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THE GENUS NYSIUS AND
ITS ALLIES IN THE
HAWAIIAN ISLANDS

(HEMIPTERA, LYGAEIDAE, ORSILLINI)

BY
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The Genus *Nysius* and its Allies in the Hawaiian Islands¹ (Hemiptera, Lygaeidae, Orsillini)

By **ROBERT LESLIE USINGER**

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INTRODUCTION

Hawaiian species of the tribe Orsillini are attractive subjects for study from at least three entirely different points of view. To the resident of Hawaii they are among the least known though commonest insects from sea level to the tops of the mountains on introduced and native plants. To the Hemipterist they present a fascinating array of primitive and modern forms comprising half of the known orsilline fauna of the world. To the evolutionist they represent the first case of tremendous proliferation of species in insular areas which presents a possibility of experimental analysis. An attempt has been made to elucidate the general subject along these three fronts, stressing the taxonomic, phylogenetic, biological, and philosophical sides of the problem.

ACKNOWLEDGMENTS

During the course of this investigation many friends assisted in various phases of the work. O. H. Swezey, F. X. Williams, and F. R. Fosberg were companions on numerous field trips and willingly shared their wide knowledge of field conditions and especially of the botany of the Hawaiian islands. Gratitude is due the many field entomologists whose collecting will form the basis of monographic work on Hawaiian insects for years to come. Most noteworthy of these are Thomas Blackburn, R. C. L. Perkins, O. H. Swezey, J. C. Bridwell, D. T. Fullaway, W. M. Giffard, Frederick Muir, P. H. Timberlake, and E. H. Bryan, Jr. Associates at the Bishop Museum who made the work possible include the former director, H. E. Gregory, the present director, Peter H. Buck, E. H. Bryan, Jr., C. M. Cooke, Jr., Amy Suehiro, and E. C. Zimmerman.

Of Hemipterists, G. W. Kirkaldy must be mentioned as the pioneer. His unfortunate accident soon after arriving in Hawaii and his untimely death some seven years later prevented his doing the work which now, 30 years later, is just appearing. W. E. China, Curator of Hemiptera at the British Museum (Natural History) and one of the best authorities on *Nysius* in the world, has

¹ Submitted in partial satisfaction of the requirements for the degree of Doctor of Philosophy in entomology to the Graduate Division of the University of California.

been a constant source of encouragement, comparing specimens with types in his charge and making drawings. H. G. Barber, Curator of Hemiptera at the United States National Museum, who is at present engaged in monographing the North American *Nysius*, loaned material and went over the specimens and illustrations. Others who have sent or loaned material include J. H. Evans, Hobart, Tasmania; A. L. Tonnoir, Canberra, Australia; the late Walther Horn, Berlin-Dahlem; O. Lundblad, Stockholm, Sweden; C. J. Drake, Ames, Iowa; Nathan Banks, Cambridge, Massachusetts; and H. H. Ross, Urbana, Illinois.

In California, the late E. P. Van Duzee, eminent Hemipterist and curator of entomology at the California Academy of Sciences, gave freely of his wide experience, particularly in the bibliography of Hemiptera, and ran a number of species through the keys, suggesting points where these could be clarified. At the University of California, E. C. Van Dyke, E. O. Essig, S. F. Light, R. Goldschmidt, and E. B. Babcock have aided greatly in the philosophical and practical aspects of the problem, as have my associates, E. G. Linsley and C. D. Michener, while Eldon Gardner made the chromosome slides of *Nysius strigosus* auct. non Uhler. G. F. Ferris of Stanford University contributed much to the philosophical side of the work.

The illustrations were drawn from my camera lucida outlines by Frieda Abernathy of Berkeley. Her interest and enthusiasm has been an inspiration in itself, and no credit is too great for her excellent work.

HISTORY

The first species of Hawaiian Orsillini, *Nysius coenosulus*, was described in 1859 by the great Swedish Hemipterist, Carolus Stål, from material presumably collected by J. G. H. Kinberg on the Eugenie Resa Expedition, which arrived in Honolulu on June 22, 1852. Following this came the diligent work of Thomas Blackburn who collected in the islands from 1876 to 1882. Blackburn described some of his material himself but a large proportion of it was sent to Buchanan White, who first (1881) briefly suggested the philosophical implications of the group.

Nothing further was added to the *Nysius* picture until R. C. L. Perkins began his collecting for the Fauna Hawaiiensis. Perkins' extensive field work turned up most of the species of *Nysius* known today. A combination of circumstances, however, greatly hindered the rapid advancement of systematic work from this point onward. In 1902, the eminent, though somewhat unorthodox Scotch Hemipterist, G. W. Kirkaldy, worked up the Hemiptera for the Fauna Hawaiiensis. He had never been to the islands and had seen but a single *Nysius* type (*Nysius coenosulus* Stål), so he wisely refrained from describing any but a few of the most obviously distinct species. In the summer of 1903 Mr. Kirkaldy went to Hawaii to aid in the campaign against the sugar-cane

leafhopper. Two years later a riding accident resulted in a broken leg which made field work practically impossible and started the trouble which resulted in his death in San Francisco in 1910. During the intervening years however, Kirkaldy, although still in ignorance concerning all but one of the previously described species of the group, prepared the supplemental Hemiptera volume for the Fauna Hawaiiensis. In this, he described many new species as well as a few which were not new, separated off two subgenera for peculiar highland forms, and gave a key to the species known to him. Unfortunately, this supplement was not published until after Kirkaldy's death, so that he had no opportunity to correct the mechanical errors which make his key entirely unworkable or to catch a preoccupied name which appeared for one of his new species. Following closely upon this work, Perkins, with Blackburn's types and "cotypes" before him, went over Kirkaldy's types in the British Museum, pointed out obvious synonymy, and certain not so obvious synonymy with which I am unable to concur, and described a number of new species.

With such a background, it is little wonder that diligent collectors like Swezey, Bridwell, Timberlake, and others who followed during the next 25 years, were discouraged in their efforts to identify their captures. During this period and even up to the present, no authentic or even approximately correctly identified collections of *Nysius* existed in the Territory of Hawaii, except for a few of Kirkaldy's unrevised "cotypes." Perkins' valuable collection, containing his own and Blackburn's type material, was sent to Bishop Museum in 1930.

MATERIAL, METHODS, AND EXPLANATION OF TERMS

When I arrived in the Hawaiian islands in 1935 to study the Heteroptera, I found in various collections several thousand unidentified *Nysius* bugs. Of the 35 names assigned to the Hawaiian *Nysius*, seven had been synonymized (at least three incorrectly), and one was an Australian species which had been erroneously recorded. It was possible to place most of these species at once, because a fine lot of type material was found at the Experiment Station of the Hawaiian Sugar Planters' Association and at Bernice P. Bishop Museum. This included type material of all of Kirkaldy's species except the two uniques, *N. oresitrophus* and *N. kamehameha*, Perkins' and Blackburn's holotypes, and Blackburn's identifications of the species which he sent to Buchanan White (probably mostly paratopotypes). Mr. China writes that holotopotypes have been designated for all of Kirkaldy's species in the British Museum, so the remaining specimens mentioned by that author in his descriptions become paratopotypes. The remaining material at hand in 1935 was supplemented by extensive collecting and exchange, all over the world but particularly in the circum-Pacific area. I now have a study collection of over 6,000 specimens of the tribe Orsillini and have examined 165 species and subspecies of this tribe. About half of this number of specimens and species is Hawaiian.

During my year in Hawaii, I visited each of the six main Hawaiian islands—Kauai, Oahu, Molokai, Lanai, Maui, and Hawaii. I tried to establish headquarters in the high native forest of each island, and I established camps on the highest points of Hawaii, Oahu, and Lanai. Oahu and Hawaii were most thoroughly collected, and Maui was scarcely touched. Lowland faunas were also studied, including visits to Manana, Mokulua, and Popoia Islands off the northeast coast of Oahu. Of great aid for comparative purposes was the experience gained and the material collected in Guam, the Philippine Islands, China, Japan, and in North and Central America. Of equal value were the specimens studied and the contacts made with the museums visited during these trips including a visit to all of the principal insect collections of North America during 1937.

Collecting was done almost entirely by "sweeping" with a large bag of unbleached muslin attached to the frame of a stout fish-landing net and by "beating" with a stout club into an inverted black umbrella. Sweeping was most effective in collecting on low shrubs and herbs, but beating proved most satisfactory in collecting on the larger forest trees. Series up to 100 or 200 specimens were taken whenever possible, and every effort was made to determine whether the insects were really attached to the particular plant on which they were collected or whether they were merely resting or perhaps feeding but not breeding on it. Nymphs were collected in alcohol. Copulating pairs were collected whenever possible. In several collecting vials eggs were laid, sometimes before the vial was reexamined at the end of the day's collecting.

Adequate series of well mounted material for a serious study of these insects are so important, and sometimes so absolutely necessary, that a considerable portion of the material of a given species was often excluded from the paratype series because important characters were obscured by a card or by glue. Specimens are best studied when glued to a light cardboard point, the tip of which has been bent downward so that it fits against the right meso- or metapleuron of the specimen, leaving the entire sternal area and left pleurites exposed, or when one of a series is mounted ventral side up. The second method may be confusing if more than one species is represented in the same series.

Descriptions were made of all of the species by the same plan so that they are all comparable. Almost any combination of intermediate or high power oculars or objectives of an ordinary binocular microscope will suffice to show pubescence and other fine characters. Wherever possible and unless otherwise indicated, descriptions were made from male specimens. Female characters and any points of difference, besides the usual somewhat larger size and relatively broader form with shorter hemelytra of the females, were added in their proper place.

Table 1. Range of variability in *Oceanides nubicola* (Kirkaldy)*

MALES

	Head l:w	Head ao:le	Head wi:we	Pronotum l:w	Rostrum Proportions	Antennal Proportions	Size w:l
1	16.5 :18.25	7 :6.5	10 :4	14.5 :26	10 -10 -10 -11	6 -13 -12 -11	30 :83
2	16 :18	7 :6	10 :4	14 :25	9.5 -9.5 -8 -9	6.5 -12.5 -11 -10.5	29 :80
3	16 :17.5	7 :6	10 :4	13.5 :23	11 -10 -8.5 -10	6.5 -13 -11.5 -11	27 :79
4	16 :18	7 :6	10 :4	14.5 :26	10 -11 -9 -10	6.5 -13 -11.5 -11	29 :82
5	16.5 :18	7 :6	10 :4	14.5 :26	10 -10 -9 -10	6 -12 -10 -11	29 :82
6	17 :19	7 :6	11 :4	15 :26	10 -10 -9.5 -11	6 -12.5 -11 -11	30.5 :83
7	17 :18	7 :6	10 :4	14 :25.5	10.5 -10 -8.5 -10	6.5 -12 -10 -10	29 :82
8	16 :18	7 :6	10 :4	14.5 :25	10 -9 -8 -10	6 -12 -11.5 -11.5	29 :80.5
9	16 :18	6.5 :6	10 :4	14 :25	10 -11 -10 -10.5	6.5 -12.5 -11 -11	30 :78
10	16 :18.5	7 :6	10.5 :4	14.5 :26.5	10 -9.5 -9 -10.5	6 -13 -11 -10.5	29.5 :81
Av.	16.3 :18.1	6.9 :5.9	10.1 :4	14.3 :25.4	10.1 -10 -8.9 -10.2	6.2 -12.5 -11 -10.9	29.2 :81
Range	16/17.0 17/19	6.5/6 6/6.5	10/11 4/4	13.5/15 23/26.5	9.5/11 9/11 8/10 9/11	6/6.5 12/13 10/12 10/11	27/30.5 83/78

FEMALES

1	17 :20	7 :6	12 :4	16.5 :30	12 -12 -10 -10	6.5 -13 -11 -10.5	35 :90
2	17.5 :19	7.5 :6	11 :4	15 :28.5	12 -11 -10 -10	6.5 -12 -11.5 -11	34.5 :88
3	17.5 :19.5	7.5 :6	11.5 :4	16 :28.5	12 -11 -9 -11	6 -13 -11 -10.5	35 :89
4	17 :19	7 :6.5	11 :4	15.5 :29	11.5 -11 -9 -10	6 -13 -11 -10.5	34 :89
5	17 :18.5	7.5 :6	10.5 :4	14.5 :27	11 -11 -10 -11	6 -12 -11.5 -10	34 :89
6	17 :18.5	7.5 :6	11 :3.75	15 :27	11 -11 -10 -11	6 -12 -10.5 -10.5	33 :83
7	17.5 :19.5	7.5 :6.5	11.5 :4	16 :29	10.5 -11 -10 -10	6 -12 -11 -11	35.5 :90
8	17.5 :19	7.5 :6	11 :4	15.5 :29	12 -11 -10 -11	6 -13 -11 -11	35 :92
9	16 :19	7.5 :6	11 :4	15.5 :27.5	11 -10.5 -9 -10	6 -12 -11 -10.5	35 :90
10	17.5 :20	8 :6.5	12 :4	17 :30.5	12 -11.5 -11 -11	6 -14 -12 -11	35.5 :95
Av.	17.1 :19.2	7.4 :6.1	11.3 :4	15.6 :28.6	11.5 -11.1 -9.8 -10.5	6.1 -12.6 -11.1 -10.6	34.6 :89.5
Range	16/17.5 18.5/20	7/8 6/6.5	10.5/12 3.75/4	14.5/17 27/30.5	10.5/12 10.5/12 9/11 10/11	6/6.5 12/14 10.5/12 10/11	33/35.5 83/95

* All measurements are in micrometer units. The following abbreviations have been used: head, length (l): width (w); anteocular region (ao): length of an eye (le); width of interocular space (wi): width of an eye (we). Pronotum, length (l): width (w). Rostrum, proportions of segments. Antennae, proportions of segments. Size, width across hemelytra (w): total length (l). The average and the extremes are given beneath each column.

The average variation between sexes and the range of variation in a typical highland species are shown in table 1. This table was made from measurements of 10 males and 10 females representing the extremes as well as the mean of a series of several hundred specimens of *Oceanides nubicola* collected on *Myoporum* trees near Humuula, Hawaii. The numerical characters and proportions used in the specific descriptions are included and have been left as micrometer units to facilitate comparison.

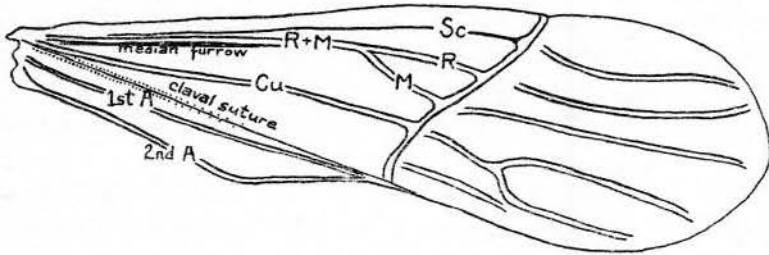


FIGURE 1.—Typical hemelytral venation in the Orsillini.

All measurements were made with an eye-piece micrometer, one unit equalling 0.055 mm. or 5.5μ (18 units = 1 mm.). Specimens were measured by tipping the insects so that the desired parts were in the same plane. The abbreviated or telegraphic form used in the descriptions may be amplified as follows: *length of head* on median line from base of head to tip of tylus; *width of head* including eyes; *anteocular length* measured from level of front margins of eyes to apex of tylus; *length of eyes* from posterior to anterior margins of eyes along longitudinal axis of the insect; *width of interocular space* is the smallest distance between inner margins of eyes; *width of eyes* is the greatest width of an eye at this same level at right angles to the longitudinal axis of the body; *antennae*, each segment measured individually and then added together for the total length; *width of pronotum* is the greatest or posterior width across humeri; *length of pronotum* on median line; *hemelytra*: *length of membrane* from apex of commissure of clavus to membranal apex; exceeding tip of abdomen by the distance beyond apex of abdomen which shows through the hyaline membrane; *length of costal margin of corium*, a straight line from basal articulation at humeral angle to outer apical angle; *length of membrane beyond level of apices of coria*, measured from an imaginary line drawn across these apices to base and to apex; *point of branching of R + M* measured from base of corium in a straight line to point of branching and then to joining of R and apical margin (fig. 1); *depth of female genital cleft* measured from apex of cleft at level of ovipositor to apex of abdomen compared with basal length, not to base of abdomen which is usually obscured but to inner posterior margin of metapleuron where it turns up to metacoxal

flange; *length of insect* measured in a single plane from apex of tylus to tip of membrane; *width of insect* (unless otherwise noted) is the distance across broadest part of hemelytra.

In describing pubescence, such places as the coxal flanges, posterior reflexed margins of metapleura, evaporating areas adjacent to ostiolar canals, ocular margins, tylus anteriorly, antenniferous tubercles or callosities are stated to be naked "as usual" if they have previously been described under a higher category. In color descriptions, unless otherwise noted, the antenniferous tubercles, apex of tylus, elevated portions of bucculae anteriorly, dorsal longitudinal stripe between the eyes, ocular margins, coxal flanges, anterior margin of prosternum, and reflexed posterior margins of metapleura are pale. The femora, when spotted, are always more distinctly spotted below than above.

The names used for the various body parts are those customarily employed throughout hemipterological literature, the tylus being the clypeus of other insects; the juga, the "paraclypeal" (Spooner, 1938) or hypopharyngeal plates (Snodgrass, 1938); the interocular space, the fused vertex and frons; bucculae, the elevated and parallel plates on either side of the base of the rostrum; callosities transversely on anterior lobe of pronotum, the outward indications of the thoracic skeleton; humeri, the postero-lateral angles of the pronotum; and the third, fourth and fifth abdominal segments being numbered from the first visible abdominal segment, the true first abdominal segment being obsolescent in the Hemiptera. Venational terminology is after China and Myers (1929, p. 111, fig. 4) and the term "coxal flange" has been adopted as defined by Brindley (1934). The expression "level of" is used frequently and refers to an imaginary line drawn between two designated points.

Detailed locality, host, and collector records are given separately for all type material and the various localities, months of collection, collectors, and host plants are summarized for other material. Numbers from 1400 to 1451 refer to types in the collection of B. P. Bishop Museum. Locality names are spelled according to Coulter's *Gazetteer* (1935) even if Coulter's spelling differs from that on the label of the insect. In citing type material from other authors the correct names are enclosed in brackets. Botanical names follow Hillebrand (1888), Rock (1913), or more recent monographs where these exist, and new synonymies with resulting nomenclatorial changes are used when these are known to me and seem to have been generally accepted.

To facilitate recording of data and to conserve space the following initials are used as abbreviations for collectors' names throughout the work: Thomas Blackburn (T. Blackb.); R. C. L. Perkins (R.C.L.P.); O. H. Swezey (O.H.S.); J. C. Bridwell (J.C.B.); David T. Fullaway (D.T.F.); Frederick Muir (F.M.); W. M. Giffard (W.M.G.); G. W. Kirkaldy (G.W.K.); F. X.

Williams (F.X.W.); P. H. Timberlake (P.H.T.); W. H. Meinecke (W.H.M.); C. Montague Cooke, Jr. (C.M.C.); A. M. Adamson (A.M.A.); E. H. Bryan, Jr. (E.H.B.); R. L. Usinger (R.L.U.).

The synonymical bibliographies under the various systematic headings from tribe to species cite the original reference to each name including synonyms and any additional information or even mention of the name as it relates to the Hawaiian fauna. These references are complete in themselves and have not been repeated in the formal bibliography at the end of the work. In dealing with some of the widespread species such as *Nysius delectus* White and *N. coenosulus* Stål it has been necessary to follow the name blindly, citing each reference under that name, although it is often quite possible that the species in question has been misidentified. Text references to literature cited in the formal bibliography are by author followed by the year of publication in parentheses.

The full-tone illustrations are, in a sense, glorified diagrams. I first drew them as camera lucida outlines in two planes, one parallel to the declivent axis of the head and pronotum and the other parallel to the main axis of the body showing the scutellum and hemelytra. To draw these bugs as seen in a single plane would not convey a complete, true picture of the insect because the essential head and pronotal characters would be out of focus. Bringing the entire dorsal surface into a single plane conveys the general facies of the insect, the form of the various body parts, and, by means of surface modeling with carbon pencil and various tones of ink on "OO" granular chalk surface "Ross Board", the convexity of some of the surfaces, and the general color pattern. As general facies is practically impossible to describe in words, these illustrations serve admirably to supplement the descriptions. However, they do not supplant the descriptions and all measurements and proportions, often necessarily distorted in the illustrations, must be taken from the descriptions.

Much confusion has been introduced into systematic biology because of failure of monographers to define the terms used for the various categories. Many of the striking differences of opinion in this field seem to be due to the application by one worker of his own definitions of species, subspecies and other terms to another person's work.

A definition of the term subspecies has gradually emerged in recent years and is clearly summarized by Darlington (1938). The essence of this definition is observed or assumed intergradation between two geographically more or less isolated races. By rule of thumb, then, closely allied forms are species if they maintain their differences where their ranges overlap, whereas closely allied forms are subspecies if they occur in adjacent areas with intermediates actually found or assumed to be present in the intervening areas. The seemingly endless modifications of this principle were discussed by several authori-

ties at the recent symposium on this subject sponsored by the British Association on the Relation of Systematics to General Biology (Linn. Soc. London, Proc., 151st Session, pt. 2, pp. 89-114, 1939).

Applied to closely allied forms on adjacent islands of an archipelago, a further refinement of the concept becomes necessary. Here the ranges of the forms are abruptly discontinuous with no possibility of intermediates in the intervening areas. Hence we must depend upon degree of difference in determining the status of these forms. As differences range in degree almost uninterruptedly from individual variations, through geographically localized variations, to strong specific differences, we are faced with the necessity of drawing a line which will do the least violence to the natural situation. The purely arbitrary nature of this line for organisms of all groups is stressed by Ginsburg (1938) and must be emphasized here, for, without actually crossing allied forms of questionable status, any conclusions regarding their interrelationships must be recognized as temporary approximations to be checked by breeding experiments when possible. Sufficient latitude must be allowed the term subspecies so as to include obvious forms of a single species found under similar conditions on each island and exhibiting only slight structural differences. On the other hand, the term must be circumscribed so as to exclude forms which belong to a single phylogenetic branch containing a representative from each island but which have become so distinct that they bear but little resemblance to each other. Examples of these various points are cited and discussed in the sections on phylogeny and species formation, following the main body of descriptive and biological data which must serve as a foundation for such discussion.

The following definitions are offered at this point in the hope that they may be of aid in interpreting the systematic work. They embody the conclusions reached after weighing the various factors mentioned above and tempering these with the practical requirements of a mechanical classification of the Orsillini of the Hawaiian islands. Genera differ qualitatively, as well as quantitatively, from their allies, possessing one or more characters not found in other groups. Subgenera are used for widely divergent branches of a single phylogenetic stock possessing combinations of characters not found in allied groups. Species are closely allied, but sharply distinct forms differ from one another in many characters, some of which may be minute but all of which contribute toward a distinctive facies of the insect. Subspecies are geographically localized segregates of a single species, differing from one another in only one or a few characters, occasionally reverting to the parental type. These differences are average. For convenience, varietal names have been applied to three color forms within single populations where these seem to have resolved themselves into distinctly separable groups.

Holotypes and allotypes of all new species (except the holotype of *Glyptonysius laevigatus* which has been returned to the United States National Museum) are deposited in the type collection of Bishop Museum and numbered from 1400 to 1451. All of Perkins' and Blackburn's types are likewise stored in Bishop Museum. Kirkaldy's types have all been verified by W. E. China and are stored in the British Museum (Natural History). Buchanan White's types are under the care of Mr. James Ritchie, curator of the Perth Museum in Scotland, and have likewise been checked by Mr. China. The only other Hawaiian *Nysius* type is Stål's *coenosulus* (in the Naturhistoriska Riksmuseum, Stockholm), which Kirkaldy examined and which Dr. O. Lundblad informs me is a unique.

Sets of paratypes or authentically identified material representing as many of the species as possible will be placed in the collections of the Hawaiian Sugar Planters' Experiment Station, the British Museum (Natural History), the United States National Museum, the California Academy of Sciences, and of the author; and representatives of the better known species will be placed in the collections of the University of Hawaii, the Board of Agriculture and Forestry of the Territory of Hawaii, the Naturhistoriska Riksmuseum, Stockholm, and the Deutsches Entomologisches Institut at Berlin-Dahlem; while the bulk of the material will be stored in Bishop Museum.

The genera and species are arranged and numbered in series as nearly as possible from the most primitive to the most complex, derived, or recent. Where evidence of relationship is obscure or wanting, the species are arranged according to successively adjacent positions on a horizontal plane such as would be formed if all of the species in the phylogenetic trees were extended up to a single level. In closely allied groups with little or no evidence as to the relative age of the members, the species are placed according to age of the islands to which they are confined, Kauai species being assumed to be oldest and Hawaii species youngest. For further discussion of phylogenetic relationships, see page 115.

A complete list of species, subspecies, varieties, and synonyms precedes the taxonomy section. A serial number is given to each species and this number in parentheses precedes specific names in the keys.

TAXONOMY

SYSTEMATIC ARRANGEMENT

- Tribe ORSILLINI (Stål)
- Genus *Oceanides* (Kirkaldy)
1. *pteridicola* (White)
= *insulivagus* (Kirkaldy)
 2. *montivagus* (Kirkaldy)
 3. *vulcan* (White)
 4. *ventralis*, new species
 5. *picturatus*, new species
 6. *delicatus*, new species
 7. *myopori*, new species
 8. *nubicola* (Kirkaldy)
 9. *planicollis*, new species
 10. *bryani*, new species
 11. *parvulus*, new species
 12. *fosbergi*, new species
 13. *nimbatus* Kirkaldy
 14. *membranaceus*, new species
 15. *incognitus*, new species
 16. *sinuatus*, new species
 17. *bimaculatus*, new species
 18. *rugosiceps*, new species
 19. *oribasus* (Kirkaldy)
 20. *oresitrophus* (Kirkaldy)
 21. *arboricola* (White)
 22. *perkinsi*, new species
 23. *dilatipennis*, new species
- Genus *Glyptonysius*, new genus
24. *hylaicus* (Kirkaldy)
 25. *laevigatus*, new species
- Genus *Neseis* (Kirkaldy)
- Subgenus *Physonysius*, new subgenus
26. *molokaiensis*, new species
 27. *ampliatus*, new species
- Subgenus *Leionysius*, new subgenus
28. *haleakalae* (Perkins)
 29. *pallidus*, new species
- Subgenus *Neseis* (Kirkaldy)
30. *kirkaldyi* (Usinger)
(= *monticola* Kirkaldy non Distant)
- Subgenus *Trachynysius* Usinger,
new subgenus
31. *whitei whitei* (Blackburn)
 32. *whitei brachypterus*, new subspecies
 33. *oahuensis*, new species
 34. *cryptus*, new species
 35. *fulgidus*, new species
 36. *nitidus impressicollis*, new subspecies
 37. *nitidus contubernalis*, new subspecies
 38. *nitidus consummatus*, new subspecies
 39. *nitidus insulicola* (Kirkaldy)
 40. *nitidus nitidus* (White)
 41. *nitidus picturi*, new subspecies
 42. *nitidus comitans* (Perkins)
 43. *hiloensis jugatus*, new subspecies
44. *hiloensis interoculatus*, new subspecies
 45. *hiloensis approximatus*, new subspecies
 46. *hiloensis intermedius*, new subspecies
 47. *hiloensis hiloensis* (Perkins)
 48. *swezeyi*, new species
 49. *saundersianus* (Kirkaldy)
 50. *alternatus*, new species
 51. *silvestris* (Kirkaldy)
 52. *chinae*, new species
 53. *mauiensis* (Blackburn)
 54. *mauiensis variety pallidipennis*, new variety
 55. *fasciatus fasciatus*, new subspecies
 56. *fasciatus fasciatus variety hyalinus*, new variety
 57. *fasciatus convergens*, new subspecies
- Subgenus *Icteronysius*, new subgenus
58. *ochriasis* (Kirkaldy)
 59. *maculiceps*, new species
- Genus *Nysius* Dallas
60. *sublittoralis* Perkins
 61. *longicollis* Blackburn
 62. *fucatus*, new species
 63. *rubescens* White
 64. *fullawayi fullawayi*, new subspecies
 65. *fullawayi fullawayi variety infuscatus*, new variety
 66. *fullawayi flavus*, new subspecies
 67. *frigatensis*, new species
 68. *terrestris*, new species
 69. *suffusus*, new species
 70. *chenopodii*, new species
 71. *lichenicola* Kirkaldy
 72. *blackburni* White
(= *lichenicola* var. *brunnealis* Kirkaldy)
(= *lichenicola* var. *atralis* Kirkaldy)
 73. *nemorivagus* White
 74. *nigriscutellatus*, new species
 75. *nihoae*, new species
 76. *neckerensis*, new species
 77. *dallasi* White
(? = *vinitor*, Kirkaldy non Bergroth)
 78. *coenosulus* Stål
 79. *delectulus* Perkins
 80. *delectus* White (= *kamehameha* Kirkaldy)
 81. *mixtus*, new species
 82. *communis*, new species
 83. *abnormis*, new species
- Genus *Nesomartis* Kirkaldy
84. *psammophila* Kirkaldy

TRIBE ORSILLINI (Stål)

Orsillaria Stål, Öfv. Vet. Akad. Förh. 29(7) : 43, 1872. *Nysiina* Uhler, U. S. Geol. Surv. Bull. 1 : 304, 1876.

Head subtriangular; with two ocelli located sublaterally near posterior margin and two suboval glabrous areas between ocelli and eyes; antenniferous tubercles located immediately in front of eyes; directed obliquely downward, their outer angles scarcely to distinctly produced; bucculae forming a distinct rostral groove, distinct on either side of rostrum at least basally. Rostrum and antennae four-segmented, the first antennal segment short and thick, second and third segments subcylindrical, and fourth fusiform.

Pronotum subtrapezoidal; with transverse or slightly oblique glabrous callosities before the middle; elsewhere more or less punctate except on elevated humeral angles and along posterior margin; posterior margin always slightly depressed sublaterally near basal angles of scutellum.

Scutellum subtriangular, usually broader than long and, in most cases, longer than commissure of clavus; triradiately carinate and with sides narrowly elevated near apex, elsewhere depressed and punctate.

Hemelytra complete in Hawaiian species, at least reaching tip of abdomen; clavus and corium impunctate or roughened by very superficial, irregular punctures; the clavus never surrounded by distinct punctures; claval vein (1st A) inconspicuous; claval suture double and often with two distinct rows of punctures at least basally; corium with vein Cu slightly inwardly arched, vein R + M very prominent and branched subapically; corium strongly depressed laterad of R + M, at least basally, and sometimes with a row of punctures visible from the side; vein Sc usually inconspicuous, visible only posteriorly on expanded costal area; costal margins always more or less sinuate subbasally; apical margin of corium sinuate, deflected laterad at joining of vein Cu; membrane with five longitudinal veins, the inner two (1st A and Cu) joined near the base by a cross vein in Hawaiian species (fig. 1). Venation of hind wings apparently as in other Lygaeinae (see figure of venation of *Lygaeus bicrucis* Say, in Hoke, 1936).

Anterior margin of prosternum broadly feebly elevated and distinctly punctured; pro, meso and metapleura more or less punctate, the metapleuron longitudinally sulcate sublaterally and distinctly lamellate and moderately reflexed along posterior margin continuing onto metacoxal flange. Coxal flanges very largely covering bases of coxae, glabrous. Scent apparatus consisting of an ostiolar canal and evaporating area on either side located at anterior margin of metapleuron, arising just behind mesocoxa and continuing laterad as an overlapping anterior plate and a smaller, inferior, posterior plate; aperture a little beyond base of mesocoxal flange laterally, the ostiolar canal continuing beyond this as a rounded or subacute apical lobe; dull evaporating area comprising the entire surrounding area including inner anterior half of metapleuron and at least a small portion of the adjacent posterior margin of mesopleuron. Coxae all approximate but not contiguous. Mesosternum at least and metasternum slightly longitudinally sulcate at middle.

Abdominal spiracles all located dorsally near the connexival margins. Sixth visible dorsal abdominal segment in the male moderately arcuate posteriorly. Sutures of at least the first three ventral segments straight, reaching lateral margins. Second visible ventral segment with three trichobothria on either side of middle, the outer two of each set closer together than to the third and the lateral one on either side a little anterior to the others. Third segment with a similar arrangement but with the lateral member of each set located a little posterior to the others. Fourth and fifth segments with three trichobothria located sublaterally, one anteriorly placed and approximately equidistant from anterior and lateral margins while the posterior two are very closely approximate and are in the same glabrous area. Sixth segment with only two trichobothria closely approximate and located within a single glabrous area. Male genital capsule distinctly foveate posteriorly and ventrally. Female ovipositor held at rest within a more or less deep cleft or emargination of fourth and fifth ventral segments, the fourth and fifth segments usually at least partially concealed beneath third segment at middle.

Legs of moderate length, the femora a little incrassate and, in Hawaiian species, unarmed. Tarsi three-segmented and provided with stout claws and arolia.

The nymphs differ from the adults, besides their smaller size, undeveloped genitalia, and wing pads, in having two-segmented tarsi, no ocelli, and no metasternal scent glands. Probably replacing the metasternal scent glands functionally, the nymphs have two dorsal abdominal scent glands with paired openings located at middle of posterior margins of fourth and fifth abdominal segments respectively.

The form and number of chromosomes arranged on the equatorial plate at the metaphase of the first maturation division are shown for a single California species, *Nysius strigosus* auct. non Uhler (fig. 2). Specimens were placed in Bouin's fixative, the testes were dissected out and sectioned and the slides were stained with iron hematoxylin.



FIGURE 2.—*Nysius strigosus* auct. non Uhler, chromosomes on equatorial plate at metaphase of first maturation division.

Type genus: *Orsillus* Dallas.

This is the division Orsillaria of Stål and most other European Hemipterists. The tribal ending "ini" was applied by Van Duzee (1916) to bring our classification into closer accord with that of other orders. The Orsillini, together with the Metrargini and Lygaeini, form the subfamily Lygaeinae.

The three subfamilies Chauliopininae, Lygaeinae, and Cyminae are all closely allied and are the only lygaeids with all of the abdominal spiracles located dorsally and all of the ventral abdominal sutures reaching the lateral margins. Of these, the Chauliopininae differ in that the male genital capsule is not foveate, the coriaceous portions of hemelytra are distinctly punctate, and the two inner veins of the membrane are strongly curved basally but not connected by a cross vein. The Cyminae differ in that the coriaceous portions of hemelytra are more or less distinctly punctate, the clavus being either entirely punctate, with three rows of punctures, or hyaline; the two inner veins of membrane are not connected by a cross-vein, and the nymphs have abdominal scent glands either at posterior margins of third, fourth, and fifth segments (Ischnorrhynchini) or only on third and fourth segments (Cymini) (Usinger, 1938).

Within the subfamily Lygaeinae, the Orsillini may readily be distinguished from the typical tribe Lygaeini which has the apical corial margins straight or nearly so, the outer angles of antenniferous tubercles not subacute, the clavus and corium entirely impunctate, and the ostiolar canal very short and provided with a large, often strongly elevated apical lobe which evidently serves as an evaporating surface, as no conspicuous, opaque evaporating area, as in the Orsillini, is present. The only other tribe is the exclusively Hawaiian Metrarg-

gini, originally proposed as a subfamily by Kirkaldy (1902). *Metrarga* is structurally very similar to the Orsillini but is very different in appearance, being much broader and flatter, the antenniferous tubercles sharply produced as stout spines, the posterior margin of sixth tergite in the male subtruncate, the coxal flanges punctate, and corial vein Sc distinct throughout its length and

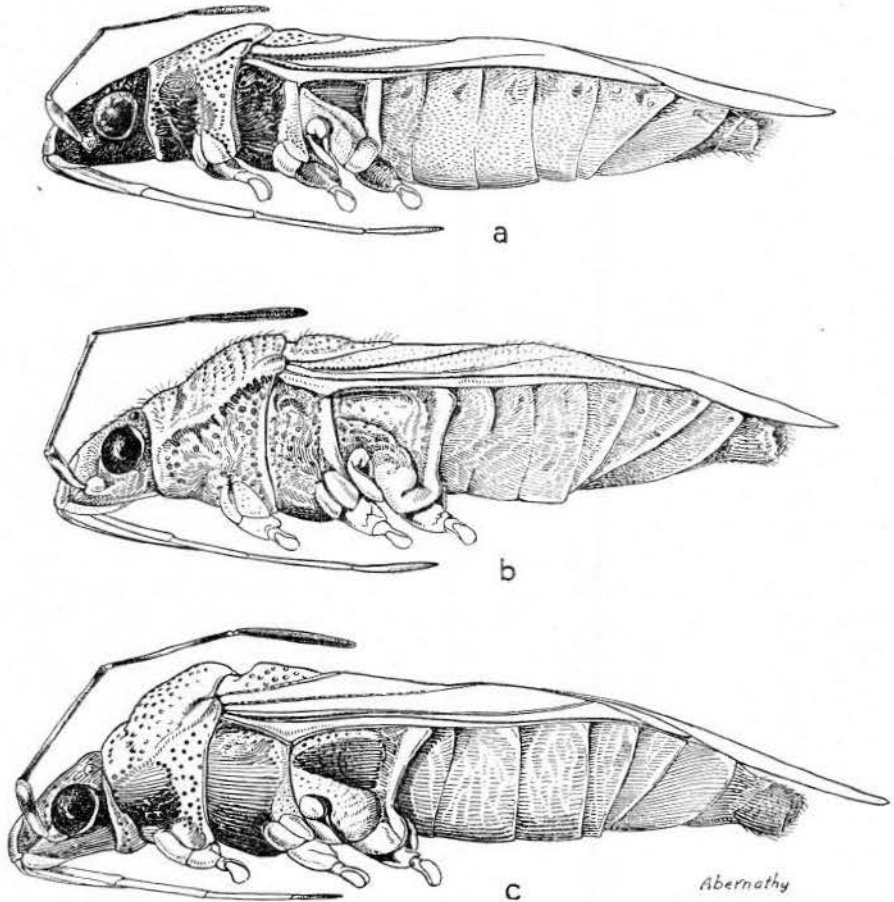


FIGURE 3.—a, *Oceanides nimbatus* Kirkaldy; b, *Nysius delectus* White; c, *Neseis* (*Trachynysius*) *saundersianus* (Kirkaldy). (All females in side view.)

evidently complete, joining apical margin of corium near corial apex. As pointed out by H. G. Barber (personal correspondence) this group certainly deserves no more than tribal rank within the Lygaeinae. China (in Hutchinson, 1934) has shown that Kirkaldy was in error as to the position of the abdominal spiracles; and the form and extent of the hamus of the hind wing, the only other character thought to be of significance, is precisely as Kirkaldy describes it, at least in the species of *Lygaeus* and *Nysius* studied by me.

KEY TO THE HAWAIIAN GENERA OF ORSILLINI

1. Body in great part clothed with subappressed, pale pubescence, distinct on clavus and corium and often with longer, erect hairs as well (fig. 3, *b*). Claval sutures and vein R+M usually without conspicuous rows of punctures except sometimes basally (these punctures distinct in *sublittoralis* and less distinct in *fucatus*). Posterior margin of metapleuron concave, its outer angle moderately produced and rounded (fig. 3, *b*). Elevated portions of bucculae reaching about midway between level of apices of antenniferous tubercles and base of head (fig. 3, *b*)..... 2
- Body almost naked above (fig. 3, *a, c*) or at least without a subappressed pubescence on clavus and corium (except in *pteridicola*, in which the postero-lateral angle of metapleuron is a right angle). Claval sutures and vein R+M with distinct rows of punctures. Postero-lateral angle of metapleuron usually either sharply right-angled (fig. 3, *a*) or subangulately produced (fig. 3, *c*). Elevated portions of bucculae scarcely surpassing level of antenniferous tubercles (fig. 3, *a, c*)..... 3
2. Head, including eyes, broader than greatest width of pronotum..... **Nesomartis**.
Head, including eyes, always narrower than greatest width of pronotum..... **Nysius**.
3. Upper surface of head relatively strongly elevated along middle, with very conspicuous, sinuous wrinkles. Eyes rather small, about one third as wide as interocular space. Posterior margin of metapleuron rectilinear, its postero-lateral angle a right angle. Costal margins of corium subbasally sinuate and then rather evenly arcuate throughout their length (fig. 3, *a*)..... **Oceanides**.
Head variously formed but never with the combination indicated above. Posterior margin of metapleuron always more or less concave, the postero-lateral angle either moderately produced and subrounded or strongly produced and subacute. Costal margins of coria usually subparallel beyond subbasal sinuations to level of apex of scutellum and, even in strongly dilated species, subrectilinear for a short distance 4
4. Antenniferous tubercles laterally carinate, the carinae extending back to inner anterior margins of eyes. Pronotal and hemelytral disks with ochraceous, laevigate elevations. Meso and metapleura very strongly punctate..... **Glyptonysius**.
Antenniferous tubercles not laterally carinate. Pronotal and hemelytral disks without irregular laevigate elevations. Meso and metapleura usually feebly, irregularly punctate (fig. 3, *c*)..... **Neseis**.

Genus **OCEANIDES** Kirkaldy

Oceanides Kirkaldy, Fauna Haw. 2: 536, 1910 (as subgenus).

Body oblong-oval to broadly oval posteriorly. Head subtriangular in outline; antero-ocular portion relatively long and prominent, broad just in front of eyes; antenniferous tubercles prominent and appearing to be continuous with sides of head in front of eyes, their sides subparallel or anteriorly convergent; disk always roughened and most often by large, distinct, irregular wrinkles; clothed with a more or less distinct, appressed pubescence except on obliquely divergent spots in front of ocelli, without smooth areas adjacent to ocular margins; bucculae moderately elevated anteriorly, decreasing at about level of antenniferous tubercles, the rostral groove not quite reaching base of head.

Pronotum a little declivous with reference to the main axis but with its disk subflattened or at least without the posterior lobe convexly elevated with anterior lobe depressed; disk typically with an appressed pubescence surrounding callosities and, in *pteridicola*, with a short, subappressed, white pubescence throughout, being less dense on posterior margin.

Clavus and corium typically naked but, in *pteridicola*, with a very short but distinct, pale, subappressed pubescence; claval suture with two distinct rows of punctures and vein R + M with a single row, this last best seen from the side; vein Sc distinct in a few spe-

cies; costal margins moderately to strongly, often very evenly arcuate beyond subbasal situation.

Posterior margin of metapleuron straight, the lateral angle an abrupt right angle. Female genital cleft usually very shallow. Rostrum reaching at least to posterior coxae and usually beyond this.

Genotype: *Nysius (Oceanides) nimbatus* Kirkaldy.

Described as a subgenus but clearly distinct from other genera on the basis of the punctures of claval suture and vein R + M, the strongly rugose upper surface of head with antenniferous tubercles almost following the contour of sides of juga, and the right-angled metapleuron postero-laterally. The naked upper surface, except on head and anterior lobe of pronotum, is likewise distinctive, although shared with the other Hawaiian genera *Neseis* and *Glyptonysius*, but breaks down in the very anomalous species, *O. pteridicola*. Relationship is suggested with *Neseis* and *Glyptonysius*, both of which are largely naked above and have the same prominent punctures on claval suture and vein R + M. *Nysius sanctae-helenae* White has a right-angled metapleural angle but this must certainly be classed as parallelism, because it is difficult to conceive of a real relationship here unless both forms are considered relicts of a once widespread primitive stock. *Oceanides* is known only from the Hawaiian islands.

KEY TO THE SPECIES OF OCEANIDES

1. Clavus and corium clothed with very short, appressed, pale hairs. Hawaii(1) *O. pteridicola*.
Clavus and corium naked, or with scattered, almost invisible, short erect bristles..... 2
2. Clavus and corium distinctly but irregularly marked with dark brown to ferruginous spots or blotches, some of which anastomose, the maculations of the two sides usually asymmetrical..... 3
Clavus and corium more or less maculated but always regularly and symmetrically 4
3. Costal margins of coria evenly arcuate throughout. Oahu, Molokai, Lanai, and Maui(2) *O. montivagus*.
Costal margins of coria strongly dilated but subparallel at middle, being widest anteriorly in the male and posteriorly in the female. Hawaii.....(3) *O. vulcan*.
4. Entire body, or at least parts of pronotum, with a distinct reddish or reddish-ferruginous tinge 5
Body ochraceous or lighter with brown or black markings..... 9
5. Rostrum not surpassing posterior coxae. Membrane rather uniformly embrowned with the veins sometimes faintly lighter. Oahu.....(6) *O. delicatus*.
Rostrum slightly to distinctly surpassing posterior coxae, reaching at least to second abdominal segment. Membrane variously maculated but never evenly embrowned throughout 6
6. Rostrum reaching only onto second abdominal segment, the first segment not or scarcely reaching base of head. Membrane generally infuscated with the veins clear, thus forming, when crossed at rest, an oblique cross-hatching of pale lines 7
Rostrum reaching at least to third abdominal segment, the first segment slightly surpassing base of head. Membrane pale basally and on either side near apices of coria 8

7. Antecular portion of head distinctly longer than an eye. Pronotum rather sparsely punctate, the irregular rows of punctures on posterior lobe more than one puncture width apart. Size large, 4.4 to 5 mm. Hawaii.....(8) *O. nubicola*.
 Antecular portion of head subequal to, or a little shorter than, length of eye. Pronotum densely punctate, the irregular rows of punctures on posterior lobe less than one puncture width apart. Size usually smaller, 3.94 to 4.5 mm. Kauai(7) *O. myopori*.
8. Membrane very distinctly marked with brown, broadly from middle of apical margins of coria on either side, then more narrowed to center and thence widening, fanlike, to apex. Elsewhere clear, white. Size small, 4.11 to 4.55 mm. Oahu(5) *O. picturatus*.
 Membrane indistinctly pale basally and laterally. Size larger, 4.86 to 5.13 mm. Kauai(4) *O. ventralis*.
9. Rostrum not or scarcely exceeding posterior coxae..... 10
 Rostrum reaching to or beyond middle of second abdominal segment..... 14
10. Pronotum relatively densely punctate, the punctures coarse and much less than one puncture width apart except posteriorly; with four or five rows of closely approximated punctures in front of callosities. Clavus and corium uniformly brown in color with a darker brown spot at middle of apical margin of corium. Membrane uniformly, lightly infuscated. Very large and strongly dilated posteriorly, 5.7 to 6.2 mm. by 2.3 to 2.5 mm. Maui.....(23) *O. dilatipennis*.
 Pronotum less densely and usually more finely punctate with not more than three rows of punctures in front of callosities. Hemelytra never as above. Size usually much smaller and never exceeding 5.16 by 2.2 mm. 11
11. Pronotum long and narrow, from 61 to 63 percent as long as broad, the posterior lobe pale or, at most, with humeral angles darker. Clavus immaculate and corium with black marks narrowly confined to apical margin and only broadening out to costal margin subapically in one species..... 12
 Pronotum shorter and broader, 56 percent as long as broad, the posterior lobe varying in color but usually with broad, sublateral fuscous areas extending to posterior margin. Clavus infuscated at least apically. Corium sometimes infuscated basally and always broadly fusco-maculate on apical fourth except laterally and subapically 13
12. Head densely clothed with long, appressed, pale hairs. Corium distinctly marked with brown along apical margin and sometimes dark at inner and outer ends of apical margin. Pronotal disk with numerous fine punctures; lateral margins scarcely sinuate. Maui.....(17) *O. bimaculatus*.
 Head only sparsely clothed with a short, appressed, pale pubescence. Corium slightly embrowned along entire apical margin, with a small spot at middle of apical margin. Pronotal disk with only a few coarse punctures. Sides distinctly sinuate. Oahu(16) *O. sinuatus*.
13. Head above very strongly, irregularly rugose. Clavus and corium broadly fusco-maculate both basally and along at least inner half of apical margin. Oahu(22) *O. perkinsi*.
 Head less strongly rugose and often smooth or slightly transversely wrinkled at middle. Clavus and corium immaculate basally. Oahu.....(21) *O. arboricola*.
14. Clavus and corium entirely pale and immaculate or, at most, with a spot or "U"-shaped mark at apex of cell R+M..... 15
 Clavus often infuscated apically and corium always with more extensive markings along apical margin including a broad fuscous spot apically between vein Cu and claval suture..... 16
15. Antecular portion of head shorter than an eye. Pronotal disk subflattened. Size small, 4.22 to 4.66 mm. long. Kauai.....(9) *O. planicollis*.
 Antecular portion of head longer or occasionally (Lanai specimens) subequal to length of eyes. Pronotal disk moderately convex. Size larger, 4.66 to 6.11 mm. All the islands except Molokai.....(13) *O. nimbatus*.

16. Color often very dark, the dark brown to black areas exceeding in extent the pale areas and at least with large black marks at middle of basal third of corium as well as broadly along apical margin. Pronotum usually entirely black except for pale humeri and a pale spot at middle of posterior margin..... 17
 Black markings of hemelytra always less extensive..... 18
17. Body form broadly oval. Pronotum impunctate and transversely rugose posteriorly. Membrane black, even at base. Maui.....(20) *O. oresitrophus*.
 Body form elongate-oval, slender. Pronotum at least sparsely punctate and transversely rugose posteriorly. Membrane pale at base and with pale veins. Oahu(19) *O. oribasus*.
18. Membrane with a dark brown mark from middle of apical margin of corium on either side, extending apically, crossing at middle, and when hemelytra are folded at rest, appearing narrowly expanded, fanlike, posteriorly. Oahu(14) *O. membranaceus*.
 Membrane variously variegated or infuscated but never as above..... 19
19. Rostrum very long, reaching well onto, or exceeding, third abdominal segment. Oahu(15) *O. incognitus*.
 Rostrum not exceeding second abdominal segment..... 20
20. Posterior lobe of pronotum rather extensively embrowned, at least sublaterally. Subapical corial spots reaching practically to costal margins. Membrane generally infuscated, without conspicuously clear veins. Kauai.....(18) *O. rugosiceps*.
 Posterior lobe of pronotum immaculate or with brown confined to humeri. Subapical corial spots not approximating costal margins. Membrane variably infuscated but with the veins, at least, clear..... 21
21. Clavus infuscated apically. Upper surface of head and margins of callosities with very inconspicuous, pale, appressed hairs. Hawaii.....(10) *O. bryani*.
 Clavus immaculate apically. Upper surface of head and margins of callosities with a distinct, conspicuous, golden, appressed pubescence..... 22
22. Humeral angles immaculate. Callosities black. Pronotum relatively long and broad. Lanai(12) *O. fosbergi*.
 Humeral angles brown. Callosities light brown to ferruginous. Pronotum short and narrowed. Oahu.....(11) *O. parvulus*.

1. *Oceanides pteridicola* (White) (pl. 1, A).

Nysius pteridicola White, Ann. Mag. Nat. Hist. V, 7: 55-56, 1881. Kirkaldy, Haw. Ent. Soc., Proc. 1: 190, 1908; Fauna Haw. 2: 537, 543, 1910. Perkins, Ent. Soc. London, Trans. (1911), 734, 1912.

Nysius insulivagus Kirkaldy, Fauna Haw. 2: 544, 1910.

Head a little less than half again as broad as long, 18-14; anteocular distance a little greater than length of an eye, 6-5; eyes less than half as wide as interocular space, 4-10; upper surface roughly rugose punctate, feebly elevated medially and covered with a short, appressed, white pubescence. Rostrum reaching almost to third abdominal segment, the first segment exceeding base of head; segments one to four 11-11-11-8. Antennae about one third longer than width of pronotum, 35.5-27; segments one to four 5-11.5-10-9.

Pronotum almost twice as broad as long, 27: 15; half again as broad as head, 27: 18; and slightly longer than head, 15: 14; sides slightly to distinctly rounded anteriorly and almost straight posteriorly; disk only feebly convex, the callosities scarcely elevated; entire surface with short, pale, subappressed hairs which are sometimes less conspicuous on posterior portion; punctures irregular but rather dense except narrowly along posterior margin and on humeri.

Hemelytra exceeding tip of abdomen only by one tenth the total length of membrane; membrane one fifth shorter than costal margin; two thirds as long beyond level of apices of coria as in front of this (half as long in female); clavus and corium opaque, vein

R + M branching between apical third and apical fourth; vein Sc quite complete and submarginal; costal margins rather feebly rounded basally and more strongly so posteriorly; clavus and corium finely, densely, but shallowly punctate except along narrowly expanded costal margins, entirely covered by a short, subappressed, pale pubescence.

Under surface more or less pubescent with the usual glabrous areas, the abdomen with more distinct, suberect hairs. Female genital cleft relatively shallow, its apex two thirds as far from tip of abdomen as from base; fourth ventral segment half as long as third at middle, the fifth concealed beneath fourth at middle.

Color ferruginous, the head black with pale tylus. Pronotum with dark brown punctures, paler longitudinal midline of posterior lobe and humeri, with reddish-brown callosities. Scutellum with depressed areas black and elevated areas ferruginous, the tip ochraceous. Hemelytra ferruginous with paler costal margins and sometimes darker brown near apex of corium towards the center from vein Cu and in cell formed by branching of vein R + M. Apical margin of corium, except in the above two places and at apex, ochraceous. Membrane usually with a few, ill-defined brown areas but sometimes entirely clear and occasionally generally infuscated with clear veins and apex. Under side in great part black with the usual paler glabrous areas and with the posterior part of the venter ferruginous. Rostrum fulvous with black apex. Antennae ferruginous with darker brown apex of first segment and bases of remaining segments.

Size: male, length 4.05 mm., width 1.55 mm.; female, length 4.94 mm., width 2.16 mm.

Described from a pair collected by me at Kilauea, Hawaii, Aug. 18, 1935, on *Metrosideros*. The series before me includes a female from the Blackburn collection, Hawaii, labeled *Nysius pteridicola* on the under side of the card to which the specimen is glued. Mr. China compared this with Buchanan White's type with which, he says, it "agrees very well except that, in the female type the second antennal segment is relatively slightly longer in comparison with the third." A female paralectotype of Kirkaldy's *insulivagus*, Hualalai, 8,000 feet, Aug. 1892 (R.C.L.P.) (the holotype is likewise a female with the same data) and 33 specimens from Kilauea, five from Kahuku, Kau, Hawaii, two from Kau, Hawaii (O.H.S., R.L.U., W.M.G., F.M., G.W.K., and D.T.F.), Jan., May, June, Aug., and Oct., (one from Niuhii, Hawaii, May 19, 1917, O.H.S., pl. 1, A), all specimens with host records having been taken on *Metrosideros*, are also at hand. Perkins collected this species on the summit of Haleakala, 10,000 feet, Maui, in July.

2. *Oceanides montivagus* (Kirkaldy) (pl. 1, C).

Nysius montivagus Kirkaldy, Fauna Haw. 2: 544, 1910.

Nysius vulcan (White) Perkins, Ent. Soc. London, Trans. (1911), 734, 1912 (= *montivagus* Kirkaldy).

Head considerably broader than long, 18:14.5, anteoocular portion scarcely longer than an eye, 6:5.5; eyes less than half as wide as interocular space, 4:10; upper surface moderately elevated, convex along middle except for feeble depression in front of level of ocelli; coarsely, rugosely punctate and clothed with fine, appressed, often inconspicuous hairs. Rostrum reaching to second abdominal segment, the first segment slightly surpassing base of head; segments one to four 10-11.5-10-7. Antennae slightly more than half again as long as width of pronotum, 41:26.5; segments one to four 6-13-11-11.

Pronotum less than twice as broad as long, 26.5:15.5; half again as broad as head, 26.5:18; and slightly longer than head, 15.5:14.5; sides rather broadly strongly rounded anteriorly and scarcely sinuate behind level of callosities; disk a little convex, the callosi-

ties scarcely elevated, with short, appressed pubescence over the entire anterior lobe except on callosities.

Hemelytra exceeding tip of abdomen by a little more than one fourth the total length of membrane; membrane one fourth shorter than costal margin; but little shorter beyond level of apices of coria than in front of this, 14:17 (much shorter in the female, 14:25); corium subopaque, vein R+M branching at apical third; disk distinctly but rather superficially punctate; costal margins rather evenly arcuate throughout.

Under surface clothed with a very fine, rather inconspicuous, appressed pubescence except on the usual glabrous areas. Female genital cleft rather deep, the distance from its apex to tip of abdomen one fourth longer than basal length, 19:25; fourth segment about one fifth as long as third at middle, 1.5:7, the fifth segment concealed beneath fourth at middle.

Color light brown to ferruginous, the head black with tylus pale at apex. Pronotum with callosities black, anterior margin, especially on median laevigate spot, irregular longitudinal line on middle of posterior lobe, and humeri ochraceous to white, the posterior lobe with a more or less distinct, large, brown spot on either side of middle and another sublaterally. Scutellum black basally especially at middle and in punctures, reddish-ochraceous on elevated portions becoming white apically. Clavus and corium clear brownish-ochraceous to testaceous with very irregular ferruginous markings throughout and with brown corial tips. Membrane brown-spotted basally and more generally and uniformly embrowned apically. Under side in great part black with the usual pale glabrous areas and with ferruginous posterior portion of abdomen. Rostrum pale with black apex. Antennae light brown with darker brown spots on first segment, darker bases of second and third segments, and dark brown fourth segment. Legs light brown or paler with dark brown spots on under surfaces of femora.

Size: male, length 4.5 mm., width 1.72 mm.; female, length 4.89 mm., width 2.02 mm.

Described from a male paralectotype, Halepaakai [Haalelepaakai], Lanai, July 1894 (R.C.L.P.) (the holotype is a female with the same data) except for rostral proportions and female genital characters which are not visible in this carded specimen. That this species is not a synonym (Perkins, 1911) of *O. vulcan* is evident from the keys, illustrations, and descriptions given here. Kirkaldy included a specimen from Hawaii in his type material (he did not know White's *vulcan*) indicating that he also confused these species. (See plate 1, C).

Some variation is to be observed in the series before me, the membrane being almost clear in some specimens and the callosities ferruginous. In general, six Maui specimens from Haelaau, Dec. 22, 1928, 2,000 to 3,000 feet, on *Dodonaea* (O.H.S., E.H.B.) and Kula Pipe Line, Aug. 25, 1929, on ferns (O.H.S.) and the six Molokai specimens, Kainalu, Kawela, and Puu Kolekole, on *Metrosideros*, *Sadleria* ferns, and *Dubautia* (O.H.S., E.H.B.) appear to be typical whereas the series of 26 specimens from Oahu, one specimen each from Lanihuli, Piko Trail, Peahinaia Ridge, and Palikea (O.H.S.) and Punaluu and Pauoa Flats (R.L.U.); two specimens from Aiea (O.H.S.); three specimens from Kukuiala (R.L.U.); and 15 specimens, Pukuloa Valley (R.L.U.) collected in every month except Jan., May, Aug., Sept., and Oct., are all considerably smaller (3.88 to 4.5 mm.) and usually somewhat darker in coloration. A subspecific name seems scarcely justifiable, however. Of the 26 Oahu specimens, 21 were taken on *Metrosideros polymorpha* (*ohia lehua*),

one was taken on *Pipturus* and the others bear no host record. The Molokai and Maui records are about equally divided between *Metrosideros*, *Dodonaea*, and ferns, with one specimen on *Dubautia*. From my own experience, it seems certain that *Metrosideros* is the preferred host of this species as of its Hawaiian ally, *O. vulcan*.

3. *Oceanides vulcan* (White) (pl. 1, B).

Nysius vulcan White, Ann. Mag. Nat. Hist. V, 7: 56, 1881. Kirkaldy, Haw.

Ent. Soc., Proc. 1: 190, 1908; Fauna Haw. 2: 537, 543, 1910. Perkins,

Ent. Soc. London, Trans. (1911), 734, 1912 (= *montivagus* Kirkaldy).

Nysius montivagus Kirkaldy, Fauna Haw. 2: 544 (in part), 1910.

Head about one fifth shorter than broad, 15:18.5; anteocular portion subequal in length to an eye, 6:6; eyes less than half as wide as interocular space, 4.5:10; upper surface rugosely roughened and irregularly punctate, moderately elevated along middle and with scattered, appressed, pale hairs, especially anteriorly and laterally. Rostrum reaching to middle of second abdominal segment, the first segment surpassing base of head; segments one to four 13-11-11.5-7. Antennae slightly more than half again as long as width of pronotum, 43.5:28; segments one to four 6-13.5-12-12.

Pronotum about three fourths broader than long, 28:15.5; half again as broad as head, 28:18.5; and scarcely longer than head, 15.5:15; sides broadly rounded anteriorly and feebly sinuate behind level of callosities; disk moderately convex, feebly elevated in region of callosities and depressed laterally behind this; with a short, pale, appressed pubescence over most of anterior lobe surrounding callosities.

Hemelytra (in the male) exceeding tip of abdomen by one fourth the length of membrane; membrane one fourth shorter than costal margin; the portion of membrane beyond level of apices of coria two thirds as long as that in front of this level, 15:22; corium subopaque, hyaline in light-colored areas, vein R+M branching a little beyond middle; costal margins widest a little beyond level of apex of scutellum and strongly arcuate at this level, subrectilinear and converging posteriorly and a little more rounded at apices. In the female the membrane exceeds tip of abdomen by one fifth its total length; the membrane is five sevenths as long as costal margin and only about half as long beyond level of apices of coria as in front of this, 14:27; vein R+M branches considerably beyond middle, and the costal margins are abruptly dilated a little before level of apex of scutellum and then are subrectilinear and a little divergent posteriorly to near apices where they turn abruptly inward.

Under surface with a short, inconspicuous, appressed pubescence except on the usual glabrous areas, the venter with longer, erect hairs. Female genital cleft quite deep, a little less than half again as long from apex of cleft to tip of abdomen as from apex of cleft to base of abdomen, 26:19; fourth segment very short at middle, only one seventh as long as third, fifth concealed beneath fourth at middle.

Color light brown to ferruginous, the head black except on apex of tylus. Pronotum with anterior lobe black except on front margin, especially on raised point at middle, the posterior lobe ochraceous along mid-line and on humeri, elsewhere brownish, appearing darker on either side of middle and sublaterally. Scutellum black on depressed areas and in punctures, reddish brown on elevated areas with white apex. Hemelytra light brown to ochraceous with irregular ferruginous throughout except along pale, expanded costal margins, the apices narrowly brown. Membrane pale at base and irregularly mottled with brown posteriorly. Under surface black anteriorly with the usual pale areas. Abdomen ferruginous posteriorly. Rostrum pale with black apex. Antennae light brown, the first segment darker subapically and second and third segments darker basally. Legs light brown or paler with dark brown spots on the femora.

Size: male, length 4.27 mm., width 1.61 mm.; female, length 5.27 mm., width 2 mm.

Material examined includes a female (compared with the type by W. E. China) from the Blackburn collection, Hawaii, labeled *Nysius vulcan* beneath the card to which the specimen is affixed, and 28 other specimens, all collected at Kilauea (Mrs. Jaggard, R.C.L.P., R.L.U., O.H.S., G.W.K., W.M.G., D.T.F.), mostly on *Metrosideros* (a few of Kirkaldy's are labeled "Koa" very indistinctly in pencil) taken in Feb., March, June, July, Aug., and Sept. (See plate 1, B, female, Kilauea, Hawaii, June, 1903, R.C.L.P. Compared with type by W. E. China, 1939).

4. *Oceanides ventralis*, new species (pl. 1, D).

Head scarcely broader than long, 20:18; anteocular region a little longer than an eye, 8:7; eyes about one third as wide as interocular space, 4:12; upper surface strongly convex near base of tylus and feebly depressed near the middle in front of ocelli; rugose and punctate and clothed with an appressed pale pubescence. Rostrum reaching well onto fourth abdominal segment, the first segment surpassing base of head; segments one to four 14-14-15-13.5. Antennae rather short, half again as long as width of pronotum, 43:29; segments one to four 6-12.5-12.5-12.

Pronotum less than twice as broad as long, 29:16; less than half again as broad as head, 29:20; and a little shorter than head, 16:18; sides subrectilinear, only feebly amplified at level of callosities, strongly convergent anteriorly; disk feebly convex; callosities subflattened and a little depressed, surrounded by short, appressed, pale hairs.

Hemelytra exceeding tip of abdomen by one seventh the length of membrane; membrane one fifth shorter than costal margin, the length beyond level of apices of coria three fifths that of basal length; corium subhyaline; vein R+M branching at apical fourth; costal margins distinctly evenly arcuate.

Under surface with a very short, appressed pubescence except on the usual glabrous areas, and on posterior portion of abdomen, this last with more erect hairs. Female genital cleft rather shallow, not reaching to middle of abdomen, the ratio of posterior length behind apex of cleft to anterior length, 20:26; fourth ventral segment over half as long as third at middle, 5:9; the fifth very short, less than one fifth as long as fourth at middle.

