

*Campylaspis rufa* Hart, 1930

Figure 2.25

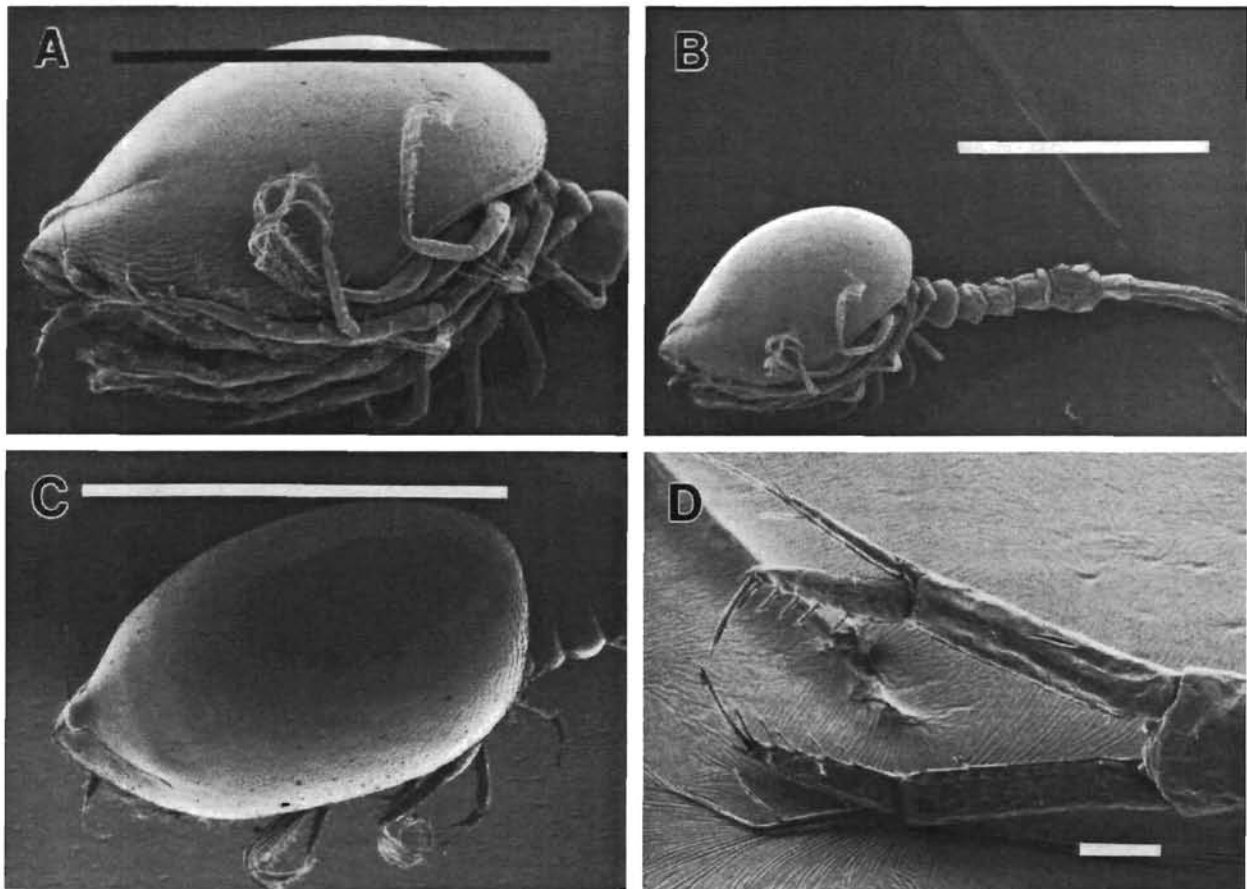
**Material Examined.** Santa Maria Basin region, Phase II. Cruise 1-1 (November, 1986), Sta. R-3 (2); Cruise 1-2 (January, 1987), R-7 (4).

**Description.** Female, 3.5 mm. Carapace large, smooth, comprising more than half total length of body, extending dorsally over pereonites 1-3; antennal notch obsolete; eyelobe broadened, without lenses. Pereopod 2 articles 5 and 7 subequal in length. Uropod peduncles twice length of endopod and approximately equal in length to last 2 pleonites combined; medial margin of peduncle armed with large scales giving coarsely serrate appearance; endopod with about 7 medial setae. Color dark reddish-brown to orange, with large dark red chromatophores scattered over body.

**Remarks.** The very small adult body size and smooth, reddish brown carapace serves to distinguish this species from all others in the Santa Maria Basin region. *Campylaspis rufa* has never been found in even moderate abundance; its occurrence here extends its range throughout the Oregonian Province.

**Type Locality and Type Specimens.** Mitlenatch, Vancouver Island, British Columbia, 200 m.; type in British Columbia Provincial Museum.

**Distribution.** Vancouver Island to Point Conception, 200 - 565 m.



**Figure 2.25.** *Campylaspis rufa* Hart, 1930. Female: A, carapace and pereonites, lateral view; B, body, lateral view; C, carapace, dorsal view; D, uropods. Scale A-C = 1mm, D = 0.1 mm.

## *Campylaspis rubromaculata* Lie, 1971

Figure 2.26

*Campylaspis nodulosa* Lie, 1969 (*non* Sars, 1887)

**Material Examined.** Santa Maria Basin, Phase II, Cruise 1-1 (November, 1986), Sta. R-4 (1), R-5 (14), R-7 (8), PJ-1 (15); Cruise 1-2 (January, 1987), R-1 (3), R-2 (1), R-4 (1), R-5 (4), PJ-1 (10); Cruise 1-3 (May, 1987), R-1 (3), R-8 (3), PJ-1 (9); Cruise 2-3 (October, 1987), R-5 (3), PJ-1 (6); Cruise 2-4 (January, 1988), R-1 (2), R-8 (2), PJ-1 (16); Cruise 2-5 (May, 1988), R-1 (1), PJ-1 (2); Cruise 3-1 (October, 1988), PJ-1 (1); Cruise 3-4 (May, 1989), R-1 (3), R-8 (1), PJ-1 (9).

**Description.** Female, 4 mm. Carapace elevated posteriorly, covered with low tubercles in middorsal region, laterally forming dorsal border to sulcus, with single ridge of low tubercles forming ventral border to sulcus and short row of 3 tubercles extending into sulcus dorsally; pseudorostral lobes without tubercles dorsally, slightly elongate; eyelobe enlarged, without noticeable lenses. Pereonites 1 and 2 with middorsal projections, pereonite 1 visible in lateral view; pereonites 3-5 with strong ridge along posterior border. Pereopod 2 article 7 nearly 1.5 times length article 5; articles 4 and 5 armed with plumose setae. Uropod peduncle as long as last 2 pleonites combined and more than twice length of endopod; latter terminally quadrate, armed with 3-5 setae medially and 1 short and 1 long setae terminally; exopod shorter than endopod, with single subterminal seta medially. Color in life, orange with red pigment chromatophores.

**Remarks.** This species was originally described by Lie (1969), but the proposed name, *Campylaspis nodulosa*, was occupied as Sars (1887) had described a species from the North Atlantic with that name. *Campylaspis rubromaculata* bears considerable resemblance to *C. sagamiensis* Gamô and *C. maculinodulosa* Watling and McCann, which is described below. See remarks under that species for characters which can be used for their separation.

**Type Locality and Type Specimens.** Puget Sound, Seattle, Washington, Holotype female, USNM 125081, 23 m.

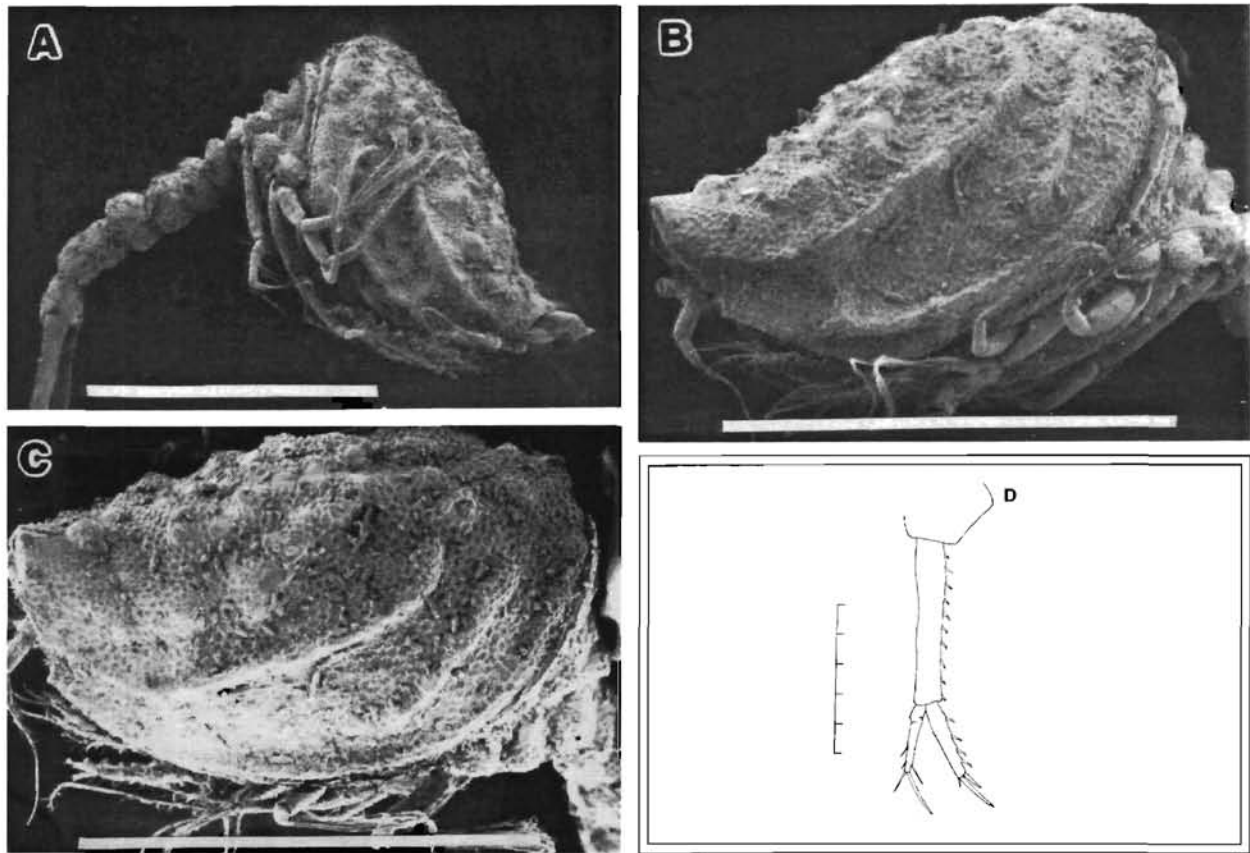
**Distribution.** Southern California to Washington, 22-565 meters.

## *Campylaspis maculinodulosa* Watling and McCann, new species

Figure 2.27

**Material Examined.** Santa Maria Basin, Phase II, Cruise 1-1 (November, 1986), Sta. R-1 (19), R-4 (5), PJ-1 (5); Cruise 1-2 (January, 1987), R-1 (3), R-4 (4), R-8 (2), PJ-1 (2); Cruise 1-3 (May, 1987), R-1 (16), R-4 (1), R-5 (1), R-8 (3), PJ-1 (2); Cruise 2-3 (October, 1987), R-1 (12), R-4 (4), R-5 (2), R-8 (4), PJ-1 (2); Cruise 2-4 (January, 1988), R-1 (3), R-4 (3); Cruise 2-5 (May, 1988), R-1 (20), R-4 (6), R-8 (16); Cruise 3-1 (October, 1988), R-1 (12), R-4 (5), R-8 (2); Cruise 3-4 (May, 1989), R-1 (24), R-8 (11).

**Description.** Adult size, female and male, 2.0 mm. Carapace slightly elevated posteriorly, with covering of non-contiguous low tubercles dorsally; lateral sulcus bordered with lightly tuberculate ridge dorsally and row of widely spaced tubercles ventrally; pseudorostral lobes longer than normal for the genus, with row of 3 tubercles extending anteriorly from lateral carapace ridge; eyelobe distinct, without noticeable lenses. Pereonites 1 and 2 with middorsal projections; pereonites 3 and 4 with low dorsolateral tubercles. Pereopod 2 article 3 present; article 7 only slightly longer than article 5. Uropod peduncle as long as last 2 pleonites combined and nearly twice length of endopod; rami subequal in length; peduncle unarmed medially and endopod with 1 or 2 medial setae. Color in life translucent white with spots on tubercles. Male carapace lower and more elongate, only 2 lateral tubercles at posterior end of sulcus; uropod longer than in female, with about 10 evenly spaced setae on peduncle medial margin, endopod with 4-5 medial setae.



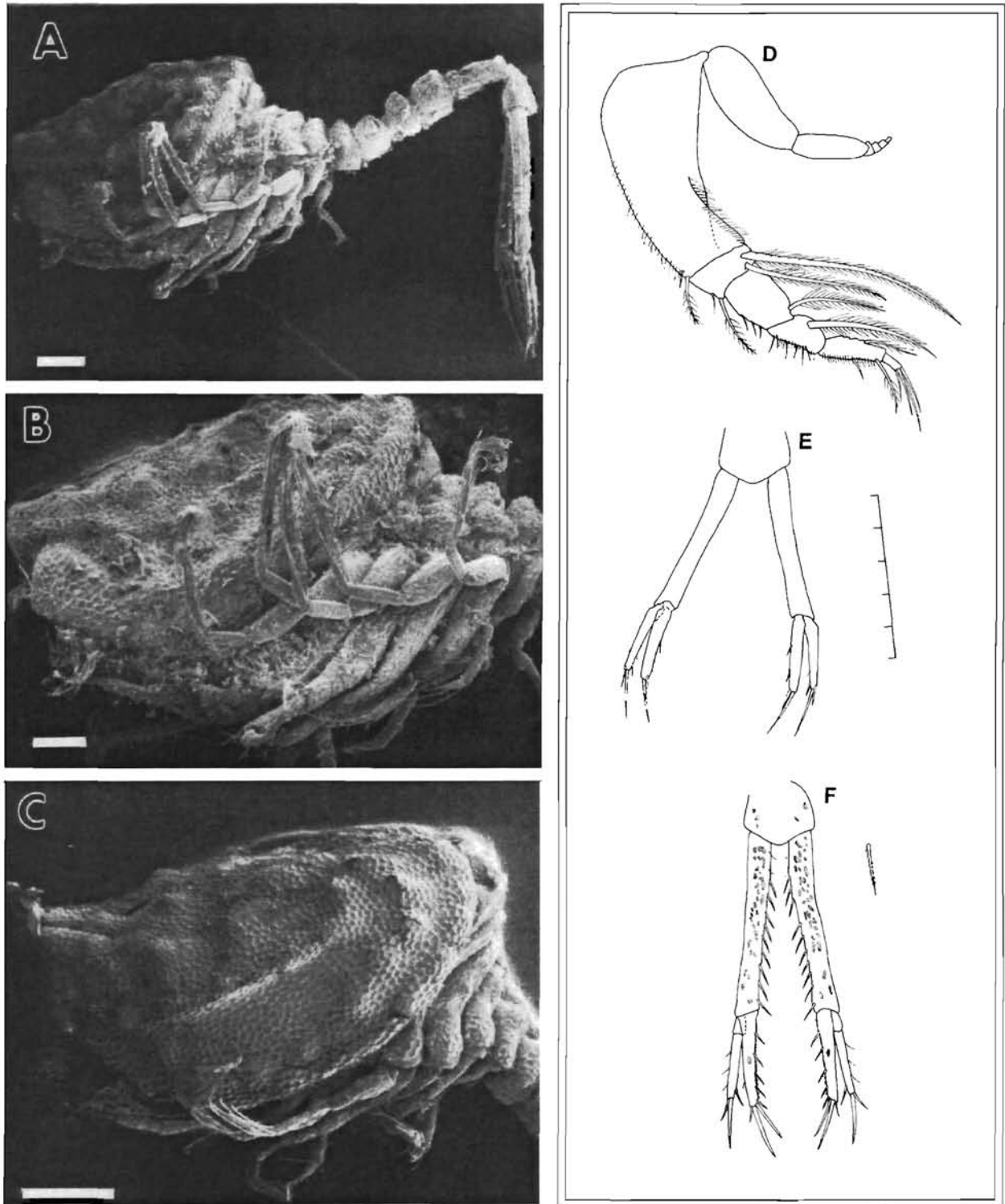
**Figure 2.26.** *Campylaspis rubromaculata* Lie, 1971. Subadult female: A, body, lateral view; B, carapace and anterior pereonites, lateral view; C, carapace, dorsal view; E, uropod. Scale, A-C, 1.0 mm, D = 0.5 mm.

**Remarks.** This species is very similar in general form to *C. rubromaculata*, but differs from the latter in the presence of tubercles rather than a short ridge at the posterior end of the carapace lateral sulcus, and in the lack of setae on the medial margin of the female uropod peduncle. *Campylaspis sagamiensis* Gamô exhibits a very similar arrangement of tubercles on the carapace, but differs from *C. maculinodulosa* in having the tubercles more widely separated such that a continuous ridge is not formed above the sulcus, and in its weakly setose male uropod peduncle.

**Type Locality and Type Specimens.** California, Santa Maria Basin, off Point San Luis, Sta.R-1 35°05.83'N, 120°49.16'W, 91 m, holotype USNM 273575, paratypes USNM 273567 and LACM 95-74.1.

**Etymology.** From Latin, *maculosus*, = spotted, and L., *nodulus*, = knob, referring to the chromatophores that are associated primarily with the tubercles on the carapace.

**Distribution.** Known only from the Santa Maria Basin region, 90-154 m.



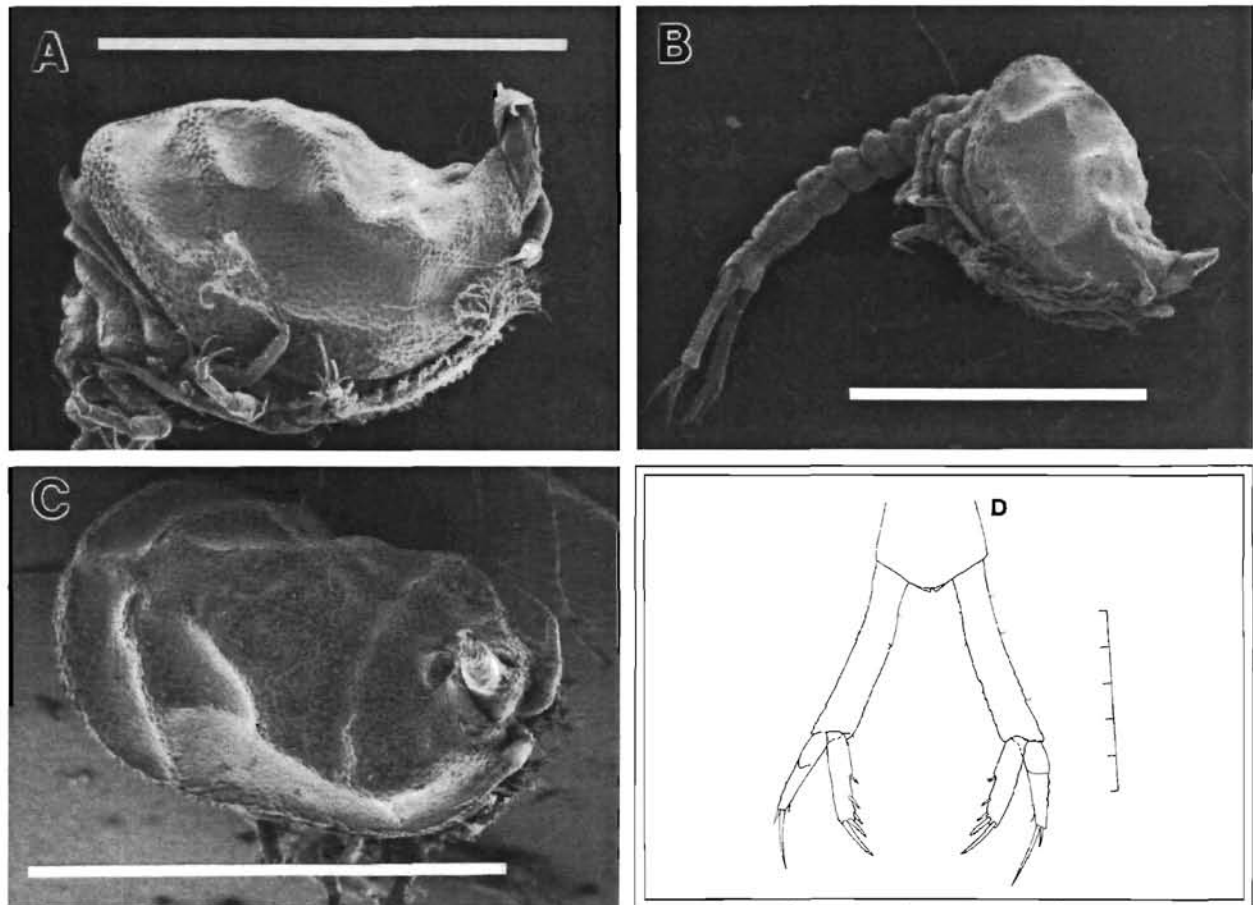
**Figure 2.27.** *Campylaspis maculinodulosa* Watling and McCann, new species. Male: A, body, lateral view; B, carapace and pereonites, lateral view; F, uropods. Female: C, carapace and pereonites, lateral view; D, maxilliped 3; E, uropods. Scale, A= 0.1 mm, B,C = 0.2 mm, E = 0.5 mm.

*Campylaspis hartae* Lie, 1969

Figure 2.28

**Material Examined.** Santa Maria Basin, Phase II, Cruise 1-2 (January, 1987), Sta. R-5 (3), PJ-1 (3); Cruise 1-3 (May, 1987), R-1 (7), R-5 (8); Cruise 2-3 (October, 1987), R-5 (17), R-8 (4); Cruise 2-4 (January, 1988), R-5 (5); Cruise 2-5 (May, 1988), R-5 (8); Cruise 3-1 (October, 1988), R-4 (4), R-5 (4), R-8 (1); Cruise 3-4 (May, 1988), R-4 (2), R-5 (3).

**Description.** Adult female, 3.5 mm. Carapace strongly elevated posteriorly, with several series of strong ridges bordering deep sulci, 3 of which transverse, with first crossing frontal lobe and joining lateral ventral ridges anteriorly, second passing obliquely posteriorly to middorsal region, and posteriormost running from ventrolateral ridge to middorsal ridge, 2 of which are horizontal and border lateral sulcus. Eyelobe enlarged but without distinct lenses. Pereonite 1 only with strong middorsal projection. Pereopod 2 article 3 distinct, article 7 short and wide but longer than article 5, armed with several lateral setae. Uropod peduncle nearly equal in length to last 2 pleonites and 2 to 2.5 times length of endopod; peduncle unarmed medially, but heavily scaled, endopod with 3 medial setae. Immature male very similar to female; uropod endopod with more medial setae, but peduncle remains without medial setae.



**Figure 2.28.** *Campylaspis hartae* Lie, 1969. Female: A, carapace and pereonites, lateral view; B, body, lateral view; C, carapace, dorsal view; D, uropods. Scale, A-C = 1 mm, D = 0.5 mm.

**Remarks.** This species can be distinguished from all others in this region by the very deep depressions between the ridges combined with the absence of tubercles on the carapace. Of the 69 specimens examined in this study only a single individual was a male. Lie did not record a male from the type locality. While mature males of campylaspids are always rare, they are usually encountered at some time during the year.

**Type Locality and Type Specimens.** Puget Sound, off Seattle, 22-23 m, sediment >80% sand, mean particle size 0.113-0.235 mm. Holotype, USNM 125077.

**Distribution.** Probably distributed throughout San Diego and the Oregonian Provinces, a species of the shallow shelf, known thus far from depths of 22-154 m.

