

## The Taxonomy, Ecology, and Distribution of Northern California Isopods of the Genus *Idothea* with the Description of a New Species<sup>1</sup>

ROBERT J. MENZIES, *Allan Hancock Foundation, University of Southern California, Los Angeles 7, California.*

### INTRODUCTION

The usual small isopod collection contains numerous idotheid species and a very few species belonging to other groups. These are often species belonging to parasitic genera such as *Cymothoa* or destructive boring forms like *Limnoria* and *Sphaeroma*. Doubtless the large size and frequent great abundance of idotheid individuals accounts largely for their dominance in collections. However, insofar as the California coast is concerned, one who attempts to classify idotheid species meets with many difficulties. For example, males of one species have been known for many years under a name differing from that applied to the females, varieties of a single species have been known under different names, and certain species have been incorrectly named and confused with other species. Since many of the inadequacies in the classification can be traced to an originally poor description it is the purpose of this paper to correct earlier errors and to provide a simpler and more satisfactory classification of the species known to occur on the California coast. In certain instances it has been found impossible to solve, with the available material, a particularly difficult taxonomic problem and in such cases the problem is merely stated and discussed to a limited extent for the benefit of future workers.

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Since the morphology and location of the frontal projections of the idotheid head appear not to have been mentioned hitherto in the descriptions of American species, it has been thought desirable to illustrate those structures and to discuss in a synoptic way their specific significance in the classification of the various species. The discussions of the ecology and distribution of the species are only attempts to bring together what is now known about them. It is anticipated that patterns of distribution and ecology will be altered somewhat when other areas are studied more extensively. This applies particularly to more southern localities where relatively little is known concerning the isopod fauna.

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#### GENERIC STATUS

Genus *Idothea* Fabricius, 1799.

*Idothea* FABRICIUS, 1799, emended from RICHARDSON (1905a, p. 356).

*Pentidotea* RICHARDSON, 1905a, restricted.

The genus *Pentidotea* Richardson, so far as I can determine, differs from *Idothea* Fabricius only in that the maxillipedal palp consists of five separate articles and not four as in *Idothea*. Since it has been shown that very small specimens of *Pentidotea resicata* (Stimpson), the genotype of *Pentidotea*, have a maxillipedal palp consisting of but four separate articles (Menzies and Waidzunas, 1948, p. 109) it seems essential that *Pentidotea* be considered a subgenus of *Idothea*. I believe that this arrangement not only expresses phylogenetic relationships more clearly but also removes *Pentidotea* from a list of genera differing from *Idothea* in much more essential characteristics. The generic diagnosis given by Richardson (1905a, p. 356) for *Idothea* can be

made to include *Pentidotea* simply by adding to the second sentence the words, "or five articles."

GENERIC DIAGNOSIS: Flagellum of second antenna multi-articulate. Maxillipeds with a palp composed of four or five articles. Epimera of all the segments (somites) of thorax (peraeon), with the exception of the first, distinctly separated from the somites. Abdomen (pleon) composed of three segments, with a suture line on either side at the base of the terminal segment, indicating perhaps another partly coalesced segment. Includes the subgenera *Idothea* and *Pentidotea*.

#### STRUCTURAL CHARACTERISTICS USED IN IDOTHEID TAXONOMY

No special structure can be singled out as an absolutely reliable specific characteristic for the identification of a species and in most instances a composite of characteristics is needed to distinguish one species from another. Interestingly enough certain features quite reliable in distinguishing one species from another may be totally unreliable in separating two other species. Early taxonomic researches in general employed too few characteristics in distinguishing various species. For example, in Richardson's monograph (1905a, pp. 356-376) one characteristic, the shape of the terminal segment of the body or telson, is used excessively in distinguishing twelve species of isopods (*Idothea* and *Pentidotea*). The keys, and the descriptive material as well, for that reason remain seriously wanting in diagnostic details. The main characteristic used by Richardson in separating groups of species, that of general body shape, is a very variable taxonomic character. Thus *Idothea fewkesi* is separated from *Idothea ochotensis* primarily because the body of *I. fewkesi* is "slender, linear, filiform," while that of *I. ochotensis* is "oblong-ovate." In reality it is very doubtful whether the two are specifically distinct. *Idothea gracillima* (Richardson, *non* Dana) is classified by Richardson as the slender, linear, filiform type, although ovigerous specimens of that species are far more oblong-ovate than filiform. The very limited use of the telson outline as a specific characteristic is illustrated in a paper by Menzies and Waidzunus (1949) wherein the generally concave posterior margin of the telson of *I. (P.) resecata* is shown to be subject to considerable developmental