Color ferrugineous to ochraceous with a distinct reddish tinge. Head black except at middle of tylus. Pronotum with black callosities, ochraceous anterior margin and reddish ochraceous posterior lobe. Scutellum with raised portions ivory white, the base and punctures black. Hemelytra brownish-ochraceous or darker with a dark brown apical margin, the membrane pale at the base and generally infuscated elsewhere. Under surface of head and thoracic sterna and pleura black except on the usual pale glabrous areas. Abdomen light ferrugineous. Rostrum pale with black apex. Antennae dark brown except for pale base of first segment. Legs pale with brown-spotted femora and lightly infuscated tibiae and tarsi.

Size: female, length 4.86 to 5.13 mm., width 1.53 to 1.9 mm.

Holotype female, 1400, Kauaikinana, Kauai, Aug. 2, 1925, on *Wikstroemia* (O.H.S.) and one female paratype, same data.

Allied to *O. nubicola* (Kirkaldy) but with a longer rostrum and with concolorous membranal veins.

5. *Oceanides picturatus*, new species (pl. 1, E).

Head quite slender, scarcely broader than long, 16.5:15.5; anteocular portion a little longer than an eye, 7:6; eyes small, about one third as wide as interocular space, 3.25:10; upper surface moderately elevated, irregularly rugose, and sparsely clothed with appressed, pale hairs. Rostrum reaching to third abdominal segment, the first segment slightly

exceeding base of head; segments one to four 12-11-11.5-11.5. Antennae a little less than twice as long as width of pronotum, 40:22.5; segments one to four 6-12-11-11.

Pronotum a little less than twice as broad as long, 22.5:13; less than half again as broad as head, 22.5:16.5; and distinctly shorter than head, 13:15.5; sides feebly sinuate; disk a little transversely depressed before middle; callosities scarcely elevated, surrounded by an inconspicuous, appressed pubescence; coarsely punctate except on humeri and posterior margin.

Hemelytra moderately long, exceeding tip of abdomen by one sixth of the total length of membrane; membrane one fifth shorter than costal margin; about half as long behind level of apices of coria as in front of this; corium subopaque, vein R+M branching at apical fourth; costal margins gradually, rather evenly arcuate.

Under side with a subappressed pubescence especially on the abdomen. Female genital cleft rather shallow, the length from its apex to tip of abdomen about three fourths the distance from apex of cleft to base of abdomen, 17:23; fourth abdominal segment less than half as long as third, 4:10; and fifth one fourth as long as fourth.

Color reddish-brown, the head black with an obscure longitudinal line at middle of interocular space, middle of tylus, apices of antenniferous tubercles, and elevated anterior portions of bucculae paler, reddish-ochraceous. Pronotum ochraceous, the callosities, posterior margin, and humeri darker reddish-brown. Scutellum pale reddish with white apex and black punctures. Clavus light brown basally gradually merging into dark brown towards the apex. Corium light brown basally and along basal two-thirds of expanded costal margins. Membrane white basally and laterally near apices of coria, elsewhere brown. Under surface ferruginous with black thoracic sterna and pale coxal flanges. Rostrum pale basally and dark reddish apically. Antennae brown, the first segment paler with black spots; first and second joints between segments white. Legs light brown basally with dark brown spots on the femora and infuscated tibiae and tarsi.

Size: male, length 4.11 mm., width 1.47 mm.; female, length 4.55 mm., width 1.75 mm.

Holotype male, 1401, Kaunuaehona, Oahu, June 17, 1917 (J.C.B.), (pl. 1, E); allotype female, 1401A, Peahinaia Ridge, April 28, 1929 (O.H.S.); paratypes one male, same data as holotype; one male, Tantalus, and one male, Konahuanui, Oahu, 1907 (R.C.L.P.); one male, Palolo, Oahu, May 13, 1917 (J.C.B.); one female, Pauoa Ridge, Oahu, Nov. 17, 1918; and one male and one female, Pauoa Flats, Oahu, April 23, 1934, on *Wikstroemia* (O.H.S.).

All specimens are quite typical except the female from Pauoa Flats, which is considerably darker with black callosities. The Perkins specimens are marked "var.?" but are entirely distinct from any species known to me. *O. picturatus* is closest to *O. ventralis* but is smaller with a fanlike brown marking on the membrane.

6. *Oceanides delicatus*, new species (pl. 3, H).

Head one fifth broader than long, 18:15; the anteocular portion a little shorter than length of an eye, 5.5:6.5; eyes half as wide as interocular space, 4.5:9; upper surface scarcely elevated along the middle, rugosely punctate and clothed with short, appressed, pale hairs. Rostrum reaching posterior coxae, the first segment not quite reaching base of head; segments one to four 8-8-8-8. Antennae less than twice as long as width of pronotum, 38:23; segments one to four 6-11-10-11.

Pronotum less than twice as broad as long, 23:13; about one third broader than head, 23:18; and a little shorter than head, 13:15; lateral margins feebly sinuate; disk a little elevated and scarcely, transversely impressed at hind margins of callosities; callosities subflattened, surrounded by short, appressed, pale hairs. Posterior lobe rather evenly, moderately densely punctate, except on posterior margin and humeri.

Hemelytra of average length, exceeding tip of abdomen by one sixth the length of membrane; membrane only one tenth shorter than costal margin, the portion behind level of apices of coria three fourths as long as the portion in front of this; corium hyaline, vein R+M branching at apical third; costal margins moderately, rather evenly arcuate.

Under surface rather densely clothed with a pale, appressed pubescence except on the usual glabrous areas. Female genital cleft reaching not quite to middle of abdomen, the distance from this point to base of abdomen, 18:22; fourth abdominal segment about half as long as third at middle and fifth concealed beneath fourth at middle.

Color light brown to ochraceous, the head black except for ochraceous tylus, apices of antenniferous tubercles, and elevated portions of bucculae anteriorly. Pronotum with brown punctures and humeri and reddish brown callosities. Scutellum with ivory white laevigate areas tinged with brown, the depressed, punctate areas dark brown. Hemelytra almost clear and colorless, or testaceous, with brown along commissure of clavus and irregularly near the center and inwardly on the corium as well as interruptedly along apical margin of corium extending forward for a short distance along inner branch of R+M and broadening near apex of corium. Membrane rather uniformly infuscated except for slightly pale veins. Under surface black ventrally and laterally on the thorax except for the usual paler areas, reddish-brown on abdomen with some black centrally. Rostrum pale with black apex. Antennae brownish, the first segment ochraceous with darker rings or spots. Legs pale, the femora brown-spotted and tarsi infuscated apically.

Size: male, length 4.27 mm., width 1.41 mm.; female, length 4.66 mm., width 1.66 mm.

Holotype male, 1402, allotype female, 1402A, and six paratypes, Pukaloa [Pukuloa] Valley, Oahu, March 22, 1936, on *Elaeocarpus* (R.L.U.). Additional material includes one specimen, Haleauau Valley, March 8, 1936, on *Elaeocarpus* (R.L.U.) (pl. 3, *H*); one specimen, Oahu, labeled *Nysius arboricola* (T. Blackburn); one specimen, Tantalus, Sept. (R.C.L.P.); one specimen, Tantalus, 1,300 feet, Nov. 19, 1911 (W.M.G.).

The principal variation observed in this series is in intensity of color, some specimens being darker and others lighter than above. The species is perhaps closest to *O. nubicola* but has a much shorter rostrum.

7. *Oceanides myopori*, new species (pl. 1, *F*).

Head about one sixth broader than long, 17:14.5; the antecular portion distinctly shorter than eye, 5.5:7; eyes large but less than half as wide as interocular space, 4:9; upper surface roughened by small, indistinct punctures and large, longitudinal wrinkles, scarcely elevated along middle and clothed with a pale, appressed pubescence. Rostrum reaching second abdominal segment, the first segment not quite attaining base of head; segments one to four 10-9.5-9-8. Antennae less than twice as long as width of pronotum, 37:22; segments one to four 6-11-10-10.

Pronotum less than twice as broad as long, 22:12.5; about one fifth wider than head, 22:17; and shorter than head 12.5:14.5; sides scarcely sinuate; disk subflattened, the callosities not or scarcely elevated, with inconspicuous appressed hairs, especially anterolaterally; coarsely and densely punctured in irregular rows over much of posterior lobe except on posterior margin and humeri.

Hemelytra exceeding tip of abdomen by a little less than one fourth the length of membrane. Membrane about one fifth shorter than costal margin; about half as long beyond level of apices of coria as in front of this. Corium hyaline, vein R+M branching at apical fourth; costal margins gradually and rather evenly arcuate.

Under surface with the usual appressed pubescence. Female genital cleft rather shallow, the distance from its apex to tip of abdomen a little less than two thirds the distance from its apex to base of abdomen, 14:24.

Color light brown, the head black with the tylus reddish-ochraceous at middle. Prono-

tum ferrugineous on anterior lobe including callosities; brownish-ochraceous posteriorly. Scutellum reddish-brown with black depressed areas and white apex. Hemelytra ochraceous or clearer with, typically, an ill-defined brown area at middle of corium and a brown area at apex of inner branch of vein R+M, and very narrowly brown corial apices. Membrane brown with white veins. Under side with head and thoracic pleura ferrugineous, the sterna and most of venter black. Rostrum pale with black apex. Antennae brownish or lighter with pale but dark-spotted first segment and dark base and apex of second segment. Legs pale with brown or black-spotted femora and infuscated apices of tibiae and tarsi.

Size: male, length 3.94 mm., width 1.44 mm.; female, length 4.55 mm., width 1.72 mm.

Holotype male, 1403, allotype female, 1403A, and nine paratypes, (pl. 1, F, female paratype) Kumuweia, Kauai, Dec. 28, 1935, on *Myoporum* (R.L.U.). Additional specimens include one damaged female, same data as above, and six specimens, same locality as above, Aug. 3, 1925, on *Myoporum* (O.H.S.). Very close to *O. nubicola* but smaller with a shorter head.

8. *Oceanides nubicola* (Kirkaldy) (pl. 1, G).

Nysius nubicola Kirkaldy, Fauna, Haw. 2: 542-543, 1910. Perkins, Ent. Soc. London, Trans. (1911), 735, 1912.

Head but little wider than long, 18:16; antecular portion a little longer than an eye, 7:6; eyes less than half as wide as interocular space, 4:10; upper surface very coarsely rugose and punctate, elevated along middle with a slight, subbasal depression; sparsely clothed with a short, pale, appressed pubescence. Rostrum reaching a little beyond posterior coxae, attaining middle of second abdominal segment, the first segment slightly surpassing base of head; segments one to four 9.5-9.5-8-9. Antennae more than half again as long as width of pronotum, 40.5:25, segments one to four 6.5-12.5-11-10.5.

Pronotum less than twice as broad as long, 25:14; a little less than half again as broad as head, 25:18; and shorter than head, 14:16; sides feebly sinuate, being a little ampliate at level of callosities; disk slightly convex, feebly depressed at hind margins of subflattened callosities, the callosities surrounded by short, depressed, pale hairs.

Hemelytra exceeding tip of abdomen by about one seventh the length of membrane; membrane one fourth shorter than costal margin; its length beyond level of apices of coria two thirds that of the portion in front of this level; corium subhyaline, vein R+M branching a little before apical fourth; costal margins rather evenly arcuate, a little more strongly so posteriorly.

Under surface with a short, appressed, pale pubescence except on the usual glabrous areas, the abdomen conspicuously pubescent. Female genital cleft rather shallow, reaching a little more than one third of the distance to base of abdomen, 16:44; fourth segment half as long as third at middle, 4.5:9; and fifth segment one third as long as fourth, 1.5:4.5.

Color light brown to ochraceous with a ferrugineous or even more reddish tinge, especially in the females. Head black with a distinct longitudinal reddish-ochraceous stripe down the middle, interrupted for a short distance behind tylus. Pronotum with black callosities, brown punctures, and an ill-defined, longitudinal, paler line along middle. Scutellum black at base and in punctures and white at apex. Hemelytra very variable in extent and intensity of color but generally pale basally and laterally on clavus and corium and infuscated apically, the apical margin pale. Membrane usually pale at base but, in general, variegated with brown areas. Under side in great part black with the usual pale glabrous areas on thorax. Rostrum pale with black apex. Antennae fulvous with dark brown spots apically on first segment, darker brown at base and apex of second segment and at base of third segment. Legs pale with brown-spotted femora and lightly infuscated tibiae and tarsi.

Size: male, length 4.4 mm., width 1.61 mm.; female, length 5 mm., width 1.94 mm.

Holotype, a male, Kona, Hawaii, 4,000 feet, Aug. 1, 1892. Ten paratypes are before me as well as several hundred other specimens as follows: Blackburn, Hawaii, 120; Kona, 4,000 feet, Aug., and North Kona, 5,000 feet, July (R.C.L.P.) and Hawaii, July 1903 (R.C.L.P.); Kilauea, June 1903 (R.C.L.P.); Kona, Hawaii, 4,000 to 5,000 feet, June to Sept., 1892 (R.C.L.P.), and Hualalai, 5,000 feet (R.C.L.P.); and a series of 100 or more specimens taken by myself at Humuula, Hawaii, elevation approximately 6,500 feet, on *Myoporum sandwicense* (*naio*) Aug. 5, 1935. (See pl. 1, G, female, 5 miles west of Humuula, Hawaii, Aug. 5, 1935, R.L.U.)

9. *Oceanides planicollis*, new species (pl. 3, D).

Head one fifth broader than long, 18:15; produced in front of the eyes for a distance less than length of an eye, 5.5:6.5; eyes relatively large, one half as broad as interocular space, 4.5:10; upper surface very coarsely rugose, obscurely clothed with appressed, pale hairs, and moderately elevated along middle. Bucculae as usual. Rostrum extending onto second abdominal segment, the first segment reaching base of head; segments one to four 10-11-10-9. Antennae less than twice as long as greatest width of pronotum, 37:22; segments one to four 6-11-10-10. Pronotum small, about twice as broad as long, 22:12; about one fifth broader than head, 22:18; and four fifths as long as head on median line, 12:15; sides scarcely sinuate; disk subflattened, the callosities not elevated, surrounded by a few appressed, pale hairs; punctures sparse but rather evenly spaced on posterior lobe, impunctate on humeri and posterior margin.

Hemelytra moderately long, exceeding tip of abdomen by one fourth the total length of membrane; membrane about four fifths as long as costal margin, 33:41; a little more than half as long beyond level of apices of coria as before this, 12:22; clavus and corium greatly roughened by superficial punctures, subhyaline, branching of vein R + M at about apical third, very inconspicuous, Sc obsolete. Costal margins feebly sinuate subbasally and then rather feebly arcuate to apices of coria.

Postero-lateral angle of metapleuron a right angle; meso and metapleura rather sparsely, superficially punctured. Under surface clothed with a fine, subappressed pubescence except on the usual glabrous areas, with erect hairs ventrally on the abdomen. Female genital cleft very shallow, reaching only about one third the way to base of abdomen, the fourth segment over half as long as third at middle, fifth one fifth as long as fourth.

Color testaceous or darker, the head black with middle of tylus, apices of antenniferous tubercles and elevated margins of bucculae, pale. Eyes, ferruginous with pale inner margins. Pronotum with callosities black. Scutellum black at middle of base in punctures; elsewhere brownish-ochraceous with the tip white. Hemelytra in great part pale with a brown spot at middle of apical margin of corium and with extreme apex of corium infuscated. Membrane apparently immaculate. Under surface black with the usual glabrous areas pale laterally and posteriorly on the abdomen. Rostrum pale with black apex. Antennae fulvous, the first segment paler yellow, with brown spots, the second dark brown at base and pale at apex. Legs pale with brown-spotted femora and infuscated apices of tibiae and tarsi.

Size: male, length 4.22 mm., width 1.5 mm.; female, length 4.66 mm., width 1.77 mm.

Holotype male, 1404, and allotype female, 1404A, Halemanu, Kauai, Aug. 27, 1921, on *Euphorbia* (O.H.S.).

Allied to *O. nimbatus* Kirkaldy but shorter with a distinctly shorter head.

10. *Oceanides bryani*, new species (pl. 2, A).

Head one sixth broader than long, 17.5:15; produced in front of the eyes for a distance equal to length of an eye, 6:6; eyes small, less than half width of interocular space,

3.75:10; upper surface feebly elevated between the eyes, coarsely rugose, ridged, and punctate and irregularly clothed with fine, appressed, pale hairs except narrowly along elevated base and on tylus. Bucculae elevated anteriorly, depressed at level of antenniferous tubercles, the rostral groove not reaching base of head. Rostrum reaching the posterior margin of second abdominal segment, the first segment slightly exceeding base of head; segments one to four 10-9.5-9-9. Antennae more than half again as long as greatest width of pronotum, 36.5:22; segments one to four 6-11-9.5-10.

Pronotum almost twice as broad as long, 22:12; about one fourth broader than head, 22:17.5; and one fifth shorter than head, 12:15; lateral margins scarcely ampliate at level of callosities; disk smooth and polished with scattered punctures except posteriorly, on humeri, and on callosities; anterior lobe elevated at middle and roundly depressed laterally; callosities smooth and feebly elevated, completely surrounded by short, appressed, pale hairs; deeply, transversely impressed along hind margins of callosities, the impression feebly interrupted at middle by a longitudinal carina; posterior disk subflattened at middle, rounded at sides.

Hemelytra of moderate length, exceeding tip of abdomen by less than one fourth the total length of membrane; membrane shorter than costal margin of corium, 34:40; about two thirds as long beyond level of apices of coria as in front of this level, 14:20; costal margins a little sinuate subbasally, otherwise evenly, moderately arcuate throughout; corium subopaque, covered with very superficial, irregular punctures; vein R + M with inner apical branch ill-defined but diverging at apical fourth, Sc present, lateral portion of costal margin a little reflexed.

Posterior margin of metapleuron straight, the postero-lateral angle a right angle; meso and metapleura with a few deep punctures. Undersurface clothed with a short, pale pubescence except at middle and sublaterally on under surface of head; anteriorly and along middle of prosternum; on meso and metasterna; coxal flanges; ostiolar canal and evaporating area; on convex, glabrous, sublateral areas of thoracic pleura; and on reflexed posterior margin of metapleuron. Female genital cleft very shallow, its apex only half as far from tip of abdomen as from base of abdomen; fourth visible abdominal segment over half as long as third on median line, 4:7; the fifth one fourth as long as fourth.

Color ochraceous, head black except for pale on middle of tylus, apices of antenniferous tubercles, and bucculae anteriorly. Pronotum with callosities black and punctures brownish. Scutellum with punctures and depressed areas black, elevated portions reddish-ochraceous, the apex white. Corium with dark brown to black on apical portion between claval suture and vein Cu, on apical portion of cell formed by branching of vein R + M, and narrowly along inner apical margin. Membrane pale at basal third, infuscated posteriorly, especially toward the middle, with the veins pale. Under surface black with ochraceous anterior margin of prosternum, coxal flanges, ostiolar canal, posterior reflexed portion of metapleuron, and humeri laterally. Posterior abdominal segments brown or paler. Rostrum pale with black apex. Antennae brown, the first segment paler with black, interrupted annulus at middle, second and third segments a little darker basally and subapically and pale at apices. Legs pale with femora brown-spotted on apical half and tarsi infuscated apically.

Size: male, length 4.11 mm., width 1.44 mm.; female, length 4.55 mm., width 1.72 mm.

Holotype male, 1405, Aug. 5, 1935, Humuula, Hawaii (R.L.U.); allotype female, 1405A, five miles west of Humuula, on *Euphorbia*, Aug. 5, 1935, and a series of 55 paratypes, all taken on *Euphorbia* west of Humuula on the slopes of Mauna Kea, about 5,000 feet, Aug. 5-8, 1935 (R.L.U.) (pl. 2, A, female paratype). Twenty other specimens are at hand from the same series but are in poor condition. Other material which apparently belongs here includes three specimens, Kona, Hawaii, Sept., 1892, 2,500 feet and 3,000 feet (R.C.L.P.); one specimen, 656-6; one specimen, Kilauea, Nov. 1, 1917 (W.M.G.); one

specimen, South Kona, Hawaii, Aug. 8, 1919 (O.H.S.); and one specimen, South Kona road, Hawaii, 1,600 feet, Aug. 26, 1917, on *Straussia hawaiiensis* (W.M.G.).

In some specimens the membrane is immaculate while others are much darker than the holotype with black markings of apex of corium more extensive, with the apices of clavi infuscated and with the pronotal disk brown sublaterally, the yellowish humeral angles appearing very light in contrast. *O. bryani* is suggestive of *O. arboricola* but has a much longer rostrum and a narrower pronotum.

I take great pleasure in naming this species after E. H. Bryan, Jr., who was with me when these bugs were collected and who did so much to encourage my work.

11. *Oceanides parvulus*, new species (pl. 3, C).

Head a little broader than long, 16:13.5; produced in front of the eyes for a distance a little less than length of an eye, 5.5:6; eyes small, scarcely more than one third as wide as interocular space; upper surface rather strongly elevated, roughened by coarse rugosities and punctures, and clothed with a short, appressed pubescence. Bucculae as usual. Rostrum reaching almost to third abdominal segment, the first segment attaining base of head; segments one to four 9-9-9-8. Antennae almost twice as long as greatest width of pronotum, 34:18; segments one to four 5-10-9-10.

Pronotum small, less than twice as broad as long, 18:11; only one eighth broader than head including eyes, 18:16; and shorter than head on median line, 11:13.5; sides only feebly converging anteriorly and very slightly more amplified at level of callosities; disk appearing subflattened, being feebly depressed and rounded laterally and not at all transversely impressed, the callosities scarcely, if at all, elevated; clothed with a distinct, short, pale, subappressed pubescence anteriorly and especially surrounding the callosities.

Hemelytra of moderate length, exceeding the tip of abdomen by about one fifth the length of membrane; membrane four fifths as long as costal margin and scarcely more than half as long beyond level of apices of coria as in front of this; clavus and corium subhyaline, distinctly but very superficially punctate and a little rugose; vein R + M branching at apical third, Sc inconspicuous; costal margin feebly sinuate subbasally and then evenly arcuate to apex of corium.

Postero-lateral angle of metapleuron a right angle. Meso and metapleura very superficially and sparsely punctate. Under surface clothed with a short, pale, appressed pubescence except on the usual smooth areas. Female a little larger, relatively broader, and with the sides of pronotum more distinctly sinuate; genital cleft very shallow, its apex reaching only about one third the distance to base of abdomen; fourth ventral segment three fourths as long as third at middle, the fifth one third as long as fourth.

Color light brownish-testaceous, the head black except at middle of tylus, apices of antenniferous tubercles, and bucculae anteriorly. Pronotum with brown punctures, dark brown callosities, and a brown spot on each humerus. Scutellum black at middle of base and in punctures, the apical carina ochraceous. Hemelytra pale with dark brown to black at apex of corium between claval suture and vein Cu, at apex of cell formed by branching of vein R + M, and on inner margin of corium at apex. Membrane generally infuscate except for pale base and pale veins. Under surface in great part black with the glabrous areas except thoracic sterna ochraceous. Rostrum pale with black apex. Antennae light brown or paler with brown or black spots on first segment and at bases of second and third segments. Legs pale with brown-spotted femora and infuscated tibiae and tarsal apices.

Size: male, length 3.55 mm., width 1.28 mm.; female, length 4.05 mm., width 1.5 mm.

Holotype male, 1406, allotype female, 1406A (pl. 3, C) and 23 paratypes, all collected on the Manoa-Palolo Ridge along the trail to Mt. Olympus, Oahu, on *Straussia kaduana* (R.L.U.). The holotype, allotype, and 12 paratypes were collected on Sept. 15, 1935, while the others were collected on Sept. 22, Oct. 6, and Nov. 3, 1935 and March 29, 1936. Other material includes eight less perfect specimens, same data as above; two specimens, Pukuloa Valley, Oahu, March 22, 1936 (R.L.U.); three specimens, Manoa, Oahu, on *Euphorbia* (O.H.S.); four specimens (W.M.G.) and five specimens (R.C.L.P.), Tantalus, Oahu; two specimens, Pacific Heights, Oahu (O.H.S.); one specimen, Nuuanu Pali, Oahu (J.C.B.); two specimens, west side of Mt. Kaala, Oahu (O.H.S.); and one specimen each from Waialae Iki and Waialae Nui, Oahu (O.H.S.).

There is considerable variation in the series of paratypes, some females having hemelytra which scarcely exceed the tip of the abdomen. In one specimen an ill-defined longitudinal line is discernible on the vertex. Some specimens have more strongly ampliate pronotal margins at level of callosities. The species is related to *O. bryani* but is smaller with a very narrow pronotum.

12. *Oceanides fosbergi*, new species (pl. 3, A).

Head about one sixth broader than long, 17:14.5; produced in front of the eyes for a distance equal to length of an eye, 6:6; eyes less than half as wide as interocular space, 4:9; upper surface coarsely rugose and punctate and clothed with short, appressed, pale hairs except for smooth posterior margin and tylus. Bucculae feebly elevated anteriorly, decreasing in height at level of antenniferous tubercles, the rostral groove just reaching base of head. Rostrum reaching middle of second abdominal segment, the first segment slightly surpassing base of head; segments one to four 11-10-9-9. Antennae more than half again as long as greatest width of pronotum, 35.5:22; segments one to four 5.5-10.5-9.5-10.

Pronotum about one third broader than head, 22:17; a little over half again as broad as long, 22:13.5; and a little shorter than head on median line, 13.5:14.5; sides distinctly sinuate being conspicuously ampliate at level of callosities; disk scarcely transversely impressed along hind margins of callosities, the callosities surrounded by a short, pale, appressed pubescence.

Hemelytra of moderate length, exceeding tip of abdomen by one fifth the length of membrane; membrane three fourths as long as costal margin of corium, 29:38, about one half as long beyond level of apices of coria as before this; corium roughened by irregular, superficial punctures, vein R + M branching at apical third, vein Sc faintly indicated; costal margin feebly sinuate subbasally, otherwise evenly arcuate, extreme edges feebly reflexed.

Posterior margin of metapleuron straight, the postero-lateral angle a right angle, meso and metapleura distinctly but irregularly punctate; under surface clothed with a short, appressed, pale pubescence except on the usual glabrous areas and with more erect hairs posteriorly on the venter. Female genital cleft shallow, its apex about three fifths as far from tip of abdomen as from base; fourth visible ventral segment over half as long as third at middle, 5:7, the fifth less than half as long as fourth, 2:5.

Color ochraceous or a little darker, the head black except at middle of tylus, apices of antenniferous tubercles and bucculae anteriorly. Pronotum with black callosities. Scutellum black at middle of base and in punctures, white at apex. Corium black apically between vein Cu and claval suture, on posterior two thirds of cell formed by branching of vein R + M, and along inner apical margin, with vein Cu brown

almost to base. Membrane pale at base, entirely clouded elsewhere except for pale veins. Under side in great part black with anterior margin of prosternum, sides of humeri, posterior margin of propleuron, coxal flanges, ostiolar canal, and reflexed posterior margin of metapleuron ochraceous. Abdominal segments sometimes pale posteriorly and laterally. Rostrum pale with black apex. Antennae dark brown, the first segment pale on basal half and first, second, and third segments narrowly pale at apices. Legs pale with brown-spotted femora, the tibiae light brown basally and tarsi light brown apically.

Size: male, length 3.94 mm., width 1.44 mm.; female, length 4.5 mm., width 1.66 mm.

Holotype male, 1407, allotype female, 1407A, and 19 paratypes (pl. 3, A, female), Lanaihale, Lanai, Nov. 28, 1935, on *Strausisia* (R.L.U.). Seventeen paratypes, same data as type but taken on *Coprosma*, and seven paratypes, Haalelepaakai, Lanai, Nov. 29, 1935 (R.L.U.). Three additional specimens are at hand as follows: Kapano, Lanai, 1,900 feet, Dec. 14, 1916 (W.M.G.); 3,000 feet, Lanai, Jan. 12, 1917 (W.M.G.); and Kaiholena, Lanai, Nov. 19, 1916, on *Scaevola* (G. C. Munro).

This species differs from *O. bryani* chiefly in its longer, more slender pronotum with more strongly sinuate sides and less distinct transverse impression behind callosities. Superficially it usually appears to be darker in color with more extensive black markings and with the clavus always clear at apex.

This species is dedicated to F. R. Fosberg, botanist and my companion on the Lanai field trip of November 1935.

13. *Oceanides nimbatus* (Kirkaldy) (pl. 3, G).

Nysius (Oceanides) nimbatus Kirkaldy, Fauna Haw. 2: 543, 1910.

Nysius nimbatus (Kirkaldy) Perkins, Ent. Soc. London, Trans. (1911), 732, 1912 (= *arboricola* White).

Head scarcely broader than long, 21:19; produced in front of the eyes for a distance greater than length of an eye, 8:7; eyes a little less than half the width of interocular space, 4.75:11.5; upper surface very coarsely rugose or punctate-rugose and sparsely clothed with appressed, pale hairs; moderately elevated along middle with a slight depressed area centrally in front of ocelli. Bucculae as usual. Rostrum reaching onto third abdominal segment, the first segment slightly surpassing base of head; segments one to four 15-14-14-13. Antennae a little less than twice as long as width of pronotum behind, 51:28; segments one to four as 8-15-14-14.

Pronotum three fourths broader than long, 28:16.5; one third broader than head, 28:21; and distinctly shorter than head on median line, 16.5:19; sides feebly sinuate, being a little ampliate at level of callosities; disk subflattened posteriorly, roundly depressed laterally, the callosities scarcely, if at all, elevated; punctures rather large or coarse, less than one puncture width apart in front of callosities but much sparser and more irregularly scattered in ill-defined rows posteriorly, the anterior margin, posterior margin, and humeri impunctate; callosities surrounded with appressed, pale hairs.

Hemelytra fairly long, exceeding tip of abdomen by less than one third the total length of membrane, 12:42; membrane one fifth shorter than costal margin; about half as long beyond level of apices of coria as in front of this; corium hyaline, vein R + M branching beyond apical fourth, the inner branch inconspicuous; vein Sc obsolete; costal margins sinuate basally, then rather evenly arcuate posteriorly.

Postero-lateral angle of metapleuron a right angle; meso and metapleura rather superficially punctate. Under surface with the usual pubescence. Female genital cleft

rather shallow, reaching about two fifths the distance to base of abdomen, fourth segment a little over half as long as third at middle and fifth one third as long as fourth.

Color pale, olivaceous or testaceous, the head black with apex of tylus, apices of antenniferous tubercles, and margins of bucculae anteriorly, pale. Pronotum with brown or black callosities and punctures. Scutellum dark brown to black basally and in punctures, the raised portions paler, white along median carina apically. Hemelytra pale except for a U-shaped mark at apex of vein R and extending around and forward again on apical margin of corium, and very narrow brown at extreme apex of corium. Membrane uniformly, lightly embrowned. Under surface black with the usual ochraceous or yellow areas, rostrum pale with black tip, antennae brown, the first segment pale with brown spots or a brown ring subapically, second segment dark brown basally and apically. Legs pale with brown-spotted femora and more or less infuscated tibiae and tarsi.

Size: male, length 5.11 mm., width 1.77 mm.; female, length 6.11 mm., width 2.16 mm.

Described from a pair collected by me at Punaluu, March 1, 1936 (pl. 3, G), on *Gouldia* and at Lanihuli, February 23, 1936 on *Broussaisia*. Other material at hand includes a pair of paralectotypes (carded examples with appendages damaged) Honolulu Mts., 2500-3000 feet, October and November, 1892 (R.C.L.P.) and 54 specimens from Punaluu, Lanihuli, Kuliouou, Tantalus, Pauoa Flats, Kaumuahona, Nuuanu Pali, Waiialae Iki, Olympus, Kukui-ala, Marsh Trail, Manoa Malamala, Cooke Trail, Haleauau, Mt. Kaala, Wai-lupe, and Poamoho Trail, all on Oahu. These were collected by Bridwell, Bryan, Swezey, Meinecke, Giffard, Fullaway, and Usinger on *Coprosma*, *Gouldia*, and *Broussaisia* with dates from every month of the year except August and September.

Material from other islands differs in minor characters which, although correlated with distribution, are so variable that it seems best to retain them all within a single, extremely variable species. However, the variation is here recorded in general terms according to the islands.

In Oahu specimens, the pronotum may be a little broader and flatter, the rostrum extends to the second or third abdominal segment, and the color may be considerably darker. If much lighter in color, the U-shaped corial markings are reduced to mere spots. Occasionally specimens are seen with a more variegated membrane. Two males from the Waianae Mts., Haleauau and Kaala, differ from the Koolau specimens in their proportionately narrower pronotum and the ratio of pronotal width to head width, 5:4.

Kauai specimens include 40 examples taken by Giffard, Swezey, and me on *Gouldia*, mostly at Kumuweia but one at Kaholuamanu, and two at Kauaikiana during the months of May, July, Aug., and December. These specimens have the costal margins a little less strongly arcuate, the pronotum broader and flatter on the average with the punctures denser on the posterior lobe, the rostrum usually longer, extending to the third, fourth, or fifth segments, the membrane entirely pale and the brown spot on the apical margin of corium not U-shaped. The size varies from 4.66 by 1.61 to 5.72 by 2 mm.

Lanai specimens include five specimens collected by me on Nov. 28 and 29, 1935, at Lanaihale on *Coprosma*. They are somewhat smaller, 4.3 by 1.44 mm. to 5.3 by 1.83 mm., the anteocular portion of head subequal in length to eyes, the rostrum extending to the second, third, or fourth ventral segments, the costal margins only feebly arcuate (as in Kauai specimens), and the pronotum with quite fine punctures rather evenly spaced and extending well over the posterior lobe. The corium usually has only a plain brown spot at middle of apical margin and the membrane is distinctly variegated, being clear at base and on the veins.

Only two specimens are at hand from Maui collected by E. H. Bryan, Jr. at Halehaku, June 16, 1920. These are comparatively large in size, falling within the range of the Oahu specimens. The rostrum attains the third abdominal segment, the pronotum is relatively finely punctate, the punctures covering a large portion of the posterior lobe, and the markings at middle of apical margin of corium between arms of vein R + M are in the form of short vittae.

Two Hawaii specimens were collected by Muir and Giffard at Kahuku, Kau, Jan. 15, 1917 and by Swezey at Kilauea, July 8, 1934, on *Vaccinium*. These are likewise of an intermediate size, the rostrum extending to third abdominal segment, the pronotum relatively finely and evenly punctate posteriorly, the membrane variegated in one specimen and clear in the other and the corium with a U-shaped spot.

14. *Oceanides membranaceus*, new species (pl. 3, F).

Head about one sixth broader than long, 17:14.5; produced in front of eyes for a distance equal to length of an eye; eyes less than half as wide as interocular space, 4:9; upper surface distinctly elevated, highest at middle, coarsely rugose and punctate and densely clothed with a conspicuous, pale, appressed pubescence except narrowly at base and on middle of tylus. Bucculae feebly elevated anteriorly, decreasing at level of antenniferous tubercles, the rostral groove not reaching base of head. Rostrum reaching to middle of second abdominal segment, the first segment scarcely attaining base of head; segments one to four 10-9.5-10-10. Antennae less than twice as long as greatest width of pronotum, 39:22; segments one to four 6-11-10.5-11.5.

Pronotum less than twice as broad as long, 22:12.5; about one third broader than head, 22:17; and a little shorter than head on median line, 12.5:14.5; sides slightly sinuate, being a little ampliate at level of callosities; disk subflattened posteriorly at middle, depressed laterally behind callosities but not deeply transversely impressed at hind margins of callosities; callosities surrounded by an appressed, pale pubescence.

Hemelytra of moderate length, exceeding tip of abdomen by about one fourth the total length of membrane; membrane almost one fifth shorter than costal margin of corium, 34:43; only two thirds as long behind level of apices of coria as in front of this; corium subhyaline, covered with superficial punctures, vein R + M branching at apical third, Sc faintly indicated; costal margins feebly sinuate subbasally, then more or less arcuate, being subflattened near the middle, especially in some females.

Posterior margin of metapleuron straight, the postero-lateral angle a right angle; meso and metapleura distinctly but irregularly punctate; under surface of abdomen clothed with a short, pale, appressed pubescence and with erect hairs at the middle posteriorly. Female genital cleft shallow, its apex about half as far from tip of abdomen as from base of abdomen; fourth visible ventral segment, at middle, over half as long as third, 5:7; the fifth less than half as long as fourth, 2:5.

Color brownish-ochraceous, the head black except for pale middle of tylus, apices of antenniferous tubercles, and bucculae anteriorly. Pronotum light brown anteriorly with black callosities. Scutellum with black basally and in punctures and light reddish-brown on elevated areas, its apex white. Corium with black apically between Cu and claval suture, narrowly along posterior margin to the large spot over cell formed by branching of R + M, this spot extending and disappearing towards the costal margin, apices of coria pale. Membrane with a brown vitta from middle of apical margin of corium to apex. Under surface largely black with the usual pale areas on the thorax. Abdomen variegated with light brown and black. Rostrum pale with black apex. Antennae brown with pale first segment basally and pale joints between first and second and second and third segments, the second segment darker brown basally and apically and the third basally. Legs pale, the femora almost immaculate, only faintly brown-spotted, tibiae and tarsi brown apically.

Size: male, length 4.11 mm., width 1.47 mm.; female, length 4.66 mm., width 1.75 mm.

Holotype male, 1408, allotype female, 1408A, four male and one female paratypes, Pukuloa Valley, Oahu, March 22, 1936, on *Euphorbia* (R.L.U.). Other material which seems to belong here includes 29 specimens from Haleauau Valley, Oahu (O.H.S. and R.L.U.) (pl. 3, F, female, Mar. 8, 1936, R.L.U.), Kukuiuala Valley, Oahu (O.H.S.), Puu Kalena (O.H.S.) and Wahiawa (O.H.S.), all on *Euphorbia*.

The females are much broader with proportionately shorter hemelytra. This species differs from its nearest allies, such as *O. parvulus*, in its slightly larger size, subflattened costal margins, almost immaculate femora, and striking membrane markings.

15. *Oceanides incognitus*, new species (pl. 3, E).

Head but little broader than long, 18:16; anteoocular portion almost equal to length of an eye, 6:6.5; eyes a little less than half as wide as interocular space, 4:10; upper surface irregularly, rugosely punctate and clothed with pale, appressed hairs, only feebly elevated along middle. Bucculae distinctly elevated anteriorly but abruptly decreasing at level of apices of antenniferous tubercles, the rostral groove continuing to base of head. Rostrum reaching almost to fourth abdominal segment, the first segment surpassing base of head; segments one to four 13-13-13-12. Antennae almost twice as long as greatest width of pronotum, 46:24; segments one to four as 7-14-13-12.

Pronotum comparatively slender, one third broader than head, 24:18; about two thirds broader than long, 24:15; and scarcely shorter than head on median line, 15:16; sides scarcely sinuate; disk depressed and rounded laterally and subflattened medially with the callosities scarcely elevated, surrounded by an appressed, pale pubescence; punctures of disk sparse and irregular at middle of posterior lobe, the humeri and posterior margin rather broadly impunctate.

Hemelytra moderately long, exceeding tip of abdomen by one fifth the length of membrane; membrane about one sixth shorter than costal margin, only half as long beyond level of apices of coria as before this level; corium in great part hyaline, vein R + M branching at apical fourth, Sc obsolete; costal margins sinuate subbasally beyond which they are evenly arcuate.

Postero-lateral angle of metapleuron a right angle; meso and metapleura very superficially, irregularly punctate. Under surface with a subappressed, pale pubescence except on the usual glabrous areas. Female genital cleft shallow, scarcely reaching middle of abdomen, the fifth segment concealed beneath fourth at middle and fourth a little over half as long as third at middle.

Color pale fulvous to testaceous, the head black with apex of tylus, apices of

antenniferous tubercles, and elevated portions of bucculae, pale. Anterior lobe of pronotum black except along anterior margin, the punctures, even on posterior lobe, brown. Scutellum black at base, brown in punctures, and pale apically. Hemelytra pale with dark brown areas at apex of clavus, between vein Cu and claval suture, in region of cell formed by branching of vein R + M, and at extreme apex of corium. Membrane with an ill-defined brown mark extending apically from about middle of apical margin of corium. Under surface in great part black, with the usual glabrous areas light brown or ochraceous and with abdomen posteriorly and laterally at least partially brownish. Rostrum pale with black apex. Antennae light brown, the first segment yellow with brown markings and the joints between the other segments pale. Legs pale with brown bases of coxae, brown-spotted femora, brown subapical rings on front tibiae, and brown tarsi.

Size: male, length 4.4 mm., width 1.63 mm.; female, length 4.93 mm., width 1.83 mm.

Holotype male, 1409 (pl. 3, E), and allotype female, 1409A, Haleauau, Oahu, Dec. 1, 1929, on *Pteralyxia* (O.H.S.). Paratypes: one male and one female, same data as above but Feb. 9, 1930, and one female, same locality, March 13, 1932. Additional material includes one female, Kukuiala Valley, April 11, 1936, on *Myrsine* (R.L.U.) and, doubtfully, one male, Olomana Summit (W. Donaghho), and one male, Tantalus (R.C.L.P.). Allied to *O. membranaceus* but with an ill-defined membranal fascia and a longer rostrum.

16. *Oceanides sinuatus*, new species (pl. 2, D).

Head one fifth broader than long, 18:15; the antecular region about as long as an eye, 6:6; eyes less than half as wide as interocular space, 4:10; upper surface rather strongly elevated along middle, entirely rugosely punctate and clothed with a short but distinct, appressed pubescence. Rostrum reaching to posterior coxae, the first segment not attaining base of head; segments one to four 10-8-8-9. Antennae less than twice as long as width of pronotum, 39.5:23; segments one to four 6-12-10.5-11.

Pronotum a little more than half again as broad as long, 23:14.5; a little less than one third broader than head, 23:18; sinuate, being moderately ampliate at level of callosities; disk a little convex, the callosities feebly, broadly elevated and surrounded by a conspicuous, short, appressed pubescence; rather sparsely punctate on posterior lobe.

Hemelytra exceeding tip of abdomen by one fifth the total length of membrane; costal margin one third longer than membrane; membrane two and one half times as long in front of level of apices of coria as behind this level; corium hyaline, vein R + M branching at apical fourth; costal margins evenly, rather strongly arcuate.

Pubescence of under surface conspicuous, especially on the venter. Female genital cleft relatively shallow, the distance from its apex to tip of abdomen only two thirds the distance from its apex to base of abdomen; fourth abdominal segment a little more than half the length of third at middle, 5:8, and fifth segment concealed beneath fourth at middle.

Color flavous, the head black with pale apex of tylus. Pronotum with callosities and punctures black and posterior margin brown. Scutellum ochraceous on laevigate elevations and black in depressions. Corium dark brown along apical margin between branches of vein R + M. Membrane rather uniformly lightly embrowned with the veins sometimes paler. Under side in great part black with the usual pale areas and with the abdomen brown posteriorly. Rostrum pale with black apex. Antennae brownish, paler on part of first segment with darker brown maculations, the second and third joints between segments white and the second and also more or less the third darker brown basally and subapically. Legs pale with brown-spotted femora.

Size: male, length 4.44 mm., width 1.64 mm.; female, length 4.83 mm., width, 1.86 mm.

Holotype male, 1410, Puu Kaua, Oahu, Nov. 6, 1932 (O.H.S.) (pl. 2, *D*); allotype female, 1410A, Puu Hapapa, Waianae Mts., Jan. 16, 1927, on *Artemisia* (O.H.S.); one paratype female, Waianae Mts., March 13, 1910, on *Styphelia* (D.T.F.), and one paratype male, Oahu (D.T.F.). Allied to *O. arboricola* but with a more slender pronotum and different dorsal maculations.

17. *Oceanides bimaculatus*, new species (pl. 3, *B*).

Head one eighth broader than long, 18:16; the antecular portion scarcely longer than an eye, 7:6.5; eyes less than half as wide as interocular space, 4:10; upper surface a little elevated, distinctly rugose, and densely clothed with an appressed, pale pubescence. Rostrum reaching posterior coxae, the first segment not attaining base of head; segments one to four 9-8.5-8-8. Antennae not quite twice as long as width of pronotum, 43:23; segments one to four 6-12-12-13.

Pronotum relatively slender and but little narrowed anteriorly; a little more than half again as broad as long; approximately one fourth broader than head, 23:18; and one eighth shorter than head; disk subflattened, at least posteriorly, and not at all impressed transversely; the callosities scarcely or not at all elevated, surrounded by an appressed, pale pubescence.

Hemelytra very short, scarcely surpassing tip of abdomen. Membrane one fourth shorter than costal margin; only about one fifth as long behind level of apices of coria as in front of this. Corium hyaline. Vein R + M branching at apical fourth. Costal margins more strongly rounded posteriorly than anteriorly.

Under surface clothed with a sparse but distinct, pale, appressed pubescence except on the usual glabrous areas. Female genital cleft reaching two fifths of the distance to base of abdomen, the fourth segment at middle about half as long as third and the fifth concealed beneath fourth at middle.

Color ochraceous or paler with the head black except on tylus, apices of antenniferous tubercles and on elevated portions of bucculae anteriorly. Pronotal punctures brown, the callosities ferruginous. Scutellum white with brown to black punctures. Corium with a distinct brown fascia extending along apical margin between the branching of vein R + M and then abruptly turning laterally and broadening towards the costal margin but not actually attaining the margin. Also with a short brown spot or fascia on apical margin near apex of clavus. Membrane clear or only faintly embrowned. Under surface black with the usual pale areas on thoracic sterna and pleura. Abdomen ochraceous with brown on basal half, especially medially. Rostrum pale with black apex. Antennae light brown, the first segment paler with dark spots. Legs pale with brown-spotted femora.

Size: male, length 4.27 mm., width 1.61 mm.; female, length 4.72 mm., width 1.8 mm.

Holotype male, 1411, allotype female, 1411A, and one male paratype, Hae-laau, Maui, Dec. 19, 1928, on *Alyxia* (O.H.S.) (pl. 3 *B*). A fourth specimen is glued to a card and labeled Maui. There is very little variation except that the allotype has somewhat longer hemelytra and the "Maui" specimen has broader and slightly oblique posterior corial fasciae. Closest to *O. sinuatus* but with conspicuous appressed hairs on the head and distinctive maculations.

18. *Oceanides rugosiceps*, new species (pl. 2, *E*).

Head three fourths as long as broad, 14.5:19.5; produced in front of the eyes for a distance less than the length of an eye, 6:7; eyes quite large, a little less than half

as wide as interocular space, 4.5:10.5; upper surface coarsely, densely, and very irregularly rugose, scarcely elevated at middle and subdepressed laterally along inner margins of the large, convex eyes; with a few, inconspicuous hairs on upper surface. Bucculae as usual. Rostrum extending almost to third abdominal segment, the first segment reaching base of head; segments one to four 11-11-11-12. Antennae broken off.

Pronotum less than twice as broad as long, 25.5:14; about one fourth broader than head and subequal in length to head on median line; sides distinctly sinuate; disk subflattened centrally, the callosities only feebly elevated and with only a suggestion of a transverse impression at hind margins of callosities; punctures extending posteriorly at middle, the posterior margin and humeri impunctate; with almost no hairs surrounding the callosities in these possibly rubbed specimens.

Hemelytra exceeding tip of abdomen by about one seventh the total length of membrane, membrane one fifth shorter than costal margin; extending about one half as far behind level of apices of coria as length before this; corium subopaque, vein R + M branching at apical fourth, Sc obsolete; costal margins sinuate subbasally and then evenly arcuate.

Postero-lateral angle of metapleuron a right angle; meso and metapleura distinctly but irregularly punctate; under surface pubescent as usual. Female genital cleft relatively shallow, its apex not reaching middle of abdomen, fourth ventral segment almost as long as third at middle and fifth one third as long as fourth.

Color brownish-ochraceous, the head black with the usual exceptions; eyes white. Pronotum with anterior lobe black except on anterior margin, the dark brown or black extending broadly backwards on either side to posterior margin. Scutellum shining black with white apex. Hemelytra with dark brown or black at apex of clavus, apically on corium between vein Cu and claval suture, and on cell R + M, this last extending laterally almost to costal margin leaving apical region of corium pale, the entire apical margin, however, very narrowly brown, membrane evidently uniformly lightly embrowned. Under surface black with the usual glabrous areas pale, the abdomen pale posteriorly. Rostrum pale with black apex. Legs pale with brown-spotted femora.

Size: male, length 4 mm., width 1.65 mm.; female, length 4.88 mm., width 1.94 mm.

Holotype male, 1412, (pl. 2, E), and allotype female, 1412A, Halemanu, Kauai, June 29, 1932, on *Pterotropia* (O.H.S.). Allied to *O. bryani* but with darker pronotal and hemelytral maculations and less conspicuous hairs on the head.

19. *Oceanides oribasus* (Kirkaldy) (pl. 2, G).

Nysius oribasus Kirkaldy, Fauna Haw. 2: 544, 1910. Perkins, Ent. Soc. London, Trans. (1911), 734, 1912.

Head distinctly broader than long, 19:15.5; anteocular portion a little longer than an eye, 7:6; eyes less than half as wide as interocular space, 4.33:10.33; upper surface feebly elevated, very rough, with irregular, coarse, longitudinal and other wrinkles throughout, and with a few short, appressed, pale hairs, especially near ocular margins. Rostrum reaching third abdominal segment, the first segment slightly exceeding base of head; segments one to four 12-11-11-11. Antennae almost twice as long as width of pronotum, 43:23; segments one to four 7-13-11-12.

Pronotum a little over half again as broad as long, 23:14; about one fifth broader than head, 23:19; lateral margins distinctly, rather strongly sinuate, being broadly amplified at level of callosities and rather abruptly incurved between this and humeri; disk a little elevated anteriorly near callosities, with a pale, appressed pubescence surrounding callosities, and punctures of posterior lobe scattered, leaving humeri, narrow posterior margin, and more extensive area at middle impunctate.

Hemelytra relatively short, exceeding tip of abdomen by about one seventh the length of membrane, 5:34; membrane about one fourth shorter than costal margin,

34:44; only half as long beyond level of apical angles of coria as in front of this; dark areas of clavus and corium opaque; vein R + M branching a little beyond middle, the inner branch distinctly sinuate; costal margins moderately arcuate and a little reflexed; disk of corium with a few, suberect bristles visible against the dark background.

Under surface with a short, appressed pubescence at least laterally on the abdomen. Female genital cleft not quite reaching middle of abdomen, the fourth ventral segment not quite half as long as third at middle, 4:10; the fifth concealed beneath the fourth at middle.

Color very variable but, in general, shining dark brown to black, the head entirely black except for brown eyes, pale ocular margins, and red ocelli. Pronotum with black callosities and brown posterior lobe except for yellow center and humeri and with at least a white spot at middle of anterior margins. Scutellum black basally, and white apically with black punctures. Hemelytra in great part brown to piceous with more or less extensive pale areas along inner margins of clavus, on expanded costal margins to apical third, near outer apical portion of vein Cu, and sometimes extending laterad to join costal pale area, and spot subapically. Membrane clear at base, narrowly near apices of coria and along veins. Under surface black with the usual glabrous areas paler. Rostrum pale with black apex. Antennae brown with pale base and apex of first segment and joints between the succeeding segments. Legs pale with brown coxae, brown-spotted femora, the spots sometimes confluent, and tibiae and tarsi more or less infuscated.

Size: male, length 4.38 mm., width 1.58 mm.; female, length 5.16 mm., width 1.97 mm.

Described from two perfect specimens taken in Haleauau Valley at the base of Mt. Kaala, Waianae Mts., Oahu, March 8, 1936, on *Straussia* (R.L.U.) (pl. 2, G). The holotype is a female from Waialua, Koolau Range, Oahu, 2,000 feet, collected in February, 1893 (R.C.L.P.), with the corium continuously pale subbasally and laterally and then inwardly to a small spot. Material before me includes one specimen each as follows: female, same data as above; female paralectotype, Kaala Mts., 1,500 ft., Jan., 1893 (R.C.L.P.); male, Haleauau, Sept. 14, 1930, on *Elaeocarpus* (O.H.S.); female, Peahinaia Ridge, April 13, 1930, on *Straussia* (O.H.S.); female, Waipio Ridge, Aug. 28, 1927 (O.H.S.); female, Nuuanu Pali, October 19, 1919 (W.M.G.); female, Tantalus, 1,300 feet, Oct. 15, 1905 (W.M.G.); and male, Halawa, Dec. 17, 1922 (O.H.S.).

There is considerable size variation, up to 5.5 by 2 mm. Some specimens have much more extensive pale areas, the corium being dark only at extreme base, along apical half of claval suture wide enough to surpass vein Cu, broadly near middle of apical margin of corium and extending laterally almost to costal margin, and at extreme apex. The membrane may have more pale areas, and the legs are sometimes very pale with brown spots on the femora. Kirkaldy designated his Waialua specimen as the type, but specimens from the Koolau Range do not appear to differ in any constant characters from the Waianae specimens upon which the above description was based.

I have a badly mutilated specimen from Kauai, Kaholuamanu, April 1920, (J. A. Kusche) which differs in pronotal form and corial maculation and

which has a clear membrane. This will doubtless prove to be a distinct species when adequate material is collected.

20. *Oceanides oresitrophus* (Kirkaldy) (pl. 2, F).

Nysius oresitrophus Kirkaldy, Fauna Haw. 2: 542, 1910. Perkins, Ent. Soc. London, Trans. (1911), 734, 1912.

Head about one fourth broader than long, 19:15; the anteocular region scarcely shorter than an eye, 6:6.5; eyes large, a little over one third as wide as interocular space, 4:11; upper surface moderately elevated along middle and very coarsely, irregularly wrinkled with, however, a pair of raised wrinkles, one on either side, arising on inner margins of ocelli and diverging anteriorly towards antenniferous tubercles, with a shallow longitudinal impression at middle of interocular space; upper surface entirely naked; bucculae only feebly elevated anteriorly and obscured by glue posteriorly. Rostrum distinctly surpassing posterior coxae, the first segment just reaching base of head; segments one to four 11-11-13-11. Antennae over half again as long as width of pronotum, 42:26.5; segments one to four 6-13-11-12.

Pronotum less than twice as broad as long, 26.5:15; less than half again as broad as head, 26.5:19; and as long as head; sides strongly sinuate at level of callosities; disk feebly convex, polished, and naked with distinct punctures only immediately in front of and behind callosities, the anterior portion near front margin very finely, transversely rugose and the posterior third impunctate and with three or four very large, transverse wrinkles; with a longitudinal carina feebly developed along middle.

Hemelytra exceeding tip of abdomen by one fourth the length of membrane; membrane about one fifth shorter than costal margin; a little more than half as long beyond level of apices of coria as in front of this; corium moderately convexly rounded; vein R + M branching about at apical third; costal margins feebly dilated from base but rectilinear on basal third and distinctly arcuate only posteriorly. Metapleural angle a right angle.

Color shining pitch brown to black with ochraceous markings. Head black except for ochraceous tip of tylus at middle and elevated edges of bucculae. Pronotum piceous with faintly paler anterior margin and with sharply contrasting ivory-white spots at middle of posterior margin and laterally at humeral angles. Scutellum black with an ochraceous mid-line apically. Clavus pale, ochraceous to testaceous, infuscated near base and along commissure. Corium likewise pale with large dark brown to black spots subbasally, at inner apical angle and broadly, almost to costal margin, at apical third with extreme apex likewise infuscated. Membrane rather uniformly embrowned. Under surface black except for the usual paler areas, the rostrum light brown with black apex. Antennae dark brown except basally and ventrally on first segment and at joints of remaining segments. Legs variegated, the trochanters pale, femora pale with broadly brown at middle and brown at apex above, tibiae brown except for pale bases, and tarsi brown.

Size: male, length 4.61 mm., width 1.77 mm.

The unique type bears the label, Maui, Haleakala, Perkins, 636, and Kirkaldy amplifies this by "over 5000 feet." and "Oct." Perkins (1912) states that, "the unique type has evidently been placed in a damp jar for relaxation until the gum has spread over the whole surface. Until cleaned it is in no condition for being described. The description will probably be found incorrect." According to a personal communication from W. E. China, 1938, "The type is in good condition. The gum mentioned by Perkins merely gives the insect a uniform glossy surface and scarcely affects the description. Perhaps it has dried since Perkins saw it."

Mr. China made an excellent sketch of the type. This formed the basis of the full-tone drawing (pl. 2, *F*) which was then submitted to him for correction and rechecking.

21. *Oceanides arboricola* (White) (pl. 2, *C*).

Nysius arboricola White, Ann. Mag. Nat. Hist. V, 1: 368, 369, 1878.

Kirkaldy, Haw. Ent. Soc., Proc. 1: 190, 1908; Fauna Haw. 2: 538, 1910. Perkins, Ent. Soc. London, Trans. (1911), 732, 1912.

Head about one fifth broader than long, 17:14; produced in front of the eyes for a distance a little less than length of an eye, 5.5:6; eyes small, less than half as wide as interocular space; upper surface polished and coarsely punctate-rugose, sparsely clothed with appressed, pale hairs; distinctly elevated along middle above; bucculae very feebly elevated anteriorly. Rostrum slightly exceeding posterior coxae, the first segment not reaching base of head; segments one to four 10-10-9-9. Antennae half again as long as width of pronotum, 38:25; segments one to four 6-11-10-11.

Pronotum almost twice as broad as long, 25:14; about half again as broad as head, 25:17; and equal in length to head on median line; sides distinctly sinuate, moderately ampliate at level of callosities; disk highly polished, but little elevated except for callosities; punctures very sparse on posterior lobe, the posterior margin and humeri impunctate; with pale, appressed hairs surrounding callosities.

Hemelytra moderately long, exceeding tip of abdomen by one fifth the total length of membrane; membrane considerably shorter than costal margin, 30:38; two thirds as long beyond level of apices of coria as before this. Corium highly polished, superficially punctate, and subhyaline; vein R + M branching at apical fourth; Sc inconspicuous. Costal margin feebly sinuate subbasally and then rather strongly, evenly arcuate to apex, the edge submarginally impressed.

Postero-lateral angle of metapleuron almost or a right angle; meso and metapleura feebly, irregularly punctate. Under surface with a short, pale, appressed pubescence except on the usual glabrous areas. Female genital cleft moderately deep, its apex at about middle of abdomen, the fourth ventral segment three fourths as long as third at middle but fifth concealed beneath fourth at middle.

Color brownish-ochraceous, the head black except for pale middle of tylus, apices of antenniferous tubercles, and bucculae anteriorly. Pronotum with black on callosities and broadening laterally and with brown punctures. Scutellum black basally, on either side of middle, and in punctures; pale laterally and along median carina apically; clavus a little embrowned apically; corium dark brown at inner apex, at cell formed by branching of vein R + M, and along inner margin next to membrane at apex of corium; membrane variable but clear at base, brown opposite middle of apical margins of coria and generally infuscated posteriorly with clear veins. Under side black to dark brown with glabrous areas except thoracic sterna and evaporating surface of ostiolar canal ochraceous. Middle of venter pale. Rostrum pale with black apex. Antennae brown, the first segment pale marked with brown subapically and base and apex of second segment pale. Legs pale with brown-spotted femora and infuscated tarsal apices.

Size: male, length 4.33 mm., width 1.66 mm.; female, length 4.61 mm., width 1.86 mm.

Described from a male in the Blackburn collection, Oahu, with the name *arboricola* written beneath the card to which the specimen is affixed. There is some doubt concerning the identity of this species, however, as indicated by Mr. China's notes on comparing the above specimen with Buchanan White's type. "Your specimen differs from the type male in having the pronotum

rather broader posteriorly with the punctures fewer and much more irregular, fourth antennal segment relatively longer compared with third and median keel of scutellum more distinct. . . . Your specimen agrees with [the] type in general appearance." Perkins synonymized *nimbatus* of Kirkaldy with *arboricola*, but Kirkaldy's species is very different from *O. arboricola* as indicated in the present keys. Other material includes seven specimens from Mount Tantalus, Oahu (R.C.L.P.); three specimens collected at the same place (W.M.G., O.H.S., E.H.B.) (pl. 2, C, female, Jan. 10, 1923, O.H.S.); two specimens, Oahu, Koebele, 1903; two, Konahuanui Ridge (R.C.L.P.); one, Oahu, Blackburn; and one, 696 (Kirkaldy?).

The material before me is variable, the posterior lobe of the pronotum often being broadly embrowned laterally and the entire insect appearing darker at times.

22. *Oceanides perkinsi*, new species (pl. 2, H).

Head about one fifth broader than long, 23:19; produced in front of the eyes for a distance slightly greater than length of an eye, 8:7; eyes small, less than half as broad as interocular space, 5:13; upper surface highly polished and coarsely, irregularly wrinkled; distinctly elevated along middle; with a few, pale, appressed hairs anteriorly and a rather dense patch of hairs behind each eye. Bucculae quite as usual. Rostrum attaining posterior coxae, the first segment just reaching base of head; segments one to four 12-12-10-11. Antennae half again as long as width of pronotum behind, 48.5:32; segments one to four 8-14-12.5-14.

Pronotum less than twice as broad as long, 32:18; about one third broader than head, 32:23; and scarcely shorter than head on median line, 18:19; sides distinctly sinuate; disk highly polished and moderately convex; callosities a little elevated and the disk depressed laterally behind them; punctures very dense, less than one puncture width apart, on anterior lobe surrounding callosities, much sparser and more irregularly placed medially on posterior lobe; posterior margin narrowly and humeri broadly impunctate; disk densely covered with a pale, appressed pubescence surrounding callosities.

Hemelytra very short, exceeding tip of abdomen by one tenth the length of the membrane; membrane four fifths as long as costal margin; only half as long beyond level of apices of coria as before this; pale areas of clavus and corium subhyaline; vein R + M branching at about apical fourth; Sc inconspicuous; costal margins feebly sinuate subbasally, otherwise evenly, strongly arcuate throughout.

Postero-lateral angle of metapleuron slightly produced. Meso and metapleura distinctly but irregularly punctate ventrally, impunctate laterally. Under surface pubescent as in *arboricola*. Female genital cleft reaching about to middle of abdomen, the fourth ventral segment less than half as long as third at middle, 3:8.

Color ochraceous, the head black except for brownish or paler apices of tylus, juga, antenniferous tubercles and edges of bucculae, and with a short, inconspicuous reddish longitudinal line between the ocelli. Pronotum very broadly black on anterior lobe except along anterior margin, the posterior lobe with brown punctures and a broad brown fascia sublaterally on either side. Pale areas of pronotum yellow. Scutellum black basally and in punctures, pale on elevated areas. Clavus brown basally, apically along commissure, and along entire outer margin. Corium dark brown on basal fifth except on depressed costal area and broadly along entire apical margin to outer arm of vein R + M from whence it diverges laterally to costal margin, leaving apex of corium pale except narrowly along inner apical margin. Membrane fringed with brownish throughout, with a broad, darker brown area along apical margin of corium

a little beyond middle extending posteriorly and meeting at middle of membrane from either side where the two hemelytra are crossed. Under surface in great part pale with black under surface of head, thoracic sterna, and thoracic pleura except for the usual glabrous areas. Abdomen brown sublaterally and at middle basally. Rostrum pale with dark apex. Antennae dark brown to black with pale basal half of first segments and joints between second, third and fourth segments. Legs pale with brown spots on under surfaces of femora, a subapical ring around front tibiae and slightly embrowned tibiae and tarsi.

Size: female, length 5.16 mm., width 2.22 mm.

Holotype female, 1413, Honolulu Mts., Manoa-Palolo Ridge, 2,000 feet, (R.C.L.P.) (pl. 2, *H*).

This species is similar to *O. arboricola* but is much larger with a shorter rostrum, more strongly rugose upper surface of head, more strongly contrasting coloration with more extensive dark areas, and with somewhat differently marked membrane.

23. *Oceanides dilatipennis*, new species (pl. 2, *B*).

Head about one sixth broader than long, 23:19; the antecular portion a little longer than an eye, 8:7.5; eyes relatively small, about one third as wide as interocular space, 4.5:14; upper surface elevated along middle, coarsely, longitudinally rugose, and with only a few, inconspicuous, appressed, pale hairs mostly anteriorly and laterally. Rostrum scarcely exceeding hind margins of metacoxae, the first segment not quite reaching base of head; segments one to four 13-13-12-10. Antennae less than twice as long as width of pronotum, 52:30; segments one to four 8-17-14-13.

Pronotum three fifths as long as broad, 18:30; less than half again as broad as head, 30:23; and scarcely shorter than head, 18:19; lateral margins strongly sinuate, the sides of anterior lobe strongly arcuate, contracted behind level of callosities and then posteriorly divergent to humeri; disk of anterior lobe broadly, transversely elevated across middle, a little depressed behind this and then elevated along posterior margin and humeri, without distinct hairs, even antero-laterally.

Hemelytra relatively short, exceeding tip of abdomen by only one ninth the total length of membrane; membrane one fourth shorter than costal margin; a little less than one third as long behind level of apices of coria as in front of this; corium subhyaline, vein R + M branching a little before apical third; Sc visible throughout its length and submarginal; costal margins very strongly arcuate giving the body a very strongly posteriorly dilated appearance, the greatest distance across hemelytra almost half again as great as width of pronotum, 42:30.

Under surface pubescent at least anteriorly on the abdomen. Female genital cleft extending a little beyond middle of venter; the fourth segment one third as long as third at middle and the fifth segment concealed beneath fourth at middle.