### *Campylaspis blakei* Watling and McCann, new species

Figure 2.29

**Material Examined.** Santa Maria Basin, Phase II, Cruise 1-1 (November, 1986), Sta. R-4 (1), R-5 (6); Cruise 1-2 (January, 1987), R-2 (1), PJ-1 (2); Cruise 1-3 (May, 1987), R-5 (5); Cruise 2-3 (October, 1987), R-2 (1), PJ-1 (3); Cruise 2-4 (January, 1988), PJ-1 (1); Cruise 2-5 (May, 1988), R-2 (1), R-5 (2), PJ-1 (1); Cruise 3-1 (October, 1988), R-4 (1), R-5 (1), PJ-1 (7); Cruise 3-4 (May, 1989), PJ-1 (2).

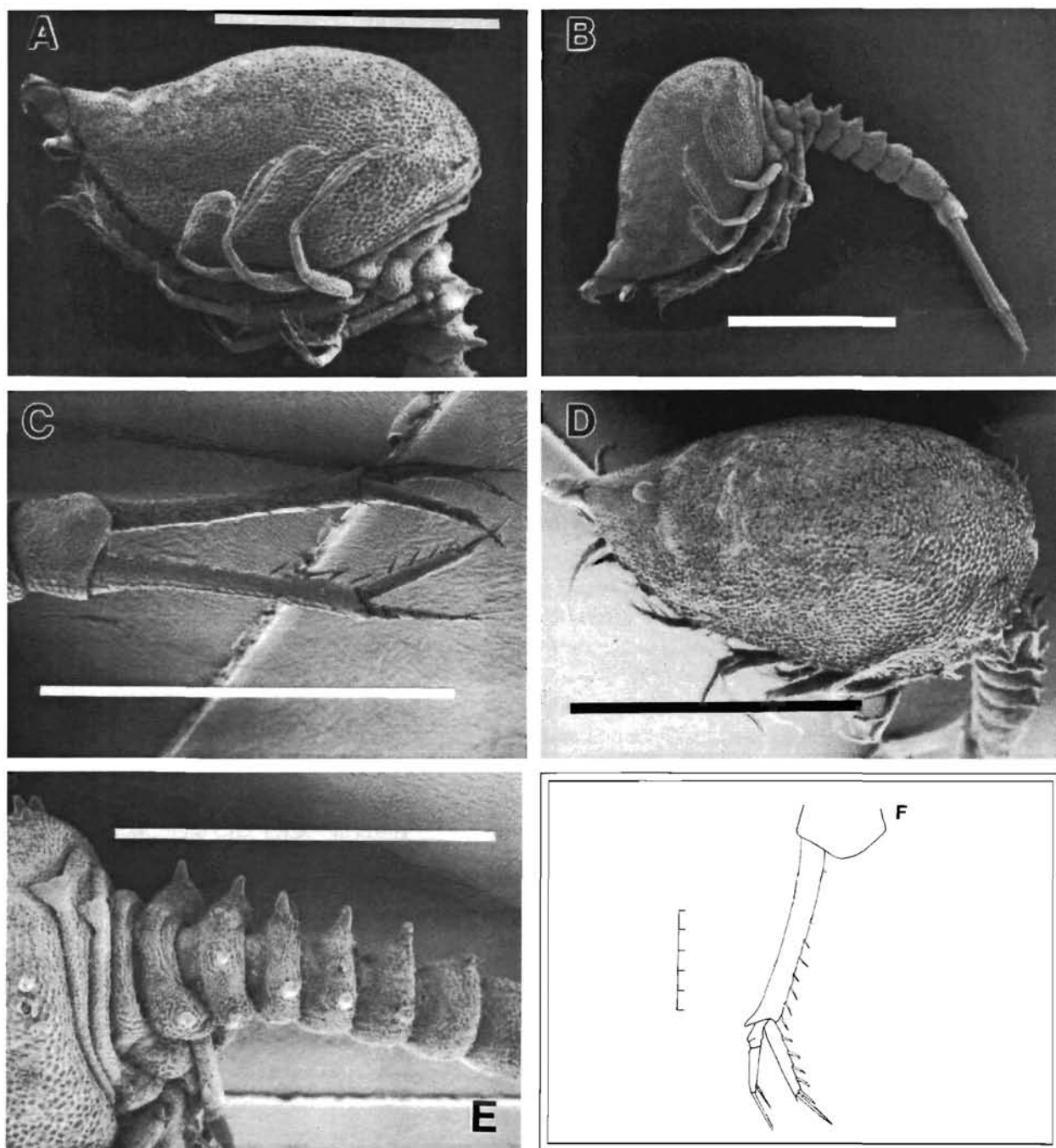
**Description.** Female, 3 mm. Carapace strongly elevated posterodistally, broadly rounded, with gently sloping lateral sulcus not bounded by ridges; with paired set of 3 small spines dorsolaterally near posterior margin; eyelobe small, distinct; pseudorostral lobes ordinary. Pereonites 1 and 2 with middorsal projections; pereonite 4 with dorsally projecting lateral spines; pereonite 5 with both dorsolateral and lateral dorsally projecting spines. Similar spines also on pleonites 1-4. Pereopod 2 article 3 distinct; article 7 as long as article 5. Uropod peduncle as long as last 3 pleonites combined and about 2.5 times length of endopod; peduncle slightly flared terminally. Endopod and distal half of peduncle armed with 4 to 6 and 4 setae respectively. Color in life, white to gray, translucent. Male unknown.

**Remarks.** This species is unique among members of this genus which have a smooth carapace in possessing blunt, dorsally projecting spines on the pereonites and pleonites.

**Type Locality and Type Specimens.** California, Santa Maria basin, off Purisima Point, Sta. R-5, 34°42.69'N, 120°50.83'W, 154 m, holotype USNM 273548, paratypes USNM 273549 and LACM 95-73.1.

**Etymology.** The species is named in honor of my friend and colleague, the lead scientist of the Santa Maria Basin macrobenthic sampling program, and senior editor of this Atlas project, in recognition of his many contributions to our knowledge of the benthic fauna of the Southern California continental shelf.

**Distribution.** Known from the Santa Maria Basin area and off Pt. Loma, San Diego, 92-161 m.



**Figure 2.29.** *Campylaspis blakei* Watling and McCann, new species. Female: A, carapace and pereonites, lateral view; B, body, lateral view; C, uropods; D, carapace, dorsal view; E, pereonites 1-5 and pleonites 1-4, dorsal view; F, uropod. Scale, A-E = 1 mm, F = 0.5 mm.

*Campylaspis biplicata* Watling and McCann, new species

Figure 2.30a, b

**Material Examined.** Santa Maria Basin Region, Phase II, Cruise 1-1 (November, 1986), Sta. R-6 (17), PJ-1 (3); Cruise 1-2 (January, 1987), R-1 (1), R-3 (6), R-5 (11), R-6 (1); Cruise 1-3 (May, 1987), R-3 (9), R-5 (7), R-6 (9), R-9 (10), PJ-1 (2); Cruise 2-3 (October, 1987), R-2 (1), R-3 (18), R-5 (4), R-6 (11), R-9 (4), PJ-1 (3); Cruise 2-4 (January, 1988), R-3 (11), R-5 (20), R-6 (10), R-9 (5), PJ-1 (2); Cruise 2-5 (May, 1988), R-3 (1), R-5 (14), R-6 (12), R-9 (2), PJ-1 (1); Cruise 3-1 (October, 1988), R-1 (2), R-3 (15), R-5 (20), R-6 (14), R-9 (7), PJ-1 (3); Cruise 3-4 (May, 1989), R-3 (3), R-4 (1), R-5 (24), R-6 (11), R-9 (3), PJ-1 (8).

**Description.** Adult size, female and male, 2.0 mm. Carapace extended strongly posteriorly, appearing flattened dorsally; with lateral, nearly horizontal sulcus becoming wider from posterior to anterior, bounded above and below by soft ridges ornamented with pigment spots; eyelobe small, pseudorostral lobes slightly enlarged, branchial siphons about twice length of pseudorostrum. Pereonites 1 and 2 with middorsal projections; pleonite 4 pleurae extending back along pereonite 5. Pereopod 2 article 3 distinct, article 7 longer than article 5, with terminal seta as long as article in length. Uropod peduncle as long as last 3 pleonites combined and twice length of endopod, with only a few weak setae; exopod basal article half length of distal article; endopod with 3-5 medial setae. Male uropod endopod somewhat more robust than in female.

**Remarks.** The presence of two, three, or four subparallel lateral ridges on the carapace occurs in several species, many of which have been found in the deep Atlantic (e.g., *C. arcuata* Jones, *C. plicata* Jones, *C. valleculata* Jones, *C. exarata* Jones, *C. bicarinata* Jones, *C. crispa* Lomakina, *C. johnstoni* Hale, *C. macrophthalma* Sars, *C. sinuosa* Gamô, *C. umbensis* Gurwitschi, *C. undata* Sars). The appendage morphology of *C. biplicata* is somewhat similar to that seen in *C. crispa* and *C. umbensis*, however, both of these species have three ridges that are more vertical (relative to the ventral margin). In the form of the ridges *C. plicata* resembles most closely the Atlantic species of Jones and Sars, but differs from them in the form of the appendages, especially the uropod.

**Type Locality and Type Specimens.** California, Santa Maria Basin, off Point Sal, Sta. R-9, 34°53.68'N, 120°59.12'W, 410 m, holotype USNM 273546, paratypes USNM 273547 and LACM 95-72.1.

**Etymology.** From Latin, *bis* = two, and *L. plicatus* = fold, referring to the two lateral ridges on the carapace.

**Distribution.** Known from Puget Sound to San Diego, including the Santa Maria Basin Region, 47-410 m, with most specimens found at 145-410 m.

Genus *Procampylaspis* Bonnier, 1896

**Type Species.** *Procampylaspis echinata* Bonnier, 1896.

**Diagnosis.** Carapace strongly elevated in female, occasionally covering part of first pereonite; anterolateral corner not produced in females, weakly produced in males; ocular lobe single, middorsal, often rudimentary. Mandible molar elongate, weakly triturative distally. Maxilla with movable endites. Antenna 1 peduncle article 2 without process, longer than article 3. First maxilliped 6-articulate, dactyl minute. Maxilliped 2 dactyl with recurved processes, claw-like. Female maxilliped 3, pereopods 1 and 2 with exopods; male maxilliped 3 and pereopods 1-4 with exopods. Pereopod 1 article 3 (ischium) subequal to or longer than article 4. Uropod peduncle usually as long as or longer than pleonite 6; exopod basal article short, not submerged in peduncle; exopod longer than its terminal seta.

**Remarks.** This genus is distinguished from other members of the family by the shape of the dactyl on maxilliped 2 and the elongate ischium on pereopod 1.



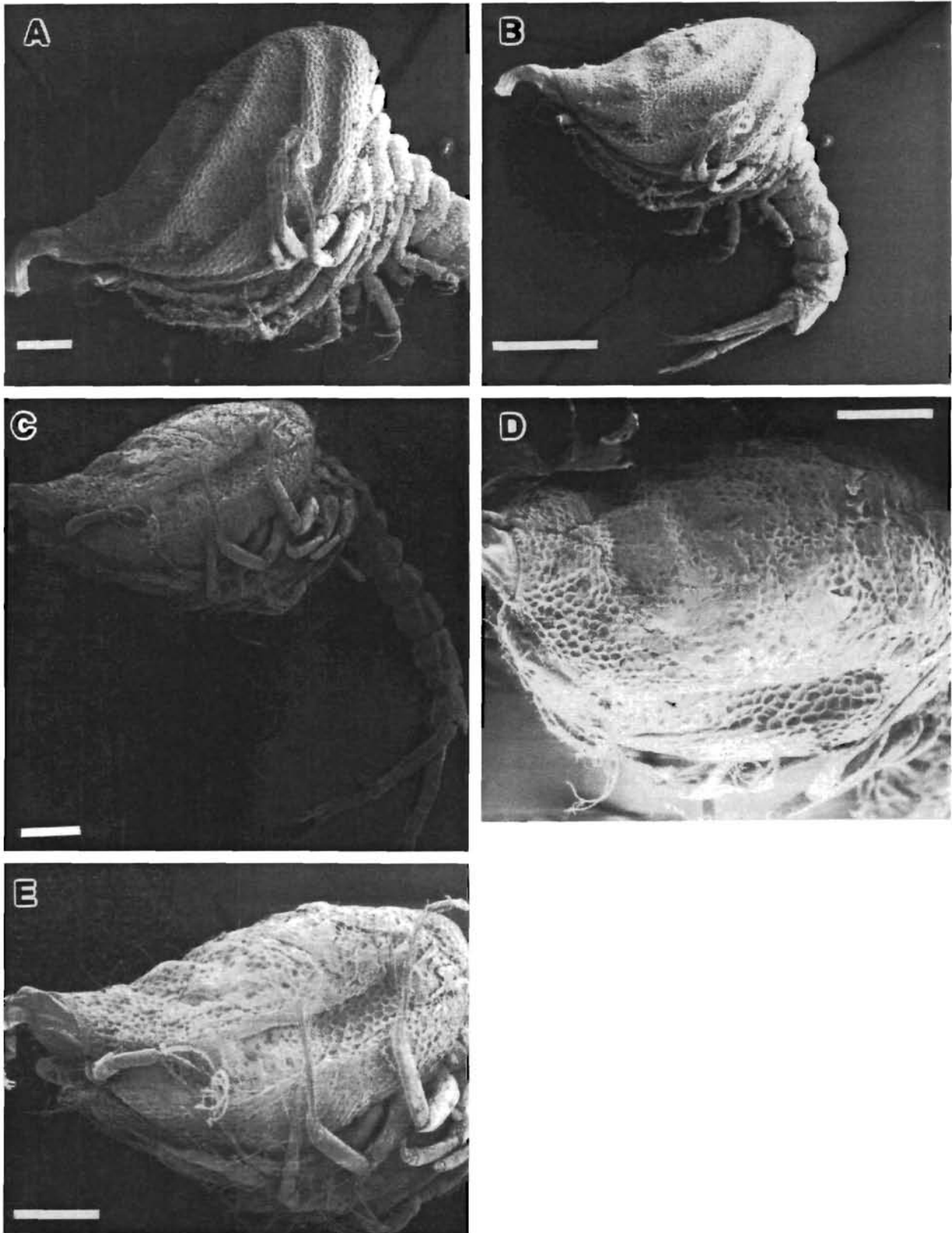
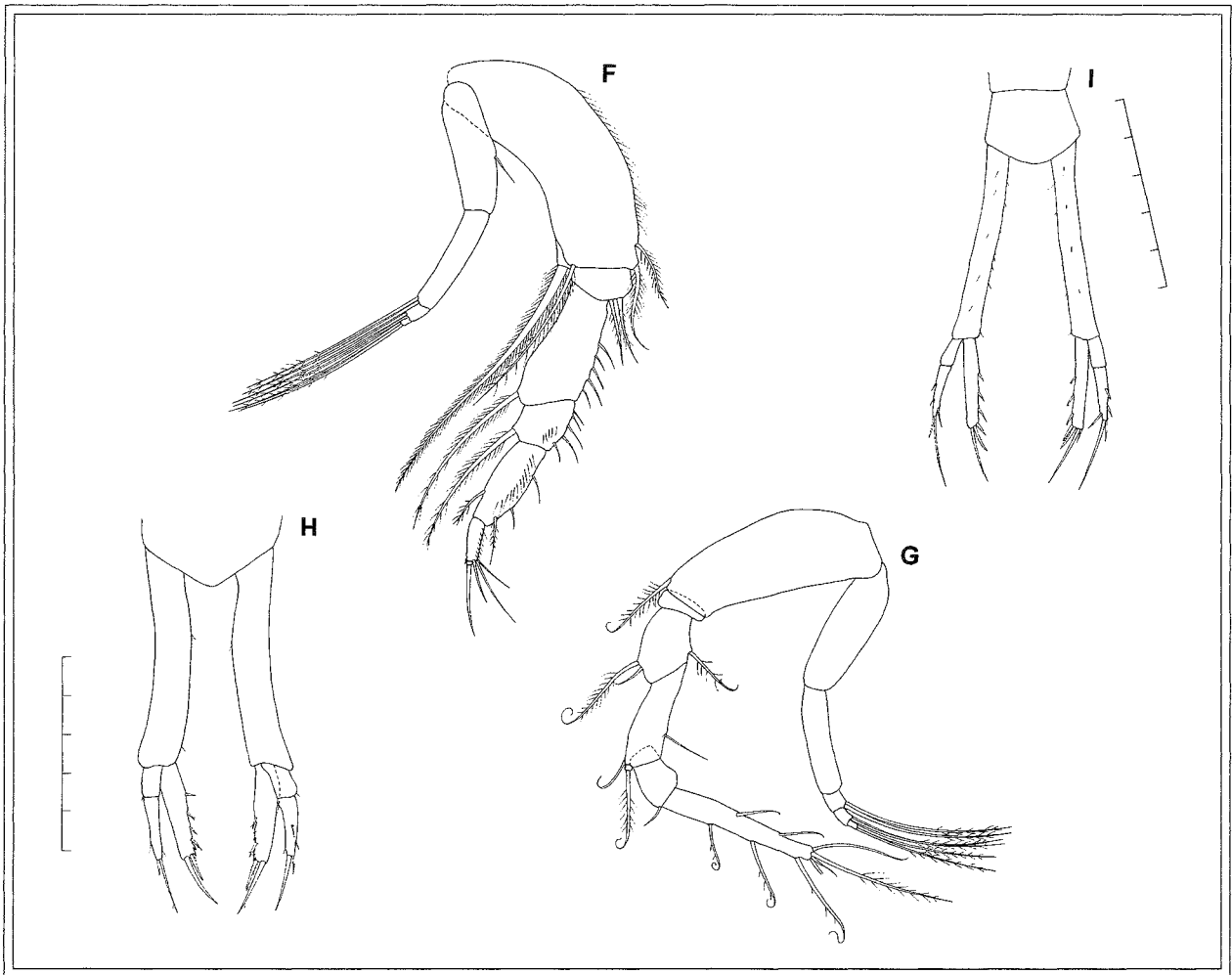


Figure 2.30a. *Campylaspis biplicata* Watling and McCann, new species. Female: A, carapace and pereonites, lateral view; B, body, lateral view. Male: C, body, lateral view; D, carapace, dorsal view; E, same, lateral view. Scale, A = 0.2 mm, C-E = 0.3 mm, B = 0.5 mm.



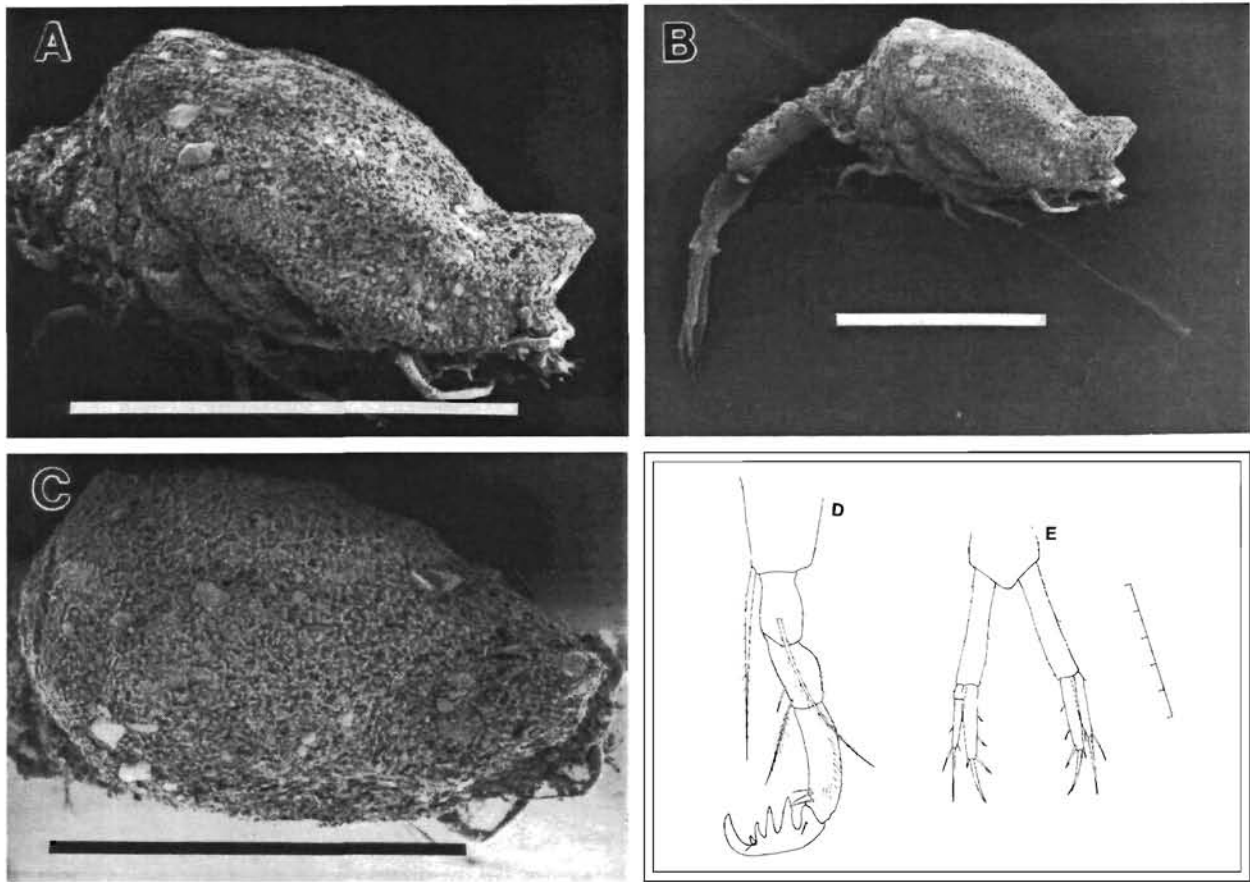
**Figure 2.30b.** *Campylaspis biplicata* Watling and McCann, new species. Female: F, maxilliped 3; G, pereopod 2; H, uropod. Male: I, uropod. Scale H, I = 0.5 mm.

***Procampylaspis caenosa* Watling and McCann, new species**

Figure 2.31

**Material Examined.** Santa Maria Basin Region, Phase II, Cruise 1-1 (November, 1986), Sta. R-1 (3), R-2 (3), PJ-1 (8); Cruise 1-2 (January, 1987), R-1 (6), R-2 (4), R-4 (5), R-5 (7), PJ-1 (3); Cruise 1-3 May, 1987, R-1 (6), R-2 (3), R-4 (1), R-5 (8), PJ-1 (9); Cruise 2-3 (October, 1987), R-1 (6), R-2 (6), R-4 (11), R-8 (6), PJ-1 (6); Cruise 2-4 (January, 1988), R-1 (4), R-4 (15), R-5 (3), R-8 (2), PJ-1 (1); Cruise 2-5 (May, 1988), R-1 (5), R-4 (10), R-5 (3), R-8 (4); Cruise 3-1 (October, 1988), R-1 (6), R-4 (3), R-5 (1), R-8 (2), PJ-1 (6); Cruise 3-4 (May, 1989), R-1 (3), R-4 (10), R-8 (3), PJ-1 (4).

**Description.** Female, 3.0 mm. Carapace slightly elevated dorsally; covered with dense coating of sediment through which shallow lateral sulcus visible, bordered above and below by low ridges, upper of which may bear 3-5 large conical spines; pseudorostral lobes enlarged, directed somewhat upward; eyelobe not distinct. Pereonites 1 and 2 without middorsal projections. Pleonites 1-5 with paired dorsolateral spines. Maxilliped 2, articles 6 and 7 subequal in length; terminal article with 4 large recurved claw-like teeth, and 1



**Figure 2.31.** *Procampylaspis caenosa* Watling and McCann, new species. Female: A, Carapace and anterior pereonites, lateral view; B, body, lateral view; C, carapace, dorsal view; D, maxilliped 2; E, uropods. Scale, A-C = 1 mm, E = 0.5 mm.

smaller tooth nestled between penultimate and last claw. Uropod peduncle 1.5 times length of endopod; medial margin of peduncle unarmed, of endopod with 2 setae; exopod with very long terminal seta, extending to end of endopod terminal seta. Male, similar to female but carapace and uropod peduncles more elongate.

