

apex. The Bering Islands specimens differ, so far as I can determine, only in having less distinct postero-lateral telson angles and a more pointed posterior median telsonic projection. Such differences do not appear to merit consideration as specific differences, although they may very well be of considerable subspecific importance.

Although *I. (I.) fewkesi* is certainly a California species, Fee records it at Departure Bay, British Columbia, without any mention of *I. (I.) ochotensis*, a species previously recorded from areas near there. Gurjanova not only recorded *I. (I.) fewkesi* as a component of the Alaskan fauna but *I. (I.) ochotensis* as well and further described a species which is, in my opinion, doubtfully distinct from *I. (I.) ochotensis*, placing Richardson's 1899 and 1900 records for that species in synonymy with her new but inadequately described *I. (I.) aleutica*.

It appears clear that the species related to *I. (I.) ochotensis* and *I. (I.) fewkesi*, presented in the following list, are very poorly distinguished from one another and are in need of careful study and redescription before their validity can be either questioned or substantiated.

1. *Idothea (I.) aleutica* Gurjanova, 1933 pp. 91-92, 103, figs. 9-10, type locality, Komandor Islands. Range, Aleutian Islands to northwestern coast of North America.

2. *Idothea (I.) derjugini* Gurjanova, 1933, pp. 91, 103, figs. 7-8, Japanese Sea and southern part of Okhotsk Sea.

3. *Idothea (I.) fewkesi* Richardson, 1905a, pp. 359-360, figs. 387-388. See synonyms listed in this paper for this species.

4. *Idothea (I.) ochotensis* Brandt, 1851, pp. 145-146, pl. VI. Type locality and range, Okhotsk Sea to northern California. See also: Richardson, 1905a, pp. 366-367, figs. 396-397, and synonyms, 1905b, pp. 216; Gurjanova, 1933, pp. 93-94, 104, fig. 13; Hatch, 1947, p. 219 (references only, not the specimens recorded by Dr. Hatch which are specimens of *I. (P.) montereyensis* Maloney, see p. 185 in this paper).

### ***Idothea (Idothea) urotoma* Stimpson, 1864.**

(Plate 2, figures A-J).

*Idothea urotoma* STIMPSON, 1864, p. 155.—MIERS, 1883, p. 34.—RICHARDSON, 1899a, p. 845; —1899b, p. 264; —1900a, p. 226.

