

Insects and other invertebrates from Laysan Island

by

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Introduction

The following paper provides an annotated list of the insects and other invertebrates recorded from Laysan Island in the Leeward Chain of the Hawaiian Islands. Also the various plant species and birds are listed separately with notes on the insects that are associated with each. A bibliography lists all known sources of information on the insects of Laysan.

The fauna and flora of Laysan were subjected to a profound biological change early in this century due to the introduction of domestic rabbits. Native pritchardia palms, sandalwood trees and probably other plants characteristic of the Leeward Hawaiian Islands became extinct as the rabbits ate their own way to oblivion, creating a veritable desert island. Many native insects that were unique to Laysan went the way of their host plants, for example 7 of the 8 species of weevils and 6 of the 8 species of noctuid moths. In general, the collections of 1912 and earlier (rabbits were introduced in 1903) are of original inhabitants and those since 1923 (when the last rabbit was presumably killed) represent the survivors or new immigrants.

At the present time, there are few endemic insects on Laysan to match the unique finch and teal. The commonest example is the false chinch bug, Nysius fullawayi fullawayi Usinger, a complex that is characteristic of the eastern islands of the Leeward Chain but is related, at least distantly, to lowland Nysius species of the main Hawaiian Islands. Curiously, two color forms were observed among the Nysius, the nymphs of the widespread form being quite dark whereas those on a sedge (Fimbristylis) were pale. Adults of the two forms proved to be identical, even in internal genitalic characters.

Insects and other arthropods have been collected from Laysan Island by a number of scientists. Rothschild in 1894 recorded a number of moths. Schauinsland (1899) included insects in the report of his visit to the island in 1896. The bird lice collected by the Stanford Albatross Expedition in 1902 were reported by Kellogg and Paine (1910), but most of the names used were changed by Zimmerman (1948). Insects were collected by G. P. Wilder in 1905 (Perkins, 1906), by W. A. Bryan in 1911 (Dill and Bryan, 1912), by D. T. Fullaway in 1912 (1914) and again in 1923 with the Tanager Expedition. A summary of these records was given in a report of the Tanager Expedition by E. H. Bryan, Jr. (1926). The bird lice collected by the Tanager Expedition were not reported until 1940 by Thompson. This report appeared too late to be included by Zimmerman, except as a note in the final proof. Four flies

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brought back by G. P. Wilder in 1930 were recorded by Bryan (1931). Gulick (1932) included Bryan's Laysan Coleoptera and Diptera lists in a discussion of the biological peculiarities of oceanic islands. Zimmerman's Insects of Hawaii (1948 et seq.) includes many of the above records with valuable information on synonymy, keys for identification and biological data.

In 1959 the senior author spent three days in April and eight days in July on the island and reported the insects collected with a summary of all those previously recorded (Butler, 1961a). In September 1961, both authors spent six days collecting on the island and this paper is a report of this work. In June 1962 John W. Beardsley, Experiment Station of the Hawaiian Sugar Planters' Association, visited Laysan for five days. He has kindly furnished a number of new records of Lepidoptera, Coleoptera, Diptera and Hymenoptera which have been added to the manuscript of the 1961 collections and indicated by asterisks. Approximately 189 species are here recorded from Laysan with information as to the dates each species was collected and the names used in these records. In most cases absence of records for 1959, 1961, or 1962 is strong evidence that the species no longer occurs on Laysan.

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Systematic List of Species

A R A C H N I D A

ACARINA

Phytoseiidae

Typhlodromus (Amblyseius) largoensis (Muma), determined by
D. A. Chant. 1961. On Sicyos hispidus Hillebrand.

Rhodacaridae

Gamasiphis sp., determined by D. M. Tuttle. 1961.

Tenuipalpidae

Brevipalpus obovatus Donnadieu (Brevipalpus inornatus (Banks)),
det. by D. M. Tuttle. 1959, 1961. Abundant on Scaevola
causing severe defoliation in some areas.

Argasidae

Ornithodoros capensis Neumann, det. by D. M. Tuttle. 1959, 1961.
Abundant on the ground near the lake, under dead albatrosses
and under Nama.

Ixodidae

Ixodes sp., 1959. In ear of Laysan teal.

Scheloribatidae

Scheloribates cf. calcaratus Jacot, det. by D. M. Tuttle. 1961.
Under Heliotropium.

ARANEIDA

(Determined by W. J. Gertsch)

Argiopidae

Tetragnatha vicina Simon. 1959, 1961.

Lycosidae

Lycosa oahuensis Keyserling. 1959, 1961.

Salticidae

Hasarius adansoni Audouin. 1961.

Menemerus bivittatus Dufour. 1959.

Scytodidae

Scytodes striatipes Koch. 1959

Theridiidae

Coleosoma floridanum Banks. 1959, 1961. Several immature on
Pluchea, Sicyos and Scaevola.

Theridion rufipes Lucas. 1961.

C R U S T A C E A

ISOPODA

Porcellionides sp. (probably P. pruinosus) det. by M.A. Miller.
1961. (1923 and 1959 specimens not determined.)

C H I L O P O D A

Geophilidae

Honuaphilus alohanus Chamberlin. 1923.

1961 specimen not yet determined.

H E X A P O D A

THYSANURA

1959 species not identified. Abundant in duff. No specimens could be found in 1961.

COLLEMBOLA

(Determined by D. L. Wray)

Entomobryidae

Entomobrya marginata Tullberg. 1961. Under Casuarina in duff.

Drepanocyrtus terrestris Folsom. 1959, 1961. Very abundant in duff under Casuarina, under Cynodon and under railroad ties.

ORTHOPTERA

Blattidae

Phyllodromia sp. 1912.

Blattella germanica (L.). 1923

Cutilia soror (Brunner), (Polyzosteria soror Brunner). 1912.