**Remarks.** The combination of conical carapace spines and broad lateral sulcus, along with the details of the maxilliped 2 dactyl, help to distinguish this sediment-covered species. Of the 26 known species of *Procampylaspis*, only 5 have been found at shallow shelf depths.

**Type Locality and Type Specimens.** California, Santa Maria Basin, off Purisima Point, Sta. R-4, 34°43.01'N, 120°47.39'W, 92 m, holotype USNM 273542, paratype USNM 273543 and LACM 95-71.2.

**Distribution.** Known from the Santa Maria Basin region and off Pt. Loma, San Diego, 47-161 m.

**Etymology.** From Latin, *caenosus*, = muddy, dirty, referring to the covering of sediment particles on the carapace surface.

Genus *Cumella* Sars, 1865

**Type Species.** *Cumella pygmaea* Sars, 1865

**Diagnosis** (from Watling, 1991b). Carapace anteroventral corner acute to slightly rounded, not strongly projecting; ocular lobe single, middorsal; siphons united medially, occasionally slightly separated; pseudorostral lobes of varying length, usually slightly to strongly upturned, meeting in front of eyelobe. Mandible molar columnar. Maxilla with movable endites. Antenna 1 peduncle article 2 with or without process, subequal to or longer than article 3. Maxilliped 1 of normal length. Female maxilliped 3, pereopods 1 and 2 with exopods; male maxilliped 3 and pereopods 1-4 with exopods. Uropod peduncle usually as long as or longer than pleonite 6; exopod basal article short, not submerged in peduncle; exopod much longer than its terminal seta.

**Remarks.** Following the lead of Bacescu (1971) who erected the first subgenus in this very large genus, Watling (1991b) added three additional subgenera in an attempt to define some pattern among the species. For diagnoses of the subgenera, see Watling (1991b).

*Cumella (Cumella) morion* Watling and McCann, new species

Figure 2.32

**Material Examined.** Santa Maria Basin Region, Phase II, Cruise 1-1 (November, 1986), Sta. R-4 (17); Cruise 1-2 (January, 1987), R-1 (8), R-4 (5), R-8 (11); Cruise 1-3 (May, 1987), R-1 (13), R-4 (39), R-8 (4); Cruise 2-3 (October, 1987), R-1 (1), R-4 (24), R-8 (14); Cruise 2-4 (January, 1988), R-1 (4), R-4 (21), R-5 (1), R-8 (8), PJ-1 (1); Cruise 2-5 (May, 1988), R-1 (2), R-4 (107), R-8 (5); Cruise 3-1 (October, 1988), R-1 (4), R-4 (31), R-8 (16); Cruise 3-4 (May, 1989), R-1 (1), R-4 (110), R-8 (4).

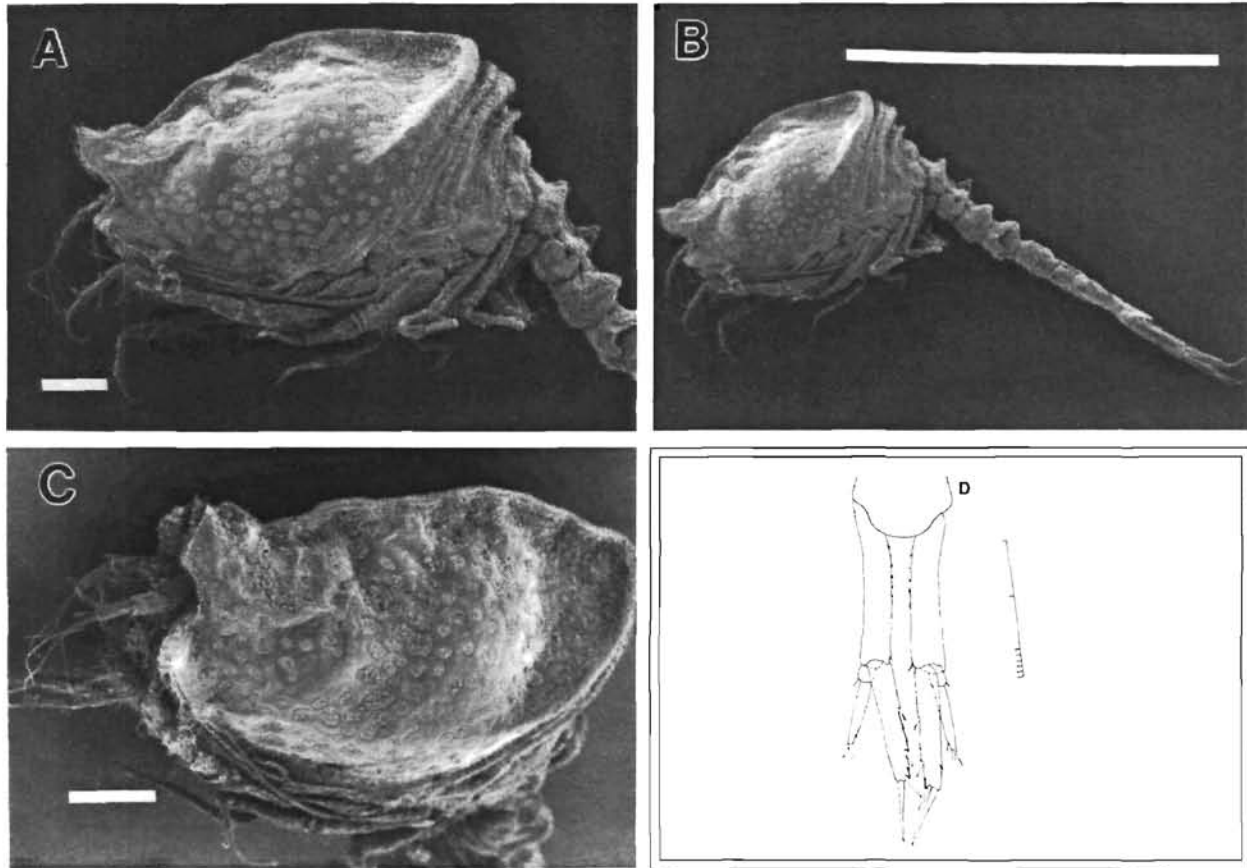
**Description.** Female, 1.5 mm. Carapace with flared ridge along posterodorsal margin, dorsally joining large middorsal crest which originates on frontal lobe; eyelobe without obvious lenses; pseudorostral lobe with short, curved horizontal ridge extending onto carapace frontal lobe. Pereonites 1 and 2 with thickened posterior margin; pereonite 3 with slight middorsal process. Body compressed laterally. Pleonites 1 -4 with dorsally-directed middorsal processes. Uropod peduncle and endopod subequal in length, about as long as last 2 pleonites combined; endopod with 2 medial setae and 2 terminal setae.

**Remarks.** This species is quite similar in carapace shape and appendage morphology to *C. (C.) rigida* Gamô and *C. (C.) sadoensis* Gamô, but differs from both in not possessing a dorsolateral vertical ridge midway along the carapace and in bearing vertical processes on pleonites 1 - 3.

**Type Locality and Type Specimens.** California, Santa Maria Basin, off Purisima Point, Sta. R-4, 34°43.01'N, 120°47.39'W, 92 m, holotype USNM 273544, paratype USNM 273545 and LACM 95-71.1.

**Etymology.** A morion is a visor-less helmet with a high crest worn by some 16th century soldiers, for example, the Spanish conquistadors who frequented the Californian shores, and to which the carapace of this species bears some resemblance.

**Distribution.** Known only from the Santa Maria Basin region, most abundant at the 90 m stations, but occasionally found to 154 m.



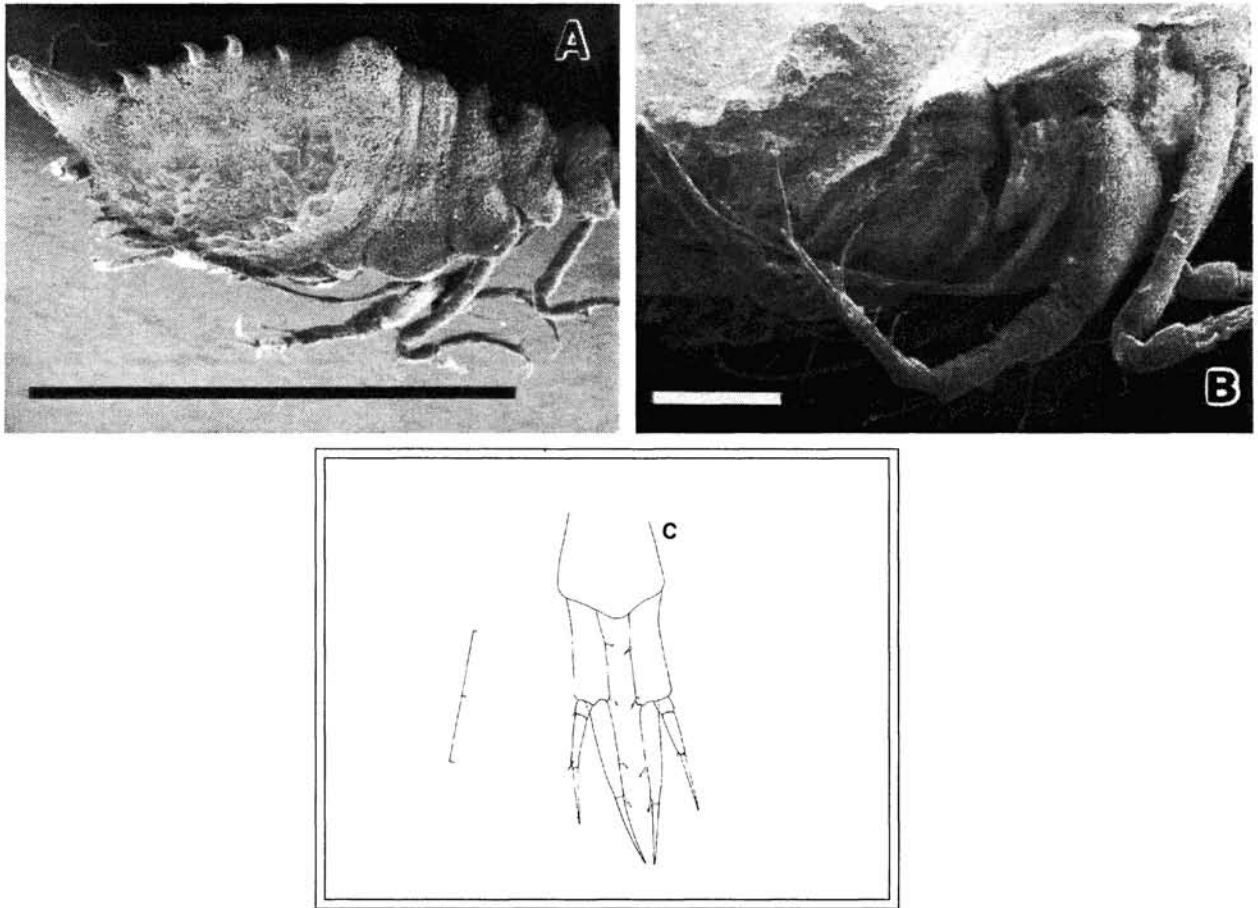
**Figure 2.32.** *Cumella (Cumella) morion* Watling and McCann, new species. Female: A, carapace, pereonites, and anterior pleonites, lateral view; B, body, lateral view; C, carapace, anterodorsal view; D, uropods. Scale, A,C, D = 0.2 mm, B = 1 mm.

***Cumella (Cumella) californica* Watling and McCann, new species**

Figure 2.33

**Material Examined.** Santa Maria Basin Region, Phase II, Cruise 1-1 (November, 1986), Sta. R-4 (2), PJ-1 (1); Cruise 1-2 (January, 1987), R-4 (4), R-5 (1), R-8 (2), PJ-1 (1); Cruise 1-3 (May, 1989), R-4 (1), R-5 (5), R-8 (1), PJ-1 (6); Cruise 2-3 (October, 1987), R-4 (24), R-5 (3), R-8 (4), PJ-1 (1); Cruise 2-4 (January, 1988), R-4 (7), R-5 (1), R-8 (6), PJ-1 (4); Cruise 2-5 (May, 1988), R-4 (2), R-5 (1), R-8 (13), PJ-1 (2); Cruise 3-1 (October, 1988), R-4 (9), R-5 (2), R-8 (20), PJ-1 (3); Cruise 3-4 (May, 1989), R-4 (23), R-8 (3), PJ-1 (15).

**Description.** Female, 2 mm. Carapace with swollen ridge parallel to posterior margin, giving appearance of elevated submarginal region dorsally; 4-5 spines in middorsal row beginning on frontal lobe; eyelobe small; pseudorostral lobes directed forward, subacute. Pereonites with flared lateral margins, becoming nearly horizontal. Uropod peduncle as long as last pleonite; endopod as long as peduncle, with elongate, partially fused terminal seta; exopod distal article as long as terminal seta.



**Figure 2.33.** *Cumella (Cumella) californica* Watling and McCann, new species. Female: A, carapace and pereonites, dorsolateral view; B, pereonites and pereopods 1-3; C, uropods. Scale, A = 1 mm, B,C = 0.2 mm.

**Remarks.** In addition to the new species described here, three *Cumella (Cumella)* species are known to have coarse spines along the middorsal crest of the carapace, viz., *C. (C.) arguta* Gamô, *C. (C.) meridionalis* Jones, and *C. (C.) quadrispinosa* Gamô. None have the broadly flaring pleurites nor the short uropod peduncles seen in *C. (C.) californica*.

**Type Locality and Type Specimens.** California, Santa Maria Basin, off Purisima Point, Sta. R-4, 34°43.01'N, 120°47.39'W, 92 m, holotype USNM 273540, paratype USNM 273541 and LACM 95-70.1.

**Distribution.** Known from the Santa Maria Basin Region and off Pt. Loma, San Diego, 45-154 m.

## Acknowledgements

We would like to express our appreciation to several people who helped with the production of this paper. Most of the line drawings in the species descriptions are the wonderful handiwork of Patrice Rossi, with a few being contributed by B. McKenzie. The original introductory figures are the work of C. Chisholm. Very able assistance with the SEM was always kindly given by K. Edwards. Additional distribution records were made available by Tim Stebbins of the City of San Diego Marine Biology Lab, and the participants of a cumacean workshop held at Friday Harbor Laboratories in February, 1995. This project was supported by the U.S. Department of the Interior, Minerals Management Service, under Contract No. 14-35-0001-30484.

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## Attachment I

### Phase I and II manuscript names with formal equivalents

#### Family Diastylidae

*Diastylis paraspinulosa* = *D. sentosa* **new species**

*Diastylis* sp. 1 = *Diastylis pellucida* Hart, 1930

*Diastylis* sp. 2 = *Diastylis sentosa* **new species**

*Diastylis* sp. 5 = *Diastylis santamariensis* **new species**

*Diastylis* sp. A = *Diastylis crenellata* **new species\***

*Diastylis* sp. E = *Diastylis quadriplicata* **new species**

*Leptostylis longimana* = *Leptostylis calva* **new species**

*Leptostylis villosa* = *Leptostylis* ? (specimens too damaged, but are definitely not *L. villosa*).

*Leptostylis* sp. 1 = *Leptostylis abditis* **new species**

*Leptostylis* sp. A = *Leptostylis calva* **new species**

*Leptostylis* sp. E = *Diastylis crenellata* **new species\***

#### Family Leuconidae

*Hemileucon* sp. 1 = *Alloeoleucon santamariensis* **new species**

*Leucon* sp. H = *Leucon (Diaphonoleucon) declivis*, **new species**

*Leucon* sp. A = *Leucon (Leucon) falcicosta*, **new species**

*Leucon* (? *Epileucon*) sp. B = *Leucon (Crymoleucon) bishopi* Bacescu, 1988

*Eudorella* sp. 2 = *Eudorella redacticruris* **new species**

*Eudorella* sp. 1 = *Eudorella truncatula* Bate, 1856

#### Family Nannastacidae

*Campylaspis* sp. N = manca, probably of *C. rubromaculata*

*Campylaspis* sp. 6 = *Campylaspis rufa* Hart, 1930

*Campylaspis* sp. 1 = *Campylaspis maculinodulosa*, **new species**

*Campylaspis* sp. 10, *Campylaspis* sp. 12 = *Campylaspis hartae* Lie, 1969

*Campylaspis* sp. E = *Campylaspis blakei*, **new species**

*Campylaspis* sp. B, sp. 7, sp. 8, sp. 9, and *Campylaspis* nr. *crispa* = *Campylaspis biplicata*, **new species**

*Campylaspis* sp. 4 = *Procampylaspis caenosa*, **new species**

*Cumella* sp. 1 = *Cumella (Cumella) morion*, **new species**

*Cumella* sp. 2 = *Cumella (Cumella) californica*, **new species**

\*Note that *Diastylis crenellata* is correctly listed twice on the checklist.

## Attachment II

List of cumaceans previously found in the Oregonian Province

### Family Diastylidae

*Anchicolurus occidentalis* (Calman, 1912) as  
*Colurostylis* (?)

*Diastylis abbotti* Gladfelter, 1975

*Diastylis californica* Zimmer 1936

*Diastylis paraspinulosa* Zimmer, 1926

*Diastylis pellucida* Hart, 1930

*Diastylis umatillensis* Lie, 1969

*Diastylopsis dawsoni* Smith, 1880

*Leptostylis villosa* Sars, 1869 (doubtful record  
of Hart, 1930)

### Family Lampropidae

*Hemilamprops californica* Zimmer, 1936

*Hemilamprops gracilis* Hart, 1930

*Lamprops carinata* Hart, 1930

*Lamprops quadriplicata* Smith, 1879

*Lamprops serrata* Hart, 1930

*Lamprops tomalesi* Gladfelter, 1975

*Lamprops triserrata* Gladfelter, 1975

*Lamprops krasheninnikovi* Derzhavin, 1926

*Lamprops obfuscata* (Gladfelter, 1975)

*Mesolamprops bispinosa* Given, 1964

*Mesolamprops dillonensis* Gladfelter, 1975

### Family Leuconidae

*Eudorella pacifica* Hart, 1930 (includes  
*Eudorella tridentata* Hart, 1930)

*Eudorellopsis biplicata* Calman, 1912

*Eudorellopsis integra* Smith, 1879

*Eudorellopsis longirostris* Given, 1961

*Leucon armatus* Given, 1961

*Leucon magnadentata* Given, 1961

*Leucon subnasica* Given, 1961

### Family Nannastacidae

*Campylaspis canaliculata* Zimmer, 1936

*Campylaspis hartae* Lie, 1969

*Campylaspis rubromaculata* Lie, 1969

*Campylaspis rufa* Hart, 1930

*Cumella vulgaris* Hart, 1930

### Family Bodotriidae

*Cyclaspis nubila* Zimmer, 1936

### 3. THE TANAIIDACEA

by

Masahiro Dojiri<sup>1</sup> and Jürgen Sieg<sup>2</sup>

#### Introduction

The Tanaidacea is an order of free-living and exclusively benthic malacostracans belonging to the Peracarida, which also includes the orders Mysidacea, Amphipoda, Cumacea, Isopoda, Spelaeogriphacea, and Mictacea. Presently, the tanaids include three recent suborders (i.e., Apseudomorpha, Neotanaidomorpha, and Tanaidomorpha) and one extinct suborder (i.e., Anthracocaridomorpha), 21 families, and about 700 extant species. Most species are exclusively marine, but a few are known to occur in fresh or brackish water. Species that have been reported from fresh water are typically marine, euryhaline species. There are no strictly fresh water Tanaidacea. This order is most closely related to the Isopoda (see Siewing, 1953; Fryer, 1964; Sieg, 1983a), although Watling (1981) considered it a sister taxon to the Cumacea.

#### Taxonomic History

The first tanaidacean ever described is probably "*Gammarus heteroclitus*" recorded by Viviani (1805) from Genoa, Italy. The published illustrations are reminiscent of members of the genus *Leptochelia*, but the species cannot be identified with any certainty. For this reason, it was listed as *incertae sedis* under the family Paratanaidae (now Leptocheliidae) by Sieg (1983b). Prior to the discovery of Viviani's work, "*Cancer Gammarus Talpa*," now attributed to *Apseudes talpa* and described by Montagu (1808), was considered the first known tanaidacean. In both cases, the incorrect identifications indicate that the authors thought that these organisms belonged to the Gammaridea (Amphipoda). Although Latreille (1831) had transferred these species to the isopodan group "Heteropa" (= Heteropoda), their supposed amphipod affiliation could still be found in Gerstaecker (1883).

These tanaid species then were taxonomically grouped with the Isopoda for quite some time. Milne-Edwards (1840) thought that the known species should be included in the "Idoteides", while White (1847, 1850) placed them in the "Asellita." Dana (1852) introduced the name "Anisopoda" which indicated that this group of miscellaneous species represented a very unusual group among the isopods. This prompted Bate and Westwood (1868) to place them in the "Tribus Vagantia" of their "Isopoda Aberrantia" which contained anthurid and gnathiid isopods among others. G. O. Sars (1882) named them "Isopoda chelifera."

Finally, Claus (1888) elevated the Anisopoda to the ordinal level, a taxonomic position equal to that of the Isopoda. Hansen (1895) introduced the name Tanaidacea, which is now the commonly accepted name for the order.

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<sup>2</sup> Universität Osnabrück, Standort Vechta, Driverstraße 22, 2848 Vechta, Germany. Dr. Sieg passed away due to an inoperable brain tumor on 14 August 1996, 17 days before his 50th birthday. He leaves behind his wife Angelika and his two children Rebecca and David.

The systematics of some tanaidacean groups is still in a state of flux. Many new species remain to be described, and the diversity within this order is only now being recognized. So far about 700 species have been described, but the estimated number of tanaidacean species calculated from deep-sea samples could raise this number well over 3,000 species.

Tanaidaceans have a relatively well-known fossil record that dates back to the Lower Carboniferous (Schram, 1974; Sieg, 1983a, 1984a) and shows the first radiation in the Jurassic (Schram *et al.*, 1986). Even some Eocene specimens are known (Sieg, unpublished data).

Since G. O. Sars (1882), only two families, Tanaidae and Apseudidae, were recognized until Lang (1949) published his first paper on the Tanaidacea; this paper marks the starting point for a more complex, but better foundation for the systematics of this order. In the following years, Lang (1956a, 1956b, 1970, 1971, 1973) published a series of papers not only describing a few new families, but also dividing the order into two suborders Monokonophora and Dikonophora. Subsequently, the classification was further revised by Sieg (1973, 1976, 1980a, 1984a) who included the fossil record in his analysis.

Four suborders are presently recognized. The first suborder, Anthracocaridomorpha, contains exclusively Carboniferous and Permian species. The second suborder, Apseudomorpha, consists of fossil species from the Jurassic (Schram *et al.*, 1986) as well as all the extant taxa formerly united in the Monokonophora. The third suborder, Neotanaidomorpha, is a group of exclusively deep-sea species (Gardiner, 1975) which have no known fossil record. The final suborder, Tanaidomorpha, includes one fossil (Jurassic) species and all remaining taxa formerly grouped under the suborder Dikonophora.

