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**The Isopod Crustacea of the Hawaiian Islands**  
**(Chelifera and Valvifera)**

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INTRODUCTION

This article is the first of a series which will constitute a monograph on the Isopoda of the Hawaiian islands. All six superfamilies or tribes (five marine and one terrestrial) of this order of Crustacea are represented here. The present paper deals with the Hawaiian representatives of two marine subfamilies, the Chelifera (Tanaioidea) and the Valvifera (Idotheoidea).

The isopod Crustacea have been a rather neglected element in the fauna of the Hawaiian islands. Reports on the more or less incidental and incomplete collections of isopods made by some of the early exploring expeditions which collected for a time in this vicinity make up most of the small amount of literature on this group. The terrestrial isopods of Polynesia in general are much better known than the marine isopods which have scarcely been investigated. A probable reason for the neglect of the marine isopods is the fact that most of them are quite small and inconspicuous in the reef algae and coral formations which makes their collection and identification difficult. It should not be surprising, therefore, that eight of the nine species here reported are new, that there are three new genera, and that this is a new locality record for the single known species.

The nine species herein described belong to nine genera, a fact which makes them fairly easy to recognize and to key. Future collections, especially more extensive collections from islands other

than Oahu (the source of most of our material), will undoubtedly uncover additional species.

I am indebted to Professor C. H. Edmondson of the University of Hawaii and Zoologist at Bernice P. Bishop Museum for a representative collection of isopods from Hawaii. I am also grateful to Bishop Museum for use of the facilities there. Thanks are also due Commander G. T. Finlay, commander of the Honolulu Coast Guard District, and Mr. F. A. Edgecomb, Superintendent of Lighthouses in the Coast Guard Service, for permission to make a recent trip to the islands of Molokai and Maui on the tender *Kukui*. Collections made on this trip include most of the species herein described and thereby greatly extend their known ranges.

The holotypes of all new species herein described are deposited in Bishop Museum.

The illustrations in this paper are camera lucida drawings.

#### KEY TO THE SUPERFAMILIES OF HAWAIIAN ISOPODS

(Adapted from Richardson, 1905)

1. First pair of legs chelate. Uropods terminal.....**Chelifera (Tanaioidea)**.
- 1a. First pair of legs without chelae. Uropods terminal or lateral.....2.
2. Uropods lateral .....3.
- 2a. Uropods terminal .....4.
3. Uropods visible dorsally, with flattened branches forming with telson a caudal fan .....**Flabellifera (Cymothoidea)**.
- 3a. Uropods not visible dorsally, modified to form large opercular plates hinged laterally and covering the pleopods.....**Valvifera (Idotheoidea)**.
4. Aquatic forms. Pleopoda branchial.....5.
- 4a. Terrestrial forms. Pleopoda adapted for air breathing, sometimes provided with tracheal trees.....**Oniscoidea**.
5. Free living. Symmetrical. Abdominal appendages usually covered by opercular plates formed by an anterior pair of pleopods.....**Asellota (Aselloidea)**.
- 5a. Ectoparasites on Crustacea. Females usually asymmetrical. Pleopods never covered by operculum.....**Bopyroidea (Epicaridea)**.

#### SUPERFAMILY CHELIFERA (TANAIOIDEA)

Richardson (11)<sup>1</sup> gives the following description:

Head fused with the first and sometimes with the second segment of the thorax to form a carapace. Branchial cavity on each side of carapace. The following five or six segments of thorax distinctly defined with epimera small or inconspicuous.

<sup>1</sup> Numbers in parentheses refer to Literature Cited, p. 321.

Uropods terminal, consisting of a short basal segment and one or two filamentary branches. First pair of legs terminate in a cheliform hand. Abdomen generally composed of six segments, usually distinct. First pair of antennae furnished with one or two flagella. First maxillae have a backward directed palp, situated in the posterior part of the carapace. Maxillipeds have a four-jointed palp, and a large backward directed branchial epignath, which passes into the branchial cavity. Pleopoda when present natatory.

There are two records of this superfamily in the Hawaiian islands: Richardson (10) refers to a mutilated specimen, *Apseudes* sp?, collected by the *Albatross* expedition off the south coast of Molokai; and Edmondson (3) states that the genera *Tanais* and *Leptochelia* occur here, but no species is identified. We have found eight species belonging to eight genera in the superfamily on the reefs around Oahu and there are possibly several more species around Oahu and the other islands. Three of the eight genera and seven of the eight species are new, and this is a new locality record for the single known species. That this group should have been overlooked is not surprising when we consider that none of the specimens exceeds 5 mm. in length and the fact that they are so well concealed.

Both families of the superfamily, Tanaidae and Apseudidae, are represented here. The major characters of the families are incorporated in the following key to the Hawaiian species of the superfamily Chelifera.

#### KEY TO THE HAWAIIAN CHELIFERA

1. Superior (first) pair of antennae with a single flagellum, never double. Second pair of legs slender. Body not attenuated behind. (Family Tanaidae) .....2.
- 1a. Superior pair of antennae with a double multiarticulate flagellum. Second pair of legs distally flattened. Body attenuated behind. (Family Apseudidae) .....4.
2. Five pairs of pleopoda present. Last three segments of abdomen not abruptly narrower than first three.....*Leptochelia dubia* (Krøyer).
- 2a. Three pairs of pleopoda present. Last segments of abdomen abruptly narrower than first three. (Genus *Tanais*, sensu lat.).....3.
3. Abdomen composed of six segments. No transverse band of setae on dorsal side of first and second abdominal segments.....*Anatanais insularis*, n. sp.
- 3a. Abdomen composed of five segments. Transverse band of setae on first and second abdominal segment.....*Tanais vanis*, n. sp.
4. Four or five pairs of pleopoda present.....5.
- 4a. Pleopoda absent (or one rudimentary pair present).....6.
5. Five pairs of pleopods present. Telson longer than broad.....*Apseudes tropicalis*, n. sp.



Abdomen about one-fifth length of body, composed of six segments. Terminal segment rounded, slightly produced in a terminal obtuse point. Five pairs of biramous pleopods with flattened branches fringed with long, finely plumose

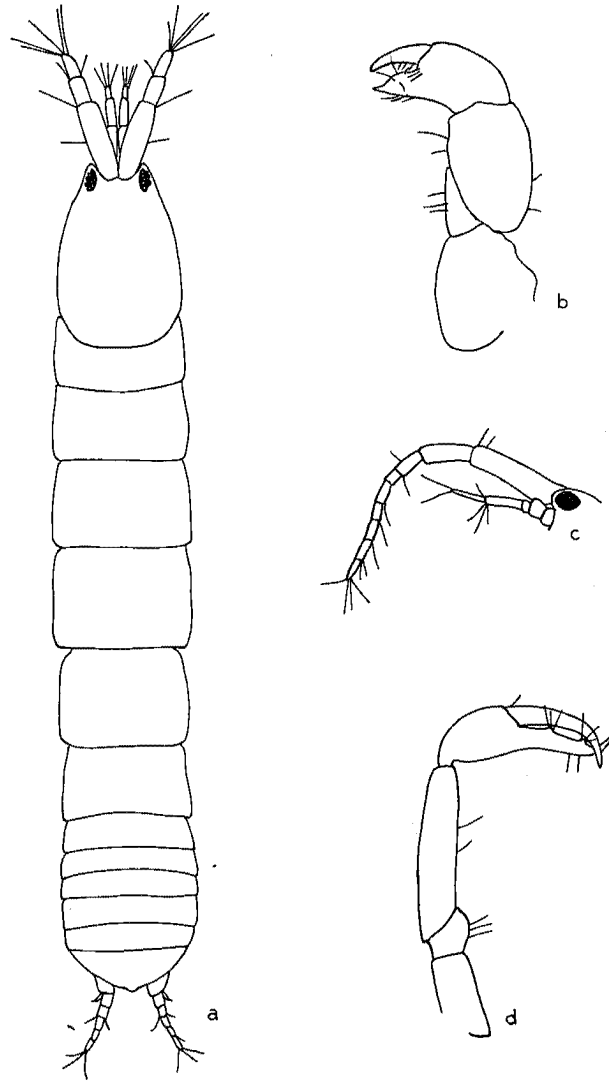


FIGURE 1.—*Leptocheilia dubia* (Krøyer): *a*, female, dorsal view; *b*, cheliped of female; *c*, antennae and anterior part of head of male, lateral view; *d*, cheliped of male.