variation. Richardson (1905a, p. 357, fig. 385) illustrates considerable variation in the posterior margin of the telson of *Idothea gracillima* (Richardson, *non* Dana). The above examples illustrate the need for a more comprehensive treatment of the species avoiding the use of vague terms such as oblongovate, slender, and filiform. Other numerous examples are available and researchers on the Pacific coast marine isopods in general appear to have added little to the taxonomy of the species subsequent to Richardson's monograph.

In view of the above considerations it seems desirable to discuss the external morphology of the idotheid isopod and to emphasize particular features which have proven useful in the identification of the various species.

*The cephalon* (head): The oral appendages, including the mandibles and maxillae, in general, appear to be very constant intergenerically and thus to be of little use in specific determination. The maxilliped, on the other hand, although generally showing little or no obvious specific differences, does differ in the number of coupling hooks present on the endognath. In *I. (P.) stenops* two coupling hooks are present on each endognath while that structure in all of the other species investigated has but one coupling hook. Long setae present on the outer border of the maxillipedal palp articles are characteristically present in *I. (I.) fewkesi*. This is in contrast to the short setae present on that appendage in most species. The antennae, although presenting some excellent generic characteristics, appear relatively constant within the genus. The frontal area of the cephalon between the supra-antennal line (frontal margin of the head) and the mandibles has a number of projections or laminae which vary in size, shape, and relationship to one another in various species while remaining relatively constant for a single species. In order dorso-ventrally these structures are (1) the frontal process; (2) the clypeus, which has (a) a frontal lamina (number 1) which is a dorsal extension of the clypeus and (b) a frontal lamina (number 2) which is a ventral extension of the clypeus; and (3) the labrum. These features are illustrated in text figure 1, A-C, for the species *I. (P.) vosnesenskii*. An excellent comparative account of frontal protuberances in various isopod groups with particular reference to the Onis-



coidea is given by Vandel (1943, pp. 31–59, figs. 12–18). In idotheid species the frontal process may bifurcate at the tip as in *I. (P.) stenops* and to a limited extent in *I. (P.) aculeata*, be blunt as in *I. (I.) urotoma*, or be pointed as in the majority of the species. The frontal lamina 1 may be medially concave as in *I. (I.) urotoma*; evenly rounded as in *I. (P.) montereyensis*, *I. (P.) resecata*, and *I. (I.) rufescens*; or it may be triangulate in other species, e.g., *I. (P.) schmitti* and *I. (P.) aculeata*. A frontal lamina 2 that extends forward beyond frontal lamina 1 appears in *I. (P.) wosnesenskii* and *I. (P.) schmitti*, but not in *I. (P.) montereyensis*, *I. (I.) fewkesi*, and *I. (I.) rufescens*. The shape and direction of the eye with reference to the body axis is a very useful specific character in certain instances. It is transversely elongate in *I. (P.) stenops*, pyriform in *I. (P.) resecata*, and circular in *I. (P.) aculeata*.