## External Morphology

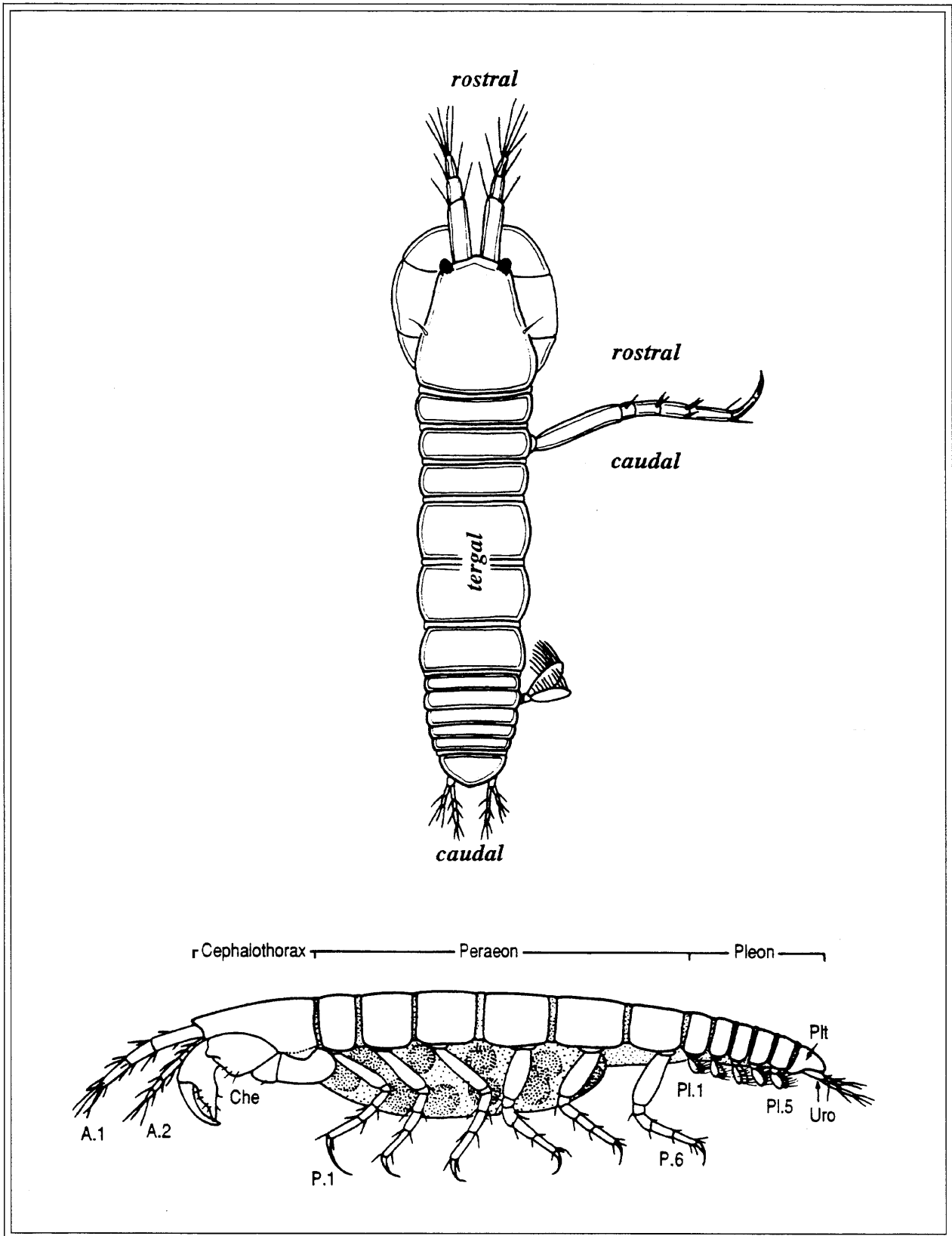
Because the tanaidacean fauna collected for this study belongs predominantly to the suborder Tanaidomorpha, much of the general discussion on morphology presented here focuses on this suborder. Additionally, however, morphological features of the Apseudomorpha, specifically the Apseudidae, that differ from those of the Tanaidomorpha are discussed. Much of the information provided here is taken from the compilation published by Sieg (1984a).

### Body Shape

The general habitus of the tanaidomorphans is characterized by its cylindrical body shape, while that of the apseudomorphans is dorsoventrally depressed. Terminology for the descriptions of the surfaces of body **somites** and appendages follow that of Lang (1968): **tergal** and **sternal** are synonymous with dorsal and ventral, respectively; **rostral** and **caudal** are synonyms of anterior and posterior, respectively (Figure 3.1).

The body (Figure 3.1), ranging in total length from 1 to 37 mm, always consists of three tagmata of which the first one, the **cephalothorax**, is formed by the fusion of the **cephalon** and the first two **thoracomeres**. A small **carapace** encloses the **branchial chamber**. Eight appendages, seven of which are paired, are found attached to this region: antenna 1 (**antennule**), antenna 2 (**antenna**), **labrum** (unpaired), **mandibles**, maxilla 1 (**maxillules**), maxilla 2 (**maxilla**), **maxilliped** (thoracopod 1), and **cheliped** (thoracopod 2).

The remaining six free thoracomeres are called **pereonites** (or pereomeres), each bearing one pair of **uniramous** walking legs, the **pereopods**, and collectively forming the second tagma referred to as the **pereon**. Only the first pair of pereopods bear **exopodites**. The last tagma, the **abdomen** or **pleon**, is predominantly six-segmented and composed of five **pleonites** and a **pleotelson**. Sometimes the pleonites are reduced in number or totally fused with the pleotelson. Typically, each pleonite bears one pair of **biramous pleopods**. Pleopods may be present or absent. Usually only the last abdominal somite is fused with the **telson**, forming the pleotelson. The appendages of the pleotelson, the **uropods**, are filiform or styliform, and uni- or biramous, but may be reduced in some tanaidomorphan families.



**Figure 3.1.** Generalized habitus of a tanaidomorphan: top, dorsal view; bottom, lateral view.

Genital openings are found on the **coxae** of the fourth pair of pereopods (thoracopod 6) in the female. In the male, these openings are centered on a cone located on the **sternite** of the last pereonite (thoracomere 8). Some species of tanaidaceans have one slender, elongate “genital cone” having one common outlet for both **testes** (“*Monokonophora*” *sensu* Lang), but others have two cones, each with an outlet for one testis (“*Dikonophora*” *sensu* Lang). Various intermediate stages exist between these two extremes: a single genital cone can be relatively broad and bear two openings, or the cone may be deeply incised resulting in a dicondyl (bilobed) type of genital cone.

Hooks, referred to as **hyposphaenia**, are located on the sternites of some of the pereonites in apseudids and occasionally in tanaidomorphans. Ridges may occur on the sternal area of the pleonites (e.g., *Scoloura*).

Females of some tanaidacean species lack pleopods, while females of other species have a reduced number of pleonal somites.

The reduction in the number of pleonal segments is a more or less common feature within the Tanaidae in which the pleon is composed of up to five pleonites of which only three are fully developed. Each of the three distinct pleonites bear one pair of pleopods. The evolutionary fate of the posterior two pleonites differs among the various genera of this family. For example, in phylogenetically primitive genera of the Tanaidae, the last two pleonites remain separate, but are distinctly smaller and never have pleopods. In more derived genera (e.g., *Zeuxo*) the last two pleonites are represented by two small **tergites** dorsally, but by only a single sclerite ventrally. Furthermore, in some genera, one or both of the pleonites may be absent, resulting in a four-segmented (e.g., *Tanais*) or three-segmented (e.g., *Pancolus*) pleon.

Typically, the pleonites are as wide as the pereonites. In contrast, within the subfamily Anarthrurinae, the pleonites of the females are usually narrower than the pereonites. This is also the case in some species of the Akanthophoreinae.

Sexual dimorphism is commonly observed in the general habitus of most tanaidacean groups with the exception of the Tanaidae. Males often look quite different from the females. For example, the “**swimming males**”, found in such families as the Paratanaidae, Anarthruridae, Typhlotanaidae, Pseudotanaidae, among others, have a much more strongly developed pleon than the female and bears well-developed pleopods. Even in those taxa in which the females lack the pleopods, these appendages are still present in the corresponding males. In taxa that have an abbreviated post-marsupial development in the male, the **subadult males** may look quite similar to the females, but can be distinguished by a stouter antenna 1 and somewhat more strongly developed pleon.

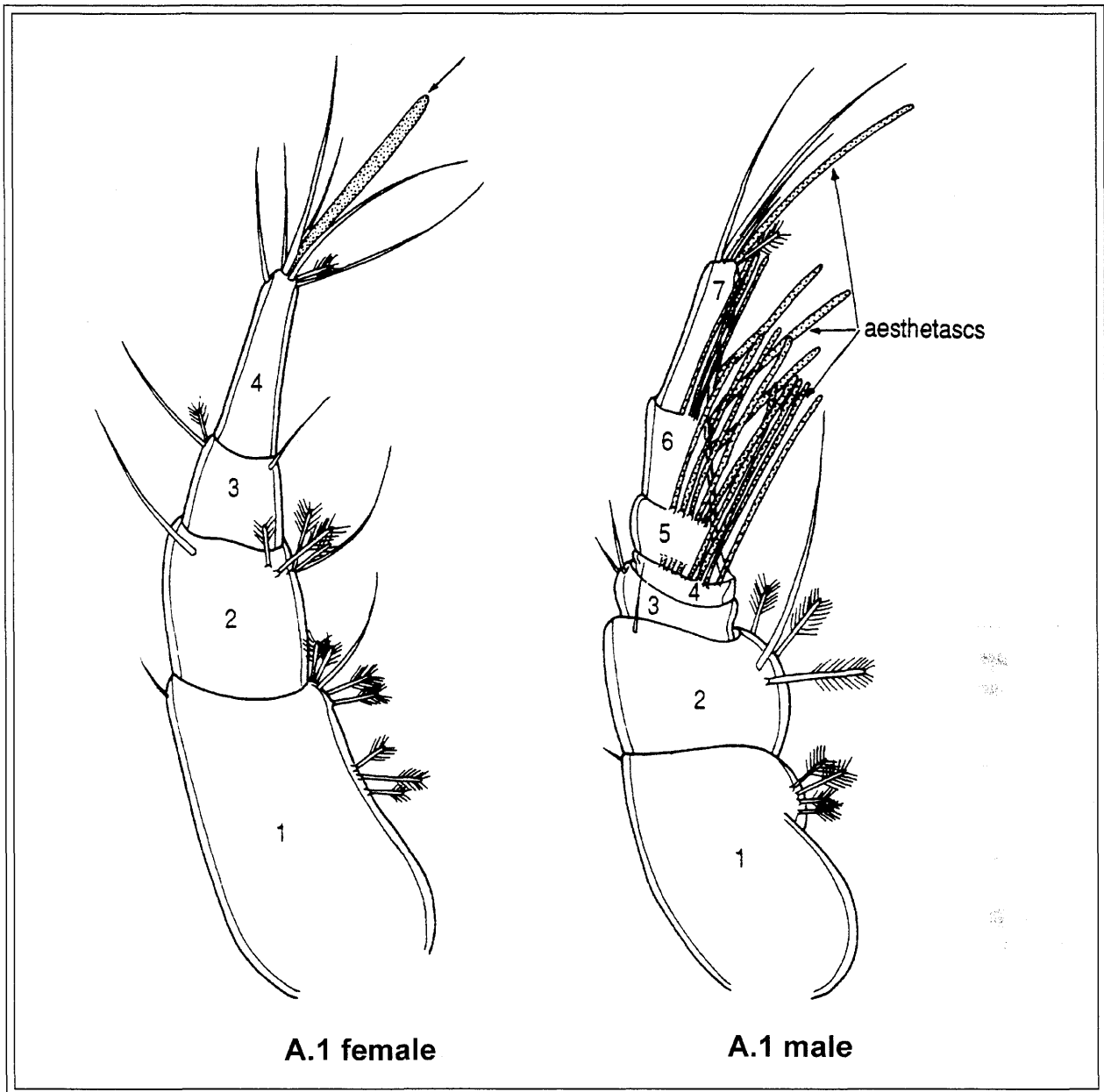
### Antenna 1

In most tanaidacean species, antenna 1 (Figure 3.2) is uniramous and uniform in structure. Major differences occur only between sexes.

Antenna 1 in the female typically is three- or four-segmented. The four-segmented condition is most likely plesiomorphic, and, apparently, the three-segmented state is the result of the fusion of the two proximal segments. This proposed transformation series is supported by the presence of one or two long setae at the midlength of the first segment; these setae are thought to mark the original segmental suture of the plesiomorphic segments. The last segment typically bears one single distal **aesthetasc**.

Antenna 1 of the male is always seven-segmented in those groups that have “swimming males” (e.g., Anarthruridae, Pseudotanaidae, among others). In these taxa, there is a three-segmented **peduncle** and a four-segmented **flagellum**. Each segment of the flagellum bears a large group of aesthetascs. Some long setae typically occur on the terminal segment.

Males of the Leptocheliidae are characterized by an antennal flagellum consisting of three or more segments. Each flagellar segment is not annular as in the “swimming males” of the other families but more elongate, and morphologically similar to a normal segment. Typically, they bear a group of at least 3-5 aesthetascs.



**Figure 3.2.** Generalized first antenna of female and male tanaidomorphan.

In the Tanaidae, in which sexual dimorphism is weakly expressed, antenna 1 of the male is only somewhat more elongate than in the female, but otherwise is similar.

### **Antenna 2**

Antenna 2 (Figure 3.3) typically is six-segmented and does not show any great morphological variability.

The first segment is small and in most cases semicircular in cross-section. Unfortunately, it is quite often overlooked, resulting in an incorrect count of segments. The second and third segments are distinct and each typically bears a distal seta on its outer border. Segment four is elongate and always bent ventrally. The distinctly 7-segmented antenna 2 of the members of the genus *Heterotanooides* Sieg, 1973

(Kudinova-Pasternak, 1977; Sieg, 1973, 1977b, 1986a) and the possible remnant of the segmental suture still present in many Akanthophoreinae species suggest that the fourth segment may be the result of the fusion of two segments. Segment five is similar in length and shape to the fourth, while the sixth is always tiny and conical in the Tanaidomorpha. In some genera the sixth segment appears to be fused to the fifth, resulting in a “five-segmented” antenna 2.

The antenna 2 of apseudids differ from that just presented for tanaidomorphans.

### **Mouthparts**

Sexual dimorphism within the mouthparts is one of the characteristic features of the suborder Tanaidomorpha. The only exception to this general rule is the Tanaidae in which males and females have morphologically identical mouthparts. In all other tanaidomorphan families, adult males have strongly reduced mouthparts (Sieg, 1984a).

Morphological reduction does not occur in the **palpus** of maxilla 1 and the **epignath** in tanaidomorphan species. Both are generally found to be functionally active in the respiratory chamber. In some species, i.e., *Siphonolabrum fastigatum* Sieg, 1986, the maxilla 2 and remnants of the maxilla 1 **endite** may also be present (Sieg, 1986a). In other species, mostly in “swimming males,” only the maxilliped remains, while the other mouthparts are fused to the labrum forming a conspicuous “**epistome**.” Leptocheliidae do not have a functional maxilliped, but instead have two small lamellae occasionally bearing some setae.

### **Labrum**

The labrum is always hood-shaped (a convex flap) and morphologically uniform throughout the entire suborder Tanaidomorpha (Figure 3.3), except in *Siphonolabrum* Lang, 1973 (Figure 3.12).

### **Mandible**

The detailed morphology of the mandible (Figure 3.3) of tanaidomorphans is an important diagnostic character in distinguishing genera and species. For this reason, illustrations of this appendage is mandatory in taxonomic descriptions. Unfortunately, some structures, e.g., the **lacinia mobilis** or the **pars molaris**, may look quite different depending upon the viewing angle.

In all tanaidomorphan genera, each one of the mandibular pair is different (asymmetric) from the other member and generally lacks a palpus. Each consists of the mandibular body (corpus mandibularis), a mandibular projection (pars molaris), an articulated “cutting blade” (lacinia mobilis), and a fixed distal “cutting blade” (pars incisiva). Some setae located near the lacinia mobilis are present in members of the family Tanaidae; these setae are probably the remnants of the much better developed spine-row found in the Apseudoidea.

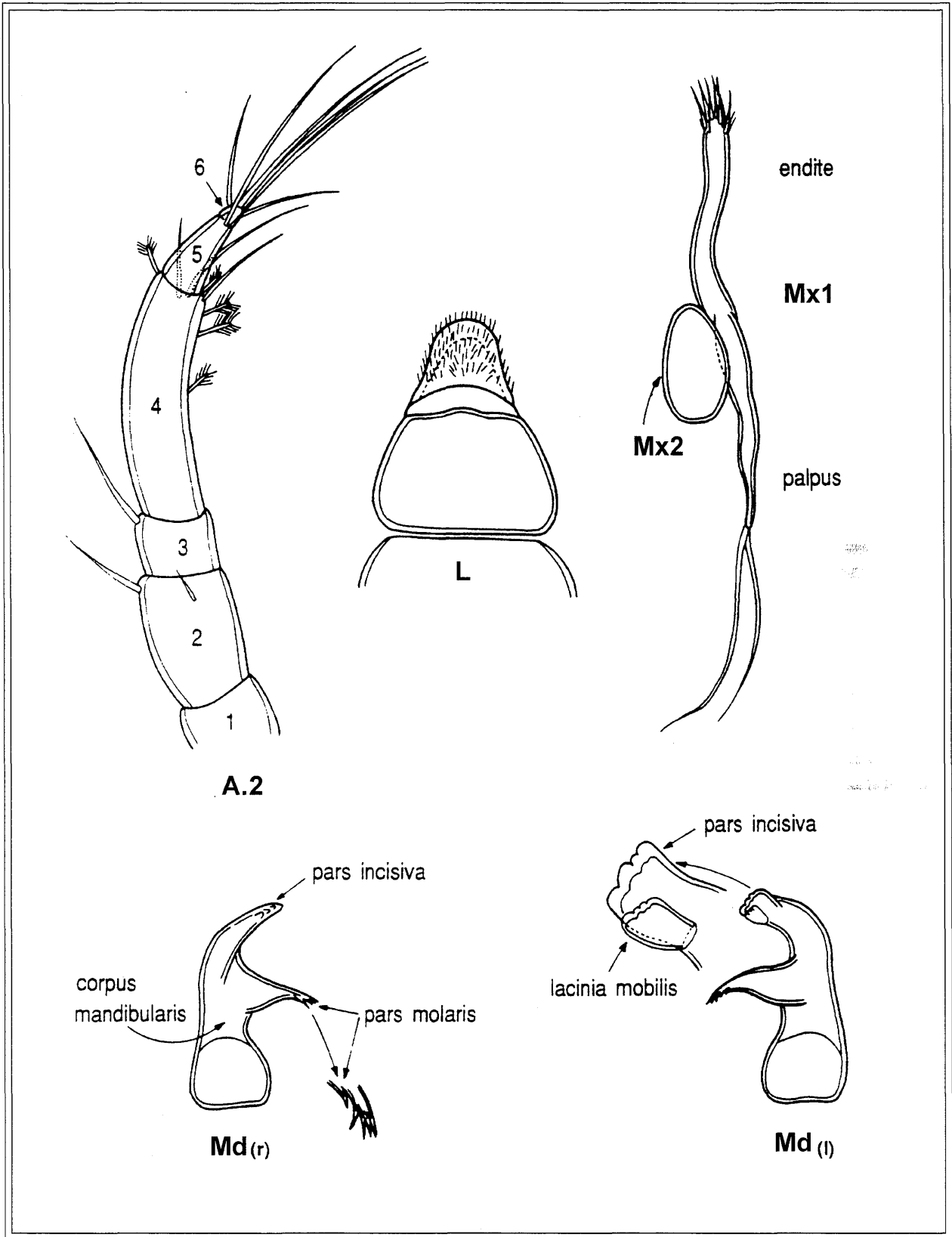
The asymmetry of the mandibles generally is expressed in the reduction of the lacinia mobilis of the right mandible. Within the Tanaidomorpha, the lacinia mobilis of the right mandible is freely articulated only in members of the Tanaidae, but is fused to the pars incisiva in the remaining families. This fusion results in a “two-pointed” pars incisiva.

Within the Leptocheliidae and Typhlotanaiidae these structures are not good generic or specific discriminants because all species within a particular family seem to have nearly identical mandibles.

On the other hand, the lacinia mobilis of the right mandible in the members of the Tanaidae shows various degrees of morphological reduction and, therefore, is a valuable character in species identification (Sieg, 1980b).

In other families, e.g., Anarthruridae and Pseudotanaiidae, the morphology of the pars molaris is one of the most important taxonomic characters at the generic and specific levels. As first shown for *Pseudotanais*, species that otherwise resemble each other in body shape and armature of appendages can easily be distinguished by the shape of the pars molaris (Sieg, 1977a). For many anarthruridean genera, the general shape of the pars molaris is characteristic; species can be distinguished from each other by small morphological





**Figure 3.3.** Generalized tanaidomorphan second antenna, labrum, right and left mandible, first maxilla, and second maxilla.

differences at the apex of this structure. Within certain groups, e.g., *Araphura* Bird and Holdich, 1984, a thin, multi-pointed pars molaris is typical; the number and shape (blunt versus pointed) of the processes (tips) on the apex are important specific discriminants (Sieg and Dojiri, 1989).

Finally, within many genera of the subfamily Leptognathiinae and Anarthrurinae the pars molaris is more or less reduced and represented only by a thin weak lobe (e.g., *Tanaopsis* G. O. Sars, 1882) or is totally reduced as in *Siphonolabrum* Lang, 1971.

### First and Second Maxillae

Maxilla 1 (Figure 3.3) exhibits only slight variation among the various tanaidomorphan taxa. It consists of a single endite and a one-segmented palpus. The number of spines on the endite is constant for all species within a specific genus, but may vary among the genera (Lang, 1967). So far the lowest number of observed spines is five and the highest twelve. The palpus typically bears two long terminal setae, except in the family Tanaidae in which a greater number of setae is present in the majority of species.

Maxilla 2 (Figure 3.3) is oval in shape throughout the Tanaidomorpha and occasionally bears one or two setae.

### Paragnath (= Labium or Hypopharynx)

The labium (Figure 3.4) consists of two lobes that are medially fused in the proximal third. It consists of an inner and outer lobe with the outer lobe bearing a small one-segmented palpus distally in the plesiomorphic family Tanaidae. In all other tanaidomorphan families the palpus is absent and the outer lobe has undergone further reduction. In most species of the families Anarthruridae and Typhlotanaidae, the outer lobe is represented by a convex protrusion, while it is totally missing in the Pseudotanaidae.

### Thoracopods

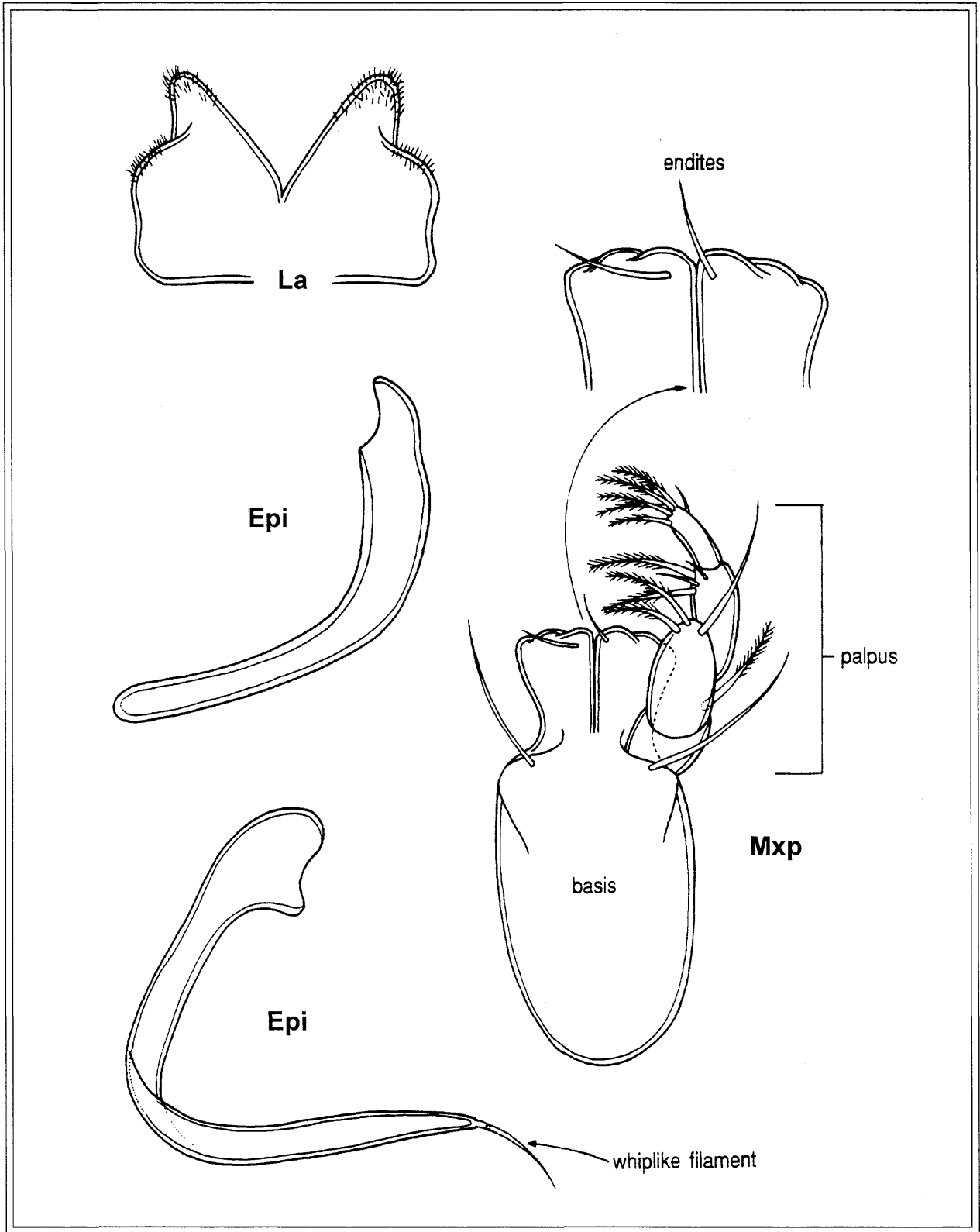
As in all malacostracans, the Tanaidacea have eight thoracic somites of which two, without exception, are fused to the cephalon forming a cephalothorax. The first pair of thoracopods, the maxilliped, is specialized and serves as an additional pair of mouthparts. The second pair has been modified into a cheliped. Therefore, out of the ancestral eight thoracopods, only six pairs of walking legs or pereopods are present.