setae. Uropoda biramous, less than half as long as abdomen. Endopodite with five articles, exopodite composed of an inconspicuous short article shorter than first article of inner branch.

The males differ from the females in three major features: (1) the flagellum of the first antenna is not rudimentary but is composed of six articles, (2) the eyes are twice as large as those of the female and (3) the cheliped is much more elongate and slender, especially the carpus and the fingers of the chela are quite different being longer, more recurved at the tip with the immovable finger bearing two tubercles on the inner margin.

Oahu: Waikiki, Sept. 8, 1932, C. H. Edmondson; Sept. 9, 1938 and July 31, 1939, M. A. Miller. Kawela Bay, July 23, 1938 and July 26, 1939, Miller. Kaneohe Bay, Aug. 25, 1938, Miller. Hanauma Bay, Aug. 25, 1938, Miller. Halona, Sept. 12, 1938, Miller and A. H. Banner.

Maui: Hawea Point, Feb. 7, 1940, Miller. Hanamanioa, Feb. 8, 1940, Miller. Hana, Feb. 9, 1940, Miller.

*Leptocheilia dubia* is hardly distinguishable from *L. savignyi* (Krøyer), a species widely distributed along the Atlantic coasts and in the Mediterranean. According to Richardson (11), the only distinguishable difference is in the number of articles in the inner branch (endopodite) of the uropod, *L. savignyi* having six articles while *L. dubia* has five.

This is the first published report (to my knowledge) of this common species in the Pacific. *L. dubia* has previously been reported from Brazil, Bermuda, and Porto Rico (Richardson, 11); from Jamaica (Richardson, 12); from Ireland (Tattersall, 18); and from the Red Sea (Monod, 5). It probably has a wide distribution in the Pacific.

The presence of a single-jointed exopodite of the uropod places *L. dubia* with the majority of the species in the genus and separates it from *L. lifuensis*, reported by Stebbing (13) from the Loyalty Islands, and from *L. minuta* which was described from the "Feejees" by Dana in 1853 and which has since been reported from the Loyalty Islands and from the Red Sea by Stebbing (13, 15). The exopod of *L. lifuensis* is two-jointed, that of *L. minuta* is two- or three-jointed.

The only other species of the genus in Polynesia is *L. erythraea* (Kossmann) which has been reported from the Paumotu (Tuamotu) Islands (Nierstrasz, 6). It also occurs in the Red Sea.

Genus TANAIS, sensu lat. (*Tanais* Audouin and Milne Edwards 1829, and *Anatanais* Nordenstam 1930)

Richardson (11) gives the following description:

Eyes present and well-developed. Abdomen composed of five or six segments. Only three pairs of pleopoda present, all fully developed. Uropods simple, single branched. Incubatory pouch formed of two lamellae issuing from the base of the fifth pair of legs. Mandibles strong with molar expansion well developed.

Nordenstam (8a), in 1930, established the subgenus *Anatanais* for the species of *Tanais* having six abdominal segments. The next year Dudich (Stephensen, 17), apparently without knowledge of Nordenstam's paper, established the genus *Hexapleomera* for the same group of species. In 1936, Stephensen (17) elevated Nordenstam's subgenus *Anatanais* to generic rank placing *Hexapleomera* in synonymy with it, thus: *Anatanais* Nordenstam, 1930 (= *Hexapleomera* Dudich, 1931). Stephensen accordingly transfers fourteen species of *Tanais* to *Anatanais* leaving eight in the old genus *Tanais*, s. str. (with five segments in the metasome). Four species of *Tanais* were unassigned because they were so incompletely described that they could not be placed.

***Anatanais insularis*, new species (fig. 2).**

Holotype female. Body narrow, elongate, 2.2 mm. by 0.5 mm. Color white with dorsal surface marked by black transverse bands and spots formed by dense aggregates of melanophores. Considerable individual variation in these markings is encountered but usually a broad transverse band covers front quarter of head and narrower bands extend across posterior parts of first two abdominal segments. Transverse bands and/or lateral spots generally found on all thoracic segments except the first.

Carapace slightly longer than wide. Head with well developed ocular lobes containing small composite eyes. Frontal margin slightly produced in a bluntly triangulate process. Lateral sides of carapace slightly swollen posteriorly. First and second antennae about equal in length, the first with three articles while the second has four. Both antennae possess an apical tubercle bearing a tuft of setae and representing a rudimentary flagellum. Basal article of first antenna stout and slightly longer than distal two articles combined. Second segment of second antenna about one-third as long as the basal article which is the longest, third and fourth articles subsequent and each about two-thirds as long as basal article. Mandible as usual in the genus without palp, with stout molar process, with blunt incisive tooth and blunt bidentate lacinia mobilis. Apex of first maxilla with six spines. Maxilliped with palp of four articles, the first inconspicuous and short, the second and third fairly broad and the fourth narrow.