Color brownish, the head black except at apex of tylus. Pronotum with anterior lobe and punctures black, the anterior margin and posterior lobe broadly brown. Scutellum black with a narrow white line on apical two-thirds of median carina. Hemelytra brownish, becoming paler or clearer posteriorly with a darker brown line along apical margin between branches of vein R + M. Membrane more or less clear, being a little infuscated at least basally. Under surface almost entirely black, the usual pale areas brown. Rostrum light brown with black apex. Antennae light brown with the apices of first three segments paler and the bases of second and third darker. Legs light brown, the femora with confluent dark brown spots giving a broadly brown appearance except basally and apically.

Size: female, length 5.72 to 6.27 mm., width 2.38 to 2.55 mm.

Holotype female, 1414, and one female paratype, Mahana, Maui, Oct. 13, 1926 (O.H.S.) (pl. 2, B).

A very distinctive species not closely allied to any previously described form, although clearly pertaining to the *Oceanides* group.

Genus **GLYPTONYSIUS**, new genus

Head entirely, coarsely wrinkled above; antenniferous tubercles very prominent, extending forward and downward from in front of the eyes, the outer margins distinctly carinate, the carinae extending backward to inner anterior margins of eyes; bucculae moderately elevated anteriorly, decreasing at level of antenniferous tubercles, the rostral groove not reaching base of head.

Antero-lateral angles of pronotum each with a blunt, laterally directed tubercle.

Clavus and corium naked, the claval suture with two rows and vein R + M laterally with one row of distinct punctures. Pronotal and corial disks with irregular, laevigate elevations, especially on veins of corium.

Thoracic pleura very strongly, coarsely punctate. Posterior margin of metapleuron concave, the lateral angle rather strongly produced.

Genotype: *Nysius hylaeus* Kirkaldy.

A small, very distinctive group recorded only from Oahu and Kauai. Although very divergent, it has the punctate claval sutures which indicate either its great age or a common origin with other Hawaiian endemic genera or both. The produced metasternal angles suggest an alliance with the great *Neseis* group but its own peculiar characters immediately set this apart as one of the most distinct genera of the Orsillini.

KEY TO THE SPECIES OF GLYPTONYSIUS

1. Size small, 3.44 to 4.22 mm. Anteocular portion of head equal to length of an eye. Pronotum relatively narrow, only one seventh broader than head. Kauai(24) *G. hylaeus*.
- Size larger, 4.39 to 4.66 mm. Anteocular portion of head one third longer than an eye. Pronotum broader and more convex anteriorly, one third broader than head. Oahu.....(25) *G. laevigatus*.

24. *Glyptonysius hylaeus* (Kirkaldy) (pl. 4, G).

Nysius hylaeus Kirkaldy, Fauna Haw. 2: 539, 1910. Perkins, Ent. Soc. London, Trans. (1911), 735, 1912.

Head relatively large, transverse, 17.5:14; produced in front of the eyes for a distance equal to length of an eye; eyes large, a little less than two thirds as wide as interocular space, 5:8; upper surface not elevated between the eyes, highly polished and with large wrinkles throughout, naked except for a few short hairs on tylus and juga; antenniferous tubercles laterally carinate and with the carinae extending backward along inner margins of eyes; bucculae distinctly but feebly elevated anteriorly, reduced at level of antenniferous tubercles, the rostral groove not reaching base of head. Rostrum reaching to posterior part of middle coxae, the first segment short, not reaching base of head, second segment subequal in length to first, third a little shorter and fourth shortest. Antennae approximately half again as long as width of pronotum behind, 29:20; segments one to four 5-8-7.5-8.5.

Pronotum broader than long, 20:13; only a little broader than head including eyes, 20:17.5; lateral margins relatively feebly convergent anteriorly, the ratio of posterior to anterior widths, 20:15; sides rounded, feebly carinate as seen from the side, and slightly to distinctly sinuate, being feebly swollen at level of callosities; with a small but distinct, rounded tubercle on each antero-lateral angle; disk depressed laterally, flattened posteriorly, and densely punctate except on posterior margin and elevated callosities; minutely pubescent on anterior lobe surrounding the callosities laterally.

Hemelytra rather short, exceeding tip of abdomen by only one ninth the total length of membrane; corium subhyaline, the veins distinctly but irregularly, callosely elevated; costal margins sinuate subbasally and rather strongly arcuate posteriorly.

Color yellowish or testaceous, often with a reddish tinge with fuscous to piceous apex and lateral sutures of tylus, eyes, under side of head and juga in part. Callosities with shining black vittae occupying one half or more of their area, with a distinct white elevated line longitudinally between; humeral angles each with a brown spot laterally. Scutellum ochraceous with a brownish-piceous spot at middle of base. Clavus and corium pale with irregular scattered brown spots and brown apical margins, the veins of corium irregularly alternated with brown and ivory-white. Membrane with base broadly pitchy-brown, elsewhere irregularly but densely infuscated. Beneath, pale yellow tinged with brownish on the pleura, the sterna brown, and abdomen tinged with red. Rostrum pale but infuscated at base and at apex. Legs pale, with more or less distinct brown rings at middle of femora, at joints and middle of tibiae and at apices of tarsi. Antennae with first segment pale except for brown inner apical half, second and third segments brownish with pale apices, the fourth segment brown except for slightly pale base, densely clothed with a fine pubescence.

Size: male, length 3.44 mm., width 1.33 mm.; female, length 4.22 mm., width 1.66 mm.

Material examined: A paralectotype of Kirkaldy, Waimea Mts., Kauai, 4,000 ft., May 1894, Perkins; a female specimen, number 631; and a male and female collected at Kumuweia, Kauai, June 25, 1932, on *Dubautia* (O.H.S.) (pl. 4, G, male). The holotype is a female, Kauai, 4,000 ft., Perkins which agrees with the above specimens but has a more distinct branch of corial vein R + M.

25. *Glyptonysius laevigatus*, new species (pl. 4, H).

Head broader than long, 19.5:16.5; produced in front of the eyes for a distance one third greater than length of eyes; eyes small, about half as wide as interocular space; upper surface polished and with large, irregular wrinkles; interocular area not elevated; antenniferous tubercles laterally carinate, the carinae extending along inner margins of eyes anteriorly; tylus, juga, and antenniferous tubercles clothed with a short, fine pubescence. Bucculae distinctly elevated anteriorly, reduced at level of antenniferous tubercles, the rostral groove not reaching base of head. Apex of rostrum entirely obscured in both specimens but at least not reaching as far as middle of posterior coxae, the first segment not quite reaching base of head; segments one to four (female) apparently 6-11-8.5-7. Antennae relatively long, a little less than two thirds as long as width of pronotum; segments one to four 7-11-10-12.

Pronotum almost half again as broad as long, 26:18; one third broader than head including eyes; two thirds as wide across anterior tubercles as at posterior margin; lateral margins strongly sinuate, distinctly convex at level of callosities; obscurely carinate as seen from the side; disk strongly elevated, especially anteriorly at callosities, depressed laterally in front of humeri; punctate throughout, except on posterior margin and callosities; a distinct, subacute tubercle antero-laterally just behind eyes; without conspicuous pubescence, even antero-laterally.

Hemelytra short, exceeding tip of abdomen by one tenth the length of membrane; corium subhyaline; costal margins sinuate at base, scarcely subparallel, and then evenly convex.

Postero-lateral angle of metapleuron strongly, angularly produced; thoracic pleura very coarsely, densely punctate. Female abdominal sutures obscured.

Color variegated, yellowish with brown sides and under surface of head anteriorly, the antenniferous tubercles piceous laterally. Interocular space yellow at middle, fulvous on either side. Pronotum pale with brownish punctures posteriorly at middle and ivory-white sublaterally and irregularly surrounding callosities. Callosities each with a black posteriorly bisinuate vitta. Scutellum with a black spot at middle of base. Clavus and corium pale with irregular brown spots. Veins of corium with irregular, elevated white areas. Membrane variegated with brown spots. Beneath largely pale with brown punctures on pleura, the venter remarkably smooth, polished, and uniformly pale yellow except for black area surrounding fovea of male genital capsule. Rostrum infuscated at apex. Antennae with first segment pale except for brown spot on inner apical half, second and third segments brown except at apices, fourth segment brown except narrowly at base. Legs pale except for brown ring just beyond middle of femora followed by a narrower white ring. Tibiae infuscated at middle and at apices, tarsi brown at apices.

Size: male, length 4.39 mm., width 1.44 mm.; female, length 4.66 mm., width 1.83 mm.

Holotype male, Tantalus, Oahu, 2,000 feet, Aug. 20, 1904, J. Kotinsky, in the United States National Museum (pl. 4, *H*), allotype female, 1415, Oahu, Blackburn Collection, no. 101.

This is the "*hylaenus* var." of Kirkaldy. It is a very distinct species which is remarkably rare in collections, considering its habitat on Mount Tantalus, almost within the Honolulu City limits.

Genus **NESEIS** Kirkaldy

Neseis Kirkaldy, Fauna Haw. 2: 537, 1910 (as subgenus).

Head smooth and polished or partially, finely punctate or rugulose above; antenniferous tubercles short and projecting laterally or obliquely outward from just in front of and below the eyes; eyes substylate, with more or less distinct and often rather broad glabrous areas on head adjacent to their inner margins; bucculae moderately elevated anteriorly, decreasing at level of antenniferous tubercles, and continuing posteriorly almost to posterior margin of head forming a rostral groove.

Clavus and corium entirely naked or with a few short, erect hairs which are invisible at low magnification; claval suture with two distinct rows of punctures and vein R + M with a row of distinct punctures at least basally as seen from the side.

Posterior margin of metapleuron concave, the lateral angle usually strongly produced. Meso and metapleura in general rather superficially and irregularly punctate.

Genotype: *Nysius* (*Neseis*) *monticola* Kirkaldy (= *kirkaldyi* Usinger).

Described as a subgenus by Kirkaldy who unfortunately selected a very atypical form as his type. So many species of this group have come to light that Evan's decision (1929) to elevate it to generic rank is amply justified. Several subgenera have been separated out, not only as a convenience in grouping, but also in order to include some very divergent groups, doubtless monophyletic, that would otherwise need to be considered as separate genera.

KEY TO THE SPECIES OF NESEIS

1. Eyes very small, less than one third the width of interocular space, the head moderately elevated above, finely granular, and clothed with an inconspicuous, subappressed, pale pubescence. Body almost entirely pale yellowish to ochraceous with darker markings confined, in great part, to head and under surface. Subgenus *Icteronysius* 2
 Eyes larger, more than one third as wide as interocular space, the head variously formed above. Color usually darker with more distinctive dark maculations or with the head smooth, polished, and almost naked above..... 3
2. Rostrum reaching to middle of second abdominal segment. Head marked with a distinct black pattern above. Hawaii, Mauna Kea.....(59) *Neseis maculiceps*.
 Rostrum reaching only to middle of metacoxae. Head with markings very ill-defined, light brown. Hawaii, Kilauea.....(58) *Neseis ochriasis*.
3. Head smooth, polished, and naked above..... 4
 Head roughened by minute to distinct granules, punctures, or wrinkles and clothed with a more or less distinct, subappressed pubescence, at least anteriorly 7
4. Costal margins strongly dilated and rounded from just before level of apex of scutellum, not subparallel, even subbasally. Corium subopaque. Membrane short, scarcely exceeding tip of abdomen. Subgenus *Physonysius*..... 5
 Costal margins scarcely to distinctly arcuate but never before level of apex of scutellum, always subparallel subbasally. Corium usually at least partly hyaline and membrane usually longer. Subgenus *Leionysius*..... 6
5. Corium dark brown to piceous with femora variegated with or entirely pitchy brown. Maui(27) *Neseis ampliatus*.
 Color paler, flavous with dark brown markings, the legs pale and often with brown-spotted femora. Molokai.....(26) *Neseis molokaiensis*.
6. Pronotal disk subflattened. Color rather uniformly pale except for eyes and commissure of clavus, the membrane concolorous. Size relatively large, 4.4 by 1.8 mm. Maui.....(29) *Neseis pallidus*.
 Pronotal disk distinctly convex posteriorly. Distinctly maculated with fulvous and piceous, the membrane embrowned on either side subbasally and at middle of apical half. Size smaller, 4 by 1.53 mm. Maui.....(28) *Neseis haleakalae*.
7. Eyes very large, substylate. Upper surface of head with broad, glabrous areas at middle and laterally near inner margins of eyes, these areas occupying most of the upper surface of the head. Costal margins strongly dilated. Maui and Hawaii. *Neseis whitei*, subspecies..... 8
 Eyes less strongly produced. Upper surface of head with glabrous areas, when present, less extensive. Costal margins less strongly dilated..... 9
8. Hemelytra long, the membrane complete and exceeding tip of abdomen by one third its length. Maui and Hawaii.....(31) typical *Neseis whitei*.
 Hemelytra strongly abbreviated, the membrane exceeding tip of abdomen by less than one third its length. Hawaii.....(32) subspecies *brachypterus*.
9. Femora unspotted 10
 Femora brown or black-spotted..... 12
10. Rostrum long, reaching to second abdominal segment, its third segment much longer than the others; proportion of segments two and three 7.5: 11.5. Maui.(30) *Neseis kirkaldyi*.
 Rostrum shorter, reaching only to middle coxae, the last three segments subequal, or the last segment slightly the shortest..... 11
11. Hind femora tinged with red apically. Clavus and corium in great part opaque, black, except at middle of costal margins. Oahu.....(51) *Neseis silvestris*.
 Hind femora not tinged with red. Clavus and corium hyaline, either pale or lightly infuscated, the corial apices brown. Oahu.....(33) *Neseis oahuensis*.

12. Largest species in the genus ranging from 5.16 mm. to 7.22 mm. in length. Antennae very long, almost two thirds longer than greatest width of pronotum behind. Membrane uniformly, lightly infuscated. All high islands except Kauai.....(49) **Neseis saundersianus**.
Usually much smaller or, if approaching in length *N. saundersianus*, either with antennae shorter, less than one half longer than width of pronotum behind, or with the membrane fuscofasciate at middle..... 13
13. Femora at middle and subapically and tibiae basally, apically, and at middle with distinct, black annulations. Membrane with a very few, irregular brown spots. Kauai.....(50) **Neseis alternatus**.
Femora brown-spotted with the spots sometimes confluent and tibiae often infuscated apically but never as above..... 14
14. Rostrum surpassing posterior coxae, usually attaining second or third abdominal segment 15
Rostrum not surpassing posterior coxae, usually reaching only to middle coxae 22
15. Upper surface of head comparatively smooth, with only a few minute wrinkles, and naked except for a few inconspicuous hairs anteriorly. Color tinged with fulvous. Oahu.....(35) **Neseis fulgidus**.
Upper surface of head, at least in part, rugosely punctate and with distinct, pale, appressed pubescence. Color ochraceous with darker markings. All of the high islands. **Neseis nitidus** subspecies..... 16
16. Size very small, slender and short, 4.1 mm. by 1.22 mm. Oahu.....(37) subspecies **contubernalis**.
Size always larger than this..... 17
17. Color almost entirely pale, ochraceous or yellowish, with light brown markings at apices of coria, on pronotum and on upper surface of head. Pronotum typically relatively narrowed with sides feebly convex. Hawaii.....(42) subspecies **comitans**.
Color always darker, brownish-ochraceous, with more extensive black or dark brown markings on hemelytra, pronotum, and upper surface of head..... 18
18. Pronotum relatively large and robust, distinctly longer than head on median line; broad, the sides arcuate throughout their length except for a slight sinuation just behind callosities; humeral angles broadly rounded. Molokai.....(38) subspecies **consummatus**.
Pronotum smaller, subequal in length to head or, if slightly longer, with the sides almost straight, only feebly ampliate at level of callosities, and humeral angles more abruptly rounded..... 19
19. Pronotum very short and broad, a little shorter than head; deeply transversely impressed at hind margins of callosities, the posterior lobe strongly convex immediately behind this. Kauai.....(36) subspecies **impressicollis**.
Pronotum not as above, less deeply impressed at hind margins of callosities..... 20
20. Head broad immediately in front of eyes, gradually narrowing anteriorly. Maui.....(40) typical **nitidus**.
Anteocular portion of head abruptly narrowed just in front of the eyes, the outer margins of juga strongly concave basally..... 21
21. Head relatively narrow, but little broader than long, 17:15. Eyes larger than half the width of interocular space, 4.5:8. Lanai.....(39) subspecies **insulicola**.
Head a little broader, the proportion of width to length 18.5:15. Eyes less than half the width of interocular space. Hawaii.....(41) subspecies **pipturi**.
..... 23
22. Head very short, the anteocular portion only two thirds as long as an eye..... 23
Head longer, produced in front of the eyes for a distance greater than two thirds the length of an eye..... 27
23. Pronotum strongly narrowed anteriorly, scarcely more ampliate at level of callosities; disk strongly convex behind transverse impression, the posterior lobe distinctly, longitudinally fasciate at middle and sublaterally. Costal

- margins scarcely convergent posteriorly. Hawaii and Lanai. *Neseis fasciatus* subspecies 24
- Pronotum more nearly subquadrate, the lateral margins turned outward a little at level of callosities; disk only moderately convex or subflattened on posterior lobe and with only the usual brown spots at humeral angles and middle of posterior margin. Maui. *Neseis mauiensis* varieties..... 26
24. Pronotal disk very strongly convex on posterior lobe. Lanai..... (57) subspecies *convergens*.
Pronotal disk only moderately convex on posterior lobe. Hawaii. Typical *fasciatus* varieties 25
25. Clavus and corium pale, subhyaline..... (56) var. *hyalinus*.
Clavus and corium in great part dark brown or black, subopaque..... (55) typical *fasciatus*.
26. Color in great part fuscous to black, the callosities usually black. Corium broadly infuscated, dark brown to black..... (53) typical *mauiensis*.
Color much paler, the callosities sometimes brown. Usually with a longitudinal pale line at middle of interocular region. Corium infuscated only interruptedly on veins and narrowly at apex..... (54) var. *pallidipennis*.
27. Body form short and broad (35 to 38 percent as broad across hemelytra as long), appearing very robust throughout; costal margins distinctly arcuate behind level of apex of scutellum or more slender with the costal margins more gradually arcuate throughout. Female genital cleft shallow, the fourth visible ventral segment about half the length of third at middle..... 28
Body more slender (31 to 33 percent as broad across hemelytra as long), the sides subparallel; costal margins of coria only feebly arcuate beyond apex of scutellum. Female genital cleft deeper, the fourth visible ventral segment concealed beneath third at middle. *Neseis hiloensis*, subspecies..... 30
28. Costal margins scarcely sinuate subbasally and at level of apex of scutellum, otherwise moderately evenly arcuate. Ground color, including upper surface of head, light brown. Pronotum extensively distinctly punctate on posterior lobe. Molokai..... (34) *Neseis cryptus*.
Costal margins distinctly dilated beyond level of apex of scutellum. Ground color reddish or ochraceous with black upper surface of head and other maculations 29
29. Size large, 4.7 to 5.3 mm. Distinctly tinged with reddish, the clavus brown only narrowly on commissure and corium brown only near outer apical angle. Molokai..... (48) *Neseis swezeyi*.
Size smaller, 4.27 to 4.5 mm. Brownish-ochraceous marked with black on apical third of clavus and on inner apical portion of corium between vein Cu and claval suture. Molokai..... (52) *Neseis chinai*.
30. Eyes small, less than half the width of interocular space. Juga very large, subtriangular, and inflated. Oahu and Molokai..... 31
Eyes larger, more than half as wide as interocular space. Juga small and with strongly concave side margins. Hawaii and Maui..... 32
31. Pronotal disk moderately convex, scarcely transversely impressed behind callosities, the posterior lobe longitudinally fasciate. Sides scarcely sinuate behind level of callosities. Oahu..... (43) subspecies *jugatus*.
Pronotal disk sharply, transversely impressed at hind margins of callosities, the posterior lobe not longitudinally fasciate; strongly convex and with sides strongly sinuate. Molokai..... (44) subspecies *interoculatus*.
32. Very small (3.94 to 4.22 mm. by 1.38 to 1.44 mm.), slender, pale species, ochraceous with extensive yellow areas on pronotal disk. Markings light brown and confined to apices of coria, membrane, humeral angles, and middle of posterior margin of pronotum. Hawaii..... (47) typical *hiloensis*.

- Larger than above, proportionately broader, and ochraceous with more extensive dark fuscous to black markings on hemelytra..... 33
33. Anteoalar portion of head four fifths as long as an eye, 6:7.5. Interocular space a little elevated along middle. Lateral margins of pronotum moderately but distinctly ampliate at level of callosities. Maui.....
.....(45) subspecies **approximatus**.
- Anteoalar portion of head a little more than two thirds as long as an eye, 5:7. Interocular space subdepressed and flattened. Lateral margins of pronotum almost straight, scarcely ampliate at level of callosities. Hawaii.....
.....(46) subspecies **intermedius**.

Subgenus **PHYSONYSIUS**, new subgenus

Head naked above and entirely smooth, polished, and roundly elevated or convex. Pronotum with very broad, smooth, moderately elevated callosities, the lateral margins broadly swollen at this level and the antero-lateral angles each with a minute, laterally directed tubercle.

Clavus and corium subopaque; costal margins strongly dilated from their bases, sinuate subbasally, subrectilinear, and then strongly ampliate; membrane quite small.

Pronotal disk naked. Rostrum short, reaching only to middle coxae, the segments gradually decreasing in length apically.

Metapleural angle distinctly, subacutely produced.

Body form very broad and strongly dilated posteriorly, the color in great part dark brown to piceous.

Genotype: *Neseis (Physonysius) ampliatus*, new species.

26. *Neseis (Physonysius) molokaiensis*, new species (pl. 4, F).

Head rather short and robust, three fourths as long as broad; produced in front of the eyes for a distance a little less than length of an eye, 6:7; eyes small, a little less than half as wide as interocular space, 5:11; upper surface smooth, polished, and strongly elevated at middle. Bucculae distinctly elevated anteriorly, gradually diminishing in height at level of antenniferous tubercles, the rostral groove not reaching base of head. Rostrum reaching anterior margin of middle coxae, the basal segment reaching to posterior limits of rostral groove, but not to base of head; segments one to four 9-8-7-7. Antennae half again as long as greatest width of pronotum, 45.5:29, segments one to four 6.5-14-13-12.

Pronotum approximately half again as wide at humeral angles as long, 29:20, and wider than the head across eyes in about the same proportion, 29:21. Lateral margins seen from the side with scarcely an indication of a carina; greatly swollen at level of callosities and with a minute lateral tubercle at anterolateral angle; disk subflattened on posterior lobe, a little depressed laterally in front of humeri with the callosities very broad and distinctly elevated.

Hemelytra short, the membrane exceeding tip of abdomen by one fifth its total length; clavus and corium subhyaline, venation as in *ampliatus*; corium convex at least posteriorly; costal margins divergent from base, sinuate subbasally and abruptly, strongly arcuate behind level of apex of scutellum; membrane small, surpassing apices of coria by less than one third its total length.

Postero-lateral angles of metapleura moderately, angulately produced. Meso and metapleura only superficially punctate, the metapleura obliquely rugose just above ostiolar lobe. Female genital cleft rather shallow, the fourth visible segment about half as long as third at middle.

Color shining, pitchy black with paler fulvous to ochraceous on the following: ocular margins; longitudinal line between the eyes; apices of antenniferous tubercles; anterior elevated portions of bucculae; entire pronotum except along anterior and lateral margins, humeri and punctures; scutellum except for black punctures and a

large black spot at middle of base and at basal angles; clavus except along commissure; corium except along punctured lateral margin basally, around closed cell, apical margin and apex; rostrum except at apex; ostiolar canal; reflexed posterior margins of metapleura; coxal sockets; antennae except for subapical brown ring on first segment, basal and subapical brown rings on second and third segments and all of fourth segment except extreme base; and legs except for brown-spotted femora and infuscated apices of tibiae and tarsi. With a yellow longitudinal line on middle of pronotum anteriorly. Membrane hyaline with brown areas opposite middle of apical margins of coria extending to apex.

Size: male, length 5.22 mm., width 2.44 mm.; female, length 5.55 mm., width 2.66 mm.

Holotype male, 1416, allotype female, 1416A, nine female and ten male paratypes, Mapulehu-Punaula Ridge, Molokai, Aug. 15, 1936 on *Freycinetia* (R.L.U.); one male paratype, Kainalu, Molokai, July 28, 1927, 2,000-3,000 feet elevation, *Freycinetia* (E.H.B.) (pl. 4, *F*).

Some paratypes have almost uniformly brown coria and a brown spot frequently occurs at middle of posterior margin of pronotum. This and the following species are entirely distinct from any previously known Orsillini.

27. *Neseis* (*Physonysius*) *ampliatus*, new species (pl. 4, *I*).

Head rather short and broad, the ratio of width to length, 21:16; produced in front of the eyes for a distance a little less than length of an eye, 6:7; eyes small, as wide as half the interocular space; upper surface distinctly convex at middle, smooth and polished without punctures or hairs. Bucculae moderately elevated anteriorly, gradually decreasing in height at level of antenniferous tubercles, the rostral groove not quite reaching base of head. Rostrum reaching middle coxae, the first segment scarcely exceeding limits of rostral groove, not attaining base of head; segments one to four 9-8-8-7. Antennae half again as long as greatest width of pronotum, 50:32; segments one to four 7-15-14-14.

Pronotum almost two thirds as long as broad, 22:32; half again as broad as width of head, 32:21; lateral margins not carinate when viewed from the side but rather narrowly rounded, greatly swollen at level of callosities; disk subflattened at middle of posterior lobe, depressed laterally in front of humeral angles, faintly transversely impressed just behind callosities and more distinctly so at anterior margin; surface without apparent hairs, even antero-laterally.

Hemelytra very broad and convex and relatively short, the membrane exceeding tip of abdomen by about one sixth its length. Clavus and corium subopaque, the corium convex posteriorly and roundly depressed laterally; vein Sc distinct; vein R + M branching at about apical third; costal margins diverging from base, sinuate subbasally, subrectilinear for a short distance and then evenly, arcuately rounded; membrane small, extending beyond apices of coria for only one third of its total length. Postero-lateral angle of metapleuron acutely, angulately produced. Meso and metapleura only shallowly, sparsely punctate. Female genital cleft relatively shallow, the fourth visible ventral segment a little over half as long at middle as third segment, fifth visible segment concealed at middle.

Color above rather uniformly dark pitchy brown to black, being darkest on the head and sides of the pronotum and lightest where the light shows through laterally on the coria beyond sides of the abdomen; apex of scutellum white. Membrane tinted with white at base and hyaline laterally, brown from middle of apices of coria to apex. Under side likewise piceous, or brownish on the female venter, with pale coxal sockets and brown to pale ostiolar canal and reflexed posterior margins of metapleura. Rostrum pale except at apex. Antennae testaceous with a broad, subapical brown ring on

first segment, a brown ring basally and subapically on second segment and subbasally on third segment and entirely brown on fourth segment except at extreme base. Legs in great part pale ochraceous, the femora often spotted with brown and even entirely brown except broadly at base and narrowly at apex of posterior femora. Tibiae usually brownish at base, middle, and apex. Tarsi brown apically.

Size: male, length 5.33 mm., width 2.38 mm.; female, length 5.11 mm., width 2.33 mm.

Holotype male, 1417, allotype female, 1417A, one paratype female, Haleakala, Maui, over 2,000 feet, on *Rubus* (R.C.L.P.); paratypes, one female, Haleakala, 2,000 feet, March 1902 (pl. 4, I); three females and two males, Haleakala, windward side, 2,500 feet, all collected by R. C. L. Perkins.

Very close to *N. molokaiensis* from which it differs in its nearly uniform piceous coloration.

Subgenus **LEIONYSIUS**, new subgenus

Head short, broad, naked, and polished with the interocular space distinctly elevated or convex at middle. Costal margins subparallel subbasally and then rather strongly arcuate; clavus and corium subhyaline to very clear; membrane long. Pronotal disk naked, moderately to finely punctate. Rostrum not exceeding posterior coxae. Metapleural angle only feebly to moderately produced, subrounded at apex.

Genotype: *Nysius haleakalae* Perkins.

28. **Neseis (Leionysius) haleakalae** (Perkins) (pl. 4, E).

Nysius haleakalae Perkins, Ent. Soc. London, Trans. (1911), 735, 1912.

Head three fourths as long as broad, 12:16; produced in front of the eyes for a distance a little less than length of an eye, 4.5:5.5; eyes of moderate size, half as wide as interocular space, 4:8; upper surface entirely smooth, polished, naked and elevated at middle. Bucculae elevated anteriorly, decreasing at level of antenniferous tubercles, the rostral groove reaching about three fourths of distance to base of head. Rostrum reaching posterior margins of middle coxae, the first segment just attaining base of head; segments one to four 7-7-6-6. Antennae about half again as long as width of pronotum, 32.5:22.5; segments one to four 4-9-10-9.5.

Pronotum over half again as broad as long, 22.5:13; a little less than half again as broad as head, 22.5:16; and a little longer than head, 13:12; lateral margins distinctly sinuate, moderately swollen at level of callosities, sinuate at middle, and a little rounded posteriorly; disk shining and naked, the callosities subflattened, depressed, and coarsely punctate along their anterior and posterior margins, the posterior disk rather strongly convex, superficially punctured, and with a few ill-defined, transverse wrinkles.

Hemelytra moderately long, exceeding tip of abdomen by less than one third the total length of membrane; scarcely shorter than costal margin, 34:36; and about as long beyond level of apices of coria as before this; corium subhyaline, a little convex posteriorly at middle, vein R + M branching at apical fourth, vein Sc faintly indicated; costal margins subbasally sinuate, then parallel to level of apex of scutellum and rather strongly dilated and rounded beyond this.

Postero-lateral angle of metapleuron only moderately or quite distinctly produced. Meso and metapleura distinctly punctate. Ostiolar lobe subrounded apically. Under surface almost naked except for short, appressed pubescence at sides of head and venter, and erect, pale hairs especially at middle of abdomen.

Color shining ochraceous tinged with reddish-ochraceous with brown eyes, pink ocelli and white on tylus, longitudinal stripe between eyes, antenniferous tubercles,

and bucculae. Pronotum ochraceous on anterior lobe, brown on posterior disk except for somewhat pale posterior margin. Scutellum white with brown punctures, basal angles, and spot at middle of base. Hemelytra with clavus on apical half and corium on inner apical half and at apex infuscated. Membrane with brown at middle of apical half and on either side before apices of coria. Under surface entirely brown except for ochraceous anterior margin of prosternum, posterior margins of pro and mesopleura, coxal flanges, ostiolar canal, and narrow lateral margins of venter. Antennae ochraceous with brown on inner apical portion of first segment and at bases of second and third segments, fourth segment almost entirely infuscated. Rostrum pale with black tip. Legs pale with femora unspotted, the posterior femora, however, entirely dark brown on apical two thirds.

Size: male, length 4.05 mm., width 1.53 mm.

Described from the type, Haleakala, Maui, less than 2,000 feet, March, 1902 (R.C.L.P.). A second male specimen (pl. 4, *E*), same data as above, lacks most of the reddish tinge, has extensive, irregular white areas on the head, and lacks most of the brown markings of clavus and corium, leaving only the commissure of clavus and subapical spots on coria brown. This specimen is somewhat smaller, 3.94 mm. by 1.5 mm.

29. *Neseis* (*Leionysius*) *pallidus*, new species (pl. 4, *D*).

Head strongly transverse, a little more than two thirds as long as wide; produced in front of the eyes for a distance less than length of an eye, 5:6; eyes small, less than half as wide as interocular space, 4:10; upper surface smooth, polished and naked, with a smooth, rounded elevation at middle of interocular space. Bucculae elevated anteriorly, decreasing at level of antenniferous tubercles, the rostral groove quite short, reaching about two thirds the distance to the posterior margin. Rostrum reaching middle of posterior coxae, the first segment attaining base of head; segments one to four 9-8-8-8. Antennae damaged, the first three segments measuring 6-12-12. Pronotum a little more than twice as broad as long, 25:14; scarcely longer than head on median line, 14:13; and one third broader than head, 25:18; lateral margins strongly sinuate, strongly swollen at level of callosities; disk smooth, polished and almost naked, subflattened with only a faint, transverse impression at posterior margins of callosities, depressed at middle of lateral margins; very sparsely, superficially punctured.

Hemelytra rather long, extending beyond apex of abdomen for a distance equal to one third the total length of membrane; membrane one seventh shorter than costal margin; extending beyond level of apices of coria for a shorter distance than length from this level to base, 17:20; corium hyaline, vein R + M branching at about middle; with vein Sc faintly indicated; costal margins abruptly dilated subbasally, then incurved to level of apex of scutellum behind which they are rather strongly dilated or arcuate.

Postero-lateral angle of metapleuron moderately produced; subrounded at apex. Meso and metapleura very superficially punctate, ostiolar lobe subrounded apically. Under surface almost entirely naked except for a few hairs on the venter.

Color almost entirely pale ochraceous, the eyes brown, ocelli pink, humeri with a faint brownish tinge, elevated portions of scutellum white, apices of clavi and extending to inner apical corners of coria brown. Apices of coria a little brownish. Membrane uniformly lightly clouded. Under surface pale with brown genital capsule and apex of abdomen above. Antennae pale with inner apex of first segment and bases of second and third segments brown. Rostrum pale with black apex. Legs pale with brown-spotted femora and infuscated apices of tibiae and tarsi.

Size: male, length 4.4 mm., width 1.8 mm.

Holotype male, 1418, Haleakala, Maui, 9,400 feet, on *Styphelia*, March 23, 1932, Owen Bryant (pl. 4, *D*).

Allied to *N. haleakalae* but larger, paler, and with a subflattened pronotal disk.

Subgenus **NESEIS** Kirkaldy

Head naked above, very smooth anteriorly on juga and on broad inner ocular margins, feebly wrinkled only at middle. Antero-lateral angles of pronotum each with a very small, laterally-directed tubercle; disk entirely naked. Hemelytra with vein Sc quite distinct posteriorly; costal margins distinctly sinuate subbasally, subparallel to about level of apex of scutellum, and then moderately strongly arcuate to apex of corium. Rostrum reaching second abdominal segment, the third segment very long, half again as long as second. Metapleural angle very strongly produced.

Body form elongate-oval. Color in great part fulvous or amber colored, the legs unspotted and membrane a little infuscated throughout.

Genotype: *Nysius* (*Neseis*) *monticola* Kirkaldy (= *kirkaldyi* Usinger).

30. *Neseis* (*Neseis*) *kirkaldyi* (Usinger) (pl. 4, *A*).

Nysius monticola Kirkaldy, Fauna Haw. 2: 544-546, 1910 (non Distant, Biologia Centrali-Americana, Heterop. 1, Suppl.: 383, 1893). Perkins, Ent. Soc. London, Trans. (1911), 735, 1912. Evans, Bull. Ent. Res., London 19: 354, 1929.

Nysius kirkaldyi Usinger, Haw. Ent. Soc., Proc. 9: 443, 1937.

Head almost as long as broad, 17:20; produced a little farther in front of eyes than length of an eye, 7:6.5; eyes small, less than half as wide as interocular space, 4.5:11; upper surface almost entirely naked, smooth, and polished, with a few, indistinct, transverse wrinkles posteriorly at middle; distinctly elevated along middle, depressed at base of tylus and enlarged beyond this point on tylus; bucculae about as usual with elevated portions a little longer. Rostrum reaching middle of second abdominal segment, the first segment reaching onto prosternum; segments one to four 12-12-18-10. Antennae a little more than half again as long as width of pronotum, 46.5:29.5; segments one to four 6.5-14.5-13-13.

Pronotum slightly less than twice as broad as long, 29.5:17; half again as broad as head; and equal in length to head; lateral margins distinctly sinuate, swollen at level of callosities and a little concave at middle; disk coarsely punctate sublaterally at middle and feebly punctate on posterior lobe; only a little elevated on posterior lobe with laevigate, elevated callosities, anterior margin, longitudinal line at middle except posteriorly, and one on either side of middle extending from hind margins of callosities half way to posterior margin, narrow lateral margins, and humeral angles.

Hemelytra relatively short, exceeding tip of abdomen by about one seventh the total length of the membrane; membrane only four fifths as long as costal margin; only two thirds as long beyond apices of coria as in front of this; corium subhyaline, vein R + M branching at apical third; costal margins distinctly sinuate, relatively strongly expanded and arcuate beyond level of apex of scutellum.

Postero-lateral angle of metapleuron strongly, subacutely produced. Under surface sparsely clothed with an almost concolorous pubescence although appearing to be naked on the usual smooth areas and on the thoracic pleura. Female genital cleft shallow, its apex two thirds as far from tip of abdomen as from base; fourth segment half as long as third at middle, the fifth one fourth as long as fourth.

Color light brownish or fulvous with paler, ochraceous ocular margins, longitudinal line between the eyes, tip of tylus, antenniferous tubercles, bucculae anteriorly,

sides of head beneath, laevigate areas of pronotum excepting callosities, elevated portions of scutellum more or less, anterior margin of prosternum, and coxal flanges. Membrane uniformly light brown throughout. Antennae with dark brown inner apical portion of first segment, bases of second and third segments and all except base of fourth segment. Rostrum fulvous with darker apex. Legs pale fulvous with brown tarsal apices.

Size: male, length 5 mm., width 1.88 mm.; female, length 5.27 mm., width 1.94 mm.

Described from a female specimen, Haleakala, Maui, 2,000 feet, March 1902 (R.C.L.P.), "compared with the type which it quite resembles except for the slightly shorter rostrum" by Perkins. A typical male, Kula Pipe Line, Maui, June 13, 1927, on *Broussaisia* (O.H.S.) (pl. 4, A), differs only in having a small dark brown line at middle of membrane. A third specimen from the Hawaiian Sugar Planters' Association collection taken by Timberlake along the Ukulele Pipe Line, 5,000 feet, Haleakala, Maui, July 12, 1919, differs in its smaller size (female length 4.56 mm., width 1.96 mm.), more strongly dilated costal margins, and shorter antennae in which the second and third segments are subequal and slightly shorter than the fourth. This may represent a distinct species.

Although originally recorded from the west Maui mountains, the only positively known records of this species are from east Maui (Usinger, 1937).

Subgenus **TRACHYNYSIUS**, new subgenus

Head roughened above by minute granules or rugosities and with a more or less distinct, fine, appressed pubescence except on glabrous areas, these glabrous areas usually confined to a longitudinal line at middle of interocular space and anteriorly along tylus, ocular margins, and elongate-oval, obliquely divergent spots in front of ocelli. These areas sometimes enlarge to occupy a considerable portion of upper surface of head. Interocular space often a little elevated along middle but never roundly convex at middle. Pronotum usually with a short, appressed pubescence surrounding callosities. Metapleural angle distinctly produced.

Genotype: *Nysius hiloensis* Perkins.

31. *Neseis* (*Trachynysius*) *whitei* (Blackburn) (pl. 5, D).

Nysius whitei Blackburn, Linn. Soc. N. S. Wales, Proc. II, 3: 346, 1888.

Kirkaldy, Haw. Ent. Soc., Proc. 1: 190, 1908; Fauna Haw. 2: 538, 1910. Perkins, Ent. Soc. London, Trans. (1911), 733, 1912.

Head about one third broader than long, 17.5:13; produced in front of the eyes for a distance three fourths as long as an eye; eyes rather large, almost half as wide as interocular space, 4.5:8.5; upper surface smooth, polished, and naked, being scarcely, almost imperceptibly granular sublaterally and finely, rugosely granular on juga; a little elevated along middle and depressed at base of tylus; bucculae distinctly elevated anteriorly, decreasing at level of antenniferous tubercles, the rostral groove scarcely attaining base of head. Rostrum reaching to middle coxae, the first segment as long as rostral groove but not reaching base of head; segments one to four 6-6-5-5. Antennae one half longer than width of pronotum at humeral angles; segments one to four 5-10-10-10.

Pronotum about three fifths as long as broad, 14:23; about one third broader than head, 23:17.5; and a little longer than head on median line, 14:13; lateral margins

strongly sinuate, distinctly swollen at level of callosities and a little arcuate posteriorly; disk a little convex, distinctly transversely impressed along posterior margins of callosities, without any pubescence, even antero-laterally.

Hemelytra exceeding tip of abdomen by one third the total length of membrane; membrane almost as long as costal margin; almost as long beyond apices of coria as before this level, 14:17; corium mostly hyaline, depressed laterally and a little apically, being scarcely convex on apical half; vein R + M branching at apical third, vein Sc quite distinct. Costal margins sinuate subbasally and distinctly, relatively strongly arcuate beyond level of apex of scutellum.

Postero-lateral angle of metapleuron distinctly angulately produced; meso and metapleura with scattered, rather feeble punctures and with impunctate areas sublaterally. Under surface with a distinct, appressed, pale pubescence laterally on the head, becoming more inconspicuous and much sparser on thoracic pleura; the venter with appressed hairs laterally and suberect hairs ventrally. Female genital cleft rather shallow, its apex four fifths as far from apex as from base of abdomen, the fourth segment half as long as third on median line and fifth segment one third as long as fourth on mid line.

Color light brown to ochraceous, the head with yellow ocular margins, midline between the eyes, tylus and inner margins of juga, antenniferous tubercles, bucculae anteriorly, and under surface laterally, and with darker brown juga and eyes and red ocelli. Pronotum with ochraceous anterior margin and mid-line extending posteriorly between callosities and with brown spots on humeri and at middle of posterior margin. Scutellum black at middle of base with yellow elevated regions. Hemelytra with region of commissure of clavus and corium subapically at enclosed cell of R + M and faintly at inner apex brown. Membrane brown laterally near middle of apical margin of corium and indistinctly at middle posteriorly. Beneath brown laterally and black ventrally with yellow anterior margin of prosternum, coxal flanges, ostiolar canal, and reflexed posterior margin of metapleuron; antennae entirely pale. Rostrum pale with black apex, and legs pale with a broad brown annulation subapically on posterior femora.

Size: male, length, 4.05 mm., width 1.55 mm.

Described as fully as possible from Blackburn's carded type, Hawaii, which has the left hind leg broken off at the middle of the femur, the right hemelytron missing except for the clavus, and the left humeral angle slightly eaten away. It has seemed best to describe the type as completely as possible because of the tremendous variation in structure or coloration in the series before me. A male collected by Giffard, Olaa, 25 miles, Hawaii, 3,000 feet, September 8, 1917, and a female collected by me along the Upper Hamakua Ditch Trail, Hawaii, Aug. 15, 1935 are almost entirely pale above with complete hemelytra, a generally lightly infuscated membrane, and pale legs with brown-spotted femora on my specimen. More or less typical specimens but for their larger size, up to 5.11 mm. by 2.11 mm., are at hand, collected by Muir and Giffard at Olaa and Kilauea (pl. 5, *D*, female, Kilauea, Hawaii, Aug. 1921, F.M.). Maui specimens which appear to belong near here include two damaged specimens from Haleakala, Maui, 2,000 feet and one carded example collected by Perkins at 2,500 feet on the windward side of Haleakala. In these Maui specimens the antennae appear to be more slender and the femora are brown-spotted.

32. *Neseis* (*Trachynysius*) *whitei brachypterus*, new subspecies.

Hemelytra abbreviated, exceeding tip of abdomen by less than one tenth of total length of membrane; membrane only two thirds as long as costal margin and extending

less than half as far behind apices of coria as length in front of this. Coloration varying from quite pale and similar to the typical form to much darker with dark areas of head piceous, the entire pronotum except on elevated carina at middle of anterior margin piceous, or, on posterior lobe, pitchy dark brown and the clavus and corium dark brown at least on posterior third.

Holotype male (1452), allotype female (1452A), and 12 paratypes, Nauhi Gulch, Hawaii, 5,000 to 6,000 feet, Sept. 28, 1931, collected by Swezey and Williams on *Astelina*.

33. *Neseis* (*Trachynysius*) *oahuensis*, new species (pl. 5, C).

Head three fourths as long as wide, 12:16; produced in front of eyes for a distance less than length of an eye, 4.5:5.5; interocular space twice as wide as an eye; upper surface polished and smooth or with obsolescent punctures and wrinkles, subflattened, being a little depressed along inner margins of eyes and a little elevated at middle, with a few, appressed, pale hairs on juga; juga moderately convex, especially along inner margins, the portion of head in front of eyes abruptly narrowed at base, but convexly rounded at sides of juga. Bucculae elevated anteriorly, decreasing at level of antenniferous tubercles, the rostral groove not quite reaching base of head. Rostrum reaching about to middle of hind margins of middle coxae, the first segment not exceeding rostral groove; segments one to four 6-6-6-5. Antennae half again as long as greatest width of pronotum, 31.5:21; segments one to four 4.5-9-9-9.

Pronotum a little less than two thirds as long as broad, 13:21; about one third broader than head, 21:16; lateral margins, seen from the side, feebly carinate even anteriorly, seen from above, distinctly sinuate, strongly rounded at level of callosities; disk moderately elevated throughout, feebly, irregularly impressed behind callosities and depressed laterally, with an inconspicuous pubescence antero-laterally; callosities a little elevated.

Hemelytra long, exceeding tip of abdomen by one third the length of membrane; membrane a little shorter than length of costal margin, 29:33; about as long behind apices of coria as before this; corium hyaline, vein R + M obscurely branched at apical fourth; costal margins subbasally sinuate, then subparallel to level of apex of scutellum and moderately arcuate behind this.

Postero-lateral angle of metapleuron moderately produced, subrounded at apex. Punctures of meso and metapleura very superficial. Under surface covered with a fine, appressed pubescence laterally on head and thorax, with longer, more erect hairs on the venter.

Female proportionately broader than the male with a relatively shallow genital cleft, the length of exposed portion of ovipositor subequal to portion of abdomen anterior to this, the fourth segment one third as long as third at middle.

Color pale fulvous to ochraceous, the eyes, humeral angles and apices of coria, brown. Head ochraceous with ill-defined fulvous either side of middle. Pronotum ochraceous with brownish punctures. Scutellum brown at middle of base, ochraceous on elevated areas with a white tip. Commissure of clavus fuscous and veins of corium infuscated. Dilated costal margin pale or whitish except at apex. Membrane brown laterally and at middle. Under side light brown, the head posteriorly, anterior portion of prosternum, coxal flanges, ostiolar canal, bucculae, and portions of abdominal segments yellow. Antennae pale with black inner apical half of first segment, black bases of second and third segments, and sometimes with a brownish fourth segment, the joints pale. Rostrum pale with black apex. Legs pale, ochraceous to testaceous, with the apices of tarsi infuscated. Femora immaculate.

Size: male, length 3.72 mm., width 1.27 mm.; female, length 4 mm., width 1.44 mm.

Holotype male, 1419, allotype female, 1419A, and twelve male and nine female paratypes, Manoa-Palolo Ridge, Koolau Range along the Mount Olym-

pus Trail, on *Boehmeria grandis*, Oahu, Nov. 3, 1935 (R. L. U.) (pl. 5, C); one male, same data as type but March 24, 1936; one male, Mt. Olympus, Oahu, March 31, 1935, on *Boehmeria* (O. H. S.). Additional material, somewhat smaller or not quite typical, includes two specimens from Makaleha, Mount Kaala, Oahu, on *Boehmeria*, Jan. 8, 1922 (O. H. S.), and one specimen each from Waiahole, Oahu, June 12, 1921, and Hauula, Oahu, Aug. 2, 1914.

In some specimens the entire posterior margin of pronotum is brown with more extensive brown at middle. *N. oahuensis* is somewhat suggestive of *N. hiloensis* but is paler with hyaline clavus and corium.

A unique specimen which is larger, more reddish in coloration with more rugulose upper surface of head, less sinuate sides of pronotum, and less strongly dilated costal margins from Waihee, Maui, March 1, 1926, on *Boehmeria* (O. H. S.) is doubtless a distinct species but can better be described when a longer series is at hand.

34. *Neseis* (*Trachynysius*) *cryptus*, new species (pl. 5, A).

Head a little broader than long, 17:15; produced in front of the eyes for a distance equal to length of an eye; eyes relatively small, less than half as wide as interocular space, 4:9.5; upper surface minutely rugosely roughened and with fine appressed hairs which are scarcely visible in one specimen; with smooth, polished ocular margins, oval areas extending to ocelli, longitudinal line at middle of interocular space, and tylus; upper surface convex along middle, a little depressed posteriorly and laterally.

Antenniferous tubercles very prominent, protruding obliquely downward from inner anterior margins of eyes, their outer margins arcuate as seen from above. Bucculae elevated anteriorly, decreasing in height at level of antenniferous tubercles, the rostral groove not reaching base of head. Rostrum reaching almost to posterior margins of middle coxae, the first segment not reaching base of head; segments one to four 7-7-6-6. Antennae short, only one fourth longer than greatest width of pronotum, 33:26; segments one to four 4.5-10-9-9.5.

Pronotum robust, over half again as broad as long, 26:16; a little longer than head on median line, 16:15; and about half again as broad at humeral angles as head across eyes, 26:17; lateral margins not or scarcely sinuate at middle, almost evenly arcuate throughout; disk rather strongly convex with a distinct transverse impression at posterior margins of callosities; with a distinct pubescence of pale, subappressed hairs anterolaterally.

Hemelytra fairly long, exceeding tip of abdomen by one third the length of membrane; membrane one sixth shorter than costal margins; and about as long behind level of apices of coria as before this point; corium hyaline, vein R + M branching at apical fourth, Sc faintly indicated; costal margins only feebly dilated and arcuate behind level of apex of scutellum.

Postero-lateral angle of metapleuron strongly, angulately produced. Meso and meta-pleura distinctly but not strongly punctured. Under surface clothed laterally with a fine, appressed pubescence and with sparse erect hairs ventrally on abdomen. Female genital cleft rather shallow, the distance from apex of cleft to tip of abdomen less than length of abdomen before this, 16:18; fourth segment one half as long as third at middle.

Color light brown, the head paler, ochraceous, surrounding eyes, on longitudinal stripe at middle of interocular space, tylus, apices of antenniferous tubercles, anterior portions of bucculae, and sides of head beneath. Pronotum a little darker brown anterolaterally and in punctures. Scutellum black at middle of base and in punctures, white at tip. Hemelytra with base and commissure of clavus, apices of coria, and membrane at

middle of apical half and extending to just before apices of coria on either side, dark brown. Under side brown with pale anterior portions of prosternum, coxal flanges, ostiolar lobes, reflexed portions of metapleura and abdomen laterally and along posterior margins of some of the segments. Antennae dirty ochraceous with infuscated inner apex of first segment, bases of second and third segments and all of fourth segment. Rostrum pale with black apex. Legs pale with brown spots on the femora.

Size: female, length 4.55 mm., width 1.61 mm.

Holotype female, 1420, (pl. 5, *A*) and one paratype female, Mapulehu Valley, Molokai, August 14, 1936 (R.L.U.). The paratype is shorter (4.28 mm.) but just as broad as the type. It is a little paler but otherwise quite typical.

N. cryptus is allied to the *hiloensis* group but is broader with a very shallow female genital cleft.

A single female from Keanae, Maui, June 27, 1920 (E.H.B.) is apparently a new species allied to *N. cryptus*. It differs mainly in its shorter and broader head and pronotum.

35. *Neseis* (*Trachynysius*) *fulgidus*, new species (pl. 5, *B*).

Head a little more than three fourths as long as wide, 13:16; produced before the eyes for a distance equal to length of an eye, 6:6; eyes large, one half as wide as interocular space; upper surface highly polished and smooth or only obscurely, finely rugose; depressed along ocular margins and a little elevated at middle, with a few scattered hairs near ocelli and along sides of juga; juga slender, the head abruptly narrowed in front of eyes. Bucculae feebly elevated anteriorly and decreasing in height even before level of antenniferous tubercles, the rostral groove not quite reaching base of head. Rostrum extending to second abdominal segment, the first segment reaching a little beyond base of head; segments one to four 10-9-9-7. Antennae over two thirds longer than greatest width of pronotum, 36.5:21; segments one to four 5-11.5-11-9.

Pronotum less than half again as wide as head, 21:16; and almost as long as width of head, 14:16; lateral margins a little carinate on posterior lobe as seen from the side, distinctly sinuate as seen from above, being broadly rounded at level of callosities; disk strongly convex on posterior lobe, a little depressed anteriorly with roundly elevated callosities and a transverse impression at their posterior margins; with a very short, obscure irregular pubescence antero-laterally around the callosities.

Hemelytra long, exceeding tip of abdomen by one third the total length of membrane; membrane a little shorter than length of costal margin, 32:35; as long beyond apices of coria as before this; corium hyaline, vein R + M branching at apical fourth; costal margins sinuate subbasally, then parallel behind which they are moderately dilated, a little reflexed at lateral margins on posterior half.

Postero-lateral angle of metapleuron moderately produced, subrounded at apex. Meso and metapleura only feebly punctate. Under surface, except for constant glabrous regions, with a sparse, very fine pubescence and with some long erect hairs on venter. Female proportionately broader, the genital cleft quite deep, the ovipositor more than half the total length of abdomen, 20:13; the fourth segment not entirely concealed at middle.

Color pale fulvous to ochraceous, the eyes and base of head extending to a sharp point beyond each ocellus, black. Antennae pale with black on inner apical half of first segment, bases of second and third segments and brown fourth segment, the joints white. Pronotum with a brown spot at middle of posterior margin and brown humeral angles. Scutellum with ivory-white apex. Clavus brown at base and along commissure, corium brown at apex. Membrane brown opposite brown apical corial spots and along middle of apical half. Under surface in great part pale fulvous with meso and metasterna and middle of venter black, and glabrous areas yellow. Rostrum yellow with black apical three

fourths of last segment. Legs ochraceous with the femora more or less brown-spotted and the tibiae and tarsi infuscated apically.

Size: male, length 4.05 mm., width 1.33 mm.; female, length, 4.39 mm., width 1.55 mm.

Holotype male, 1421, allotype female, 1421A, and nine male and four female paratypes, Punaluu, Koolau Range, Oahu, on *Pipturus*, March 1, 1936 (R.L.U.) (pl. 5, B, female paratype). One male and one female, Haleauau, Waianae Range, Oahu, on *Pipturus*, March 8, 1936 (R.L.U.). Additional material at hand includes five specimens from Mount Olympus, Oahu (O.H.S.). Three of these are labeled *Coprosma*. Four other specimens which differ only in their smaller size are at hand, one from Palolo, Oahu, June 29, 1917 (J.C.B.) and three specimens from the United States National Museum from Punaluu, Oahu, June 11, 1916 (J.C.B.).

The paratypes vary, some being much darker with black basal vittae extending farther forward between the eyes, and with a distinct ochraceous line longitudinally at middle. The hemelytra are much darker in some specimens and the rostrum reaches only to the posterior coxae in one or two specimens. Closely allied to the *nitidus* group but with the upper surface of the head smooth and the general coloration fulvous.

36-42. *Neseis (Trachynysius) nitidus* (White) (pl. 7).

A very common species which may be recognized by its long, subparallel form, strongly produced head, long rostrum, rugosely punctate upper surface of head and ochraceous general coloration with fuscous markings.

This species, which occurs on every island, lives on *Pipturus albidus* (*mamake*). Due either to unusual plasticity or to great age, the populations of each island are readily recognizable as distinct, although closely allied, entities. As each of these populations eventually may prove to be, or may become distinct species, I describe each separately but use the term subspecies as defined on page 11.

36. *Neseis (Trachynysius) nitidus impressicollis*, new subspecies (pl. 7, D).

Head almost as long as broad, 15:17; produced farther in front of the eyes than length of an eye, 7:6; eyes rather small, less than half as wide as interocular space, 4:9; upper surface rugosely or scabrously roughened and covered with a short, fine, appressed pubescence except on the usual glabrous areas; a little elevated along middle and subdepressed sublaterally; bucculae as usual for this group. Rostrum extending almost to third abdominal segment, the first segment exceeding base of head; segments one to four 11-11-10-9. Antennae about half again as long as greatest width of pronotum, 35:23; segments one to four 5-10.5-10.5-9.

Pronotum less than two thirds as long as broad, 14:23; less than half again as broad as head, 23:17; and a little shorter than head, 14:15; lateral margins strongly convergent anteriorly and almost straight, being scarcely ampliate at level of callosities; disk moderately convex, distinctly, transversely impressed at hind margins of callosities with a distinct, short, appressed pubescence antero-laterally around callosities.

Hemelytra long, exceeding apex of abdomen by one third the total length of membrane; membrane subequal in length to costal margin; a little longer beyond level of apices of coria than in front of this, 19:16; corium hyaline, vein R+M branching at about apical fourth; costal margins only moderately arcuate beyond level of apex of scutellum.

Postero-lateral angle of metapleuron distinctly, angulately produced. Meso and metapleura sparsely but distinctly punctate. Under surface with a short, appressed, pale pubescence laterally on the thorax and over the entire ventral surface of abdomen with longer, erect hairs on venter. Female genital cleft quite deep, its apex about two thirds as far from base as from tip of abdomen, the fourth ventral segment scarcely visible at middle.

Color light brown to ochraceous with the head black or dark brown with yellow ocular margins, stripe at middle of interocular space, tylus and sides of juga, antenniferous tubercles, bucculae anteriorly, and under side of head laterally and posteriorly. Pronotum with callosities light brown, the humeri and spot at middle of posterior margin dark brown. Anterior and lateral margins and a median longitudinal carina anteriorly white. Scutellum black at center of base and in punctures, elevated carinae white. Hemelytra with commissure of clavus, apices of coria, and light, scattered markings on the corial veins brown. Membrane brown a little beyond middle of apical margins of coria and on middle of posterior half. Under surface black ventrally with the usual glabrous areas white or yellowish, the margins of connexivum, posterior margins of fourth and fifth ventral segments in male, and posterior margins of fourth, fifth, and sixth ventral segments in female, pale. Connexivum alternated with black in the female. Antennae with first segment pale except on inner apex, second and third segments brownish with darker bases and subapices, the fourth segment brown. Rostrum pale with black apex. Legs pale, the femora brown-spotted and apices of tibiae and tarsi infuscated.

Size: male, length 4.33 mm., width 1.38 mm.; female, length 4.88 mm., width 1.61 mm.

Holotype male, 1422, allotype female 1422A, and 76 paratypes, Kumuweia, Kauai, Dec. 30, 1935, on *Pipturus* (R.L.U.) (pl. 7, D, female). Two specimens, same data as types but collected by O. H. Swezey, on Aug. 16, 1925 and 16 specimens, Aug. 19-23, 1921 (O.H.S.); two specimens, Halemanu, Aug. 30, 1931, three specimens, Kalalau Lookout, June 18, 1922 (E.H.B.), Aug. 20, 1921 (O.H.S.), and Dec. 29, 1935 (R.L.U.) and one specimen, Summit Camp, April 23, 1922 (O.H.S.). All of these were collected on *Pipturus* except for one on *Osmanthus*, one on *Cyrtandra*, and one on *Dodonaea*. Two adults and a nymph have also been studied from Koloa, Kauai, Aug. 2, 1908. There is little variation in the long series of specimens before me. *N. n. impressicollis* may be distinguished from typical *N. n. nitidus* by the deep transverse impression of the pronotal disk.

37. *Neseis* (*Trachynysius*) *nitidus contubernalis*, new subspecies (pl. 7, B).

Head one eighth shorter than broad, 14:16; produced in front of the eyes for a distance less than length of an eye; eyes large, broader than half width of interocular space, 4.5:7; upper surface subflattened and a little depressed, particularly laterally between the eyes; finely scabrous and rather densely clothed with fine, appressed hairs except on the usual glabrous areas. Bucculae elevated anteriorly, depressed at level of antenniferous tubercles, the rostral groove not reaching base of head. Rostrum exceeding posterior coxae but scarcely reaching second abdominal segment, the first segment surpassing base of head; segments one to four 11-11-7-7. Antennae a little less than twice as long as greatest width of pronotum, 38:21; segments one to four 5-11-12-10.

Pronotum half again as broad as long and equal in length to head on median line; a little over one fourth broader than head across eyes, 21:16; lateral margins scarcely sinuate, only feebly ampliate at level of callosities. The disk moderately, rather evenly elevated along middle, not transversely impressed at posterior margins of callosities; with fine, subappressed hairs surrounding callosities and along lateral margins at least anteriorly.

Hemelytra long, surpassing apex of abdomen by one third the length of membrane; membrane as long as costal margin, extending further beyond apices of coria than length anterior to this, 19:14; corium hyaline, vein R + M branching at apical fourth; costal margins almost parallel, a little incurved at middle and scarcely dilated posteriorly.

Postero-lateral angle of metapleuron only moderately produced, subrounded at apex. Meso and metapleura distinctly but not deeply punctate. Under surface clothed with short, appressed, pale pubescence, especially laterally, with suberect hairs posteriorly on the abdomen, the anterior margin of prosternum, mesosternum, coxal flanges, ostiolar canals, and reflexed posterior margins of metapleura glabrous.

Color light brown to ochraceous, the head black except for ocular margins, longitudinal line at middle of interocular space, tylus, inner margins of juga, antenniferous tubercles, elevated portions of bucculae, and under surface; rostral groove black. Pronotum with fulvous callosities, brown humeri, and a brown spot at middle of posterior margin; lateral and anterior margins, an ill-defined longitudinal carina at middle anteriorly, and irregular discal laevigate areas at middle of disk white. Scutellum black at middle of base and white at apex. Hemelytra marked with dark brown in region of commissure of clavus, at apices of coria, around and interior to inner branch of vein R + M and along apical margin of corium towards the center from this; membrane with a dark brown stripe at middle of apical half and a small spot on either side just before level of apices of coria. Under side light brown laterally and darker brown to black within lateral margins with the usual yellow areas. Antennae ochraceous with black inner apex of first segment and dark bases of the remaining segments. Rostrum pale with black apex. Legs pale with the femora more or less brown-spotted and tibiae and tarsi infuscated apically.

Size: male, length 4.1 mm., width 1.22 mm.

Holotype male, 1423, and one paratype, Punaluu, Oahu, March 1, 1936, on *Pipturus* (R.L.U.). Other material at hand includes a single male, Haleauau, Waianae Mts., Oahu, March 8, 1936, on *Pipturus* (R.L.U.) (pl. 7, B), one male, Nuuanu Pali, Oahu, Nov. 19, 1919 (W.M.G.), and one female, Manoa, Oahu (H.L.Lyon).

The Haleauau specimen has more extensive brown markings, the inner corial vein brown on apical half and basal markings of membrane covering all of base of membrane except for a narrow longitudinal white line and the costal margins a little more strongly dilated behind level of apex of scutellum. The female from Manoa is 4.16 mm. long and 1.33 mm. wide and has pink-tinged coria which may indicate that it is not fully mature. In this specimen the female genital cleft is very deep, the distance from middle of third abdominal segment to apex of abdomen being almost five times as great as distance basally from this point, the fourth abdominal segment is entirely concealed at middle, and the second antennal segment is infuscated subapically while the fourth is entirely brown. The small size and slender body form will distinguish this subspecies from its nearest allies.

38. *Neseis* (*Trachynysius*) *nitidus consummatus*, new subspecies (pl. 7, C).

Head less than one fourth broader than long, 19:16; produced in front of the head for a distance equal to length of an eye, 7:7; not abruptly narrowed immediately in front of eyes, the antecular region quite broad at base, subtriangular; eyes of moderate size, a little less than half the width of interocular space, 5:9; upper surface minutely scabrous and clothed with appressed, light hairs but naked on the usual pale areas. Bucculae distinctly elevated anteriorly, reduced at level of antenniferous tubercles, the rostral groove

not reaching base of head. Rostrum reaching posterior margins of hind coxae opposite base of second abdominal segment, the first segment reaching a little way onto prosternum; segments one to four 12-12-10.5-8. Antennae half again as long as greatest width of pronotum, 42:28; segments one to four 6-13-12-11.

Pronotum two thirds as long as broad, 19:28; less than one fourth longer than head on median line, 19:16; and about half again as broad at humeral angles as the head across eyes, 28:19; lateral margins scarcely sinuate, almost evenly arcuate, being subrectilinear at middle; disk moderately convex with only a trace of a transverse impression at hind margins of callosities; with white, subappressed hairs antero-laterally surrounding the callosities.

Hemelytra rather long, exceeding tip of abdomen by one third the length of membrane; membrane almost as long as costal margin, 40:43; longer beyond level of apices of coria than before, 23:17; corium hyaline, vein R + M branching at apical fourth; costal margins only feebly dilated behind level of apex of scutellum.

Postero-lateral angle of metapleuron strongly, angulately produced. Meso and metapleura only superficially punctured. Under side rather conspicuously clothed with pale, appressed pubescence, especially laterally, with more erect pale hairs ventrally on the abdomen.