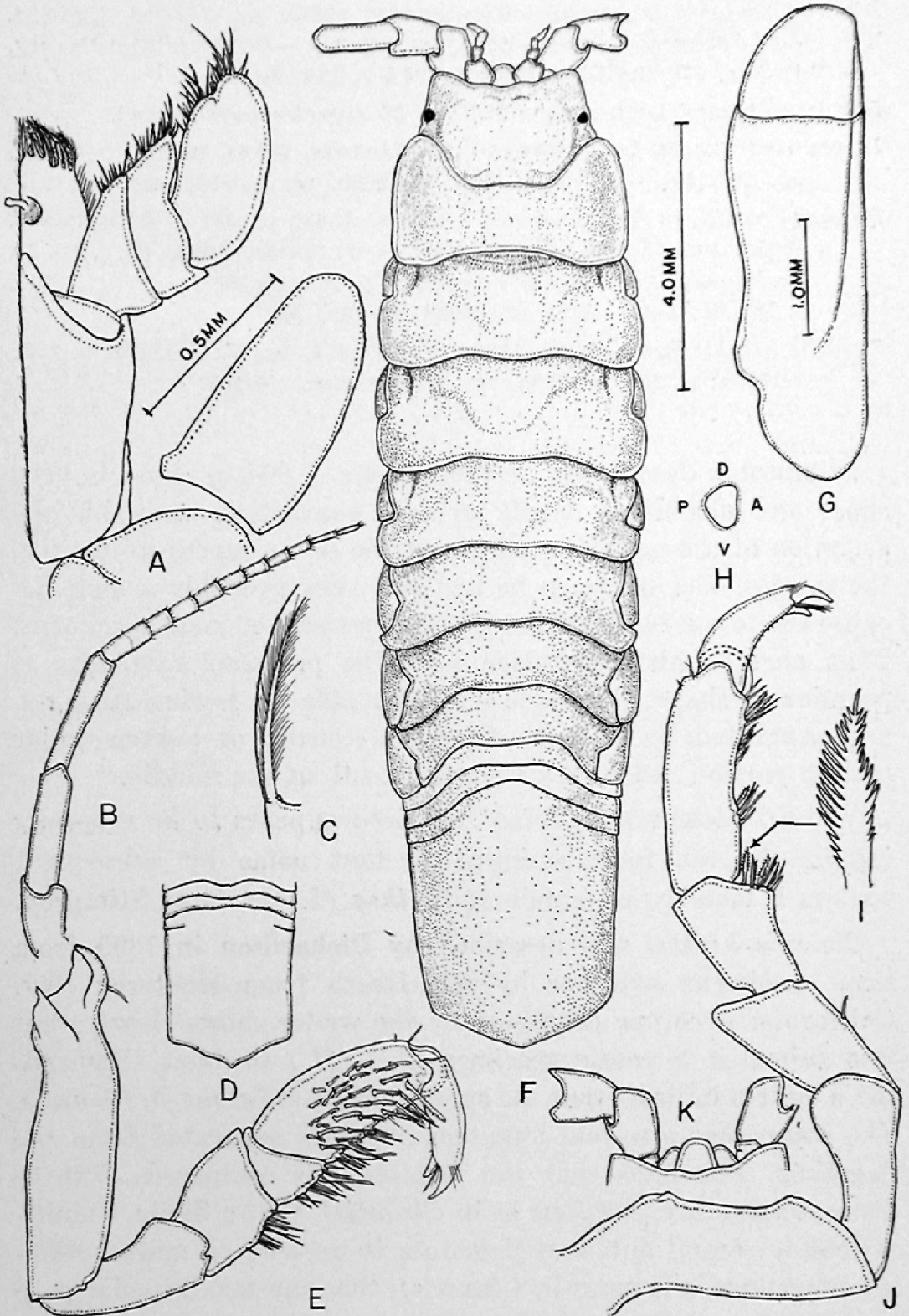


Plate 2. *Idothea (Idothea) wrotoma* Stimpson. Figure A. maxilliped; B. second antenna; C. plumose seta at outer distal angle of uropodal basal segment, inner surface; D. telson, male; E. first pereopod; F. adult female, dorsal surface; G. uropod; H. eye, lateral view; I. apex of spinulate seta of seventh pereopod; J. seventh pereopod; K. cephalon, dorsal view.

- Idothea urotoma* STIMPSON.—RICHARDSON, 1905a, pp. 358-359, fig. 386.  
—JOHNSON AND SNOOK, 1935, pp. 289-290. —RICKETS AND CALVIN,  
1939, p. 155, fig. 74. —HATCH, 1947, p. 218, fig. 94.
- Idotea rectilinea* LOCKINGTON, 1877, p. 36 (*species inquirenda*).
- Idotea rectilineata* LOCKINGTON, —RICHARDSON, 1899a, p. 845; —1899b,  
pp. 264-265; —1900a, p. 226; —1900b, pp. 131-133, fig. 5.
- Idothea rectilinea* LOCKINGTON. —MIERS, 1883, p. 34. —RICHARDSON,  
1905a, pp. 360-362, figs. 389-391. —STAFFORD, 1912, pp. 124-127,  
fig. 7. —JOHNSON AND SNOOK, 1935, p. 289, fig. 243. —LIGHT, 1941,  
p. 88, fig. 560. —HEWATT, 1946, p. 199, 204.
- Cleantis heathii* RICHARDSON, 1899a, pp. 851-852, fig. 25; —1899b, p. 272;  
—1900a, p. 229, —1905a, pp. 407-408, figs. 457-458.