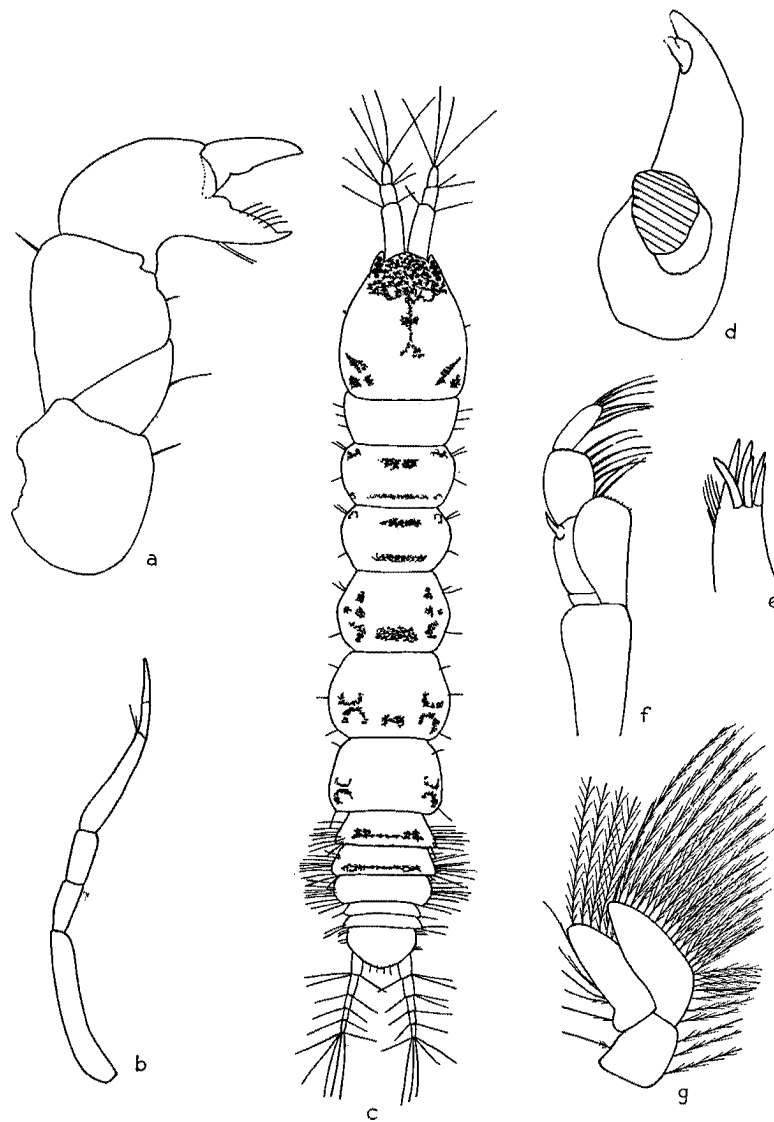


FIGURE 2.—*Tanais insularis*, n. sp.: *a*, cheliped; *b*, second leg; *c*, female, dorsal view; *d*, mandible; *e*, distal end of first maxilla; *f*, maxilliped; *g*, first pleopod.



First free segment of thorax shorter than the rest and usually not pigmented. Last three segments longer than second and third which are subequal. Cheliped stout compared to rest of thoracic appendages which are slender. Last three legs differ from preceding three in that the basal segment is more dilate and the claw is much more uncinat. Very few spines on legs.

Abdomen composed of six segments, the first three being almost as wide as the thorax. Lateral margins of first three segments fringed with long setae. Last three segments of abdomen abruptly narrower than first three. Terminal segment rounded posteriorly with a very small terminal notch sometimes evident in larger specimens. Uropods composed of five articles, a basal segment with a single four-jointed branch. Distal ends of all articles provided with two or three long setae, the terminal segment with an apical tuft.

Oahu: Waikiki (type locality), 1925, Edmondson; Sept. 9, 1938, Miller. Kawela Bay, July 23, 1938 and July 26, 1939, Miller. Hanauma Bay, Aug. 25, 1938, Miller. Halona, Sept. 12, 1938, Miller and Banner.

Maui: Hawea Point, Feb. 7, 1940, Miller. Hana, Feb. 9, 1940, Miller.

Hawaii: Kailua, Dec. 28, 1930, Edmondson.

There is little to distinguish this common species from *Anatanais gracilis* (Heller) (4) described from St. Paul Island in the Indian Ocean and later reported from the Gulf of Manaar by Stebbing (14) who gives additional figures and comments. Comparing our specimens with these descriptions, however, we observe the following differences. The pleotelson in our specimens does not narrow gradually as reported for *A. gracilis* but narrows abruptly at the fourth segment. The basal segment of the uropod is not thick and triangulate as described and figured in *A. gracilis* but is cylindrical and not much thicker than the segments which follow. The carpus of the second leg is slightly narrower and more elongate in *A. insularis* than in *A. gracilis*. There are also slight differences in the mouthparts, notably in the apices of the mandibles. These differences coupled with the vast distance separating the known localities of these forms warrants their segregation as separate species.

*A. insularis* and *A. gracilis* are quite similar to *Anatanais normani* (Richardson) (11) from California, the chief difference being that in *A. normani* the uropod has a branch of five articles while in *A. gracilis* and in *A. insularis* the branch of the uropod is composed of four articles.

***Tanais vanis*, new species (fig. 3).**

Body elongate, rectilinear, about five times longer than wide. Holotype female, 3.0 mm. by 0.6 mm. Color white with transverse black bands or irregular black spots marking dorsal surface.

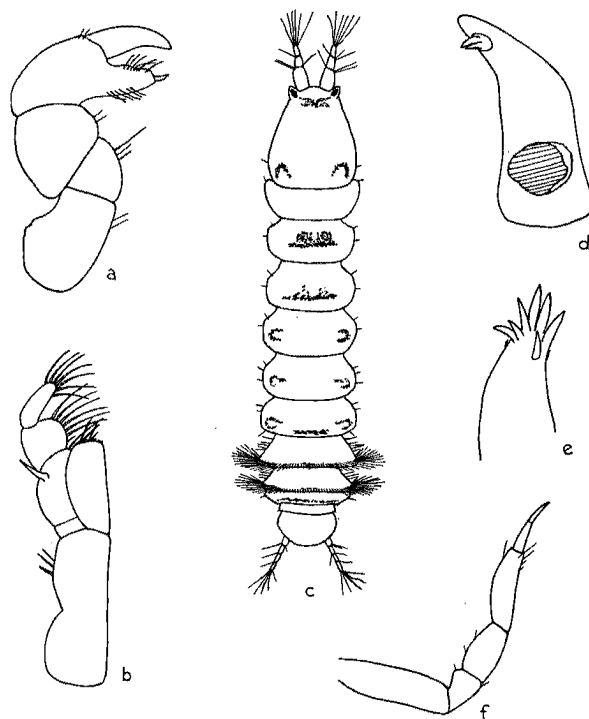


FIGURE 3.—*Tanais vanis*, n. sp.: a, cheliped; b, maxilliped; c, female, dorsal view; d, mandible; e, distal end of first maxilla; f, second leg.

Carapace (head and first thoracic segment fused) slightly longer than wide. From its posterior and widest part, the carapace tapers gradually toward the anterior end which is half the width of the posterior end. Frontal margin of head obtusely triangulate. Ocular lobes extend horn-like from anterolateral angles of head and contain distinct black compound eyes. An irregular black band extends transversely across front of head between the bases of the ocular lobes. Posterolateral parts of carapace marked by U-shaped black patterns. Basal article of first antenna as long as distal two articles together. A distal tubercle bearing a tuft of setae represents the flagellum. Second antenna slightly shorter and narrower than first antenna and composed of four articles plus a distal tubercle bearing a tuft of setae which represents the flagellum. Basal article of second antenna the longest, second article one-third the length of the

first, third article twice as long as second and fourth article with the apical tubercle as long as the third. Mandible without palp, with strong molar process and double-toothed lacinia. Distal end of maxilla provided with seven spines. Maxilliped has a palp of four articles, but the basal article is difficult to distinguish.

First free thoracic segment shorter than the posterior five which are subequal. Anterolateral parts of first thoracic segment produced forward around the base of the carapace. Sides of last five thoracic segments rounded and incised at the articulations between segments giving lateral margins of thorax a scalloped effect. Chelipeds very stout, fingers of chela subequal in length and breadth of base. Second leg narrow, ambulatory. Posterior three thoracic legs not markedly different from preceding three.

Abdomen composed of five segments, the posterior two abruptly narrower than the anterior three which are as wide as the thorax. A dense, erect, transverse band of long setae fringes the posterior margins of the first and second abdominal segments. The third abdominal segment is about half the length of the first or second. The fourth segment is a narrow band. The terminal segment is broadly rounded, roughly semicircular. Three pairs of biramous ciliated pleopods are present on the first three abdominal segments. Uropods composed of four articles, a basal segment and a single triarticulate branch.

