowlands; Laysan.
<i>Limosina aequalis</i> Grimshaw	Oahu.
<i>Borborus bilineatus</i> Grimshaw	Kahoolawe, Hawaii, (probably general).

Family TETHINIDAE

<i>Tethina insularis</i> Aldrich	Pearl and Hermes Reef.
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Family ORTALIDAE (OR OTTIDAE)

Subfamily Ulidiinae

<i>Chrysomya aenea</i> (Fabricius)	General, lowlands.
<i>Euxesta quadrivittata</i> Macquart	General, lowlands.
(<i>E. annonae</i> Loew, nec Fabricius)	
<i>Euxesta semifasciata</i> Malloch	Kauai.
<i>Notogramma stigma</i> (Fabricius)	Oahu.
<i>Acrosticta apicalis</i> (Williston)	General, lowlands.
(<i>A. pallipes</i> Grimshaw)	

Subfamily Platystominae

Scholastes bimaculatus Handel General, lowlands. ("Coconut fly.")

Family TRYPETIDAE

Subfamily Dacinae

Chaetodacus cucurbitae (Coquillett) General, lowlands. ("Melon fly.")

Subfamily Ceratitinae

Ceratitis capitata (Wiedemann) General, lowlands. ("Mediterranean fruitfly.")

Subfamily Tephritinae

Eutreta xanthochaeta Aldrich General, lowlands. ("Lantana gallfly," introduced, 1902, to control lantana.)
(*E. sparsa*, locally)

Phaeogramma vittipennis Grimshaw

Molokai, Maui.

Tephritis crassipes (Thomson)

General, at higher elevations.

" *cratericola* Grimshaw

Maui.

" *dubautiae* Bryan

Oahu.

" *limpidapex* Grimshaw

Maui.

" *swezeyi* Bryan

Oahu.

Family PLOPHILIDAE

Piophilina casei (Linnaeus) Oahu, Hawaii. ("Cheese skipper.")

Family CHIROMYIIDAE

Chiromyia (Scyphella) flava (Linnaeus) Oahu.

Family CANACIDAE

Canace nudata Cresson Oahu, Lisiansky, Wake.

Procanace nigroviridis Cresson Kauai.

Family EPHYDRIDAE

Subfamily Psilopinae

Discomyza maculipennis Cresson Oahu.

Atissa antennalis Aldrich Necker Island.

Subfamily Notophilinae

Paralimna insularis (Grimshaw) Oahu.

(*Notophila insularis* Grimshaw)

Hecamedea albicans (Meigen) Oahu, Kahoolawe.

Family DROSOPHILIDAE (Continued)

Drosophila <i>nasalis</i> Grimshaw	Molokai.
“ <i>nigra</i> Grimshaw	Maui.
“ <i>nigra</i> var. <i>iki</i> Bryan	Hawaii.
“ <i>obscuricornis</i> Grimshaw	Molokai.
“ <i>obscurifrons</i> Grimshaw	Molokai.
“ <i>ochracea</i> Grimshaw	Hawaii.
“ <i>olaae</i> Grimshaw	Hawaii.
“ <i>parva</i> Grimshaw	Hawaii.
“ <i>paucipuncta</i> Grimshaw	Hawaii.
“ <i>perkinsi</i> Grimshaw	Oahu, Maui, Hawaii.
“ <i>picticornis</i> Grimshaw	Kauai, Oahu.
“ <i>pilimana</i> Grimshaw	Kauai, Oahu, Molokai, Hawaii, (probably general).
“ <i>plumosa</i> Grimshaw	Hawaii.
“ <i>polita</i> Grimshaw	Lanai, Hawaii?
“ <i>punalua</i> Bryan	Oahu.
“ <i>pusilla</i> Grimshaw	Molokai, Maui.
“ <i>repleta</i> Wollaston	General, in lowlands.
“ <i>setiger</i> Grimshaw	Oahu, Molokai.
“ <i>sharpi</i> Grimshaw	Kauai.
“ <i>sordidapex</i> Grimshaw	Hawaii.
“ <i>undulata</i> Grimshaw	Hawaii.
“ <i>varifrons</i> Grimshaw	Oahu.
“ <i>xanthosoma</i> Grimshaw	Hawaii.
“ <i>z-notata</i> Bryan	Oahu.
Hypenomyia <i>varipennis</i> Grimshaw	Molokai.
Idiomyia <i>grimshawi</i> Bryan	Oahu.
“ <i>heteroneura</i> Perkins	Hawaii.
“ <i>oahuensis</i> Grimshaw	Oahu.
“ <i>obscuripes</i> Grimshaw	Maui.
“ <i>perkinsi</i> Grimshaw	Molokai.
“ <i>picta</i> Grimshaw	Maui.
“ <i>silvestris</i> Perkins	Hawaii.

Family ASTEIIDAE

Asteia <i>apicalis</i> Grimshaw	Hawaii.
Asteia <i>hawaiiensis</i> Grimshaw	Hawaii.
Stenomicro <i>angustata</i> ? Coquillett	General, cane fields.
Bryania <i>bipunctata</i> Aldrich	Nihoa Island.

Family CHLOROPIDAE (OSCINIDAE)

Prohippelates <i>pallidus</i> (Loew)	Oahu, Kahoolawe, (perhaps general), Lisiansky, Midway, Cure, Wake.
(<i>Hippelates</i> <i>nigricornis</i> Thomson)	
Siphunculina <i>signata</i> Wollaston	Oahu, Kaula, Nihoa, French Frigates Shoal, Lisiansky.

Family CARNIDAE

Rhodesiella <i>elegantula</i> (Becker)	Oahu.
Rhodesiella <i>tarsalis</i> Adams	Oahu, Hawaii.

Family MILICHIIDAE

Subfamily Milichiinae

Milichiella lacteipennis Loew	General; Midway, Pearl and Hermes Reef.
Milichiella circularis Aldrich	Oahu.
Milichia orientalis Malloch	Oahu, Nihoa, Necker, Gardner Island.

Subfamily Madizinae

Desmometopa m-nigrum Zettersted or <i>D. tarsalis</i> Loew	Oahu.
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Family OCHTHIPHILIDAE

Leucopis nigricornis Egger	Oahu, Kahoolawe (perhaps general).
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Family AGROMYZIDAE

Agromyza virens Loew	Oahu
Liriomyza pusilla (Meigen) (<i>Agromyza diminuta</i> (Walker))	General ("Serpentine leaf miner.")
Ophiomyia lantanae (Froggatt)	General, lowland. ("Lantana seed fly," introduced from Mexico, 1902.)

Suborder PUPIPARA

Family HIPPOBOSCIDAE

Subfamily Olfersinae

Lynchia maura Bigot	General, about pigeons. ("Pigeon fly.")
Olfersia acarta Speiser	Hawaii, Lanai.
Olfersia spinifera Leach	Kauai, Nihoa, Necker, French Frigates Shoal, Laysan, Li- siansky, Johnston, Wake. ("Frigate bird louse fly.")

Subfamily Ornithomyiinae

Ornithomyia varipes Walker	Molokai.
Ornithoica confluenta Say var. <i>peroneura</i> Speiser	Hawaii, Kauai (?).
Ornithoica sp.?	Kauai.

Subfamily Lipopteninae

Melophagus ovinus (Linnaeus)	Hawaii.
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