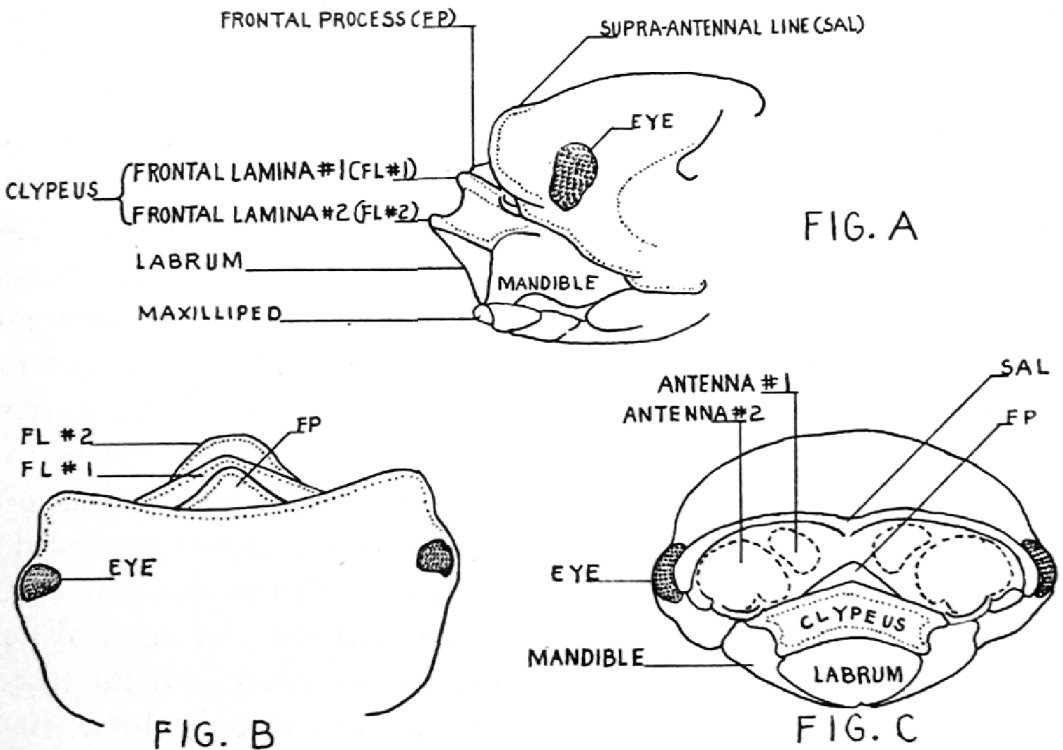


Figure 1. Terminology of cephalic structures of idotheid isopod *Idothea (Pentidotea) wosnesenskii* (Brandt). A. lateral view; B. dorsal view; C. frontal view.

*The peraeon (thorax)*: The morphology of the peraeopods (legs) changes considerably in the number and size of the setae of certain segments in the course of development and is there-

fore of limited use as a specific characteristic. In certain cases, however, particularly in distinguishing the young of *I. (I.) rufescens* from those of *I. (P.) resecata*, the peraeopods are of decided value. Other characteristics of these two species are of relatively little use in separating the young of each species. The length of the epimeral plates compared with the length of the somites at the lateral borders has been used recently in distinguishing several idotheid species (Hatch, 1947, pp. 216-219). It is of particular importance to note that at the second, third, and fourth somites it is largely a matter of personal opinion whether an epimeral plate covers the entire border of its somite or not, because the limits of the borders are difficult to define exactly. Thus it is very difficult in the species *I. (P.) aculeata* and *I. (P.) schmitti* to say with certainty just where the lateral border commences and the posterior border ceases. This is true as well in *I. (P.) wosnesenskii*, *I. (P.) stenops*, and *I. (I.) rufescens*. In certain other species the lateral borders of these somites are well defined, e.g., *I. (P.) montereyensis*, and in such cases the comparative characteristic remains quite useful. Perhaps a more valuable character is the expression of the epimeral length in relationship to the length of the somite along the mid-line, although even here one meets a number of intraspecific variables. The shape of an epimeral plate appears fairly constant and one can distinguish specimens of *I. (P.) schmitti* from specimens of *I. (P.) aculeata* in that the postero-lateral angles of the seventh epimeral plates are sharp and acute in the latter and evenly rounded in the former.

*The pleon (abdomen)*: The shape of the lateral borders of the first pleon somite when viewed dorsally serves to distinguish certain species. In *I. (P.) stenops* that border is straight and wide while in *I. (P.) wosnesenskii* it is narrow and acute. The configuration of the posterior border of the telson and its relative usefulness in distinguishing species has already been discussed. The penis, pleopods, and uropods of the species investigated show few or no specific differences.