Oahu: Waikiki (type locality), Sept. 9, 1938 and July 31, 1939, Miller. Kawela Bay, July 26, 1939, Miller.

Molokai: Laau Point, Feb. 14, 1940, Miller.

The general distribution and character of the black markings on the dorsal surfaces of *Anatanais insularis* and *Tanais vanis* are quite similar and their mouthparts, chelipeds, and antennae differ only in the finer details. Nevertheless, *T. vanis* can easily be distinguished from *Anatanais insularis* by its two conspicuous setiferous bands on the abdomen and by the more fundamental character that its pleotelson is composed of five instead of six segments. *Tanais stanfordi* Richardson (9) from Clipperton Island and *T. seurati* Nobili (7) from the Tuamotu Islands are the only previously known species of *Tanais* in Polynesia. Stephensen (17) after going "through the literature cited in the Zoological Record," lists *T. seurati* with the species of *Anatanais* indicating that this species has six abdominal segments although Nobili (7) in his diagnosis mentions only five, "trois premiers segments avec des poils marginaux, deux derniers segments plus courts." Nierstasz (6), however, does not list *T. seurati* in his list of species with five abdominal segments. The omission (which might be an oversight) indicates that the species has six abdominal segments. For the present we shall consider this species as incor-

rectly removed from *Tanais*, s. str. *T. stanfordi* has three (or four?) articles in the uropod counting the basal segment, *T. seurati* has six and *T. vanis* has four.

Four other tanaid species to my knowledge display transverse setiferous bands, so conspicuous a feature in *T. vanis*. *T. cavolinii* Milne Edwards, an Atlantic and Mediterranean species, and *T. gallardoii* Giambiagi, a fresh-water Argentine species, possess the transverse setiferous bands. A figure in Stephensen's paper (17) shows a transverse row of setae across the dorso-lateral parts of the first three abdominal segments but each band is interrupted middorsally by a wide gap devoid of setae. Nordenstam (8a) states that *Anatanais novae-zealandiae* (Thomson) is "characterized by its well-marked ciliated bands on the first three abdominal segments."

#### APSEUDIDAE

Richardson (11) gives the following description:

Body attenuated behind. First pair of antennae with two unequal multi-articulate flagella. Second pair of antennae usually furnished with a scale at the end of the second article of the peduncle. Mandibles with palp. Anterior maxillae with two masticatory lobes. Posterior maxillae well developed and setose. Epignath of maxillipeds large, laminar, branchial in character. Two anterior pairs of legs usually provided at the base with minute, two-jointed exopods. Second pair of legs fossorial in character. Uropoda double-branched; branches multiarticulate.

#### Genus APSEUDES Leach

Richardson (11) gives the following description:

Second antennae with a scale articulated to the end of the second article. Exopods present on both pairs of gnathopods. Five pairs of pleopoda present, in which the branches are uniarticulate. First pair of legs in male larger than in female. First pair of antennae usually alike in the two sexes.

#### ***Apseudes tropicalis*, new species (fig. 4).**

Holotype female, length 2.1 mm., width at first thoracic segment 0.4 mm. Color light brown to white.

Head and first thoracic segment fused to form carapace, small lateral projections and a groove extending inward from them on each side marking the line of fusion. Carapace slightly longer than wide. Frontal margin of head produced to form a bluntly triangular rostrum. Ocular lobes moderate, eyes small, each composed of about five ocelli.

Superior antennae with basal joint of peduncle twice as long as second

and third joints which are subequal. Primary flagellum with six, secondary flagellum with three articles. Inferior antennae with flagellum of five articles extending to origin of flagella of upper antennae. Scale about equal in length to basal joint of flagellum, with three or four setae.

Mandible with palp of three articles. Apex of mandible terminates in a quadridentate incisive process subtended by a large lacinia mobilis bearing rod-like processes. Molar plate prominent. Inner plate of first maxilla with four spines, outer plate with seven spines. Maxilliped with a large palp of four articles.

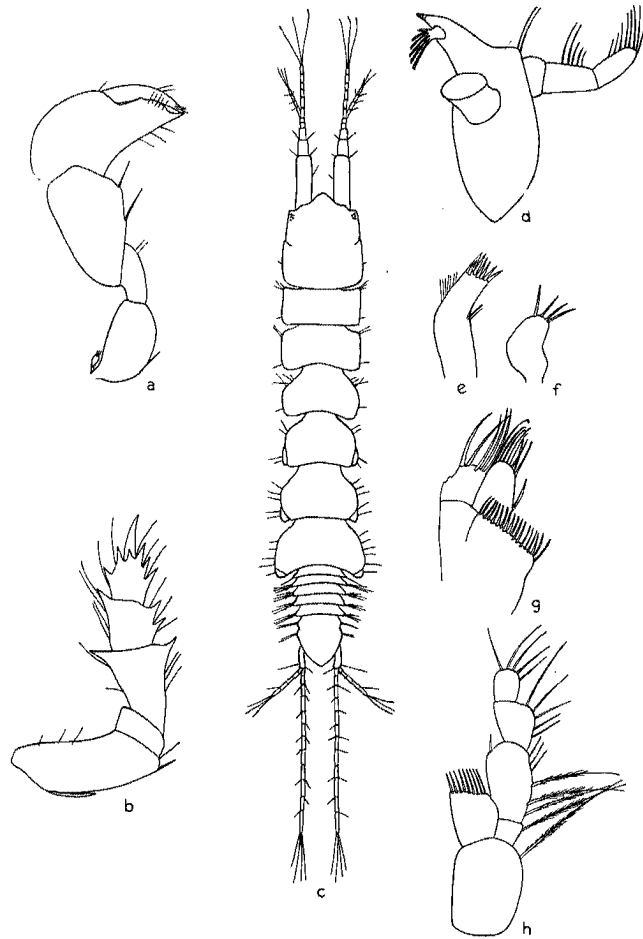


FIGURE 4.—*Aapseudes tropicalis*, n. sp.: a, cheliped; b, second leg; c, female, dorsal view; d, mandible; e, distal end of outer lamina of first maxilla; f, distal end of inner lamina of first maxilla; g, second maxilla; h, maxilliped.

Sides of thorax nearly parallel. First two free thoracic segments subequal, the remainder increasing in length from front to rear. Epimera visible dorsally only on last three thoracic segments. Margins of each thoracic segment provided with three to six spines.

First gnathopod with a broad hand. Movable finger (dactylus) of chela simple. Immobile finger with tubercle or tooth in middle of inner margin followed by a convexity bearing spines and ending sharply in a triangular projection which crosses in closing with tip of dactylus. Carpus expanded distally, armed with two long spines with plumose bases. At the base of the first gnathopod is an inconspicuous ovoid exopod which bears four spines at its apex.

Second gnathopod with distal articles flattened and expanded, and bearing prominent spinous processes, two on merus, three on carpus, five on the propodus. There is a slender exopod at the base of this appendage.

Abdomen abruptly narrower than thorax, composed of six segments the last of which is equal in length to the preceding five. The first five segments are subequal with triangular lateral plates bearing tufts of plumose setae. The last segment is longer than wide, bears two small projections on each side and terminates in a bluntly triangular process. Five pairs of ciliated, biramous pleopods are present. Uropods slender, with endopodite of twelve and exopodite of five articles, each branch ending in a tuft of bristles.

Oahu: Waikiki (type locality), Jan. 1932, Edmondson; Sept. 9, 1938, Miller.