### Maxilliped and Epignath

The maxilliped (Figure 3.4) is the posteriormost appendage of the mouthparts. The coxa, if present, is small and situated at the base of the appendage. The **basis** is the largest segment and may be partly or completely fused to the other member of the pair. The distal portion of the basis carries a pair of protrusions or lobes referred to as the maxillipedal endites. The endopod consists of four segments and articulates with the basis. A free **ischium** is invariably absent and is probably integrated into the basis. The remaining endopodal segments, collectively known as the palpus, are the **merus**, **carpus**, **propodus**, and **dactylus**. An exopodite is never present throughout the entire order.

Within the Tanaidomorpha, the progressive fusion of the basal region of this appendage is of some taxonomic value. The most plesiomorphic character state is represented by the Tanaidae. In this family, the coxa is still present and the medial borders of the basis, as well as the maxillipedal endite, are not fused. In all other families, the coxa is absent. In the Leptocheliidae, the basis remains unfused as in the Tanaidae, but the coxa is missing. One of the more derived character states is represented by the subfamily Pseudotanainae in which the bases and the endites are completely fused, forming a plate-like structure and enclosing the posterior portion of the mouth chamber. Anarthruridae and Typhlotanaidae exhibit various degrees of fusion along the medial margins of the basis and occasionally of the endite.

The distal margin of each endite usually bears one or two setae and some translucent hemispherical protrusions. In some taxa, the presence or absence and the spatial arrangement of these structures may be of taxonomic importance.



**Figure 3.4.** Generalized tanaidomorphan labium, maxilliped, and epignath.

The basis always bears at least one seta close to the articulation of the palpus. The number of setae on the palpus may play an important taxonomic role in distinguishing genera, especially within the family Leptocheliidae in which some taxa have been described as having up to eight.

So far, the available information on the setation of different palpal segments is not reliable enough to draw any definitive conclusions. The merus (first segment) usually does not bear any setae. The carpus (second segment) usually is equipped with an outer seta which appears spiniform in some species. The inner margin of this segment bears several elements, variable in number as well as in structure: some are setiform, while others are highly sclerotized and spiniform, and sometimes barbed. The number and the combination of spines and setae on this segment might be uniform within the genus or subfamily. The same holds true for the propodus (third segment), but this segment never bears an outer seta. The terminal (fourth) segment, the dactylus, is digitiform and typically bears one small outer seta and a group of inner setae variable in number and size.

Sexual dimorphism in the maxillipeds is common except in the Tanaidae. Even in families in which the males lack mouthparts, remnants of the maxilliped and a normally developed epignath are present. Typically, however, the maxilliped in the male is well-developed. Differences between the two sexes in these taxa are found in the setation and shape of the segments. In contrast, the maxilliped is almost completely reduced in the males of Leptocheliidae. Typically, it is only represented by a small plate-like structure that bears one or two setae. In some leptocheliid males, the remnants of the palpus are represented by knoblike projections.

Articulated to the maxilliped of all Tanaidomorpha is a posteriorly-directed **epipodite**, known as the epignath. In the Tanaidae it is a broad, kidney-shaped structure, while in all other families it is small and elongate (sausage-like). Sometimes the tip is elongate and resembles a whiplike filament.

### **Cheliped**

The general structure of the tanaidomorphan cheliped (Figure 3.5), especially the presence or absence of a coxa, has been a subject of controversy (Lang, 1971; Lauterbach, 1970; Sieg, 1980a, 1984a) and can only be discussed in conjunction with the carapace.

Tanaidomorphan taxa all have a well-developed dorsal carapace which curves ventrally to form a ventral chitinous plate that houses the branchial chamber into which the palpus of maxilla 1 extends and the epignath is located.

Lang (1971) stated that there exist some taxa that have a coxa and others that lack this segment. On the other hand, Lauterbach (1970) in his paper on the cephalothorax of *Tanais cavolinii* Milne-Edwards, 1840 [= *T. dulongii* (Audouin, 1826)] believed the coxa to be absent and used the term **side-piece** (“Seitenstück”) in alluding to this structure. This side-piece, or plate, that lies near the insertion of the cheliped is probably a remnant of the sternite of the second thoracic segment and not the chelipedal coxa as suggested by some authors. These sclerotized plates were referred to as the “coxa” by Lang (1971) and “**pseudo-coxa**” by Sieg (1980b, 1984a); the latter author confirmed Lauterbach’s opinion that a chelipedal coxa is absent in all tanaidomorphan families.

The morphology of the cheliped is uniform throughout the Tanaidomorpha. The cheliped always consists of a well-developed basis which is articulated to the cephalothorax along its proximal margin or at a point slightly removed from this margin and indicated by a conspicuous projection. The ischium is generally thought to be absent, except in the Neotanaidomorpha (Gardiner, 1975). The merus is small and more or less triangular having the carpal articulation along the tergal margin. The carpus is a very large segment bearing two setae on the tergal border, usually one on the proximal and another on the distal areas; the sternal border usually bears some longer setae. The propodus and dactylus together form the **chela**. The sternal part of the propodus is greatly expanded and is called the “**fixed finger**.” The tergal margin of the fixed finger may be characteristically denticulated, while the sternal margin usually bears three setae. The

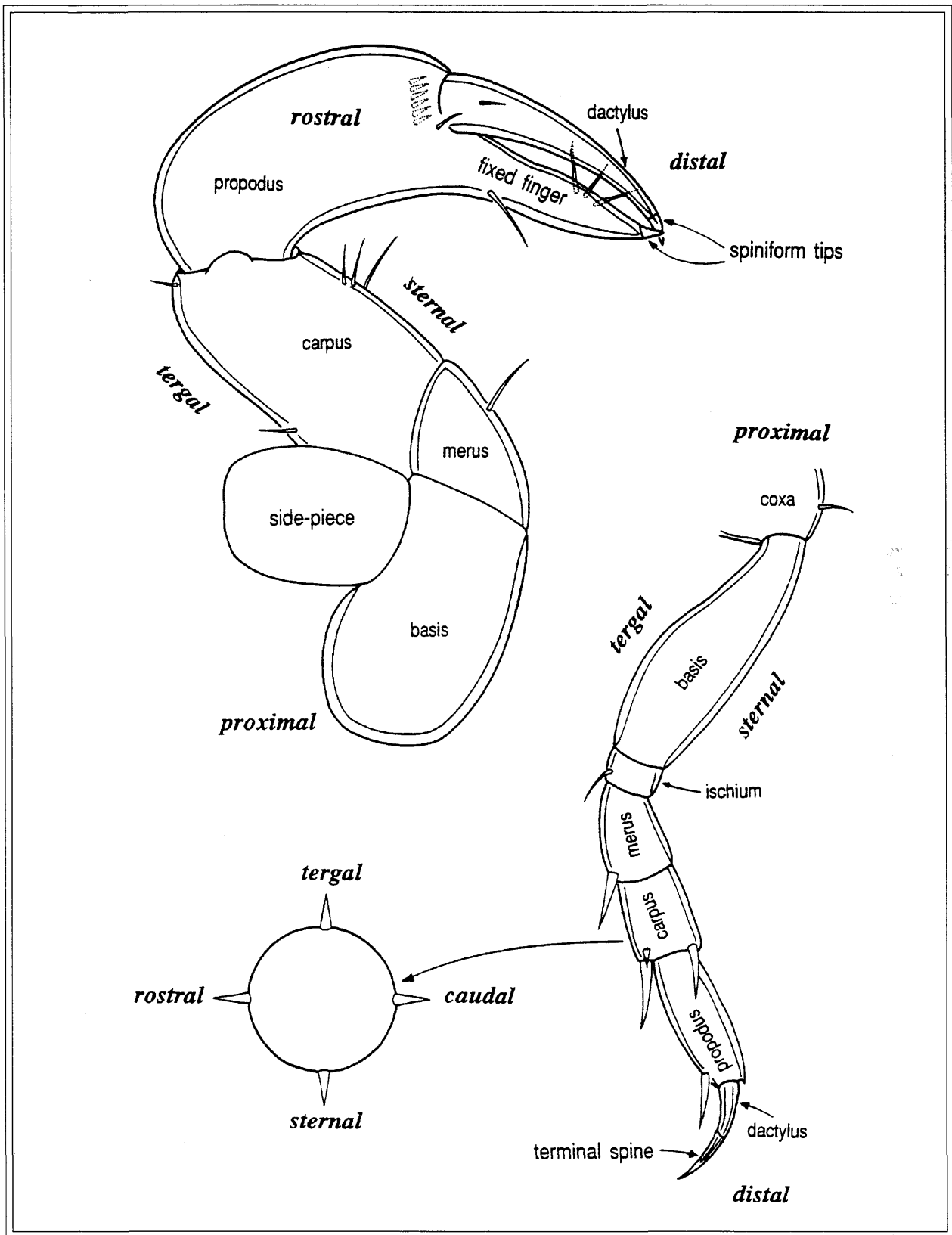


Figure 3.5. Generalized tanaidomorph cheliped and pereopod.

fixed finger and dactylus have strongly sclerotized tips. Typically, there is a row of smaller setae, often referred to as the “comb,” located on the rostral side near the articulation of the dactylus.

Sexual dimorphism in the Tanaidomorpha is often primarily expressed in chelipedal differences. This is a common feature, especially in the Leptocheiliidae in which up to four different kinds of chelipeds can be distinguished in one species [e.g., *Heterotanais oerstedti* (Krøyer, 1842); see Bückle-Ramirez, 1965; Sieg, 1984a]. Fortunately, none of the genera in this atlas has such a complicated post-marsupial development. On the other hand, “swimming males”, which exhibit a general habitus different from that of their corresponding females, possess chelipeds morphologically similar to that of the female.

## Pereopods

The remaining six pairs of thoracopods are called pereopods 1-6 (Figure 3.5). The cheliped has been referred to as the first pereopod by some authors; this misnomer results in seven pairs of pereopods. However, since “pereopod” refers to a “walking leg” and Bate (1856) clearly restricted the term to the appendages of “free” thoracic somites, we prefer the terminology used herein. This point has been discussed in the past to some extent (Wolff, 1956; Lang, 1957; Sieg, 1980b; Messing, 1981).

All pereopods are styliform. Morphological adaptations of the pereopods to different kinds of sediments or habitats, observed in the Apsideoidea, are not found in the Tanaidomorpha. Typically, each pereopod consists of a coxa, basis, ischium, merus, carpus, propodus, and dactylus which bears a strong terminal spine. An exopodite is never developed in the Tanaidomorpha. Within the family Tanaidae, the ischium is absent and is most probably fused with the basis.

The six pairs of pereopods can be separated into two functional groups. Females develop **oostegites** on pereopods 1-4, or exclusively on pereopod 4.

**Pereopods 1 to 3.** The first three pairs of pereopods are attached to the anteroventral corner of the pereonites, are directed anteriorly, always have free coxae, and are used for spinning the silk tube. The coxa always has a bicondyle-type articulation which lies in a longitudinal (anterior-posterior) direction. The basis also exhibits this type of articulation, but lateral in orientation. This “cardanic” articulation allows the animal to move the leg in all directions. The terminal spine of these pereopods is never fused to the dactylus. Its morphological independence appears to be correlated with the special function of spinning a silk tube which is produced by the **thoracic glands**,

The armature of each segment is important for distinguishing genera and identifying species. In plesiomorphic taxa, pereopods 1-3 bear only setae on each segment. In more derived taxa, especially in the Anarthruridae, spines have secondarily developed on the merus and carpus, the number and position of these spines are taxonomically useful characters.

In most taxa, pereopod 1 is more slender than the next two pairs of pereopods and usually does not have spines on the merus and/or carpus.

**Pereopods 4 to 6.** The last three pairs of pereopods are attached to the posteroventral corner of the pereonite, are directed laterally, have a coxa fused with the sternite of the pereonite, and are used for clinging to the tube.

The dactylus and terminal spine are often fused to form a **claw**. The fusion produces a large, functionally strong prehensile structure that is used to grasp the inner surface of the tube. This structure is very characteristic for some taxa (e.g., Tanaidae). In the Anarthruridae the dactylus is uniquely modified: the sternal border of the elongate dactylus is concave and the two resulting ridges are lined with setules (hairs). The basis can be quite massive in many Typhlotanaidae.

The fourth and fifth pair of pereopods are quite similar in appearance and armature. However, the propodus of pereopod 6 bears some additional distal setae or spines on the sternal border in most taxa. The armature of each segment of these pereopods is as taxonomically important as in the preceding three pairs.

## Marsupium

Three different types of **marsupia** or **brood pouches** exist within the Tanaidomorpha.

The “normal- (= *Heterotanais*-) type” is represented by all families except Tanaidae and Pseudotanaidae. This type of marsupium is formed by four pairs of oostegites on pereopods 1-4. Each oostegite develops from the coxa as a bilamellar sheet, containing some epithelial tissue within the interlamellar space. After the animal moults, the oostegites start to grow. Each sheet of the oostegite becomes much thinner and most of the epithelial tissue is lost or resorbed. The eggs lie between the oostegites and the ventral surface of the body wall.

The “*Pseudotanais*-type” is quite similar to the normal-type. However, only one pair of oostegites are present; they occur exclusively on pereopod 4, and cover the genital opening.

The “*Tanais*-type” is unique. Although it also consists of only one pair of oostegites on pereopod 4 as in the *Pseudotanais*-type, the morphology of the oostegite is very different. During the early developmental stages, these oostegites are not sheet-like but more or less sac-like and filled with tissue. Later in the adult, the eggs are laid or placed inside the oostegites, resulting in **brood sacs** or “**ovisacs**” (Lang, 1960). How the eggs get inside the oostegites and how they get fertilized is still unknown. The nutrition of the developing embryos was recently studied by Johnson and Attramadal (1982).

## Pleopods

The pleopods (Figure 3.6) are morphologically very uniform throughout all tanaidomorphan families. The basis articulates with a one-segmented **exopodite** and a one-segmented **endopodite**. The outer border of the exopodite bears a row of many, long, pinnate setae, while the entire inner border remains unarmed (naked). The outer border of the endopodite is similar to that of the exopodite. The inner border bears at least one distal seta, but it may have several setae in some species of the Tanaidae.

Variation in setation is quite common and may be taxonomically valuable. Very often the outer margin of the exopodite bears a proximal “specialized” seta spatially separated by a distinct gap from the other setae (Figure 3.6). This seta typically is slightly stouter than the others and is not pinnate, but pilose. Reduction in the number of setae is very common and, therefore, both pleopodal rami may bear only a few distal setae. Frequently, these setae may not have pinnae, consequently, are naked.

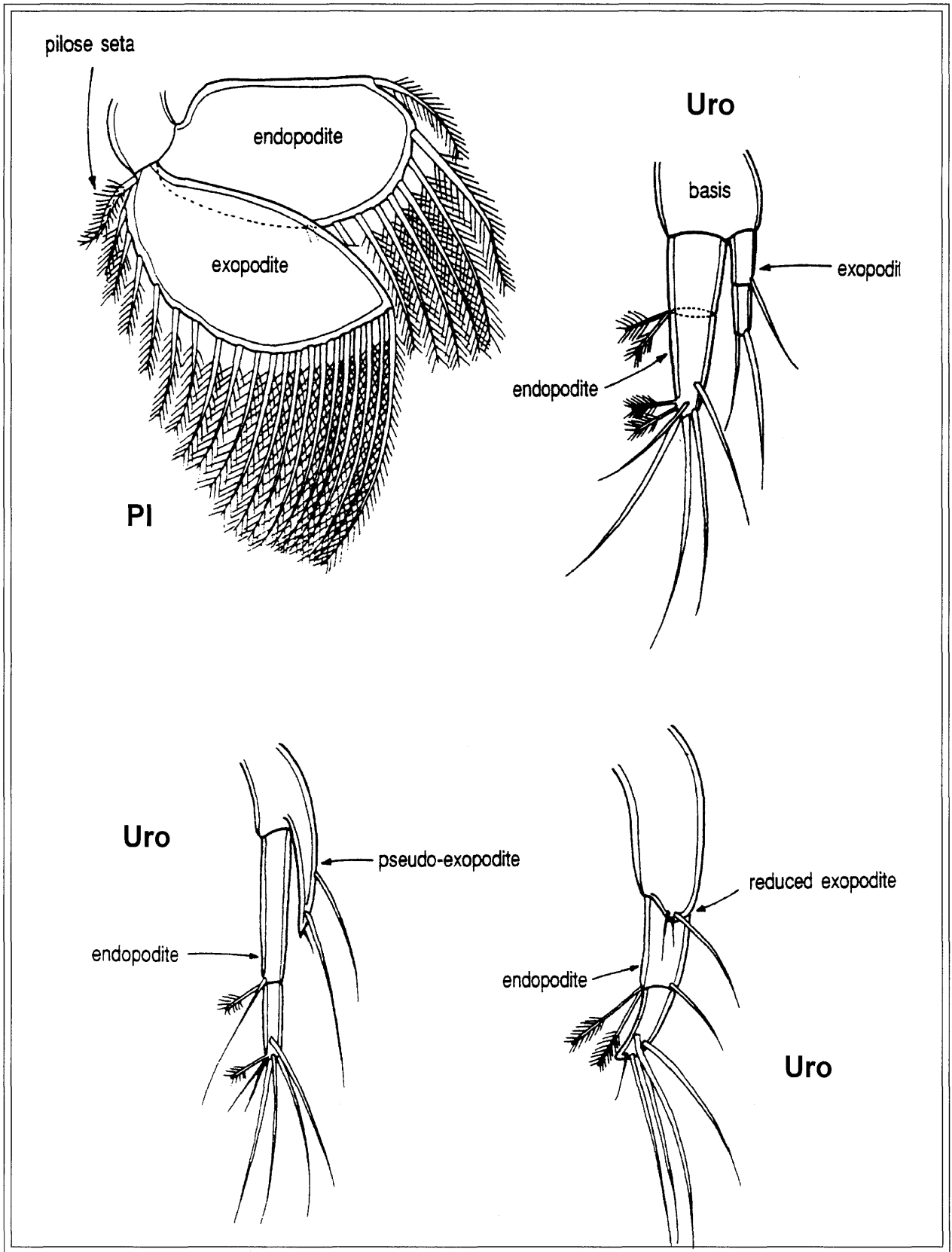
In the adults of some species, pleopodal setation is absent, but much more common is the complete loss of the pleopods. Since **manca-stages** and **juveniles** of several species also lack pleopods, this character has to be used with caution, since the juveniles of one species could be confused with the adults of other species.

Sexual dimorphism is observed in all those species in which “swimming males” have been reported. Often the females lack pleopods while the corresponding males have very large ones [e.g., *Pseudotanais forcipatus* (Lilljeborg, 1864)].

## Uropods

The uropods (Figure 3.6), which articulate on the pleotelson, are the last pair of appendages. They are typically biramous structures consisting of a one-segmented basis, a short exopodite, and a longer endopodite. In contrast to the Apsideoidea, the uropods within the Tanaidomorpha are not filiform, but are styliform. The only tanaidomorphan species that have uropods morphologically similar to those of the Apsideoidea are some species of the Tanaidae.

Reductions in the number of exopodal and endopodal segments is a common feature and has great taxonomic relevance. Generally, the plesiomorphic families (e.g., Tanaidae and Leptocheiliidae) typically have more than two endopodal segments, while the more derived ones (e.g., Anarthruridae, Pseudotanaidae, and Typhlotanaidae) never have more than two.



**Figure 3.6.** Generalized tanaidomorph pleopod and representative examples of uropods.



The exopodite also has undergone some morphological changes. In some taxa, e.g., the entire family Tanaidae, the exopodite is absent. A much more common modification is the fusion of an exopodal remnant with the basis, a feature found in some genera of the anarthruran subfamily Akanthophoreinae.

The uropod may be sexually dimorphic in some taxa. The uropod in the female of *Siphonolabrum fastigatum* Sieg, 1986 has the exopodite fused to the basis and the endopodite is two-segmented. The male, in contrast, has a small but free exopodite and the endopodite seems to be three-segmented (Figure 3.13).

## Internal Anatomy

The internal morphology of tanaiids is still poorly known, especially that of the Tanaidomorpha. For detailed light-microscopical studies of the internal anatomy of tanaiids, the reader is directed to Siewing (1953) and Lauterbach (1970). Only a brief account is provided herein.

The nervous system consists of a brain, a subesophageal mass, and a ventral chain. The eyes are sessile, if present, and may or may not have visual elements. The **alimentary tract** consists of a ventral mouth, a stomach (part of the **foregut**) which is divided into a filter and a masticatory chamber, a syncytial midgut, and a terminal anus. There are two pairs of **hepatopancreases**, and one pair of **maxillary glands** for excretion. The gonads are paired; the **ovaries** are connected to the **oviducts** which open laterally at the base of the sixth pair of thoracic legs; the testes are connected to one or two **genital cones** on the last thoracic segments via the **vas deferentia**.

## Development

Sexual dimorphism is common, but present only when accompanied by **hermaphroditism**, **protogyny**, and possibly **protandry**. Females produce several broods. Development of eggs takes place inside a marsupium. The post-marsupial development of the order is only partly understood. In all cases, development is direct and there is no planktonic larval stage. After hatching, the embryo, still contained within the broodpouch, changes (without a molt) to the first post-embryonic stage (manca-I); the last pair of pereopods and all pleopods have not yet developed. In the second stage (manca-II), the rudiments (anlage) of these appendages are present. In addition to these differences, both manca stages can be distinguished from the adult by the proportionately smaller pereonites. The next stage is termed "**neuter**" and represents the preparatory female/male which is followed by the adult. Post-embryonic instars and adult females resemble each other closely, but usually differ markedly from the males, which often do not feed, having reduced mouthparts, and a sealed anus.

Apseudomorphans are probably all primarily **gonochoristic** (Sieg, 1984a) and follow the post-embryonic development of *Pagurapseudes largoensis* reported by Messing (1979). Sexual dimorphism among members of this suborder is only weakly developed, and is reflected in the first antenna and cheliped.