Stimpson's description of this species (1864, p. 155) is very short and elucidates mostly generic characters. Only his description of the posterior margin of the telson serves to identify the species. The specimen he had was very probably a male because the telson he describes is characteristic of male specimens. That part of his description is, "The posterior extremity is peculiar in shape, the angle on either side projecting strongly, and separated by a notch from the convex or subtriangular middle portion, which bears a small tooth at the middle."

While Lockington's *Idotea rectilinea* appears to be a *species inquirenda*, the form assigned to that name by subsequent writers is merely the female of *Idothea (I.) urotoma* Stimpson.

*Cleantis heathii* was described by Richardson in 1899 from some specimens sent her by Mr. Heath from Monterey Bay, California. A cotype examined by the writer shows clearly that this animal is a young specimen of *I. (I.) urotoma*. Richardson's figures indicate that the species does not belong in *Cleantis*. The cotype has a second antennal peduncle separated from the flagellum. The facts that the pleotelson is composed of three distinct segments (not four as in *Cleantis*), that a distinct multi-articulate second antennal flagellum is present (a multi-articulate flagellum is lacking in *Cleantis*), that the maxillipedal palp is composed of four articles (five articles in *Cleantis*), seem sufficient evidence that the species does not belong in *Cleantis*.

It is perhaps pertinent to remark here that young specimens of *Idothea* and *Pentidotea* have a second antennal flagellum composed of fewer segments than have adult specimens.

DIAGNOSIS: Supra-antennal line with a slight median emargination on either side of which is a small convexity. Frontal process elongate, apex blunt; frontal lamina 1 medially not exceeding the length of frontal process and having produced sides and a deep median concavity; frontal lamina 2 not visible in dorsal view. Lateral margins of cephalon converging anteriorly. Eyes small and quadrangular in shape. Maxilliped with a single coupling hook, last segment of palp lacking long setae on outer border. Posterior border of pleotelson triangular; in female specimens the postero-lateral borders are usually not irregular while in male specimens the first half of each postero-lateral border is slightly concave and the postero-medial part is convex and provided with a distinct but minute median tooth. Conspicuous, short, posteriorly projecting, postero-lateral angles are formed on the telsons of some male specimens.

TYPE LOCALITY: Puget Sound, Washington.

LOCATION AND NUMBER OF THE TYPE: The types appear to have been lost.

MEASUREMENTS OF TYPE: None given.

MEASUREMENTS OF SPECIMENS OTHER THAN THE TYPE: Figured ovigerous female, length 16.2 mm., width 4.0 mm.; large male, length 8.7 mm., width 1.8 mm.

ECOLOGY: From all of the records examined and from collections made in northern California it appears that the species is most abundant in the mid-intertidal zone of exposed rocky coast localities. Hewatt records it as a subtidal species at Santa Cruz Island. There is one record in the Pacific Marine Station collections of a specimen from a protected bay locality at Nick's Cove, Tomales Bay, Marin County, California. Most of the specimens were found on the under surface of rocks encrusted with bryozoa. Ovigerous specimens were collected during the months of April, May, and July.

GEOGRAPHIC RANGE: Puget Sound to Ensenada, Lower California, and the Channel Islands, Catalina Harbor and Santa Cruz Island.

**SPECIMENS EXAMINED:** A total of eight male and nine female specimens were examined from localities in Marin County, California.

***Idothea (Idothea) rufescens*, Fee, 1926.**

(Plate 3, figures A-F).

*Idothea rufescens* FEE, 1926, p. 18 (30), pl. 1, fig. 12.—HATCH, 1947, p. 219, fig. 12.—MENZIES AND WAIDZUNAS, 1948, p. 111.