It is probable that the mutilated "*Aapseudes* sp.?" of Richardson (10) taken off the coast of Molokai belongs to this new species. The nearest and only known Polynesian neighbors to this species belonging to the same genus are *A. seurati* Nobili and *A. rikiteanus* Nobili (7) from the Tuamotu Islands. *A. tropicalis* can easily be distinguished from *A. seurati* by the absence of a sharply pointed rostrum. Less obvious characters separate it from *A. rikiteanus*. Between *A. tropicalis* and *A. rikiteanus*, however, are noted the following differences:

<i>A. tropicalis</i>	<i>A. rikiteanus</i>
Rostrum extends one-third the length of first article of peduncle of upper antenna.	Rostrum extends one-half the length of first article of peduncle of superior antenna.
Thoracic segments provided with spines.	Segments of thorax not provided with spines.
Last segment of abdomen triangulate.	Last segment of abdomen rounded.
First article of peduncle of superior antenna more than three times as long as wide.	First article of peduncle of upper antenna a little more than twice as long as wide.
Primary flagellum with 6 articles, secondary with 3.	Primary flagellum with 7 articles, secondary with 5.

Genus *PARAPSEUDES* Sars

Richardson (11) gives the following description:

Exopods present on both pairs of gnathopods. Only four pairs of pleopoda present, with one of the branches two-jointed. Second pair of antennae with a scale articulated to the end of the second article.

*Parapseudes neglectus*, new species (fig. 5).

Holotype female, 2.3 mm. in length, 0.6 mm. wide at first thoracic segment. Body gradually tapers from carapace to telson. Color in alcohol light brown, almost white, with no black markings. Margins of body except head equipped with numerous long setae. Appendages, especially antennae and uropods also abundantly provided with hairs.

Sides of carapace slightly arcuate. Frontal margin of head broadly produced in a bluntly rounded process slightly constricted at the base. Ocular lobes distinct with small compound eyes each composed of about eight ocelli. First antenna with double flagellum, each branch composed of five articles with those of the inner branch slightly shorter. Second antenna extends to point of origin of flagella of first antenna and bears a scale articulated at distal end of second article.

Mandible with a three-jointed palp, tridentate incisive process subtended by a blunt lacinia bearing four rod-like setae, and a stout molar process. Inner lamina of first maxilla bears four plumose spines at the apex, distal end of outer lamina with six spines. Second maxilla with the usual three setiferous lobes. Maxilliped with a palp of four articles, the second and third of which are very broad.

First free thoracic segments rectangular, the remainder with posterolateral angles successively more and more produced posterolaterally. Epimera visible dorsally on last four thoracic segments. Cheliped moderately developed. Inside distal margin of immovable finger with a tooth-like projection and a row of short bristles. Merus, carpus, and propodus of second leg flattened. Carpus and propodus provided on inner margin with four and seven stout spines, respectively. Inner margin of all except the basal segment with long bristles. Outer distal margin of merus and carpus with a single long spine, that of the propodus with two spines. Dactylus slender with a single claw. A very inconspicuous two-jointed exopodite articulates at base of second leg.

Abdomen composed of six segments, narrower than thorax but not abruptly so. Telson as long as three preceding abdominal segments and bluntly rounded at apex. Lateral margins of first five abdominal segments produced posterolaterally in triangulate processes from each of which one or two bristles emerge. Four pairs of biramous pleopods present thickly furnished with long plumose setae. Uropods biramous, the exopodite with three articles, the endopodite multiarticulate, variable in length, in some specimens half as long as body.

Oahu: Kahala, Jan. 1930, Edmondson. Kawela Bay (type locality), July 24, 1938 and July 26, 1939, Miller. Hanauma Bay, Aug. 25, 1938, Miller.

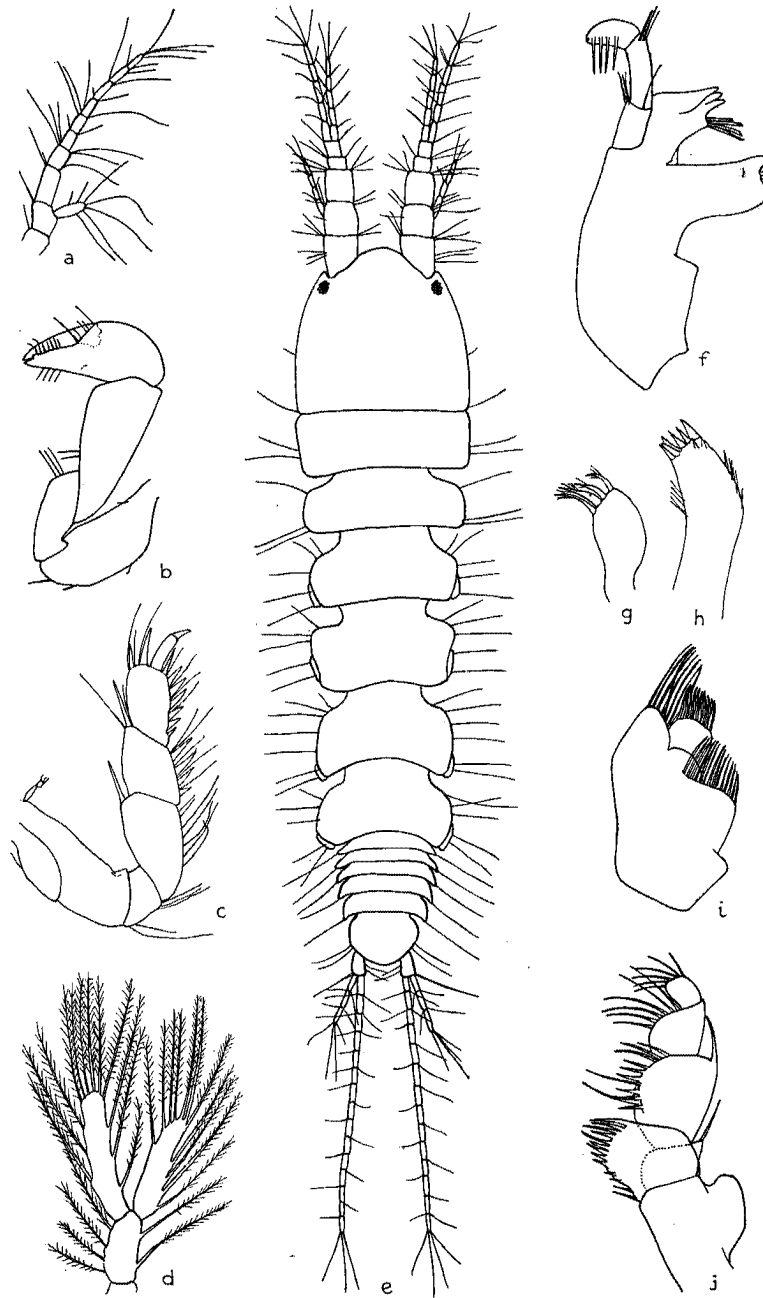


FIGURE 5.—*Parapseudes neglectus*, n. sp.: a, second antenna; b, cheliped; c, second leg; d, first pleopod; e, female, dorsal view; f, mandible; g, distal end of inner lamina of first maxilla; h, distal end of outer lamina of first maxilla; i, second maxilla; j, maxilliped.



Molokai: Laau Point, Feb. 14, 1940, Miller.

Mau: Hanamanoa, Feb. 8, 1940, Miller.

Hawaii: Kailua, Dec. 28, 1930, Edmondson.