Periplaneta americana (L.) 1912, 1959.

Pycnoscelus surinamensis (L.), det. by A. B. Gurney. 1912, 1959, 1961.

ISOPTERA

Kalotermitidae

Cryptotermes brevis (Walker). ?1923., 1959.

EMBIOPTERA

Oligotomidae

Oligotoma oceanica Ross. 1923.

Oligotoma saundersii (Westwood). 1959. In duff under Casuarina, very abundant.

1961 species not yet determined.

DERMAPTERA

(Determined by A. B. Gurney)

Labiduridae

Anisolabis eteronoma Borelli, (Anisolabis maritima (Géné)). 1912, 1923, 1961.

Anisolabis perkinsi Burr. 1959. Abundant in duff and under dead albatrosses at edge of lake.

Euborellia annulipes (Lucas). 1912, 1959, 1961.

CORRODENTIA

Lepidopsocidae

Cyrtophania hirsuta Banks. Det. by E. L. Mockford. 1959, 1961.
Very abundant in duff under Casuarina.

Cerobasis sp. (undertermined nymph), det. by E. L. Mockford. 1961.

Peripsocidae

Ectopsocus fullawayi Enderlein. 1912.

Elipsocidae

Kilaueella sp. 1912.

MALLOPHAGA

Menoponidae

Actornithophilus milleri (Kellogg and Kuwana). 1923.

Host: Anous stolidus pileatus (Scopoli), noddy tern.

Ancistrona vagelli (Fabricius), (Ancistrona gigas Piaget). 1902.

Host: Pterodroma hypoleuca (Salvin), Bonin Island petrel.

Austromenopon sternophilum (Ferris). 1923.

Host: Anous stolidus pileatus (Scopoli), noddy tern.

Longimenopon puffinus Thompson. 1923.

Hosts: Puffinus pacificus chlororhynchus Lesson - Wedge-tailed shearwater and Puffinus nativitatis Streets, Christmas Island shearwater.

Philopteridae

Docophoroides brevis (Dufour), (Eurymetopus taurus (Nitzsch)), 1902.

Hosts: Diomedea nigripes Audubon, black-footed albatross and Diomedea immutabilis Rothschild, Laysan albatross.
"The most abundant species", according to Kellogg and Paine (1910).

Docophoroides sp. 1923.

Host: Diomedea immutabilis Rothschild, Laysan albatross.

Saemundssonina snyderi (Kellogg and Paine), (Dochophorus snyderi Kellogg and Paine). 1902, 1923.

Hosts: Sterna lunata Peale, gray-backed tern and Sterna fuscata oahuensis Bloxam, sooty tern.

Quadriceps birostris (Giebel). 1902.

Host: Sterna lunata Peale, gray-backed tern.

Quadriceps separata (Kellogg and Kuwana), 1923.

Host: Anous stolidus pileatus (Scopoli), noddy tern.

Pectinopygus gracilicornis (Piaget), (Liperus gracilicornis var. major Kellogg. 1902.

Hosts: Fregata minor palmerstoni (Gmelin), frigate bird and Sterna lunata Peale, gray-backed tern.

Pectinopygus sulae (Rudow), (Liperus potens Kellogg and Paine), 1902.

Hosts: Fregata minor palmerstoni (Gmelin), frigate bird, Sterna lunata Peale, gray-backed tern, and Sula sula rubripes Gould, red-footed booby.

Harrisoniella ferox (Giebel), (Lipeurus ferox Giebel and Lipeurus densus Kellogg). 1902.

Hosts: Diomedea nigripes Audubon, black-footed albatross and Diomedea immutabilis Rothschild, Laysan albatross.

Harrisoniella sp. (?) 1923.

Hosts: Diomedea nigripes Audubon, black-footed albatross and Diomedea immutabilis Rothschild, Laysan albatross.

Perineus concinnus Kellogg and Chapman (Lipeurus concinnus Kellogg and Chapman). 1902.

Host: Diomedea immutabilis Rothschild, Laysan albatross.

Perineus giganticulum (Kellogg), (Lipeurus confidens Kellogg). 1902.

Hosts: Diomedea nigripes Audubon, black-footed albatross, Sterna lunata Peale, gray-backed tern.

Giebelia (?) mirabilis Kellogg. 1923.

Host: Puffinus pacificus chlororhynchus Lesson, wedge-tailed shearwater.

Halipeurus mirabilis Thompson (family uncertain). 1923.

Hosts: Puffinus pacificus chlororhynchus Lesson, wedge-tailed shearwater and Diomedea nigripes Audubon, black-footed albatross.

Lunaceps sp. (family uncertain). 1923.

Host: Numenius tahitiensis (Gmelin), bristle-thighed curlew.

THYSANOPTERA

(Determined by F. A. Bianchi)

Phlaeothripidae

Haplothrips gowdeyi (Franklin). 1959, 1961. Collected from flowers of Tribulus, Cynodon, Eragrostis and Cyperus laevigatus.

Haplothrips sesuvii Priesner. 1961. Collected from flowers of Sesuvium portulacastrum, also as strays on Cynodon, Eragrostis, Pluchea and Cyperus laevigatus.

Thripidae

Frankliniella sulphurea (Schmutz). 1959, 1961. Collected from flowers of Capparis sandwichiana, Ipomoea pes-caprae, Nama, Portulaca and Tribulus.

HEMIPTERA

Cydnidae

Geotomus pygmaeus (Dallas), det. by R. L. Usinger. 1959, 1961.
In duff under Cyperus and abundant at lights.

Lygaeidae

Nysius spp. 1912.

Nysius fullawayi fullawayi Usinger, det. by R. L. Usinger. 1959, 1961. Very common on Cyperus laevigatus but nymphs and adults also on Portulaca, Boerhavia, Nama and other plants.
A form with pale nymphs was found only on Fimbristylis.