Fee's very brief description and semi-diagrammatic illustration of this species leave much to be desired. From the original description alone it is apparent that *I. (I.) rufescens* can be distinguished from *I. (P.) resecata* by two features only, viz., a four-segmented maxillipedal palp and a red or white color. Adult specimens of *I. (P.) resecata* have a five-segmented maxillipedal palp and are usually green in color. Menzies and Waidzunas placed *I. (I.) rufescens* in synonymy with *I. (P.) resecata* when they found young specimens of *I. (P.) resecata* to have a maxillipedal palp consisting of only four articles. These authors were further aware of the extreme color variation exhibited particularly by certain idotheid species. Although attempts to procure Fee's types have failed, by good fortune two female specimens were collected which may be Fee's species. Dr. Melville Hatch kindly loaned some specimens which he had identified as *I. (I.) rufescens*. Interestingly enough some of the specimens sent by Dr. Hatch were green in color, although they are doubtless identical with the red specimens I had collected. In most respects the specimens, including some ovigerous and therefore adult females, fit the description of *I. (I.) rufescens*; however, the epimeral plates at the fifth and seventh perion somites are of a different shape from those figured by Fee, being more rectangular than triangular. The posterior margins of those somites are medially convex and not concave as Fee indicates. Young specimens of the species identified as *I. (I.) rufescens* differ from young specimens of *I. (P.) resecata* in having ovoid eyes, an apically blunt frontal process, and peraeopods of a decidedly different structure. The eyes of *I. (P.) resecata* are pyriform and the frontal process apically pointed. The carpal segment of the seventh peraeopod of *I. (P.) rufescens* is considerably shortened as compared with that of *I. (P.) resecata* and the