The long bristles and hairs on the body and appendages of this species often collect large accumulations of debris which aid in concealing the specimens. After collection considerable time is usually spent in cleaning off the specimens to expose identification characters. Hairiness is not unique in this genus since Stebbing (16) describes such a species of *Parapseudes* from the Indian Ocean under the name *P. hirsutus*.

The most obvious of the several differences between *Parapseudes neglectus* and *P. hirsutus* is the fact that the rostrum bears a sharp point and the telson is triangularly produced in *P. hirsutus*, while in *P. neglectus* both the rostrum and apex of the telson are bluntly rounded.

#### Genus SYNAPSEUDES new genus

Body only slightly attenuated posteriorly. First thoracic segment fused to head to form carapace. Abdomen composed of only three segments. Flagellum of first antenna with two rudimentary branches. Second antennae rudimentary. Eyes present. No exopodite on first two pairs of legs. Pleopoda absent. Uropods biramous but with branches greatly reduced.

#### *Synapseudes minutus*, new species (fig. 6).

Holotype female, 1.2 mm. by 0.3 mm. Color light brown with carapace black in type and most specimens.

Head rectangular with front produced into a rectangular rostrum terminating anteriorly in a rectangular or squarish process. Ocular lobes absent. Small black eyes on anterolateral part of head. Three peduncular joints of first antenna stout, the basal joint as long as the second and third combined. Flagellum of first antenna composed of two rudimentary branches, the outer branch with three small articles while the inner has four, the branches being so closely adjoined that the double nature of the flagellum is difficult to detect. Second antenna rudimentary, composed of three small narrow articles extending about one-third the length of the basal article of the first antenna. No flagellum on second antenna, its place being taken by a long bristle attached to the end of the terminal article. Mandible with a narrow, three-jointed palp, a well-developed molar process and a single incisive tooth beneath which is a bluntly triangulate lacinia mobilis subtended by a brush of setae. Maxilliped with palp of four articles.

First and last free thoracic segments shorter than the others which are subequal. Sides of thorax roughly parallel. Postero-lateral angles of last three thoracic segments slightly produced posteriorly. Chelipeds with subequal fingers tipped with black. In male specimens one cheliped (sometimes

the right, sometimes the left) may be enlarged and over half the length of the body. Second thoracic leg with ischium, merus and carpus flattened and spinous at distal ends. No exopodite on first and second thoracic legs.

Abdomen not abruptly narrower than thorax but tapers gradually. Apex of terminal segment produced in a blunt rounded process. Pleopoda absent. Uropods short and biramous, the inner branch with two short articles, the outer branch with one.

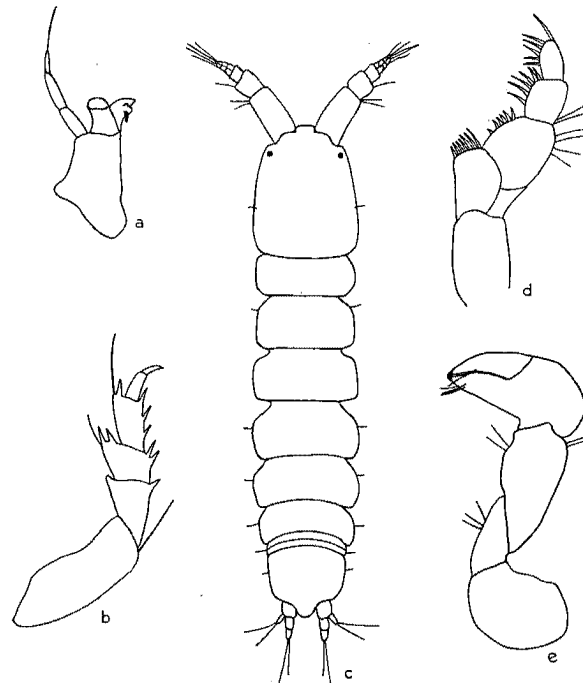


FIGURE 6.—*Synapseudes minutus*, n. gen., n. sp.: a, mandible; b, second leg; c, female, dorsal view; d, maxilliped; e, cheliped.

Oahu: Waikiki (type locality), 1925, Edmondson; Sept. 9, 1938, Miller. Kawela Bay, July 23, 1938, Miller.

Mau: Hawea Point, Feb. 7, 1940, Miller. Hanamanioa, Feb. 8, 1940, Miller.

Reduction seems to involve many of the major features of this new apseudid: reduction in body size, reduction of the flagellum of the first antenna to two rudimentary branches, marked reduction of the second antenna with elimination of its flagellum, reduction of the

uropods, elimination of the pleopoda and reduction of the number of segments in the pleotelson to three. This is the first case in the family Apseudidae in which the number of pleotelson segments is less than six. This is also the first case of complete absence of pleopoda in this family, but the same condition is reported in the two new genera next described in this paper. All these reductions in *Synapseudes minutus* may be associated with its very small size.

#### Genus **HODOMETRICA** new genus

Basal joint of first antenna longer than carapace with a large spinous process on outer distal end. Double flagellum well developed. Rudimentary scale on second antenna. Body markedly attenuated posteriorly. Eyes absent. Abdomen abruptly narrower than thorax, composed of five narrow sub-cylindrical segments and a roundly triangular terminal segment. Pleopods absent. Exopods present on first two pairs of legs. Outer branch of uropod short.

#### **Hodometrica proliza**, new species (fig. 7).

Holotype female. Body long, narrow, attenuated posteriorly, 2.6 mm. in length and 0.5 mm. wide at first thoracic segment. Color light brown to white.

Front of head broad, slightly produced in a bluntly rounded process. Anterolateral lobes small, pointed. Eyes absent. Point of fusion of head and first thoracic segment to form carapace indicated by lateral indentations. Antennae widely inserted. Basal joint of first or superior antenna longer than carapace with a spinous process on its outer distal end. Second article of peduncle hardly longer than spine of basal article. Third article of peduncle about twice as long as second. Double flagellum of first antenna with ten articles in long branch, six articles in shorter branch. Second antenna does not extend to tip of basal peduncular segment of first antenna, composed of a four-jointed peduncle and a flagellum of three articles. A minute scale articulates at end of basal segment.

Mandible with a large three-jointed palp and a long molar process provided with a rasp-like grinding edge. Incisive process of mandible with four small blunt teeth. Lacinia mobilis with four teeth and subtended by four rod-like setae. Inner endite of first maxilla with five plumose setae at apex, outer endite with seven spines at apex. Second maxillae composed of three setiferous lobes. Maxilliped bears a broad five-jointed palp the basal article of which is barely discernible.

Fourth and fifth free thoracic segments much longer than the others. Thorax tapers posteriorly. Lateral margins of thorax, head, and abdomen provided with a few short setae. Two types of chelipeds present indicating a possible sexual difference although one specimen possesses both types. The commoner type of cheliped is more slender with long carpus and equal fingers. The other type is stouter with a much shorter carpus, a very broad hand and unequal fingers, the thumb being short and stout and the movable finger being longer with a blunt tubercle on the middle of its inner margin.