Reduviidae

Empicoris rubromaculatus (Blackburn). 1959.

Nabidae

Nabis blackburni White (Reduviolus blackburni White), det. by
R. L. Usinger. 1961.

Nabis capsiformis Germar, det. by R. L. Usinger. 1912.

Anthocoridae

Orius persequens (White), (Triphleps persequens White). 1912.

Miridae

Cyrtopeltis modesta (Distant), det. by R. L. Usinger. 1959,
1961. On Boerhavia and Nicotiana. This is the "tobacco
suck-fly", described from Central America and now a pest of
tobacco and tomato in California, Hawaii, etc.

Oronomiris hawaiiensis Kirkaldy. 1896, 1912.

HOMOPTERA

Cicadellidae

Circulifer tenellus (Baker), det. by J. P. Kramer. 1961. On
Boerhavia.

Deltocephalus sonorus Ball, det. by J. P. Kramer. 1961. On
Cynodon.

Delphacidae

Chloriona paludum (Kirkaldy), (Kelisia paludum Kirkaldy,
Liburnia paludum (Kirkaldy)). 1912.

Aphididae

Aphis medicaginis Koch. 1912?

Aphis craccivora Koch, det. by L. M. Russell. 1959, 1961.
Hosts: Tribulus, Boerhavia, Ipomoea indica.

Aphis gossypii Glover, det. by L. M. Russell. 1959, 1961.
Hosts: Scaevola and Sicyos.

Rhopalosiphum maidis (Fitch), det. by L. M. Russell. 1959, 1961.
Host: Eragrostis.

Pseudococcidae (Determined by J. W. Beardsley)

Antonina graminis (Maskell). 1959, 1961. Hosts: Cynodon and Eragrostis.

Planococcus citri (Risso). 1959, 1961. Hosts: Boerhavia ?, Capparis, Eragrostis, Ipomoea pes-caprae, Sicyos, Tribulus, and Cocos.

Pseudococcus sp. (apparently new). 1959, 1961. Host: Scaevola.

Ferrisiana virgata (Cockerell). 1959, 1961. Hosts: Boerhavia, Ipomoea indica, Tribulus, Portulaca, Pluchea, Sicyos.
Found in the crop of a Laysan finch.

Trionymus insularis Ehrhorn. 1959. Host: Eragrostis.

Coccidae (Determined by J. W. Beardsley)

Saissetia nigra (Nietner). 1912, 1959, 1961. Hosts: Cyperus pennatifolius, Pluchea and Scaevola.

Diaspididae (Determined by J. W. Beardsley)

Hemiberlesia lataniae (Signoret). 1959. Host: Casuarina.

NEUROPTERA

Chrysopidae

Chrysopa carnea Stephens, (Chrysopa lanata Banks), det. by P. A. Adams. 1959, 1961. Adults very abundant flying around Scaevola in 1959. Both larvae and adults very abundant on Eragrostis in 1961.

LEPIDOPTERA

Noctuidae

*Heliothis sp. - zea group, det. by D. F. Hardwick. 1961, 1962.
Hosts: Larvae believed to be this species were found on the heads of Eragrostis in 1961. In 1962 this species was reared from larvae feeding in flowers and green seed capsules of Nicotiana.

* 1962 records provided by J. W. Beardsley.

Agrotis dislocata (Walker), det. by D. F. Hardwick. 1912, 1923, 1959, 1961. Flying at night and very abundant.

*Agrotis evanescens (Rothschild), (Peridroma evanescens Rothschild, Agrotis eremiotiles (Meyrick)), det. by D. F. Hardwick. 1894, 1896, 1911, 1912, 1959, 1961, 1962. Adults were reared from large cutworms found around the bases of Nicotiana in 1962.

Agrotis fasciata (Rothschild), (Peridroma fasciata Rothschild). 1894.

Agrotis laysanensis (Rothschild), (Prodenia laysanensis Rothschild). 1894.

Agrotis procellaris Meyrick, (Euxoa procellaris (Meyrick)). 1896, 1905, 1912.

Agrotis sp. larvae. Abundant under Nama, Boerhavia and Tribulus. Similar larvae were recovered from the stomach contents of a Laysan teal.

Peridroma porphyrea (Denis and Schiffermueller), (Agrotis saucia Huebner). 1905.

Pseudaletia unipuncta (Haworth), (Cirphis unipuncta (Haworth)). 1894.

*Elaphria nucicolora (Guenée). 1962. One adult at light.

Laphygma exigua (Huebner), det. by D. F. Hardwick. 1961.

Trichoplusia ni (Huebner), det. by D. F. Hardwick. 1961.

*Plusia chalcites (Esper). 1962. Adults taken flying around Scaevola at dusk.

Hypena laysanensis (Swezey), (Nesamiptis laysanensis Swezey). 1912.

Sphingidae

Herse cingulata (Fabricius). 1959, 1961.

Pyralidae

Hymenia recurvalis (Fabricius), det. by E. G. Munroe. 1896, 1905, 1912, 1959, 1961.

Hedylepta laysanensis (Swezey), (Omiodes laysanensis Swezey). 1912.

Oeobia dryadopa (Meyrick), (Pyrausta dryadopa Meyrick). 1912.

*Pyralis manihotalis Guenée. 1962. One adult at light.

Ephestia cautella (Walker), (Ephestia elutella Huebner). 1912.

Pterophoridae

Megalophipida defectalis (Walker), (Trichoptilus oxydactylus (Walker)), det. by D. F. Hardwick. 1905, 1961.

Host: Boerhavia.

Plutellidae

Plutella maculipennis Curtis. 1959. (omitted from Butler, 1961a).