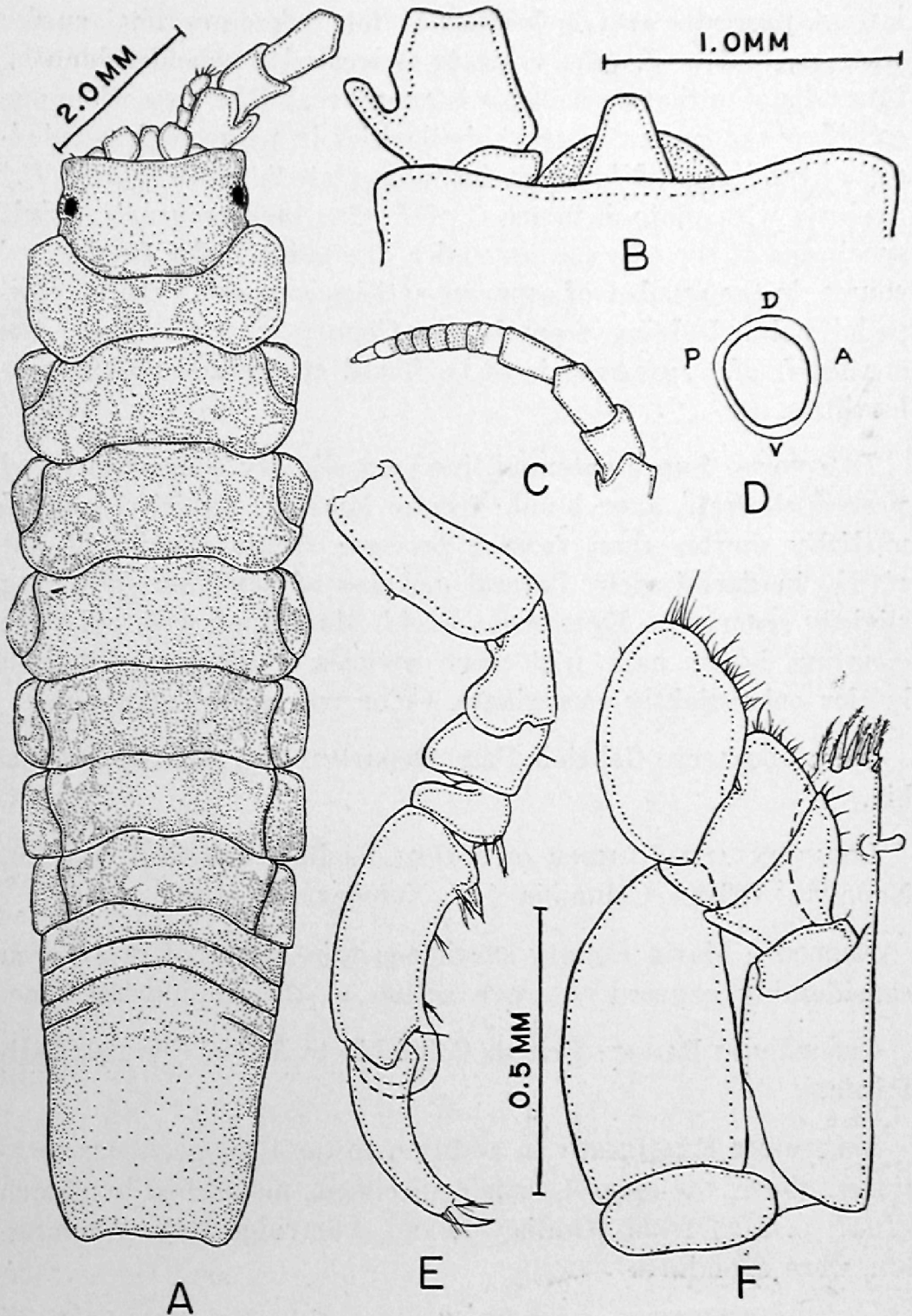


Plate 3. *Idothea (Idothea) rufescens* Fee. Figure A. female, dorsal view; B. cephalon, dorsal view, first antennae removed; C. second antenna; D. eye, lateral view; E. seventh pereopod; F. maxilliped.

largest propodal seta is located at the infero-proximal angle; whereas, that of *I. (P.) resecata* is located a considerable distance distal to that angle. This is a very real difference when one considers the generally great similarities in peraeopod morphology of two "related" species. Compare plate 7, figure E of *I. (P.) aculeata* with plate 8, figure C of *I. (P.) montereyensis*. Adult specimens of the two species under discussion differ further, of course, in the number of separate articles composing the maxillipedal palp. Judging from Marin County material alone, the species *I. (I.) rufescens* is to be found at exposed rocky coast localities.

**DIAGNOSIS:** Supra-antennal line very slightly concave, frontal process elongate, apex blunt; frontal lamina 1 semicircular and medially shorter than frontal process; frontal lamina 2 not visible in dorsal view. Lateral margins of cephalon diverging slightly anteriorly. Eyes large, ovoid. Maxilliped with only one coupling hook; palp with four articles. Posterior pleotelson border only slightly emarginate. Color red, white, or green.

**TYPE LOCALITY:** Gabriola Pass, Departure Bay, British Columbia.

**LOCATION AND NUMBER OF TYPE:** Pacific Biological Station, Nanaimo, British Columbia (?). Number not given.

**ECOLOGY:** Marin County specimens were collected in an area considerably exposed to wave action at the laminarian zone.

**GEOGRAPHIC RANGE:** British Columbia to Marin County, California.

**SPECIMENS EXAMINED:** In addition to the two specimens mentioned above, the several female specimens mentioned by Hatch (1947, p. 219) from Whidbey Island, Partridge Bay, Washington, were examined.

### Subgenus **Pentidotea.**

The subgenus *Pentidotea* is represented in northern California by six species, *Idothea (Pentidotea) resecata* Stimpson, *I. (P.) stenops* Benedict, *I. (P.) wosnesenskii* (Brandt), *I. (P.) aculeata* Stafford, *I. (P.) montereyensis* Maloney, and *I. (P.)*

*schmitti* Menzies (= *Pentidotea whitei* Richardson, 1905a, non Stimpson, 1864, p. 155).