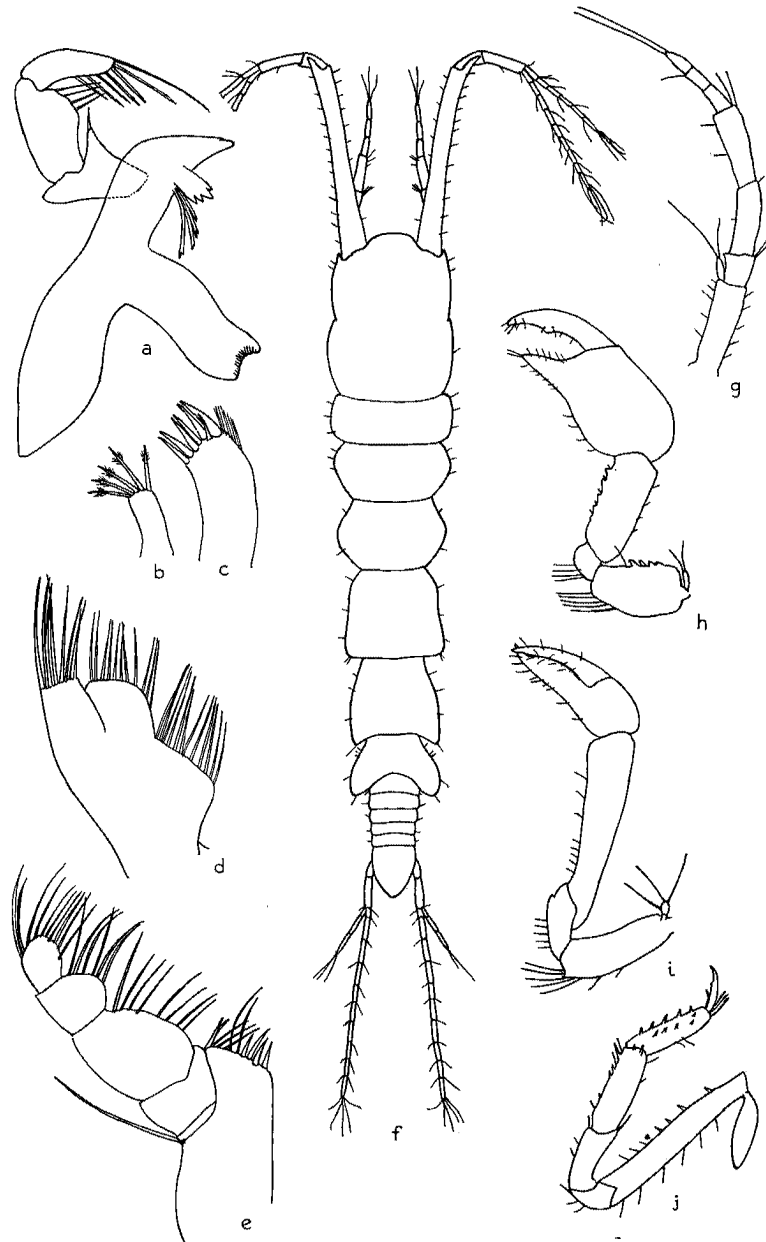


FIGURE 7.—*Hodometrica proluxa*, n. gen., n. sp.: a, mandible; b, distal end of inner lamina of first maxilla; c, distal end of outer lamina of first maxilla; d, second maxilla; e, maxilliped, distal end; f, female, dorsal view; g, second antenna; h, cheliped, stout type; i, cheliped, attenuated type; j, second leg.

Abdomen abruptly narrower than thorax, subcylindrical, composed of six segments. First five segments small, ring-like, without pleopods. Terminal segment slightly wider than preceding segments, produced posteriorly in a roundly triangular process. Uropods composed of a two-jointed basal part and two branches, the outer short with three articles, the inner branch long with ten articles.

Oahu: Hanauma Bay (type locality), Dec. 26, 1929, Edmondson.

*Hodometrica* is the fourth blind genus in the family Apseudidae and is the only eyeless member of the superfamily Chelifera found in local waters. The other three blind apseudid genera, *Typhlapseudes*, *Sphyrapus* and *Leiopus*, have been dredged from deep water, the records ranging from 450 to 1,450 fathoms. *Hodometrica* was collected in shore waters, but it may occur in deeper waters as well.

#### Genus APSEUDOMORPHA new genus

Body attenuated posteriorly. First thoracic segment fused to head to form carapace. Abdomen reduced but composed of six segments. Flagellum of first antenna with two subrudimentary branches. Rudimentary scale articulated to second article of second antenna. Eyes present. No exopodite on first two pairs of legs. Pleopoda absent except for a rudimentary first pair in the male.

#### *Apseudomorpha oahuensis*, new species (fig. 8).

Holotype female, 1.8 mm. in length and 0.4 mm. in width at first thoracic segment. Color white with two rectangular black patches on posterodorsal sides of carapace and usually irregular black markings on dorsal side of third and sixth free thoracic segments. Colors faded in preserved specimens.

Head roughly rectangular with front broadly produced in a roundly triangular rostrum ending anteriorly in a median blunt tubercle. Lateral to this tubercle the frontal margin bears two microscopic crenulations. Ocular lobes fairly well-developed with small black eyes. Flagellum of first antenna composed of two short branches, the inner branch with two articles, the outer with three. Second antenna extends to tip of second article of peduncle of first antenna and bears a small scale attached to its second article. Mandible with a three-jointed palp, a broad molar plate and an apical tooth subtended by a blunt lacinia mobilis bearing four rod-like setae.

The six free thoracic segments gradually taper posteriorly with their posterolateral angles more and more produced posteriorly in bluntly rounded processes. In some specimens the chelipeds are greatly dilated, especially the basis, carpus and propodus, and the immovable finger is shorter than the movable finger and twice as broad at the base. In other specimens the cheliped is more attenuated, especially the carpus, and the fingers are subequal in length and thickness. One specimen shows chelipeds intermediate between these two extremes. Second leg distally flattened and spinous. Inner margin of merus, carpus and propodus of second leg armed with one, two and four

spines, respectively. Outer margin of merus, carpus and propodus of second leg armed with one, one and two spines, respectively.

Abdomen short, abruptly narrower than thorax. Articulations between first five segments somewhat indistinct. Lateral margins of second to fifth abdominal segments produced posterolaterally in triangular processes tipped with one or two bristles. Posterior margin of terminal segment produced in a triangular process tilted up at the apex. Pleopods absent except for a rudimentary first pair in male. Uropods biramous with basal article composed of two articles, outer branch with a single article and inner branch with four articles. Both branches with an apical tuft of setae.

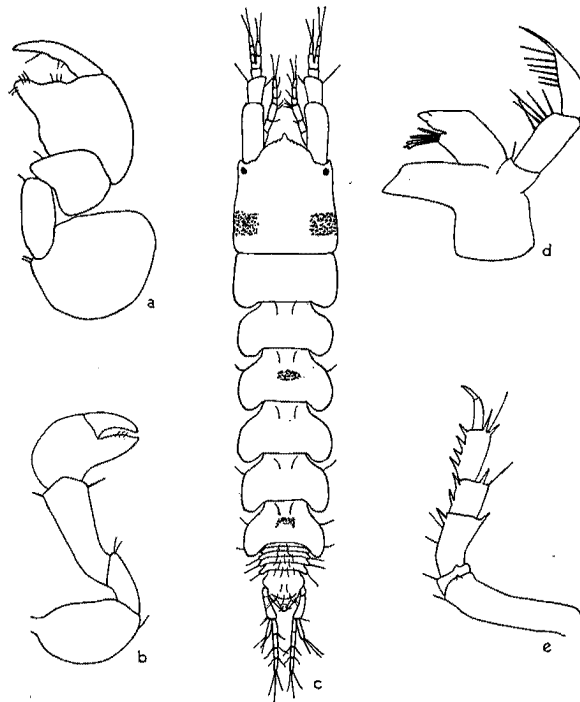


FIGURE 8.—*Apsedomorpha oahuensis*, n. gen. and n. sp.: a, cheliped, stout type; b, cheliped, attenuated type; c, female, dorsal view; d, mandible; e, second leg.