On the other hand, members of the Tanaidomorpha exhibit a great variety of post-marsupial developmental pathways. A gonochoristic type of development similar to that of the Apseudomorpha is found in the plesiomorphic tanaidomorphan taxa (e.g., Tanaidae). Reduction of the mouthparts in the male phase sometimes leads to a highly complicated post-marsupial development expressed by up to four different types of males (e.g., Leptocheliidae). Mainly, the secondary males may show strongly developed dimorphism resulting in huge and striking chelipeds as well as totally different first antenna. More apomorphic families (e.g., Anarthruridae, Pseudotanaidae, and others) are also gonochoristic, but the sole primary male is adapted for the search of the female ("swimming male"). However, since males have not yet been discovered for many taxa, parthenogenesis may be the means of reproduction in these genera. Sexual dimorphism and protogyny are common in this suborder.

## Ecology and Biology

Tanaids normally build tubes by spinning silk produced by glands having their outlet on the dactylar tips of the first to third pereopods. During construction, feces and detritus are added to the silk. These tubes can be found in the sediment or among algae, hydroids, and sponges. The presence of these tubes in fine sediment may reduce erosion, thus resulting in a more stable sandy bottom. When building a new tube, juveniles bore through the wall of the "mother tube" and build their own nearby (Bückle-Ramirez, 1965). Therefore, tanaidaceans have patchy distribution with high population densities. High population densities on the magnitude of  $10^4$  to  $10^5$  /  $m^2$  can be observed in shallow waters. Consequently, they are an important part of the food web within marine ecosystems: tanaids serve as food for polychaetes, amphipods, decapods, fishes, and some water birds.

Analyses of the stomach and gut contents indicate that tanaids are usually scavengers or detritivores, although some may be raptorial carnivores. Their food normally consists of detritus or small algae, mainly diatoms. They may occasionally feed on nematodes and harpacticoids (Feller, 1978). Only the kalliapseudids are filter feeders (Lang, 1956a) as indicated by the setal structure on their maxilliped and cheliped (Sieg, 1984a).

Very little is known concerning habitat preference. Within the suborder Tanaidomorpha, there are some indications that several families occur in more or less regularly distinct habitats. For example, Tanaidae are common in algal mats. If there is also plenty of sediment between these algal filaments, members of the family Paratanaidae are also found in this habitat, although they are more typical of sandy bottoms. If the sand is less coarse or if the percentage of mud increases, members of the Leptognathiinae and Pseudotanaidae would replace members of these other families.

## Zoogeographic Distribution

Tanaids have a worldwide distribution, inhabiting the intertidal zone down to the hadal zone (nearly 8,000 m depth). This order is not well known from tropical waters and in the deep sea, simply because the group has not been extensively studied from these regions. It does, however, appear to be well represented in the deep sea (e.g., Holdich and Bird, 1985; Sieg, 1983a, 1984a). Even though tanaids are not very diverse in shallow waters, the few species that are present in a specific locality may be very abundant there (Barnard, 1970). As in other peracarids, tanaids also show an increase in species diversity with increasing depth (Hessler *et al.*, 1979). According to Wolff (1977), tanaids may comprise as much as 19% (by number) of the benthic macrofauna at 5,000 m depth, and quite often the order is found to be the second most abundant peracarid group, next to amphipods, in ecological studies of the deep sea.

The zoogeography, and even the descriptive distributional patterns, of the Tanaidacea have been so far largely ignored by biologists. This is mainly a result of the difficulty in accumulating and analyzing the information (data) contained in the scattered literature. Recent monographic revisions (Gardiner, 1975; Sieg, 1977a, 1980b) and a bibliographic index listing all known literature pertaining to this order (Sieg, 1983b) have helped in the compilation of the published literature. In an attempt to help analyze distributional patterns, an EDP-database was established at the Universität Osnabrück, Abteilung Vechta (Sieg, 1984). Initial use of this database aided in the recognition and understanding of the distributional patterns of a few families (Sieg, 1980b, 1983b) and species composition within a given area (Sieg and Heard, 1983). The most comprehensive use of this database involved all the available information on the Tanaidacea and allowed the study of worldwide distributional patterns of this order (Sieg, 1986b).

Data has revealed that the shallow water regions of the southern hemisphere, specifically around Antarctica, may have been the "evolutionary center" for this order (Sieg, 1986b). A large number of tanaid families and genera, along with a very high degree of endemism, supports this contention.

The tanaid composition between the temperate North Atlantic and the temperate North Pacific regions are very different. The North Atlantic has been studied more in relation to tanaids than the North Pacific, which may account, in part, for the huge difference between these two areas: the great dissimilarity between these areas may be more apparent than real. Since our tanaidacean fauna of the southern temperate region is still only poorly known, especially in the southern part of South America and in the New Zealand area, comparisons among it and other zoogeographic areas may be preliminary at best. Our scanty information suggests that the northern temperate waters of the Pacific and the Atlantic Oceans share a more similar tanaid composition with the tropical warm waters of these oceans than with the southern temperate regions of these bodies of water.

The tropical warm water areas of the Atlantic, Indian, Indo-West Pacific, and Pacific zoogeographic subregions are more diverse than the northern or southern temperate zones and are different from each other, i.e., characterized by independent species compositions. In contrast to isopods and amphipods, tanaids may have their greatest number of species within the tropics. The Atlantic tropical subregion appears to have a more diverse tanaidacean fauna than the Pacific tropical subregion, but, as in the temperate waters, this may be an artifact of our past preference for studying the Atlantic Ocean. The tanaid fauna of the tropical Atlantic region, which includes the Caribbean Sea, Gulf of Mexico, and Mediterranean Sea, seems to have a closer relationship to that of the tropical Pacific than to the Indian Ocean. The Indo-West Pacific fauna shares some species with both the tropical Pacific and Indian Oceans, a result consistent with its intermediate geographic position between these two oceans.

## Depth Distribution

The distribution of tanaids in relation to the depth has been summarized (Sieg, 1983a, 1986b). Several generalities concerning the tanaid families have been noted. For example, the Apseudidae appears to have a large bathymetric range, extending from shallow water (0-200 m) to nearly 6,000 m.

The Neotanaidae (not treated in this atlas), the lone family within the suborder Neotanaidomorpha, is typically deep sea. The depth-distribution of this family has been discussed by Wolff (1956) and Gardiner (1975).

Finally, the depth-distribution of the Tanaidomorpha has been reviewed by Sieg (1983a, 1986b). The plesiomorphic families (i.e., Tanaidae, Leptocheliidae, and Paratanaidae) are, with some exceptions, shallow-water taxa. The more derived families (i.e., Anarthruridae, Typhlotanaidae, and Pseudotanaidae) occur throughout a broad depth range from shallow water to hadal depths (below 6,000 m). The Leptognathiinae, a subfamily of the Anarthruridae, exhibit a high species diversity at bathyal depths (200-2,000 m), which gradually decreases in abyssal (2,000-6,000 m) and hadal depths.

In general, a relatively large number of tanaid species, contrary to most other crustaceans, appear to have broad depth ranges, ranging from shallow water to the deep sea. However, as the taxonomy of the Tanaidacea becomes better known, this perception may be modified.

## Materials and Methods

The specimens examined were part of an extensive voucher collection of Crustacea collected for the MMS/Santa Maria Basin and Western Santa Barbara Channel Study and Atlas, supplemental MMS material from the bulk collection obtained from Battelle, a collection of Tanaidacea housed at the Los Angeles County Museum of Natural History, and specimens collected by the Biology Laboratory, Environmental Monitoring Division, Bureau of Sanitation, Department of Public Works of the City of Los

Angeles. Selected specimens were measured and dissected in glycerol. The appendages were mounted on slides according to the procedure described by Sieg (1973).

All type and non-type specimens have been deposited in the National Museum of Natural History and Santa Barbara Museum of Natural History and the National Museum of Natural History (Smithsonian Institution), except those on loan from the Los Angeles County Museum of Natural History.

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## **Abbreviations Used in Keys and Figures**

A.1 = first antenna	Mxp = maxilliped
A.2 = second antenna	Epi = epignath
L = labrum	Che = cheliped
Md(r) = right mandible	P.1-P.6 = pereopods 1-6
Md(l) = left mandible	Pl.1-Pl.5 = pleopods 1-5
Mx.1 = first maxilla	Plt = pleotelson
Mx.2 = second maxilla	Uro = uropod
La = labium	

## Glossary

The following terms are defined with respect to their application to the Tanaidacea.

- Abdomen:** See pleon.
- Aesthetasc:** A setiform element, thin-walled (not sclerotized), cylindrical throughout entire length, with blunt tip, probably chemosensory, and occurring exclusively on flagellum of antenna 1.
- Antenna:** Second pair of cephalic appendages (Antenna 2).
- Antennule:** First pair of cephalic appendages (Antenna 1).
- Alimentary tract:** Tubular structure between mouth and anus, consisting of foregut, midgut, and hindgut, and associated with hepatopancreas.
- Basis:** Second segment (article) of thoracic and abdominal appendages; **sympodal** segment immediately distal to coxa and carrying the rami.
- Biramous:** A term used to describe an appendage having two rami (branches), an exopodite and endopodite.
- Branchial chamber:** Cavity between carapace and body wall into which the maxillular palp and the epignath extend; synonymous with respiratory chamber.
- Brood pouch:** See marsupium.
- Brood sac:** Specialized marsupium of the family Tanaidae; each sac-like oostegite (“ovisac” sensu Lang, 1960) houses eggs within its cavity.
- Carapace:** Outgrowth of the maxillary segment which is fused with tergites of first and second thoracomere; it is curved ventrally, covered on its inner surface with a respiratory epithelium, and encloses respiratory chamber.
- Carpus:** Fifth segment (article) of thoracic appendages.
- Caudal:** Term introduced by Lang (1968) to describe a specific surface or border of body somite or appendage; synonymous with posterior.
- Cephalon:** Anteriormost part of body, bearing eyes (when present), mouth, two pairs of antennae and mouthparts, excluding maxilliped.
- Cephalothorax:** Anterior tagma resulting from fusion of cephalon and first two thoracomeres.
- Chela:** Distal end of cheliped formed by propodus and dactylus.
- Cheliped:** Second pair of thoracic appendages, adjacent and posterior to maxilliped.
- Claw:** Fusion of dactylus and terminal spine in pereopods.
- Coxa:** First segment (article) of thoracic and abdominal appendages; sympodal segment proximal to basis.
- Dactylus:** Seventh segment (article) of thoracic appendages.
- Endite:** Medially-directed projection of coxa or basis.
- Endopodite (endopod):** Inner ramus of thoracic and abdominal appendages.
- Epignath:** Epipodite of maxilliped.
- Epipodite:** Exite of coxa with branchial function; exclusively found on maxilliped.
- Epistome:** Portion of cephalothorax of male, posterior to labrum and consisting of fused remnants of mouthparts.
- Exopodite (exopod):** Outer ramus of thoracic and abdominal appendages.
- Flagellum:** Multisegmented distal portion (ramus) of antenna 1 or 2.
- Fixed finger:** Distally-directed projection of chelipedal propodus.

- Foregut:** Anterior part of alimentary tract, consisting of esophagus and stomach.
- Genital cones:** Conical projection on sternite of sixth pereonite of male; this projection bears one or two gonopores.
- Gonochoristic:** Sexes separate; condition in which individuals remain the same sex throughout their entire life cycle.
- Grinding area:** Flat distal end of processus molaris which typically is surrounded by a slightly crenulated wall; often reduced or lacking.
- Hepatopancreas:** Caeca located at border of fore- and hindgut and mostly directed posteriorly; occasionally one pair is directed anteriorly.
- Hermaphroditism:** Condition in which individuals develop functional male and female genital organs - either simultaneously or sequentially.
- Hypopharynx:** See labium.
- Hyposphaenium (pl. hyposphaenia):** Process (hook) on sternite of pereonite or pleonite.
- Incisor process:** See pars incisiva.
- Ischium:** Third segment (article) of thoracic appendages.
- Juveniles:** Post-embryonic stages that show neither sexually defined morphological structure nor have developed functional gonads.
- Labium:** Flat, bilobed structure situated posterior to mouth, with or without a one-segmented distal palp; not homologous with a segmental appendage; lower lip.
- Labrum:** Bulbous, hood-like structure situated anterior to mouth; upper lip.
- Lacinia mobilis:** Articulated “cutting blade” of mandible; developed mainly on left mandible, very often absent on right mandible.
- Lower lip:** See labium.
- Manca(-stage):** Post-embryonic developmental stage, lacking sixth pereopod and pleopods (Manca-I) or having rudiments of these appendages (Manca-II).
- Mandibles:** Pair of appendages immediately posterior to labrum; functions in masticating food.
- Marsupium:** Ventral chamber in female formed by oostegites in which eggs and embryos are brooded.
- Maxillae:** Third pair of mouthparts (maxilla 2).
- Maxillary gland:** Excretory organ situated in maxillary somite with its opening on maxilla.
- Maxilliped:** First pair of thoracic appendages; specialized for feeding.
- Maxillules:** Second pair of mouthparts (maxilla 1).
- Merus:** Fourth segment (article) of thoracic appendages.
- Molar process:** See pars molaris.
- Neuter:** Post-embryonic stage with full set of pereopods and pleopods, but without developed gonads (“juveniles”).
- Ocellus:** A simple eye or pigment spot functioning as light receptor.
- Oostegite:** Normally thin, flat plates arising from inner margin of coxae of pereopods 1 - 4 or only 4.
- Ovary:** Female gonad.
- Oviduct:** Tube in female for passage of ova from ovary to gonopores.
- Ovisacs:** Marsupium of Tanaidae; saclike structure within which eggs are brooded.
- Palpus (or palp):** Segmented or unsegmented structures of different origin in mandible, maxilla 1, labium, and maxilliped.
- Paragnath:** See labium.
- Pars incisiva:** Fixed (non-articulated) distal “cutting blade” of mandible; synonymous with incisor process.

- Pars molaris:** Medial projection of mandible originally used for grinding; synonymous with molar process.
- Peduncle:** First three segments of antenna 1 and first five segments of antenna 2.
- Pereon:** Free thoracomeres 3-8; anterior portion of trunk, excluding maxillipedal and chelipedal somites.
- Pereonite:** Somite belonging to the pereon.
- Pereopod:** Walking leg; appendage belonging to one of six free thoracomeres (3-8).
- Pleon:** Posteriormost body tagma, consisting of pleonites and pleotelson.
- Pleonite:** Somite belonging to pleon.
- Pleopod:** Appendage of pleonite, often natatory.
- Pleotelson:** Structure resulting from fusion of at least sixth pleomere (abdominal somite) and telson.
- Propodus:** Sixth segment (article) of thoracic appendages.
- Protandry (adj. protandrous):** Hermaphroditism in which functional male phase precedes female phase.
- Protopodite (protopod):** First two segments (coxa and basis) of thoracic or abdominal appendages; synonymous with sympodite (adj. sympodal).
- Protogyny (adj. protogynous):** Hermaphroditism in which functional female phase precedes male phase.
- Pseudobiramous:** Condition in which two rami are present in uropods, but one is fused to proximal segment (basis).
- Pseudo-coxa:** Posterior part of cephalothorax to which cheliped articulates.
- Rostral:** Synonymous with anterior (Lang, 1968); see caudal.
- Side-piece:** Sclerite articulated on one side to carapace and on other side to area posterior to a distal projection of chelipedal basis; formerly called coxa.
- Somite:** Body segment, usually covered with sclerotized tergite and sternite.
- Sternal:** Term introduced by Lang (1968) to describe a specific surface of body somite or appendage; synonymous with ventral.
- Sternite:** Ventral sclerotized surface of body.
- Subadult males:** Second juvenile stage of males that are sexually mature.
- Swimming male:** Highly transformed male having a large pleon with well-developed pleopods and a small pereon; mouthparts reduced, except maxilliped.
- Sympodite (adj. sympodal):** First two segments (coxa and basis) of thoracic or abdominal appendages; synonymous with protopod(ite).
- Telson:** Posteriormost part of body, bearing anus; in Recent tanaidaceans always fused to sixth pleonite to form pleotelson.
- Tergal:** Synonymous with dorsal (Lang, 1968); see sternal.
- Tergite:** Sclerotized dorsal surface of body.
- Testes:** Male gonads.
- Thoracic glands:** Compound glands lying in first three pereonites and secreting silk-like substances that are transported via a channel to end of dactylus and used for constructing tubes; restricted to Tanaidomorpha.
- Thoracomere:** Thoracic somite; in tanaidaceans first and second thoracomeres are fused with cephalon and bear specialized appendages, maxilliped and cheliped, respectively.
- Uniramous:** A term used to describe an appendage having only one ramus (branch), an exopodite or endopodite.
- Upper lip:** See labrum.
- Uropods:** Styliform abdominal appendages of the pleotelson; usually biramous, but often uniramous or pseudobiramous.
- Vas deferentia:** Tubes in male for passage of sperm from testes to gonopores.

## List of Species

- Suborder Apseudomorpha Sieg, 1980  
Family Apseudidae Leach, 1814  
Genus *Carpoapseudes* Lang, 1968  
***Carpoapseudes caraspinosus* Dojiri and Sieg, new species**
- Suborder Tanaidomorpha Sieg, 1980  
Family Tanaidae Dana, 1849  
Genus *Zeuxo* Templeton, 1840  
*Zeuxo maledivensis* Sieg, 1980
- Family Leptocheliidae Lang, 1973  
Genus *Leptochelia* Dana, 1849  
*Leptochelia dubia* (Krøyer, 1814)
- Family Paratanaidae Lang, 1949  
Genus *Paratanais* Dana, 1849  
***Paratanais intermedius* Dojiri and Sieg, new species**
- Family Anarthruridae Lang, 1971  
Subfamily Anarthrurinae Lang, 1971  
Genus *Siphonolabrum* Lang, 1972  
***Siphonolabrum californiensis* Dojiri and Sieg, new species**
- Subfamily Akanthophoreinae Sieg, 1986  
Genus *Paraleptognathia* Kudinova-Pasternak, 1981  
*Paraleptognathia* cf. *gracilis* (Krøyer, 1842)  
***Paraleptognathia bisetulosa* Dojiri and Sieg, new species**
- Genus *Scoloura* Sieg and Dojiri, 1991  
*Scoloura phillipsi* Sieg and Dojiri, 1991
- Genus ***Chaulioleona* Dojiri and Sieg, new genus**  
***Chaulioleona dentata* Dojiri and Sieg, new species**
- Genus *Araphura* Bird and Holdich, 1984  
***Araphura breviararia* Dojiri and Sieg, new species**  
***Araphura cuspirostris* Dojiri and Sieg, new species**
- Genus *Tanaella* Norman and Stebbing, 1886  
***Tanaella propinquus* Dojiri and Sieg, new species**
- Genus *Incertae Sedis*  
Male species 1  
Male species 2  
Male species 3
- Subfamily Leptognathiinae Sieg, 1973  
Genus *Leptognathia* G.O. Sars, 1882  
*Leptognathia* cf. *breviremis* (Lilljeborg, 1864)
- Genus *Tanaopsis* G.O. Sars, 1896  
*Tanaopsis cadieni* Sieg and Dojiri, 1991
- Family Typhlotanaidae Sieg, 1984  
Genus *Typhlotanais* G.O. Sars, 1882  
***Typhlotanais williamsae* Dojiri and Sieg, new species**  
***Typhlotanais crassus* Dojiri and Sieg, new species**
- Family Pseudotanaidae Sieg, 1973  
Genus *Pseudotanais* G.O. Sars, 1882  
***Pseudotanais makrothrix* Dojiri and Sieg, new species**  
***Pseudotanais californiensis* Dojiri and Sieg, new species**



## Key to Families

- 1A. A.1 biramous; Md with palp (suborder Apseudomorpha) ..... *Carpoapseudes caraspinosus*
- 1B. A.1 uniramous; Md without palp (suborder Tanaidomorpha) ..... 2
- 2A. Mouthparts (except maxillipeds in some families) reduced to lobiform structures (generally males) .  
9
- 2B. Mouthparts not reduced (females and some males) ..... 3
- 3A. P.1 - P.6 without ischium; Uro uniramous; Mxp with coxa and with basis not fused medially; last 2  
pleonites smaller than 3 preceding ones (occasionally with only 3 or 4 pleonites), with 3 pairs of  
pleopods ..... Tanaidae
- 3B. P.1 - P.6 with ischium; Uro typically biramous, sometimes pseudobiramous; Mxp without coxa,  
basis fused or unfused medially; typically with 5 pleonites of equal size ..... 4
- 4A. Endopodite of Uro at most with 2 segments ..... 5
- 4B. Endopodite of Uro with more than 2 segments (Mxp not fused medially; with eyes) .....  
..... Leptocheliidae
- 5A. Endite of Mxp enlarged and laterally expanded ..... Paratanaidae
- 5B. Endite of Mxp not enlarged nor laterally expanded ..... 6
- 6A. Merus of P.1 with 1 tergal spine; dactylus of characteristic shape (elongate, semicircular in  
cross-section, and both margins covered with fine setules), not fused with terminal spine .....  
..... Anarthruridae (subfamily Akanthophoreinae and subfamily Anarthrurinae)
- 6B. Merus of P.1 with setae only; dactylus of typical shape (not elongate), usually fused to terminal  
spine ..... 7
- 7A. Pars molaris of Md broad, grinding area surrounded by crenulated wall ..... Typhlotanaidae
- 7B. Pars molaris of Md reduced, small, grinding area without crenulated wall, and terminating as an  
attenuate process or several points, or bearing several spiniform elements ..... 8
- 8A. Carpus of P.2 with 1 tergal spine; pereonites 1 and 2 extremely small, about 5-7× broader than long;  
marsupium formed by only 1 pair of oostegites ..... Pseudotanaidae
- 8B. Carpus of P.2 with only setae; pereonites 1 and 2 of typical shape, mostly about 3-4× broader than  
long; marsupium formed by 4 pairs of oostegites ..... Anarthruridae (subfamily Leptognathiinae)
- 9A. With eyes ..... 10
- 9B. Without eyes ..... 11

- 10A. Mxp reduced to lobiform structure, lacking palpus; A.1 with more than 7 segments; Che much larger than and different in shape from that of female ..... Leptocheliidae (males)
- 10B. Mxp not reduced to lobiform structure, but modified from that of female, palpus always present; A.1 with 7 (?) segments, first 2 segments distinctly broader than remaining ones; Che of similar size and shape to that of female ..... Paratanaiidae (males)
  
- 11A. Che articulated to cephalothorax along proximal margin of basis .....  
..... Anarthruridae (males - subfamily Anarthrurinae)
- 11B. Che articulated to cephalothorax by a “side-piece” along distal lateral margin of basis ..... 12
  
- 12A. Merus of P.1 with tergal spine ..... Anarthruridae (males - subfamily Akanthophoreinae)
- 12B. Merus of P.1 with only setae ..... 13
  
- 13A. Last 3 segments of A.1 of similar length ..... Typhlotanaiidae (males)
- 13B. Last 2 segments of A.1 of similar length .....  
..... Pseudotanaiidae (males) and Anarthruridae (males - subfamily Leptognathiinae)

### Key to Genera and Species

Note: Genera enclosed within brackets are those that have been reported from California, but were not represented in the present study. Species enclosed within brackets indicate males that were not collected.