### Subgenus **Idothea**.

This subgenus as far as northern California is concerned contains but three species, *Idothea (Idothea) urotoma* Stimpson,

*I. (I.) fewkesi* Richardson, and *I. (I.) rufescens* Fee. The species *Stenosoma gracillimum* Dana (1854, p. 175) is in my opinion a *species inquirenda*, while the species given that name by Richardson (1905a, pp. 356-358) apparently is a synonym of *Idothea (Pentidotea) montereyensis* Maloney. *Idothea rectilinea* Lockington (1877, p. 36) should also be placed in *species inquirenda* status, while the species listed under that name by Richardson (1905a, pp. 360-362) is a synonym of *I. (I.) urotoma* Stimpson, being the female of that species.

KEY TO THE NORTHERN CALIFORNIA SPECIES OF THE SUBGENUS IDOTHEA

1. Frontal process apically blunt, frontal lamina 1 with a pronounced median concavity.....*I. (I.) urotoma* Stimpson
- Frontal process apically blunt or pointed, frontal lamina 1 semi-circular, lacking a median concavity.....2
2. Posterior margin of telson concave in outline. Epimeral plates of peraeon somites five and six occupying entire lateral margins of those somites. Frontal process apically blunt.....*I. (I.) rufescens* Fee
- Posterior margin of telson with a pronounced median projection. Epimeral plates of peraeon somites five and six occupying only three-fourths of the lateral margins of those somites. Frontal process apically pointed.....*I. (I.) fewkesi* Richardson

***Idothea (Idothea) fewkesi* Richardson, 1905.**

(Plate 1, figures A-I).

*Idothea fewkesi* RICHARDSON, 1905a, pp. 359-360, figs. 387-388.—Fee, 1926, pp. 17-18 (29-30).—? GURJANOVA, 1936, pp. 258-259.—HATCH, 1947, p. 218.

This species appears very closely related to a number of described species, some of which may prove to be synonyms; indeed, *I. (I.) fewkesi* may be found to be a synonym of one of the earlier described species. None of these related species, with the exception of *I. (I.) fewkesi*, is really adequately known and at present the species remain distinguished from one another only by very vague and unreliable descriptive terms. The species *I. (I.) fewkesi* is described adequately and is recognizable as constituting one of the members of the northern California isopod fauna. For that reason it seems best to retain the name until certain taxonomic knots can be thoroughly untied. It will suffice here