Oahu: Hanauma Bay (type locality), Aug. 25, 1938, Miller. Waikiki, Sept. 9, 1938, Miller. Kawela Bay, July 24, 1939, Miller. Halona, Sept. 12, 1938, Miller and Banner.

*Apsedomorpha* is the third and last new genus of the family Apsedeutidae described in this paper. All three new genera show

marked reduction of the pleotelson, though in different ways, and concomitant absence of pleopoda. In the other two genera of the family represented here, namely *Apseudes* and *Parapseudes*, there are five and four pairs of pleopoda, respectively. In *Dalapseudes*, a California genus, there are only three pairs of pleopoda and in *Pagurapseudes* there are five (?) pairs of rudimentary pleopods. In the three new genera described herein, *Synapseudes*, *Hodometrica* and *Apseudomorpha*, the pleopoda are absent except in the males of the last named genus in which there is a rudimentary first pair. Thus, the Hawaiian genera of the Apseudidae complete the series of pleopod diminution in this family with both extremes of the series here represented.

The following species of the superfamily Tanaioidea are now known from Polynesia:

#### Tanaidae

- Leptochelia dubia* (Krøyer). Hawaiian islands.
- Anatanais insularis*, n. sp. Hawaiian islands.
- Tanais vanis*, n. sp. Hawaiian islands.
- Leptochelia lifuensis* Stebbing. Loyalty, Pine, Fiji, Gambier (Mangareva) Islands.
- Leptochelia minuta* Dana. Fiji, Loyalty Islands.
- Leptochelia erythraea* (Kossman). Tuamotu Islands.
- Tanais seurati* Nobili. Tuamotu Islands.
- Tanais stanfordi* Richardson. Clipperton Island.

#### Apseudidae

- Apseudes tropicalis*, n. sp. Hawaiian islands.
- Parapseudes neglectus*, n. sp. Hawaiian islands.
- Synapseudes minutus*, n. gen., n. sp. Hawaiian islands.
- Hodometrica prolixa*, n. gen., n. sp. Hawaiian islands.
- Apseudomorpha oahuensis*, n. gen., n. sp. Hawaiian islands.
- Apseudes rikiteanus* Nobili. Tuamotu Islands.
- Apseudes seurati* Nobili. Tuamotu Islands.

#### SUPERFAMILY VALVIFERA (IDOTHEOIDEA)

Richardson (11) gives the following description:

Uropods lateral, valve-like, ventrally placed, closing over the five pairs of branchial pleopods being attached on the outer margins to the sides of the terminal segment and opening and closing like folding doors. Legs of first pair not cheliform.

The only reference in the literature to this entire superfamily in the Hawaiian islands is made by Edmondson (3) who mentions a local *Idothea* species, specimens of which were observed to be 5 mm. in length and which is "brown like the seaweed among which it lives." This species, herein described as a new species of the genus *Colidotea*, seems to be the only local representative of this superfamily, at least on the reefs about Oahu. Presumably, the lack of extensive areas of soft or noncalcareous seaweed on our reefs has limited the development of the family Idotheidae here.

#### IDOTHEIDAE

Richardson (11) gives this description:

Body more or less broad, depressed. Abdomen with some or all of the segments fused to form the large terminal segment. Legs usually nearly alike and ambulatory, but first three pairs sometimes pronouncedly subcheliform in structure.

#### Genus COLIDOTEA Richardson

Richardson (11) writes:

Flagellum of second pair of antennae multi-articulate. Epimera of the four anterior thoracic segments coalesced and firmly united with the segments. Abdomen consisting of a single segment, with a suture line on either side at the base indicating another partly coalesced segment. Maxilliped with the palp composed of four articles.

#### *Colidotea edmondsoni*, new species (fig. 9).

Body elongate, slightly ovate, four times longer than wide: Holotype female 7 mm. by 1.75 mm. Color variable but usually brown. In one specimen, the head is dark reddish brown while the body is light brown. In another, the central dorsal part of the head is white while the rest of the body is medium brown. One specimen is black with white legs and antennae. Colors fade in preserved specimens.

Head two-thirds as long as wide, bearing dorsally a conical, rostral elevation with a bituberculate apex bent forward toward anterior margin of head. Frontal margin concave, anterolateral angles prominent, slightly obtuse. Eyes small, rounded, laterally situated. First antenna with basal article dilate, distal article clavate, its tip reaching the middle of the third article of peduncle of second antenna. Second antenna about half the length of body, with a flagellum of two, three, four or five articles, depending on the age of the specimen.

Mandibles stout with broad molar expansion, no palp, three teeth on incisive process and three teeth on lacinia mobilis. First maxillae with three plumose setae on inner endite, six stout spines on outer. Second maxillae with



the inner distal article bearing plumose setae, the outer two distal articles with ctenate setae. Maxillipeds with palp of four articles, the distal one broadly ovate, the proximal article inconspicuous.

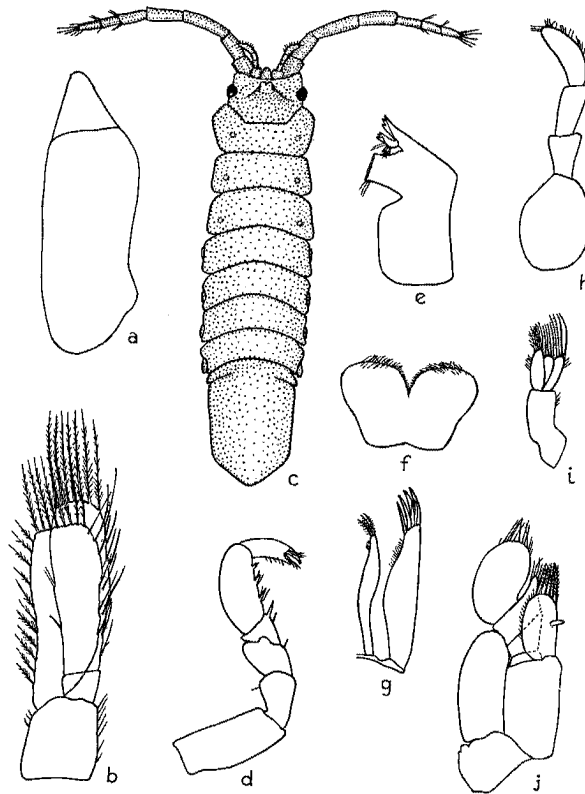


FIGURE 9.—*Colidotea edmondsoni*, n. sp.: a, first pleopod; b, second pleopod; c, female, dorsal view; d, first leg; e, mandible; f, lower lip; g, first maxilla; h, first antenna; i, second maxilla; j, maxilliped.

Thorax with lateral margin slightly arcuate, epimera distinct only on the last four segments. First segment of thorax with anterolateral parts produced anteriorly to surround posterior part of head. Thoracic appendages uniform, biunguiculate, and with only a few scattered spines.

Abdomen composed of a single segment with suture lines on each side indicating the first coalesced segment. Posterior margin roundly triangulate. The opercular pleopod bears a triangulate posterior segment one-third the length of the anterior segment. Branches of second pair of pleopods furnished with long plumose setae.

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