Color light brown to ochraceous, the head very dark brown or ferrugineous with black base and two black vittae extending forward to include ocelli, with ochraceous ocular margins, tylus, antenniferous tubercles, elevated portions of bucculae and under surface laterally. Pronotum with fulvous callosities and at least brown humeri. Scutellum black at middle of base, white at apex. Hemelytra with base and commissure of clavus, veins posteriorly and apices of coria, and membrane at middle posteriorly and just before apices of coria laterally, brown. Under surface brown laterally and black ventrally with pale anterior portion of prosternum, coxal plates, ostiolar lobes, and reflexed portion of metapleuron. Antennae dirty ochraceous with black inner apical portion of first segment, base and subapex of second segment, and base of third segment. Rostrum brownish or paler with black apices. Legs pale with brown-spotted femora.

Size: male, length, 5.05 mm., width about 1.83 mm.

Holotype male, 1424, Mapulehu-Punaula Ridge, Molokai, Aug. 15, 1936 (R.L.U) (pl. 7, C).

This subspecies has the broad anterior portion of the head of *N. n. nitidus*, but differs in its shorter rostrum and flatter and differently formed pronotum.

39. *Neseis* (*Trachynysius*) *nitidus insulicola* (Kirkaldy) (pl. 7, E).

Nysius insulicola Kirkaldy, Fauna Haw. 2: 541, 1910.

Head a little broader than long, 17:15; produced in front of the eyes for a distance a little less than length of an eye, 6:7; eyes large, over half the width of interocular space, 4.5:8; upper surface scarcely elevated along middle, scabrous, exhibiting a few punctures, and clothed with an irregular, pale, appressed pubescence except on the usual smooth areas. Bucculae distinctly elevated anteriorly, reduced at level of antenniferous tubercles, the rostral groove not reaching base of head. Rostrum distinctly surpassing posterior coxae but reaching only to middle of second abdominal segment; segments one to four 11-10-10-9. Antennae over half again as long as width of pronotum, 39.5:24; segments one to four 5-12-12-10.5.

Pronotum about three fifths as long as broad, 15:24; about one third broader than head, 24:17; and as long as head; lateral margins relatively strongly convergent anteriorly, a little rounded at level of callosities; disk moderately and rather evenly convex, the transverse impression at posterior margins of callosities obsolescent and the depression at middle very shallow; with a few short, subappressed hairs antero-laterally.

Hemelytra long, exceeding tip of abdomen by nearly one half the length of membrane, 16:38; membrane about as long as costal margin; longer behind level of apices of coria

than in front of this, 20:18; corium hyaline, vein R + M branching at apical fourth; costal margins appearing subparallel, only feebly dilated behind level of apex of scutellum.

Postero-lateral angle of metapleuron moderately, angulately produced and a little rounded at apex. Meso and metapleura superficially punctured. Under surface with scattered, appressed, pale hairs laterally except on glabrous areas and with a few suberect hairs on venter.

Color light brown to ochraceous, the head black with ochraceous ocular margins, tylus and obscure inner margins of juga, very ill-defined longitudinal stripe at middle of interocular space, antenniferous tubercles, bucculae anteriorly, and under surface laterally. Pronotum ochraceous with fulvous callosities and brown humeri and a brown spot at middle of posterior margin. Scutellum black at middle of base, paler elsewhere except in punctures, with yellowish sides and apex. Hemelytra with commissure of clavus, apices of coria, and membrane at middle of posterior half and obscurely near apices of coria brown. Under side light brown or ochraceous laterally and black ventrally with the coxal flanges, ostiolar canal, and reflexed posterior margins of metapleura yellow to white. Antennae rather generally infuscated with the inner apical half of first segment black. Rostrum ochraceous to fulvous with black apex. Legs pale with the femora brown-spotted, the tibiae and tarsi infuscated apically.

Size: male, length 4.61 mm., width 1.52 mm.

Described from a single male specimen, Lanai, over 2,000 feet, Jan. 1894 (R.C.L.P.) (pl. 7, *E*) which may be designated as an allolectotype inasmuch as the holotype is a female. Nothing can be said concerning the limits of variation in this subspecies because only two specimens appear to have been captured. I beat *Pipturus* on Lanai but only found a single *Neseis* which escaped from my net. This form will doubtless prove to be common but local, like the *Pipturus* inhabiting species on the other islands. *N. n. insulicola* differs from *N. n. nitidus* and *N. n. pipturi* mainly in its slightly shorter rostrum and larger eyes.

40. *Neseis* (*Trachynysius*) *nitidus nitidus* (White) (pl. 7, *G*).

Nysius nitidus White, Ann. Mag. Nat. Hist. V, 7: 53, 54, 1881. Kirkaldy, Haw. Ent. Soc., Proc. 1: 190, 1908; Fauna Haw. 2: 543, 1910. Perkins, Ent. Soc. London, Trans. (1911), 732, 1912 (= *saundersianus* Kirkaldy).

Head a little broader than long, 17:14; subtriangularly produced in front of eyes for a distance equal to length of an eye, 6:6; and thus appearing quite broad immediately in front of eyes; eyes less than half as wide as interocular space, 4:9; upper surface feebly elevated along middle and subdepressed around eyes, a little scabrous and clothed with a fine, appressed pubescence except for the usual glabrous areas; bucculae moderately elevated anteriorly, decreasing at level of antenniferous tubercles, the rostral groove not reaching base of head. Rostrum reaching to base of third abdominal segment, the first segment extending onto prosternum; segments one to four 5.5-12-11-10.5.

Pronotum over half again as broad at humeri as long, 24:14; subequal in length to head on median line; a little less than half again as broad as head, 24:17; lateral margins a little swollen at level of callosities, otherwise scarcely sinuate; disk moderately convex, particularly on posterior lobe, feebly, transversely impressed along hind margins of callosities and with a depression anteriorly at middle of hind lobe, scarcely pubescent anterolaterally.

Hemelytra exceeding tip of abdomen by about one third the length of the membrane; membrane a little shorter than costal margin, 37:40; extending as far beyond level of

apices of coria as in front of this; corium hyaline, vein R + M branching at apical fourth; costal margins feebly but distinctly dilated beyond level of apex of scutellum.

Postero-lateral angle of metapleuron moderately produced, subrounded at apex. Meso and metapleura very sparsely and superficially punctate. Under side clothed with a fine, appressed, pale pubescence laterally with somewhat longer, erect hairs posteriorly on abdomen. Female genital cleft very deep, the distance from apex of cleft to tip of abdomen two and one half times that of basal portion of abdomen, fourth segment entirely concealed at middle.

Color pale brown to ochraceous, the head black except for ochraceous-yellow ocular margins, tylus, inner edges of juga, longitudinal line at middle of interocular space, antenniferous tubercles, elevated portions of bucculae, and under surface laterally and before rostral groove. Pronotum with humeri, posterior margin narrowly, and a spot at middle of posterior margin brown, punctures brown, callosities yellow and anterior margin and interrupted longitudinal carina at middle anteriorly white. Scutellum fusco-piceous basally, especially at middle, the elevated portions laterally and apically white. Hemelytra with commissure of clavus, veins of corium irregularly on posterior half, and apices of coria brown, the membrane clouded at middle posteriorly and near apices of coria. Beneath ochraceous or paler laterally and black on thoracic sterna and broadly at middle of venter basally. Antennae rather generally infuscated, the first segment pale with brown inner apex, the second and third darker fuscous basally and subapically, and the fourth generally infuscated. Rostrum pale with black apex. Legs pale with brown-spotted femora and infuscated apices of tibiae and tarsi.

Size: male, length 4.61 mm., width 1.53 mm.; female, length 4.5 mm., width 1.53 mm.

Described from a series of specimens in the Blackburn collection (pl. 7, G, "Maui" T. Blackb.). These are labeled *Nysius nitidus* on the under surface of the cards on which they are mounted. Specimens of *N. mauiensis* are mixed in with this series. Perkins synonymized Kirkaldy's *N. saundersianus* with this species and placed the two species together in his collection with a note, "nitidus F.B.W. 2 species here." As White's description clearly calls for a small species with rostrum extending to the middle of the abdomen, there is no excuse whatever for placing the largest species in the genus with a short rostrum as a synonym of it. Mr. China has kindly compared one of my Blackburn specimens with Buchanan White's type and reports that the two are identical. Actually, this species is very near *N. n. pipturi* from Hawaii and should be looked for on *Pipturus* on Maui. It may be distinguished from *N. n. pipturi* by its less strongly narrowed anterior portion of head immediately in front of the eyes.

41. *Neseis (Trachynysius) nitidus pipturi*, new subspecies (pl. 7, F).

Head about five sixths as long as broad, 15:18.5; produced in front of the eyes for a distance a little less than length of an eye, 6.5:6, and rather abruptly narrowed immediately in front of the eyes; eyes large, as wide as interocular space, 4.5:9.5; upper surface scabrous and covered with a fine, appressed pubescence except for smooth ocular margins, tylus, and longitudinal lines at middle; a little elevated along middle and depressed posteriorly near the eyes. Bucculae moderately elevated anteriorly and decreasing in height at level of antenniferous tubercles, the rostral groove reaching almost to base of head. Rostrum reaching to third abdominal segment, the first segment extending onto prosternum; segments one to four 13-13-12-10. Antennae long and slender but considerably less than twice as long as width of pronotum, 44:26; segments one to four 6-13-13-12.

Pronotum almost half again as wide as long, 26:17.5; distinctly longer than head on median line, 17.5:15; and a little more than half again as broad as head including eyes, 26:18.5; lateral margins obscurely carinate posteriorly as seen from the side, scarcely sinuate as seen from above being but feebly rounded at level of callosities; disk relatively strongly convex, particularly on posterior lobe, the callosities only slightly elevated but with a more or less distinct transverse impression along their posterior margins; with a distinct, appressed pubescence antero-laterally surrounding the callosities.

Hemelytra fairly long, surpassing apex of abdomen by a little more than one third the total length of membrane, 15:40; membrane almost as long as costal margin, 40:43; and extending further beyond apices of coria than before this level, 23:18; corium hyaline, vein R + M branching a little beyond apical third; costal margins a little dilated behind level of apex of scutellum.

Postero-lateral angle of metapleuron scarcely to distinctly produced. Meso and metapleura very superficially punctured. Pubescence of under side short, appressed, and pale laterally on head and thorax and throughout the ventral surface of the abdomen with some longer, erect hairs posteriorly on the abdomen. Thoracic sterna glabrous. Female genital cleft very deep, the distance from middle of notch to apex of abdomen five sevenths the total length of abdomen, fourth segment entirely concealed at middle.

Color light brown to ochraceous, the head darker black, at least basally, and extending finger-like to include ocelli; eyes dark brown; ocular margins, longitudinal line at middle, tylus, antenniferous tubercles, elevated portions of bucculae and under surface of head laterally yellow. Pronotum with humeri and a spot at middle of posterior margins brown. Scutellum black basally and especially at middle of base, white on raised apical portion. Commissure of clavus, veins of coria posteriorly, and apices of coria dark brown to black, the dilated costal margins clear before apices. Membrane clouded longitudinally at middle of apical half and near apices of coria. Under side brownish laterally and black ventrally with ochraceous to white anterior margin of prosternum, coxal flanges, ostiolar canal, and reflexed posterior margins of metapleura. Antennae ochraceous with black inner apex of first segment, black basal and subapical rings of second and third segments, and black base of fourth segment. Rostrum pale with black apex. Legs pale with black-spotted femora and infuscated apices of tibiae and tarsi.

Size: male, length 5 mm., width 1.55 mm.; female, length 5.16 mm., width 1.66 mm.

Holotype male, 1425, allotype female 1425A, nine female and twelve male paratypes, Kilauea, Hawaii, Aug. 19, 1935 (pl. 7, *F*, female paratype) on *Pipturus* (R.L.U.); one female, Kilauea, 29 miles, May 1, 1921 (D.T.F.); one male, Kilauea, 29 miles, number 10, Oct. 28, 1915 (W.M.G.); and two males, Kilauea, Hawaii, July 19, 1934, on *Pipturus* (O.H.S.). In addition there are four specimens from Kona, Kealakekua, Hawaii, 3,500 feet, Aug. 20, 1919 (P.H.T.); one specimen, Upper Hamakua Ditch Trail, Kohala Mountains, Hawaii, Sept. 5, 1919 (O.H.S.); and three imperfect specimens, same data as the type, all collected on *Pipturus*.

The black coloration is much more extensive on the upper surface of the head and elsewhere in many of the paratypes. *N. n. pipturi* is perhaps closest to *N. n. insulicola* but has a broader head with relatively small eyes.

42. *Neseis* (*Trachynysius*) *nitidus comitans* (Perkins) (pl. 7, *A*).

Nysius comitans Perkins, Ent. Soc. London, Trans. (1911), 736, 1912.

Head almost as long as broad, 14:16; produced in front of eyes for a distance equal to length of an eye; eyes half as wide as interocular space; upper surface elevated along middle and a little depressed sublaterally, smooth and polished at inner margins surround-

ing eyes, lightly transversely wrinkled on median line and tylus, the remaining area continuing forward on juga quite roughly, rugosely granulous and beset with a fine, white pubescence; bucculae distinctly elevated anteriorly, becoming abruptly reduced at level of apices of antenniferous tubercles, the rostral groove continuing to a point two thirds the distance to base of head. Rostrum long, attaining apex of second abdominal segment, the first segment distinctly surpassing base of head; segments one to four 12.5-12-11-9. Antennae almost twice as long as width of pronotum, 39:21.5; segments one to four 5-12-11-11.

Pronotum a little less than two thirds as long as broad, 13.5:22; less than half again as broad as head, 22:16; and subequal in length to head, 13.5:14; lateral margins feebly arcuate at level of callosities; disk convex, the transverse impression behind callosities ill-defined and interrupted; surface moderately punctate, the entire base, postero-lateral angles and callosities glabrous and impunctate with a fine, appressed pubescence surrounding callosities.

Posterior margin of metapleuron distinctly, roundly emarginate, its lateral angle rounded. Meso and metapleura superficially punctate. Under surface clothed with a fine, appressed, white pubescence, especially laterally on head and thorax and over the entire ventral surface of abdomen. Female genital cleft very deep, extending for almost two thirds the length of abdomen, the fourth abdominal segment completely concealed at middle.

Color rather light, flavous, the head fulvous except for ivory-colored longitudinal line at middle interrupted at base of tylus, base of head, and smooth areas at inner margins of eyes; eyes brown, ocelli red. Pronotum fulvous narrowly on humeri and at middle of posterior margin. Elevated portions of scutellum ivory-white. Corium narrowly fuscous at apex, the membrane obscurely clouded near middle of apical half and opposite apices of coria. Antennae lightly annulated with fuscous laterally at slightly beyond middle of basal segment, basally and subapically on second segment, and at bases of third and fourth segments. Rostrum black at apex. Under side variegated, ivory-white around coxal flanges, on margins of pleura, etc. Femora light testaceous and brown-spotted.

Size: male, length 4.52 mm., width 1.2 mm.; female, length 4.68 mm., width 1.4 mm.

Described from the holotype, Hilo, Hawaii, 1,200 feet, July 1903 (R.C. L.P.), which is before me. Additional material includes ten other specimens from the same series (pl. 7, *A*, female); seven specimens taken by Timberlake on the road near the Kau-Kona line, Kau, Hawaii, Aug. 18, 1919 on *Pipturus albidus*; six specimens, Hilo, Hawaii, Oct. 26, 1908; four specimens, Ookala, Hawaii, Oct. 18, 1908; and four specimens, Kaumana Caves, Hawaii, Aug. 20, 1935, on *Pipturus* (R.L.U.).

This form is exceedingly variable, typically differing from *N. n. pipturi*, which is found on *Pipturus* at Kilauea, by its smaller size, paler coloration with brown instead of black head markings above, a narrower, more parallel-sided pronotum and more convex or less deeply transversely impressed disk behind the callosities and a longer, narrower head.

43-47. *Neseis* (*Trachynysius*) *hiloensis* (Perkins).

A common *Pipturus*-inhabiting species which is closely allied to *N. nitidus* and which, with that species, occurs in its various forms on each of the main islands of the Hawaiian group except Kauai. In general, *N. hiloensis* is smaller than *N. nitidus* with a shorter head and much shorter rostrum.

At least one of the subspecies described below would be considered as a full species according to all previous standards of specific distinctness in

Nysius elsewhere in the world. However, connecting links on successive islands from Oahu to Hawaii bind the divergent forms into a single species complex.

43. *Neseis (Trachynysius) hiloensis jugatus*, new subspecies (pl. 6, L).

Head five sixths as long as wide, 15:18; produced in front of the eyes for a distance equal to length of an eye; upper surface subflattened or a little elevated at middle, not depressed between the eyes, obscurely, transversely, rugosely roughened and covered with a short, pale, appressed pubescence except along very narrow ocular margins and suboval glabrous spots extending from ocelli to middle of inner margins of eyes. Ocelli as close to each other as each is to adjacent eye. Jugs exceptionally large, subtriangular, and swollen, giving the head in front of the eyes a convexly arcuate appearance on either side rather than the concave appearance typical of other members of this group. Bucculae very distinctly elevated anteriorly, decreasing at level of antenniferous tubercles, the rostral groove not reaching base of head. Under surface of head a little swollen on either side of bucculae and beset with very fine, appressed, white hairs. Rostrum short, reaching middle coxae, the first segment extending only about one half the distance to base of head; segments one to four 6.5-6.7. Antennae half again as long as width of pronotum behind, 34.5:23; segments one to four 4.5-10-10-10.

Pronotum a little less than two thirds as long as broad, 14:23; almost one third broader than head, 23:18; lateral margins, seen from the side, a little carinate, seen from above, distinctly sinuate, being swollen at level of callosities; disk only moderately elevated, feebly but distinctly transversely impressed at hind margins of callosities and depressed at middle of side margins; with a close, pale, appressed pubescence anterolaterally around callosities.

Hemelytra long and slender, extending beyond tip of abdomen by one third the total length of membrane; membrane as long as corium along costal margin and produced beyond apices of coria as far as its length in front of this; corium subhyaline, vein R + M branching at apical fourth; costal margins subparallel, a little dilated subbasally, then parallel or a little incurved beyond which they are feebly arcuate.

Postero-lateral angles of metapleuron moderately produced, subrounded at apex. Meso and metapleura very feebly, irregularly punctate. Under surface except on bucculae, coxal flanges, ostiolar canal and surrounding evaporating area, and posterior margins of metapleura beset with a short, fine, appressed, pale pubescence. Female a little broader than male with the genital cleft very deep, the ovipositor almost twice as long as basal segments and the fourth and fifth segments completely obscured at middle.

Color brown, the head black with narrow ochraceous ocular margins, longitudinal line at middle of vertex, tylus at middle, juga along inner margins, antenniferous tubercles, and bucculae anteriorly and with brown under surface laterally on basal half. Pronotum light brown to ochraceous with brown humeral angles and median and sublateral, irregular, longitudinal brown stripes, the sublateral ones deflected obliquely on callosities. Scutellum brown with black spot at middle of base and ochraceous to white basal and apical angles. Clavus dark brown at base and apex, pale subbasally. Corium with the veins, an ill-defined area before middle and within vein Cu, and apex dark brown. Membrane pale at base and near apices of coria, elsewhere brown. Beneath variegated brownish or black with the glabrous areas and anterior margins of prosternum yellow. Rostrum yellow with black apical three fourths of last segment. Legs pale, white to ochraceous, with black-spotted femora and infuscated apices of tibiae and tarsi. Antennae brown, the first segment ochraceous with black on inner apical half, second segment infuscated basally, joints pale.

Size: male, length 4.27 mm., width 1.33 mm.; female, length 4.27 mm., width 1.44 mm.

Holotype male, 1426, allotype female, 1426A, two male and two female paratypes, Punaluu, Koolau Range, Oahu on *Pipturus*, March 1, 1936 (R.L.U.) (pl. 6, L, female paratype). Four female and two male paratypes, Haleauau,

Waianae Mts., Oahu, March 8, 1936, on *Pipturus* (R.L.U.). One additional female and three males were collected at 1,500 feet, Mt. Tantalus, Oahu on Aug. 27, 1918, by W. M. Giffard. These are somewhat pale, variable as to convexity of head and are mounted on the same point with a unique specimen which belongs near *N. n. approximatus*.

This subspecies may be distinguished by the greatly enlarged juga.

44. *Neseis* (*Trachynysius*) *hiloensis interoculatus*, new subspecies (pl. 6, K).

Head only a little broader than long, 19:16; produced in front of the eyes for a distance almost equal to length of an eye, 6.5:7; eyes relatively small, less than half as wide as interocular space, 4.5:10; upper surface very finely but distinctly scabrous and covered with a short, pale, appressed pubescence except on the usual glabrous areas; distinctly elevated along middle and a little depressed laterally with the juga quite large, subtriangular, and a little swollen along inner margins. Bucculae moderately elevated anteriorly, reduced at level of antenniferous tubercles, the rostral groove not reaching base of head. Rostrum reaching to middle coxae, the first segment not quite attaining base of head; segments one to four 8-7-7-8. Antennae almost one third longer than greatest width of pronotum, 35:27; segments one to four 5-10-10-10.

Pronotum three fifths as long as wide, 16:27; almost half again as broad as head including eyes, 27:19; and subequal in length to head on median line; lateral margins distinctly ampliate at level of callosities; disk moderately convex and strongly, transversely impressed at hind margins of callosities, with obscure, appressed hairs antero-laterally around callosities.

Hemelytra fairly long, exceeding tip of abdomen by one fourth the total length of membrane; membrane almost as long as costal margin, 40:42; longer behind level of apices of coria than in front of this, 21:18; corium badly obscured but evidently subhyaline, vein R + M branching at apical fourth; costal margins only moderately arcuate behind level of apex of scutellum.

Postero-lateral angle of metapleuron strongly produced, subrounded at apex; meso and metapleura very irregularly punctate. Under surface clothed with a short, appressed pubescence, especially laterally and excepting on the usual glabrous areas with more erect hairs ventrally on the abdomen. Female genital cleft quite deep, its apex two thirds as far from base as from tip of abdomen, the fourth ventral segment only one fifth as long as third at middle.

Color light brown with darker markings, the head black except for ocular margins, small stripe at middle of interocular space, tylus at middle and inner margins of juga obscurely, antenniferous tubercles, bucculae anteriorly, and under surface laterally, ochraceous. Pronotum with light brown callosities and dark brown humeral angles and spot at middle of posterior margin; anterior margin at middle and extending as a carina between callosities, white. Scutellum black basally, along middle, and laterally; brown elsewhere except for white apical carinae. Hemelytra somewhat obscured by foreign substance but at least with commissure of clavus, apex of corium and region of inner branch of R + M brown. Membrane with the usual spots near middle of apical margins of coria and the median line apically very ill-defined. Under surface black ventrally with brown or ochraceous laterally except on meso and metathoraces, the usual glabrous areas pale as well as female genital segments and convex vein which is alternated with black. Antennae pale with darker brown inner apical portion of first segment, bases and subapices of second and third segments, and all of fourth segment. Rostrum pale with black apex. Femora brown-spotted, the tibiae and tarsi infuscated apically.

Size: female, length 4.72 mm., width 1.61 mm.

Holotype female, 1427, Mapulehu-Punaula Ridge, Molokai, Aug. 15, 1936 (R.L.U.) (pl. 6, K).

This form suggests a transition from the *hiloensis-intermedius-approximatus* stock to the very distinctive *Neseis h. jugatus* of Oahu, a subspecies which likewise occurs on *Pipturus* but which is more slender and parallel-sided with the eyes more greatly reduced and juga more strongly inflated.

45. *Neseis (Trachynysius) hiloensis approximatus*, new subspecies (pl. 6, H).

Head almost one third broader than long, 19.5:15; produced in front of the eyes for a distance equal to four fifths the length of an eye, 6:7.5; eyes almost half as wide as interocular space, 5:9.5; upper surface of head appearing subdepressed between the eyes, a little elevated along the middle, minutely scabrous and rather densely clothed with a short, pale, appressed pubescence except on the usual glabrous areas. Bucculae distinctly elevated anteriorly, decreasing at level of antenniferous tubercles, the rostral groove not reaching base of head. Rostrum reaching to posterior margins of middle coxae, the first segment not quite reaching base of head; segments one to four 9-8-8-7. Antennae half again as long as greatest width of pronotum, 37:25; segments one to four 5-11-11-10.

Pronotum about two thirds as long as broad, 16:25; about one fourth broader than head including eyes, 25:19.5; and slightly longer than head on median line, 16:15; lateral margins only moderately convergent anteriorly, a little sinuate, being a little ampliate at level of callosities; disk moderately convex, especially on posterior lobe, distinctly transversely impressed at hind margins of callosities, with a distinct, appressed, pale pubescence antero-laterally around the callosities.

Hemelytra long, exceeding apex of abdomen by one third the length of membrane; membrane almost as long as costal margin, 38:40; a little longer beyond level of apices of coria than before this, 21:17; corium hyaline, vein R + M branching at apical fourth; costal margins subparallel, being only feebly arcuate beyond level of apex of scutellum.

Postero-lateral angle of metapleuron distinctly, angulately produced; meso and metapleura sparsely, irregularly punctate. Under surface rather densely clothed with a short, appressed, pale pubescence, especially laterally, with erect hairs ventrally on the abdomen. Female genital cleft quite deep, the distance from its apex to tip of abdomen almost twice that to base of abdomen and the fourth abdominal segment completely concealed beneath the third at middle.

Color light brown to ochraceous, the head black except for ocular margins, stripe at middle of interocular space, tylus and inner margins of juga, antenniferous tubercles, bucculae anteriorly, and under surface posteriorly and laterally. Pronotum with brown spots on humeri and at middle of posterior margin. Scutellum black basally and extending half way to the apex at middle and with black punctures laterally, white at apex. Hemelytra with brown inner base, apex, and commissure of clavus, inner branch of vein R + M and apical margin of corium. Lateral expanded areas of costal margin whitish before the apex. Membrane brown-spotted near middle of apical margin of corium and posteriorly at middle. Under surface black ventrally and brown laterally with glabrous areas yellow. Antennae with first segment pale with brown spot apically on inner side, second and third segments brown basally and subapically, the fourth segment light brown. Rostrum pale with black apex. Legs pale with brown-spotted femora occasionally ringed subapically; the tibiae and tarsi infuscated apically.

Size: male, length 4.66 mm., width 1.5 mm.; female, length 5 mm., width 1.72 mm.

Holotype male, 1428, allotype female, 1428A (pl. 6, H), two male and one female paratypes, Waihee Valley, Maui, alt. 50 feet, May 11, 1918 (W.M.G., D.T.F.). Other material includes one female, Keanae, Maui, Aug. 22, 1918, on *Pipturus* (O.H.S.) and one male, Haelaau, Maui, Dec. 19, 1928, on *Sideroxylon* (O.H.S.).

Differs from *N. h. intermedius* in the slightly more strongly produced anteocular portion of the head, more strongly elevated interocular space at middle and slightly more ampliate lateral margins of pronotum at level of callosities.

46. *Neseis (Trachynysius) hiloensis intermedius*, new subspecies (pl. 6, J).

Head about one third broader than long; produced in front of the eyes for a distance considerably less than length of an eye, 5:7; eyes large, over half as wide as interocular space, 5:9; upper surface finely scabrous or almost granular and sometimes almost imperceptibly clothed with a short, appressed pubescence except on the usual glabrous areas; interocular space a little depressed, particularly laterally, and subflattened. Bucculae elevated anteriorly, decreasing at level of antenniferous tubercles, the rostral groove not reaching base of head. Rostrum reaching level of apices of middle coxae, the first segment just attaining base of head; segments one to four 8-7-7-7. Antennae approximately half again as long as greatest width of pronotum, 35:24; segments one to four 5-10-10-10.

Pronotum about three fifths as long as broad, 15:24; one fifth broader than head across eyes, 24:19; and scarcely longer than head on median line, 15:14; sides rather strongly convergent anteriorly and only feebly ampliate at level of callosities; disk moderately convex, particularly on posterior lobe, a little depressed in front of callosities and feebly impressed behind them; with a short, appressed, inconspicuous pubescence anterolaterally around callosities.

Hemelytra exceeding tip of abdomen by one third the length of membrane; membrane scarcely shorter than costal margin; extending farther behind level of apices of coria than length of membrane before this. Corium subhyaline, vein R + M branching at apical fourth; costal margins subbasally sinuate, then subparallel to level of apex of scutellum and moderately arcuate posteriorly.

Postero-lateral angle of metapleuron distinctly, angulately produced; meso and metapleura distinctly but irregularly punctate. Under side with an appressed, inconspicuous pubescence laterally and on venter. Female proportionately broader than the male, genital cleft fairly deep, its apex three fourths as far from base as from tip of abdomen, 15:20; fourth segment very short at middle, only one fifth the length of third segment.

Color light brown, the head black except for ochraceous ocular margins, tylus and inner margins of juga, antenniferous tubercles, bucculae anteriorly, and under surface laterally. Pronotum with brown humeri and a brown spot at middle of posterior margin and with whitish lateral margins at middle and longitudinal median carina at least anteriorly. Scutellum piceous on basal depressed area and extending posteriorly at middle, with black punctures and white apex. Hemelytra with dark brown to black at extreme base and on commissure of clavus, along vein Cu and inner branch of R + M, at apices of coria and on membrane basally except for a white midline and at middle of apical half. Under side black ventrally and black variegated with brown laterally, the front margin of prosternum, coxal flanges, ostiolar canal, and reflexed posterior margin of metapleuron ochraceous. Antennae ochraceous or darker, the first segment pale with black inner apex, the second segment infuscated basally and subapically, the third segment fuscous except for pale apex, the fourth segment brown. Rostrum ochraceous with black apex. Legs pale with brown spots and a generally suffused brown color on femora, tibiae and tarsi brownish at least apically.

Size: male, length 4.27 mm., width 1.44 mm.; female, length 4.72 mm., width 1.66 mm.

Holotype male, 1429, allotype female, 1429A, one female and three male paratypes, Kilauea, Hawaii, Aug. 19, 1935, on *Pipturus* (R.L.U.) (pl. 6, J, male). Other material at hand includes one male, Hawaii, Koebele; one male, Upper Hamakua Ditch Trail, Kohala Mts., Hawaii, Sept. 5, 1919 on *Pipturus*

(O.H.S.); and one male, Upper Hamakua Ditch Trail, Oct. 2, 1929, on miscellaneous ferns (O.H.S.).

There is some variation, particularly in color, in the series, the black markings of the membrane and corial veins often being less extensive. Also an obscure longitudinal pale line is visible in some specimens between the eyes. The entire under surface of the head is black in the two females.

This species has the aspect of the *hiloensis* group but has the short head and rostrum and, in the female, even the posteriorly convergent costal margins of the *mauiensis* group.

47. *Neseis* (*Trachynysius*) *hiloensis hiloensis* (Perkins) (pl. 6, I).

Nysius hiloensis Perkins, Ent. Soc. London, Trans. (1911), 735-736, 1912.

Head a little broader than long, 18:14; produced in front of the eyes for a distance less than length of an eye, 5.5:7; eyes large, over half as wide as interocular space, 5:8; upper surface somewhat scabrous and covered with a pale, appressed pubescence except along ocular margins, on oval areas between these margins and ocelli, and on tylus; interocular space subflattened or a little depressed sublaterally near the base; bucculae distinctly elevated anteriorly, decreasing at level of antenniferous tubercles, the rostral groove not reaching base of head. Rostrum reaching posterior margins of middle coxae, the first segment attaining base of head; segments one to four 7-7-7-6. Antennae half again as long as greatest width of pronotum, 34:23; segments one to four 5-10-10-9.

Pronotum half again as broad at humeral angles as long, 23:14.5; a little less than one third broader than head across eyes, 23:18; subequal in length to head on median line; lateral margins feebly carinate on posterior lobe as seen from the side, feebly sinuate at middle as seen from above; disk only moderately convex, the callosities feebly elevated and the posterior lobe a little more elevated on either side of middle, with a fine, appressed pubescence surrounding the callosities, particularly antero-laterally.

Hemelytra rather long, extending beyond tip of abdomen for a distance less than one third the total length of membrane, 10:35; membrane scarcely shorter than costal margin, 35:38; produced just about as far behind apices of coria as length before this level; corium hyaline, vein R + M branching at apical third; costal margins appearing subparallel, subbasally sinuate, then parallel to level of apex of scutellum and feebly arcuate behind this.

Postero-lateral angles of metapleura moderately produced and subrounded at apices. Meso and metapleura irregularly punctured. Pubescence fine, pale and appressed on under surface of head, thoracic pleura, and venter at least on basal half, longer and erect especially at middle of venter on posterior half. Thoracic sterna glabrous. Female genital cleft rather deep, the length of first four abdominal segments on median line only two thirds that of posterior portion, the fourth segment one fourth as long as third on median line.

Color ochraceous with brown markings, the head black except for ocular margins, tylus and inner margins of juga, more or less distinct longitudinal line at middle of interocular space, antenniferous tubercles, bucculae anteriorly, and under surface on either side of rostral groove, yellow. Pronotum with laevigate yellowish anterior margin and longitudinal line at middle extending to middle of posterior lobe; yellow lateral depressed areas of posterior lobe; and light brown punctures; elsewhere pale yellow to white. Hemelytra with commissure of clavus, apices of coria and sometimes with corial veins brown. Membrane pale and hyaline with brown spots just opposite apices of coria and at middle of posterior half. Antennae pale yellow to white, infuscated on inner apical half of first segment, basally and subapically on second and third segments and more or less on fourth segment. Rostrum pale with fourth segment black. Under surface brown laterally and

black ventrally with pale anterior portion of prosternum, coxal flanges, ostiolar canal, reflexed posterior margins of metapleura, and lateral margins of abdominal segments. Legs pale with the femora a little spotted with brown on distal portions, the tibiae and tarsi infuscated apically.

Size: male, length 4.22 mm., width 1.38 mm.; female, length 3.94 mm., width 1.44 mm.

Described from the male type and one other male, Hilo, Hawaii, 1,200 feet, June 1903 (R.C.L.P.). Other material at hand includes five males and one female, same data as the type but collected in July 1903 (pl. 6, I, male, R.C.L.P.); and seven males and two females, Hilo, Hawaii, Oct. 26, 1908.

There is some variation in the series, the laevigate yellow areas of the pronotum being more extensive in some specimens. I spent four days in the region back of Hilo at 1,200 feet searching for this species in 1935 but found only *N. n. comitans*. The host is undoubtedly *Pipturus*. In the 1908 series, *N. n. comitans* specimens are mounted on the same pins with some of the *N. n. hiloensis* specimens and Perkins evidently collected the species together in 1903.

48. *Neseis* (*Trachynysius*) *swezeyi*, new species (pl. 5, G).

Head three fourths as long as wide, 15.5:21; produced in front of the eyes for a distance two thirds as long as an eye, 5.5:8; eyes large, a little wider than half width of interocular space, 5.5:10; upper surface irregularly, rugosely roughened and clothed with a short, pale, appressed pubescence except for smooth ocular margins, tylus, and oval spots antero-laterad to ocelli. Bucculae elevated anteriorly, gradually decreasing in height at level of antenniferous tubercles, the rostral groove not attaining base of head; segments one to four 8-8.5-8-7. Antennae one third longer than pronotum behind, 38:28; segments one to four 5-11-11-11.

Pronotum one third broader than head, 28:21; a little less than two thirds as long as broad, 18:28; lateral margins feebly carinate and a little swollen at level of callosities; disk convex on posterior lobe on either side of a shallow central depression, the sides depressed in front of humeri, transversely impressed at posterior margins of callosities; finely pubescent antero-laterally surrounding callosities.

Hemelytra moderately long, exceeding tip of abdomen by a little less than one third its total length; clavus and corium subhyaline; corium not strongly depressed laterally, apical cell of R + M medium-sized; costal margins sinuate subbasally, subparallel to level of apex of scutellum and then moderately dilated posteriorly and a little convergent near membrane; membrane about as long behind level of apices of coria as in front.

Postero-lateral angle of metapleuron strongly produced. Meso and metapleura obscurely punctate. Female genital cleft rather shallow, the fourth visible ventral segment a little over one third as long as third at middle. Venter sparsely clothed with semi-erect pale hairs ventrally and a denser, appressed pubescence laterally.

Color reddish brown with a black head except for pale ocular margins, longitudinal line at middle of interocular space, middle of tylus, inner margins of juga, apices of antenniferous tubercles, elevated anterior portions of bucculae, and under side basally and laterally; posterior margin and humeral angles of pronotum black; black base of scutellum at middle and white apex of scutellum; brown to black commissure of clavus and apical margins and apices of coria and pale extended costal margins except at apices; pale membrane with brown extreme base, spot before apices of coria and apical spot extending forward towards the lateral spots; under side pale, ochraceous on anterior margin of prosternum, posteriorly on propleura, coxal plates, ostiolar canals, posterior margins of metapleura, and sides of venter; elsewhere more or less black. Rostrum pale with black apex.

Antennae pale with black ring subapically on first segment, black ring basally and subapically on second and third segments, and generally brown fourth segment except for pale base. Legs pale with brown spots or lines on femora, brown bases and apices of tibiae, and brown apices of tarsi.

Size: male, length 4.7 mm., width 1.72 mm.; female, length 5.33 mm., width 1.94 mm.

Holotype male, 1430, allotype female, 1430A, and 16 paratypes, Mapulehu-Punaula Ridge, Molokai, Aug. 14, 1936, on *Pipturus* (R.L.U.); seven paratypes, Kainalu, Molokai, 3,000 feet, July 26, 28, 1927, on *Pipturus* (O.H.S.) (pl. 5, G, July 28, 1927); one specimen, Mapulehu Valley, Aug. 15, 1936 (R.L.U.).

A very distinctive species near *N. cryptus* but larger and tinged with reddish or ferruginous throughout. It is with great pleasure that I dedicate this distinctive species to its first collector, the veteran entomologist of the Hawaiian islands, O. H. Swezey.

49. *Neseis (Trachynysius) saundersianus* (Kirkaldy) (pl. 5, F).

Nysius saundersianus Kirkaldy, Fauna Haw. 3: 163, 164, 1902; 2: 537, 1910; Haw. Ent. Soc., Proc. 1: 189, 1908. Giffard, Haw. Ent. Soc., Proc. 1: 180, 1908.

Nysius nitidus (White) Perkins, Ent. Soc. London, Trans. (1911), 732, 1912 (= *saundersianus* Kirkaldy).

Nysius saundersi Perkins, Fauna Haw., Introduction, 195, 1913.

Head about one third broader than long, 23.5:17; produced in front of the eyes for a distance three fourths as great as length of an eye; eyes large, wider than half the width of interocular space, 6.5:11; upper surface polished, finely and irregularly rugose except for the usual glabrous areas and with a few appressed, pale hairs, especially anterolaterally; scarcely elevated along middle and subdepressed sublaterally; bucculae quite small, elevated anteriorly, decreasing at level of antenniferous tubercles, the rostral groove not reaching base of head. Rostrum reaching to middle of intermediate coxae; segments one to four 12-11-8-8. Antennae approximately two thirds longer than width of pronotum, 61:38; segments one to four 8-19-17-17.

Pronotum more than half again as broad as long, 38:23.5; and considerably longer than head on median line, 22.5:17; lateral margins strongly convergent anteriorly, more strongly ampliate at level of callosities; disk rather strongly convex, feebly, transversely impressed at hind margins of callosities, the punctures rather widely scattered and shallow, particularly on posterior lobe; with sparse, short, erect hairs, invisible from above, on disk and with short, backwardly directed, suberect hairs along lateral margins.

Hemelytra very long, exceeding tip of abdomen by over one third the length of membrane, 21:58; membrane almost as long as costal margin, 58:61; longer behind level of apices of coria than in front of this, 31:27; corium subhyaline, vein R + M branching at apical third, vein Sc distinct; costal margins sinuate subbasally, only moderately arcuate behind level of apex of scutellum.

Postero-lateral angle of metapleuron a little produced, subrounded at apex. Meso- and metapleura superficially punctured. Under surface rather densely clothed with a fine, appressed, pale pubescence laterally except on the usual naked areas, the venter posteriorly with longer, erect bristles. Female genital cleft relatively deep, the apex two thirds as far from tip of abdomen as from its base, fourth ventral segment only one third as long as third at middle.

Color light brown to ochraceous, the head black with ocular margins, longitudinal stripe between the eyes, tylus at middle, inner margins of juga, antenniferous tubercles, bucculae anteriorly, and under surface posteriorly and laterally, ochraceous. Pronotum with brown spots on humeri as well as sublaterally and at middle of posterior margin. Scutellum black basally, at middle of posterior half, and in and surrounding lateral punctures, elsewhere white. Hemelytra with base and commissure of clavus, apex of corium except for pale apical margin, and posterior branching portion of vein $R + M$, brown. Membrane uniformly light brown, a little darker near middle of apical margin of corium. Under surface dark brown to black with the usual pale areas. Antennae with first segment pale with black on inner apical half, second and third segments broadly infuscated basally and subapically, the fourth segment entirely brown. Rostrum pale with black apex. Legs pale, the femora brown-spotted and usually with a small brown ring subapically; tibiae and tarsi infuscated apically.

Size: male, length 6.72 mm., width 2.44 mm.; female, length 7.22 mm., width 2.55 mm.

Holotype, a male, Kilauea, Hawaii, Perkins, 656. The present descriptions have been drawn from a male collected by O. H. Swezey at Kilauea, Hawaii, Kipuka Puauolu, July 14, 1934, on *Urera*, and a female collected at Kilauea by Perkins in 1906. Other Hawaii material includes Kirkaldy's paralectotypes and other Perkins material from Kona and Kilauea; a series of specimens collected by Giffard in the dry forest at Kilauea, Hawaii, 4,000 feet; one specimen taken by Swezey on *Urera* and *Sapindus*, at Kilauea Aug. 5, 1919; and one specimen taken by me at Kilauea, Aug. 19, 1935. (See pl. 5, *F*, male, Kilauea, Hawaii, June 1903, R.C.L.P.)

Series from the other islands differ slightly as follows: a single male, Halehaku, Maui, June 16, 1920 (E. H. B.) has much larger eyes with the interocular space subdepressed, the head produced only one third as far in front of the eyes as length of an eye, 6:9, and the pronotum more deeply, transversely impressed at hind margins of callosities. Some Lanai specimens, including a specimen collected by Perkins on *Broussonetia*, three specimens collected by Blackburn and labeled *Nysius nitidus* on the under side of the card, and a Giffard specimen from Koele, 2,000 feet, agree with typical Kilauea examples, while a series of eight specimens collected by me at Lanaihale, Nov. 28, 1935, on *Coprosma* are considerably smaller (5.16 mm. by 1.6 mm. to 6 mm. by 2 mm.) with the eyes smaller and the head produced in front of the eyes for a length almost equal to that of an eye, 6:7. Molokai specimens include one of Kirkaldy's cotypes, Molokai Mts., 4,500 feet, Sept. 11, 1893 (R. C. L. P.) and a series of seven specimens collected by me on the Mapulehu-Punaula Ridge, Aug. 15, 1936, on *Urera*. These specimens are quite typical, but for the distinct transverse impression along hind margin of callosities. Oahu specimens include four collected in the Honolulu Mts. on *Freyinetia* by Perkins; two specimens collected by me in Pukaloa Valley on March 22, 1936 on *Pisonia* and *Claoxylon*; one specimen collected by me in Haleauau Valley, March 8, 1936, on *Pipturus*; one specimen each collected by F. X. Williams and me on Mt. Kaala; and two specimens, Malamalama, Oahu, Nov. 30, 1919 (E. H. B.). These Oahu specimens exhibit the entire range in size of body, eyes, transverse

impression of pronotal disk, and other characters seen in specimens from the other islands. Under the circumstances, then, it would appear that we are dealing with a single, very variable species which, either by frequent crossing from island to island (this being the largest and presumably the sturdiest species of the genus) or for other reasons, does not present variations resolved into separate norms on the various islands. *N. saundersianus* has not yet been recorded from Kauai. Perkins synonymized this species with *N. nitidus* but the two are very distinct as pointed out in the discussion under *nitidus*.

50. *Neseis (Trachynysius) alternatus*, new species (pl. 6, F).

Head transverse, 17:13; produced in front of the eyes for a distance subequal to length of eyes; eyes small, only half as wide as interocular space; upper surface moderately, evenly elevated between the eyes, densely, finely scabrous punctate and irregularly clothed with pale, appressed hairs, except on glabrous ocular margins, tylus, and antenniferous tubercles. Bucculae feebly elevated anteriorly, decreasing at level of antenniferous tubercles and ending at posterior extremity of rostral groove at basal third of hypostomal area. Rostrum just reaching posterior coxae, the first segment surpassing rostral groove but scarcely reaching base of head; segments one to four 8-9-7-7. Antennae short, only one sixth longer than width of pronotum behind, 31.5:25.5; segments one to four 5-9-8.5-9.

Pronotum transverse, less than twice as broad as long, 25.5:15; one third broader than head including eyes, 25.5:17; lateral margins moderately convergent anteriorly, more strongly swollen at level of callosities, subrounded at sides with a small carina seen in side view; disk moderately elevated, the callosities more strongly so, depressed laterally in front of humeri; anterior lobe clothed with pale, appressed hairs laterally surrounding callosities, the posterior lobe naked and highly polished.

Hemelytra moderately long, the membrane exceeding tip of abdomen by one eighth its length; corium depressed laterally with the extreme margin reflexed; costal margins a little dilated at base, subparallel to level of apex of scutellum, and then distinctly dilated and rounded, converging posteriorly.

Postero-lateral angle of metapleuron moderately strongly produced, rounded at apex. Female genital cleft rather deep, the fourth visible ventral segment angulately emarginate posteriorly and almost concealed beneath third segment at middle.

Color black with ochraceous to ivory-white ocular margins which enlarge a little anteriorly, mid-line of tylus, antenniferous tubercles, elevated portions of bucculae anteriorly, posterior margin of head beneath, median spot at anterior margin of pronotum and variegated areas on posterior lobe of pronotum, obscure basal angles and distinct apex and apical carina of scutellum, anterior margin of prosternum, coxal flanges, ostiolar canals, sides of humeral angles, posterior margin and angle of metapleuron, and postero-lateral angles of connexivum above and below. Hemelytra ochraceous or darker with broad irregular brown areas on apical half of clavus, inner portion of corium at middle, and apex of corium. Membrane pale with ill-defined brown markings irregularly at middle. Abdomen beneath brown with markings varying from yellow to black. Rostrum pale, with black apex. Legs yellow, the femora brown-spotted with suggestions of a median and subapical brown ring, tibiae yellow with brown rings at bases, apices, and middle. Tarsi brown at apices. Antennae black ringed with yellow on base and apex of first segment, subbasally and apically on second segment, and narrowly at base and more broadly at apex of third segment. Fourth segment more densely hairy and appearing brownish.

Length: 4.28 mm., width (pronotum) 1.42 mm.

Holotype, female, 1431, Halemanu, Kauai, June 29, 1932, on *Pterotropia* (O. H. S.) (pl. 6, F).

This species is very different in general facies from other *Neseis*, the small

eyes and scabrous-punctate upper surface of the head immediately separating it from its closest allies in the *mauiensis* group of *Neseis*. It is perhaps significant that *N. mauiensis* occurs on *Cheirodendron* on Maui while *N. alternatus* occurs on *Pterotropia*, also in the order Araliaceae, on Kauai.

51. *Neseis* (*Trachynysius*) *silvestris* (Kirkaldy) (pl. 6, G).

Nysius silvestris Kirkaldy, Fauna Haw. 2: 541-542, 1910.

Head much broader than long, 16:11.5; produced in front of the eyes for a distance slightly greater than half the length of an eye, 3.5:6; eyes very large, almost two thirds as wide as interocular space, 4.5:7; upper surface depressed and subflattened between the eyes, polished but scabrous except on ocular margins which are dilated anteriorly, on base of vertex, and on tylus. Bucculae very small but distinctly elevated anteriorly, abruptly decreasing in height at level of antenniferous tubercles, the rostral groove not reaching base of head. Rostrum reaching to middle of intermediate coxae, the first segment reaching the base of head; segments one to four 7-6-6-5. Antennae two fifths longer than width of pronotum, 27.5:20; segments one to four 5-7-7-8.5.

Pronotum five eighths as long as wide, 12.5:20; one fourth wider than head, 20:16; and a little longer than head, 12.5:11.5; sides a little carinate, strongly anteriorly convergent, and only feebly swollen at level of callosities; disk moderately convex on posterior lobe, transversely impressed immediately behind the callosities; with a short, subappressed pubescence antero-laterally surrounding the callosities.

Hemelytra long, the membrane exceeding tip of abdomen by almost one third its length; corium subopaque, apical cell of R + M very short; costal margins sinuate subbasally, parallel to level of apex of scutellum, and then moderately strongly dilated and arcuate, converging posteriorly; membrane very long, produced more than half the total length of membrane behind level of apices of coria.

Postero-lateral angle of metapleuron angulately produced. Meso and metapleura rather shallowly but distinctly punctate. Female genital cleft rather deep and subacute, the fourth visible ventral segment only one fifth as long as third at middle.

Color dark brown to black with ochraceous to yellow ocular margins, longitudinal line between the eyes, tylus and inner margins of juga except in sutures, antenniferous tubercles, elevated anterior portions of bucculae, and under surface of head posteriorly and laterally. Pronotum ochraceous with yellow anterior and lateral margins, fulvous callosities, and black posterior margin, humeri, and longitudinal fasciae extending forward from base at middle and sublaterally. Scutellum black with paler basal angles and lateral margins and white apex. Clavus and corium piceous with the anterior half of dilated costal margin pale, and with bases of coria often fulvous to fuscous. Membrane entirely brown almost to level of apices of coria, behind which it is either entirely clear or with a longitudinal brown marking at middle. Under surface pale yellow to white at anterior margin of prosternum, propleura just beneath humeri, coxal sockets, ostiolar canal, and reflexed posterior portions of metapleura; black at middle of prosternum, over most of mesosternum and mesopleura except near articulations of hemelytra, metasternum, and irregularly at middle of venter; elsewhere brownish. Rostrum yellow with black at apex. Antennae pale with black subapically on inner side of first segment, black ring basally and subapically on second and basally on third segments and a brown or paler fourth segment. Legs pale with apical half of hind femora pink or reddish, apices of tibiae and tarsi a little infuscated.

Size: male, length 3.16 mm., width 1.28 mm.; female, length 4 mm., width 1.55 mm.

The hololectotype, a female, Waianae Mts. 3,000 ft., February 1896, Perkins, 547, has the membrane clear apically. Material at hand includes two paratypes, no. 547; two males and a female, Haleauau Valley, Waianae Mts., Oahu, March 8, 1936, on *Straussia* (R. L. U.); and a male and a female, Ma-

noa-Palolo Ridge on the trail to Mount Olympus, Koolau Mts., Oahu, on *Straussia kaduana* (R.L.U.). (See pl. 6, G, male, East Manoa Ridge, on trail to Mt. Olympus, Sept. 15, 1935, R.L.U.)

52. *Neseis* (*Trachynysius*) *chinai*, new species (pl. 5, E).

Head considerably broader than long, 18:14; produced in front of the eyes for a distance less than length of an eye, 5:6; eyes rather small, one half as wide as interocular space; upper surface minutely scabrous and sparsely clothed with an appressed, pale pubescence except on the usual glabrous areas; distinctly elevated along the middle between the eyes. Bucculae distinctly elevated anteriorly, decreasing at level of antenniferous tubercles, the rostral groove not reaching base of head. Rostrum reaching onto bases of middle coxae, the first segment attaining base of head; segments one to four 8-8-7-6. Antennae about one fifth longer than width of pronotum across humeri, 31:25; segments one to four 5-9-8-9. Pronotum less than twice as broad as long, 25:14; about one third broader than head including eyes, 25:18; and equal in length to head on median line; sides strongly converging anteriorly and distinctly rounded at level of callosities; disk only moderately elevated and feebly transversely impressed at hind margins of callosities, with a very short but dense pubescence of subappressed hairs antero-laterally around the callosities.

Hemelytra fairly long, exceeding tip of abdomen by one third the length of membrane; membrane a little shorter than costal margin, 37:39; scarcely shorter behind level of apices of coria than before this, 17:18; corium subhyaline, vein R + M branching a little beyond apical third, Sc quite distinct; costal margins rather strongly arcuate behind level of apex of scutellum.

Postero-lateral angle of metapleuron strongly, subacutely produced. Meso and metapleura only superficially punctured. Under side conspicuously clothed with a fine, appressed, pale pubescence; glabrous areas naked. Female genital cleft relatively shallow, its apex at about middle of abdomen, the fourth visible abdominal segment over half the length of third at middle.

Color light brown with black head except very narrowly on ocular margins, tylus at middle, antenniferous tubercles, and bucculae anteriorly. Pronotum broadly black in region of humeral angles and with a small black spot at middle of posterior margin. Scutellar disk entirely black, the elevated sides and apex white. Hemelytra pale with black narrowly at base, on apical third and along commissure of clavus, on posterior half of corium and towards the center of vein Cu, and along posterior margin of corium including and laterad of the inner branch of R + M. Membrane infuscated basally, laterally just before apices of coria, and on middle of posterior half. Under surface in great part black on head and thorax and brown on abdomen with pale anterior margin of prosternum, coxal flanges, ostiolar canal, reflexed posterior margin of metapleuron, and portions of abdominal segments posteriorly and laterally. Antennae rather generally infuscated with the first segment pale except at inner apex, the second segment pale near the middle and apically, and the third segment pale at apex. Rostrum pale with black apex. Legs pale with brown-spotted femora, the apices of tibiae and tarsi brown.

Size: female, length 4.27 to 4.5 mm., width 1.6 to 1.72 mm.

Holotype, female, 1432, and one female paratype, Mapulehu-Punaula Ridge, Molokai, Aug. 15, 1936 (R. L. U.) (pl. 5, E).

This species has the short head and rostrum of *N. mauiensis* but is much broader and differently colored. A male and female from Maui, Kula Pipe Line, June 13, 1927 (O. H. S.) are somewhat paler, with apparently thicker antennae and more conspicuous pubescence on the head above. A longer series will be necessary to determine whether these differences are constant.

It gives me great pleasure to name this species after W. E. China, one of the best students of *Nysius*, who has done so much to facilitate my work in the Hemiptera.

53. *Neseis* (*Trachynysius*) *mauiensis* (Blackburn) (pl. 6, *E*).

Nysius mauiensis Blackburn, Linn. Soc. N. S. Wales, Proc. II, 3: 344, 346, 1888. Kirkaldy, Haw. Ent. Soc., Proc. 1: 190, 1908; Fauna Haw. 2: 538, 1910. Perkins, Ent. Soc. London, Trans. (1911), 732, 1912.

Head strongly transverse, the ratio of width to length as 19.5:14; produced before the eyes for a distance a little more than two thirds the length of an eye, 5.5:7; eyes of moderate size, one half the width of interocular space; upper surface a little elevated at middle, finely scabrous, and clothed with a very fine, pale pubescence, except along glabrous ocular margins and tylus; bucculae small but distinctly elevated anteriorly, reduced at level of antenniferous tubercles, the rostral groove not reaching base of head. Rostrum reaching posterior margins of middle coxae, the first segment scarcely reaching base of head; segments one to four 8-7-7-5.5. Antennae short, only about one tenth longer than greatest width of pronotum, 29:26; segments one to four 4-8-8-9.

Pronotum subtrapezoidal, much broader than long, 26:16; and one third broader than head including eyes, 26:19.5; lateral margins relatively slightly convergent anteriorly, feebly swollen at level of callosities and laterally carinate behind this; disk moderately and rather evenly convex, not deeply impressed behind the callosities, clothed with a fine, pale pubescence antero-laterally around the callosities.

Hemelytra relatively short, exceeding tip of abdomen by less than one third the total length of membrane; corium somewhat depressed laterally, with only the extreme edge of posterior half a little reflexed; costal margins immediately dilated at base, then subparallel to level of apex of scutellum after which they are feebly, evenly arcuate, converging posteriorly.

Postero-lateral angle of metapleuron rather strongly, angulately produced. Female genital cleft obtuse, the fourth visible ventral segment half as long as third on median line.

Color varying from quite dark fusco-piceous above to fulvous or almost testaceous with the head black except for ochraceous ocular margins enlarging to semilunar spots anteriorly, more or less distinct longitudinal line at middle, tylus at middle and often the inner margins of juga, elevated portions of bucculae, and antenniferous tubercles; pronotum pale with black callosities and fine dark brown spots on posterior margin, the sub-lateral ones largest, covering entire humeral angles except narrowly at apices, with a pale, elevated carina at middle of anterior margin sometimes extending between callosities. Scutellum fusco-piceous with ivory-white basal angles and longitudinal carina especially apically. Clavus and corium varying from pale brownish-testaceous to hyaline with veins, apex of corium and apical margin of corium brownish to entirely fusco-piceous except for pale third and depressed marginal area on basal three fourths. Membrane with a dark brown area dilating posteriorly from middle and reaching apical margins of corium, pale at base. Beneath black, with margins of sterna and pleura sometimes pale, coxal flanges, ostiolar canal, reflexed posterior margin of metapleuron, abdominal segments laterally and posteriorly and entire terminal segments beneath in female, ochraceous. Antennae either pale with black annulations or vice versa. Rostrum testaceous to fulvous becoming darker at apex. Legs pale, the femora spotted with brown on apical two thirds, the tibiae infuscated at middle and extremities and the tarsi brown at apices.

Size: male, length 4.3 mm., width 1.44 mm.; female, length 4.27 mm., width 1.55 mm.

Holotype, Maui, from the Blackburn collection. Other material examined includes 18 specimens from Waikamoi, 4,500 feet, and Olinda, 4,200 feet, Maui, collected by Swezey, Giffard, and Fullaway on *Cheirodendron*, *Co-*

prosmia, *Pelea*, *Rubus*, and *Clermontia arborescens*. (See pl. 6, E, female, Olinda, Maui, Feb. 27, 1926, O.H.S.)

Unfortunately Blackburn's type, as noted by Perkins (1911), is in a fragmentary state. All that remains is the ventral portion of the thorax, the complete right hemelytron, a portion of the left hemelytron and four legs. The corium is seen to be rather broadly embrowned at center and at apex but there is only a small, ill-defined dark area on the clavus. Although scarcely an extreme form, this specimen indicates which form should be considered as typical of the species. Blackburn gives 5 mm. as the length of his type but the costal margin is exactly the same length as that of the somewhat smaller specimen described and figured above.

54. *Neseis (Trachynysius) mauiensis* var. *pallidipennis*, new variety (pl. 6, D).

A light-colored form with pale, subhyaline corium and with brown spots restricted mainly to apices of coria. Vertex with a more distinct ochraceous line at middle. Antennae pale with brown inner half of basal segment, and brown bases and apices of second and third segments and base of fourth segment.

Holotype, male, 1433, Waikamoi, Maui, 4,500 feet, Jan. 14, 1926 (O.H.S.).

This and typical *mauiensis* were collected on the same date at Olinda, but as the color variation resolves itself into two fairly distinct phases, the varietal status seems to be warranted. Two specimens studied by Kirkaldy, Haleakala, 5,000 feet, March and April 1894 (R.C.L.P.) are somewhat smaller and relatively broader but evidently belong here.

55-57. *Neseis (Trachynysius) fasciatus*, new species.

A comparatively short and broad species with very short head and rostrum as in *N. mauiensis* but differing from that species in its distinctly narrowed anterior portion of pronotum and its more convex posterior lobe of pronotal disk. This is a very dark species with longitudinal dark fasciae posteriorly on the pronotum.

Two quite distinct forms occur, one on the island of Hawaii and the other on Lanai.

55. *Neseis (Trachynysius) fasciatus fasciatus*, new subspecies (pl. 6, A).

Head strongly transverse, the ratio of width to length, 18.5:12.5; produced in front of the eyes for a distance a little less than two thirds the length of an eye, 4.5:7; the eyes large, more than two thirds the width of interocular space, 5.5:7.5; only feebly elevated between the eyes; upper surface scabrous and either naked or clothed with an obscure, appressed pubescence except for glabrous ocular margins and middle of tylus. Bucculae small but distinctly elevated anteriorly, reduced at level of antenniferous tubercles, the rostral groove not reaching base of head. Rostrum reaching middle coxae, the first segment reaching base of head; segments one to four 8-8-6-5. Antennae short, about one fifth longer than greatest width of pronotum, 29:24; segments one to four 4-8-8-9.

Pronotum subtrapezoidal, broader than long, 24:15; one third broader than head, 24:18.5; lateral margins relatively strongly convergent anteriorly, scarcely swollen at level of callosities, and laterally carinate behind this; disk moderately strongly convex particularly on posterior lobe and distinctly impressed behind the callosities; with a fine pubescence antero-laterally surrounding the callosities.

Hemelytra of moderate length, exceeding tip of abdomen by two fifths the length of membrane; corium a little depressed along lateral area with the lateral margin feebly reflexed on posterior half; costal margins a little dilated at base, then briefly subparallel behind which they are moderately dilated and only feebly convergent posteriorly.

Postero-lateral angle of metapleuron moderately produced, rounded at apex. Female genital cleft obtuse, the fourth visible segment one half as long as third on median line.

Color varying from quite dark fusco-piceous above to fulvous or paler with head black, except for ochraceous ocular margins with ill-defined semilunar area anteriorly, middle of tylus and narrow inner margins of juga, elevated portions of bucculae, and antenniferous tubercles. Pronotum varying from pale with brownish callosities and fine longitudinal vittae at least at base to a much darker condition with ill-defined longitudinal vittae and with a whitish vitta either side of middle of posterior lobe. Scutellum pitchy black with whitish angles. Clavus and corium varying from pale subhyaline with brownish veins, apices, and apical margins, to entirely piceous, except narrowly at middle of lateral margin. Membrane embrowned longitudinally and, in dark specimens, also at base. Beneath black, with pale anterior margin of prosternum, sides of propleura, reflexed posterior margin of metapleuron, ostiolar canals, coxal sockets, and abdominal segments postero-laterally and at middle posteriorly. Rostrum rather pale except at apex. Antennae pale except for brown on inner apical half of first segments and sometimes entire fourth segment. Legs pale, the femora spotted with black on posterior half, tibiae black at base, middle, and apex and tarsi infuscated apically.

Size: male, length 4.16 mm., width 1.39 mm.; female, length 4.5 mm., width 1.63 mm.

Holotype, male, 1434, allotype female, 1434A (pl. 6, A), and two paratype females, Kilauea, Hawaii, Aug. 19, 1935, on *Coprosma* (R. L. U.). Three male paratypes, same locality on Aug. 18, 1935. Thirty specimens are before me collected at Kona, 4,000 feet; Kilauea; Puuwaawaa, North Kona, 3,700 feet; 23 miles Olaa, 2,300 feet; and Upper Hamakua Ditch Trail, on *Straussia* and *Myrsine*, by Perkins, Swezey, Giffard, and me.

56. *Neseis* (*Trachynysius*) *fasciatus fasciatus* var. *hyalinus*, new variety (pl. 6, B).

A pale form with subhyaline clavus and corium.

Holotype male, 1435, Puuwaawaa, North Kona, Hawaii, 3,790 feet, Aug. 25, 1917 (W. M. G.) (pl. 6, B). Thirteen other specimens of this form from Kilauea collected by Swezey, Giffard, and me on *Straussia*, *Coprosma*, and *Pelea*.

57. *Neseis* (*Trachynysius*) *fasciatus convergens*, new subspecies (pl. 6, C).

Head a little over two thirds as long as broad, 13:18; produced in front of the eyes for a distance less than the length of an eye, 5:6.5; eyes large, one half as broad as interocular space; upper surface finely scabrous and clothed with a fine vestiture of appressed, pale hairs except on the usual glabrous areas; subdepressed and subflattened between the eyes, the tylus rather strongly elevated just beyond base. Bucculae elevated anteriorly, decreasing at level of antenniferous tubercles, the rostral groove not reaching base of head; segments one to four 8-7.5-6-5. Antennae one fifth longer than greatest width of pronotum 31.5:26; the segments one to four 4.5-9.5-8.5-9.

Pronotum about three fifths as long as broad, 16.5:26; more than one third broader than head including eyes, 26:18; and considerably longer than head on median line, 16.5:13; sides strongly convergent anteriorly and only feebly ampliate at level of callosities; disk strongly convex on posterior lobe just behind impressed transverse line of punctures along posterior margins of callosities; with a fine, appressed, pale pubescence antero-

laterally around callosities; posterior disk with laevigate areas on either side of the middle anteriorly and laterally and with deep punctures posteriorly, feebly joined transversely by ill-defined wrinkles.

Hemelytra long, exceeding tip of abdomen by one third the length of membrane; membrane about as long as costal margin; longer behind level of apices of coria than in front of this, 21:17; corium subopaque, vein R + M branching a little beyond apical third, Sc distinct; costal margins a little arcuate beyond level of apex of scutellum.

Postero-lateral angle of metapleuron moderately produced, subrounded at apex. Meso and metapleura very superficially punctured. Under surface with a fine, dense, pale, appressed pubescence, especially laterally and on venter. Female genital cleft relatively shallow, its apex reaching about to middle of abdomen, fourth segment at middle a little less than one half as long as third, 2:5.