Tortricidae

*Crociosema plebiana Zeller. 1912, 1959, 1962. Several at light in 1962.

Hyponomeutidae

Pyroderces rileyi Walsingham. 1959.

Hyposomocoma notabilis Walsingham. 1912, 1959.

Tineidae

Tineola uterella Walsingham. 1923, 1959. One larval case.

Ereunetis kerri Swezey. 1912.

*Tinea despecta Meyrick (?). 1962. Numerous adults at light.

Ereunetis incerta Swezey. 1923, 1959.

Cygnodiidae

Petrochroa dimorpha Busck. 1912.

COLEOPTERA

Carabidae

Undetermined species. 1923.

Tachys oahuensis Blackburn, det. by G. E. Ball. 1959, 1961.

Abundant under dead albatrosses and under drying algal surface of dry lake bed.

Staphylinidae

Undetermined species. 1923.

Carpelimus sp. (Trogophloeus sp.), det. by C. H. Seevers. 1959, 1961. Abundant under dead albatrosses and under drying algal surface of dry lake bed.

Coccinellidae

Scymnus debilis LeConte. 1912.

Scymnus loewii Mulsant, (Scymnus kinbergi (Boheman)). 1912.

Species collected in 1959 assoc. with Trionymus insularis on Eragrostis.

Nitidulidae

Carpophilus dimidiatus (Fabricius), det. by L. R. Gillogly. 1961.

Cucujidae

Cryptamorpha desjardinsi Guenée. 1896.

Silvanus surinamensis L. 1923. In corn meal.

Dermestidae

Dermestes ater De Geer, (Dermestes cadaverinus Fabricius),
det. by R. S. Beal, Jr. 1896, 1911, 1912, 1923, 1959, 1961.
In 1959 was found under dead albatrosses.

Attagenus plebius Sharp. 1911

Tenebrionidae

Alphitobius diaperinus Panzer. 1912

Alphitobius piceus (Oliver). 1923, 1959. In 1923 was abundant about the carcasses of dead birds. In 1959 in clump of grass.

Alphitobius laevigatus Fabricius, det. by H. Kulzer. 1961.

Blapstinus sp. (probably). 1959

Tribolium ferrugineum Fabricius. 1896, 1912, 1923. In 1923 in corn meal.

Cleridae

Necrobia rufipes DeGeer. 1912.

Scarabaeidae

Pleurophorus micros (Bates), (Psammodius nanus DeGeer, Pleurophorus parvulus Chevrolat), det. by O. L. Cartwright. 1923, 1959, 1961. In 1923 under dead grass. Adults abundant at sunset one evening in July 1959 and 50 were swept from the air in one minute. Erroneously listed by Butler (1961a) as Bostrichidae.

Cerylonidae

Eidoreus minutus Sharp, det. by R. D. Pope. 1961. Under Heliotropium.

Corylophidae

Sericoderus minutus Matthews, det. by R. D. Pope. 1961.

Cerambycidae

Clytus crinicornis Chevrolat. 1896.

Anthribidae

Araecerus fasciculatus (DeGeer). 1959, 1961. In 1959 associated with Pluchea, and erroneously listed by Butler (1961a) as Chrysomelidae. In 1961 on Eragrostis.

Curculionidae

Dryophthorus distinguendus Perkins. 1923.

Dryotribus mimeticus Horn. 1923.

*Dryotribus wilderi Perkins. 1923, 1962. In 1962 one specimen under Eragrostis.

Macrancylus linearis LeConte, (Macrancylus immigrans Perkins). 1912, 1923.

Oodemus laysanensis Fullaway. 1912.

Pentarthrum blackburni Sharp. 1923.

Rhyncozonus bryani Perkins. 1911.

Sitophilus oryzae (L.), (Calandra oryzae L.). 1912 In food stores.

Scolytidae

Stephanoderes sp. 1912.

Hypothenemus eruditus Westwood, det. by S. L. Wood. 1961.
On Cyperus laevigatus.

DIPTERA

Chironomidae

Undetermined species. 1923, 1959.

Telmatogeton pacificus Tokunaga, det. by W. W. Wirth. 1961.
In intertidal zone on wave swept rocks.

Ceratopogonidae

*Dasyhelis sp. 1962. Sweeping Scaevola near beach.

Sciaridae

*Undetermined species. 1962. Near the lake.

Stratiomyidae

Brachycara latifrons James, det. by D. E. Hardy. 1912, 1959,
1961. Larvae under dead albatrosses along lake, (Butler, 1961b).

Dolichopididae

Chrysosoma fraternum Van Duzee, det. by D. E. Hardy. 1959, 1961.

Hyprophorus praecox Lehman. 1912, 1923, 1959.

Hyprophorus pacificus Van Duzee, det. by D. E. Hardy. 1961.

Phoridae

Megaselia scalaris (Loew), (Aphiochaeta scalaris Loew). 1912.

*Undetermined species. 1962.

Ephydriidae

Neoscatella sexnotata (Cresson), (Scatella hawaiiensis var. sex-notata Torry, Scatella sexnotata Cresson). 1912, 1923, 1930, 1959, 1961. Very abundant around the lake in which the larvae live. Adults rest on the ground and on the vegetation around the lake. The adults are fed upon by the teal.

Canaceidae

Canaceoides nudata (Cresson), det. by W. W. Wirth. 1961.

Borboridae

Limosina ferruginata (Stenhammer). 1959.

Limosina venalidis (Osten-Sacken). 1923.

Asteiidae

Bryania bipunctata Aldrich. 1959.

Drosophilidae

*Scaptomyza sp. 1962. Near the lake.

Milichiidae

Milichiella lacteipennis Loew. 1959.

Chloropidae

Siphunculina signata Wollaston. 1959.