## KEY TO THE NORTHERN CALIFORNIA SPECIES OF THE SUBGENUS PENTIDOTEA

1. Apex of frontal process entire. Maxilliped with one coupling hook. Eyes not markedly transversely elongate, length along body axis one-half or greater than one-half the width..... 2
- Apex of frontal process with a median notch..... 6
2. Frontal process blunt or widely angulate, not extending beyond frontal lamina 1. Frontal lamina 1 triangulate in dorsal view.....3
- A narrow, pointed frontal process exceeds considerably the forward extent of a semicircular frontal lamina 1..... 5
3. Postero-lateral margin of epimeral plate of seventh peraeon somite evenly convex, not acute. Eyes somewhat pyriform.....  
..... *I. (P.) schmitti* Menzies
- Postero-lateral margin of epimeral plate of seventh peraeon somite acute. Eyes reniform or oval..... 4
4. First pleon somite with acute lateral borders. Eyes reniform.....  
..... *I. (P.) wosnesenskii* (Brandt)
- First pleon somite with wide lateral borders. Eyes circular.....  
..... *I. (P.) aculeata* (Stafford)
5. Telson posterior margin deeply concave, postero-lateral angles acute, each angle with a small but noticeable dorsal carina. Specimens usually found on *Zostera* sp.....*I. (P.) resecata* (Stimpson)
- Telson posterior margin usually convex, with a small but distinct median tooth; when concave then only slightly so and lacking acute postero-lateral angles and lacking any dorsal carina above each angle. Specimens usually found on *Phyllospadix* sp.....  
..... *I. (P.) montereyensis* (Maloney)
6. Maxilliped with two coupling hooks. Eyes transversely elongate.....  
..... *I. (P.) stenops* (Benedict)
- Maxilliped with one coupling hook. Eyes oval.....  
..... Some adult specimens of *I. (P.) aculeata* (Stafford)

***Idothea (Pentidotea) stenops* (Benedict, 1898).**

(Plate 4, figures A-E; plate 9; figures A-B).

*Idotea stenops* BENEDICT, 1898, pp. 54-55, fig. 13.—RICHARDSON, 1899a, p. 846;—1899b, p. 266;—1900a, p. 227; 1904a, p. 219;—1904b, p. 663.

*Pentidotea stenops* (BENEDICT),—RICHARDSON, 1905a, pp. 375-376, figs. 407-408.—RICKETTS AND CALVIN, 1939, p. 128, fig. 63.—LIGHT, 1941, pp. 88, 92.—HATCH, 1947, p. 217, fig. 91.