Color in great part pitchy black, the head black with ochraceous spots at inner anterior angles of eyes, on middle of tylus, on inner margins of juga, antenniferous tubercles, and bucculae anteriorly. Pronotum with brown callosities, ochraceous laevigate areas between punctures, and fine, ill-defined, longitudinal black vittae (including humeral spots) on posterior lobe. Scutellum black at center, white laterally, and subbasally and on elevated portions of apex. Hemelytra with clavus and corium in great part brownish to piceous with ill-defined paler areas subbasally and between the veins, the expanded costal margins pale almost to level of branching of R + M. Membrane infuscated basally, laterally before apices of coria, and apically at middle. Under surface black ventrally and brown sublaterally on abdomen with ochraceous anterior margin of prosternum, coxal plates, propleura posteriorly and extending up to humeri, ostiolar canal, reflexed posterior margin of metapleuron and postero-lateral angles of connexivum. Antennae pale, annulated with black basally and subapically on second and third segments, the first segment brown. Rostrum pale with black apex. Legs pale with brown-spotted femora.

Size: male, length 4.61 mm., width 1.55 mm.; female, length 4.5 mm., width 1.66 mm.

Holotype male, 1436, Lanai, December 27, 1916 (W. M. G.); allotype female, 1436A, Lanai, 3,000 feet, 1894 (R. C. L. P.) (pl. 6, C), and one female paratype, Lanai, 3,000 feet, July; one male, Lanai, over 2,000 feet, July 1896; and one male, Lanai, 3,000 feet, Feb. 1894, all collected by R. C. L. Perkins. These are the specimens upon which the Lanai records of *N. maiiensis* are based and these specimens are labeled *mauiensis* by Perkins. *N. f. convergens* differs from typical *N. fasciatus* in its strongly convex posterior pronotal lobe.

Subgenus **ICTERONYSIUS**, new subgenus

Head short and transverse; eyes small, one third or less as wide as interocular space; upper surface roughened by fine punctures and clothed with a distinct, appressed, yellowish pubescence except for oblique glabrous spots in front of ocelli and very narrow ocular margins; upper surface rather strongly elevated.

Pronotum with sides strongly convex, especially anteriorly, scarcely sinuate behind level of callosities, with distinct, suberect to subappressed, yellowish hairs on anterior lobe except callosities.

Clavus and corium subhyaline; costal margins subparallel subbasally to level of apex of scutellum; membrane long.

Metapleuron distinctly produced postero-laterally and subrounded apically. Rostrum reaching at least to posterior coxae.

Color almost entirely yellow with black maculations mainly on head and thoracic sterna.

Genotype: *Nysius ochriasis* Kirkaldy.

58. *Neseis* (*Icteronysius*) *ochriasis* (Kirkaldy) (pl. 4, C).

Nysius ochriasis Kirkaldy, Fauna Haw. 3: 162, 163, 1902; 2: 541, 1910; Haw. Ent. Soc., Proc. 1: 189, 1908. Perkins, Ent. Soc. London, Trans. (1911), 734, 1912.

Head short and broad, less than half again as broad as long, 18.5:14.5; produced in front of the eyes for a distance slightly greater than length of an eye, 6:5.5; eyes small, less than one third as broad as interocular space, 3.5:11.5; upper surface finely, granularly roughened and even minutely, transversely rugose posteriorly; clothed with a short, pale, appressed pubescence except between ocelli and eyes and on tylus, elevated along middle and subdepressed sublaterally; bucculae elevated anteriorly, gradually decreasing posteriorly to well behind level of antenniferous tubercles, the rostral groove not attaining base of head. Rostrum reaching middle of hind coxae, the first segment reaching just about to base of head; segments one to four 10-9.5-9-7.5. Antennae half again as long as greatest width of pronotum, 41:27; segments one to four 6-12-12-11.

Pronotum less than twice as broad as long, 26:15; almost half again as broad as head, 26:18.5; subequal in length to head, 15:14.5; lateral margins scarcely sinuate at middle, almost entirely arcuate, especially strongly so anteriorly at level of callosities; disk relatively strongly convex and scarcely, if at all, transversely impressed at hind margins of callosities; rather densely clothed with short, appressed, pale pubescence anteriorly and laterally, especially around callosities.

Hemelytra long, exceeding tip of abdomen by more than one third the total length of membrane, 15:40; membrane scarcely shorter than costal margin, 40:43; just about as long beyond level of apices of coria as in front of this; corium hyaline, vein R + M branching at apical third, Sc visible; costal margins distinctly but only moderately arcuate behind level of apex of scutellum.

Postero-lateral angle of metapleuron only feebly produced and subrounded at apex. Meso and especially metapleuron very feebly, sparsely punctate. Under surface clothed with a short, appressed, pale pubescence except on the usual smooth areas. Female genital cleft moderately deep, its apex about midway between base and apex of abdomen, the fourth segment only one fifth as long as third at middle, fifth segment completely concealed at middle.

Color in great part pale ochraceous, the head with very ill-defined light brown markings, punctures of pronotum and scutellum brown and veins of clavus and corium ochraceous on an otherwise hyaline background. Membrane entirely clear. Under side ochraceous anteriorly and brownish posteriorly with a black rostral trough, thoracic sterna except prosternum on anterior margin, and middle of venter basally. Rostrum pale with black apex. Antennae with brown basally or medially on first segment, basally on second and third segments, and uniformly on fourth segment. Legs mostly pale with brown tarsal apices, the femora sometimes conspicuously spotted.

Size: male, length 4.66 mm., width 1.66 mm.; female, length 4.88 mm., width 1.77 mm.

The material studied includes one specimen, Kilauea, Hawaii, July 1903, and three others, July 1906 (R. C. L. P.); three specimens numbered 656, and 16 other specimens collected by Swezey, Giffard, Muir, and me at Kilauea. One of Swezey's specimens was collected on *Pelea*, but I have found the species only on *Sophora*. Two of Kirkaldy's cotypes, Hualalai, 8,000 feet, Aug. 1892 (R. C. L. P.) differ in having the pronotum a little less convex and the rostrum slightly longer. In one of Perkins' Kilauea specimens the membrane is distinctly maculated at middle. The holotype is a male, Kilauea, Hawaii, Perkins, 656. (See pl. 4, C, female, Kau desert, Kilauea, Hawaii, 3,800 feet, Sept. 13, 1917, W.M.G.)

59. *Neseis (Icteronysius) maculiceps*, new species (pl. 4, B).

Head less than half again as broad as long, 17.5:14.5; produced in front of the eyes for a distance greater than length of an eye, 6.5:5.5; eyes small, scarcely more than one fourth the width of interocular space; upper surface distinctly granulosely or rugosely scabrous and sparsely clothed with short, appressed, pale hairs; distinctly elevated between the eyes. Bucculae distinctly elevated anteriorly, gradually decreasing posteriorly to beyond level of antenniferous tubercles, the rostral groove not reaching base of head. Rostrum exceeding hind coxae, reaching to middle of second abdominal segment, the first segment scarcely surpassing base of head; segments one to four 10.5-11-11-9. Antennae half again as long as greatest width of pronotum, 40:26; segments one to four 6-12-11-11.

Pronotum a little less than twice as broad as long, 26:14.5; about half again as broad as head including eyes, 26:17.5; and equal in length to head on median line; lateral margins broadly rounded anteriorly, feebly sinuate behind level of callosities; disk moderately elevated but more subflattened than in *ochriasis*, scarcely transversely impressed at hind margins of callosities with conspicuous, erect hairs laterally and suberect or subappressed hairs surrounding callosities.

Hemelytra long, exceeding tip of abdomen by a little more than one third the total length of membrane; membrane about as long as costal margin, produced about as far behind level of apices of coria as in front of this; corium subhyaline, vein R + M branching about at apical third, vein Sc obscure but present; costal margins distinctly arcuate beyond level of apex of scutellum, more strongly so at level of apex of commissure of clavus.

Postero-lateral angle of metapleuron only moderately produced and subrounded at apex. Meso and metapleura superficially punctured. Under surface clothed with a short, appressed, pale pubescence especially conspicuous on the venter and absent on the usual smooth areas. Female genital cleft rather deep, its apex a little more than half as far from base as distance from apex to tip of abdomen, 14:25; the fourth abdominal segment only one fifth as long as third at middle, 1:5.

Color entirely light yellowish or ochraceous as in *ochriasis* but with the head maculations extending from base over ocelli and medially, except for a yellow spot at middle, to base of tylus as well as laterally on juga and surrounding tylus, black; membrane sometimes faintly infuscated throughout and femora black-spotted.

Size: male, length 4.66 mm., width 1.61 mm.; female, length 4.72 mm., width 1.83 mm.

Holotype male, 1437, and allotype female, 1437A, two miles north of Humuula, Hawaii, approximately 8,000 feet, Mauna Kea, Hawaii, July 30, 1935, on *Sophora* (R.L.U.). Twenty-four paratypes and 16 additional specimens in poor condition collected in the region of Humuula and Hookomo on Mauna Kea, 6,000 to 9,000 feet, from July 30 to Aug. 9, 1935 (R.L.U.). (See pl. 4, B, female, 2 miles north of Humuula, Hawaii, July 30, 1935, R.L.U.)

Differs from *Neseis ochriasis* in its longer rostrum, less convex pronotal disk and black marked head.

Genus **NYSIUS** Dallas

Nysius Dallas, List of Hemipt. Brit. Mus. 2: 531, 551, 1852. Stål, Eugenes Resa, Ins. 242, 1859; Enum. Hemipt. 4: 119, 1874. Lethierry et Severin, Cat. Gén. Hémipt. 2: 153-156, 1894. Kirkaldy, Fauna Haw. 3: 162, 1902; 2: 536, 1910. Evans, Bull. Ent. Res. 19: 353-354, 1929.

Body form varying from short and broad to long and slender. Head always punctate and pubescent above; elevated portions of bucculae never reaching base of head in Hawai-

ian species, usually distinctly elevated anteriorly, gradually decreasing posteriorly, and terminating midway between level of apices of antenniferous tubercles and base of head, the rostral groove continuing to posterior margin.

Pronotum always broader behind than width of head across eyes; disk scarcely to strongly declivous and subflattened or strongly convex with abruptly subflattened anterior lobe; always clothed with a short, appressed pubescence and often with longer, erect hairs as well.

Clavus and corium likewise with an appressed pubescence as well as longer, erect hairs in some species; commissure of clavus shorter than scutellum; claval suture and vein R + M typically impunctate but with distinct punctures basally in a few species and two rows of punctures throughout their length in *fucatus* and *sublittoralis*; costal margins briefly subparallel basally and then more or less distinctly dilated.

Female genital cleft reaching about to middle of abdomen, the fourth and fifth segments usually concealed at middle or the fourth briefly visible.

Genotype: *Lygaeus thymi* Wolff, Oshanin (1912).

A cosmopolitan genus difficult to characterize, even for our region, because of the wide variety of characters exhibited by the various species. *Nysius* was long ago divided into a number of subgenera by Stål (1874) and Horváth (1890). These have since been raised to genera (Evans, 1929) and it now becomes evident that the genus in its restricted sense is further divisible into a large number of groups, a few of which are represented by some of the principal dichotomies in the following keys.

The Leeward islands species are treated as nearly as possible in phylogenetic series with the Hawaiian species but have been keyed out separately to avoid confusion.

KEY TO HAWAIIAN SPECIES OF NYSIUS

1. Rostrum distinctly surpassing posterior coxae, reaching or surpassing second abdominal segment 2.
Rostrum shorter, not or scarcely surpassing posterior coxae..... 4.
2. Head as long as broad, rostrum reaching sixth abdominal segment. Relatively small, 3.77 mm. With considerable ferruginous color above. Molokai..... (83) *Nysius abnormis*.
Head broader than long, color fulvous or testaceous above..... 3.
3. Pale color largely fulvous. Membrane distinctly fusco-fasciate along middle. All the main Hawaiian islands..... (82) *Nysius communis*.
Pale color of pronotum and hemelytra either clear hyaline or testaceous. Membrane immaculate or nearly so. Kauai..... (81) *Nysius mixtus*.
4. Anteoconal portion of head very long, about half again as long as an eye or almost twice as long as an eye. Corium clothed with short, appressed, pale pubescence imparting a grayish cast to the insect; without conspicuous erect hairs 5.
Anteoconal portion of head much shorter, about as long as an eye or at most one fourth longer. Corium often with conspicuous erect hairs as well as sub-appressed hairs 7.
5. Pronotal disk with sparsely, irregularly spaced large punctures interspersed with irregular smooth areas posteriorly. Femora usually dark brown to pitchy black except at apices. Maui and Hawaii..... (71) *Nysius lichenicola*.
Pronotal disk densely covered with very fine punctures. Femora uniformly fulvous or distinctly brown-spotted..... 6.

6. Eyes located posteriorly, very near level of posterior margin of head. Pronotum subcylindrical, at least anteriorly. Scutellum about as long as broad. Claval suture bounded on either side by a row of distinct punctures and vein R of corium with a distinct row of punctures throughout its length, best seen in side view. Costal margins relatively strongly expanded. Oahu and Maui(60) **Nysius sublittoralis**.
 Eyes located a little farther forward, the posterior margin of head rounded laterally to the eyes. Pronotum subflattened or at least feebly, roundly carinate laterally on anterior lobe. Claval suture and corial vein R impunctate or at least without conspicuous punctures and costal margins less strongly expanded. Kauai, Oahu, Maui, Hawaii, and Nihoa.....(61) **Nysius longicollis**.
7. Rostrum reaching only to middle coxae. Species of intermediate size with immaculate or only faintly infuscated membrane. Head black except for a narrow pale spot or line at middle of hind margin above and along tylus. Scutellum black except at apex. Clavus and corium with backwardly directed, inconspicuous, suberect hairs. Kahoolawe and all main islands except Lanai.....(74) **Nysius nigriscutellatus**.
 Rostrum reaching posterior coxae..... 8.
8. Costal margins strongly dilated immediately behind base, the body form comparatively short and very broad posteriorly. Pronotum subcylindrical anteriorly and usually relatively strongly convex. Femora either entirely pale fulvous or lighter with only an occasional brown spot or entirely brown with irregular darker brown spots or markings..... 9.
9. Sides of body more nearly subparallel. Femora yellowish or testaceous with distinct black spots or markings (sometimes entirely black except at apices in *nemorivagus* and *blackburni*, both of which have a broad, subflattened pronotum) 10.
9. Color above rufescent marked with black. Pronotum only moderately convex. Claval suture and corial vein R without visible punctures. Membrane almost entirely clear hyaline. Femora pale fulvous or lighter with only a few spots. Hawaii(63) **Nysius rubescens**.
 Color dark brown above with black markings and with pale mainly along expanded costal margins and at middle of membrane basally. Pronotum very strongly convex. Claval suture and corial vein R with rows of punctures which are only distinct under high magnification. Membrane broadly dark brown on either side near middle of apices of coria and continuing posteriorly to apex. Femora generally dark brown with still darker spots or markings visible. Oahu.....(62) **Nysius fucatus**.
10. Fourth antennal segment very long, almost half again as long as third. Small species (3 to 4 mm.) with entirely black under surface and appendages. Upper surface variable, black to ferruginous. Maui and Hawaii, Molokai (?)(72) **Nysius blackburni**.
 Fourth antennal segment scarcely longer than third..... 11.
11. Pronotum appearing strongly transverse, subflattened, and finely punctate. Color in great part dark brown to black, with paler markings on the head and pronotum; clavus and corium irregularly marked with paler spots; and the entire expanded costal area intruding to apical margin of corium at its junction with radial vein, pale. Antennae black. Hawaii, Maui, Molokai, and Kauai(73) **Nysius nemorivagus**.
 Pronotum more rounded, convex, or cylindrical and coarsely punctate. Corium often marked with fuscous but with pale color always predominant. Antennae at least partly paler..... 12.
12. Size small, 3.5 to 4 mm. The form short and broad, the costal margins abruptly dilated subbasally and roundly converging posteriorly. Corial veins

- embrowned and membrane fuscocomaculate. Kahoolawe and all main islands except Lanai.....(68) *Nysius terrestris*.
 Size larger, over 4 mm..... 13.
13. Pronotal disk very coarsely punctate. Color almost entirely pale above except for the usual black on head and callosities, with only occasional or ill-defined markings on scutellum, clavus, corium and membrane. Kauai, Oahu, and Hawaii(77) *Nysius dallasi*.
 Pronotum more finely and regularly punctate. Scutellum black except at tip and at least with fuscous on commissure of clavus and inner veins of corium 14.
14. Hemelytra very pale, almost white, and characteristically marked, the apical margin of corium entirely, broadly black or paler near inner and outer angles and often with scattered fuscous marks posteriorly on vein R and on corial disk between R + M and Cu. Vein Cu almost always immaculate. Membrane clear. All main islands except Kauai.....(80) *Nysius delectus*.
 Hemelytra clear or with a faint fulvous tinge. Apical margin of corium alternated with black and ochraceous, only black at joining of vein Cu, between arms of R + M, and subapically at joining of vein Sc. Vein Cu irregularly spotted with fuscous. Membrane with a more or less distinct fuscous median fascia on apical half..... 15.
15. Size relatively small, 4.27 to 5.72 mm. Anteocular portion of head scarcely longer than an eye. Pale areas of clavus and corium testaceous or clear hyaline. All main islands.....(78) *Nysius coenosulus*.
 Size larger, 5.6 to 6.4 mm. Anteocular portion of head almost one fourth longer than an eye. Pale areas of clavus and corium faintly tinged with fulvous. Hawaii(79) *Nysius delectus*.

KEY TO THE LEEWARD ISLAND SPECIES OF NYSIUS

1. Anteocular portion of head two thirds longer than an eye. Body clothed above with a short, appressed, white pubescence imparting a grayish appearance. Nihoa(61) *Nysius longicollis*.
 Anteocular portion of head never more than one third longer than an eye. Pubescence, at least of clavus and corium, more erect and hence less conspicuous unless seen from the side..... 2.
2. Rostrum not or scarcely surpassing middle coxae..... 3.
 Rostrum reaching well onto posterior coxae..... 7.
3. Costal margins subparallel to about basal fifth and then abruptly, arcuately expanded. Hemelytra somewhat abbreviated and distinctly, irregularly maculated with brown on clavus and corium and on membrane at least basally and at middle. Upper surface of head and pronotum strongly, evenly, arcuately declivous as seen from the side. Fourth ventral segment of female concealed beneath third at middle..... 4.
 Costal margins appearing more evenly, feebly arcuate throughout, scarcely or only briefly subparallel basally. Hemelytra of average length and fuscocomaculate only interruptedly on apical margin of corium and occasionally on corial veins. Membrane clear or scarcely infuscated. Head and pronotum less strongly declivous above. Fourth ventral segment in female often visible for a short distance at middle..... 5.
4. Small, dark species, 3.39 to 3.77 mm. Membrane broadly brown near apical margins of coria and generally embrowned with pale veins. Nihoa.....
(69) *Nysius suffusus*.
 Larger and paler, 3.58 to 4.11 mm. Membrane only narrowly brown along apical margins of coria and infuscated along middle and apically. Necker(70) *Nysius chenopodii*.

5. Size large, the female 4.83 to 5.16 mm. Head with some distinct punctures above. Body above with some long, erect hairs best seen from the side. Nihoa.....(75) **Nysius nihoae**.
Size smaller than above. Head with punctures less clearly defined. Body above without conspicuous, long, erect hairs as seen from the side..... 6.
6. Head moderately, roundly convex above. Body in great part pale, the scutellum pale except on basal third and apical margins of coria with alternated black markings inconspicuous or wanting. Necker.....(76) **Nysius neckerensis**.
Head only feebly elevated along middle. Scutellum usually entirely black except at extreme apex. Apical margins of coria each with three distinct fuscous spots. French Frigate Shoal.....(74) **Nysius nigriscutellatus**.
7. Head and pronotal disks strongly, evenly, arcuately declivous. Upper surface of body with relatively short and inconspicuous erect hairs as seen from the side. Costal margins subparallel basally and then abruptly, strongly arcuate. Hemelytra abbreviated, often but little surpassing tip of abdomen in females. French Frigate Shoal.....(67) **Nysius frigmatensis**.
Head and pronotum less strongly declivous above. Upper surface of body with very long, erect hairs among subappressed ones, as seen from the side. Costal margins of coria more or less sinuate. **Nysius fullawayi**, subspecies..... 8.
8. Very pale yellowish above, the dark markings of head, pronotum, scutellum and apical margins of coria very limited in extent. Posterior lobe of pronotum very sparsely punctate, the punctures pale. Lisianski.....(66) subspecies **flavus**.
Darker in coloration with denser, black punctures on posterior lobe of pronotum. Pearl and Hermes Reef and Midway, typical *fullawayi* varieties..... 9.
9. Body almost entirely brown above with yellowish at middle of head, at sides of posterior lobe of pronotum, on middle of scutellum apically, and irregularly paler elsewhere. Pearl and Hermes Reef.....(65) variety **infuscatus**.
Much paler in coloration, being predominantly yellowish-ochraceous above with the usual black markings and black punctures. Pearl and Hermes Reef and Midway.....(64) typical **fullawayi**.
60. **Nysius sublittoralis** Perkins, Ent. Soc. London, Trans. (1911), 737, 1912. (See pl. 9, B.)

Head scarcely broader than long, 17.5:16.5; antocular portion almost twice as long as an eye, 9:5; eyes about one third as wide as interocular space, 3.5:10.5; located at extreme hind margin of head at level of anterior margin of pronotum; upper surface rather strongly elevated along middle, distinctly punctured, and more or less uniformly clothed with a short, white, appressed pubescence; bucculae elevated anteriorly, decreasing at level of antenniferous tubercles, the rostral groove reaching base of head. Rostrum reaching to middle of posterior coxae, the first segment not nearly reaching base of head; segments one to four 9.9-10.5-8. Antennae about three fourths longer than width of pronotum, 35:19; segments one to four 5-11-9-10.

Pronotum about one fourth broader than long, 19:15; but little broader than head, 19:17.5; and a little shorter than head, 15:16.5; sides a little sinuate; disk convexly rounded anteriorly and subflattened posteriorly, being feebly depressed medially and sublaterally on posterior lobe; very finely and densely punctate, the irregular rows of punctures behind callosities more than one puncture width apart, more or less densely clothed with appressed, short, white pubescence, this vestiture sometimes very dense. Scutellum scarcely broader than long.

Hemelytra exceeding tip of abdomen by about one fifth the length of membrane, 5:27; membrane about three fourths as long as costal margin; three fourths as long behind level of apices of coria as in front of this; corium subopaque; claval suture with two distinct rows of punctures and vein R + M branching a little beyond apical third. Costal margins subbasally sinuate, then briefly subparallel almost to level of middle of

pronotum behind which they are abruptly, strongly, arcuately dilated, the costal areas very broad. Metapleural angle scarcely produced, subrounded. Female genital cleft reaching about to middle of abdomen, the fourth and fifth segments almost or quite concealed beneath third at middle.

Color light brown, the head black with broad, anteriorly divergent brown area at middle continuing to apex of tylus with a few black marks in sutures near base of tylus; ocular margins, antenniferous tubercles apically, and elevated portions of bucculae pale. Pronotum light brown, becoming ochraceous posteriorly with a transverse black band at callosities. Scutellum black at middle of base and white at apex. Clavus and corium light fusco-testaceous, the commissure of clavus, vein Cu obscurely, and a longitudinal line just laterad to this extending from base of corium to middle of apical margin, darker brown. Expanded costal margins very pale, testaceous to white with scattered, minute, superficial brown punctures. Membrane in great part clear with longitudinal brown fascia at middle. Under surface in great part ferruginous with the usual pale areas and with black on most of thoracic sterna and pleura and under surface of head. Rostrum fulvous with black apex. Antennae pale with somewhat darker brown middle of first segment. Legs pale, especially at bases and apices of segments, the coxae darker and the femora either uniformly fulvous near middle or with still darker brown spots; tarsi infuscated apically.

Size range from smallest male to largest female, as follows: male, length 4.22 mm., width 1.41 mm.; female, length 6 mm., width 2.08 mm.

Described from the type, a male, from the Waianae Coast, Oahu, March 1907 (R. C. L. P.). Other specimens at hand include four from the Blackburn collection, Maui, labeled "*sublitoralis*" by Perkins; one specimen, Puunene, Maui, May 26, 1930 (O. H. S.); one, Koko Head, Oahu, Jan. 20, 1924 (O. H. S.) (pl. 9, B); one, Diamond Head, Oahu, Feb. 18, 1917 (D. T. F.); and one, Manana [Rabbit] Island, Oahu, Jan. 19, 1936, on *Nicotiana tabacum* (R. L. U.).

A distinctive lowland species readily distinguished by the strongly produced anteocular portion of head, punctured claval sutures and vein R + M of corium, strongly dilated costal margins, narrow scutellum, etc.

61. *Nysius longicollis* Blackburn, Linn. Soc. N. S. Wales, Proc. II, 3: 344, 345, 1888. Kirkaldy, Haw. Ent. Soc., Proc. 1: 190, 1908; Fauna Haw. 2: 538, 1910. Perkins, Ent. Soc. London, Trans. (1911), 733, 1912. (See pl. 9, C.)

Head but little broader than long, 15.5:14.5; anteocular portion almost two thirds longer than an eye, 7:4.5; eyes a little over one third as wide as interocular space, 3.5:9; located a little in front of base of head and not touching front margin of pronotum; disk elevated along middle, distinctly punctate, and clothed with a more or less distinct, white, appressed pubescence, except on small glabrous spot at middle of base; bucculae distinctly elevated anteriorly, gradually decreasing to just behind level of apices of antenniferous tubercles, the smooth rostral groove reaching to base of head. Rostrum reaching about to middle coxae, the first segment not reaching base of head, scarcely exceeding elevated portions of bucculae; segments one to four 7-7-5.5-5.5. Antennae almost twice as long as width of pronotum, 36.5:19; segments one to four 5-10.5-9-12.

Pronotum about half again as broad as long, 19:13.5; about one third broader than head, 19:15.5; and a little shorter than head, 13.5:14.5; sides slightly but distinctly sinuate, being a little ampliate at level of callosities and concave just before humeri; disk rounded laterally on anterior lobe, subflattened posteriorly, very finely and moderately densely punctate, the punctures irregularly arranged in rows about one puncture width

or more apart and rather densely clothed with appressed, white hairs except on callosities, and narrowly on anterior and posterior margins and on humeri; disk depressed at middle just behind callosities and subdepressed sublaterally near humeri.

Hemelytra in male, exceeding tip of abdomen by one fourth the total length of membrane (sometimes scarcely exceeding the tip, in the female); membrane but little shorter than costal margin and about as long beyond level of apices of coria as in front of this; clavus and corium subopaque, clothed with a short, pale, appressed pubescence; vein R + M branching a little before apical fourth; costal margins feebly to strongly arcuate from a little before level of apex of scutellum. Female genital cleft reaching only to about middle of abdomen, the fourth and fifth segments usually concealed beneath third at middle.

Color brownish-testaceous, the head black with ochraceous to rufescent apically widening pale area at middle, continuing narrowly along middle of tylus, the apices of antenniferous tubercles and elevated portions of bucculae likewise pale. Pronotum testaceous or a little darker, the anterior lobe broadly, transversely black in the region of callosities, the black extending posteriorly at least onto depressed area at middle and often indicated by black punctures sublaterally. Scutellum black at least at middle with a white tip. Clavus and corium testaceous, the commissure of clavus and usually vein Cu, corial disk just laterad to this, and apical margin of corium interruptedly dark brown. Membrane varying from almost clear to rather generally embrowned, the veins clear. Under side mostly black with the usual pale areas, the abdomen variegated with testaceous posteriorly in the female. Rostrum black on apical half. Antennae pale with brown-spotted first segment, brown apices of second and third segments and entirely brown fourth segment. Legs pale, ochraceous, with brown-spotted femora and brown apices of tibiae and tarsi.

Size: male, length 3.22 to 4.16 mm., width 0.94 to 1.27 mm.; female, length 4.05 mm. to 4.72 mm., width 1.33 to 1.47 mm.

Material before me includes Blackburn's type and six other specimens from Oahu including the following specific localities: Koko Head (O. H. S.); and Tantalus and Manana Island (R. L. U.), two of these specimens being the smallest I have seen of this species. Material is at hand from other islands as follows: Kauai, Barking Sands (R. L. U.), Nualolo (O. H. S.), and Halemanu on *Eragrostis* (O. H. S.); Maui, Puunene (O. H. S.), and Olowalu; Hawaii, Kilauea (O. H. S.) (P. H. T.) and (R. L. U.), Puako, Upper Hamakua Ditch Trail, Kohala Mts. (O. H. S.) and a series of 60 specimens taken by me on *Eragrostis* in the vicinity of Humuula on the slopes of Mauna Kea (pl. 9, C, male, two miles northwest of Humuula, Hawaii, Aug. 4, 1935); Nihoa Island, four specimens on bunch grass, June 12, 1923 (E. H. B.). Specimens have been collected in all months of the year except February, April and November.

This is an extremely variable species, which is easily recognized by its short, grayish, appressed pubescence, finely punctured pronotum, short rostrum, and relatively short head. It seems to be typically confined to bunch grass, *Eragrostis*. I had separated the Nihoa specimens as a distinct species, but they seem to fall well within the limits of variation seen among main island specimens.

62. *Nysius fucatus*, new species (pl. 9, K).

Head about one seventh broader than long, 19.5:16.5; anteocular portion a little longer than eyes, 7:6.5; eyes less than half as wide as interocular space, 4.5:10.5; upper

surface a little elevated along middle, covered with distinct punctures less than one puncture width apart except for glabrous spot at middle of base of head, and covered with a sparse but distinct, subappressed, pale pubescence; bucculae only moderately elevated anteriorly, their outer margins feebly arcuate following contour of head, gradually decreasing posteriorly and not reaching posterior margin of head. Rostrum just reaching to posterior coxae, the first segment not attaining base of head; segments one to four 9-8.5-9-7. Antennae three fifths longer than width of pronotum, 40:25; segments one to four 5-12-10-13.

Pronotum almost half again as broad as long, 25:17.5; about one fourth broader than head, 25:19.5; and scarcely longer than head, 17.5:16.5; sides feebly sinuate, being a little more ampliate at level of callosities and a little concave just behind this; disk strongly, convexly elevated at middle and convexly rounded anteriorly; covered with suberect hairs and distinctly punctate, the punctures more than one puncture width apart, except on callosities and along posterior margin and humeri.

Hemelytra exceeding tip of abdomen by one fifth the total length of membrane in the male, scarcely surpassing tip of abdomen in the female, membrane about one eighth shorter than costal margin or, in the female, less than this; scarcely shorter beyond level of apices of coria than in front of this. Clavus and corium subopaque, vein R + M branching at apical fourth. Costal margins very briefly subparallel subbasally, strongly arcuately expanded from well before level of apex of scutellum. Metapleural angle feebly produced and subrounded. Female genital cleft reaching beyond middle, the fourth and fifth segments concealed beneath third at middle.

Color brown with a suggestion of ferruginous, the head black with an ochraceous spot at middle of base, ochraceous middle of tylus, rufescent apices of antenniferous tubercles, and narrowly pale elevated portions of bucculae. Pronotum light brownish-ochraceous with a very broad, transverse black band at level of callosities and ill-defined dark brown areas sublaterally at base. Scutellum entirely black except for narrowly pale apex. Clavus and corium irregularly mottled with dark brown except basally and laterally on corium which is paler, almost testaceous. Membrane dark brown on either side near apical margins of coria and from here, along middle to apex. Under surface black except for the usual paler areas. Rostrum fulvous with black apex. Antennae fulvous with brown apices of second and third segments and all of the fourth segment. Legs fulvous with obscurely brown-spotted femora and somewhat darker apices of tibiae and tarsi.

Size: male, length 4.4 mm., width 1.58 mm.; female, length 5 mm., width 1.91 mm.

Holotype male, 1438 (pl. 9, *K*), allotype female, 1438A, and one paratype, Kolekole Pass, Oahu, May 9, 1920, on *Bidens* (O. H. S.). One additional perfectly typical but somewhat damaged specimen is at hand from Makapuu Point, Oahu, Jan. 25, 1920 (O. H. S.). In this last specimen the femora are clear fulvous without spots.

This species is closely allied to *N. rubescens* but differs in its shorter rostrum, broader head, more convex pronotum, and much darker coloration.

63. *Nysius rubescens* White, Ann. Mag. Nat. Hist. V, 7: 55, 1881. Kirkaldy, Haw. Ent. Soc., Proc. 1: 190, 1908; Fauna Haw. 2: 543, 1910. Perkins, Ent. Soc. London, Trans. (1911), 732, 1912. (See pl. 9, *H*.)

Head considerably broader than long, 18:14.5; antecular portion equal in length to eyes; eyes half as wide as interocular space, 4:9; upper surface scarcely elevated along middle, with punctures especially distinct at center and covered with an appressed, white pubescence; bucculae moderately elevated anteriorly and gradually decreasing posteriorly, the rostral groove not quite reaching base of head. Rostrum scarcely distinctly surpassing posterior coxae, the first segment not or almost attaining base of head; segments one to

four 10-10-10-8. Antennae almost twice as long as width of pronotum, 44:24; segments one to four 6-14-11-13.

Pronotum more than half again as broad as long, 23.5:14.5; more than one fourth broader than head, 23.5:18; and equal in length to head; disk convexly rounded anteriorly, distinctly punctate almost to posterior margin, the humeri glabrous and prominently elevated; conspicuously clothed with an appressed white pubescence especially on anterior lobe surrounding callosities and laterally; sides distinctly sinuate, being arcuate anteriorly at level of callosities extending to anterior margin, and concave posteriorly before outwardly flaring humeral angles.

Hemelytra complete, exceeding tip of abdomen by about one fourth the total length of membrane; membrane about one tenth shorter than costal margin; about as long beyond level of apices of coria as before this; clavus and corium subopaque, clothed with a short, fine, appressed, pale pubescence; claval suture with a few punctures basally; vein R + M branching at or a little beyond apical third; costal margins subbasally sinuate, then briefly subparallel to level of apical third of scutellum, beyond which they are very strongly arcuate, exposing a broad costal area.

Female genital cleft quite deep, reaching about two thirds the distance to base of abdomen, the fourth and fifth ventral segments concealed beneath third at middle; metapleural angle only feebly produced and subrounded.

Color brownish-ochraceous to rufescent, the head black with an anteriorly broadening rufescent area at middle continuing narrowly on tylus, with rufescent apices of antenniferous tubercles and ochraceous extreme apex of tylus and elevated portions of bucculae. Pronotum more or less rufescent with the callosities black and at least the posterior margin and humeri light brown to ochraceous. Scutellum rufescent with black at middle of base and pale apex. Clavus and corium pale brownish-testaceous or even lighter laterally with commissure of clavus, vein Cu in great part, often branches of vein R + M, extreme edge of costal margins, and apical margin of corium at junction of vein Cu, between branches of R + M and near apex, darker brown. Membrane entirely clear or irregularly infuscated on posterior half. Under surface mostly black with the usual pale areas, the abdomen sometimes rufescent posteriorly. Rostrum black apically. Antennae light brownish to fulvous, the first segment sometimes brown-spotted, the second and third segments a little infuscated apically and fourth segment generally infuscated. Legs generally pale with dark brown coxae, often indistinctly brown-spotted femora, and infuscated tarsi.

Size: male, length 4 to 4.33 mm., width 1.38 to 1.52 mm.; female, length 4.38 to 5.55 mm., width 1.66 to 2.05 mm.

At hand are 47 specimens, including a Blackburn specimen from Hawaii labeled *Nysius rubescens* on the under side of the card to which the specimen is affixed (compared with Buchanan White's type by W. E. China); one specimen, aa flows, Kau, Hawaii, 3,600 feet, July 18, 1918 (W. M. G.); and all the remaining specimens collected by Timberlake, Swezey, Perkins, Kirkaldy, and Usinger, mostly on *Vaccinium (ohelo)* at Kilauea in July, August and October. (See pl. 9, *H*, female, Crater Trail, Kilauea, Hawaii, Aug. 6, 1919, P.H.T.)

64-66. *Nysius fullawayi*, new species.

A small species, subflattened and with numerous long, erect hairs above. Rostrum reaching well onto posterior coxae. Color extremely variable.

Two distinct forms occur, one on Pearl and Hermes Reef and the other on Lisianski Island.

64. *Nysius fullawayi fullawayi*, new subspecies (pl. 9, E).

Head about one fourth broader than long, 17:13.5; the antecular portion as long as an eye, 6:6; eyes less than half as wide as interocular space, 4:9; upper surface highly polished, a little elevated along middle, irregularly, inconspicuously punctate, and clothed with a moderately dense pubescence of appressed hairs; bucculae distinctly elevated anteriorly, gradually disappearing posteriorly to about midway between level of apices of antenniferous tubercles and hind margin of head, the rostral groove continuing to posterior margin. Rostrum reaching middle of posterior coxae, the first segment not quite reaching base of head; segments one to four 8-8-8-7. Antennae more than half again as long as width of pronotum; segments one to four 5-10-8.5-11.

Pronotum a little more than half again as broad as long; slightly less than one fourth broader than head, 20:17; and scarcely shorter than head, 12.5:13.5; sides scarcely sinuate (male), feebly arcuate (female); disk often feebly, transversely impressed behind callosities; punctures very distinct and rather coarse, the posterior margin narrowly sublaterally and more broadly at middle and at humeri, impunctate; pubescence very conspicuous, being dense, appressed, and white near the middle and surrounding sinuous glabrous areas of callosities, a little longer, fulvous, and rounding over anterior margin and sparse or wanting posteriorly; entire disk and especially at sides with conspicuous, erect hairs.

Hemelytra moderately long, exceeding tip of abdomen by one sixth the total length of membrane; membrane but little shorter than costal margin; about as long behind level of apices of coria as in front of this; corium subhyaline, vein R + M branching at about apical fourth; Sc obsolete; costal margins subparallel to about level of apical third of scutellum, then rather evenly arcuately dilated or a little more strongly so just in front of middle.

Color ochraceous, the head black with an anteriorly divergent ochraceous area on middle of upper surface, narrowing to sides of tylus and anteriorly on basal half of juga; tylus surrounded with black in sutures, these distinctly visible posteriorly as two short lateral and one longer median branch from base of tylus; middle of tylus, narrow ocular margins, and apices of antenniferous tubercles ochraceous; eyes dark brown, ocelli red; under surface with a pale vitta on either side behind antenniferous tubercles, extending to base of head. Pronotum ochraceous with brown punctures and infuscated sublateral depressions of posterior margin, and black callosities and longitudinal median line behind callosities. Scutellum pale with black narrowly at base and longitudinally basally at middle, white on carina and sides near apex. Hemelytra hyaline to testaceous with the clavus and corium inwardly irregularly more or less embrowned, both on veins and disk, the apical margin of corium whitish near junction with veins Cu and R. Membrane distinctly brown basally, less distinctly so posteriorly along middle, elsewhere clear. Under surface black with the usual pale markings. Rostrum pale with black apex. Antennae light brownish-ochraceous, the first segment pale with dark brown markings, the succeeding segments darker basally or apically. Legs ochraceous; the bases of coxae, dense spots on femora, and apices of tarsi brown.

Size: male, length 3.72 mm., width 1.27 mm.; female, length 4.72 mm., width 1.75 mm.

Holotype male, 1439, allotype female, 1439A, and ten paratypes, Pearl and Hermes Reef, April 27, 1923 (D.T.F.). (See pl. 9, E, male.)

Two males from Midway Island (Eastern Island), April 1923 (D. T. F.) appear to be typical but have not been designated as paratypes because of the short series and because of possibilities for variation in such isolated populations.

N. fullawayi is somewhat suggestive of the Hawaiian species *N. coenosulus* and *N. dallasi* but is smaller, more polished and with a distinctive body form.

65. *Nysius fullawayi fullawayi* var. *infuscatus*, new variety (pl. 9, G).

Broadly and darkly embrowned not only on clavus and corium but on pronotum as well.

Holotype, male, 1440, Pearl and Hermes Reef, April 27, 1923 (D.T.F.). (See pl. 9, G.)

Typical *fullawayi* differs in having nearly immaculate hemelytra.

66. *Nysius fullawayi flavus*, new subspecies.

As in the typical form but somewhat shorter, relatively broader, and very pale, flavescens above except for the usual anteriorly divergent, sublateral black vittae of head, black sutures around tylus, black callosities and scutellum at middle of base, the usual interruptedly brown apical margin of corium, and more or less broadly embrowned membrane, especially basally and near apical corial margins.

Size: male, length 3.66 mm., width 1.27 mm.; female, length 4 mm., width 1.44 mm.

Holotype male, 1441, allotype female, 1441A, and four paratypes, Lisianski Island (northeast corner), May 17 and 19, 1923, in a grass patch (C. Grant).

Easily distinguished from typical *N. fullawayi* by the smaller size of the females and much paler coloration, the punctures of posterior lobe of pronotum and sides of scutellum pale.

67. *Nysius frigatensis*, new species.

Head one seventh broader than long, 16:14; antecular portion about one third longer than an eye, 6.5:5; eyes relatively small, a little over one third as wide as interocular space, 3.5:9; upper surface moderately, rather broadly elevated along middle, polished, indistinctly, irregularly punctured and sparsely clothed with appressed pale hairs especially conspicuous laterally on black areas; bucculae well elevated anteriorly, decreasing posteriorly to level midway between level of antenniferous tubercles and base of head, the rostral groove extending to base of head; rostrum reaching apices of posterior coxae, the first segment almost attaining base of head; segments one to four 10.5-10.5-9-7.5. Antennae three fourths longer than width of pronotum, 35:20; segments one to four 5-11-9-10.

Pronotum half again as broad as long, 20:13; one fourth broader than head, 20:16; and scarcely longer than head, 13:14; sides moderately sinuate; disk a little convex anteriorly, subflattened posteriorly, irregularly, rather sparsely punctate posteriorly and broadly impunctate at sides and on hind margin of posterior lobe; densely clothed with a fine, pale, appressed pubescence, especially long and conspicuous around callosities and with fewer erect hairs.

Hemelytra of moderate length, exceeding tip of abdomen by about one sixth the total length of membrane; membrane one eighth shorter than costal margin; about as long beyond level of apices of coria as in front of this; corium subhyaline, vein R + M branching at apical third; Sc obsolescent; costal margins subparallel about to level of apical third of scutellum, then rather abruptly dilated behind which they are feebly arcuate to apices.

Color fusco-testaceous, the head black with broad, pale anteriorly divergent area at middle, and with tylus, very narrow ocular margins, apices of antenniferous tubercles, spot on posterior margin below near eyes, elevated portions of bucculae, pale. Pronotum ochraceous with black callosities, dark brown depressed areas sublaterally on posterior margin, and ill-defined fulvous area surrounding black callosities. Scutellum black basally, brown laterally, and testaceous at apex. Clavus and corium rather uniformly hyaline-testaceous with occasional, inconspicuous brown spots; with white on posterior third of vein Cu continuing on apical margin of corium to subapical dark brown region, interrupted only slightly by a brown spot between branches of R + M. Membrane relatively

clear, only lightly, if at all, infuscated. Under surface black with the usual pale areas and with abdomen posteriorly and laterally brown. Rostrum brown with black apex. Antennae ochraceous, the first segment marked and annulated with dark brown to black, the second and third brown at apices and fourth entirely brown. Legs yellowish-testaceous with brown-spotted femora and brown at apices of tibiae and tarsi.

Size: male, length 3.77 mm., width 1.36 mm.; female, length 4.33 mm., width 1.72 mm.

Holotype male, 1442, allotype female, 1442A, and 49 paratypes, French Frigate Shoal, June 22 to 27, 1923 (E. H. B.).

A variable species with vein Cu white throughout in some specimens. This species is intermediate, both geographically and phylogenetically, between *N. fullawayi* and the *terrestris* allies, *N. suffusus* and *N. chenopodii* of Nihoa and Necker Islands. It has the head and rostrum of *N. fullawayi* with the pronotum and body form of the *terrestris* group.

68. *Nysius terrestris*, new species (pl. 9, J).

Head one fifth broader than long, 15.5:13; anteocular portion equal in length to an eye; eyes a little less than half the width of interocular space, 3.25:8; upper surface roundly elevated along middle and subdepressed laterally, roughened by feeble, irregular punctures, and clothed with a moderately dense, appressed, white pubescence; bucculae distinctly elevated anteriorly, decreasing to level of apices of antenniferous tubercles, and ending about half way between this point and base of head, the rostral groove continuing to base of head. Rostrum reaching to apices of middle coxae or a little longer, the first segment not nearly reaching base of head; segments one to four 6.5-6.5-6.5-6. Antennae little more than half again as long as width of pronotum, 32:20; segments one to four 4-10-8-10.

Pronotum over half again as broad as long, 20:12.5; one third broader than head, 20:15.5; and scarcely shorter than head, 12.5:13; sides only feebly sinuate; disk with sides rounded anterior to humeri, scarcely depressed behind callosities at middle, the anterior and posterior lobes in the same plane and without a distinct, transverse impression near callosities; punctures distinct and covering a large portion of posterior lobe, even near hind margin; clothed with a short, subappressed pubescence and a few erect hairs except on sinuous, glabrous callosities and humeri and sparsely near posterior margin.

Hemelytra (in the male) of moderate length, the membrane exceeding tip of abdomen by one fourth its total length (exceeding abdomen by only one tenth its total length in the female). Membrane one ninth shorter than costal margin (one sixth shorter in female); about as long beyond level of apices of coria as in front of this (shorter in the female); corium subhyaline, vein R + M branching at apical fourth; Cu inconspicuous; costal margins subparallel about to level of apical third of scutellum, then expanded and arcuate to apices of coria.

Color brownish-testaceous, the head black with an anteriorly widening fulvous or ferruginous area at middle, extending from base of head, between ocelli, to apex of tylus with a black spot at middle, just behind tylus, narrow ocular margins, apices of antenniferous tubercles, likewise pale fulvous. Eyes brown, ocelli reddish. Pronotum somewhat variegated, testaceous or pale fusco-testaceous with black callosities and often black behind callosities at middle; posterior margin fuscous sublaterally and indistinctly on either side of middle. A spot at middle near anterior margin as well as most of anterior margin fulvous. Humeri and posterior margin at middle testaceous. Scutellum black basally and at middle; brownish-ferruginous on either side of middle and paler at apex. Hemelytra testaceous with irregular fuscous markings confined largely to veins but sometimes obscuring parts of discal areas. Apical margin of corium black between branches of R + M and near apices of corium, elsewhere whitish. Membrane more or less generally, but irregularly, infuscated except for clear white base and veins, darkest along

middle. Under surface black with the usual pale areas light brown to testaceous. Rostrum pale with black apex. Antennae brownish with darker spots on first segment. Legs pale, testaceous or ochraceous with black bases of coxae, black-spotted femora, and infuscated apices of tibiae and tarsi.

Size: male, length 3.55 mm., width 1.25 mm.; female, length 4 mm., width 1.58 mm.

Holotype male, 1443, allotype female, 1443A, and 13 paratypes, Manana Island, Oahu, Jan. 19, 1936, on *Portulaca* (R. L. U.) (pl. 9, J). Other material at hand includes 49 specimens, Barking Sands, Kauai, Dec. 31, 1935, on *Portulaca* (R. L. U.), and seven specimens, Alakai Swamp, Kauai, Jan. 3, 1936; nine specimens, Mapulehu, Molokai, Aug. 16, 1936, on *Portulaca* (R. L. U.); 11 specimens, Haleakala, 6,000 feet, June 15, 1927, and Aug. 18, 1929, on *Argyroxiphium*, *Dubautia*, *Geranium*, and *Styphelia*.

The remainder of the 176 specimens consists of miscellaneous material with but a single specimen from a locality in most cases, taken at elevations from sea level to 7,000 feet on Kauai, Oahu, Molokai, Maui, Kahoolawe, and Hawaii during every month of the year. Host plants include *Argyroxiphium*, *Wikstroemia*, *Hibiscus*, *Dubautia*, *Styphelia*, *Sophora*, *Sida*, and *Portulaca*.

In this species the head and pronotum are distinctly, arcuately declivous above as seen from the side, the entire body is short and robust.

N. terrestris approaches *N. lichenicola* Kirkaldy, but that species has the head longer in front of the eyes, rostrum attaining or slightly surpassing apices of hind coxae, the last antennal segments longer as compared to the third, the femora usually entirely black except at bases and apices, and entire coloration much darker.

This might possibly be considered as a subspecies of *N. lichenicola*, but the two forms occur together over at least a part of their range, maintaining their distinctness, so specific status seems warranted. *N. terrestris* is mainly a lowland form, extending up to 6,000 or 7,000 feet, whereas *N. lichenicola* is mainly a highland form, occurring at altitudes from 10,000 down to 4,000 feet.

69. *Nysius suffusus*, new species.

Head about one seventh broader than long, 15:13; anteocular portion a little longer than an eye, 6:5; eyes less than half as wide as interocular space, 3.5:8; upper surface elevated along middle, irregularly, indistinctly punctate, and clothed with a short, dense, pale pubescence; bucculae moderately elevated anteriorly, decreasing posteriorly to a level about midway between antenniferous tubercles and base of head, the rostral groove continuing to posterior margin. Rostrum attaining middle coxae, the first segment very short, scarcely exceeding elevated portions of bucculae; segments one to four 7-7-7-6. Antennae a little more than half again as long as width of pronotum, 32:19.5; segments one to four 4.5-9.5-8-10.

Pronotum over half again as broad as long, 19.5:12; about one third broader than head, 19.5:15; and scarcely shorter than head, 12:13; sides feebly sinuate being a little ampliate at level of callosities and slightly flaring at humeri; disk convex, especially in region of callosities and feebly depressed just behind this at middle; distinctly punctured except very broadly on humeri and laterally immediately anterior to humeri; clothed with appressed, pale pubescence especially anteriorly surrounding callosities and with some erect hairs as well, these last most conspicuous projecting from sides of anterior margin.

Hemelytra relatively short, exceeding tip of abdomen by one fifth the length of membrane (male) or one seventh length of membrane (female); membrane about one fifth shorter than costal margin; about as long beyond level of apices of coria as in front of this; corium subopaque, vein R + M branching at apical fourth; Sc obsolete; costal margins subparallel to about level of apical third of scutellum, then rather broadly arcuate to apices.

Color brownish-ochraceous, the head black with a broad median, anteriorly divergent, pale area, ochraceous ocular margins, tylus, and antenniferous tubercles and testaceous elevated portions of bucculae. Pronotum with black callosities, dark brown sublateral depressed areas on posterior margin, and a pale median spot on posterior margin. Scutellum more or less black with pale narrowly at apex. Clavus and corium extensively, irregularly mottled with brown except on expanded costal margins, the apical margin of corium dark brown between arms of R + M and between joining of Sc and apex, pale at joining of vein R. Membrane generally infuscated, darkest brown basally, along apical margins of coria, and along middle, the veins pale. Under surface in great black with the usual paler areas. Rostrum light brown with black apex. Antennae brown, the first segment paler with darker brown markings. Legs yellowish-ochraceous with brown-spotted femora and infuscated apices of tibiae and tarsi.

Size: male, length 3.39 mm., width 1.22 mm.; female, length 3.77 mm., width 1.5 mm.

Holotype male, 1444, allotype female, 1444A, and four paratypes, Nihoa Island, June 13, 1923, on bunch grass (C. M. Cooke, Jr.) and two paratypes, Nihoa Island, June 11 and 13, 1923 (E. H. B.).

Close to *N. terrestris* but darker and with the disks of head and pronotum more strongly, roundly declivous.

70. *Nysius chenopodii*, new species.

Head about one seventh broader than long, 15:13; antecular portion scarcely longer than an eye, 5.25:5; eyes a little less than half width of interocular space, 3.5:8; upper surface a little more elevated along middle, irregularly, distinctly punctate, and clothed with a conspicuous, appressed pubescence except for glabrous base, especially at middle; bucculae distinctly elevated anteriorly, decreasing and disappearing about at basal fourth of head. Rostrum reaching almost to apices of middle coxae, the first segment slightly surpassing bucculae but not reaching base of head; segments one to four 7-7-7-6. Antennae over half again as long as width of pronotum, 32:19; segments one to four 4.5-10-8-9.5.

Pronotum half again as broad as long, 19:13; almost one third broader than head; and equal in length to head; sides feebly sinuate at middle and subrounded anteriorly; disk distinctly roundly convex anteriorly, subflattened at least at middle of posterior lobe, the whole pronotal disk, especially strongly anteriorly and continuing onto the head, roundly declivous; sometimes feebly depressed behind callosities at middle; punctures distinct, the rows quite irregular, extending very near the narrowly glabrous posterior margin and humeri; with a fairly dense, white, appressed pubescence, especially anteriorly surrounding glabrous, sinuous callosities.

Hemelytra moderately long to quite short, the membrane exceeding tip of abdomen by less than one fifth its total length in the male and only by one fifteenth its length in the female; one eighth shorter than costal margin in male and one fifth shorter in the female; slightly longer beyond level of apices of coria than in front of this in the male and slightly shorter in the female; unpigmented portions of coria subhyaline; vein R + M branching at apical fourth; costal margins subparallel to slightly beyond level of middle of scutellum, then rather strongly, arcuately dilated to apices.

Color ochraceous marked with brown and black. Head black, with an anteriorly divergent pale area at middle extending from base to just before base of tylus where it narrows and continues to tip of tylus, interrupted only by black clypeal sutures. Narrow inner ocular margins, apices of antenniferous tubercles, and elevated portions of bucculae pale.

Pronotum brownish-ochraceous with pale anterior margin, narrowly pale laterad to black callosities and dark brown at extreme outer sides of humeri, in sublateral depressed areas of posterior margin, and more lightly brown on either side of pale center of posterior margin. Scutellum black basally and along basal half at middle, fulvous laterally and testaceous apically. Hemelytra hyaline-testaceous, irregularly spotted with brown on portions of clavus and corium except on expanded lateral margins. Apical corial margins alternated with pale and fuscous in the usual manner. Membrane infuscated at least basally and along middle. Under surface black with the usual pale glabrous areas. Rostrum light brownish, becoming darker apically. Antennae brownish-ochraceous, the first segment marked with darker brown and the last rather uniformly darker brown; legs pale, the coxae marked with dark brown; femora brown-spotted, and tibiae and tarsi narrowly embrowned at apices.

Size: male, length 3.58 mm., width 1.33 mm.; female, length 4.11 mm., width 1.61 mm.

Holotype male, 1445, allotype female, 1445A, and 25 paratypes, Necker Island, July 29, 1923, on *Chenopodium* (E. H. B.).

Very close to *N. terrestris* but broader, with more polished and convex head.

71. *Nysius lichenicola* Kirkaldy, Fauna Haw. 2: 540, 1910. Ehrhorn, Haw. Ent. Soc., Proc. 3: 10, 1914, variety?

Head about one sixth broader than long, 17:14.5; the antecular portion half again as long as an eye, 7.5:5 (produced in front of the eyes in a manner suggestive of *N. longicollis* and *N. sublittoralis*, although less strongly so); eyes small, about one third as wide as interocular space, 3.5:10; upper surface distinctly elevated along middle and with few, very ill-defined punctures, clothed with short but conspicuous, appressed, grayish pubescence; bucculae well elevated anteriorly, decreasing posteriorly almost to hind margin of head, the rostral groove continuing to base of head. Rostrum reaching to posterior coxae, the first segment not attaining base of head; segments one to four 10-9-9-7.5. Antennae over half again as long as width of pronotum, 35.5:21; segments one to four 5.5-10-8-12.

Pronotum a little over half again as broad as long, 21:13; about one fourth broader than head, 21:17; and a little shorter than head, 13:14.5; lateral margins feebly sinuate; disk slightly elevated with distinct, rather large punctures irregularly interrupted by more or less distinct, laevigate areas, particularly on posterior lobe; densely clothed with a conspicuous, appressed, gray pubescence, except on sinuous callosities.

Hemelytra exceeding tip of abdomen by one fourth or less the total length of membrane; membrane one seventh shorter than costal margin; about as long beyond apices of coria as in front of this; corium opaque, veins Cu, R + M, and Sc a little elevated but very inconspicuous, being scarcely visible in some cases, R + M branching at apical third; costal margins subparallel about to level of apical third of scutellum, then abruptly, roundly, and sublaminately dilated. Scutellar and corial disks clothed with appressed grayish pubescence.

Under surface presenting no unusual characters, the female genital cleft reaching beyond middle of abdomen and the metapleura as in other *Nysius*.

Color somewhat variable but in general dark brown to black with ferruginous or testaceous pale markings covered with a grayish pubescence. Head pale at center and narrowly on ocular margins, pronotum pale with black callosities, punctures, and with occasional ill-defined markings of wider extent. Scutellum black with ochraceous posteriorly at least at middle. Clavus and corium dark fuscous irregularly variegated with testaceous, especially along expanded costal margins. Membrane entirely black or mottled with brown, in which case it is black adjacent to apical margin of corium at joining of Cu and between branches of R + M. Under surface mostly black except on coxal flanges, ostiolar canals, and reflexed metapleural margins. Antennae and rostrum entirely black.

Legs dark, the femora black except at apices, the tibiae black basally and apically, and the tarsi black apically.

Size: male, length 3.75 mm., width 1.35 mm.; female, length 4.70 mm., width 1.75 mm.

Described from type material, Haleakala, Maui, 7,000 feet, April 1894 (R. C. L. P.) and a series of 59 specimens taken between 5,800 feet and the summit of Haleakala on Maui and at Kilauea, Humuula, the aa flows at Kau, and at Nauhī Gulch on Hawaii, during the months from June to October, mostly on *Eragrostis* (occasional specimens on dandelion, *Vaccinium*, *Sophora*, *Styphelia*, *Geranium*, and *Dubautia*) by Timberlake, Swezey, Usinger, and Giffard.

This species was synonymized with *N. blackburni* White by Perkins (1912) and these two species were confused by Kirkaldy who could not find structural differences. However, the head is distinctly longer and more strongly produced in front of the eyes, the pronotum is narrower, the upper surface of the head and the pronotal disk are only sparsely and quite irregularly punctate, the corial veins are inconspicuous, the costal margins are not thickened along their edges, and the entire insect is clothed with a conspicuous, gray pubescence.

As these two species are found over the same range and do not intergrade it seems certain that they are distinct species. *N. lichenicola* appears to be typical of native grasses, particularly *Eragrostis*, where I found it commonly on the pahoehoe flats of the great central plateau of Hawaii. *N. blackburni*, although still unplaced as to host preference, has not, to my knowledge, been taken under these circumstances.

The nearest extra-Hawaiian relative of *N. lichenicola* appears to be *N. huttoni* White from New Zealand, a species which is superficially quite similar but has an entirely different type of pubescence with many long, erect hairs as well as the usual appressed ones.

72. ***Nysius blackburni*** White, Ann. Mag. Nat. Hist., V, 7: 53, 1881. Kirkaldy, Haw. Ent. Soc., Proc. 1: 190, 1908; Fauna Haw. 2: 540, 1910. Perkins, Ent. Soc. London, Trans. (1911), 733, 1912 (= *lichenicola* Kirkaldy); Fauna Haw., Introduction, 195, 1913. (See pl. 9, I.)

Nysius lichenicola var. (b) *brunnealis* Kirkaldy, Fauna Haw. 2: 541, 1910;
var. (c) *atralis* Kirkaldy, Fauna Haw. 2: 541, 1910.

Head about one fourth broader than long, 17:13.5; anteocular portion a little longer than eyes, 6:5; eyes less than half as wide as interocular space, 4:9; upper surface feebly depressed laterally near the eyes and a little elevated along middle, with distinct punctures at least in pale median area; bucculae distinctly elevated anteriorly, margins feebly arcuate, decreasing in height behind level of apices of antenniferous tubercles and not reaching base of head, although the smooth rostral groove reaches base of head. Rostrum reaching to or slightly beyond level of apices of hind coxae; first segment short, not nearly reaching base of head; segments one to four 8-8-8-7. Antennae one third longer than width of pronotum, 30.5:22; segments one to four 4-9-7.5-10.

Pronotum almost twice as broad as long, 22:11.5; a little less than one third broader than head, and shorter than head, 11.5:13.5; lateral margins scarcely sinuate; disk trans-

versely depressed anteriorly, extending back to hind margins of callosities; punctures at least along anterior margin and near middle of posterior lobe distinct but of moderate size, the irregular rows usually about one puncture width apart; humeral angles and posterior margin rather broadly glabrous.

Hemelytra exceeding tip of abdomen by one seventh the length of membrane; membrane about one sixth shorter than costal margin; two thirds as long beyond level of apices of coria as in front of this; corium subopaque, vein R + M branching a little before apical fourth; vein Cu distinct along middle of posterior dilated portion of costal area; costal margins parallel almost to level of apex of scutellum and then distinctly, rather evenly arcuate.

Pubescence of entire upper surface visible but not very dense or conspicuous. Pubescence rather sparse on under surface. Female genital cleft extending a little beyond middle of abdomen, segments four and five concealed beneath three at middle.

Color in great part black, the eyes dark brown, ocelli reddish and head narrowly ochraceous above at middle of posterior margin and between ocelli, abruptly roundly widening anteriorly and extending as two arms about to level of base of tylus. Tylus ochraceous along middle. Ocular margins narrowly pale. Pronotum with anterior margin very narrowly pale, with a laevigate spot at middle. Posterior lobe brownish-ochraceous marked with irregular darker brown areas posteriorly and with a pale longitudinal area at middle. Scutellum entirely black. Clavus and corium brownish-testaceous irregularly mottled with darker brown and with brown apices. Membrane entirely brown basally, somewhat clearer near apices of coria, variegated apically. Under surface almost entirely black, somewhat dark brown on the areas which are usually much paler in this genus. Rostrum and antennae black. Legs black with pale apices of femora.

Size: female, length 3.61 mm., width 1.44 mm.

Described from a single female from Hawaii in the Blackburn collection labelled *Nysius blackburni* beneath the card to which the specimen is affixed. W. E. China has kindly compared this specimen with Buchanan White's type, from which he states that it "differs slightly . . . in yellow mottling of costal margins but otherwise [is] identical in structure and colour pattern."

Other material includes four specimens from Nauhi Gulch, 5,000 to 6,000 feet, Hawaii, *Acacia koa*, Sept. 30 and Oct. 2, 1931 (O. H. S., F. X. W.); one specimen, Glenwood, Olaa, Hawaii, 2,300 feet, Aug. 27, 1917 (W. M. G.); 27 miles, Olaa, Hawaii, 3,600 feet, Aug. 3, 1918 (W. M. G.); and four specimens from Kilauea, Hawaii (W. M. G.) and (O. H. S.), one from the Fern Forest and one collected on *Dubautia*, two of these collected in July of 1906 and 1934. Maui specimens include Kirkaldy's type material of the *lichenicola* varieties *brunnealis* and *atralis* from Haleakala, 5,000 feet, April, 1894 (R. C. L. P.) and a somewhat intermediate specimen, likewise from Haleakala, collected on Keanae Pali, 5,200 to 5,800 feet, July 19, 1919, "Walker Coll", from the Timberlake collection (pl. 9, I).

A unique male from Kawela, Molokai, 3,700 feet, Dec. 12, 1925 (E. H. B.) may also belong near here but has a shorter fourth antennal segment, more convex and more densely punctate pronotal disk and a somewhat different coloration. It will doubtless prove to be a distinct species when further material is collected.

A somewhat variable species with relatively broad head, the anteocular portion scarcely or only moderately longer than an eye, its upper surface finely

and distinctly punctured. The pronotum is about twice as broad as long with a distinctly, finely punctured disk. The veins of the corium including Cu, R + M and its branching, and Sc are well elevated and distinct and the edge of the costal margin is a little thickened or elevated. Also the upper surface is only sparsely pubescent.

As indicated above, the two extremes in color variation have been described as the varieties *atralis* and *brunnealis* (under the species *lichenicola*) by Kirkaldy. *Atralis* has the upper surface in great part pitchy brown to black, with a pale spot at middle of hind margin of head, another at middle of hind margin of pronotum and with pale humeri and with the hemelytra feebly pale-spotted, especially laterally. *Brunnealis* is in great part pale ferruginous. As China writes that the paralectotype, upon which the present description of *blackburni* has been based "seems to be identical with the type of *lichenicola* var. *brunnealis*", this should be considered as the typical form. These varieties, although striking as extremes, have not been recognized here because the variation is continuous with complete intergradation. The few Maui specimens before me all are a little broader posteriorly, being as much as one third broader at the widest portion of the hemelytra than the width of the pronotum, whereas all Hawaii specimens are a little narrower and more parallel-sided than this. Hence a subspecies may be indicated but must await the collection of more material. *N. blackburni* superficially resembles *N. baekstroemi* Bergroth from Juan Fernandez, a species which differs in its more finely punctured upper surface of head, less conspicuous corial veins and erect as well as appressed pubescence.

73. *Nysius nemorivagus* White, Ann. Mag. Nat. Hist. V, 7: 54, 55, 1881.
Kirkaldy, Haw. Ent. Soc., Proc. 1: 190, 1908; Fauna Haw. 2: 543, 1910.
Perkins, Ent. Soc. London, Trans. (1911), 734, 1912. (See pl. 9, F.)