Tachinidae

- *Paradionaea atra (Townsend), (Leucostoma atra Townsend), det. by
D. E. Hardy. 1959 (not included in Butler, 1961a), 1962.
A parasite of Nabis.

Sarcophagidae

- Goniphyto bryani Souza Lopez, det. by D. E. Hardy. 1959, 1961.

Calliphoridae

- Lucilia graphita Shannon. 1912, 1923, 1930, 1959.

- Lucilia sp. ? 1912.

- Rhinia testacea Robineau Desvoidy. 1959.

Muscidae

- Lispe sp. ? 1912.

- Musca domestica L. 1912, 1959.

- Musca vicina Macquart. 1912, 1923, 1959.

Hippoboscidae

- Olfersia aenescens Thompson (Bequaert, 1941).

- Olfersia spinifera Leach. 1959.

HYMENOPTERA

Braconidae

- Chelonus blackburni Cameron, det. by C. F. W. Muesebeck. 1912,
1959, 1961.

- Apanteles marginiventris Cresson, det. by C. F. W. Muesebeck.
1959, 1961. In 1959 specimens were reared from Agrotis.
Cocoons were found on the leaves of Tribulus.

Mymaridae

- Unidentified species. 1912.

- *Polynema sp. reduvioli Perkins or near, det. by J. W. Beardsley.
1962. Several on Fimbristylis near lake.

Eulophidae

Near Euderus metallicus (Ashmead). 1959.

Encyrtidae

Xanthoencyrtus laysanensis Timberlake. 1912

Ectroma sp. (wingless ectromic encyrtid). 1912.

Eupelmidae

Bruchocida sp., det. by B. D. Burks. 1961.

Eupelmus sp. 1905.

Pteromalidae

1959 specimen not determined.

*Spalangia sp., det. by P. H. Timberlake. 1961, 1962. Under dead albatrosses near lake, parasitic on flies.

Cynipidae

Pseudeucoila hydrophila (Perkins), det. by C. M. Yoshimoto. 1961. Associated with flies on rocks in the inter-tidal zone.

Diapriidae

*Two species collected by J. W. Beardsley, 1962, who indicates that these may be "new records or possibly the same as the doubtful identifications reported by Bryan (1926) as Phaenopria sp. and Tropidopria sp."

Scelionidae

*Phanurus sp. nr. vulcanus (Perkins), det. J. W. Beardsley. 1961, 1962. On Cyperus near lagoon associated with Nysius.

Formicidae

Camponotus variegatus hawaiiensis Forel, det. by M. R. Smith. 1961. Collected on board ship 36 miles west of Laysan.

Cardiocondyla nuda minutior Forel. 1959. Colony in stake in ground.

Monomorium destructor (Jerdon). 1923.

Monomorium floricola (Jerdon), det. by M. R. Smith and R. W. Taylor. 1959, 1961. In 1959 under dead albatross. In 1961 under driftwood log, on Ipomoea pes-caprae, on Sicyos with Ferrisiana virgata.

Monomorium gracillimum (Smith). 1912.

Monomorium minimum Buckley, 1912.

Pheidole megacephala Fabricius. 1959.

Plagiolepis alluaudi Emery, det. by M. R. Smith and R. W. Taylor. 1959 and 1961. In 1959 associated with Saissetia nigra on Cyperus pennatifolius, also on Ipomoea pes-caprae. In 1961 was on Pluchea, Eragrostis with mealybugs and under a dead bird on the outer beach.

Ponera gleadowi Forel, det. by R. W. Taylor. 1961. Under railroad ties.

Ponera kalakauae Forel. 1923.

Ponera punctatissima schauinslandi Emery. (Swezey, Bish. Mus. Bul. 172:176.)

Tapinoma melanocephalum (Fabricius). 1912.

Tetramorium guineense (Fabricius), det. by M. R. Smith and R. W. Taylor. 1905, 1923, 1959, 1961. In 1959 associated with Planococcus citri on Sicyos and Pseudococcus sp. on Scaevola. In 1961 under Heliotropium, under railroad tie and on Pluchea.

Ectoparasites of birds

The parasites of the birds of Laysan Island include ticks (Acarina), louse-flies or hippoboscids (Diptera: Hippoboscidae) and bird lice (Mallophaga).

The most abundant tick was the soft tick, Ornithodoros capensis Neumann, which was common on the ground near the lake by dead albatrosses and beneath clumps of Nama on the beaches. This tick probably seeks albatrosses on which to feed. Three specimens of an immature Ixodes sp., a hard tick, were found in the ear of a Laysan teal in 1959. No evidence of tick infestations was observed on the birds examined in 1961.

Two species of louse-flies, family Hippoboscidae, have been collected from birds on Laysan. These can be distinguished by the key given by Bequaert (1957:426) where the host relations are also discussed. Olfersia aenescens Thompson has the widest host range with records on various oceanic fish-eating birds such as albatrosses (Diomedea), boobies (Sula), noddy terns (Anous), sooty terns (Sterna), tropic-birds (Phaethon), petrels (Pterodroma) and shearwaters (Puffinus). These sea birds are all so-called "swimmers" and have similar habits of feeding at sea and nesting or roosting in populous colonies on oceanic islands.

Olfersia spinifera (Leach) is a specific parasite on the frigate birds (Fregata) which are its only regular breeding hosts. Olfersia fossulata Macquart was listed by Butler (1961a) but this record has since been found to be in error.

Bird lice of the order Mallophaga were collected by Snyder and Fisher on the Stanford Albatross Expedition of 1902 (Kellogg and Paine, 1910) and by the 1923 Tanager Expedition (Thompson, 1948). The following list was prepared from these reports and Zimmerman's (1948) discussion.