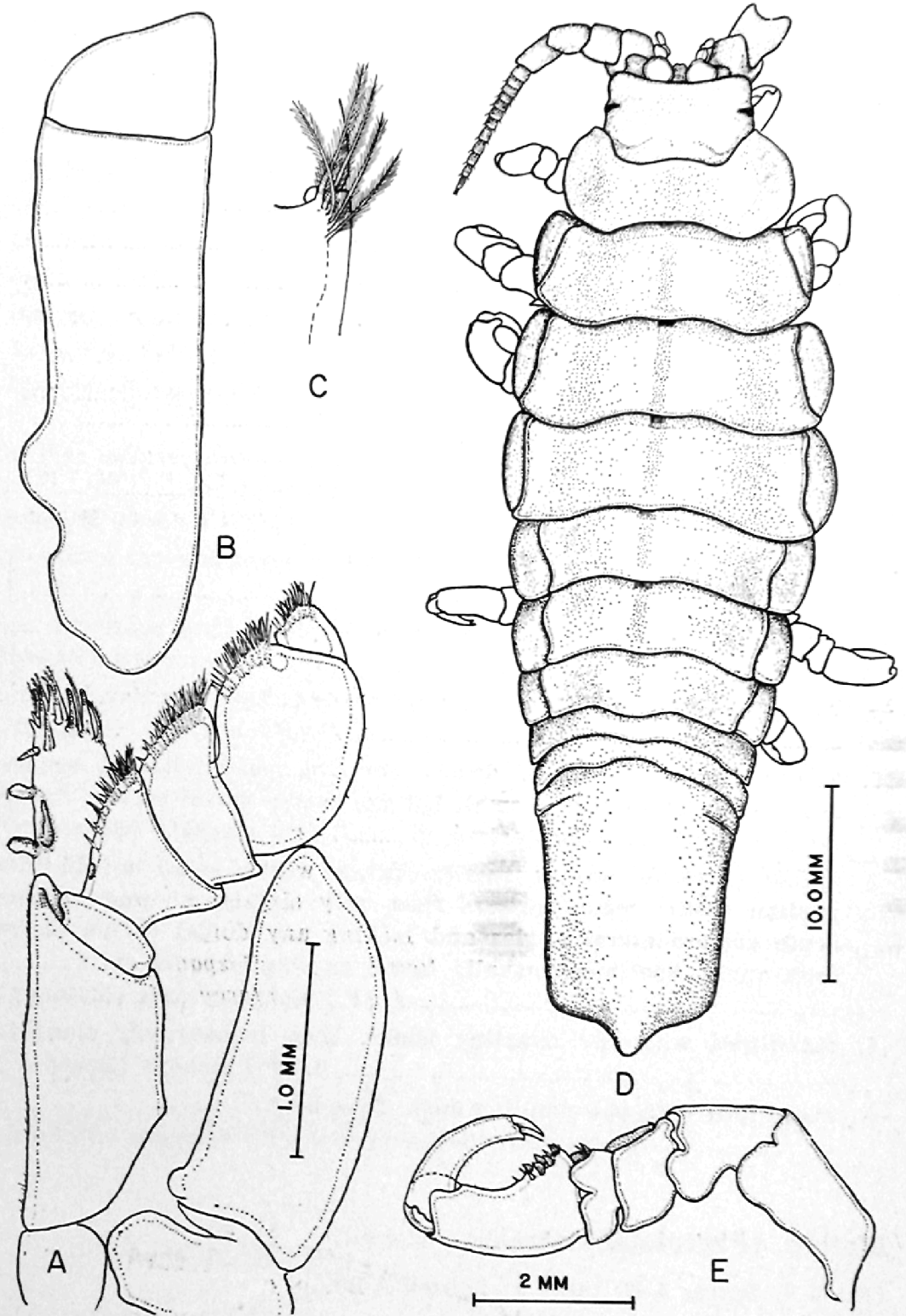


Plate 4. *Idothea (Pentidotea) stenops* (Benedict). Figure A. Maxilliped; B. uropod; C. plumose setae at outer distal angle of uropodal basal segment, inner surface; D. male, dorsal view; E. seventh pereopod.

No difficult synonymy is encountered for this species, the original description and figures of the species being quite adequate for subsequent recognition.

**DIAGNOSIS:** Supra-antennal line slightly concave; frontal process elongate, apex notched, and exceeding the forward extent of frontal lamina 1; frontal lamina 1 triangulate; frontal lamina 2 not visible in dorsal view. Eyes transversely elongate and narrow. Maxilliped with two coupling hooks. First pleon somite with lateral borders straight, not acutely pointed. Telson with sharply rounded postero-lateral angles and a produced posterior median projection.

Specimens of this species normally attain a size larger than that known for any other species of *Idothea* (*sensu lato*) occurring on the Pacific coast of North America.

**TYPE LOCALITY:** Monterey, California.

**LOCATION AND NUMBER OF THE TYPE:** Type in United States National Museum collections, Cat. No. 2276.

**MEASUREMENTS OF TYPE:** Not given.

**MEASUREMENTS OF SPECIMENS OTHER THAN THE TYPE:** Figured male, length 53.0 mm, width 15.0 mm, large ovigerous female, length 42.3 mm, width 14.2 mm.

**ECOLOGY:** Some of the specimens examined were collected from the lowest intertidal reaches of exposed rocky coast localities. A considerable number of specimens were taken from the stomachs of the fish *Hexagrammos* sp. One ovigerous specimen was collected during the month of June.

**GEOGRAPHIC RANGE:** Coos Bay, Oregon (Hatch, 1947, p. 217) to Monterey Bay, California. Hatch's Alaskan record for this species giving Richardson (1909, p. 109) as a reference is probably incorrect in that Richardson records three species on that page none of which is *I. (P.) stenops*.

**SPECIMENS EXAMINED:** A total of eight male, three female, and four young specimens were examined from northern California localities.