Head a little less than half again as broad as long, 18:14; anteocular portion as long as an eye, 6:6; eyes less than half as wide as interocular space, 4:10; upper surface scarcely elevated, with numerous coarse punctures; antenniferous tubercles short and scarcely produced laterally; bucculae moderately elevated anteriorly, gradually decreasing posteriorly and abruptly terminating at basal sixth of head. Rostrum reaching posterior coxae, the first segment attaining base of head; segments one to four 9.5-10-8.5-7.5. Antennae more than half again as long as width of pronotum, 39.5:24.5; segments one to four 5.5-13-10-11.

Pronotum over half again as broad as long, 24.5:14; one third broader than head, 24.5:18; and equal to the head in length; sides scarcely sinuate; disk rather densely, finely punctate except along shiny, posterior margin and humeri and dull callosities, depressed laterally and a little depressed at middle just behind callosities.

Hemelytra very long, exceeding tip of abdomen by over one third the total length of membrane, 15:43; membrane as long as costal margin; a little longer beyond level of apices of coria than in front of this, 22:20; pigmented portions of hemelytra subopaque; vein R + M branching at apical third; vein Sc distinct only posteriorly; costal margins subparallel almost to level of apical third of scutellum, rather strongly arcuate to middle, and then feebly arcuate to apices. Female genital cleft surpassing middle of abdomen, the fourth and fifth segments concealed beneath third at middle.

Color dark brown to black, the head black with a brownish-ochraceous spot at middle of base and another on either side of middle before base of tylus, pale stripe along middle of tylus, and pale apices of antenniferous tubercles and elevated margins of bucculae. Pronotum more or less black with black punctures, the anterior margin and short, longitudinal spot at middle of anterior margin and posterior lobe generally or at least at middle and sublaterally on posterior margin and near humeri ochraceous or ferruginous; callosities black. Scutellum black except at apex. Clavus and corium irregularly variegated with clear areas and dark fuscous to black, the areas lateral to vein R + M clear except along extreme margin and at apex. Apical margin of corium dark brown interrupted at junction with vein Cu and just behind junction of vein R. Membrane irregularly variegated with fuscous blotches, the veins, at least, clear. Under side in great part black with the usual pale areas ochraceous, sometimes with a ferruginous tinge. Rostrum and antennae entirely black except for pale joints between segments. Coxae black except at apices, the rest of legs pale with black-spotted femora and infuscated apices of tibiae and tarsi.

Size: smallest male, length 3.88 mm., width 1.31 mm.; largest female, length 5.33 mm., width 1.93 mm.

Material includes two paralectotypes from Hawaii in the Blackburn collection (compared with the type by W. E. China); 82 specimens from Hawaii collected principally at Kilauea, Parker Ranch, Nauhi Gulch, and Humuula (G. P. Wilder), (J. F. Illingworth), (W. M. G.), (O. H. S.), (F. X. W.), (R. L. U.), on *Clermontia*, *Lythrum*, *Sophora*, *Dubautia*, and amaranth in all months except February, March, May, November, and December; 33 specimens from Maui, mostly from Haleakala on *Dubautia* and *Geranium* (O. H. S., P. H. T.) in July and August of various years (pl. 9, F, female, Haleakala, Maui, 8,000 ft., Aug. 17, 1929, O. H. S.); six specimens from Kauai at Halemanu and Kokee, Aug. (O. H. S.); without precise locality, July (D. T. F.), and four specimens from Molokai, Kawela, 3,700 ft., Dec. (O. H. S.) and elsewhere on Molokai, July (D. T. F.).

Variation in color is excessive, while the only important structural variations appear to be the more or less sinuous sides of pronotum and often shorter basal segment of rostrum.

74. *Nysius nigriscutellatus*, new species (pl. 8, G).

Head one fourth broader than long, 18:14.5; anteocular portion scarcely longer than an eye, 6.5:6; eyes less than half as wide as interocular space, 4:10; upper surface a little elevated along middle, subdepressed laterally; roughened by irregular punctures which are mostly obscured by relatively dense, appressed, white pubescence; bucculae distinct anteriorly, gradually decreasing a little before base of head. Rostrum reaching hind margins of middle coxae, the first segment as long as bucculae but not reaching base of head; segments one to four 8-8.5-8-6. Antennae less than twice as long as width of pronotum, 44.5:24; segments one to four 6-14.5-12-12.

Pronotum over half again as broad as long, 24:15; one third broader than head, 24:18; and scarcely longer than head, 15:14.5; sides feebly sinuate; disk feebly convex with a slight median depression behind callosities, clothed with both appressed and erect hairs, the appressed hairs white and densest surrounding sinuous callosities on anterior lobe.

Hemelytra rather long, exceeding tip of abdomen by more than one fourth the total length of membrane; membrane but little shorter than costal margin, 37:40; the portion beyond level of apices of coria one tenth longer than in front of this; corium subhyaline or appearing dirty testaceous and subopaque, vein R + M branching a little beyond apical

third; Sc scarcely visible; costal margins subparallel and feebly sinuate basally, then somewhat gradually but distinctly to strongly divergent from about level of apical third of scutellum and then moderately arcuate to apices.

Color grayish or fusco-testaceous with black markings. Head black with a dark fulvous longitudinal line at middle of upper surface of head basally, fulvous along middle of tylus and antenniferous tubercles. Pronotum with black punctures, broadly black around callosities and a median depressed area immediately behind this, and on posterior margin sublaterally. Anterior margin narrowly elevated and pale, posterior margin, especially broadly, longitudinally at middle, and sides extending onto humeri pale and impunctate. Scutellum black except extreme apex and apically along the reflexed edges, pale. Clavus and corium fusco-testaceous to testaceous or clear with variable brown markings usually at least on commissure of clavus, irregularly on veins Cu, and R + M, and interruptedly along apical margin of corium, being dark at junction with vein Cu, between arms of R + M, and apically. Extreme edge of costal margin brown. Membrane clear or sometimes lightly irregularly infuscate. Under surface in great part black but with the usual pale areas, and, especially in the female, with the venter pale posteriorly. Rostrum pale with black apex. Antennae very pale brown, the first segment paler and marked with black, third narrowly black basally. Legs pale with brown-spotted femora and infuscated apices of tarsi.

Size: male, length 4.55 mm., width 1.55 mm.; female, length 4.94 mm., width 1.75 mm.

Holotype male, 1446, allotype female, 1446A, and 33 paratypes, south slope of Mauna Kea near Humuula, 6,000 feet, July 29, 1935, on *Styphelia* (R. L. U.) (pl. 8, G, female). Other specimens: Hawaii, Maui, Molokai, Kahoolawe, Oahu, Manana, and Kauai, collected in every month except April, September, and November. Although I collected *N. nigriscutellatus* typically on *Styphelia*, the following plant records can be listed: amaranth, dandelion, *Osmanthus*, *Cheirodendron gaudichaudii*, *Dubautia* (22 records), *Argyroxiphium grayanum*, *Portulaca*, *Artemisia*, *Eragrostis*, and *Sida*. Found from sea level to 10,000 feet. Close to *N. coenosulus* which is longer and more slender with maculated membrane and characteristically marked corium and longer rostrum.

With breeding experiments, the lowland specimens from *Portulaca* and other hosts may prove to be a distinct species.

75. *Nysius nihoae*, new species.

Head about one fourth broader than long, 19.5:16; anteocular portion a little longer than an eye, 7:6; eyes less than half as wide as interocular space, 4.5:11; upper surface a little elevated along middle, coarsely, distinctly punctured, and clothed with rather inconspicuous, appressed pubescence. Bucculae distinctly elevated anteriorly, gradually decreasing posteriorly to about basal fifth of head, the rostral groove continuing to base of head. Rostrum extending to middle coxae, the first segment scarcely surpassing bucculae; segments one to four 8.5-8-9-7. Antennae over half again as long as width of pronotum, 43.5:26; segments one to four 5.5-14-12-12.

Pronotum slightly over half again as broad as long, 26:16.5; over one fourth broader than head, 26:19.5; and scarcely longer than head, 16.5:16; sides distinctly sinuate; disk rather feebly elevated excepting callosities which are moderately, roundly elevated, with a depression at middle just behind callosities; punctures large and extending very near posterior margin, the humeri and sides of posterior lobe in front of humeri impunctate; with a conspicuous, pale, appressed pubescence, particularly surrounding callosities and on anterior margin.

Hemelytra rather long, exceeding tip of abdomen by one fourth or one fifth the total length of membrane; membrane but little shorter than costal margins; a little longer

beyond level of apices of coria than in front of this; corium subhyaline, vein R + M branching at apical fifth; costal margins sinuate subbasally, feebly divergent, even at base, and most strongly arcuate at about middle.

Color testaceous marked with brown or black. Head black with pale line and other variegations at middle, and with pale tylus, ocular margins, antenniferous tubercles, sublateral spots at posterior margin of head beneath, and elevated portions of bucculae. Pronotum pale with black callosities. Scutellum black on basal half and pale apically. Hemelytra almost immaculate, the inner claval margins near apex of scutellum and apical margin of corium near middle and near apex brown. Membrane clear or scarcely brown along center posteriorly. Under surface with dark areas very limited in extent, with the usual pale areas and with the abdomen pale posteriorly and laterally. Rostrum pale with black apex. Antennae light brown with paler, brown-spotted first segment. Legs pale with small brown spots on femora and infuscated apices of tibiae and tarsi.

Size: female, length 4.83 to 5.16 mm., width 1.61 to 1.75 mm.

Holotype female, 1447, and one female paratype, Nihoa, June 11, 13, 1923 (E. H. B.).

This species is nearest *N. neckerensis* but differs in its larger size, darker coloration, and other characters.

76. *Nysius neckerensis*, new species.

Head about one fifth broader than long, 17:14; anteocular portion slightly longer than an eye, 6:5; eyes over one third as broad as interocular space, 3.75:9.5; upper surface moderately elevated along middle, polished at middle, finely scabrous laterally but scarcely distinctly punctured and clothed with a short, white, appressed pubescence which is conspicuous laterally; bucculae distinctly elevated anteriorly, gradually decreasing to basal fourth of head where they terminate abruptly, the rostral groove continuing to hind margin of head. Rostrum (described from female) reaching middle coxae, the first segment about as long as elevated portions of bucculae; segments one to four 9-8-9-7.5. Antennae less than twice as long as width of pronotum, 37.5:22; segments one to four 5-12-9-11.5.

Pronotum a little over half again as broad as long, 22:14; about one fourth broader than head, 22:17; and equal in length to head; sides very feebly sinuate; disk comparatively subflattened, the callosities a little elevated, coarsely punctured along anterior border and more finely so posteriorly with broadly impunctate posterior margin, humeri, and sides of posterior lobe in front of humeri; clothed with rather long, appressed, white hairs, especially surrounding callosities.

Hemelytra of moderate length, exceeding tip of abdomen by one fourth the total length of membrane (male) or one sixth the total length of membrane (female), the membrane scarcely shorter than costal margin and about as long behind level of apices of coria as in front of this; corium subhyaline, branching of vein R + M apparently wanting; Sc present; costal margins scarcely, if at all, subparallel basally, feebly sinuate subbasally and then gradually arcuate to apices although more strongly so at middle.

Color pale testaceous marked with fulvous, fuscous, and black. Head black with a broad, interrupted, pale area at center above, the sutures around tylus, a short, laterally directed area on either side of base of tylus, and an inverted V-shaped maculation connecting base of tylus with lateral black areas, black margins of eyes, tylus, apices of antenniferous tubercles, a spot on either side of under surface at hind margin near eyes, and elevated portions of bucculae, pale. Pronotum with callosities black and sublateral spots on posterior margin brown. Scutellum black at extreme base, brown near middle, and pale on apical half. Hemelytra pale and immaculate except for brown along apical margin of corium near union with vein R and near apex and a very ill-defined brown area along middle of apical half of membrane, the membrane often entirely clear. Under surface with black areas restricted, with the usual pale areas and with abdomen pale except at middle

of base. Rostrum pale, with black fourth segment. Antennae light brown, the first segment paler with brown apex. Legs pale yellow with widely scattered small brown spots, and brown apices of tibiae and tarsal segments.

Size: male, length 4.05 mm., width 1.38 mm.; female, length 4.72 mm., width 1.66 mm.

Holotype male, 1448, allotype female, 1448A, and 10 paratypes, Necker Island, July 29, 1923, on *Chenopodium* (E. H. B.). Forty additional specimens are at hand from the same series but are too damaged to be made paratypes.

This species evidently occurs in company with *N. chenopodii* on Necker. *N. neckerensis* is entirely different from *N. chenopodii* which is smaller, with convex, densely punctate pronotum, subparallel bases of costal margins and brownish maculations on hemelytra. From *N. nigriscutellatus*, to which it is most closely related, *N. neckerensis* differs in its more convex and paler upper surface of head and less sinuate costal margins.

77. *Nysius dallasi* White, Ann. Mag. Nat. Hist. V, 1: 367, 1878. Kirkaldy, Haw. Ent. Soc., Proc. 1: 190, 1908; Fauna Haw. 2: 538, 1910 (= *vinitor*, Kirkaldy non Bergroth, Ent. Month. Mag. II, 2: 69, 1891). Perkins, Ent. Soc. London, Trans. (1911), 732, 1912. (See pl. 8, F.)

? *Nysius vinitor*, Kirkaldy, Haw. Ent. Soc., Proc. 1: 139, 146, 149, 152, 1907; 1: 190, 1908.

Head more than one fourth broader than long, 19:15.5; antecular portion longer than eyes, 7.5:6; eyes less than half as wide as interocular space, 4.5:10; upper surface a little elevated along middle and subdepressed laterally, punctate, and densely clothed with appressed, white hairs; bucculae distinct anteriorly, gradually decreasing posteriorly, and terminating at basal sixth of head, the rostral groove continuing to posterior margin. Rostrum reaching apices of hind coxae, the first segment not attaining base of head; segments one to four 10-10-10-7.5. Antennae twice as long as width of pronotum, 50:22.5; segments one to four 6-15.5-13-15.5.

Pronotum half again as broad as long, 22.5:15; distinctly broader than head, 22.5:19; and scarcely shorter than head, 15:15.5; sides feebly sinuate; disk rounded laterally, scarcely impressed behind callosities at middle; densely clothed with appressed, white hairs except on humeri and on slender, sinuous callosities.

Hemelytra rather long, exceeding tip of abdomen by one fourth the length of membrane; membrane about one sixth shorter than costal margin; its length beyond level of apices of coria about equal to length in front of this; corium hyaline, vein R + M branching a little beyond apical fourth, vein Sc feeble, costal margins subparallel about to level of apical third of scutellum, then rather abruptly dilated behind which they are straight or only feebly arcuate to apices.

Color testaceous with brownish-ochraceous and black markings very much in the minority as seen from above. Head with broad, anteriorly divergent areas laterally and extending inward to include ocelli; the ocular margins, middle of head, apices of antenniferous tubercles, bucculae anteriorly, and under surface narrowly behind antenniferous tubercles and beneath eyes, pale. Eyes brown. Ocelli reddish. Pronotum with black callosities and brown posterior margin, especially sublaterally. Scutellum black at base, both ventrally and laterally, elsewhere fulvous with white sides and tip. Hemelytra in great part pale, hyaline or testaceous, faintly tinged with fulvous at apex of commissure of clavus, along extreme edge of costal margin, and near middle of apical margin of corium. Membrane hyaline or somewhat tinged with white, lightly infuscated only along middle. Under surface in great part black with, however, the usual pale areas and with the lateral trichobothria-bearing spots conspicuous, brown. Rostrum pale with black apex. Antennae

fulvous or paler with testaceous first segment marked with fuscous and with the remaining segments more or less marked with brown.

Size: male, length 4.41 mm., width 1.36 mm.; female, length 5.44 mm., width 1.77 mm.

Material before me includes a single female paralectotype from the Blackburn collection, Oahu, compared with the type by W. E. China; a series of 20 specimens, Manana Island, Oahu, Jan. 19, 1936, on *Portulaca* (R. L. U.); one specimen, Barking Sands, Kauai, Dec. 31, 1935 (R. L. U.); one specimen, Kahala, Oahu, Feb. 8, 1917 (W. M. G.); Honolulu, May 19, 1927, on *Portulaca oleracea* (O. H. S.); two specimens, Ewa Coral Plain, Feb. 29, 1919 (O. H. S.); and one specimen each from Waianae, Oahu, Oct. 14, 1905; Barbers Point, Oahu, June 29, 1919 (O. H. S.); Kuliouou, Oahu, Aug. 8, 1926 (E. H. B.); Mokapu, Oahu, Sept. 3, 1923 (E. H. B.); Waianae Pt., Oahu, Oct. 14, 1905; Ewa Coral Plain, Oahu, June 25, 1920 (O. H. S.); Upper Hamakua Ditch Trail, Hawaii, July 31, 1921 (O. H. S.); and Mapulehu, Molokai, Aug. 16, 1936, on *Portulaca* (R. L. U.). (See pl. 8, *F*, female, Manana Island, Oahu, Jan. 4, 1936, R. L. U.)

78. *Nysius coenosulus* Stål, Eugenies Resa, Ins., 243, 244, 1859. Kirkaldy, Haw. Ent. Soc., Proc. 1: 152, 1907; 1: 190, 1908; Fauna Haw. 2: 540, 1910. Perkins, Ent. Soc. London, Trans. (1911), 734, 1912. Meinecke, Haw. Ent. Soc., Proc. 3: 286, 1917. Bryan, Haw. Ent. Soc., Proc. 6: 282, 1926. Illingworth, Haw. Ent. Soc., Proc. 7: 364, 1931. Swezey, Haw. Ent. Soc., Proc. 9: 97, 1935. (See pl. 8, *D*.)

Head a little broader than long, 17:15; anteocular portion scarcely longer than an eye, 6.5:6; eyes less than half as wide as interocular space, 4:9; upper surface feebly elevated and irregularly callose along middle and moderately depressed sublaterally, roughened by indistinct punctures and clothed with a relatively short, appressed white pubescence; bucculae distinct anteriorly and gradually decreasing posteriorly, ending a little behind point between antenniferous tubercles and base of head, the rostral groove extending to base of head. Rostrum reaching posterior coxae, the first segment surpassing elevated portion of bucculae but not reaching base of head; segments one to four 10-10-9-8. Antennae slightly more than twice as long as width of pronotum, 49:23.5; segments one to four 6-16-13-12.

Pronotum half again as wide as long, 23.5:16; distinctly less than half again as broad as head, 23.5:17; and slightly longer than head, 16:15; sides sinuate, being broadly but feebly ampliate at level of callosities, a little concave behind this and flaring at humeri; disk scarcely or more distinctly elevated posteriorly, feebly depressed at middle behind callosities, distinctly clothed with both erect and appressed hairs except narrowly and sinuately on callosities and along posterior margin and humeri.

Hemelytra relatively long, exceeding tip of abdomen by a little less than one fourth the total length of membrane; membrane scarcely shorter than costal margin; the portion behind level of apices of coria about as long as the part anterior to this; corium subhyaline, vein R + M branching a little beyond apical third, vein Sc scarcely visible; costal margins subparallel to level of middle of scutellum behind which they are abruptly divergent and then rather evenly arcuate. Female genital cleft reaching beyond middle of abdomen.

Color testaceous marked with fuscous or black. Head black with ochraceous median and anteriorly diverging area on head above, middle of tylus, ocular margins, apices of antenniferous tubercles, and bucculae. Eyes brown, ocelli red. Pronotum pale along slightly elevated anterior margin and more generally on posterior lobe including a more or less

distinct median longitudinal stripe and a lateral, slightly oblique stripe on each humerus. Region of callosities and median depression behind this, punctures, and sublateral depressed areas near posterior margin, black. Scutellum black with pale sides towards the apex and pale apex. Hemelytra pale, testaceous, with more or less distinct fuscous marks typically along commissure of clavus, on vein Cu, on branches of R + M, very narrowly along edge of costal margin, and along apical margin of corium near junction with vein Cu, between branches of R + M, and subapically. Membrane longitudinally interruptedly fasciate at middle, the veins clear. Under side in great part black, with the usual pale areas, the abdomen often broadly fulvous posteriorly in the female. Rostrum pale with black ventrally (when at rest) and at apex. Antennae brown, the first segment somewhat paler with black markings laterally and apically. Second segment brown at apex. Legs pale, the femora brown or black-spotted and tibiae and tarsi infuscated apically.

Size: male, length 4.27 mm. to 4.66 mm., width 1.38 mm. to 1.5 mm.; female, length 5 to 5.72 mm., width 1.72 to 2 mm.

I have a series of over 300 specimens from Hawaii, Maui, Molokai, Lanai, Oahu, and Kauai, taken in every month. This species is found typically on *Erigeron* but specimens have been captured on *Styphelia*, *Sadleria* fern, *Heterotheca*, *Euphorbia* weed, *Dubautia*, *Erythrina*, *Myrsine*, *Clermontia*, *Argyroxiphium grayanum*, *Metrosideros*, *Sophora*, *Scaevola*, *Pelea*, *Eragrostis leptophylla* and other grasses, *Amaranthus*, *Myoporum*, *Acacia koa*, *Lythrum*, *Geranium*, *Dodonaea*. (See pl. 8, D, male, Pauoa Flats, Oahu, July 21, 1935, R. L. U.)

This is the only species of which Kirkaldy saw the type, a unique in the Naturhistoriska Riksmuseum at Stockholm. I have not seen the type but have followed Kirkaldy's identification of this species.

79. *Nysius delectulus* Perkins, Ent. Soc. London, Trans. (1911), 736-737, 1912. (See pl. 8, B.)

Head a little broader than long, 20:18; anteocular portion one fourth longer than an eye, 8:6.5; eyes less than half as wide as interocular space, 4.5:11; upper surface feebly elevated along middle and laterally depressed; irregularly and indistinctly punctate and rather densely clothed with appressed, white hairs; bucculae distinctly elevated anteriorly and gradually decreasing posteriorly, terminating a little before base of head. Rostrum scarcely exceeding hind margins of posterior coxae (or, in terms of abdominal segments, to posterior margin of first segment), the first segment reaching base of head; segments one to four 13-14-14-9. Antennae approximately twice as long as width of pronotum, 54:27.5; segments one to four 7-18-14-15.

Pronotum half again as broad as long, 27.5:18; one third broader than head; and equal in length to head; sides distinctly sinuate, being broadly but feebly ampliate at level of callosities and posteriorly outwardly flaring at humeri; disk a little more elevated posteriorly, with a broad median depression behind callosities; clothed with long, erect and dense, pale, appressed hairs except on sinuous callosities, narrow posterior margin, and humeri; posterior margin narrowly and humeri broadly impunctate.

Hemelytra moderately long, exceeding tip of abdomen by slightly less than one fourth the total length of membrane; membrane almost as long as costal margin; and about as long beyond level of apices of coria as in front of this; corium subhyaline, vein R + M branching at apical fifth; vein Sc scarcely prominent; costal margins subparallel about to level of apical third of scutellum, then broadly arcuate, becoming straighter posteriorly.

Color light brownish-ochraceous, almost fulvous, with black markings. Head black with fulvous longitudinal line posteriorly at middle of interocular space, fulvous at middle

of tylus and on narrow ocular margins and apices of antenniferous tubercles. Pronotum fulvous along impunctate, elevated, anterior margin, broadly black surrounding callosities and in median depression in punctures, and sublaterally on posterior margin. Scutellum black with pale apex. Clavus and corium with elevated veins either infuscated or testaceous, with brown on commissure of clavus, irregularly on vein Cu, somewhat broadly longitudinally between Cu and R + M, along extreme edge of costal margin, and along apex of corium at junction of vein Cu between branches of R + M, and subapically. Membrane faintly, indistinctly embrowned, especially at middle, the veins clear. Under surface black with the usual pale areas including most of the posterior three fourths of venter. Rostrum pale with black apex. Antennae brownish, the first segment with black longitudinal markings; second and third darker brown apically, and fourth entirely darker brown. Legs pale with brown or black-spotted femora and darkly infuscated tarsi.

Size: male, length 5.61 mm., width 1.77 mm.; female, length 6.44 mm., width 2.19 mm.

Holotype male, and allotype female (pl. 8, B), Kilauea, Hawaii, July 1906 (R. C. L. P.); 20 more or less typical examples from the same locality, Oct. 11, 1929, on *Dubautia scabra* (O. H. S.), June 28, 1934, on *Dubautia* (O. H. S.), Aug. 1921 (F. M.), and Jan. 12, 1917 (W. M. G.); Hookomo, south slope of Mauna Kea, 8,000 feet, Aug. 9, 1935 (R. L. U.); aa flows, Kau, Hawaii, Aug. 26, 1919 (W. M. G.); and three miles north of Humuula on the south slope of Mauna Kea, Aug. 9, 1935 (R. L. U.).

This species is apparently confined to the highlands of Hawaii. Some specimens are among the largest of the genus *Nysius* (7.11 mm. by 2.36 mm.). *N. delectulus* is very close to the common *N. communis* but has a shorter rostrum and lacks the fulvous color, although this last is wanting on some specimens of true *N. communis*. This species has more the aspect of a large *N. coenosulus* but is easily distinguished from that species as indicated in the key.

80. *Nysius delectus* White, Ann. Mag. Nat. Hist. V, 1: 367, 368, 1878. Kirkaldy, Haw. Ent. Soc., Proc. 1: 139, 146, 152, 1907; 1: 190, 1908; Fauna Haw. 2: 538, 1910. Perkins, Ent. Soc. London, Trans. (1911), 733, 1912. Swezey, Haw. Ent. Soc., Proc. 2: 114, 1910; 9: 95, 97, 1935. Meinecke, Haw. Ent. Soc., Proc. 3: 286, 1917. Bryan, Haw. Ent. Soc., Proc. 3: 295, 1917; 6: 282, 1926. Illingworth, Haw. Ent. Soc., Proc. 5: 278, 1923; 6: 392, 1927; 7: 43, 1928. Swezey and Williams, Haw. Ent. Soc., Proc. 8: 190, 192, 1932. Giffard, Haw. Ent. Soc., Proc. 5: 359, 1924. (See pl. 8, C.)

Nysius kamehameha Kirkaldy, Fauna Haw. 3: 164, 1902; 2: 539, 1910; Haw. Ent. Soc., Proc. 1: 190, 1908. Perkins, Ent. Soc. London, Trans. (1911), 734, 1912.

Head one sixth broader than long, 21.5: 18; antecular portion one fourth longer than eyes, 8: 6.5; eyes less than half as wide as interocular space, 5: 11.5; upper surface a little elevated along middle and subdepressed laterally, greatly roughened and densely clothed with comparatively long, appressed, pale hairs; bucculae distinctly elevated anteriorly, gradually decreasing posteriorly so as to be scarcely discernible near posterior margin of head. Rostrum very slightly surpassing posterior coxae, the first segment usually reaching base of head; segments one to four 12-12-12-10. Antennae approximately twice as long as width of pronotum, 55: 27; segments one to four 7-17-15-16.

Pronotum half again as broad as long, 27:18 (in the male), still broader, 33:20 (in the female); two sevenths broader than head, 27:21.5; and equal in length to head, 18:18; sides concave (in the male) and feebly convex (in the female); disk subflattened (in the male) to quite distinctly convexly elevated on posterior lobe (in the female), the punctures rather coarse and distinct; clothed with dense, pale, appressed hairs around callosities and extending over anterior margin, with erect hairs short on the disk, long at sides, and very long and erect on anterior margin.

Hemelytra rather long, exceeding tip of abdomen by more than one fourth the total length of membrane in the male or by a little less than this in the female; membrane a little shorter than costal margin; about as long beyond level of apices of coria as in front of this; corium practically hyaline; vein R + M branching at apical fourth; vein Sc inconspicuous; disks of clavus and corium with numerous, suberect, short, pale hairs; costal margins subparallel almost to level of apex of scutellum, then rather abruptly outwardly dilated behind which they are moderately evenly arcuate. Under surface quite densely clothed with a short, appressed, pale pubescence except on the usual glabrous areas.

Color pale, whitish-ochraceous, and shining, the head black with pale longitudinally at middle of base, along middle of tylus, ocular margins, apices of antenniferous tubercles, and bucculae. Pronotum with callosities broadly, posterior margin at least sublaterally, longitudinal stripe along middle of anterior half of posterior lobe and punctures, black. Scutellum black with pale, raised areas apically. Clavus and corium clear or almost white with black on few punctures at base of claval sutures, black along commissure of clavus, black along apical margin of corium except at inner and outer angles, and with a few dark fuscous longitudinal markings at middle of corium. Membrane almost or quite clear, under surface black with the usual pale areas ochraceous to ferruginous. Rostrum pale, with black apex. Antennae dark brown to black, the first segment extensively marked with, or in great part, white, second and third segments white apically and fourth segment brownish apically. Legs pale, ochraceous, with black on coxae basally, black spots on femora sometimes joined to form a streak along upper surface, tibiae black basally and apically, the first tarsal segment infuscated apically and third segment entirely black.

Size: small male, length 5.61 mm., width 1.77 mm.; large female, length 6.66 mm., width 2.33 mm. (*N. kamehameha* female "long. $7\frac{1}{8}$ mm. lat. $2\frac{1}{8}$ mm." Kirkaldy, 1902.)

My material includes one of Blackburn's paralectotypes, compared with the type by W. E. China, and a series of 120 specimens from all the islands except Kauai, collected on *Dubautia*, *Coprosma*, *Metrosideros*, *Stachytarpheta*, *Phyllostegia*, *Pelea*, *Myrsine*, and *Verbena bonariensis*. (See pl. 8, C, female, Mt. Tantalus, Oahu, June 23, 1935, R. L. U.)

Nysius kamehameha was described by Kirkaldy from Hualalai, Hawaii, 5,000 feet, Aug. 1892 (R. C. L. P.). It was distinguished from *N. delectus* Kirkaldy nec White (= *delectulus* Perkins, fide Perkins) but not from the true *delectus* White, a species apparently unknown to Kirkaldy. There is nothing given in the original description of *N. kamehameha* except the slightly larger size to distinguish this species from typical *N. delectus*. Perkins (1912) said of it, "this appears to me to be very close to the true *N. delectus* F.B.-W."

The unique type is now in a fragmentary state, wanting the head, prothorax, all of the abdomen except the left side of the venter, and most of the right hemelytron. However, the middle and hind legs, left clavus and corium, scutellum, and meso and metapleura are identical in every way including size with corresponding parts of the very distinctive *Nysius delectus* and do not approach any other described species. Hence, as the remainder of the type is

lost and as no other differentiating characters have been given, *N. kamohameha* has been placed in synonymy.

81. *Nysius mixtus*, new species (pl. 8, E).

Head but little broader than long, 21:19; anteocular portion about one fifth longer than an eye, 8.5:7; eyes less than half as wide as interocular space, 5:11; upper surface distinctly, densely, and rather coarsely punctate, with a glabrous spot at middle of base; moderately elevated along middle and depressed near eyes; irregularly clothed with an appressed, pale pubescence; bucculae distinctly elevated anteriorly, gradually and arcuately decreasing posteriorly and terminating at basal seventh of head, the rostral groove continuing to posterior margin. Rostrum extending about to level of middle of fourth abdominal segment (as measured at sides of female abdomen), the first segment reaching onto prosternum; segments one to four 16-16-22-11. Antennae a little less than twice as long as width of pronotum, 51:27.5; segments one to four 7-16-14-14.

Pronotum over half again as broad as long, 27.5:16; about one third broader than head, 27.5:21; and about one sixth shorter than head, 16:19; sides feebly sinuate; disk moderately declivous and convex on posterior lobe, transversely impressed at hind margins of callosities, depressed and with a row of punctures on either side of a small, median, longitudinal carina just behind callosities, and continuing feebly in front of callosities; humeri broadly impunctate; pubescence relatively short and subappressed except for sinuous callosities.

Hemelytra exceeding tip of abdomen by one sixth the length of membrane; membrane scarcely shorter than costal margin; about as long beyond level of apices of coria as in front of this; corium subhyaline, vein R + M branching a little beyond apical third; Sc distinct; costal margins subparallel to level of apical third of scutellum and then gradually dilating behind which they are arcuate.

Color clear hyaline to ochraceous marked with brown and black. Head black with ochraceous spot at middle of posterior margin, ochraceous to fulvous stripe along middle of tylus, narrowly pale ocular margins, pale apices of antenniferous tubercles and bucculae. Pronotum broadly black on anterior lobe and extending posteriorly at middle along longitudinal carina, the anterior margin pale, punctures black and depressed sublateral areas of posterior margin dark brown. Scutellum black with narrowly pale apex. Clavus brown along inner margin apically and on commissure with a few spots scattered laterally on the disk. Corium irregularly infuscate along vein Cu and on branches of vein R + M, the apical margin fuscous at joining of vein Cu, between branches of vein R + M, and between Sc and apex. Membrane entirely clear or with only a faint cloud at middle of apex. Under surface black with the usual pale areas, the abdomen ochraceous to fulvous posteriorly at middle. Rostrum pale with dark brown to black apex. Antennae brown, the first segment marked with paler. Legs pale fulvous, the coxae black basally, femora brown-spotted, and tibiae and tarsi infuscated apically.

Size: female, length 5.33 to 6.05 mm., width 1.43 to 2 mm.

Holotype female, 1449, one paratype female, Kalalau, Kauai, Aug. 20, 1921, on *Dubautia* (O. H. S.) (pl. 8, E) and one paratype female, Kokee, Kauai, Aug. 19, 1921, on *Styphelia* (O. H. S.).

Allied to *delectus* but with a much longer rostrum and a distinctive color pattern.

82. *Nysius communis*, new species (pl. 8, A).

Head a little broader than long, 20:18; anteocular portion about one fourth longer than eyes, 8:6.5; eyes less than half as wide as interocular space, 4.75:10.5; upper surface elevated along middle and subdepressed laterally, distinctly but irregularly punctate and clothed with a short, pale, appressed pubescence; bucculae distinctly elevated anteriorly, gradually decreasing posteriorly and abruptly terminating a little before posterior

margin, the rostral groove reaching posterior margin. Rostrum reaching hind margin of second visible abdominal segment, the first segment reaching or slightly surpassing base of head, segments one to four 14-14-18-10. Antennae about twice as long as width of pronotum, 54:26.5; segments one to four 7-17-14-16.

Pronotum half again as broad as long, 26.5:17.5; slightly over one fourth broader than head, 26.5:20; and almost as long as head, 17.5:18; lateral margins moderately but distinctly sinuate, being ampliate at level of callosities; disk slightly more convexly elevated posteriorly than anteriorly and feebly depressed at middle behind callosities; conspicuously with appressed pale hairs around callosities; and with rather dense subappressed and some erect longer hairs elsewhere.

Hemelytra quite long, exceeding tip of abdomen by one third the total length of membrane; membrane a little shorter than costal margin and scarcely longer beyond level of apices of coria than in front of this; corium subhyaline, vein R + M branching about at apical fourth, vein Sc obscure, with a very few large punctures along claval suture basally; costal margins sinuate subbasally, subparallel or slightly divergent to level of apical third of scutellum, then strongly expanded behind which they are moderately, evenly arcuate.

Color fulvous with black markings. Head black with fulvous anteriorly divergent median area on head above middle of tylus and apices of antenniferous tubercles. Eyes brown, ocelli reddish. Pronotum broadly black in region of callosities and extending backwards narrowly at middle and with small black spots sublaterally on posterior margin. Scutellum black with pale apex. Clavus and corium fulvous or, laterally, clearer, hyaline, typically with dark brown to black along commissure of clavus, vein Cu, inner branch of R + M, and apical margin of corium with an ill-defined pale break just before junction with vein Sc. Costal margins brown on extreme edges. Membrane longitudinally infuscate along middle. Under surface in great part black with the usual pale areas fulvous to testaceous. Rostrum fulvous with black apex. Antennae fulvous with black apically on first segment and dark brown apical segment. Legs fulvous or paler basally with black spots on apical half of femora, especially posterior femora, and with infuscated apices of tibiae and tarsi.

Size: male, length 5.61 mm., width 1.77 mm.; female, length 5.94 mm., width 1.88 mm.

Holotype male, 1450, Humuula, Hawaii, July 30, 1935 (R. L. U.); allotype female, 1450A, four miles north of Humuula on the slopes of Mauna Kea, Hawaii, July 31, 1935 (R. L. U.). Paratypes from a series of 348 specimens from Hawaii, Maui, Molokai, Lanai, Oahu, and Kauai, collected in every month. The species is typically found on *Bidens* but has been taken on the following plants: *Argyroxiphium grayanum*, *Metrosideros*, *Styphelia*, *Coprosma*, *Euphorbia*, *Lobelia gloria-montis*, *Scaevola*, *Cibotium menziesii*, *Cheirodendron*, *Argyroxiphium virescens*, *Sadleria* ferns, *Artemisia*, and *Sophora*.

The specimens vary in size from 4.66 mm. to 6.16 mm. in length by 1.41 mm. to 2 mm. in width, and some have the membrane entirely clear. The fulvous color and long rostrum will serve to distinguish this species from its congeners.

Thirty-six paratypes: Hawaii: Kilauea, two specimens, Aug. 18, 1935, three specimens, same data, Aug. 19, 1935, and one specimen, July 28, 1935 (R. L. U.), and one specimen, Jan. 14, 1917 (W. M. G.); Humuula, two specimens, July 30, 1935, one specimen, July 31, 1935, and one specimen, Aug. 6, 1935 (R. L. U.); Hookomo, south slope of Mauna Kea, 7,000 feet, on

Sophora, one specimen, Aug. 9, 1935 (R. L. U.); south slope of Mauna Kea, 10,000 feet, one specimen, Aug. 1, 1935 (R. L. U.); Huehue, North Kona, 1,800 feet, one specimen, Aug. 25, 1917 (W. M. G.); Upper Hamakua Ditch Trail, one specimen, July 31, 1921 (O. H. S.); Puuwaawaa, North Kona, 3,700 feet, four specimens, Aug. 23, 25, 1917 (W. M. G.); Honokaa, two specimens, April 26, 1920 (O. H. S.). Oahu: Konahuanui, one specimen, July 25, 1920 (E. H. B.) (pl. 8, A); Kolekole Pass, on *Artemisia*, one specimen, Nov. 19, 1922 (O. H. S.); Mt. Kaala, 2,000 to 3,000 feet, on *Bidens*, two specimens, July 22, 1928 (E. H. B.); Waipio Ridge, one specimen, Aug. 28, 1927 (O. H. S.). Maui: Puu Kukui, on *Argyroxiphium grayanum*, one specimen, Dec. 20, 1928 (O. H. S.); Haleakala, 6,000 feet, on *Styphelia*, one specimen, July 15, 1927 (O. H. S.); Haleakala, 6,000 feet, on *Argyroxiphium sandwicense*, two specimens, Aug. 18, 1929 (O. H. S.). Lanai: Haalelepaa-kai, four specimens, Nov. 29, 1935 (R. L. U.). Molokai: Kawela, 3,700 feet, one specimen, Dec. 23, 1925. Kauai: Alakai Swamp, one specimen, July 10, 1928 (A. M. Adamson).

83. *Nysius abnormis*, new species (pl. 9, D).

Head as long as broad, 19:19; antecular portion over half again as long as an eye, 10:6; eyes less than half as wide as interocular space, 4.5:10; outer sides of antenniferous tubercles parallel, the apices feebly but distinctly produced attaining level of basal third of antecular region; upper surface roughened mostly by irregular punctures; bucculae very long, moderately elevated anteriorly and decreasing but little posteriorly until basal seventh where they decrease abruptly, not reaching base of head. Rostrum very long, reaching almost to sixth visible abdominal segment, the first segment reaching onto depressed, black, posterior portion of prosternum; segments 1-2+3-4 as 18-39-12. Antennae broken off beyond the second segment, segments one and two 6.5:13.

Pronotum about three fifths as long as wide, 15:24.5; about one fourth broader than head, 24.5:19; and about one fourth shorter than head, 15:19; sides feebly ampliate at level of callosities; disk rounded laterally but otherwise subflattened.

Hemelytra exceeding tip of abdomen by one sixth the total length of membrane; membrane one seventh shorter than costal margins; scarcely shorter beyond level of apices of coria than in front of this, 16:18; corium subopaque, vein R+M branching at apical third; vein Sc inconspicuous; costal margins subparallel subbasally and then rather strongly and evenly arcuate. Metapleural angle scarcely produced at all, subrounded.

Color brownish-testaceous, occasionally tinged with ferrugineous. Head paler, ochraceous anteriorly on tylus, at center of base of head, and narrowly around ocular margins and along margins of bucculae, with a black anteriorly divergent stripe on either side of middle, a small black puncture design behind tylus and black on basal half of antenniferous tubercles and on either side of bucculae. Pronotum with ferrugineous callosities and narrow posterior margin, the callosities margined anteriorly with black. Scutellum ferrugineous with black at least laterally and at middle of base. Hemelytra fusco-testaceous, being paler laterally and darker centrally, the apical margin of clavus narrowly and corium except at inner angle broadly black. Membrane clear at middle of base, and laterally on posterior half, rather broadly black along apical margins of coria. Under surface black with ferrugineous on the usual pale portions of sterna and pleura except for testaceous coxal flanges and reflexed posterior margin of metapleuron. Legs light brown or fulvous with darker brown spots on femora. Rostrum black apically and first two antennal segments brown.

Size: male, length 3.77 mm., width 1.71 mm.

Holotype male, 1451, Kamiloloa, Molokai, 3,000 to 3,500 feet, June 19, 1928, on *Styphelia tameiameia* (A. M. A.) (pl. 9, D).

Entirely different from other typical *Nysius* because of the long rostrum and peculiar bucculae, approaching *Orsillus* and *Belonochilus* in this respect but more nearly related to the *rubescens-fucatus* group.

Genus **NESOMARTIS** Kirkaldy

Nesomartis Kirkaldy, Canadian Ent. 39: 245, 1907; Fauna Haw. 2: 535, 1910.

Body very long and slender. Head very broad, one third wider than long; eyes appearing substylate, half as wide as interocular space; antecular portion of head a little shorter than an eye; antenniferous tubercles reaching about one third the distance to apex of antecular region, their sides straight and strongly convergent anteriorly; upper surface with coarse but ill-defined and irregular punctures, clothed with a short, appressed, pale pubescence; ocelli twice as far from inner margins of eyes as from base of head and four times as far apart as distance to base of head. Rostrum short, reaching to middle coxae, the first segment not attaining base of head. Bucculae distinct anteriorly, decreasing to about midway between level of apices of antenniferous tubercles and base of head, the rostral groove reaching posterior margin.

Pronotum very small, subcylindrical, scarcely broader than long, 11.5:10; and narrower than head including eyes, 11.5:12.5; sides feebly sinuate, the pronotum narrowest at anterior margin, wider at level of callosities, and widest across humeri measuring 7.5-9.5-11.5; callosities glabrous but not elevated; disk clothed with a short, appressed, pale pubescence and with long, erect hairs at anterior and lateral margins.

Scutellum almost as long as broad but shorter than commissure of clavus.

Clavus and corium entirely impunctate or scarcely roughened by very superficial scattered, practically invisible punctures; costal margins subparallel to a little before apical third of scutellum and then strongly, arcuately dilated; clavus and corium clothed with erect, pale hairs best seen from the side.

Posterior margin of metapleuron concave, the lateral angle scarcely produced and subrounded. Female genital cleft not reaching middle of abdomen, the fourth segment long and broadly exposed at middle (about half as long as third). Male genital capsule deeply foveate.

Genotype: *Nesomartis psammophila* Kirkaldy.

Placed by Kirkaldy in the subfamily Cyminae with the added remark that the Cyminae and Lygaeinae are inseparable and should not be maintained as distinct subfamilies. From the discussion of higher categories in this section of the Lygaeidae appearing earlier in this paper, these subfamilies are evidently quite distinct and perfectly valid. *Nesomartis*, although one of the most unique genera of the Orsillini, clearly belongs to this tribe and does not exhibit any divergent characters which might lead one to place it in the Cyminae or in any other subfamily or tribe.

84. *Nesomartis psammophila* Kirkaldy, Canadian Ent. 39: 245, 1907; Haw. Ent. Soc., Proc. 1: 189, 1908; Fauna Haw. 2: 535, 1910. Perkins, Fauna Haw., Introduction 195, 103, 1913. Usinger, Haw. Ent. Soc., Proc. 9: 209, 1936. (See pl. 9, A).

Head a little less than half again as broad as long, 18:13.5; antecular portion a little shorter than length of an eye, 5.5:6 (longer, 7:6, in the female); eyes less than half as

wide as interocular space, 4:10; upper surface a little elevated at middle and subdepressed sublaterally near ocular margins; surface polished and roughened by scattered, irregular, large but superficial punctures and clothed with a short, appressed pubescence; bucculae distinctly elevated anteriorly, decreasing near apices of antenniferous tubercles, the rostral groove narrow, just reaching base of head. Rostrum reaching middle coxae, the first segment not attaining base of head; segments one to four 8.5-9.25-7-5. Antennae twice as long as width of pronotum, 34.5:17; segments one to four, 5-11.5-8-10.

Pronotum but little broader than long, 17:14.5; narrower than head, 17:18; and a little longer than head, 14.5:13.5; sides feebly sinuate, being gently rounded anteriorly and a little outwardly reflexed posteriorly at humeri; disk rounded at the sides but subflattened above or at least without transverse or other impressions except sublaterally at base; callosities not elevated, rather broad, but with only a relatively slender and obliquely sinuous, glabrous area on either side; rather densely covered with coarse punctures mostly less than one puncture width apart except narrowly on anterior margin and more broadly on posterior margin and humeri, and a longitudinal, scarcely elevated and ill-defined line at middle; clothed with a short, subappressed, pale pubescence and with some more erect hairs laterally.

Hemelytra exceeding tip of abdomen by one sixth or less the total length of membrane; membrane scarcely shorter than costal margin; four fifths as long behind level of apices of coria as in front of this; corium hyaline, clothed with appressed and suberect, pale hairs and with long, bristle-like hairs at base of costal margin; vein R + M evidently not branching or at least the inner branch not visible; Sc present but inconspicuous; costal margins feebly sinuate subbasally, then briefly subparallel about to level of apical third of scutellum beyond which they are abruptly and rather strongly arcuate and then more gradually and evenly arcuate and posteriorly converging to apices. Metapleural angle moderately produced and subrounded as in *Nysius*. Female genital cleft fairly deep, reaching more than one third but less than one half of the distance to base of abdomen, the fourth ventral segment about half as long as third at middle. Fifth segment concealed beneath fourth at middle.

Color pale, ochraceous to testaceous, with brown eyes, black sutures at sides and base of tylus and behind reddish ocelli. Pronotum with pale to brown or black glabrous areas of callosities, and often with the posterior margin embrowned. Scutellum brown to black longitudinally at middle, at least basally. Clavus and corium hyaline-testaceous to white, vein Cu of corium brown, the darker color extending posteriorly for a short distance on apical margin of corium, and appearing to continue onto membrane forming two subparallel lines, which although interrupted at middle, gradually converge and meet at apex of membrane. Under side pale on head and thorax except in rostral groove, between the coxae, on mesosternum and on pleura laterally, the abdomen more or less pale with two black sublateral longitudinal lines on either side. Rostrum pale with black apex. Antennae pale with the apical segment dark brown. Legs pale with brown-spotted femora and infuscated apices of tibiae and tarsi.

Size: male, length 4.33 mm., width 1.11 mm.; female, length 4.94 mm., width 1.33 mm.

Originally described by Kirkaldy from the coast of Oahu on the ground among *Sida* and other plants and from the Kona coast of Hawaii, with Oahu specimens considered as typical. I have specimens before me from Halemanu, Kauai, Aug. 29, 1921, on *Eragrostis* (O. H. S.); south Waianae Mts., Oahu, Nov. 9, 1919 (O. H. S.); 1 mile north of Humuula, Hawaii, July 30, 1935, on *Sophora* (R. L. U.) (pl. 9, A). *Eragrostis* (bunch grass) is evidently the preferred host.

PHYLOGENY

In the absence of paleontological and cytological evidence, phylogeny must be based upon the structure of the existing species. The completeness of the final picture may then be checked and its accuracy measured by the degree of correlation with geographical distribution and host relationships.

Paleontologically, five species of Lygaeidae from the Oligocene beds of Florissant, Colorado, were referred to the genus *Nysius* by Scudder (1890). Although unsuccessful in my attempt to collect these during the summer of 1937 (the only lygaeid found belonged to the subfamily Cyminae), I was able, through the cooperation of Dr. F. M. Carpenter, to study Scudder's types while on a visit to the Museum of Comparative Zoology and later to review the entire collection of fossil *Nysius* studied by Scudder. From a study of this material it is evident that none of these species belongs in *Nysius* or even in the subfamily Lygaeinae (Usinger, 1940). Hence, we have no positive evidence as to which characters are primitive and which derived in the Orsillini and consequently cannot draw such nice conclusions as those of Kennedy (1929), showing the most primitive damselflies on Kauai and the most specialized on the recent island of Hawaii.

The genus *Nysius* which has overrun almost the entire world, probably originated in the north. Aside from a few localized centers of abundance of other forms, it is certainly the dominant group today. Characteristic features are the ochraceous or testaceous ground color marked with black, generally pubescent body surface, deep female genital cleft, slightly concave hind margin of metapleuron with rounded postero-lateral angle, practically impunctate claval sutures and vein R + M, and subparallel costal margins to basal third beyond which they are moderately arcuate. These may be considered as the modern, derived, or dominant characters. From this main group certain genera have obviously branched off. *Nithecus* Horvath is one of these with greatly modified hemelytra represented by short pads or, occasionally, by longer hemelytra with the membranal cross-vein wanting. Typical *Ortholomus* Stål (*punctipennis* and *nevadensis*), by its development of straight costal margins and highly developed bucculae, has gone a step farther than *Macroparius* Stål, a group which deserves only subgeneric standing, differing only in its tremendously developed bucculae. *Ortholomus* and *Macroparius* are holarctic in origin, but the latter has spread southward at least in the neotropics of the Western Hemisphere. *Nithecus* is entirely confined to the Palaearctic section of the great Holarctic realm. *Orsillus* Dallas and *Sinorsillus* Usinger, with femoral spines in the former and a subflattened body and very long, feebly elevated bucculae in both, represent a separate stock confined to the Palaearctic Region.

Going southward into the Mediterranean subregion in the Old World and the Sonoran in the New World, we find distinct, somewhat parallel evolution.

Forms with long, slender bodies, long heads, and straight costal margins characterize the fauna of these regions. *Camptocoris* Puton in the Old World is set apart by its sexually dimorphic antennae, whereas, in the New World, *Belonochilus* Uhler has spined femora and bucculae of the *Orsillus* type and such species as *scolopax* and *jamaicensis* have inermous femora and short, anteriorly elevated bucculae. In South America two distinct groups have evolved and spread out rather widely. One of these, the Californicus group, is characterized by short bucculae and subbasally dilated costal margins while the other, including *Nysius callifer* Stål and its allies, has evenly rounded costal margins and a short female genital cleft.

In sharp contrast to these mainland Orsillini, some very divergent groups are found on the Galapagos, St. Helena, Azores, New Zealand, and Hawaiian islands. Characters, some so subtle as to defy definition, are exhibited which have no counterpart in mainland areas and which impart a distinctive facies to the Orsillini of these regions. These may be considered either as specialized derivatives of the mainland stock or as primitive relicts, isolated and protected by their confinement on these remote islands. In favor of the latter view we have the evidence that these bugs are attached to native trees of great antiquity and that, in other groups if not in *Nysius*, island forms suffer, sometimes to the point of extinction, from the competition of recently introduced types.

The genus *Anorthuna* Strand from the Azores is unknown to me but is said to differ from *Nysius* only in its broadly dilated costal margins beyond basal third. Next in age appear to be the Galapagos species, *Nysius marginalis* Stål, with its tremendously developed bucculae, short, stiff, scalelike pubescence, and spinelike antenniferous tubercles; a peculiar undescribed derivative of the *Ortholomus* group with very short pubescence; and a very distinct member of the Californicus group, *Nysius naso* Van Duzee. *Nysius sanctae-helenae* White is interesting in that it has right-angled metapleural angles, found elsewhere according to present knowledge only in Hawaiian *Oceanides*.

The New Zealand orsilline fauna most closely approaches the Hawaiian in size, complexity, and peculiarity of characters. Here the resemblance ends for there seems to be little or no direct connection between the two faunas. As I have many undescribed genera and species before me and many more surely await the careful student who specializes in collecting these, this fauna will doubtless prove to closely approximate the Hawaiian fauna in degree of development. Most of the New Zealand forms center around the genus *Rhy-podes* Stål, having short bucculae, very robust bodies, conspicuous erect pubescence, and straight or moderately evenly rounded costal margins. *Hudsona* Evans is a peculiar, subglabrous form with parallel sides and strongly abbreviated hemelytra.

The peculiar Hawaiian orsilline fauna exceeds all the others in complexity

and degree of divergence and may reasonably be considered the oldest. Among Hawaiian genera, *Oceanides*, *Glyptonysius*, and *Neseis* are doubtless the oldest and may possibly have arisen from a single ancestor or ancestral stock, as all except *Oceanides pteridicola* are characterized by short bucculae, two distinct rows of punctures along the claval sutures, and absence of pubescence at least

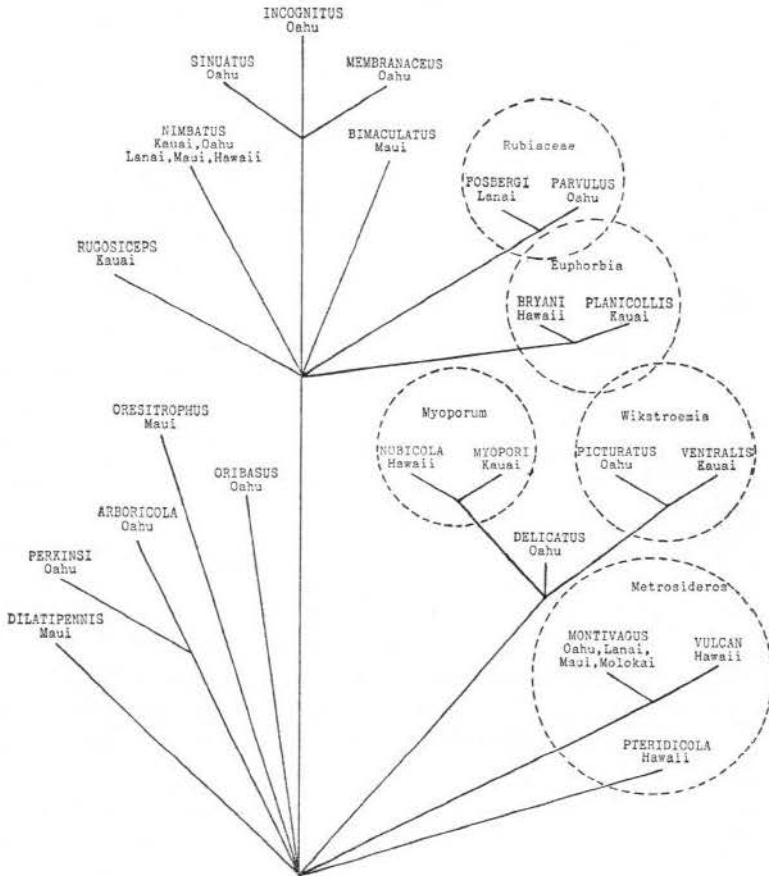


FIGURE 4.—Phylogeny of the genus *Oceanides*.

on the corium. No other known genus of the Orsillini exhibits this glabrous condition of the corium. *Oceanides*, with its convex head, rounded outer margins of antenniferous tubercles which follow the contours of the sides of the juga, very shallow female genital cleft, and right-angled metapleural angles, has been taken as most divergent. *O. pteridicola*, although closest to this group, may not belong here at all. It bears a possibly superficial but suggestive resemblance to certain New Zealand *Rhyphodes*, and is attached to *Metrosideros*

(*ohia lehua*), a tree which is widespread in Polynesia, with two thirds of its known species occurring in New Zealand. More typical *Oceanides* separate out as indicated on the phylogenetic chart (fig. 4), the most divergent members being those with ferrugineous general aspect and the very large and isolated *dilatipennis*. The phylogenetic charts (figs. 4, 5, and 6) indicate degree

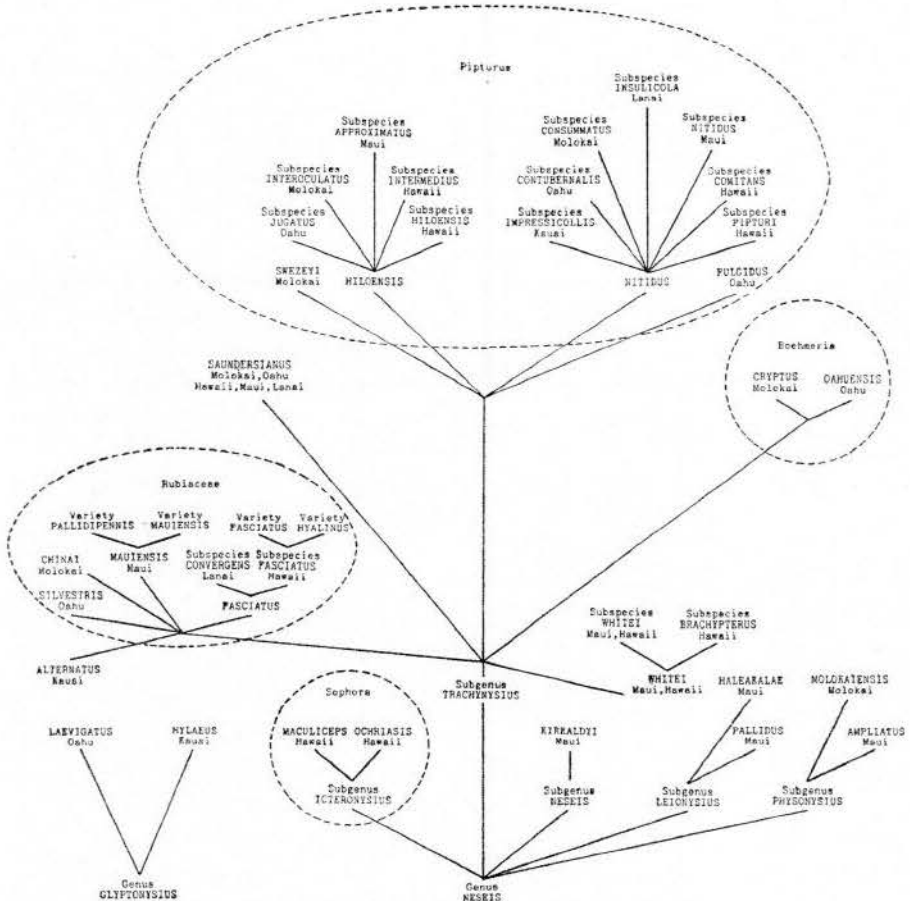


FIGURE 5.—Phylogeny of the genus *Neseis* and of the genus *Glyptonysius*.

of structural differentiation only, and do not necessarily indicate relative age of the branches or species. Superior or inferior position of a group has been governed by available space on the chart but succession from left to right and from group to group indicates affinity of adjacent forms. Theoretically, branches should arise at various points depending upon degree of structural differentiation (which may or may not indicate relative age) and all of the specific names should be projected up to a single plane at the top of the page. Third dimen-

sional interrelationships have not been shown because our knowledge is not yet complete and their inclusion would be unduly confusing.

The genus *Glyptonysius* (fig. 5) is small and isolated, having a distinct ridge or carina on either side of the head extending onto the antenniferous tubercles, a character unique among the described Orsillini. Affinities are with *Oceanides*, and perhaps most closely with *Neseis* with which it agrees in its strongly produced metapleural angles.

Neseis is the largest and most diverse genus of highland Orsillini and is placed higher in the series near *Nysius*, merely because some of its members possess characters such as a deep female genital cleft which are considered derived. Of its various subgenera, *Icteronysius* is the most isolated and, judging from the nymphs, may not belong in *Neseis* at all. Although peculiar, this group is at present attached to *Sophora chrysophylla (mamani)*, a leguminous tree which grows on the almost bare lava slopes of the most recent volcanoes of the Hawaiian islands. *Physonysius*, although superficially very distinct, surely belongs in *Neseis*, merging into the smooth, polished, but less dilated *Leionysius*, the members of which likewise have convex heads. The unique typical *Neseis* must be a side branch as no other species approaches it in general facies or rostral characters. *Leionysius* gradually merges into *Trachynysius*, which has pubescence on portions of the head and pronotum, through *whitei*, *oahuensis*, *cryptus*, and *fulgidus*, to the more typical *Pipturus*-inhabiting forms. Here a secondary evolution appears to be in progress, host isolation having early resulted in distinctive species in the Hawaiian islands. In *Oceanides*, isolation on the various islands at the same time or subsequently resulted in the formation of groups of relatively remotely allied species. In *Trachynysius* differences of a lower order are found, some so slight as to be scarcely recognizable and others approaching the status of full species. The *nitidus* group with long rostrum and the *hiloensis* group with short rostrum are closely allied species, each with distinguishable races occurring together on each island. Both *fulgidus* and *svezezyi*, although entirely distinct structurally, occur in company with these on Oahu and Molokai respectively. Another subspecies complex in *Trachynysius* is the *fasciatus* group of Hawaii and Lanai with both a dark and a pale variety on Hawaii. This group appears to be specifically distinct from the closely allied *mauiensis* which occurs on the same hosts on the neighboring island of Maui and which likewise has two varietal forms. The other species placed near *mauiensis*, such as *chinai*, *silvestris* and *alternatus*, are so distinct that they may be out of place here, although the islands on which they occur possess no other representatives of this group.

Typical *Nysius* has likewise developed to a high degree in the Hawaiian islands. Indeed, a wider range of characters is exhibited by these species than in the combined *Nysius* fauna of the rest of the world. Such characters as

form of bucculae, length of rostrum, and shape of costal margins, which are fairly reliable guides to genera elsewhere, break down completely in the various extreme species of Hawaiian *Nysius*.

The phylogenetic chart of *Nysius* (fig. 6) differs strikingly from that of *Neseis* or *Oceanides*. Some species, subspecies, or varieties have obviously been derived from other nearby and usually widespread species but the Hawaiian *Nysius* generally do not fall into natural groups. The phylogenetic tree

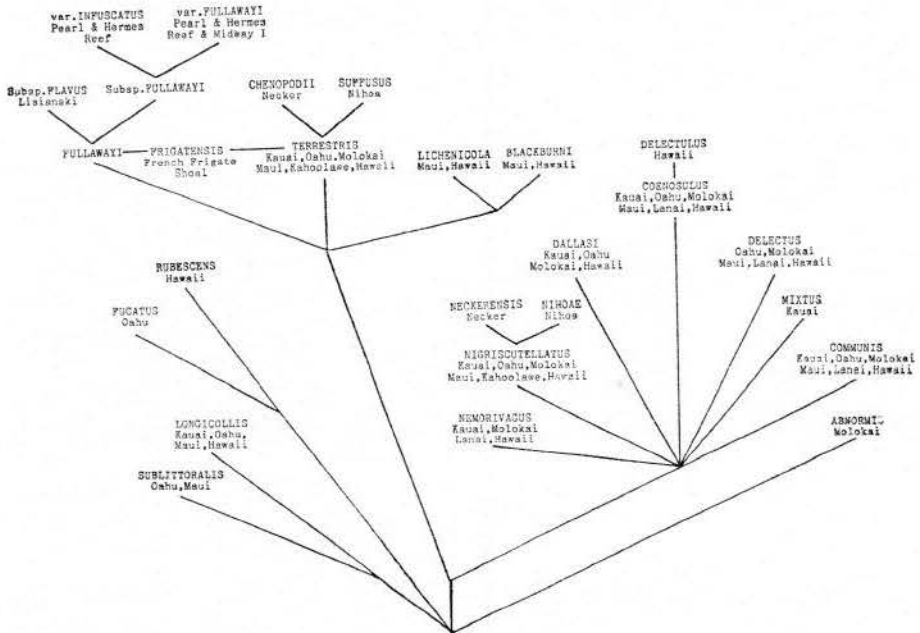


FIGURE 6.—Phylogeny of the genus *Nysius*.

should be taken only as an indication of structural similarities and differences and not as an indication of community of origin. It seems evident that, unlike the other genera, *Nysius* is polyphyletic in the Hawaiian islands, its various species or ancestors of small groups of species having arrived in Hawaii, perhaps from different regions at different times and certainly from quite different branches of the great genus elsewhere in the world. On the basis of this reasoning, it might be said that our present day *Nysius* fauna in Hawaii is the result of at least five and perhaps as many as 12 separate introductions.