- 1A. With eyes ..... 2
- 1B. Without eyes ..... 12
  
- 2A. P.1 - P.6 without ischium ..... 3
- 2B. P.1 - P.6 with ischium ..... 7
  
- 3A. Pleon with more than 3 pleonites ..... 4
- 3B. Pleon with 3 pleonites ..... [*Pancolus*]
  
- 4A. Uro long and slender, each segment more than twice as long as broad ..... [*Synaptotanais*]
- 4B. Uro short, each segment twice as long as broad ..... 5
  
- 5A. Pleon with 4 pleonites ..... [*Sinelobus*]
- 5B. Pleon with 5 pleonites (last 2 pleonites distinctly smaller than preceding ones) ..... 6
  
- 6A. First segment of A.1 twice as long as second segment ..... [*Anatanais*]
- 6B. First segment of A.1 2.5× (nearly 3x) longer than second segment (genus *Zeuxo*) .....  
..... *Zeuxo maledivensis*

7A.	A.1 with more than 3 segments .....	8
7B.	A.1 with 3 segments .....	11
8A.	A.1 with more than 4 segments (exclusively males) .....	9
8B.	A.1 4-segmented (genus <i>Paratanais</i> ) .....	<i>Paratanais intermedius</i>
9A.	A.1 with more than 7 segments; all mouthparts reduced to lobiform structures; Uro endopodite with more than 2 segments (genus <i>Leptochelia</i> ) .....	[ <i>Leptochelia dubia</i> , male]
9B.	A.1 with 6-7 segments; mouthparts except Mxp reduced to lobiform structures; Uro endopodite with 2 segments .....	10
10A.	A.1 7-segmented (genus <i>Pseudotanaeis</i> , in part) .....	[ <i>Pseudotanaeis makrothrix</i> , male]
10B.	A.1 6-segmented (genus <i>Paratanais</i> ) .....	[ <i>Paratanais intermedius</i> , male]
11A.	Endopodite of Uro with more than 2 segments; basis of Mxp not fused medially (genus <i>Leptochelia</i> ) .....	<i>Leptochelia dubia</i>
11B.	Endopodite of Uro 2-segmented; basis of Mxp fused medially (genus <i>Pseudotanaeis</i> ) .....	<i>Pseudotanaeis makrothrix</i>
12A.	A.1 7-segmented, first and second segments laterally compressed, flagellar segments with many aesthetascs; mouthparts, except Mxp, reduced to lobiform structures (exclusively males) .....	26
12B.	A.1 3- to 5-segmented, first and second segments cylindrical, only 1 terminal aesthetasc; mouthparts not reduced .....	13
13A.	A.1 3- or 4-segmented .....	14
13B.	A.1 5-segmented (exclusively subadult males of <i>Chauliopleona</i> , <i>Paraleptognathia</i> , and possibly <i>Scoloura</i> ) .....	19
14A.	A.1 4-segmented .....	15
14B.	A.1 3-segmented .....	24
15A.	Che articulated to cephalothorax by a “side-piece” along distal lateral margin of basis .....	16
15B.	Che articulated to cephalothorax along proximal margin of basis (genus <i>Siphonolabrum</i> ) .....	<i>Siphonolabrum californiensis</i>
16A.	Uro with exopodite fused to basis (pseudobiramous) .....	17
16B.	Uro with exopodite not fused to basis (biramous) .....	19
17A.	Exopodite of Uro represented by a well-developed projection, occasionally reaching length of first endopodal segment (genus <i>Araphura</i> ) .....	18
17B.	Exopodite of Uro only represented by a tiny, knoblike projection on basis (genus <i>Tanaella</i> ) .....	<i>Tanaella propinquus</i>

- 18A. Pleotelson short, with lateral borders relatively straight, and without knoblike process on posterior margin ..... *Araphura breviararia*
- 18B. Pleotelson long, subquadrate, with slightly concave lateral borders, and with knoblike process on posterior margin ..... *Araphura cuspirostris*
- 19A. Pleotelson with large, ventrolateral, triangular process (genus *Scoloura*) ..... *Scoloura phillipsi*
- 19B. Pleotelson without such a process ..... 20
- 20A. Last pleonite with a large, midventral, caudally-directed spiniform process that reaches more than half the length of the pleotelson (genus *Chaulioleona*) ..... *Chaulioleona dentata*
- 20B. Last pleonite without such a process ..... 21
- 21A. Merus of P.1 with exclusively setae or unarmed ..... 22
- 21B. Merus of P.1 with a tergal spine ..... *Paraleptognathia cf. gracilis*
- 22A. Merus of P.1 with 2 long, strong setae, both as long as carpus .....  
..... *Paraleptognathia bisetulosa*
- 22B. Merus of P.1 unarmed or with only short setae, never as long as carpus ..... 23
- 23A. Coxa of P.1 with well-developed, rostrally-directed, triangular process; merus of P.1 unarmed (genus *Tanaopsis*) ..... *Tanaopsis cadieni*
- 23B. Coxa of P.1 without such a process; merus of P.1 with 1 seta (genus *Leptognathia*) .....  
..... *Leptognathia cf. breviremis*
- 24A. Pereonites 1 and 2 extremely small, typically both pereonites together as long as third pereonite; pars molaris reduced to various degrees (genus *Pseudotanaeis* G.O. Sars, 1882) .....  
..... *Pseudotanaeis californiensis*
- 24B. Pereonites 1 and 2 of normal size, both pereonites together longer than pereonite 3; pars molaris not reduced, with broad grinding area surrounded by a crenulated wall (genus *Typhlotanaeis*) ..... 25
- 25A. Lateral borders of pereonites nearly parallel; Uro with exopodite and endopodite indistinctly 2-segmented; exopodite only slightly longer than first endopodal segment; sternal border of propodus in P.2 with 2 setae of equal size ..... *Typhlotanaeis williamsae*
- 25B. Lateral borders of pereonites convex; Uro with endo- and exopodite 1-segmented, exopodite slender, reaching about 2/3 endopodal length; sternal border of propodus in P.2 with 1 short and 1 long setae (exceeding combined length of dactylus and terminal spine) ..... *Typhlotanaeis crassus*
- 26A. Che articulated to cephalothorax by a “side-piece” along distal lateral margin of basis; Mxp endite with short distal seta ..... 27
- 26B. Che articulated to cephalothorax along proximal margin of basis; Mxp endite with long distal seta (genus *Siphonolabrum*) ..... [*Siphonolabrum californiensis*, male]

- 27A. Merus of P.1 exclusively with seta(e) or unarmed ..... 30
- 27B. Merus of P.1 with at least 1 tergal spine (subfamily Akanthophoreinae) ..... 28
- 28A. Uro with endopodite 3-segmented; caudo-distal part of chelipedal carpus not expanded; P.1 - P.3 with tergal spines of merus and carpus short, reaching only 1/3 length of following segment ..... 29
- 28B. Uro with endopodite 2-segmented; caudo-distal part of chelipedal carpus expanded; P.1 - P.3 with tergal spines of merus and carpus long, reaching about midlength of following segment (probably genus *Chauliopeona*) ..... male species 1
- 29A. Ischium of P.6 with 2 small setae; cephalothorax with anterior part distinctly smaller than posterior part; P1 with outer margin of exopodite denticulated ..... male species 3
- 29B. Ischium of P.6 with 1 spine and 1 small seta; cephalothorax with anterior part not distinctly smaller than posterior part; P1 lacking denticles on outer margin of exopodite ..... male species 2
- 30A. A.1 with segment 3 about twice as long as broad (genus *Pseudotanaeis*) .....  
 ..... [*Pseudotanaeis californiensis*, male]
- 30B. A.1 with segment 3 annular (much shorter than long) (genus *Tanaopsis*) .....  
 ..... [*Tanaopsis cadieni*, male]

## Descriptions of Species

### Suborder Apseudomorpha Sieg, 1980

Family Apseudidae Leach, 1814

Genus *Carpoapseudes* Lang, 1968

#### *Carpoapseudes caraspinosus* Dojiri and Sieg, new species

Figure 3.7

**Type Material.** Specimen (holotype, with P.1 and Che missing; USNM 284720) from cruise 3-4, Sta. R-7 (rep. 2), 34°52.90'N 121°10.30'W, 565 m, off Purisima Point, Santa Maria Basin, California, originally identified as *Apseudes gracilis*; specimen (paratype, dissected; SBMNH 144122) from Sta. BSR-28, 35°04.22'N 121°19.65'W, 603 m, southwest of Pt. San Luis, Santa Maria Basin, California, originally identified as *Apseudes gracilis*.

**Description.** (Figure 3.7). Body, 5.5 mm, about 5× longer than broad, and with 5 pairs of oostegites (cheliped with 1 pair of reduced oostegites). Cephalothorax trapezoid in general outline; midlaterally separated by indentation and 1 small thorn; anterior half also equally rounded; rostrum large, spear-shaped; eyelobes large, pointed, without visual elements. Pereonites 1 and 2 lacking spines (very often with well-developed coxal spines of P.1 and P.2 mistaken for pereonal spines), 3.5-4.0× broader than long; pereonites 4-6 with posteriorly expanded protrusions at insertion of pereopods; coxa with small thorn (often mistaken for pereonal spines); pereonite 3 about 1.5× broader than long, with long anteriorly, slightly curved thorns; pereonites 4 and 5 about 1.25× longer than broad, with laterally-directed thorns; pereonite 6 also 1.5× broader than long, laterally-directed thorn small. All 5 pleonites of equal size, with well-developed pleurites, 2.5× broader than long.

First antenna with 4-segmented peduncle, 8-segmented inner flagellum, and about 20-segmented outer flagellum; peduncle 1 about twice as long as remaining peduncular segments combined; outer flagellum with about 5 aesthetascs.

Mouthparts of typical apseudoidean shape. Maxillipeds not fused; coxa short, no seta; basis with lateral margin expanded, no setae; palpus 4-segmented, with inner palpal margin with 1 long strong seta, outer margin with 1 short, but strong seta; segments 2-4 bearing typical setation; endite with specialized spine well developed.

Cheliped slender; ischium absent; semicircular coxa of adult females with reduced oostegite; basis 2.5× longer than broad, exopodite well developed, 3-segmented, bearing 4 long pinnate setae terminally, and group of distal setae on sternal margin; merus bent tergally, with sternal margin covered with setae; carpus 2.5× longer than broad, with 2 short distal setae on tergal margin and 3 long and 4 short setae along sternal margin; propodus combined with fixed finger about twice as long as broad, bearing 6 setae sternally, spiniform element at its tip, 1 row of membranous structures (chemoreceptors?) along tergal margin, and 2 caudal setae near articulation of dactylus; dactylus with spine curved caudally, carrying 2 long and 1 short setae.

Pereopod 1 slender, non-fossorial; coxa with large anteriorly-directed projection; basis 4.8× as long as broad, no setae; exopodite 2-segmented, with 6 pinnate setae; ischium small; merus as long as carpus or slightly longer, 2.5× longer than broad, with 3 distal setae on tergal border, 1 row of setae along sternal margin, and 1 distal pinnate spine; carpus 3.7× longer than broad, with 1 row of setae along sternal and tergal margins and 2 pinnate spines distally; propodus short, 1.4× longer than broad, with row of setae along sternal and tergal margins, 1 row of 5 pinnate spines distally, 1 short specialized spine near articulation of dactylus; dactylus half as long as propodus, bearing sternal row of setae (each setal loci consisting of 2 setae) and 3 tergal setae; short terminal (dactylar) spine not fused to dactylus; terminal spine with 2 small setae at base on sternal margin.

Pleopods 1-5 of similar shape, biramous; coxa fused with sternite; basis elongate; exo- and endopodite 1-segmented; inner and outer margins covered with pinnate setae.

Pleotelson long, 2.6× longer than broad.

Uropods only partially known; basis 2.75× longer than broad, with inner margin equipped with several terminal setae; endopodite missing; exopodite 15- to 17-segmented, with 3 long setae and 1 short seta.

**Remarks.** *Carpoapseudes caraspinosus* represents the only species of the suborder Apseudomorpha Sieg, 1980 collected during the MMS Soft-Bottom Benthic Fauna of the Santa Maria Basin and Western Santa Barbara Channel study.

*Carpoapseudes* and *Leviapseudes*, both belonging to the subfamily Leviapseudinae within the Whitelegiidae, are closely related to each other. However, both genera are easily separated by the shape of the pleonites. In *Carpoapseudes* the pleonites are broader than long, while those of *Leviapseudes* are triangular and typically longer than broad. Additionally, in *Carpoapseudes* the pleonites show well-developed pleurites, while these are small in *Leviapseudes*. In *Carpoapseudes* the carpus is about 2.5× longer than broad, but in *Leviapseudes* it is almost 4.5× longer than broad.

*Carpoapseudes caraspinosus* may be distinguished from all its congeners by a combination of characters. So far, all known members of *Carpoapseudes* lack a lateral thorn anterior to the carapace chamber, which is characteristic for species of the genus *Leviapseudes*, while the new species is the only species within its genus that possesses such a small thorn. *Carpoapseudes auritocheles* Kudinova-Pasternak, 1975 and *C. caraspinosus* have anterolateral thorns on pereonite 6. But, these species may be distinguished by the shape of pereonite 2: *C. caraspinosus* lacks anterolateral thorns, while *C. auritocheles* has well-developed ones.

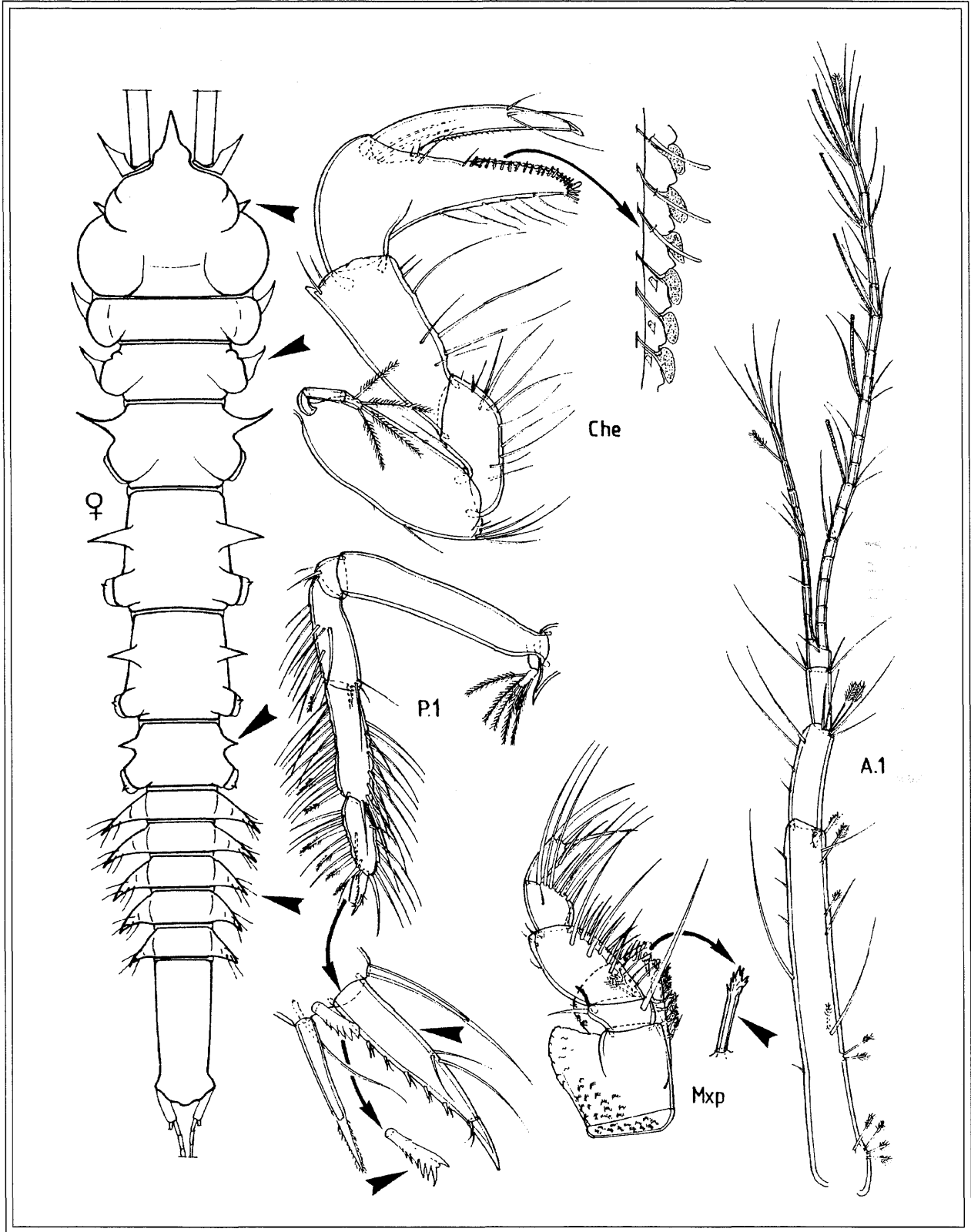


Figure 3.7. *Carpoapseudes caraspinosus* Dojiri and Sieg, new species, female: ♀, general habitus of female; A.1, first antenna; Mxp, maxilliped; Che, cheliped; P.1, pereopod 1.

Finally, the shape of the specialized propodal spine close to the articulation of the dactylus on P.1 may be characteristic. However, as in many other cases, morphological details are not always examined and reported. Because of these shortcomings, the present taxonomic value of these morphological characters is reduced and do not allow detailed morphological comparisons to be made among the species of this genus.

**Etymology.** The specific name *caraspinosus* is a combination of the Greek words *cara*, meaning head or top, and *spinusus*, thorny, and alludes to all the spines on the head and body.

**Type Locality and Type Specimens.** Santa Maria Basin, California. Types deposited in the National Museum of Natural History (USNM 284720) and the Santa Barbara Museum of Natural History (SBMNH 144122); see "Type Material."

**Distribution.** This species is so far known only from its type locality.

## Suborder Tanaidomorpha Sieg, 1980

Family Tanaidae Dana, 1849

Genus *Zeuxo* Templeton, 1840

*Zeuxo maledivensis* Sieg, 1980

Figure 3.8

**Material Examined.** 1 neuter (dissected) from Sta. 53, 34°37.96'N 120°50.38'W, 196 m, northwest of Pt. Arguello, Santa Maria Basin, California; 2 neuters from Sta.56, 34°30.32'N 121°01.02'W, 900 m, southwest of Pt. Arguello, Santa Maria Basin, California; 1 male (dissected) from Sta. BRA-6, 35°20.88'N 120°59.62'W, 109 m, between Pt. Estero and Pt. Buchon, Santa Maria Basin, California.

**Description (male)** (Figure 3.8). Body 3.8× longer than broad. Cephalothorax about as long as broad, tapered at anterior end. Pereonite 1 shortest of pereon segments; pereonites 1-5 similar in width; pereonites 4 and 5 longest and pereonite 6 narrowest of all pereonites. Pleonites 1-5 divisible into 2 groups: first group consists of pleonites 1-3, with each pleonite about 4× broader than long, bearing pleopod; second group composed of pleonites 4 and 5, with each pleonite about 10× broader than long, lacking pleopod.

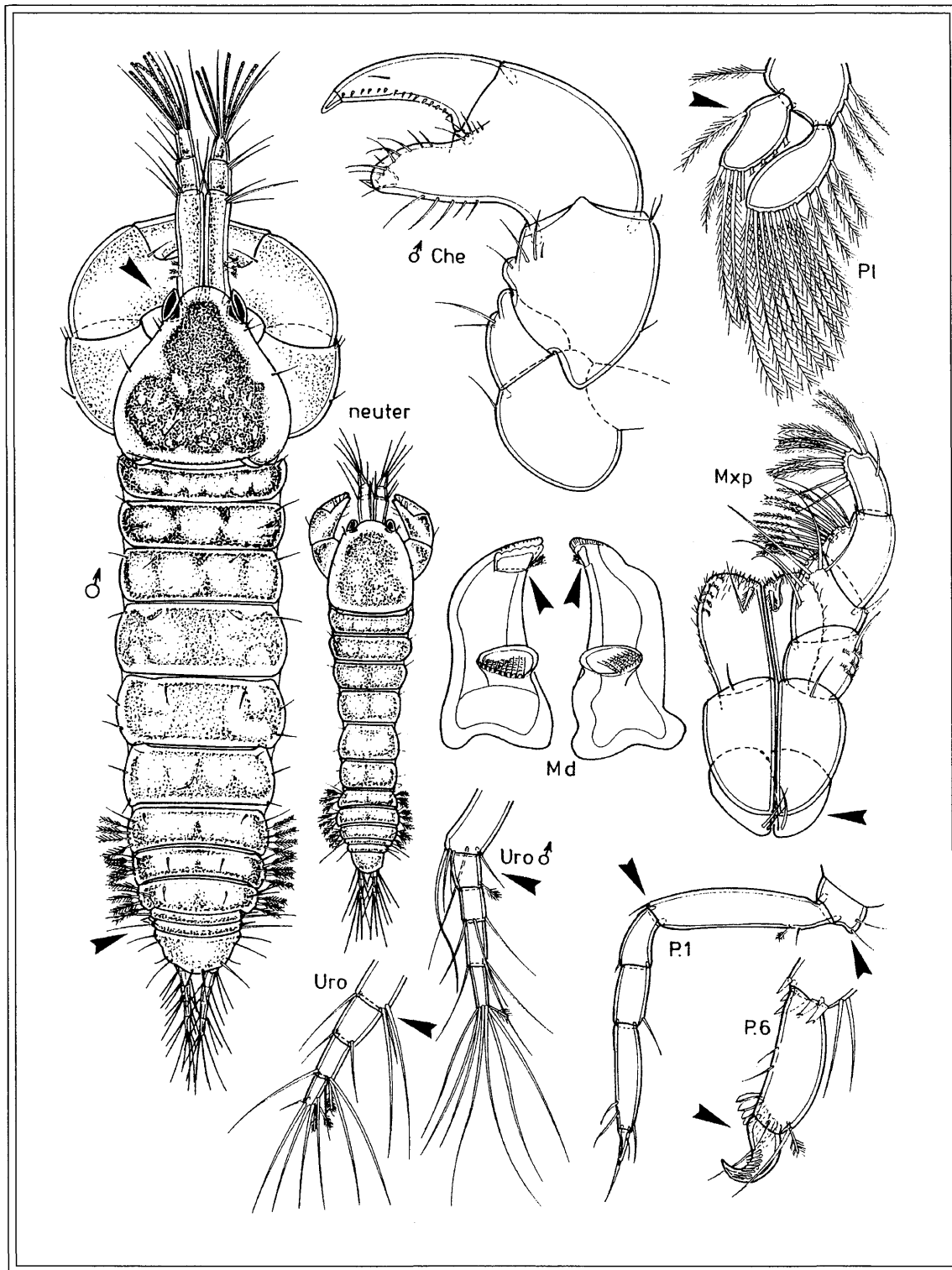
First antenna 3-segmented, bearing numerous aesthetascs terminally.

Mandible with broad, flat, crushing pars molaris; 8 hairs (setules) situated at insertion of lacinia mobilis.

Maxilliped with small coxa, each bearing 1 naked seta; basis not fused to opposite member, each bearing single distal seta. Distal margin of each endite with specialized seta, scattered setules, and several curved rows of tiny spinules. Palpus 4-segmented; first segment with lateral seta and a few rows of minute spinules; second segment with approximately 8 medial and 1 lateral setae; third segment with numerous medial setae, many pinnate at tips; inner margin of fourth segment with 7 setae (5 pinnate, 2 naked); outer margin with 2 pinnate setae terminally, 1 naked seta medially.

Cheliped with sternal protuberance articulating with side-piece. Merus small, with small protuberance on sternal distal margin, bearing 2 sternal setae. Carpus stout, about as long as broad, expanded at tergal proximal corner, bearing 1 tergal seta at midlength, 2 distal tergal setae, small rounded sternal protuberance, and 4 sternal setae. Fixed finger broad and bluntly rounded terminally, tipped with small stout spine; tergal and sternal borders with numerous setae. Dactylus with subterminal seta and numerous small, stout spinules on inner (sternal) margin.





**Figure 3.8.** *Zeuxo maledivensis* Sieg, 1980 male: ♂, general habitus of male; Md, mandible; Mxp, maxilliped; ♂ Che, cheliped; P.1, pereopod 1; P.6, pereopod 6; Pl, pleopod; Uro ♂, uropod of male; neuter, general habitus of neuter; Uro, uropod of neuter.

Pereopod 1 with coxa bearing a slight protuberance on sternal distal corner near 2 naked setae; basis with proximal hair and setae and sternal distal seta; ischium absent; merus with small tergal distal seta; carpus with 1 long sternal seta; propodus with 4 setae; dactylus slender, with 1 setule; terminal spine not fused to dactylus. Pereopod 6 with carpus bearing 2 naked setae, 3 stout bifid spines, and 2 stout spines; propodus with 2 sternal setae, 3 terminal setae, 1 terminal hair, and several spatulate spines; dactylus clawlike, armed with row of translucent spinules on each side.