Host List of Mallophaga from Laysan Island

Diomedea nigripes Audubon Black-footed Albatross
 Docophoroides brevis (Dufour)
 Halipeurus mirabilis Thompson
 Harrisoniella ferox (Giebel)
 Harrisoniella sp.
 Perineus giganticulum (Kellogg)

Diomedea immutabilis Rothschild Laysan Albatross
 Docophoroides brevis (Dufour)
 Docophoroides sp.
 Harrisoniella ferox (Giebel)
 Harrisoniella sp.
 Perineus concinnus (Kellogg and Chapman)

Puffinus pacificus chlororhynchus Lesson Wedge-tailed Shearwater
 Giebelia (?) mirabilis Kellogg
 Halipeurus mirabilis Thompson
 Longimenopon puffinus Thompson

Puffinus nativitatis Streets Christmas Island Shearwater
Longimenopon puffinus Thompson

Pterodroma hypoleuca (Salvin) Bonin Island Petrel
Ancistrona vagelli (Fabricius)

Sula sula rubripes Gould Red-footed Booby
Pectinopygus sulae (Rudow)

Fregata minor palmerstoni (Gmelin) Frigate Bird
Pectinopygus gracilicornis (Piaget)
Pectinopygus sulae (Rudow)

Numenius tahitiensis (Gmelin) Bristle-thighed Curlew
Lunaceps sp.

Sterna lunata Peale Gray-backed Tern
Pectinopygus gracilicornis (Piaget)
Pectinopygus sulae (Rudow)
Perineus giganticulum (Kellogg)
Quadraceps birostris (Giebel)
Saemundssonia snyderi (Kellogg and Paine)

Sterna fuscata oahuensis Bloxam Sooty Tern
Saemundssonia snyderi (Kellogg and Paine) Host record from Marquesas.

Anous stolidus pileatus (Scopoli) Noddy Tern
Actornithophilus milleri (Kellogg and Kuwana)
Austromenopon sternophilum (Ferris)
Quadraceps separata (Kellogg and Kuwana)

Insects as food for birds

There are only two insectivorous birds now living on Laysan, the Laysan finch and the Laysan teal. Unfortunately only a few stomach contents of each were available for study. In July, 1961, the stomach of one finch was found to be packed with the mealybug, Ferrisia virgata (Cockerell). This mealybug was very common on the stems of Boerhavia, Ipomoea indica, Tribulus, Portulaca, Pluchea and Sicyos. The birds were observed to be very active around some of these plants, picking at the stems and buds and were undoubtedly picking off mealybugs.

Laysan teal were observed feeding on cutworms and flies. Cutworms were obtained from teal stomach contents collected in August, 1959 and September, 1961. These Agrotis larvae were very abundant beneath Nama, Boerhavia and Tribulus. It was in areas with these plants that teal were observed feeding at night. The larvae have not been identified but the most abundant species of moth collected at night was Agrotis dislocata (Walker), which was probably the species being fed upon by the teal.

In April 1959, several teal were observed feeding on the fly, Neoscatella sexnotata (Cresson), by the lake. Several teal ran together down-wind across the edge of the lake stirring up the flies. Then they wheeled in a semi-circle up into the wind, "herding" the flies into the wind and snapping them up. The larvae of these flies were very abundant in the highly saline waters of the lake. The populations of this fly may be more stable than those of the cutworms, which depend upon plants and which are attacked by a number of insect parasites. The muscoid flies which were very abundant around the camp in July 1959 and September 1961 were also fed upon by the teal.

J. W. Beardsley (personal communication) reported that in June 1962, "I pulled back the edge of a tent to collect some of the many adults of Agrotis evanescens which had taken refuge there. As the moths scattered, two teal appeared suddenly on the scene and snapped up the moths as fast as they could."

It is interesting to speculate that perhaps one of the factors influencing the extinction of two of the endemic birds, the Laysan honeyeater and the miller bird, was the apparent disappearance of several species of endemic noctuids upon which they may have fed. Agrotis laysanensis (Rothschild), Agrotis procellaris Meyrick and Hypena laysanensis (Swezey) are three endemic species which have not been collected since 1912. Three other species of noctuid moths have not been collected since that date either: Agrotis fasciata Rothschild, Peridroma porphyrea (Denis and Schiffermueller) and Pseudaletia unipuncta (Haworth). Two moth species were apparently able to survive, one an endemic Laysan species, Agrotis evanescens (Rothschild) and the other, Agrotis dislocata (Walker), endemic in the Hawaiian Islands. It is upon these two species that the Laysan teal feeds. Two additional species of noctuids are probably of recent introduction, Heliothis sp. near zea group and Trichoplusia ni (Huebner). The Heliothis was feeding on the heads of Eragrostis and on the flowers and seed pods of Nicotiana, so would be out of reach of the teal. The finches were observed feeding upon the grass heads, however.

The insects associated with plants

Boerhavia diffusa Linnaeus

Aphids, Aphis craccivora Koch, were abundant on the leaves and stem tips. Mealybugs, Ferrisia virgata (Cockerell) were collected on the stems, particularly in close contact with the sand. Large cutworm larvae, Agrotis, were abundant in the sand beneath the plants. Fifty were dug up in one square yard. A moth, Megalorhipida defectalis (Walker). was abundant around the plants. A spiny larva, believed to be of this species, was collected on the plants where it was feeding on the leaves. A green mirid, Cyrtopeltis modesta (Distant) was found on the plants in some numbers.

Capparis sandwichiana De Candolle

Thrips, Frankliniella sulphurea (Schmütz), were present in the flowers. Ants were quite numerous on the stems but only one mealybug specimen, Planococcus citri (Risso), was found in the center of a leaf. Chrysopid eggs were observed. A caterpillar (undetermined) was found feeding on the leaves causing skeletonized spots and ragged edges.