Of the principal groups of *Nysius*, but little comment is required beyond the chart. *Abnormalis* is perhaps the most divergent with rostrum and bucculae reminiscent of the Palearctic *Orsillus*. *Sublittoralis* is next with its distinct rows of punctures along claval suture and vein R + M. From here, by wide

gaps through such forms as *longicollis*, *fucatus*, and *rubescens*, we arrive at the rather typical members of the group. Of these, *delectus* occurs on all of the islands but Kauai and *mixtus* may prove to be its representative on that island although the long rostrum in *mixtus* suggests an alliance with *communis*. *Delectulus* appears to be a highland endemic derivative of *coenosulus* while the widespread *nigriscutellatus* has developed two geographical isolates on Nihoa and Necker Islands which appear to be too distinct to be placed as subspecies. Similarly, the two leeward island derivatives of *terrestris* are so distinct that they must be considered as full species while the geographically intermediate *frigatensis* combines the characters of *terrestris* with those of the entirely distinct *fullawayi* group. This last group may have arrived and settled on the most remote leeward islands independent of the main island fauna.

Extra-Hawaiian affinities are more evident in *Nysius* than in the other genera. Thus *delectus* and *delectulus* could conceivably have arisen from the same stock as the widespread group typified by *pacificus* China, representatives of which I have seen from Samoa, New Hebrides, Queensland, Tasmania, the Solomon Islands, the Philippines, and Guam. *Blackburni* is quite closely allied and may be directly related to *huttoni* White from New Zealand and *baeckstroemi* Bergroth from Juan Fernandez. I have specimens from China near *nigriscutellatus* and from Japan near *terrestris*, *nigriscutellatus* having somewhat the aspect of the *minutus-inconspicuous-natalensis-simulans* group, whereas *terrestris* and *fullawayi* could conceivably have come from *ericae* (Schilling).

Nesomartis psammophila is peculiar, with no close relatives known at present. It is definitely a part of the modern element in the fauna, possessing extreme characters which we have classified as derived.

With so few direct relationships to other species, it is interesting to investigate the absence of groups in the Hawaiian fauna as a possible indication of regions to which our fauna is not related. Thus the group comprising *vinitor* Bergroth of Australia, *andrewsi* Izzard of Christmas Island (Indian Ocean) and, more remotely, *picipes* Usinger from Wake Island and *pulchellus* Stål from Guam, seems to have no representative in Hawaii. No representatives of the widespread American groups allied to *strigosus* auct. non Uhler, *californicus* Stål, *jamaicensis* Dallas, or *callifer* Stål, are found in Hawaii.

We may conclude that the old highland endemic genera of Orsillini have almost no extra-Hawaiian affinities, with the doubtful exception of a superficial resemblance between *pteridicola* and certain New Zealand *Rhypodes*. All evident relationships of typical *Nysius* are with species to the west in the Palaearctic region, to the southwest in southwestern Polynesia, Melanesia, and the Oriental realm, and to the south in Australia and New Zealand, with one ally in Juan Fernandez. An interesting anomaly is the lack of relationship with Micronesian and American species.

GEOGRAPHICAL DISTRIBUTION

The tribe Orsillini consists of about 20 genera, all but one of which are localized on particular continents in one or more adjacent zoogeographical regions or on islands, with a disproportionately large number concentrated in New Zealand and Hawaii. In contrast to this, the one genus *Nysius*, "is in some respects the most cosmopolitan of all Hemipterous genera. . . . No locality seems too remote for the species of this genus. Whether it be the icy wastes of Greenland, the coral islands of the Pacific, or the upper slopes of the Himalayas, *Nysius* is certain to be represented. It occurs from Tierra del Fuego to Siberia, from Greenland to New Zealand" (W. E. China, 1934). The islands of southeastern Polynesia form an important exception to the above statement, the assiduous work of at least four expert collectors during the past ten years having failed to turn up a single species of Orsillini in that portion of the Pacific region which includes the Society Islands, the Tuamotu and Austral archipelagoes, the Marquesas Islands and Mangareva, Rapa, Pitcairn, Henderson and other remote islands. As all of these collectors have taken *Nysius* elsewhere, and as at least one of them was looking particularly for insects of this group, it seems safe to conclude that they are not found there. (Through the kindness of Dr. O. Lundblad of the Naturhistoriska Riksmuseum, Stockholm, I have examined cotypes of *N. sordidus* Stål and *N. spurcus* Stål, collected by Kinberg on the Eugénie Resa Expedition and bearing the data "Taiti" "Kinb." *Sordidus* is the dark Neotropical form of *californicus* Stål and *spurcus* is a synonym of the Neotropical *jamaicensis* Dallas so these names must suffer the same fate as some others from this same expedition and be stricken from Polynesian lists.)

A map of the Hawaiian islands (fig. 7) shows the entire archipelago extending from Ocean Island to Hawaii and covering some 1,800 miles in a northwest-southeast direction. Orsillini have been collected on most of these islands. The absence of records for Gardner, Niihau, and Kaula and a few small reefs and shoals is due to lack of collecting. Specimens upon which Fullaway based his Laysan record (1914) cannot now be located. Our present knowledge of the distribution of Hawaiian Orsillini is summarized in tables 2 to 8. As might be expected from the relative size of the islands, the greatest number of species occur on Hawaii. The number diminishes progressively from Maui, Kauai, Molokai, Lanai, to Kahoolawe with steadily decreasing numbers toward the extremity of the leeward chain (table 7). Oahu is an exception to this because of its availability to collectors residing in Honolulu. Aside from this it appears that we have a fair and presumably uniform sampling from the various islands.

Oceanides (table 2) reaches its greatest development on Oahu, and only a single, widely distributed species has been reported from Molokai. The absence

of *nimbatus* from Molokai is undoubtedly due to inadequate collecting. A special feature of *Oceanides* distribution is the occurrence of *montivagus* on the adjacent islands of Oahu, Molokai, Maui, and Lanai, with the allied but distinct *vulcan* replacing it on Hawaii. The occurrence of *myopori* and *nubicola* on *Myoporum* at opposite ends of the main island chain suggests that additional species should be found on the same host on some of the intervening islands.

Glyptonysius (table 3) is extremely rare, only half a dozen specimens of the genus having been collected. This is especially noteworthy considering that the Oahu species occurs on Mt. Tantalus, almost within the city of Honolulu. With so few specimens it is inadvisable to generalize on the possible or probable distribution of this genus beyond noting that the two known species are confined to the adjacent and oldest islands, Kauai and Oahu.

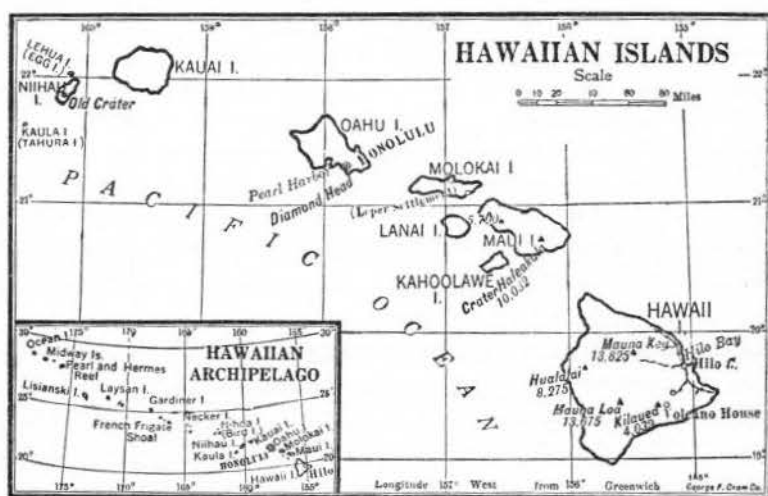


FIGURE 7.—Map of the Hawaiian islands, with inset of leeward islands.

Physonysius is one of the most striking groups of the entire tribe and could scarcely have escaped notice on Oahu or Hawaii if it were there. It is known from only two adjacent islands, Molokai and Maui. Both *Leionysius* and *Neseis* (s. str.) are confined to the slopes of Haleakala on east Maui (Usinger, 1937). *Icteronysius* appears to be a special development on *Sophora* on the volcanic slopes of Mauna Kea and Mauna Loa but should be looked for elsewhere on this same host, especially on Haleakala.

Trachynysius (table 4) is a large and rather evenly distributed group with the greatest number of species on Hawaii and the smallest number on Kauai. This is an anomalous situation, for Kauai is generally considered the oldest of the Hawaiian islands and east Hawaii is certainly the youngest. Allusion has already been made to the occurrence of closely allied subspecies, one on

each island. It is noteworthy that all of the other distinct forms of this group are one island endemics except for *whitei*, which occurs on the adjacent islands of Hawaii and Maui, and the widespread *saundersianus*, which has been found on all of the islands except Kauai.

Typical *Nysius* (table 5), on the main Hawaiian islands, occurs in regularly decreasing numbers proportional to the size of the islands, Oahu again excepted. Less than half of these are one island endemics in striking contrast to the very large proportion of species confined to one island in the other genera. From the table it appears that these "wides" are characterized by irregular and discontinuous distribution. However, Kahoolawe is not in the regular series and I spent all of my collecting time on Lanai in the highlands, thus missing the lowland species. Other gaps will undoubtedly be filled when collectors devote their attention to these interesting forms.

As regards the leeward island *Nysius* fauna, one main island species each extends to Nihoa (*longicollis*) and French Frigate Shoal (*nigriscutellatus*), the other species being endemics allied, on Nihoa and Necker, to main island species, and to *fullawayi* on Lisianski, Pearl and Hermes Reef, and Midway Islands. The endemic on French Frigate Shoal is a remarkable intermediate and arouses one's curiosity concerning the species of Laysan, an island located between French Frigate Shoal and Lisianski. Hadden writes that *Nysius* are rare on Midway, but the few specimens I have seen do not differ from typical *fullawayi* from Pearl and Hermes Reef. (See table 6.)

Table 8 summarizes the information regarding one island endemics. Only six of the main island *Nysius* are confined to a single island in contrast to 30 *Neseis* and 20 *Oceanides*. The leeward island species, which double the number of one island endemics for *Nysius*, still leave this genus far behind the two peculiar highland genera. The total of 64 one island endemics out of 84 distinguishable forms is no less remarkable than the apparent fact that all 84 forms are peculiar to the Hawaiian Archipelago. But for the larger number of Oahu endemics, the islands differ in number of one island endemics according to size rather than age. All six of the two island endemics involve adjacent islands and this is true with but a few exceptions for the species with still wider distribution. *Nesomartis psammophila* behaves like a lowland *Nysius* and still remains to be discovered on Maui, Lanai, and Molokai.

Species occurring on more than one island are summarized below.

TWO ISLAND ENDEMIC

Oceanides	
pteridicola	Maui, Hawaii
Neseis	
whitei	Maui, Hawaii
Nysius	
blackburni	Maui, Hawaii
lichenicola	Maui, Hawaii
sublittoralis	Maui, Oahu
fullawayi	Pearl and Hermes Reef, Midway

THREE ISLAND ENDEMIC

Nesomartis	
psammophila	Hawaii, Oahu, Kauai

FOUR ISLAND ENDEMIC

Oceanides	
montivagus	Oahu, Molokai, Maui, Lanai
Nysius	
nemorivagus	Hawaii, Lanai, Molokai, Kauai
dallasi	Hawaii, Molokai, Oahu, Kauai

FIVE ISLAND ENDEMIC

Oceanides	
nimbatus	Kauai, Oahu, Maui, Lanai, Hawaii
Neseis	
saundersianus	Oahu, Molokai, Maui, Lanai, Hawaii
Nysius	
delectus	Oahu, Molokai, Maui, Lanai, Hawaii
longicollis	Kauai, Oahu, Lanai, Hawaii, Nihoa

SIX ISLAND ENDEMIC

Nysius	
coenosulus	Kauai, Oahu, Molokai, Maui, Lanai, Hawaii
communis	Kauai, Oahu, Molokai, Maui, Lanai, Hawaii
terrestris	Kauai, Oahu, Molokai, Maui, Kahoolawe, Hawaii

SEVEN ISLAND ENDEMIC

Nysius	
nigriscutellatus	
.....	Hawaii, Kahoolawe, Maui, Molokai, Oahu, Kauai, French Frigate Shoal

Table 2. Distribution of the Species of *Oceanides*

Species	Kauai	Oahu	Molokai	Maui	Lanai	Hawaii
<i>arboricola</i>		×				
<i>bimaculatus</i>				×		
<i>bryani</i>						×
<i>delicatus</i>		×				
<i>dilatipennis</i>				×		
<i>fosbergi</i>					×	
<i>incognitus</i>		×				
<i>membranaceus</i>		×				
<i>montivagus</i>		×	×	×	×	
<i>myopori</i>	×					
<i>nimbatus</i>	×	×		×	×	×
<i>nubicola</i>						×
<i>oresitrophus</i>				×		
<i>oribasus</i>		×				
<i>parvulus</i>		×				
<i>perkinsi</i>		×				
<i>picturatus</i>		×				
<i>planicollis</i>	×					
<i>pteridicola</i>				×		×
<i>rugosiceps</i>	×					
<i>sinuatus</i>		×				
<i>ventralis</i>	×					
<i>vulcan</i>						×
Total	5	11	1	6	3	5

Table 3. Distribution of the Species of *Neseis*, *Leionysius*, *Physonysius*, *Icteronysius* and *Glyptonysius*

Species	Kauai	Oahu	Molokai	Maui	Lanai	Hawaii
<i>kirkaldyi</i>				×		
<i>haleakalae</i>				×		
<i>pallidus</i>				×		
<i>ampliatius</i>				×		
<i>molokaiensis</i>			×			
<i>maculiceps</i>						×
<i>ochriasis</i>						×
<i>hylaesus</i>	×					
<i>laevigatus</i>		×				
Total	1	1	1	4		2

Table 4. Distribution of the Species of *Trachynysius*

Species	Kauai	Oahu	Molokai	Maui	Lanai	Hawaii
alternatus	×					
approximatus				×		
chinaei			×			
comitans						×
consummatus			×			
contubernalis		×				
convergens					×	
cryptus			×			
fasciatus						×
fulgidus		×				
hiloensis						×
impressicollis	×					
insulicola					×	
intermedius						×
interoculatus			×			
jugatus		×				
mauiensis				×		
nitidus				×		
oahuensis		×		?		
pipturi						×
saundersianus		×	×	×	×	×
silvestris		×				
swezeyi			×			
whitei				×		×
Total	2	6	6	6	3	7

Table 5. Distribution of the Main Island Species of *Nysius* and of *Nesomartis*

Species	Kauai	Oahu	Molokai	Maui	Lanai	Kahoolawe	Hawaii
abnormis			×				
blackburni			?	×			×
coenosulus	×	×	×	×	×		×
communis	×	×	×	×	×		×
dallasi	×	×	×				×
delectulus							×
delectus		×	×	×	×		×
fucatus		×					
lichenicola				×			×
longicollis	×	×		×			×
mixtus	×						
nemorivagus	×		×		×		×
nigriscutellatus	×	×	×	×		×	×
psammophila	×	×					×
rubescens							×
sublittoralis		×		×			
terrestris	×	×	×	×		×	×
Total	9	10	8	9	4	2	13

Table 6. Distribution of Leeward Island *Nysius*

Species	Nihoa	Necker	French Frigate Shoal	Lisianski	Pearl and Hermes	Midway
chenopodii		×				
flavus				×		
frigatensis			×			
fullawayi					×	×
longicollis	×					
neckerensis		×				
nigriscutellatus			×			
nihoae	×					
suffusus	×					
Total	3	2	2	1	1	1

Table 7. Summary of Distribution of Hawaiian Orsillini

Island	Nysius	Neseis	Glyptonysius	Oceanides	Total
Kauai	9	2	1	5	17
Oahu	10	6	1	11	28
Molokai	8	7		1	16
Maui	9	9		5	23
Lanai	4	3		3	10
Kahoolawe	2				2
Hawaii	13	9		4	26
Nihoa	3				3
Necker	2				2
French Frigate Shoal	2				2
Lisianski	1				1
Pearl and Hermes	1				1
Midway	1				1

Table 8. Summary of Endemism in Hawaiian Orsillini
One Island Endemics

Island	Nysius	Neseis	Glyptonysius	Oceanides	Total
Kauai	1	2	1	4	8
Oahu	1	5	1	9	16
Molokai	1	6			7
Maui		8		3	11
Lanai		2		1	3
Hawaii	2	8		3	13
Nihoa	2				2
Necker	2				2
French Frigate Shoal	1				1
Lisianski	1				1
Total	11	31	2	20	64

ZONAL DISTRIBUTION

The wide variety of conditions found in the Hawaiian islands has an important bearing on the fauna and the flora of the region. Altitudes from sea level to nearly 14,000 feet and rainfall ranging from about 20 to over 500 inches per year create strikingly distinct life zones, which are modified by prevailing winds, exposure, edaphic conditions, and altered conditions due to the activities of men and domestic animals. With so many modifying factors, life zones soon lead to a maze of special circumstances. Although profoundly affecting the growth form of the plants of each area, these special conditions affect the insects only secondarily as a rule, most *Nysius* following the particular species or even genus of plants regardless of stunted growth in a bog region or prolific growth in a *kipuka*. Hence, for our purposes, the elaborate classification of botanical regions so excellently outlined by Rock (1913) may be reduced to the six Botanical Regions, with one exception. The Great Central Plateau of Hawaii, which apparently supports a more distinct orsilline fauna than any of the bog regions studied, has been substituted for Rock's Bog Region.

A brief review of the botanical regions is given below, stressing the plants which are of significance in this study.

STRAND

Hawaiian beaches are remarkably barren in comparison to beaches in mainland areas. The common purslane (*Portulaca oleracea*) grows on the beach as well as on low coral platforms such as Popoia and Ewa Coral Plain. *Chenopodium* on the leeward islands belongs to this zone because all of the plants of such islands as Pearl and Hermes Reef, Lisianski, Laysan, and Midway Islands must be classed as belonging to the strand.

LOWLAND ZONE

The lowland region extends from just above sea level to about 1,000 feet and consists mainly of open grassland, with recent introductions such as *Prosopis*, *Acacia farnesiana*, *Opuntia*, and *Lantana*. This is the region which has been so largely cultivated and which must once have supported a rich and interesting endemic forest. This assumption is based upon the beds of native land shells (now found only at higher elevations) found as fossils in the area and upon the rare patches of native forest, such as that on Lanai, preserved from cattle and goats. Many introduced weeds now occupy considerable areas in the lowlands, among which are such hosts of *Nysius* as *Erigeron*, *Nicotiana*, and *Chenopodium*. Native species of *Bidens* and *Artemisia* also support native *Nysius* species.

LOWER FOREST ZONE

The lower forest region merges so gradually into the middle forest zone that the precise limits of these regions are difficult to determine. In general,

the region between 1,000 and 2,000 feet, especially the valleys leading up to the mountains, may be considered as lower forest. I have never seen *Nysius* or its allies on the most characteristic and striking tree of this region, the introduced *Aleurites moluccana* (kukui). The urticaceous *Pipturus* and *Boehmeria* are common here and are especially attractive to Orsillini, particularly members of the genus *Neseis*. *Straussia*, *Elaeocarpus*, and *Metrosideros* grow in this region and support native species of *Oceanides*.

MIDDLE FOREST ZONE

Many of the hosts of Orsillini grow within this region, chiefly *Metrosideros*, *Broussaisia*, *Elaeocarpus*, *Pterotropia*, *Pittosporum*, *Pelea*, *Dubautia*, *Astelia*, *Straussia*, *Coprosma*, *Gouldia*, *Urera*, *Myrsine*, and *Wikstroemia*. This region forms by far the densest forest, although it is said to contain fewer peculiar species than the lower forest region. The altitude ranges from about 2,000 to 5,000 feet.

GREAT CENTRAL PLATEAU OF HAWAII

Above the middle forest region—or replacing it at altitudes from 2,000 to 6,000 feet on the great central plateau of Hawaii, between the volcanoes of Mauna Kea, Mauna Loa, and Hualalai—is an area composed largely of rough aa and smooth pahoehoe lava. It is richly supplied with moisture by the daily clouds which appear soon after noon and completely blanket the region. This region, which is covered mainly by *Metrosideros* on the recent lava, by native grasses throughout, and by some native and introduced weeds on the large Parker Ranch, yielded several species of *Nysius*.

UPPER FOREST ZONE

At the lower edge of the upper forest zone, at 5,000 to 6,000 feet on the slopes of Mauna Kea, *Myoporum* and *Euphorbia* each have an endemic *Oceanides*. Higher up on the lava slopes, on *Sophora*, *Styphelia*, and other plants, several species of Orsillini were found. The *Sophora*, in particular, conserves the moisture, precipitating it as fog drip from its branches to form a circle of fresh green growth beneath each tree in striking contrast to the barren, rocky surroundings. At high altitudes on Hawaii and Maui, silver-swords support a *Nysius* fauna, the commonest species of which is *N. terrestris*.

In tables 9 to 12 the species of Orsillini are arranged alphabetically within their respective genera. The life zones from which they were taken are indicated by an X. When the particular locality or circumstances of capture are unknown, question marks are used.

The complete absence of *Oceanides*, *Neseis*, and *Glyptonysius* from the strand and lowlands is in striking contrast to the relatively even spread of the species of *Nysius* throughout all of the zones. Moreover, *Neseis* is shown to inhabit the lower forest zone more than *Oceanides* due, no doubt, to the occurrence of its urticaceous hosts at lower altitudes.

Table 9. Zonal Distribution of Oceanides

Species	Strand	Lowland	Lower Forest	Middle Forest	Central Plateau Hawaii	Upper Forest
arboricola			?	?		
bimaculatus			?	?		
bryani					×	×
delicatus			×	×		
dilatipennis			?			
fosbergi				×		
incognitus				×		
membranaceus				×		
montivagus				×		
myopori				×		
nimbatus				×		
nubicola				×	×	×
oresitrophus				?		?
oribasus				×		
parvulus				×		
perkinsi			?	?		
picturatus				×		
planicollis				×		
pteridicola				×		
rugosiceps				×		
sinuatus				×		
ventralis				×		
vulcan				×		

Table 10. Zonal Distribution of Neseis, Leionysius, Physonysius, Icteronyssius and Glyptonysius

Species	Strand	Lowland	Lower Forest	Middle Forest	Central Plateau Hawaii	Upper Forest
kirkaldyi				?		
haleakalae			?			
pallidus						?
ampliatus			?	?		
molokaiensis				×		
hylaesus				?		
laevigatus			?	?		
maculiceps					×	×
ochriasis				×		

Table 11. Zonal Distribution of *Trachynysius*

Species	Strand	Lowland	Lower Forest	Middle Forest	Central Plateau Hawaii	Upper Forest
<i>alternatus</i>				×		
<i>approximatus</i>			×	×		
<i>chinaei</i>			×	×		
<i>comitans</i>			×	×		
<i>consummatus</i>				×		
<i>contubernalis</i>			×	×		
<i>convergens</i>				×		
<i>cryptus</i>			×			
<i>fasciatus</i>				×		
<i>fulgidus</i>				×		
<i>hiloensis</i>			×			
<i>impressicollis</i>				×		
<i>insulicola</i>			?	?		
<i>intermedius</i>				×		
<i>interoculatus</i>				×		
<i>jugatus</i>			×	×		
<i>mauiensis</i>				×		
<i>nitidus</i>				×		
<i>oahuensis</i>				×		
<i>pipturi</i>				×		
<i>saundersianus</i>				×		
<i>silvestris</i>				×		
<i>swezeyi</i>				×		
<i>whitei</i>				×		

Table 12. Zonal Distribution of Nysius and Nesomartis

Species	Strand	Lowland	Lower Forest	Middle Forest	Central Plateau Hawaii	Upper Forest
MAIN ISLANDS						
abnormis				×		
blackburni				×		×
coenosulus		×	×	×	×	×
communis		×	×	×	×	×
dallasi	×					
delectulus				×		×
delectus		×	×	×	×	
fucatus			×			
lichenicola				×	×	×
longicollis	×	×			×	
mixtus				×		
nemorivagus				×	×	
nigriscutellatus	×	×	×	×	×	×
psammophila	×	×		×	×	
rubescens				×		
sublittoralis	?	×				
terrestris	×	×	×	×		×
LEEWARD ISLANDS						
chenopodii	?	?				
flavus	×					
frigatensis	×					
fullawayi	×					
neckerensis	?	?				
nihoae	?	?				
suffusus	?	?				

HOST RELATIONSHIPS

The geographical distribution of phytophagous insects is so closely related to their plant hosts that the two can scarcely be dealt with separately. As the Hawaiian flora has long been recognized as the most remarkable and peculiar in the entire world with an endemism reaching nearly 85 percent (Campbell, 1933), more than usual interest is attached to an investigation of its inter-relationships with the endemic fauna. Fortunately we have some information about the host plants of 66 forms of Orsillini in Hawaii (tables 13-16), while of the remaining 18 forms, six are subspecies which probably have the same host preference as their nearest relatives, and four are leeward island species which live on lowland weeds.

Occasional specimens of almost any species of Orsillini may be found on a variety of hosts. When many separate records are before me, those occurring most frequently are accepted while single records from widely separated and unrelated plants or records which I know to be due merely to chance, have been deleted. More detailed records are listed under each description and the specimens are all preserved.

In 1925, after 20 years of study of the insect fauna of the native trees of Hawaii, O. H. Swezey published "The Insect Fauna of Trees and Plants as an Index of their Endemicity and Relative Antiquity in the Hawaiian Islands." He stated "the relative antiquity of the endemic trees may be indicated by a comparison of their respective insect faunas," the oldest trees having the largest number and most peculiar endemic insect species. Although wide divergence from this hypothesis may occur in individual groups because of special physiology or group preferences, this principle provides a useful criterion for analysis of host preferences.

In order of their assumed age and followed in parentheses by the number of species of insects known to be attached to them at that time, Swezey's list of plants is as follows: *Acacia koa* (40), *Metrosideros collina polymorpha* (30), *Pipturus albidus* (20), *Pelea* spp. (16), *Euphorbia* spp. (15), *Straussia* (7), *Cheirodendron* (6), *Myrsine (Suttonia)* spp. (6), *Cibotium* (6), *Eugenia sandwichensis* (5), *Freycinetia arnotti* (5), *Sadleria cyatheoides* (4), *Santalum freycinetianum* (3), *Hibiscus arnottianus* (3), and *Xylosma hawaiiense* (2).

This is in contrast to the number of species or subspecies of Orsillini attached to the following plant genera: *Pipturus* (9), *Dubautia* (8), *Styphelia* (6), *Straussia* (5), *Coprosma* (5), *Euphorbia* (4), *Eragrostis* (4), *Metrosideros* (3), *Elaeocarpus* (2), *Myrsine* (2), *Myoporum* (2), *Broussaisia* (2), *Wikstroemia* (2), *Pterotropia* (2), *Freycinetia* (2), *Sophora* (2), *Rubus* (2), *Boehmeria* (2), *Pelea* (2), *Argyroxiphium* (2), *Bidens* (2), *Portulaca* (2),

and *Chenopodium* (2). Each of the remaining *Nysius* hosts considered in the tables is known to support but a single species of Orsillini.

The complete absence of Orsillini on the widespread and "oldest" *Acacia koa* is striking. Likewise, no Orsillini have been collected on *Eugenia sandwichensis*, *Sadleria*, *Santalum*, *Hibiscus*, and *Xylosma*. However, *Dubautia*, *Styphelia*, *Coprosma*, *Eragrostis*, *Elaeocarpus*, *Myoporum*, *Wikstroemia*, and *Sophora*, not mentioned by Swezey, are important hosts of orsilline species.

Distinct plant groups are represented in a very different manner as hosts of the various genera of Orsillini. (See tables 13-16.) Rubiaceae, Euphorbiaceae, Myrtaceae, Apocynaceae, Elaeocarpaceae, Myoporaceae, and Thymelaeaceae predominate as hosts of *Oceanides*; the Leguminosae are hosts of *Icteronysius*; the Compositae, Epacridaceae, Gramineae, Portulacaceae, and Chenopodiaceae for *Nysius*. This at once suggests a further refinement of the host data of Orsillini compared with Swezey's list. If the *Nysius* records, which belong to plant groups not considered as excessively old by Swezey, are removed and the *Pipturus* records reduced to four, representing the number of full species, we have: *Straussia* (5); *Coprosma* (5); *Euphorbia* (4); *Pipturus* (4); *Metrosideros* (3); *Elaeocarpus* (2); *Myrsine* (2); *Myoporum* (2); *Broussaisia* (2); *Wikstroemia* (2); *Pterotropia* (2); *Styphelia* (2); *Freycinetia* (2); *Sophora* (2); *Rubus* (2); *Boehmeria* (2); and *Pelea* (2). This shows a much closer correspondence to Swezey's list and probably approximates fairly closely the old endemic flora, still with the exception of *Acacia koa*. The species of Orsillini supported by this flora belong exclusively to endemic genera in contrast to the younger fauna belonging to the widespread genus *Nysius* with species confined principally to the Compositae and other relatively recent plant groups.

Examining this younger element one notices the occurrence of such species as *Nysius coenosulus* or *delectus* on foreign weeds of recent introduction. *N. coenosulus*, for example, is found abundantly and typically on *Erigeron canadensis*, but is sparse on other plants. Unless we assume a much greater age for these weeds in the islands than can be supported by facts, or assume a more rapid rate of evolution for *Nysius* than appears possible, we must conclude that these *Nysius* species did not originate on their present lowland weed hosts. Native plants, such as *Dubautia*, which now serve as incidental hosts take on added significance as the possible original hosts of these insects.

Table 13. Host Relationships of Oceanides*

Species	Rubiaceae	Euphorbiaceae	Myrtaceae	Miscellaneous
bimaculatus				Alyxia (Apocynaceae)
bryani		Euphorbia		
delicatus				Elaeocarpus (Elaeocarpaceae)
fosbergi	Straussia Coprosma			
incognitus				Pteralyxia (Apocynaceae) Myrsine (Myrsinaceae)
membranaceus		Euphorbia		
montivagus			Metrosideros	Dodonaea (Sapindaceae)
myopori				Myoporum (Myoporaceae)
nimbatus	Gouldia Coprosma			Broussaisia (Saxifragaceae)
nubicola				Myoporum (Myoporaceae)
oribasus	Straussia			Elaeocarpus (Elaeocarpaceae)
parvulus	Straussia	Euphorbia		
picturatus				Wikstroemia (Thymelaeaceae)
planicollis		Euphorbia		
pteridicola			Metrosideros	
rugosiceps				Pterotropia (Araliaceae)
sinuatus				Artemisia (Compositae) Styphelia (Epacridaceae)
ventralis				Wikstroemia (Thymelaeaceae)
vulcan			Metrosideros	

* No host records are available for *arboricola*, *dilatipennis*, *oresitrophus*, and *perkinsi*.

Table 14. Host Relationships of *Neseis*, *Leionysius*, *Physonysius*, *Icteronysius* and *Glyptonysius**

Species	Pandanaceae	Leguminosae	Rosaceae	Miscellaneous
<i>kirkaldyi</i>				<i>Broussaisia</i> (Saxifragaceae)
<i>pallidus</i>				<i>Styphelia</i> (Epacridaceae)
<i>ampliatus</i>			<i>Rubus</i>	
<i>molokaiensis</i>	<i>Freycinetia</i>			
<i>maculiceps</i>		<i>Sophora</i>		
<i>ochriasis</i>		<i>Sophora</i>		
<i>hylaesus</i>				<i>Dubautia</i> (Compositae)

* No host records are available for *haleakalae* and *laevigatus*.

Table 15. Host Relationships of *Trachynysius**

Species	Urticaceae	Rubiaceae	Araliaceae	Miscellaneous
<i>alternatus</i>			<i>Pterotropia</i>	
<i>approximatus</i>	<i>Pipturus</i>			
<i>comitans</i>	<i>Pipturus</i>			
<i>contubernalis</i>	<i>Pipturus</i>			
<i>cryptus</i>	<i>Boehmeria</i>			
<i>fasciatus</i>		<i>Straussia</i> <i>Coprosma</i>		<i>Pelea</i> (Rutaceae) <i>Myrsine</i> (Myrsinaceae)
<i>fulgidus</i>	<i>Pipturus</i>			
<i>impressicollis</i>	<i>Pipturus</i>			
<i>intermedius</i>	<i>Pipturus</i>			
<i>jugatus</i>	<i>Pipturus</i>			
<i>mauiensis</i>		<i>Coprosma</i>	<i>Cheirodendron</i>	<i>Clermontia</i> (Lobeliaceae) <i>Rubus</i> (Rosaceae) <i>Pelea</i> (Rutaceae)
<i>oahuensis</i>	<i>Boehmeria</i>			
<i>pipturi</i>	<i>Pipturus</i>			
<i>saundersianus</i>	<i>Urera</i>	<i>Coprosma</i>		<i>Freycinetia</i> (Pandanaceae)
<i>silvestris</i>		<i>Straussia</i>		
<i>swezeyi</i>	<i>Pipturus</i>			
<i>whitei</i>				<i>Astelia</i> (Liliaceae)

* No host records are available for *convergens*, *consummatus*, *chinai*, *insulicola*, *interoculatus*, *hiloensis*, and *nitidus*.

Table 16. Host Relationships of *Nysius* and *Nesomartis**

Species	Compositae	Epacridaceae	Gramineae	Miscellaneous
abnormis		Styphelia		
coenosulus	Erigeron Dubautia Argyroxiphium	Styphelia		
dallasi				Portulaca (Portulacaceae)
delectulus	Dubautia			
delectus	Dubautia			Stachytarpheta (Verbenaceae)
fucatus	Bidens			
lichenicola			Eragrostis	
longicollis			Eragrostis	
mixtus	Dubautia	Styphelia		
nemorivagus	Dubautia			Geranium (Geraniaceae) Lythrum (Lythraceae)
nigriscutellatus	Dubautia	Styphelia		Portulaca (Portulacaceae)
psammophila			Eragrostis	
chenopodii				Chenopodium (Chenopodiaceae)
neckerensis				Chenopodium (Chenopodiaceae)
suffusus			Eragrostis	
communis	Bidens Dubautia Argyroxiphium			

* No host records are available for *blackburni*, *flavus*, *frigatensis*, *fullawayi*, and *nihooe*.

LIFE HISTORY AND DEVELOPMENTAL STAGES

Of the numerous contributions to our knowledge of the life history and immature stages of Orsillini, the most complete are Milliken's account of *Nysius ericae* (Schilling) (1918), Smith's "Life History Notes on the Rutherglen Bug" (1927), and Jordan's life history of the European *Ortholomus punctipennis* Herrich Schaefer (1933). As these works are well known and readily available there is no need to review them here except to note the close similarity which exists in the life histories and habits of these species and the typical *Nysius* of Hawaii.

In this section a wide variety of observations ranging from unrelated notes on eggs or first nymphal instars to complete life histories is given. The terminology of nymphal head parts is after Spooner (1938) and the position and number of dorsal abdominal scent glands is as described by Gulde (1902) and further amplified by Usinger (1938).

All developmental stages have been described for *Nysius coenosulus* Stål as a representative of this genus in Hawaii, and for *Oceanides nubicola* Kirkaldy as a representative of the highland generically endemic element. Beyond this, it is thought that detailed descriptions of last nymphal instars should suffice, as these show all of the nymphal characters to better advantage than do the earlier stages.

To obtain eggs of these bugs, copulating pairs in the field are placed in cotton stoppered vials with a sprig of their host plant. Usually eggs will be found, either on the plant or inserted in the cotton, at the end of the day.

***Nysius coenosulus* Stål (pl. 10).**

After numerous attempts to confine these bugs in cellophane cages and in glass tubes surrounding the stem of the plant and plugged with cotton at either end, it was found that *Erigeron* plants could best be transplanted to pots and carried to an inner, well-weeded, and walled-in court. The wingless nymphs were unable to fly away and there were no other *Erigeron* plants in the vicinity to which they might migrate. The removal of all opened flower heads, precluded any possibility of previously laid eggs interfering with the experiment. All that remained, then, was to introduce freshly hatched first instar nymphs and allow them to live under perfectly natural conditions, making daily observations.

Copulation. Pairing takes place in an end to end position with the male genital capsule slightly exerted and the long, elbowed female ovipositor completely unsheathed. The tip of the ovipositor is slightly inserted in the dorsal aperture of the male genital capsule with the short parameres on either side. In specimens collected in coition and cleared in KOH the aedeagus is clearly visible as a slender tube extending for the entire length of the ovipositor. The bugs may remain in this position for ten minutes or more, even when disturbed, and perhaps for a much longer time. A single pair copulates many times.

Oviposition. Eggs are laid in the flower heads of *Erigeron canadensis*. The female ovipositor is only bent outward from its base near the tip of the abdomen and is not flexed outward in an elbowed fashion as in copulation. It is then inserted very deeply into a compact, green, but opened flower head. The entire ovipositor and even a portion of the tip of the abdomen is buried in the disk flowers and remains in this position for 30 seconds or more. The newly laid egg is fastened parallel to one of the disk flowers and attached to the pappus. As many as a dozen eggs may be laid in a single flower head. Michalk (1933) calls this type of oviposition the "Interpoliert" or Interpolated (squeezed in or inserted) type of hemipterous egg laying.

Egg. The egg is long, slender, and nearly straight, one side being a little more curved than the other. When first laid it is almost water white or colorless and shining, with a small amount of yellow yolk at the anterior or micropylar end. As development proceeds, the egg becomes white with reddish spots indicating the position of the eyes and portions of the abdomen. The chorion is longitudinally wrinkled and bears a ring of minute but distinct micropylar processes at the anterior end. The developing embryo becomes orange later in development but the reddish eye spots are the first markings to appear followed by a red dorsal and two lateral abdominal spots. Size: length 1 mm., width 0.35 mm. Incubation period five to eight days.

Hatching. By hatching time the *Erigeron* heads open into much looser balls so that it is possible to look down to the bases of the disk flowers and see the red-spotted orange eggs ready to hatch. Eclosion is accomplished by a splitting of the chorion somewhat irregularly near the anterior end of the egg, forming a flap or lid which is forced open as the embryo expands. At this stage the embryo is completely enclosed by embryonic membrane, giving the appearance of a small, legless larva, and by merely moving back and forth, gradually works its way out of the egg. When nearly free the embryonic cover breaks and the head and various body parts are discernible as separate entities. With convulsive movements the antennae, legs, and the absurdly large rostrum are pulled free and the first instar nymph emerges. The empty egg shell is left behind with its broken emergence flap half closed again and with the cast embryonic membrane exposed still partially fastened to the inside of the chorion. This entire process occupies about ten minutes, and the bug remains quiescent for another ten minutes, still appearing quite teneral, and then becomes more active, scurrying about among the flowers of its *Erigeron* head.

First Nymphal Instar. Very pale, smooth and shining. Body form almost cylindrical in recently hatched nymphs, becoming enlarged posteriorly as development proceeds. Eyes small, about one fifth as wide as interocular space. Rostrum attaining or slightly exceeding posterior coxae, the first segment not reaching base of head; segments one to four 4-4-3-4. Antennae over twice as long as width of head, 12:4.75; segments one to four 2-2.5-2.5-5; fourth segment about as thick as femora. Tarsi two-segmented,

the first segment very short. Dorsal abdominal scent gland openings distinct at middle of posterior margins of fourth and fifth segments.

Color very pale, white with light fuscous stripes on head, fuscous pro and mesonota, and laterally on metanotum, second, third and fourth antennal segments, femora at middle, and, in older specimens, coxal flanges, extreme apex of abdomen, and tarsi. Eyes reddish and abdomen with orange to reddish spots on either side near base and posteriorly at middle in the region of abdominal scent glands. Size: length 1 mm.; width (head) 0.26 mm., (abdomen) 0.33 mm. Length of instar, three to four days.

Second Nymphal Instar. Body suboval in form, slightly attenuated anteriorly and convex above, the sides being strongly depressed but only slightly lamellately dilated. Eyes about one third as wide as interocular space, 1.5:5. Rostrum distinctly but only slightly exceeding posterior coxae. Antennae a little over half again as long as width of head.

Color testaceous, covered, at least in well-developed specimens, with irregular pink or reddish blotches, especially dorsally on the abdomen. Three pairs of fuscous stripes on the head, the middle pair extending from base of head to apex of tylus and the lateral pairs diverging anteriorly and extending to insertions of antennae. Femora broadly banded with fuscous and with tarsi infuscated. Under surface of head on either side of rostrum longitudinally infuscated. With three subrounded fuscous spots on either side covering outer half of coxae and adjacent portions of pleurites. Otherwise as in the first instar. Size: length 1.55 mm.; width (head) 0.44 mm., (abdomen) 0.88 mm. Length of instar, four days.

Third Nymphal Instar. As in the second instar but with the antennae a little less than half again as long as width of head, 14:10.

Markings more distinct than in previous instars, the markings of thoracic nota appearing as three longitudinal, posteriorly divergent fuscous stripes, the innermost, on either side, broadest. With pale, ill-defined additional stripes centrally and laterally. Size: length 1.88 mm.; width (head) 0.44 mm., (abdomen) 1.1 mm. Length of instar, five or six days.

Fourth Nymphal Instar. Thorax longer and better developed than in previous instars, the meso and metanotal pads partially developed, the mesonotal lobe being a little shorter than mesonotum at middle, 3:4; and extending to middle of first abdominal segment. Antennae a little over half again as long as broad, 20:12.5.

Head and thorax above, still more distinctly striped. Scent glands and transverse markings on either side of these as well as spots on anterior margins of last three ventral segments fuscous. Size: length 2.33 mm.; width (head) 0.69 mm., (abdomen) 1.16 mm. Length of instar, six to eight days.

Fifth Nymphal Instar. Body form elongate-oval. Head a little less than half again as broad as long, 17:12; anteocular portion considerably longer than an eye, 6.5:4.25; eyes about one third as wide as interocular space, 3.5:10; ocelli appearing simply as red dots beneath the nymphal cuticula; bucculae scarcely or not at all developed, with an ill-defined groove or depression extending to posterior margin of head. Rostrum reaching posterior coxae, the first segment not nearly reaching base of head; segments one to four 10-9-8-7. Antennae a little less than twice as long as width of head, 32:17; segments one to four 4-9-7-12.

Pronotum over twice as broad behind as long, 23:11; sides rounded anteriorly and feebly arcuate, straight, or a little concave and flaring posteriorly to humeral angles, strongly depressed and narrowly, lamellately expanded. Mesonotum as long as pronotum at middle, its posterior margin between hemelytral pads at middle, arcuate. Mesonotal pads a little longer than mesonotum at middle, 13:11; laterally rounded near base and scarcely arcuate posteriorly. Metanotum very short, less than one fifth as long as mesonotum, the metanotal pads concealed beneath mesonotal pads except at inner bases.

Dorsal abdominal scent gland openings distinct, appearing as transverse lines with small apertures on either side at middle of hind margins of fourth and fifth abdominal segments, these margins strongly deflected posteriorly at middle. Tarsi two-segmented,

the first segment shorter than second, 3:5, on front and middle legs; the two segments subequal on hind legs. Claws very small.

Color pale testaceous with brown stripes and markings dorsally on head and thorax as illustrated. Abdomen irregularly mottled with pale fuscous above with some reddish color showing through. With a transverse fuscous spot on either side of first scent gland and a spot posteriorly and laterally on either side of second gland. Genital segment narrowly black as seen from above and broadly black beneath. Under surface of head longitudinally infuscated on either side of rostral groove. Thoracic sterna white along middle. Thoracic pleura outlined with black and longitudinally striped with white, the coxal flanges alternated obliquely with black and white. Abdomen pale beneath, most often lightly mottled with pink and with trichobothrial spots (in the same relative position as in adults) indicated by small black dots. Rostrum brownish basally and black apically. Antennae brownish or paler with black markings on first segment, darker at least at bases of second and third segments, and brown on entire fourth segment. Coxae white except at extreme bases, trochanters white, femora pale with brown spots or sometimes generally embrowned except at bases and apices, tibiae light brown or paler, and tarsi brown at least apically. Eyes reddish-brown.

Size: length 3.11 mm. to 3.83 mm.; width (head) 0.8 mm. to 1 mm., (abdomen or wing pads) 1.44 to 1.66 mm. Length of instar, five days.

Moulting. During ecdysis the cuticula splits longitudinally along the middle of the thoracic nota, the split continuing forward onto the epicranial stem of the head. In front of and continuous with this, a split occurs on either side along the epicranial arms and extending near the inner margins of the eyes. The nymph draws itself out of the center of this, the front of the head forming a flap with its open side nearest the middle of the insect just as is the case with the side flaps.

Progression in growth. Dyar (1890) suggested that the sclerotized parts of the insect body increase in size in a more or less regular geometrical progression during successive instars, there being a growth factor for each species representing the increase in size at each moult. This principle has been further but rather dubiously extended by Przibram (Przibram and Megusar, 1912) and Bodenheimer (1933) to include a progression in weight in successive instars and progressively increasing surface areas while elaborate formulae have been developed to cover the many special situations encountered in the growth of different insects.

Originally proposed for the larvae of holometabolous insects and frequently applied to larvae of Hymenoptera, Coleoptera, and particularly Lepidoptera, this principle has only recently (Harries and Henderson, 1938) been extensively applied to hemimetabolous insects although the present data were plotted and tested by Dyar's Rule six years ago.

Measurements of the head widths of a random population of nymphs of *Nysius coenosulus* Stål have been plotted on a graph (fig. 8). These measurements fall into five groups corresponding to the five nymphal instars but there is an increasingly greater spread in later instars amounting to a distinct bimodal curve in the last instar. This is exactly as expected from the size differences

in sexes of the adults. Thus, although apparently indistinguishable as to sex as nymphs, the last nymphal instars are clearly differentiated as to size corresponding to their sex.

By averaging the observed head widths for each instar and dividing each value by that of the previous instar, an average growth ratio of 1.38 was obtained, the calculated head widths obtained from this agreeing remarkably well with observed values in earlier instars, and, as might be expected, less well in later instars. It should further be noted that the average growth value of 1.38 agrees quite closely with Przibram's theoretical progression factor of 1.26 (the cube root of 2) for insects in general.

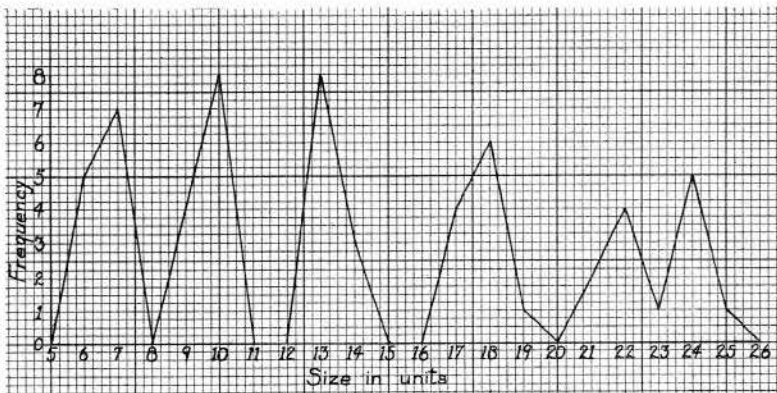


FIGURE 8.—Graph showing nymphal head width measurements of *Nysius coenosulus* Stål.

As originally suggested for insect data by Forbes (1934) and as summarized by Harries and Henderson (1938), "When the number of successive instars are equally spaced, a geometrical progression of head widths will plot on a compound interest curve of the type $y = ab^x$, where y is the head width, x is the particular instar, and a and b are constants. Since this equation may also be written $\log y = \log a + x \log b$, which is the equation of a straight line, the agreement of observed values with the Dyar principle may be illustrated by plotting . . . the actual values on the logarithmic scale of 'arith-log' paper." That the present data fit such an equation is obvious from the almost perfect alignment of the points obtained by plotting the average observed head widths against the number of instars (fig. 9, *a*). The departure of the theoretical growth ratio based on the cube root of 2 (1.26), known as the "Principle of Przibram" is shown as line B in figure 9.

Generations per year. About five weeks is required from egg to adult and, although no information is available as to the time required in the adult stage

before egg laying, Milliken (1918) found in Kansas the amazingly short average of three days from maturity to mating, one day from mating to oviposition and an average adult life of 15.2 days.

In Hawaii the entire life cycle probably occupies about six weeks. As I have found eggs, nymphs, and adults during every month of the year, development is continuous, allowing a possibility of eight or nine generations per year.

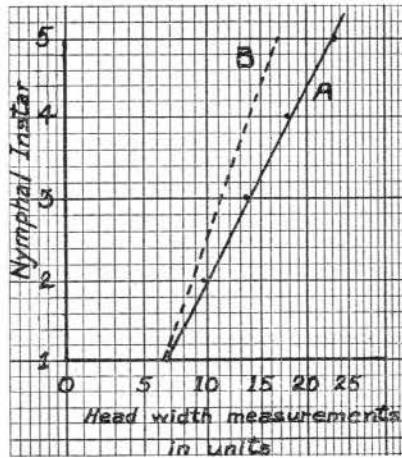


FIGURE 9.—Average nymphal head width measurements for each instar of *Nysius coenosulus* Stål, plotted on Arith-log paper to show approximation of points to a straight line.

Oceanides nubicola Kirkaldy (pl. 11).

Copulating pairs were collected on *Myoporum* on August 5 and 6, at Humuula, Hawaii. The eggs laid each day were isolated each evening. Fourteen of these hatched on August 24 and 25, giving an incubation period of from 19 to 20 days at this relatively high altitude of 6,000 feet.

In the field, I found no eggs under natural conditions, although a diligent search was made. Most of the eggs laid in captivity were simply deposited loosely at the bottom of vials. A few, however, were fastened to *Myoporum* leaves. Whether this was due to an adhesive substance on the egg or to the obviously sticky surface of the leaf is not known.

Egg. Shape elongate-elliptical, broadest slightly before middle and thence gradually rounded in both directions to apices. Color rather uniform piceoferugineous, the surface highly polished. Micropylar end with three or four white tubercles arranged as a square, rhombus, or triangle, the more closely approximated pair (where four are present) often located on the edge of a smooth, domelike elevation. In mature eggs dark eye spots may be seen just

posterior to each of the lower tubercles. These, though obscure due to the dark color of the chorion, are still visible. Size: length 0.934 mm.; diameter 0.448 mm.

As in other Orsillini, hatching is accomplished by a splitting at the micropylar end so that a three-quarter circular flap acts as a lid. An embryonic membrane is then cast when the embryo quits the chorion.

First Instar. Smooth, shining, the head very large, thorax and abdomen abruptly, lamellately flattened laterally. First three abdominal segments (dorsally) distinct, the apical segments more or less fused. Antennae very robust, as thick as tibiae, pubescent. Rostrum reaching tip of abdomen, the first segment scarcely attaining base of head.

Color black, the meso and metanota ferrugineous at the lateral margins and lightly so at middle. First abdominal segment (dorsally) ivory white, the succeeding segments ferrugineous. Antennae with first segment piceous, second piceous on basal half, ferrugino-testaceous apically, third testaceous, and fourth testaceous but lightly infuscated on apical half. Segments one to four 6-9-10-12. Under side piceous except laterally on venter which is ferrugineous. Femora piceous except for apical testaceous ring. Tibiae hairy, especially at apex; piceo-ferrugineous except for testaceous apex. Tarsi hairy, testaceous, two-segmented, the apical segment twice as large as basal. Later in development the antennae become uniformly fuscous except for apex of second and third segments. Size: length 0.97 mm.; width (head) 0.383 mm., (abdomen) 0.54 mm.

Second Instar. Disk of head and pronotum lightly, rugosely punctate, polished. Antennal segments one to four 6-10-11-16. Rostrum reaching only to middle of abdomen. Color much as in the preceding instar but the swollen dorsal surface of the abdomen is darker, piceo-ferrugineous, and the ivory white transverse band at base of abdomen is slightly narrower than the first abdominal segment, especially at middle, strongly elevated, broken at lamellar lateral expansions and continued obliquely forward. Size: length 1.47 mm.; width (head) 0.504 mm., (abdomen) 0.915 mm.

Third Instar. Similar to preceding but the pronotum is more clearly set apart from the metanotum, the lamellar margin being completely interrupted at suture. Mesonotum with clearly defined black wing pads. Abdomen, beneath these, ferrugineous, ivory-white posteriorly at middle of metanotum. Dorsal disk of abdomen with numerous white spots which are variable in size. Rostrum attaining base of first abdominal segment. Antennal segments one to four 9-14-14-18. In another example the rostrum reached half the length of the abdomen. Size: length 2.39 mm.; width (head) 0.626 mm., (abdomen) 1.17 mm.

Fourth Instar. All characters the same as above but more accentuated. Pronotum and wing pads distinctly, transversely rugose. Rostrum reaching to apex of second abdominal segment. Antennal segments one to four 13-20-19-23. Narrow lateral expansions of pronotum and mesonotum and a longitudinal line on meso and metanotum at middle and widening posteriorly white. There are apparently six abdominal segments before the genital segments, plus the one on which the transverse band is found which, in this instar, is somewhat expanded posteriorly above the next posterior segment. Before this is the mesothorax with wing pads extending posteriorly from its anterior margin and the mesothorax with the black, more heavily sclerotized pads of the hemelytra extending from its anterior margin to middle of first abdominal segment. Size: length 3.14 mm.; width (head) 0.785 mm., (abdomen) 1.5 mm.

Fifth Instar. Much as in the previous instar but with the wing pads extending to middle of third abdominal segment. White spots of dorsum of abdomen arranged in a pattern. First segment, between wing pads, all white except for two postero-lateral ferrugineous areas. Second segment ferrugineous with an irregular row of white spots just within anterior and posterior margins. Third segment with posterior margin lightly emarginate at middle and the same submarginal transverse rows of white spots as well as denser cluster at middle. Fourth segment lightly arcuate posteriorly at middle and with

a quadrate, feebly transverse black spot extending onto anterior margin of fifth segment. Fifth segment strongly arcuate posteriorly at middle making the sixth segment very short at middle where a subquadrate black spot occurs. Apical genital segment black at tip, this black extending onto antepical segment and even onto sixth abdominal segment ventrally. Rostrum scarcely exceeding hind coxae. Antennal segments one to four 14-25-23-29. Tarsi two-segmented.

In a somewhat smaller specimen (head width distinctly less), which I assume to be the male, the color is considerably darker, the light lateral and median areas of thorax being much smaller in extent and the dorsum of abdomen with a pair of white spots on third and fifth segments and two pairs on fourth and sixth segments as well as numerous obscure smaller spots. Size: length 4.12 mm.; width (head) 0.934 to 1.028 mm., (abdomen) 1.92 mm.

In general, the black head and thorax and ferruginous abdomen with the transverse band of white covering basal abdominal segment will readily distinguish nymphs of this species from any other with which I am familiar.

***Oceanides bryani* Usinger.**

A copulating pair was collected on *Euphorbia olovaluana* var. *gracilis* (Rock) at Humuula, Hawaii, Aug. 6, 1935 and an egg was laid the same day. The egg hatched on August 25, 1935, giving an incubation period of 19 days. Both the egg and the first nymphal instar are suggestive of *nubicola*, the shape and size being quite similar.

First Instar. Color much lighter than in *nubicola*, the venter ochraceous behind a transverse white band, the femora fuscous except for testaceous apices, the tibiae sanguineous on inner sides and testaceous on outer sides, tarsi testaceous. Antennae testaceous, with the basal and apical segments somewhat infuscated. Rostrum almost attaining apex of abdomen. Antennal segments one to four 6-8-10-12. Size: length 0.897 mm.; width (head) 0.364 mm., (connexivum) 0.504 mm.

***Oceanides fosbergi* Usinger.**

A copulating pair was collected on *Coprosma* at Lanaihale, Nov. 30, 1935 and two eggs were laid during this and the following day. These eggs hatched on December 15, 1935, giving an incubation period of less than 16 days. This seems short in comparison with *nubicola* and *bryani*, but is to be expected as these were brought to the lowlands and hatched in the laboratory in Honolulu under much warmer conditions than their accustomed home on the highest peak on the island of Lanai.

First Instar. Dark ferruginous in color, the antennae lighter, testaceous, and slightly infuscated at base of first segment and on fourth segment. Apices of femora and tibiae and all of tarsi testaceous. Abdomen lighter than head, thorax and rostrum, being ferruginous with an ivory white basal transverse band dorsally. Rostrum exceeding tip of abdomen. Antennal segments one to four 5-7-9-12. Size: length 0.861 mm.; width (head) 0.373 mm., (connexivum) 0.504 mm.

***Oceanides membranaceus* Usinger.**

Last Nymphal Instar. Body form elongate-oval, general color fulvous marked with brown or red. Antennae a little less than twice as long as width of head, 30:16; segments one to four 4-9-8-9. Rostrum attaining hind margin of second abdominal segment, the first segment not reaching base of head; segments one to four 10-10-8-10. Color pale fulvous

with a yellowish cast with dark brown on the sides of tylus on either side of middle of head above, forming two lines which diverge anteriorly about to anterior margins of eyes, then abruptly turn briefly backward and toward the center and finally proceed anteriorly, converging at base of tylus. With a light brown arm extending laterad on either side, near base of tylus and another spot on either side near inner margins of eyes. Pronotum with a transverse brown spot on either side of middle at a level corresponding to the callosities of adults. Mesonotum with an oblique brown area basally on either side of middle. Head and thorax above with an ill-defined, pale, longitudinal line along middle.

Abdomen very strikingly marked above, the first three segments with progressively stronger punctures at center, irregularly suffused with two briefly transverse brown spots on either side of the reddish area at middle of segments, with transverse abdominal sutures and an ill-defined, sublateral impression or suture irregularly marked with brown. These same characteristics obtain posteriorly but are modified due to the posterior distortion of hind margins of fourth and fifth abdominal segments for the scent glands. Paired gland apertures and genital segment black, and a larger area in front of the posterior gland, orange. Under surface of head posteriorly on either side of rostral groove, pleural margins irregularly and coxal flanges, indistinct subapical rings on femora, coxae basally, and tarsal claws brown. Rostrum pale with black apex. Antennae pale fulvous with light brown near white joints and with darker brown on apical half of fourth segment.

Size: length 3.27 mm.; width (head) 0.88 mm., (wing pads) 1.41 mm.

Collected on *Euphorbia* at Kukuiala Valley, Oahu, Feb. 9, 1936 (R. L. U.).

Oceanides nimbatu Kirkaldy (pl. 12, A).

Last Nymphal Instar. Body form elongate with sides subparallel. Color brown marked with darker, fuscous, and tinged with reddish. Antennae twice as long as width of head, 39.5:19.5; segments one to four 6-11-11-11.5. Rostrum surpassing middle of second abdominal segment, segments one to four 14-13-13-13.

Head broader than long, 19.5:16.5; antecular portion over half again as long as an eye, 9:5.5; eyes one fourth as wide as interocular space, 3.25:13; upper surface with a few, indistinct punctures.

Pronotum over twice as broad as long, 25:11, its sides feebly anteriorly convergent, very strongly but narrowly depressed and subrounded anteriorly and rectilinear posteriorly; disk transversely rugose. Mesonotal pads likewise narrowly depressed and even a little reflexed.

Head brownish with dark fuscous along sutures of tylus and behind this on either side of a median pale, longitudinal line, these fuscous fasciae not reaching base of head, anterolaterally divergent, sending out an arm on either side toward but not reaching antenniferous tubercles, following the curve of the epicranial arms. With a short fuscous fascia on either side near middle of inner margins of epicranial arms. Vertex laterad to epicranial arms and surrounding red eyes, dark pitchy brown.

Pronotum brown with small pale spots, almost black callosities, and narrowly testaceous lateral margins. With a narrow, white, longitudinal line along middle extending throughout mesonotum as well. Mesonotum, including pads, otherwise dark brown to black except for pale spots sublaterally and testaceous lateral margins. Abdomen pink with numerous small white spots with black margins of abdominal glands and genital segments.

Under surface of head dark brown with pale center of posterior third and conspicuous pale sutures extending from just below antenniferous tubercles to posterior margin of head near eyes. Under surface of thorax light brown to testaceous with the pleura surrounding coxae black. Venter dark at middle and pink laterally with conspicuous, transverse black areas at middle of the last two segments and genital segments. Position of trichobothria indicated by small brown spots.

Antennae light brown to ochraceous with darker brown spots on first segment, dark bases of second and third segments and almost entirely brown last segment. Rostrum pale

with dark brown to black apex. Legs pale with dark brown bases of coxae and broad subapical rings on femora. Size: length 4.72 mm.; width (head) 1.04 mm., (wing pads) 1.72 mm.

Collected on *Gouldia* on Lanihuli, Oahu, Feb. 23, 1936 (R. L. U.).

***Neseis* (*Icteronysius*) *maculiceps* Usinger (pl. 12, B).**

Last Nymphal Instar. Body form suboval, general color yellowish-ochraceous to white marked and mottled with brown to black.

Head broader than long, 17:15; the anteocular portion over half again as long as an eye, 7:4; eyes less than half as wide as interocular space, 3.25:10.5; color brownish black and white above, being entirely brown except for epicranial sutures to level of ocelli, white laterally surrounding eyes and white with black markings on frons in much the same pattern as *fasciatus* (pl. 12, D). Antennae one fifth longer than width of pronotum, 31.5:25; less than twice as long as width of head, 31.5:17; segments one to four 5-9-9-8.5. Rostrum slightly exceeding posterior coxae, the first segment not reaching base of head; segments one to four 10-10-8-7.5. Antennae with an irregular ring of brown spots at middle of first segment, dark brown at bases and broadly so on apical half of fourth segment. Rostrum pale except for apex of last segment.

Pronotum two and one half times as broad as long, 25:10; the lateral margins very narrowly, lamellately expanded. Region of callosities with sinuate, transverse dark brown markings surrounded by a more or less clear area, with the middle disk longitudinally likewise fairly clear. Elsewhere, except on lateral margins, brown with pale or hyaline spots or areoles. Mesonotum and wing pads entirely but very irregularly embrowned, the pale or hyaline areas either irregular and rather large or small and in the form of regular round spots.

Abdomen yellow or slightly tinged with reddish above and more or less distinctly spotted with white, the scent glands and genital segment narrowly black.

Under surface black-marked anteriorly and posteriorly on head, subquadrately or subrectangularly surrounding whitish areas at middle of thoracic pleura, and on genital segments. Legs more or less pale, the femora brown-spotted, the tibiae infuscated at least apically, and the tarsi brown on apical half of second segment. Venter with at least the lateral trichobothrial spots black.

Size: length 4.16 mm.; width (head) 0.94 mm., (wing pads) 1.88 mm.

Collected on *Sophora* at Humuula, July 30, 1935 (R. L. U.).

***Neseis* (*Physonysius*) *molokaiensis* Usinger (pl. 12, C).**

Last Nymphal Instar. Body form very broadly oval, almost round, only moderately attenuated in front. General color of head, thorax, and appendages fulvous or lighter marked with dark brown, the abdomen pink, spotted with white.

Head over half again as broad as long, 19:12; anteocular portion as long as an eye, 5:5; eyes less than half as wide as interocular space, 4.5:10; upper surface entirely smooth. Epicranial arms sinuate near inner posterior margins of eyes. Antennae about half again as long as width of head, 30:19; segments one to four 4-8-8-10. Rostrum reaching middle coxae; segments one to four 7-5-4-5.

Pronotum strongly transverse, over twice as broad as long, 29:11, the sides strongly convergent anteriorly and rounded near antero-lateral angles. Lateral margins strongly and rather broadly flattened. Mesonotal pads very narrowly but sharply reflexed laterally just before extreme edge.

Head fulvous to ochraceous with dark brown arms at situations, base of head lightly at middle and darker on either side on vertex except under eyes. Pronotum ochraceous with dark brown callosities, testaceous lateral lamellae, and white longitudinal line at middle, this last extending and widening posteriorly through metanotum. Meso and meta-nota dark brown, the wing pads variegated with ochraceous near the base and obliquely

subapically. Abdomen pink with numerous white spots, the scent glands surrounded by black. Under side of head brown with anterior portion and stripes from point of insertion of antennae to posterior margin pale. Thoracic pleura dark brown to black except laterally, the lamellate areas of pronotum and wing pads brown beneath with pale edges. Venter pink and white with black at points of insertion of trichobothria. Genital segments and the two ventral abdominal segments in front of these black. Antennae yellowish-ochraceous with distinct dark brown annulations anteriorly on first segment, basally and subapically on second and third segments and brown except basally on fourth segment. Rostrum black at extreme apex. Legs pale, the femora, excepting anterior femora, broadly brown on distal half except narrowly at apices. Tibiae narrowly brown at base and broadly ringed at middle.

Size: length 3.38 mm.; width (head) 1.04 mm., (abdomen) 2.33 mm.

Collected on *Freyinetia* vines (*ieie*) on the Mapulehu-Punaula Ridge, Molokai, Aug. 15, 1936 (R. L. U.).

Neseis oahuensis Usinger.

Copulating pairs were collected on *Boehmeria grandis* along the Manoa-Palolo Ridge on the trail to Mount Olympus, Oahu, at about 2,000 feet. Eggs laid when the pairs were taken to the lowlands hatched in 12 days.

The egg is subcylindrical, slightly tapering at its posterior end, and is three times as long as its greater diameter. It is pale testaceous or almost water white and shining posteriorly and is tinged with fulvous anteriorly. The chorion has a few small but distinct wrinkles toward the micropylar end as well as six very prominent circularly arranged processes. Size: length 1.44 mm.; width 0.48 mm.; depth 0.52 mm.