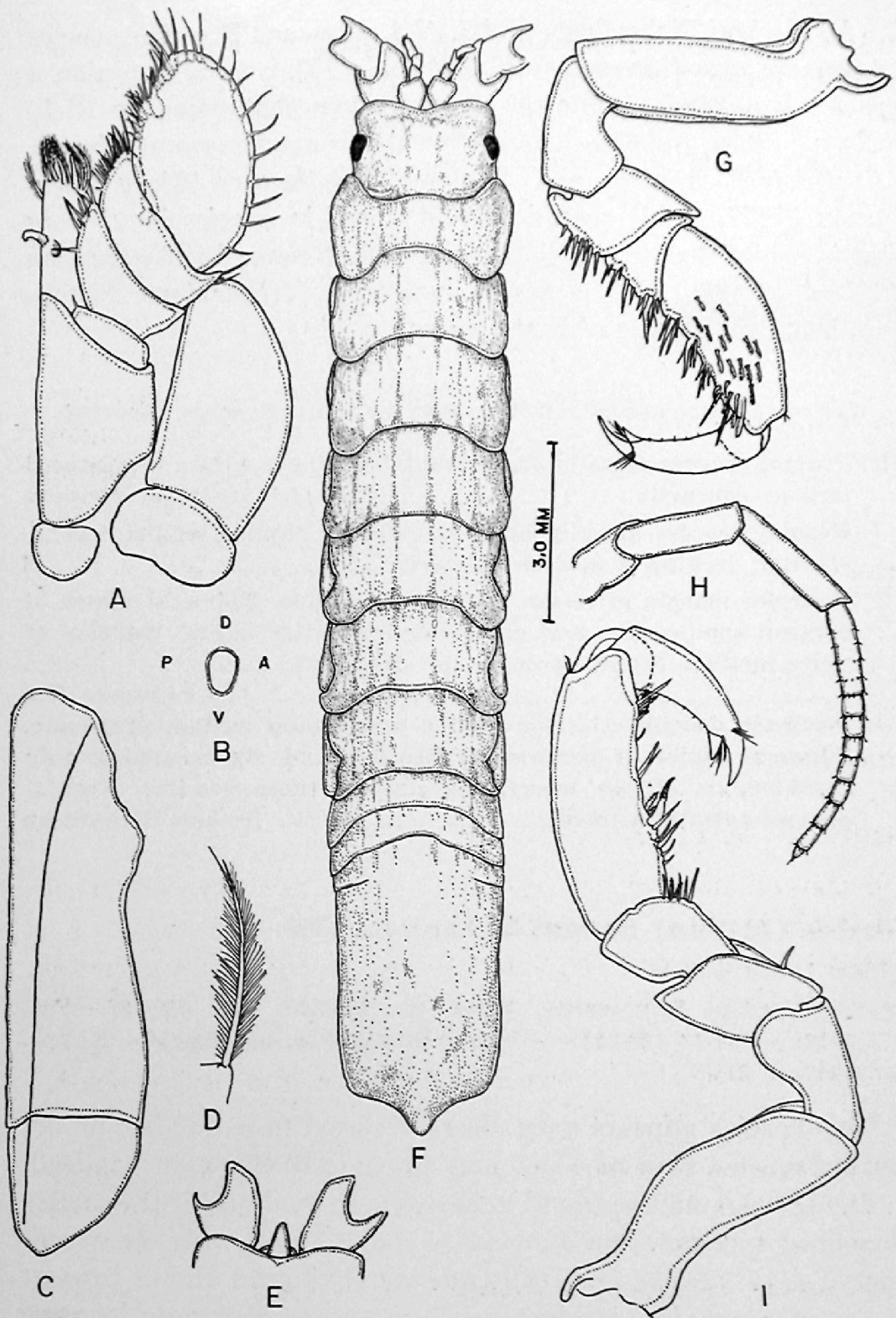


Plate 1. *Idothea (Idothea) fewkesi* Richardson. Figure A. maxiliped; B. eye, lateral view; D = dorsal, V = ventral, P = posterior, A = anterior; C. uropod; D. plumose setae at outer distal angle of uropodal basal segment, inner surface; E. cephalon, dorsal view, first antennae removed; F. male, dorsal view; G. first pereopod; H. second antenna; I. seventh pereopod.

to provide what are believed to be adequate figures and a diagnosis to permit the recognition of this species as it was originally described.

**DIAGNOSIS:** Supra-antennal line with a distinct median emargination; frontal process elongate, narrow, and pointed; frontal lamina 1 shorter than the frontal process, broadly convex in outline; apex of frontal lamina 2 not extending beyond frontal lamina 1. Lateral margins of cephalon sub-parallel. Eyes large, bulging and nearly rectangular in shape. Maxillipedal endognath with a single coupling hook; last palp article with a conspicuous fringe of long setae on outer border. Pleotelson elongate, with a distinct elongate median projection on posterior margin.

**LOCATION OF TYPE:** Museum of Comparative Zoology, Cambridge, Massachusetts; Cat. No. 6730, two specimens.

**TYPE LOCALITY:** Santa Barbara, California.

**MEASUREMENTS OF TYPE:** Length 42 mm., width 7.5 mm.

**MEASUREMENTS OF SPECIMENS OTHER THAN TYPE:** Figured male, length 19.2 mm., width (at second peraeon somite) 3.0 mm.; large male, length 39.0 mm., width 5.5 mm.; large ovigerous female, length 24.0 mm., width 5.0 mm.

**ECOLOGY:** Most of the specimens examined from northern California localities were collected at a depth of 25–35 feet and a very few were collected from the surface. It appears that as far as northern California localities are concerned the species is typically sub-intertidal. A number of ovigerous female specimens were collected in waters off Dillon Beach during the months of July and October, 1947.

**SPECIMENS EXAMINED:** A total of 41 male and 60 female specimens were examined from localities in northern California, Oregon, and Washington.

The species *Idothea (I.) ochotensis* Brandt appears to be very closely related to *I. (I.) fewkesi*. Some specimens identified by Richardson as *I. (I.) ochotensis* from the Bering Islands which the writer has examined differ only very slightly from specimens of *I. (I.) fewkesi* taken in northern California. The northern California specimens have telsons with distinct postero-lateral angles and a posterior median projection that is blunt at the