Casuarina equisetifolia Linnaeus

A few armored scales, Hemiberlesia lataniae (Signoret), were found on the branches. In the duff beneath the tree there were embiids (Oligotoma saundersii (Westwood)), Collembola (Entomobrya marginata Tullberg and Drepanocyrtus terrestris Folsom), psocids (Cryptophania hirsuta Banks) earwigs (Anisolabis perkinsi Burr.), sowbugs (Porcellionides sp.) and lepidopterous larvae (undetermined) in silken tubes.

Cocos nucifera Linnaeus

Mealybugs, Planococcus citri (Risso), were found on the palms at the north end of the lake.

Cynodon dactylon (Linnaeus) Persoon

Thrips, Haplothrips gowdeyi (Franklin), were collected from the plants. Mealybugs, Antonia graminis Maskell, were abundant on the stems at the lower nodes. Collembola, Drepanocyrtus terrestris Folsom, were abundant beneath the plants. Leafhoppers, Deltocephalus sonorus Ball, were present, as well as Nysius fullawayi fullawayi Usinger.

Cyperus laevigatus Linnaeus

Adults of Nysius fullawayi fullawayi Usinger were abundant.

Cyperus pennatiformis var. bryanii Kükenthal

Black armored scales, Saisettia nigra (Nietner), were extremely abundant, mostly on the under sides of the leaves but also on the flower heads. The scales were attended by ants, Plagiolepis alluaudi Emery. Only a few mealybugs (undetermined) were present.

Eragrostis variabilis (Gaudichaud) Steudel

Much of the grass in September 1961 showed the effects of injury by mealybugs and aphids. The older leaves were black with fungus-covered honeydew. Three species of mealybugs were present: Antonina graminis (Maskell) in colonies on the upper roots and on the lower

stems, Planococcus citri (Risso) and Trionymus insularis Ehrhorn on the leaves. Honeydew was present and the mealybugs were attended by ants which nested at the crowns of the plants. Two species of ants were collected: Pheidole megacephala F. and Plagiolepis alluaudi Emery. According to the 1959 records, coccinellids were also associated with the mealybugs but specimens are not now available. None were collected in 1961.

Aphids, Rhopalosiphum maidis (Fitch), were abundant on the leaves. Ants were associated with them also. Lacewing larvae and adults, Chrysopa carnea Steph., were abundant on and around the plants. In September 1961, 58 adults were swept from one clump of grass. A noctuid larva, believed to be Heliothis sp. zea group, was present on the heads. Thirty larvae were collected in 1000 net sweeps. Another caterpillar, (undetermined but possibly Hymenia recurvalis (Fabricius)), was very abundant on the lower portions of the stems.

A thrips, Haplothrips gowdeyi (Franklin) was abundant on the grass heads. A few beetles, Araecerus fasciculatus (DeGeer), were collected on the grass heads but they may not be closely associated with the plants.

Fimbristylis cymosa R. Brown

Nysius fullawayi fullawayi Usinger with pale nymphs were found only on this plant.

Heliotropium curassavicum Linnaeus

A small green looper larva, possibly Trichoplusia ni (Huebner), was feeding on the leaves. Underneath the plants were ants (Tetramorium guineense (Fabricius)), sowbugs (Porcellionides sp.), earwigs, roaches (Pycnoscelus surinamensis (L.)), and mites (Scheloribates cf. calcaratus Jacot).

Ipomoea indica (Burmenn) Merrill

Aphids, Aphis craccivora Koch, were abundant on the stem tips. Mealybugs, Ferrisia virgata (Cockerell) were collected. Larvae of the sweet potato hornworm, Herse cingulata (Fabricius), might be present on this plant but none were observed.

Ipomoea pes-caprae (Linnaeus) Sweet

Mealybugs, Planococcus citri (Risso), were collected on the stems where they were often attended by ants. Two species were collected: Monomorium floricola (Jerdon) and Plagiolepis alluaudi Emery. Thrips, Frankliniella sulphurea (Schmütz), were present in the flowers. Larvae of the sweet potato hornworm, Herse cingulata (Fabricius), might be present on this plant but none were observed. A brilliant metallic-green dolichopodid fly was abundant, resting on the leaves.

Nama sandwicensis A. Gray var. laysanicum A. Brand

Some small plant bugs, Nysius fullawayi fullawayi Usinger, were present on the plants on the beaches of the east shore. Pyralid larvae, undetermined, were found in webbing at the crown of the plants and in the sand. Beneath the plants Agrotis larvae of apparently two species,

one a large dark-grey color and the other a smaller and green, were very abundant in the sand. A thrips, Haplothrips sesuvii Priesner, was in the flowers.

Nicotiana tabacum Linnaeus

A mirid, Cyrtopeltis modesta (Distant) was quite abundant, both the nymphs and adults. A very large cutworm was observed feeding on the leaves at night in 1959 and 1961 and caused extensive leaf injury. Beardsley in 1962 reared Agrotis evanescens (Rothschild) from the base of injured plants and reared Heliothis sp. near zea from flowers and green seed pods.

Pluchea indica (Linnaeus) Lessing

An armored scale, Saissetia nigra (Nietner), was very abundant on the undersides of the leaves. A mealybug, Ferrisiana virgata (Cockerell), was also present. The ant, Tetramorium guineense (Fabricius), was collected on this plant. A few beetles, Araecerus fasciculatus (DeGeer), were collected.

Portulaca lutea Solander

A mealybug, Ferrisiana virgata (Cockerell), was present and a few Chelonus blackburni Cameron were swept from the plants.