First Instar. Head and thorax shining black. Abdomen orange. Legs and antennae water white, the latter distinctly pilose. Size: length 1.16 mm.; width (head) 0.5 mm., (connexivum) 0.56 mm.

Neseis (Trachynysius) fulgidus Usinger (pl. 12, E).

Last Nymphal Instar. Body form relatively short and broad. General color ochraceous to fulvous with brown markings and a varying amount of red.

Head about one third broader than long, 15:11.5; antecular portion a little longer than an eye, 6:5; eyes less than half as wide as interocular space, 3.5:8; upper surface finely rugose; epicranial arms sinuate behind obliquely anteriorly divergent, sublateral glabrous areas. Antennae about half again as long as width of head, 23:15; segments one to four 3-6-6-8. Rostrum distinctly surpassing hind coxae, reaching to posterior margin of first abdominal segment; segments one to four 9-9-7.5-6.5.

Pronotum very broad, half again as broad as head, 21:15; shorter than head, 9:11.5; the sides strongly lamellately expanded, rounded anteriorly and feebly divergent posteriorly. Mesonotal pads likewise rather broadly expanded laterally, not or scarcely reflexed, and rather evenly arcuate. Pro and mesonotal disks at least partially, finely, transversely rugose.

Head very pale brown with darker brown in sutures surrounding tylus, on glabrous sublateral areas and two anteriorly divergent lines extending anteriorly from base of head between epicranial arms. Juga with very obscure, oblique stripes. Ocelli indicated only by two pink spots. Eyes red. Pronotum pale fulvous with brown callosities and white, subhyaline lamellae at sides. Mesonotum reddish brown, the wing pads fulvous with brown laterally at base and at apex; lamellate margins white at middle. Metanotum white at middle and brown laterally on exposed portions of wing pads. Upper surface of abdomen white basally and pink with white spots posteriorly, the scent glands narrowly margined

with black and genital segments black. Under surface pale ochraceous to white, the head marked with brown on either side of white rostral groove to sublateral longitudinal sutures but pale at base of this area and brown laterally along posterior margin. With a brown spot behind insertion of antennae. Thoracic sterna and pleurites adjacent to coxae white, with single broad oblique longitudinal brown stripes on pro and mesopleura becoming double on metapleura. Venter pale at middle and suffused with pink and white-spotted laterally, with broad brown vittae at middle of posterior segments and with black points marking the insertion of trichobothria.

Antennae ochraceous with brown anteriorly on first segment, basally and subapically on second segment, basally on third segment, and on apical half of fourth segment. Rostrum pale with black apex. Legs white with femora infuscated subapically, tibiae infuscated at middle and apically and tarsi brown at least apically.

Size: length 2.77 mm.; width (head) 0.83 mm., (hemelytral pads) 1.38 mm.

Collected on *Pipturus albidus* at Punaluu, Oahu, March 1, 1936 (R. L. U.).

Neseis (Trachynysius) nitidus pipturi Usinger.

Last Nymphal Instar. Body form rather broad but elongate-oval. Color rather uniformly yellowish-ochraceous with a few brown marks. Head almost as long as broad, 16:17.5; the antecular portion over one half longer than an eye, 8:5; frons with a white longitudinal line at middle, interrupted anteriorly and then continuing along middle of tylus, with a white spot adjacent to inner margins of eyes anteriorly extending as a very fine, irregular line posteriorly through each ocellus. Juga variegated with white above. Antennae a little longer than width of pronotum, 28:25; over half again as long as width of head, 28:17.5; proportion of segments one to four 4-7-7-10. Rostrum exceeding posterior coxae and reaching well onto second abdominal segment, the first segment almost reaching base of head; segments one to four 11-11-11-9.5.

Pronotum over twice as broad as long, 25:11.5; broadly lamellately expanded laterally and immaculate or lightly embrowned over callosities. Mesoscutum scarcely brown near middle. Wing pads infuscated laterally at about basal third on inner margins near base, and at apices. Abdomen with an occasional white spot above, the margins of glands narrowly brown or black and genital segments dark.

Antennae pale with brown apically on first segment, brown rings basally and subapically on second and third segments and dark brown on apical three fourths of last segment. Rostrum pale except for brown labrum and brown apical two thirds of fourth segment. Under surface almost entirely immaculate, the head sometimes faintly embrowned laterally in front and behind and the propleura lightly infuscated. Venter sometimes indistinctly marked with white. Legs pale, the femora faintly ringed with brown subapically; tibiae feebly infuscated at middle and apically and at least the apical half of second tarsal segment fuscous.

Size: length 4.27 mm.; width (head) 0.972 mm., (wing pads) 1.83 mm.

Collected on *Pipturus* at Kilauea, Hawaii, Aug. 19, 1935 (R. L. U.).

Neseis (Trachynysius) fasciatus fasciatus Usinger (pl. 12, D).

Last Nymphal Instar. Body form rather broadly elongate-oval and brightly colored with testaceous, brown and red. Antennae about as long as width of pronotum, 24:24; and one third longer than width of head; segments one to four 3.5-6.25-6.25-8.5. Rostrum scarcely surpassing middle coxae, the first segment not nearly reaching base of head; segments one to four 7-6-6-6.5.

Head almost half again as broad as long, 18:13; eyes less than half as wide as interocular space, 4:10. Pronotum almost two and one half times as wide as long, 24:10; sides strongly lamellate and arcuate throughout.

Color pale yellowish-ochraceous more or less spotted with reddish throughout. Head with a white median, longitudinal line on frons extending nearly to base of tylus and with

narrowly white along inner margins of eyes, the epicranial arms angled near eyes; with a broad, oblique, brown mark on either side, extending from epicranial arms to posterior margin, with anteriorly divergent brown lines on either side of middle extending from base to about middle of frons, and with a posteriorly directed, inverted Y-shaped brown line extending from base of tylus and almost meeting these. Brown at lateral angles of epicranial arms and along antero-lateral margins of juga. First antennal segment with a brown ring on apical half, second and third with brown rings basally and subapically, and fourth pale on basal fourth and brown apically. Rostrum pale except for apical three fourths of last segment. Pronotum with a white median longitudinal line and dark brown on either side extending from anterior margin just behind eyes posteriorly and medially, and second pair arising from the middle of these and likewise extending towards the middle and a little farther backwards, with an ill-defined brown area behind this. Margins pale, almost hyaline.

Mesonotal disk variegated with brown, the wing pads with an oblique, variegated, broad brown fascia extending from just behind antero-lateral angles to inner anterior angles and brown at tips.

Abdomen above with numerous white spots on the otherwise cream-colored or reddish background, the scent glands narrowly surrounded with fuscous and genital segment almost black.

Under surface in great part pale with a pair of brown spots beneath the head both anteriorly and posteriorly. Thoracic pleura brown just above coxae, interrupted with oblique pale areas. Femora brown at least on apical half, tibiae ringed with brown a little before middle and apical half of second tarsal segment brown.

Size: length 3.44 mm.; width (head) 1 mm., (wing pads) 1.8 mm.

Beaten from *Pipturus* at Kilauea, Hawaii, Aug. 19, 1935 (R. L. U.).

***Nysius terrestris* Usinger.**

This species occurs in great numbers in company with *Nysius dallasi* on *Portulaca oleracea*. I found the two species in great abundance in the dense growth of *Portulaca* which completely carpets large areas of ground on Manana Island. Thirty-seven copulating pairs were counted, and no crossing of the two species was observed.

Near the beach at Mapulehu, Molokai, a similar situation was observed, thousands of bugs running about on the plants and on the ground beneath. Nymphs from first instar (pink or red in color) to large last instar crowded and tumbled about in the dry dirt. Copulating pairs were isolated in vials with plant material and dirt. On August 17, 1936, several perfectly typical *Nysius* eggs were found glued to the surface of the glass vial with dirt particles adhering to them, forming a protecting or concealing cover. These eggs hatched on August 23, giving an incubation period of six days.

***Nysius rubescens* White (pl. 12, F).**

Last Nymphal Instar. Body form elongate-oval, more attenuated anteriorly. General color dark fuscous with pale spots and markings on head and thorax and brownish-ochraceous with a reddish tinge on abdomen.

Head one seventh broader than long, 16:14; anteocular portion almost half again as long as an eye, 7:5; eyes less than half as wide as interocular space, 3.5:9; epicranial arms scarcely sinuate near the eyes. Antennae slightly less than twice as long as width of head, 29:16; segments one to four 4-8-7-10.

Pronotum twice as broad as long, 20:10; one fourth broader than head, 20:16; and about one third shorter than head, 10:14; disk strongly rounded at the sides, the lateral margins minutely carinate but not at all lamellately expanded. Hemelytral pads likewise non-lamellate, only narrowly pale margined, and convex.

Color of head and thorax dark fuscous, spotted with pale, the head with a pale line on tylus and two sinuous longitudinal pale lines on either side of head near the eyes.

Pronotum with black callosities, slender white line along middle extending to hind margin of mesonotum, and with narrowly pale lateral margins. Eyes reddish. Abdomen brownish-ochraceous tinged with reddish. The scent glands narrowly surrounded with black and genital segments black. Under surface of head and thorax black, at least laterally.

Venter in great part pale with black spots at insertions of trichobothria and with genital segments black. Antennae dark brown to black except narrowly at apices of second and third segments. Rostrum black at least at apex. Femora black with white at apices, tibiae brownish with paler bases and apices, apical tarsal segments infuscated.

Size: length 3.44 mm.; width (head) 0.88 mm., (abdomen) 1.61 mm.

Collected on *Vaccinium (ohelo)* at Kilauea, Hawaii, Aug. 14, 1935 (R. L. U.).

KEY TO SOME NYMPHS OF HAWAIIAN ORSILLINI

1. Head with at least two complete, anteriorly divergent, longitudinal, black or white fasciae sublaterally near the eyes. Genus *Nysius*..... 2
 Head black or white-marked but with only a short, incomplete spot or stripe on either side along inner margin of epicranial arm near eyes and often with the inner stripes incomplete or wanting..... 3
2. Disks of head and thorax in great part fuscous with white spots. Sides of pronotum and hemelytral pads laterally scarcely lamellately expanded, very narrowly pale *Nysius rubescens* White.
 Disks of head and thorax in great part longitudinally alternately striped with fuscous and white, the fuscous areas more or less spotted with white. Sides of pronotum and hemelytral pads broadly, lamellately expanded and broadly pale *Nysius coenosulus* Stål.
3. Epicranial arms scarcely sinuate near inner, posterior angles of eyes. Head very long, broad and convex in front of the eyes. Pronotum and hemelytral wing pads roundly convex, abruptly depressed and narrowly lamellate at sides. Genus *Oceanides* 4
 Epicranial arms distinctly sinuate near inner posterior angles of eyes. Head often subflattened above and always less convex anteriorly. Pronotum and hemelytral wing pads much flatter, the sides often strongly lamellately expanded. Genus *Neseis* 6
4. Head, pronotum and mesonotum, including hemelytral pads, entirely black except for narrow lamellate margins..... *Oceanides nubicola* (Kirkaldy).
 Head and thorax above, light brown with darker markings..... 5
5. Color pale fulvous with darker brown on base of head, callosities, and hemelytral pads apically. Size small, 3.27 mm. in length..... *Oceanides membranaceus* Usinger.
 Color darker brown with pale spots on pronotum and mesonotum and dark brown to black callosities and hemelytral pads apically. Size larger, 4.72 mm. *Oceanides nimbatus* (Kirkaldy).
6. Head and thorax brown, entirely pale spotted or streaked, the head ivory-white with distinctive longitudinal brown markings. Hemelytral pads neither lamellately expanded nor sublaterally impressed.....
 *Neseis (Icteronysius) maculiceps* Usinger.

- Head and thorax otherwise, the hemelytral pads clear and immaculate at middle, the lateral margins either lamellately expanded or sublaterally impressed..... 7
7. Body very broad, particularly posteriorly, two thirds as broad as long, the hemelytral pads distinctly, sublaterally impressed.....
- **Neseis (Physonysius) molokaiensis** Usinger.
- Body more slender, about half as wide as long, the hemelytral pads distinctly expanded. *Neseis* subgenus *Trachynysius*..... 8
8. Rostrum short, not reaching posterior coxae..... **fasciatus** Usinger.
- Rostrum longer, exceeding posterior coxae..... 9
9. Body short, broad, and subflattened above, only twice as long as broad, the head only indistinctly marked with brown. Size small, 2.77 mm..... **fulgidus** Usinger.
- Body longer and more slender, over twice as long as broad, 77 : 33. Color very pale, the head with ivory-white markings. Size larger, 4.27 mm..... **pipturi** Usinger.

NATURAL ENEMIES

Orsillini have no visible means of defense save their obnoxious odor, and hence have many potential enemies in Hawaii—birds, toads (*Bufo marinus*), frogs, skinks, geckoes, spiders, predaceous Hemiptera, hymenopterous and dipterous parasites, insect-storing larrid wasps, and the *Pheidole* ant—only a few of which are really effective. Native birds have become so rare in the highlands that they cannot be of much importance now, although they may once have consumed Orsillini in some numbers. This is less true of lowland birds such as the introduced mynah bird. Frogs are largely confined to water, and the toads, skinks, and geckoes, although feeding extensively on invertebrates in the lowlands, have not been observed frequenting the particular places where *Nysius* occur. Native and introduced spiders must consume large numbers of Orsillini. Predaceous bugs include the ubiquitous Nabidae of lowland and highland, the highland endemic Anthocoridae, *Physopleurella*, *Poronotus*, *Lashiochilus*, and *Lilia*, all of which are too rare to reduce orsilline populations greatly, and the common *Orius persequens* White of the lowlands. This last is certainly one of the principal predators, attacking young nymphs in particular on a wide variety of lowland weeds. The recently introduced *Geocoris* (Usinger, 1936) may be important locally, as I found *punctipes* abundant on *Portulaca* plants with *Nysius dallasi* and *terrestris* on Manana Island. *Zelus renardii* Kolenati and various Emesidae such as *Empicoris rubromaculatus* (Blackburn) doubtless eat *Nysius* at times, but I have never observed them doing so.

Of the numerous introduced and native hymenopterous egg parasites recorded from Hawaii, only a few species, mostly scelionids with one mymarid, have been reared from bug eggs. Of these only *Telenomus vulcanus* Perkins was actually reared from the eggs of *Nysius* (probably *delectulus*) in the flower heads of *Dubautia* at Kilauea (Swezey, 1929). Much remains to be done in rearing parasites from the eggs of native insects, but these parasites are probably not an important factor in keeping down Orsillini in the Hawaiian

islands. I have reared many eggs of various species without getting one parasite.

Another possibly more important hymenopterous parasite of Orsillini in Hawaii is the larrid, *Silaon rohweri* Bridwell (1920), a minute wasp which nests in emergence holes of cerambycids, storing these with *Nysius*. As these observations were made on Ewa Coral Plain, it seems probable that the *Nysius* is either *terrestris*, *dallasi*, *coenosulus*, or *nigriscutellatus* or perhaps all of these. The larrid is presumably of American origin and has been reported from Oahu, Maui, and Molokai. Bohart and MacSwain (unpublished ms.) observed in California unidentified larrids storing large numbers of *Nysius minutus* Uhler, especially in the nymphal stages, and apparently capturing no other insects.

The only internal dipterous parasite reared from *Nysius* to date is the tachinid, *Phasia occidentis* Walker, studied by Milliken and Wadley (1923). This was reared from the false chinch bug, *Nysius ericae* (Schilling) in Kansas. Of a population of 220, 7.7 percent was parasitized, the parasites mostly attacking the females.

The aggressive lowland ant, *Pheidole megacephala* (Fabricius), has proved to be an enemy of most endemic insects, driving all but the sturdiest or most resistant before it. *Pheidole* extends over the entire strand and lowland zones and even into portions of the lower forest. It may be responsible for the absence of *Oceanides* and *Neseis* in the rare patches of endemic lowland forest where, with few exceptions, only cockroaches, *Siphanta acuta*, and other introduced insects are now found. By their large populations in the lowlands, typical *Nysius* show every evidence of successfully competing with *Pheidole* ants. The success of *Nysius* species in the lowlands may be due to their ability to conceal their eggs, to the repellent effect of the scent glands of the nymphs and adults, or to some factors entirely unknown to us as yet.

In conclusion it may be said that Hawaiian Orsillini are remarkably free from effective natural enemies. The predatory *Orius persequens* White and the nest-storing *Silaon rohweri* Bridwell are effective only in the lowlands, where *Nysius* is able to build up to tremendous populations.

ECONOMIC IMPORTANCE

At least two species of the genus *Nysius* are notorious pests of agricultural crops. The Rutherglen bug (*Nysius vinitor* Bergroth) of Australia (Smith, 1927), the false chinch bug (*Nysius ericae* Schilling) of Europe and North America (Milliken, 1918), and the minute false chinch bug (*Nysius minutus* Uhler) in the western United States (Essig, 1926) attack cultivated crops. The bugs build up to large populations on weeds and then turn to cultivated

fields in the vicinity when their normal hosts become incapable of supporting their increased numbers.

An excellent summary of damage by species of *Nysius* to agricultural crops, compiled largely from records in the "Review of Applied Entomology" is given by Evans (1936). He records *H. binotatus* Germar on fruit, especially on peaches, and on potatoes in South Africa; *N. clevelandensis* Evans on fruit and vegetable crops, tobacco and cotton in Queensland; *N. delectus* White on tobacco in Hawaii; *N. ericae* Schilling on fruit and vegetable crops in the Palaearctic and Nearctic regions; *N. graminicola* Kolenati on cotton in the southern Palaearctic region; *N. huttoni* White on lucerne in New Zealand; *N. inconspicuous* Distant on tea in Malaya; *N. minutus* Uhler on peach and apricot trees, potatoes, and flax in the western United States; *N. senecionis* Schilling on vines in Europe and northern Africa; *N. turneri* Evans on vegetable crops and ornamentals in Tasmania; and *N. vinitor* Bergroth on fruit and vegetable crops, tobacco, and cotton throughout Australia.

Dr. Walter Carter tells me that he found *N. nemorivagus* White in great numbers at Parker Ranch, Waikii, Hawaii, where it caused wilt and collapse of potato plants. I found thousands of specimens of this same species at Waikii on amaranth in 1935 and it seems reasonable to assume that the bugs turned to potatoes from such weeds.

The various methods of mechanical and chemical control which have proved most successful were summarized by Knowlton (1934).

An interesting relationship between *Nysius* bugs and *Euphorbia* plants has been recorded by Lafont (1910) and others. It has been shown that *Nysius euphorbiae* Horvath transmits a protozoan, *Leptomonas davidi*, from the latex of one *Euphorbia* plant to another. Latex samples from various native euphorbias in Hawaii were examined microscopically but no *Leptomonas* was found.

Considering the potentialities of *Nysius* as pests, the scarcity of records of damage in Hawaii is remarkable. *Nysius coenosulus* occurs in countless numbers in old pineapple fields taken over by *Erigeron* but, possibly due to the presence of green weeds throughout the year, the various *Nysius* species, although among the commonest of Hawaiian insects, have not become serious pests here.

BIONOMICS²

A flood of light may be thrown on the theoretical problem of the origin of species by the study of the probable origin of species with which we may be familiar, or of which the actual history or the actual ramifications may in some degree be traced.—DAVID STARR JORDAN (1905).

The interpretation of the descriptive and observational data on the species of *Orsillini* occurring in the Hawaiian islands involves some of the most fundamental principles and questions in modern biology. Why, for example, do we find more species of *Orsillini* within the limits of the Hawaiian Archipelago than are known to occur in all the rest of the world? How does it happen that many of these have no close relatives elsewhere in the world?

If inordinate proliferation of species in insular areas occurred only occasionally in a small number of plant and animal groups, it should warrant but little special attention. But more thorough exploration and the application of more refined methods of analysis bring up many examples of insular speciation. Particularly noteworthy in the birds are the Geospizidae of the Galapagos (Swarth, 1931) and the Drepaniidae of Hawaii (Henshaw, 1902), in the land shells the Achatinellidae and Amastridae of Hawaii (Gulick, 1905, Pilsbry, Cooke and Hyatt, 1911), the genus *Partula* of Polynesia and Micronesia (Crampton, 1917, 1925, 1932), and the genus *Bulimulus* of the Galapagos (Dall, 1896) as well as a number of plant and insect genera. Hence it seems certain that we are dealing with a fundamental evolutionary process. An attempt will be made to analyze this process in the following pages.

CHARACTERISTICS OF THE ENVIRONMENT

ORIGIN

The Hawaiian archipelago is clearly volcanic in origin with subsequent or coincident coral formation in some areas. Some geologists maintain that the islands are as recent as Pliocene or even Pleistocene, having arisen as volcanic cones from the bottom of this deepest portion of the Pacific. Gregory (1930) speaking as a geologist and Pilsbry (1916) and Campbell (1933) dealing with the land shells and plants respectively, advocate a tremendous Pacific continent or at least land connections to the southeast. An even earlier, Cretaceous origin has been postulated, largely on the basis of the known age of the nearest mainland relatives of the peculiar families of land shells.

I discard the minority opinion of the "Pacific continent" advocates because it raises more problems than it solves, and instead, adopt the "stepping stone" hypothesis. According to this view, migration takes place by short jumps from island to island along the chains or arcs which run in a northwest-southeast direction across portions of the Pacific basin. That many such island chains

² "The science that treats of the origin of organic types and of the relations in which they stand to each other and to the physical environment." (Gulick, 1905, after Lankester, *Encyc. Brit.*, 9th ed.)

might have come and gone during the history of the Pacific is suggested by the number of isolated shoals and reefs which are scattered here and there, sometimes surrounded by depths of nearly 15,000 feet. Along such chains during periods of elevation, interisland communication must have taken place with great frequency.

The main Hawaiian chain forms a more or less orderly progression in point of age from east Hawaii which is youngest with active volcanoes at the present time, to Kauai, the oldest and most isolated of the entire group. To the northwest, the extensive chain of leeward islands decreases progressively in elevation and changes from volcanic rock to coral. These islands were probably at one time high and eventually, either by subsidence or weathering, were reduced to their present levels, subsequent coral formation and fluctuations in sea level resulting in the coral islands or reefs of the present day. A few endemic birds, plants and insects of Nihoa, Laysan and other islands, and an endemic *Rhyncogonus* weevil on remote Wake Island present the only evidence of an early leeward island biota. The leeward islands, as well as the Micronesian islands, show evidence of tremendous changes, so that their ancient biotas would certainly have been wiped out. Their present fauna, then, must have arrived relatively recently from neighboring land areas and, but for the few endemics mentioned above, the fauna actually consists of widespread immigrants characteristic of all the coral islands of the Pacific.

It is the ancient leeward chain of high islands which is of importance as a migration lane for the endemic Hawaiian biota. Such a circuitous route would eventually link Hawaii by way of former Micronesian islands, with New Guinea and all of its interrelated or once connected regions such as Australia, New Caledonia and New Zealand, thence, perhaps, to Antarctica and around to Juan Fernandez. The truly oceanic south and central Polynesian islands were doubtless populated in a similar fashion along chains of islands and from the same original source, but, as suggested by most students of the problem, along different and more direct routes via Fiji, Samoa, Tuamotus, Australs, and other island chains. This accounts for the similarity between the animal and plant groups of Hawaii and those of Australia, New Zealand or Juan Fernandez through community of origin, yet provides a reasonable explanation for the complete absence of many groups, such as the Orsillini, from southeastern Polynesia, the very islands where they would be expected to occur had the fauna of Hawaii been derived directly from the southwest.

PHYSICAL CONDITIONS

On the main islands of the Hawaiian group, many physical conditions are found: elevations from sea level to almost 14,000 feet; temperatures from 85 to 90 degrees F. in the lowlands to well below freezing on the top of Mauna

Kea, which is snow-capped in the winter and bears unmistakable moraines and striae of glaciers; yearly rainfall from less than 20 inches to more than 500 inches on Mount Waialeale; edaphic conditions ranging from limestone so recent and hard that it clinks under foot, through equally hard, smooth pahoehoe or unbelievably rough aa lava, to the rich humus of the rain forest floor and finally to the bog swamps on the high plateaus of Maui, Oahu, and Kauai; and wind conditions varying from the northeast slopes which are constantly exposed to the trade winds to the stifled heads and pockets of valleys on the leeward sides of the islands.

Despite the great variety over the islands as a whole, there is a remarkable uniformity of conditions in any particular repeated ecological niche, so that identical physical conditions usually can be found in spots on each of the main islands.

BIOTIC CONDITIONS

On oceanic islands the general characteristics of the flora and fauna may be more important than the physical conditions in directing the course of evolution of specific groups. This is due to the depauperate biota of such regions, a condition which Gulick (1932) has termed "disharmonic" because entire groups of plants and animals may never have reached such remote shores. However, in the very old Hawaiian islands, plants and animals have had sufficient time to thoroughly occupy all available ecological niches, achieving a superficially harmonic condition. This is particularly true of plants, as animals may be scarce in some habitats such as fresh-water streams, soil or on many plants. Competition in some of these situations is reduced to a minimum, so that an immigrant insect suited to the local conditions may live and breed uninterruptedly and increase to the limit of its available food. That such an increase does not occur among endemic insects of the highlands, despite the absence of apparent enemies, indicates that decadence may come about under such conditions and result in so-called relic groups. It is not surprising, then, that new immigrants from highly competitive mainland areas, when accidentally or purposely introduced into oceanic islands by man, are found to displace the insular forms.

A tremendous biological upset has occurred in the lowlands of most oceanic islands. There is good reason to believe that in the Hawaiian islands the entire area from sea level to an altitude of approximately 2,000 feet was once covered with a rich, endemic, lowland forest. Today the region mainly supports cultivated crops and immigrant species which have run wild. This change was the result of accidental and deliberate introductions of plants by the Polynesians and white men, of fires and clearing operations, and of the introduction of domestic animals brought by them. The original flora has been wiped out almost completely, with only a few remaining patches of lowland forest which support the endemic fauna. These resistant natives may be relatively recent

immigrants in the sense of geologic time, as they belong to widespread genera which have not yet lost their ability to compete with foreign invaders.

CHARACTERISTICS OF THE BUGS

A few special characteristics of orsilline bugs make them particularly likely to succeed in island colonization.

ADAPTABILITY

Some members of the tribe Orsillini can flourish under almost any natural condition. *Oceanides* and *Neseis*, however, have lost much of the plasticity and adaptability which they probably had at one time, and are now restricted to narrow zonal and host ranges.

DISPERSAL

The presence of *Nysius* on most islands is mute evidence of their dispersability. This may be due in part to their volability, but probably should be attributed to the high ratio of surface area to body weight and to their ability to withstand the adverse conditions of wind transport. Even with ordinarily strong winds in Hawaii, Swezey (1939) and I have seen thousands of lowland *Nysius* congregating on high ridges, having been blown up and left stranded far from their accustomed food plants. Such flights of individuals are always composed of the dominant typical *Nysius*, the species of which occur commonly on several of the islands. Members of *Oceanides* and *Neseis*, on the other hand, stay close to their food plants and do not appear to be caught up by the winds. The only species of these endemic genera which occur on more than one island are *Oceanides nimbatus* Kirkaldy and *Neseis saundersianus* Kirkaldy, both very large and possibly the strongest fliers of the entire Hawaiian orsilline fauna.

HOST AND ISLAND SPECIFICITY

In contrast to the restriction of the species of *Oceanides* and *Neseis* to particular islands and host plants, species of *Nysius* are mostly widespread in the Hawaiian archipelago and occur on a small variety of introduced weeds or modern groups of endemics. Of greatest interest, however, is the intimate association between phylogenetic groups of *Neseis* and *Oceanides* and particular families or closely allied groups of plants. This results in geographical replacement due to the complete isolation of natural populations of the insects of separate islands of the archipelago. All stages in the process of divergence may be seen at the present time. Thus the various species in the endemic genera fall into a series, ranging from (1) the widespread and variable *Oceanides nimbatus*, not yet broken up into distinguishable forms on the various islands,

through (2) the scarcely differentiated *Neseis saundersianus*, to (3) the "polytypic species" (Huxley, 1938) or "Rassenkreis" (Rensch, 1929) *Neseis nitidus*, then to (4) the "supra-species" (Huxley, 1938) *Neseis hiloensis* (at least as regards the Molokai and Oahu forms), and finally to (5) that which Huxley (1938) has called a "geographical subgenus" and Rensch (1929) has called an "Artenkreis", namely the *Neseis mauiensis* and *fasciatus* group with allied species on the older islands.

EVOLUTION

The endemic genera *Neseis*, *Oceanides*, and *Glyptonysius* probably migrated down the long series of leeward islands before the main islands of the present day were built. They must have arrived not later than earliest Tertiary times as judged by mainland evolutionary rates, or perhaps later than this considering that evolution has taken place in the absence of severe competition. It is difficult to say whether a single stock similar to present-day *Nysius* arrived and evolved the very special and peculiar characteristics common to these genera, or whether one or more representatives of a then widespread type arrived and were subsequently replaced in mainland areas by the now dominant genus *Nysius*.

The early members of the *Neseis* stock doubtless preferred endemic plants of the family *Urticaceae* or later became restricted in great part to this group of plants. Similarly, the *Oceanides* stock became attached to rubiaceous and euphorbiaceous plants and a few others of this general type.

With insular isolation and marked host preferences the stage was set for speciation. A considerable mutation pressure was greatly increased in effectiveness by low environmental resistance. At the same time and opposed to mutation pressure, the effect of the scattering of variability during reproduction, with its tendency towards homozygosity (Dobzhansky, 1937; Wright, 1931, 1932) was avoided by the unusual degree of isolation. A gravid female blown to a neighboring island would build up an independent small population. Under such circumstances Wright has shown that particular genes will tend, merely by chance, to become either fixed or lost. This is in marked contrast to the equilibrium of variability maintained in very large populations.

Given a large number of isolated populations, so derived, there would follow mutations of varying magnitude which eventually must have included physiological isolating mechanisms, because we now find such species as *nitidus* and *hiloensis*, obviously monophyletic, coexisting and yet maintaining their distinctness. In this manner, island after island has been populated by the various types of *Neseis* and *Oceanides*. Secondarily, and apparently after the present islands of the main group were formed and isolated, certain of these species, notably *nitidus*, *hiloensis* and the *mauiensis-fasciatus* group, broke up. This

may have occurred either by the breakup of a single population which occurred on all of the islands, or by migration from island to island. The latter alternative appears more plausible, because *hiloensis* never reached Kauai, although it occurs in company with *nitidus* on each of the other islands. The species then proceeded to diverge, reaching varying degrees of differentiation, the extent of which cannot be determined without breeding experiments.

Typical *Nysius* is represented by more divergent species and greater variety of forms in Hawaii than in any other equivalent area. This cosmopolitan genus may have arrived at a later date than the endemic genera discussed above. It seems likely that its representatives arrived at different times or possibly at the same time from different mainland stocks, because the species vary in their characteristics from the unique *N. abnormis* to such typical species as *N. terrestris* and *N. nigriscutellatus* that differ from mainland species only in trivial details. They are found on native species of Compositae, Gramineae and Portulacaceae, the same groups of plants on which their congeners are found throughout the world. Each species must have built up enormously in numbers and acquired a greater range of variability through increased survival of mutant forms and partial isolation. Most of them remained as single species due to their inherent ability to travel from island to island. The entire archipelago from sea level to mountain tops was soon invaded, the various forms competing with both the decadent endemics and the introduced forms already inhabiting these regions. A few species of *Nysius* became localized on particular islands and plants, but most of them remained tolerant although showing marked host preferences. The most recent invader, *N. fullawayi*, is even now moving slowly down the leeward chain where it exhibits bewildering variation.

After the arrival of man, *Neseis* and *Oceanides* retreated from or died out in the lowlands, and are now making a last stand in the highlands, with many other relics. *Nysius*, however, are still sufficiently adaptable to thrive, having withstood all newcomers including the predatory ants. As their native plant hosts disappeared or were replaced by weeds in the lowlands, these bugs turned to new hosts, such as *Erigeron*, which are probably similar to the host plants in their original home.

The conclusion seems inevitable that geographical isolation or host isolation or both may be sufficient to set in operation the processes of species formation, while the biotic environment plays an all important role in determining the rate and limits of this evolution. A disharmonic insular area with great gaps in its environment allows many non-lethal mutations to persist, whereas a fiercely competitive mainland environment rigidly rejects all but the best adapted, thus favoring adaptive evolution by natural selection.

What is now needed is not so much general, or even special collecting of existing forms, as years of experimental work in breeding a well selected series of animals in the field.—PERKINS (1913).

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* Synonyms, homonyms, and misidentified names are italicized.



A



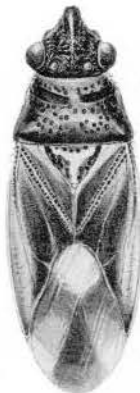
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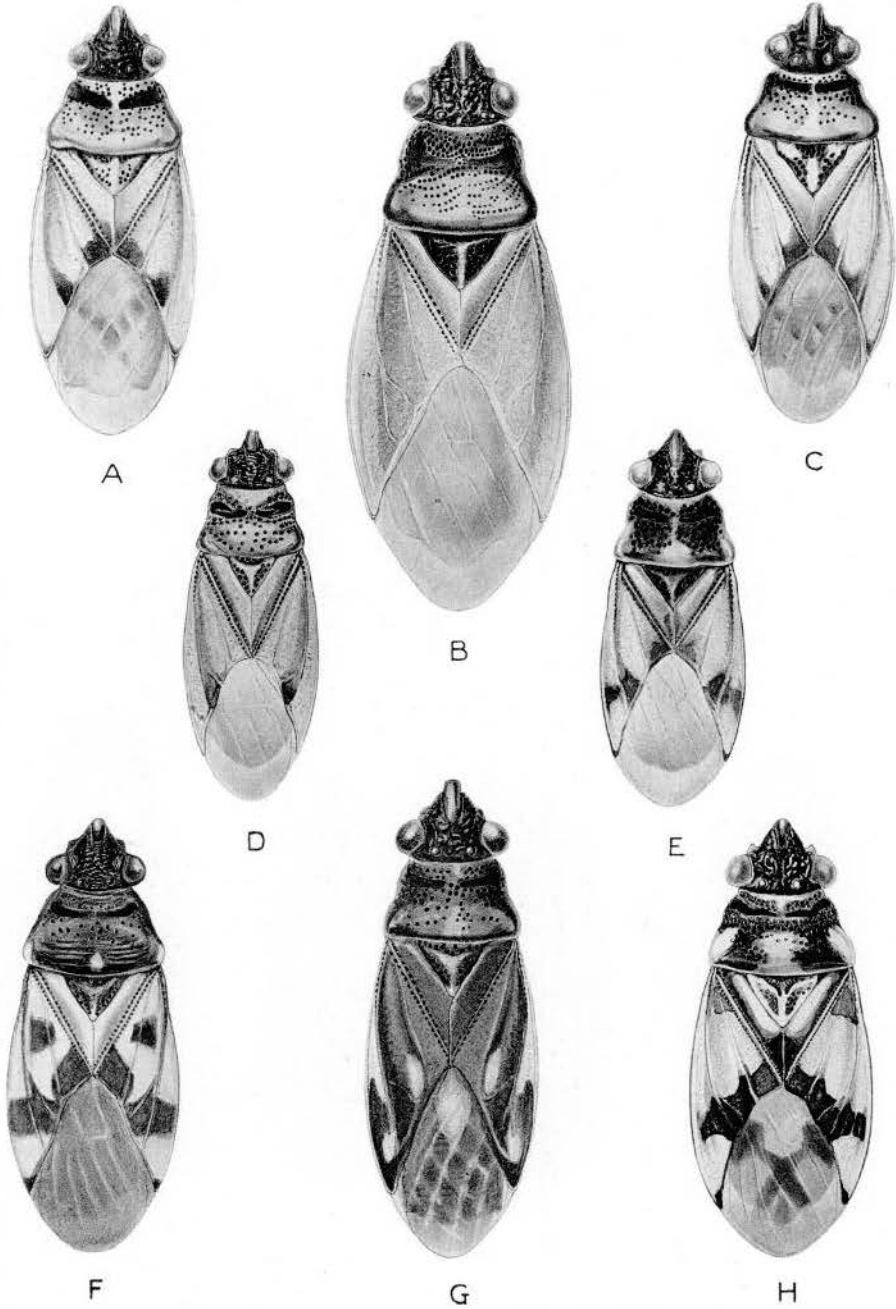


F



G

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A, *OCEANIDES BRYANI*, FEMALE PARATYPE; B, *O. DILATIPENNIS*, FEMALE PARATYPE; C, *O. ARBORICOLA*, FEMALE; D, *O. SINUATUS*, MALE HOLOTYPE; E, *O. RUGOSICEPS*, MALE HOLOTYPE; F, *O. ORESITROPHUS*, MALE HOLOLECTOTYPE; G, *O. ORIBASUS*, FEMALE; H, *O. PERKINSI*, FEMALE HOLOTYPE.



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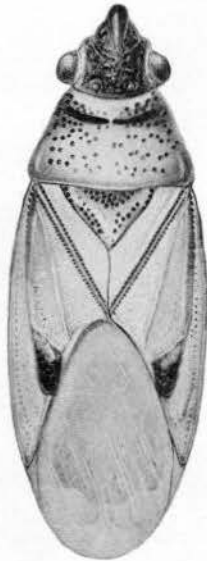
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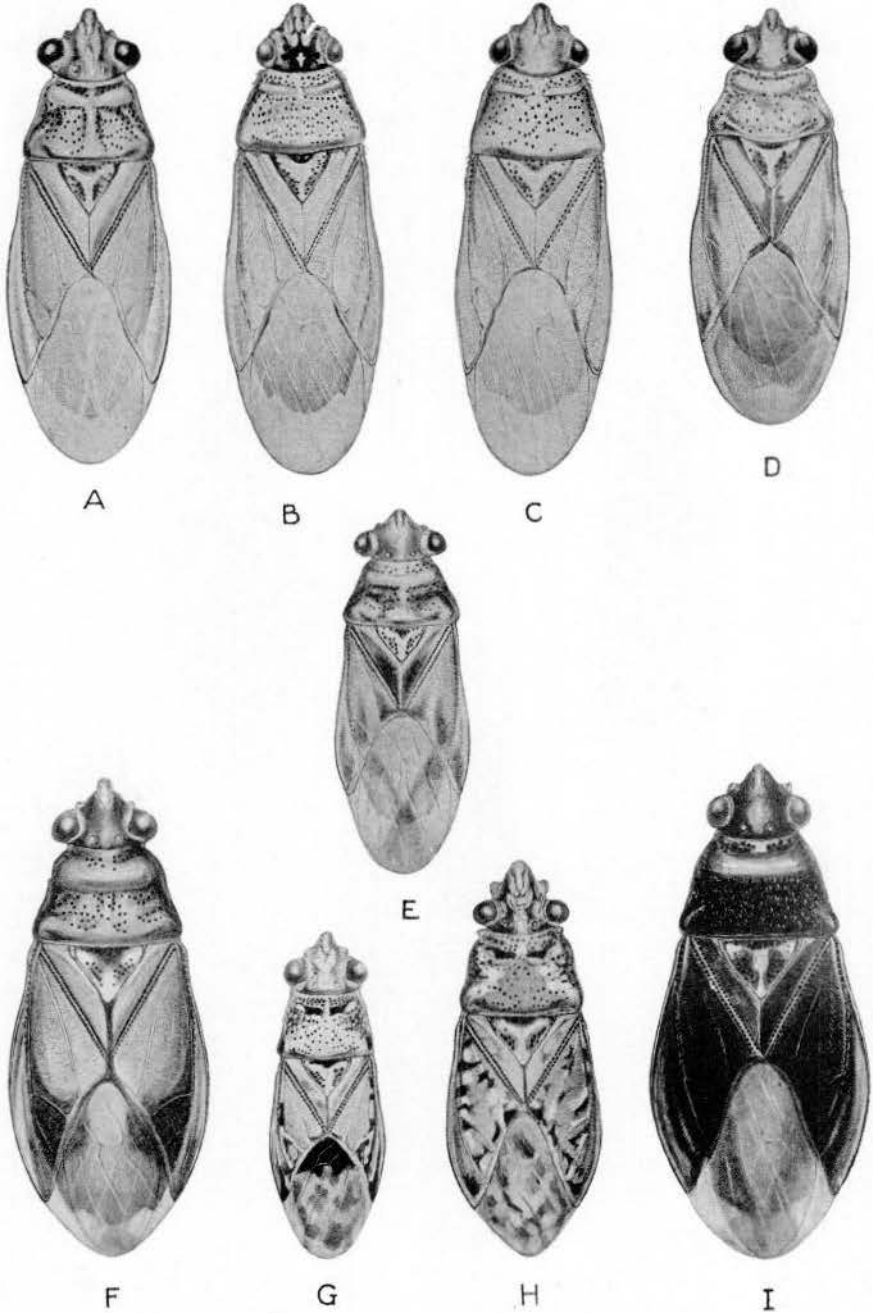


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H

A. *OCEANIDES FOSBERGI*, FEMALE PARATYPE; B. *O. BIMACULATUS*, MALE PARATYPE; C. *O. PARVULUS*, FEMALE ALLATYPE; D. *O. PLANICOLLIS*, MALE HOLOTYPE; E. *O. INCOGNITUS*, MALE HOLOTYPE; F. *O. MEMBRANACEUS*, FEMALE; G. *O. NIMBATU*, FEMALE; H. *O. DELICATUS*, FEMALE.



A. *NESEIS (NESEIS) KIRKALDYI*, MALE; B. *N. (ICTERONYSIUS) MACULICEPS*, FEMALE; C. *N. (ICTERONYSIUS) OCHRIASIS*, FEMALE; D. *N. (LEIONYSIUS) PALLIDUS*, MALE HOLOTYPE; E. *N. (LEIONYSIUS) HALEAKALAE*, MALE; F. *N. (PHYSONYSIUS) MOLOKAIENSIS*, MALE PARATYPE; G. *GLYPTONYSIUS HYLAEUS*, MALE; H. *G. LAEVIGATUS*, MALE HOLOTYPE; I. *NESEIS (PHYSONYSIUS) AMPLIATUS*, FEMALE PARATYPE.



A



B



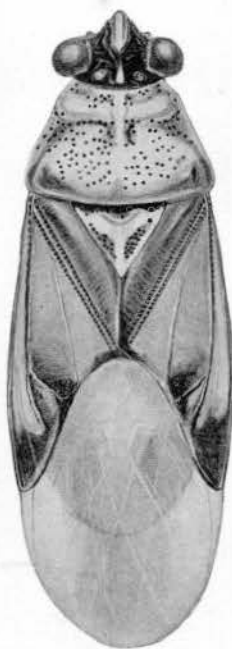
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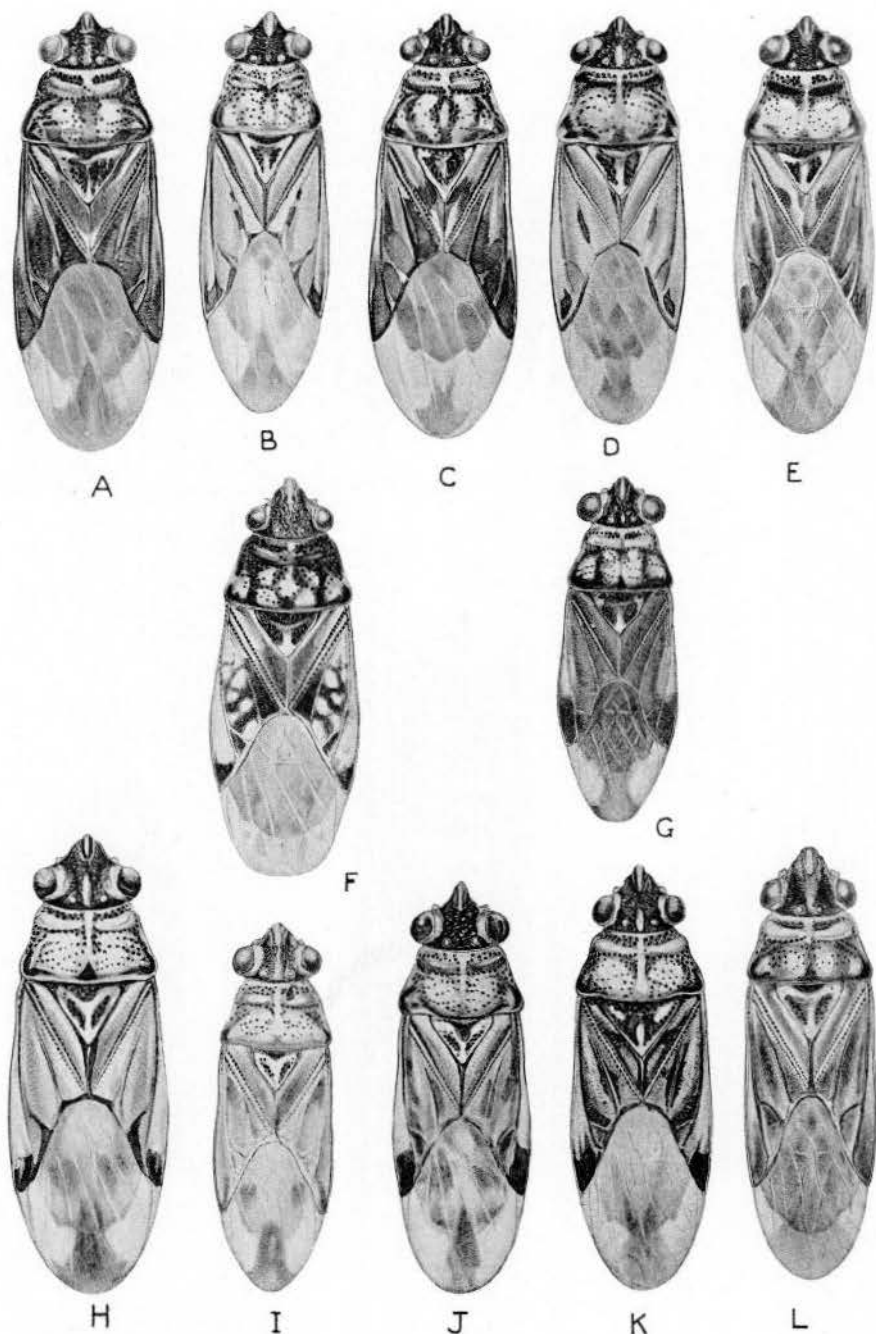


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G

A. *NESEIS (TRACHYNYSIUS) CRYPTUS*, FEMALE HOLOTYPE; B. *N. (TRACHYNYSIUS) FULGIDUS*, FEMALE PARATYPE; C. *N. (TRACHYNYSIUS) OAHUENSIS*, FEMALE PARATYPE; D. *N. (TRACHYNYSIUS) WHITEI*, FEMALE; E. *N. (TRACHYNYSIUS) CHINAI*, FEMALE PARATYPE; F. *N. (TRACHYNYSIUS) SAUNDERSIANUS*, MALE; G. *N. (TRACHYNYSIUS) SWEZEVI*, FEMALE.



A. *NESEIS (TRACHYNSISIUS) FASCIATUS*, FEMALE ALLOTYPE; B. *N. (TRACHYNSISIUS) FASCIATUS* VAR. *HYALINUS*, MALE HOLOTYPE; C. *N. (TRACHYNSISIUS) FASCIATUS* CONVERGENS, FEMALE ALLOTYPE; D. *N. (TRACHYNSISIUS) MAUIENSIS* VAR. *PALLIDIPENNIS*, MALE HOLOTYPE; E. *N. (TRACHYNSISIUS) MAUIENSIS*, FEMALE; F. *N. (TRACHYNSISIUS) ALTERNATUS*, FEMALE HOLOTYPE; G. *N. (TRACHYNSISIUS) SILVESTRIS*, MALE; H. *N. (TRACHYNSISIUS) HILOENSIS* APPROXIMATUS, FEMALE ALLOTYPE; I. *N. (TRACHYNSISIUS) HILOENSIS* HILOENSIS, MALE; J. *N. (TRACHYNSISIUS) HILOENSIS* INTERMEDIUS, MALE PARATYPE; K. *N. (TRACHYNSISIUS) HILOENSIS* INTEROCULATUS, FEMALE HOLOTYPE; L. *N. (TRACHYNSISIUS) HILOENSIS* JUGATUS, FEMALE.



A



B



C



D



E



F



G

A. *NESEIS (TRACHYNYSIUS) NITIDUS COMITANS*, FEMALE; B. *N. (TRACHYNYSIUS) NITIDUS CONTUBERNALIS*, MALE; C. *N. (TRACHYNYSIUS) NITIDUS CONSUMMATUS*, MALE HOLOTYPE; D. *N. (TRACHYNYSIUS) NITIDUS IMPRESSICOLLIS*, FEMALE PARATYPE; E. *N. (TRACHYNYSIUS) NITIDUS INSULICOLA*, MALE ALLOLECTOTYPE; F. *N. (TRACHYNYSIUS) NITIDUS PIPTURI*, FEMALE; G. *N. (TRACHYNYSIUS) NITIDUS NITIDUS*, MALE.



A



B



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D



E

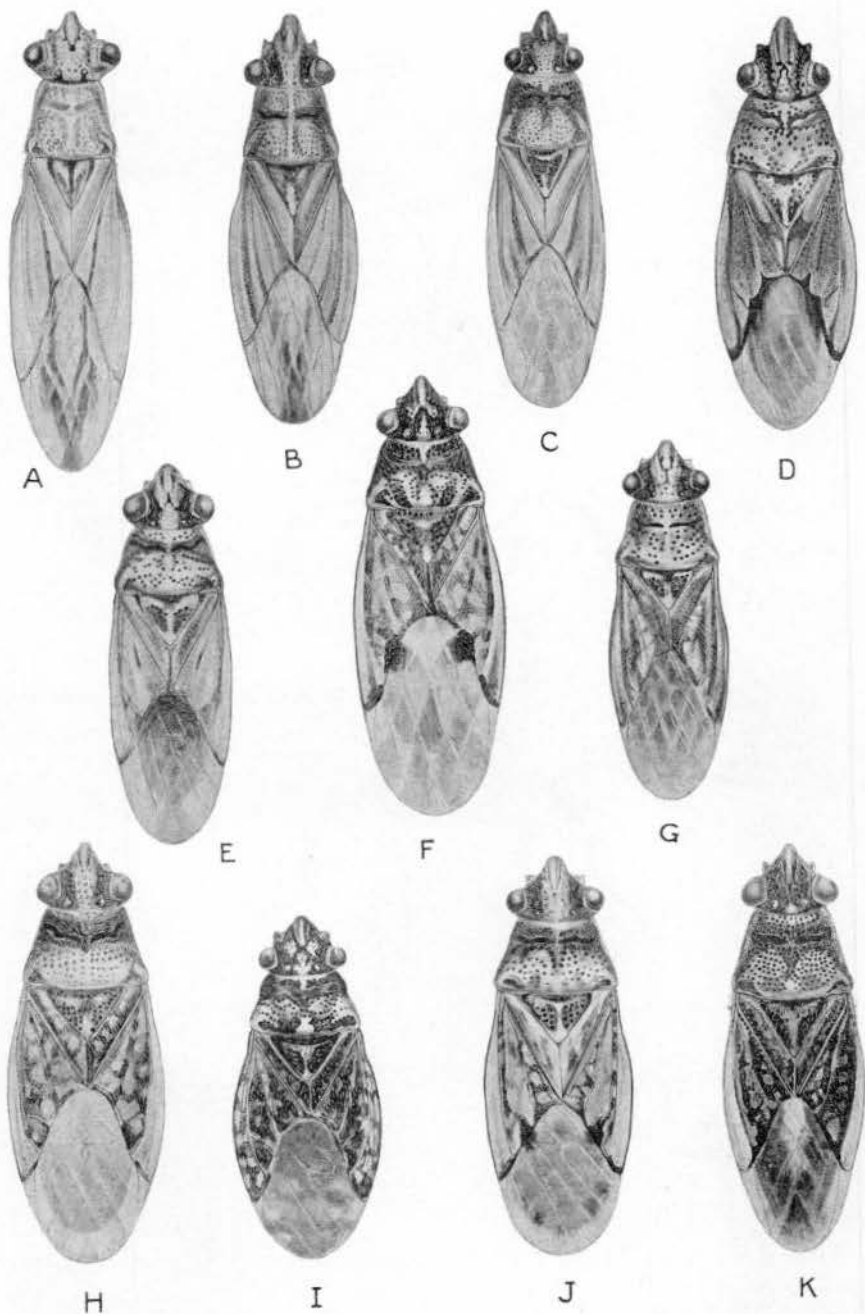


F

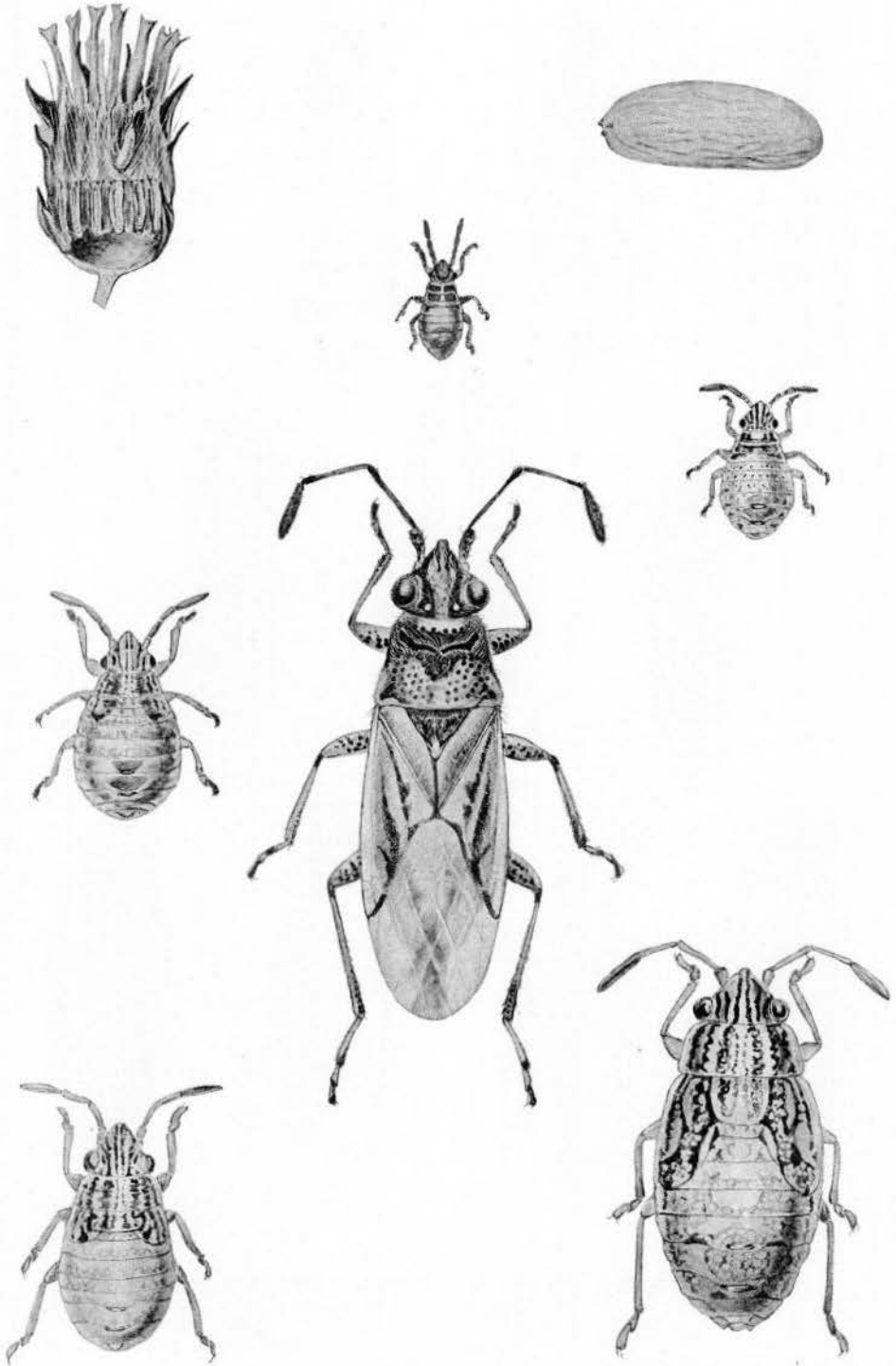


G

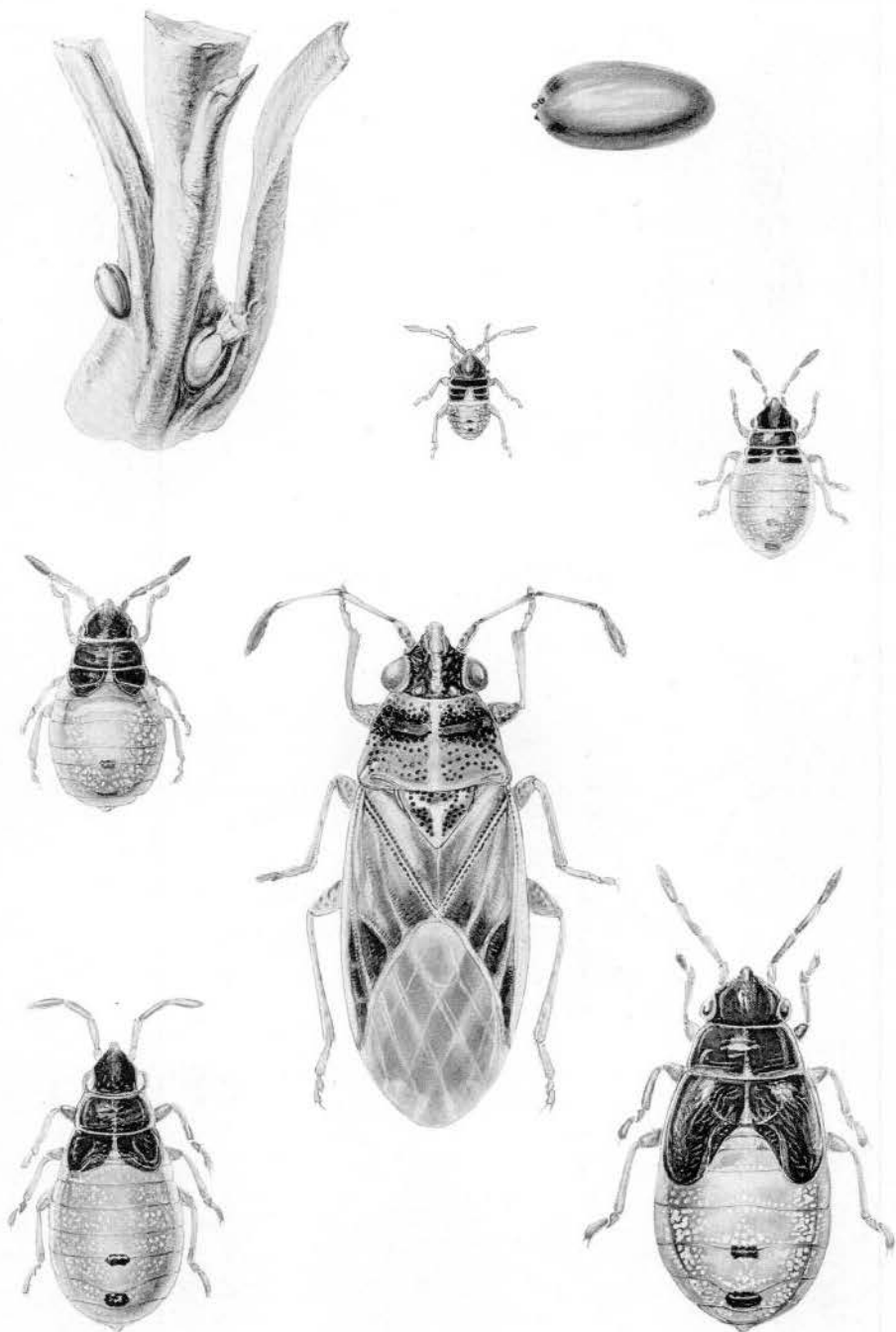
A. *NYSIUS COMMUNIS*, FEMALE; B. *N. DELECTULUS*, FEMALE ALLOTYPE; C. *N. DELECTUS*, FEMALE; D. *N. COENOSULUS*, MALE; E. *N. MIXTUS*, FEMALE; F. *N. DALLASI*, FEMALE; G. *N. NIGRISCUTELLATUS*, FEMALE.



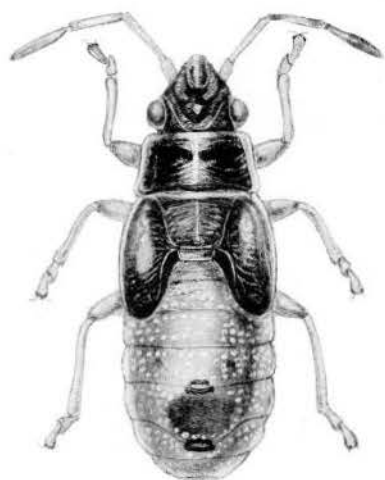
A, *NESOMARTIS PSAMMOPHILA*, FEMALE; B, *NYSIUS SUBLITTORALIS*, MALE; C, *N. LONGICOLLIS*, MALE; D, *N. ABNORMIS*, MALE HOLOTYPE; E, *N. FULLAWAYI*, MALE; F, *N. NEMORIVAGUS*, FEMALE; G, *N. FULLAWAYI INFUSCATUS*, MALE HOLOTYPE; H, *N. RUBESCENS*, FEMALE; I, *N. BLACKBURNI*, FEMALE; J, *N. TERRESTRIS*, FEMALE; K, *N. FUCATUS*, MALE HOLOTYPE.



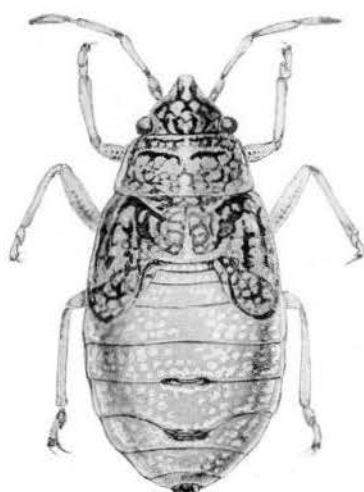
NYSIUS COENOSULUS: EGG IN PLACE IN A FLOWER HEAD OF *ERIGERON CANADENSIS*;
EGG GREATLY ENLARGED; FIVE SUCCESSIVE NYMPHAL INSTARS; ADULT, MALE.



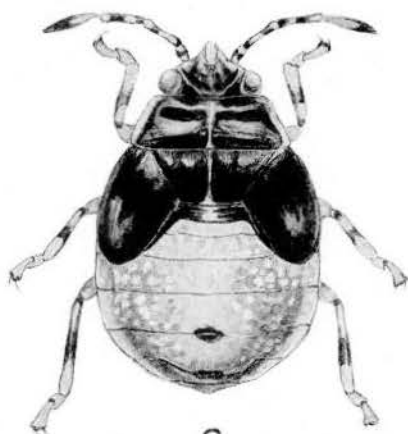
OCEANIDES NUBICOLA: EGGS IN PLACE ON STEM OF *MYOPORUM SANDWICENSE*; EGG GREATLY ENLARGED; FIVE SUCCESSIVE NYMPHAL INSTARS; ADULT, FEMALE.



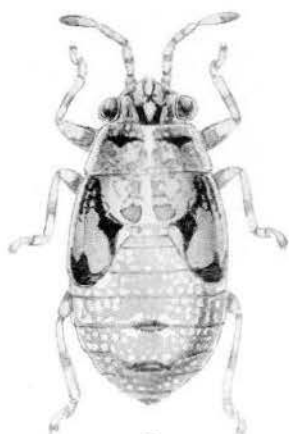
A



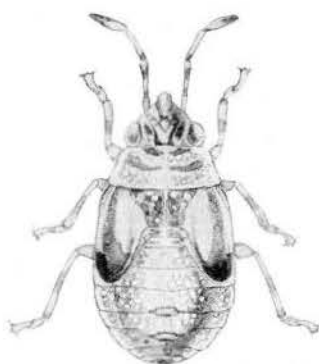
B



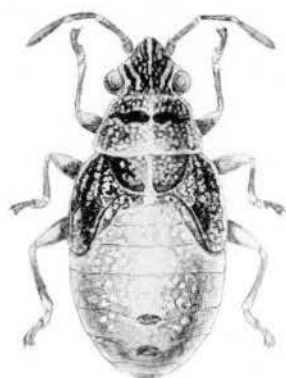
C



D



E



F

LAST NYMPHAL INSTARS: A, *OCEANIDES NIMBATUS*; B, *NEZEIS (ICTERONYSIUS) MACULICEPS*; C, *N. (PHYSONYSIUS) MOLOKAIENSIS*; D, *N. (TRACHYNYSIUS) FASCIATUS*; E, *N. (TRACHYNYSIUS) FULGIDUS*; F, *NYSIUS RUBESCENS*.