Scaevola sericea Vahl

Aphids, Aphis gossypii Glover, were present on the undersides of the leaves. Also on the undersides of the leaves were scales, Saissetia nigra (Nietner), as well as on the stems. Mealybugs, Pseudococcus sp. apparently new, were found at the inside axil of the large leaves where they were protected in the hairy material. Some were also up on the leaves at the terminal buds. The ant, Tetramorium guineense (Fabricius), was attending the aphids, mealybugs and scales and a colony was found in the ground at the base of a plant. Golden-eyed lacewing adults, Chrysopa carnea Steph., were abundant and were flying over the leaves. A dozen or so were observed in one small portion of a bush in July 1959.

A very heavy infestation of spider mites, Brevipalpus obovatus Dönadieu, was present at one location on the south-east coast. The lower leaves of the plants had turned rusty yellow and were dropping off. This seriously reduced the cover, shade and concealment from enemies for the ground-nesting birds beneath, particularly the red-tailed tropic birds.

Numerous small spiders, Coleosoma floridanum Banks, were hidden in light webs in curled leaves. The plants were a favorite resting place for the extremely abundant muscoid flies, and their fecal specks were very noticeable on the leaves.

Sesuvium portulacastrum Linnaeus

The leaves were chewed. Larvae were present in silken tubes extending into the ground. Small cream-white moths were abundant about the plants. A thrips, Haplothrips sesuvii Preisner, was found in the flowers.

Sicyos hispidus Hillebrand

Two species of mealybugs, Planococcus citri (Risso) and Ferrisiana virgata (Cockerell), were present and attended by two species of ants, Tetramorium guineense (Fabricius) and Monomorium floricola (Jerdon), respectively. The aphid, Aphis gossypii Glover, was also collected.

Tribulus cistoides Linnaeus

Dark green aphids, Aphis craccivora Koch, were feeding on the leaves and the petioles of the flowers.

Scattered individual mealybugs, Ferrisiana virgata (Cockerell) and Planococcus citri (Risso) were found on the stems, leaves and seeds. No ants appeared to be attending them. The thrips, Haplothrips gowdei (Franklin) and Frankliniella sulphurea (Schmütz), were present in the flowers.

Small yellow to bright green larvae (undetermined) with black heads were found feeding on the leaves and flowers, often hidden in the bracts. Sometimes there were two in a single bloom. They fed when the young leaflets were still closed together and made "windows" in the leaflets.

Cutworms, Agrotis sp., were abundant in the sand beneath the plants. In one 3 square foot area 25 larvae were dug up. Cocoons of Apanteles marginiventris Cresson were found on the leaves. A few adults of this species were reared from Agrotis larvae, and some adults were swept from the plants.

Insects and other animals associated with the lake

One of the outstanding topographical characteristics of Laysan is the central lake with its highly saline water. There are several animals that are associated with the lake and the surrounding area.

In the Sesuvium-Cyperus-Heliotropium plant association immediately surrounding the lake there was an amphipod (undetermined) which was very abundant in the damp ground around the roots. There were also ants (Tetramorium guineense (Fabricius)), sowbugs (Procellionides sp.), earwigs (Anisolabis perkinsi Burr), roaches (Pycnoscelus surinamensis (L.)), and mites (Scheloribates cf. calcaratus Jacot). An earthworm was also present and, according to Schauinsland (1899:90), was named Pontodrilus ehippiger Rosa var. laysanianus.

Beneath the salt and algal crust in the damp unvegetated area surrounding the lake, one could find the above mentioned amphipod and earthworm, particularly under the carcasses of dead albatrosses. There were also two common beetles, a carabid, Tachys oahuensis Blackburn, and a staphylinid, Carpelimus sp. These were found together beneath pieces of the rubbery dried algae.

The most abundant animals in the lake were brine shrimp and a fly larva. These animals live in a very rigorous habitat as, in addition to the high salt content of the water, it was also quite hot. Temperatures were taken at 3 pm on July 25, 1959, and were as follows:

<u>Distance from shore</u> in yards	<u>Depth of water</u> in inches	<u>Water temperature C°</u>
5	1½	39.3
11	3½	38.5
13	5	34.0 at surface 32.0 in mud
16	19	33.0

There was a distinct thermocline to a cooler temperature at approximately the 5 foot depth which was noticed when swimming in the lake.

Brine shrimp, Artemia, were extremely abundant and were continuously swimming against the currents. In some shallow areas they were so dense that the water appeared to be red. In addition to the Artemia, Schauinsland observed the larvae of a little dipteran, Neoscatella sexnotata (Cresson). These larvae stand perpendicular to the surface of the piece of alga or stone to which they are attached with two caudal hooks. They appear to maintain a large air bubble at the entrance to the tube-like body. These larvae were observed living in the water from the edge of the lake to depths of 6 to 7 feet. The pupae were much

darker in color and probably come to the surface to permit the adult to escape. There were large "windrows" of dark exuviae along the margin of the lake and along the margins of previous water levels. The adult flies were extremely abundant, resting on the damp areas surrounding the lake and on the vegetation. They were very noticeable on the stems of Cyperus where they lined up on the shady side of the stems. There were also large numbers resting on the other plants around the lake, from which the flies flew up in small black clouds when disturbed. It was upon these flies that the Laysan teal were observed feeding in April 1959.

Insects and the windward lagoon

On the wet surfaces of the rocks in the intertidal zone along the windward lagoon, two species of flies were collected in 1961. Dr. Hugh Caspers conducted some studies in this area in April 1959 but the report of his observations is not available. The most common fly in 1961 was the chironomid, Telmatogeton pacificus Tokunaga. The other fly was a canaceid, Canaceoides nudata (Cresson). A cynipid, Pseudeucoila hydrophila (Perkins), was associated with these flies.

Land snails

The current list of land snails from Laysan consists of Lamellidea gracilis (Pease) and Tornatellides bryani Pilsbry and Cooke, according to Y. Kondo.

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