Pleopods 1-3 with basis carrying 3 outer pinnate setae and 1 inner pinnate seta; exopodite with numerous outer pinnate setae; endopodite with several outer pinnate setae and 1 inner pinnate seta.

Pleotelson, 2.3× broader than long, with irregular border.

Uropod uniramous; basis with 5 setae. Exopodite absent. Endopodite 4-segmented; first segment with 1 feathered hair; second segment with 3 setae; third segment with 3 setae; fourth segment with 7 setae and 1 feathered hair.

**Description (neuter)** (Figure 3.8). Body about 4× longer than broad. Cephalothorax about as long as broad. Pereonites tapering posteriorly. Pleonites 1-3 expanded slightly relative to preceding pereonites 5 and 6.

Uropod with endopod only 3-segmented.

**Remarks.** *Zeuxo maledivensis* Sieg, 1980 is recorded for the first time in California waters. It had previously been recorded only from the Maldives, Japan, and Florida, but its occurrence in California was predicted by Sieg and Winn (1981:341). So far, a total of eight species belonging to the family Tanaidae have been recorded from the California coast: *Synaptotanaeis notabilis* Sieg and Winn, 1981, *Sinelobus stanfordi* (Richardson, 1901), *Pancolus californiensis* Richardson, 1905, *Anatanais pseudonormani* Sieg and Winn, 1981, *Zeuxo normani* (Richardson, 1901), *Z. paranormani* Sieg, 1980, and now *Z. maledivensis* Sieg, 1980.

*Sinelobus stanfordi* and *Pancolus californiensis* are easily recognized by having 4 and 3 pleonites, respectively. *Synaptotanaeis notabilis* also has 5 pleonites visible dorsally. But, this species differs from *Zeuxo* in having the two reduced pleonites still free and not fused sternally to the pleotelson. Finally, the totally different shape of the uropodal segments makes the distinction between *Synaptotanaeis notabilis* and *Zeuxo* species quite easy. *Anatanais pseudonormani* may be recognized by the relatively elongate cephalothorax and the large triangular protrusion of the coxa in pereopod 1.

Within *Zeuxo*, the newly recorded species *Z. maledivensis* is characterized by having a slightly reduced lacinia mobilis on the right mandible. This is also true for *Z. normani* and *Z. paranormani*, but *Z. maledivensis* can be distinguished from these two congeners by the pleopodal endopodite which bears only 1 seta, instead of 2 or 3, on the inner border. Finally, the coxal protrusion on pereopod 1 in *Z. maledivensis* is only slightly developed, while it is distinctly larger in *Z. normani* and *Z. paranormani*.

Juveniles (neuters) of *Z. maledivensis* have only 4-segmented uropods, as does *Z. coralensis* Sieg, 1980, another species predicted by Sieg and Winn (1981) to inhabit California waters. It can be distinguished from adults of this species (juveniles of *Z. coralensis* have a 3-segmented uropod) by the shape of the coxal protrusion in pereopod 1 and additionally by the armament of the second segment of the maxillipedal palpus. In *Z. maledivensis* there are only 2 relatively long setae, while adults of *Z. coralensis* have mostly 4 (seldomly 3) setae in addition to the 3 pilose spines.

**Type Locality and Type Specimens.** Holotype and paratypes deposited in Senckenberg Museum/Frankfurt (SMF 8690 and SMF 8691), Zoologisches Museum Berlin (ZMB 15951) and National Museum of Natural History (USNM).

**Distribution.** *Zeuxo maledivensis* Sieg, 1980 is known from scattered records from the Maldives, Japan, Florida, and the Santa Maria Basin, California.

Family Leptocheliidae Lang, 1973

Genus *Leptochelia* Dana, 1849

*Leptochelia dubia* (Krøyer, 1842)

Figures 3.9, 3.10

**Material Examined.** Santa Maria Basin, phase I: 1 male from Sta. 6, 35°20.88'N 120°59.62'W, 190 m, between Pt. Estero and Pt. Buchon, October 1984; 1 female from Sta. BRA-16, 35°12.23'N 121°16.29'W, 591 m, off Pt. Buchon, March 1985; 1 female and 1 neuter from Sta.-73, 34°28.21'N 120°36.80'W, 98 m, between Pt. Conception and Pt. Arguello, February 1985. Santa Maria Basin, phase II: 1 neuter from cruise 1-3, Sta. R-4 (rep. 1), 34°43.01'N 120°47.39'W, 93 m, off Purisima Pt., May 1987; 1 neuter from cruise 3-4, Sta. R-4 (rep. 3), 34°43.01'N 120°47.39'W, 93 m, off Purisima Pt., May 1989; 1 manca-I from cruise 2-4, Sta. R-4 (rep. 2), 34°43.01'N 120°47.39'W, 93 m, off Purisima Pt.; 1 female from cruise 3-4, Sta. R-4 (rep. 2), 34°43.01'N 120°47.39'W, 93 m, off Purisima Pt., May 1989; 1 female from cruise 1-3, Sta. R-8 (rep. 1), 34°55.30'N 120°45.87'W, 90 m, off Pt. Sal, May 1987.

From Santa Monica Bay, California, collected by Biology Laboratory, Environmental Monitoring Division, City of Los Angeles: 10 females, 1 neuter from Sta. B8, 33°53'48"N 118°28'27"W, 45 m, 11 January 1990; 7 females from Sta. D4, 33°51'07"N 118°31'30"W, 80 m, 11 January 1990; 1 female and 1 male from Sta. C4(2), 33°58'17"N 118°34'00"W, 60 m, 12 July 1990; 3 females and 1 male from Sta. B3, 34°00'25"N 118°35'46"W, 45 m, 09 July 1990; 4 females, 1 male, and 8 neuters (1 neuter dissected) from Sta. D2, 33°53'40"N 118°35'20"W, 79 m, 08 January 1990; 1 male from Sta. 4C, 33°50'40"N 118°26'22"W, 77 m, 24 July 1986; 3 females and 1 male from Sta. C1(2), 33°59'49"N 118°42'50"W, 60 m, 09 July 1990; five females and 3 males (1 female and 1 male dissected) from Sta. B8, 33°53'48"N 118°28'27"W, 45 m, 19 July 1990; 4 females and 2 males from Sta. D4, 33°51'07"N 118°31'30"W, 80 m, 03 September 1987.

From Los Angeles County Museum of Natural History: 3 females, 1 male, and 2 neuters (LACM 59-147), 205 m, rocks, 2.45 mi, 249.5° T (true north) from Gull Island, Santa Cruz Channel, Santa Barbara County, California, 33°56.10'N 119°52.28'W, R/V *Velero IV* (AHF 6806-59), 22 December 1959; 3 females (LACM 59-147), 205 m, rocks, 2.45 mi, 249.5° T from Gull Island, Santa Cruz Channel, Santa Barbara County, California, 33°56.10'N 119°52.28'W, R/V *Velero IV* (AHF 6806-59), 22 December 1959; 6 females (LACM 59-149), 201 m, rocks, 2.3 mi, 246.5° T from Gull Island, Santa Cruz Channel, off south side of Santa Cruz Island, California Channel Islands, California, 33°56.05'N 119°52.05'W, R/V *Velero IV* (AHF 6805-59), 22 December 1959; 1 female (LACM 59-161), 86 m, sand, 2.4 mi, 248° T from Kinton Point, Santa Cruz Island, California Channel Islands, California, 33°59.53'N 119°55.92'W, R/V *Velero IV* (AHF 6803-59), 22 December 1959; 1 female and 1 neuter (LACM 55-35), 73 m, mud, 9.9 mi, 203° T from Santa Monica Pier Light, Los Angeles County, California, 33°51.37'N 118°34.7'W, R/V *Velero IV* (AHF 2998-55), 06 February 1955; 1 female (LACM 58-60), 35 m, green mud, 2.1 mi, 231° T from Santa Monica Pier Light, Los Angeles County, California, 33°59.2'N 118°32.0'W, R/V *Velero IV* (AHF 5732-58), 15 May 1958; 2 females (LACM 55-67), 119 m, sand and mud, 7.4 mi, 229° T from end of El Segundo Pier, Los Angeles County, California, 33°50.00'N 118°32.38'W, R/V *Velero IV* (AHF 3385-55), 23 August 1955; 1 female (LACM 53-125), 229 m, sand, 6.4 mi, 239° T, end of Redondo Beach Pier, Los Angeles County, California, 33°47.05'N 118°30.12'W, R/V *Velero IV* (AHF 2789-53), 08 July 1953; 2 females (LACM 54-38), 11 m, mud with stones, 4.1 mi, 331° T from Palos Verdes Point, Los Angeles County, California, 33°50.00'N 118°28.00'W, R/V *Velero IV* (AHF 2725-54), 08 May 1954; 1 female (LACM 53-128), 183 m, sand, 3.4 mi 301° T from Pt. Vicente Light, Los Angeles County, California, 33°44.13'N 118°25.80'W, R/V *Velero IV* (AHF 2357-53), 08 July 1953; 1 female and 1 male (LACM 57-102), 20 m, coarse black sand, 3.35 mi, 112° T from Pt. Vicente Light, Los Angeles County, California, 33°43.30'N 118°20.88'W, R/V

*Velero IV* (AHF 5102-57), 24 May 1957; 2 females (LACM 60-100), 219 m, 4.7 mi, 349.5° T from Pt. Fermin Light to midpoint, Los Angeles County, California, 33°37.80'N 118°16.73'W, R/V *Velero IV* (AHF 7161-60), 08 October 1960; 1 male (LACM 60-101), 214 m, mud, 3.8 mi, 163.5° T from Pt. Fermin Light, Los Angeles County, California, 33°38.60'N 118°16.27'W, R/V *Velero IV* (AHF 7174-60), 09 October 1960; 2 females and 1 male (LACM 53-126), 75 m, sand, 6.3 mi, 184° T from L.A. Breakwater Lighthouse, Los Angeles County, California, 33°36.23'N 118°15.50'W, R/V *Velero IV* (AHF 2355-53), 11 July 1953; 8 females and 1 fragment (LACM 52-51), 88 m, 9.2 mi, 156.5° T from L.A. Lighthouse, Los Angeles County, California, 33°34.08'N 118°10.68'W, R/V *Velero IV* (AHF 2126-52), 25 June 1952; 1 female (LACM 60-108), 16 m, silt, 0.2 mi, 254.5° T from base of Newport Pier, Newport Canyon, Orange County, California, 33°36.40'N 117°55.90'W, R/V *Velero IV* (AHF 7031-60), 05 May 1960; 1 female (LACM 60-184), 139 m, sand, 45 mi, 037.5° T from Point La Jolla, San Diego County, California, 32°52.38'N 117°15.5'W, R/V *Velero IV* (AHF 7043-60), 07 May 1960; 2 females and 1 male (LACM 60-185), 84 m, sand, 1.4 mi, 027.5° T from Point La Jolla, San Diego County, California, 32°52.35'N 117°15.45'W, R/V *Velero IV* (AHF 7044-60), 07 May 1960.

**Description (female)** (Figure 3.9). Body, 3-5 mm long, about 7× longer than broad. Cephalothorax, 1.4× longer than broad, with curved lateral borders and tapered anterior end. Pereonite 1 shortest of pereonites; pereonites 2-6 quadrangular with relatively straight, parallel, lateral borders; pereonite 4 longest; pereonite 5 almost as long as broad. Pleonites 1 and 5 narrowest of pleonites and pleonites 2-4 broadest; each pleonite about 5× broader than long.

First antenna 3-segmented; first segment long and slender, 3.5× longer than broad; third segment with 2 subterminal setae and slight constriction giving appearance of a fourth segment; formula for armature: 4 setae + 7 feathered hairs, 2 setae + 1 feathered hair, 4 setae + 1 aesthetasc.

Second antenna 6-segmented with armature formula as follows: 1 small seta, 2 stout spines, 1 stout spine, 3 setae + 3 feathered hairs, 2 setae, and 5 setae.

Mandible with pars molaris broad; crushing area well-developed; 1/3 of surrounding wall denticulated.

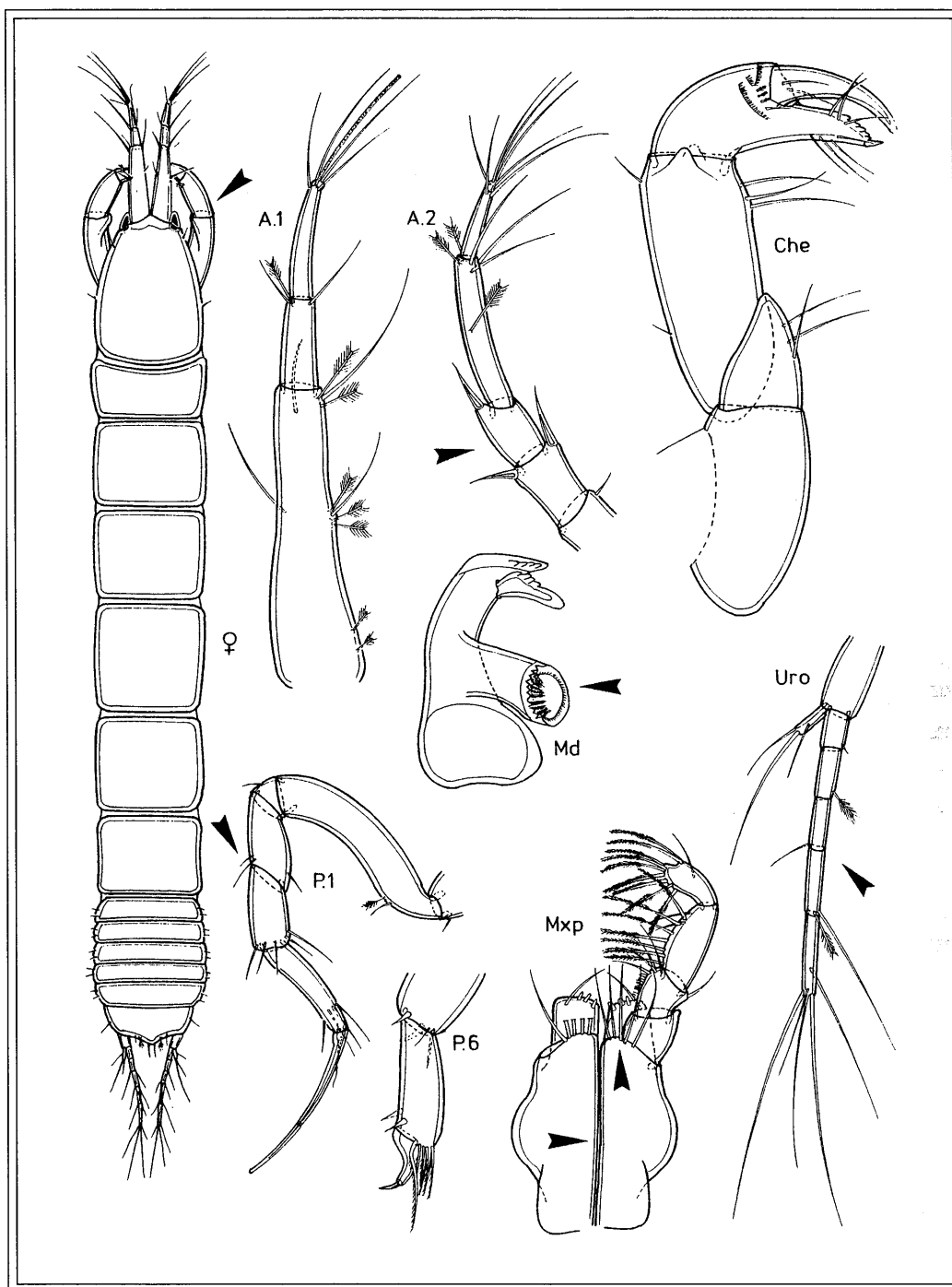
Maxilliped without coxae; basis not fused medially and bearing 5 setae near insertion of palpus. Endites each lobiform with 3 hyaline bulbs and 1 seta. Palpus 4-segmented; distal margin of first segment slanting toward inner border, unarmed; second segment trapezoidal, inner border longer than outer, outer border with 1 seta, inner border with 4 setae and row of small setules; third segment longest, with 7 pinnate setae and 2 naked setae; fourth segment with 9 pinnate setae and 1 naked seta.

Cheliped carpus slender, 2.5× longer than broad, with 2 tergal setae and 3 sternal setae. Palm comb with 3 small pinnate setae and 1 naked seta; 3 rows of minute spinules situated near comb. Fixed finger with spiniform tip and 5 indentations; tergal border with 3 setae and 1 seta (dotted seta in figure) near insertion of dactylus; sternal border with 4 setae. Dactylus with 1 proximal seta.

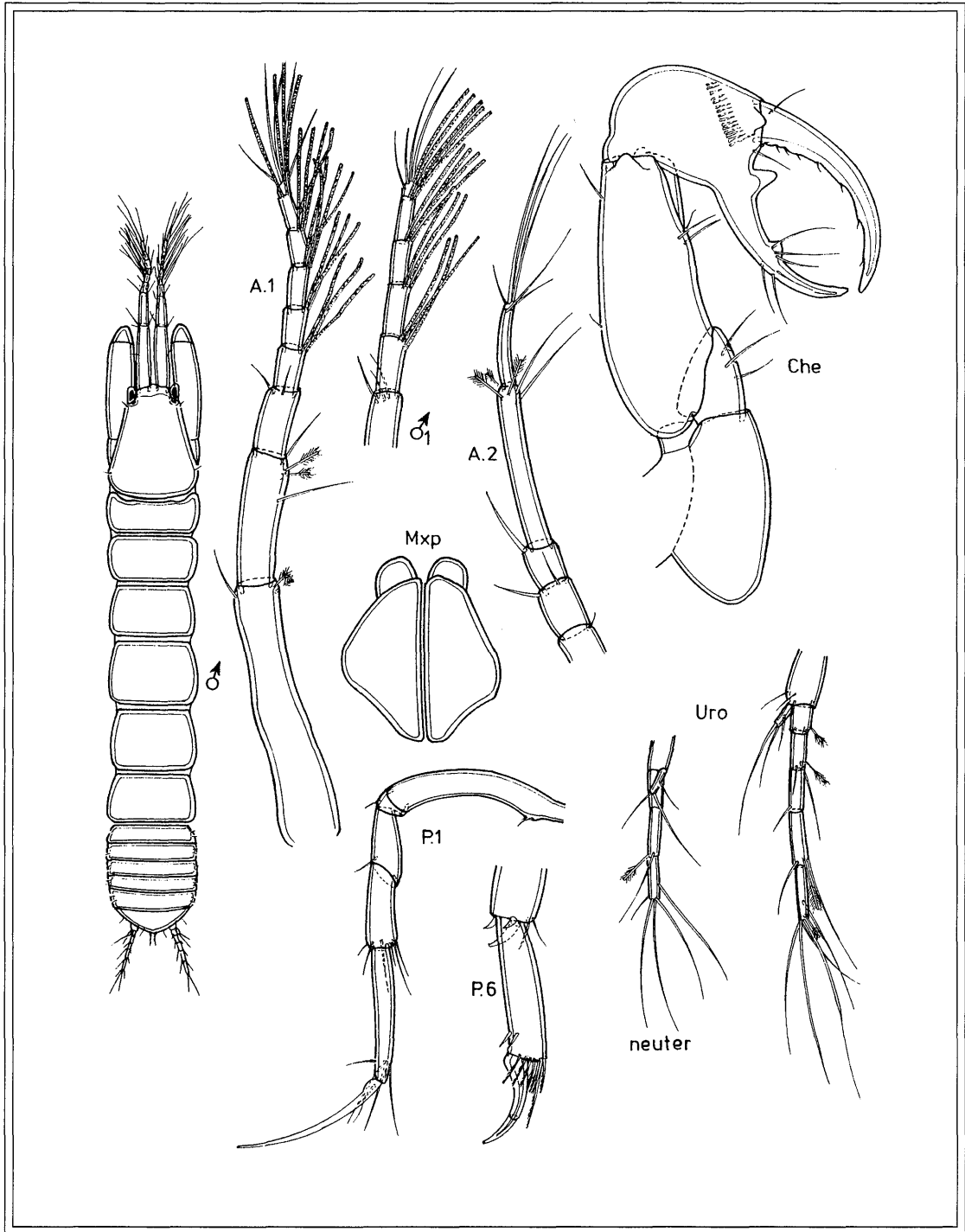
Pereopod 1 with merus bearing 2 tergal setae and 1 sternal seta; carpus with 5 setae; propodus with 1 tergal and 3 sternal setae; dactylus and terminal spine longer than propodus; dactylus with 1 seta. Pereopod 6 with carpus bearing 2 setae and 2 spines; propodus with 2 tergal spines and 1 long and 4 shorter pinnate setae; dactylus and terminal spine forming a stout curved claw.

Pleotelson, 2.5× broader than long, with protuberant posteromedian area.

Uropod biramous. Exopodite 1-segmented, 2.8× longer than broad, with 3 setae. Endopodite 5-segmented; first segment 1.5× longer than broad, with 1 small distal seta; second segment 2.8× longer than broad, with 1 feathered hair; third segment 3× longer than broad, with 1 distal seta; fourth segment 4× longer than broad with 1 long seta and 1 feathered hair; fifth segment about 5.7× longer than broad, with 1 subterminal and 4 long terminal setae.



**Figure 3.9.** *Leptochelia dubia* (Krøyer, 1842) female: ♀, general habitus of female; A.1, first antenna; A.2, second antenna; Md, mandible; Mxp, maxilliped; Che, cheliped; P.1, pereopod 1; P.6, pereopod 6; Uro, uropod.



**Figure 3.10.** *Leptochelia dubia* (Krøyer, 1842) male: ♂, general habitus of male; A.1, first antenna; ♂1, flagellar segments of first antenna (variant); A.2, second antenna; Mxp, maxilliped; Che, cheliped; P.1, pereopod 1; P.6, pereopod 6; Uro, uropod.

**Description (male)** (Figure 3.10). Body, 2 - 3.5 mm long, 6× longer than broad. Cephalothorax 1.3× longer than broad, with narrow anterior end and broad posterior end. Pereonite 1 shortest of pereonites and pereonite 4 longest; all pereonites similar in width. Pleonites 1-5 slightly broader than pereonites, each about 5-5.5× broader than long.

First antenna with 3-segmented peduncle and 5- or 6-segmented flagellum; first segment long, slender, about 4.5× longer than broad; second segment 3.2× longer than broad; third segment 2× longer than broad; remaining segments comparatively short; last one considerably smaller than preceding ones. Formula for armature as follows: 1 seta + 2 feathered hairs, 2 setae + 2 feathered hairs, 2 setae, 3 aesthetascs, 3 aesthetascs, 4 aesthetascs, 4 aesthetascs, 3 aesthetascs, 4 setae + 1 aesthetasc.

Second antenna 6-segmented; first segment semicircular in cross-section; second and third segments short, about as long as broad; segment 4 long and slender, 6.7× longer than broad; segment 5 about 5.7× longer than broad; segment 6 minute, as long as broad. Armature formula as follows: 1 seta, 1 seta + 1 spine, 1 spine, 2 setae + 3 feathered hairs, 1 seta (?), and 5 setae (?).

Maxilliped sexually dimorphic; basis reduced to unarmed plates; palpus reduced to rounded lobes without setae.

Cheliped carpus slender, 2.4× longer than broad. Palm comb with numerous spinules. Fixed finger curved with 1 proximal tergal process and 1 tergal process near midlength; 1 tergal seta located between proximal process and insertion of dactylus and 3 setae near process at midlength; sternal border with 3 setae. Dactylus slender, curved, with 1 proximal tergal seta and several setules along sternal margin.

Pereopod 1 more slender than in female; merus with 1 tergal seta; carpus with 6 setae; propodus with 5 setae; dactylus and terminal spine as long as propodus; dactylus with 1 seta. Pereopod 6 carpus with stout spines and 2 sternal setae; propodus with 2 tergal spines and 1 long and 7 shorter pinnate setae.

Pleotelson about 2.2× broader than long.

Uropod biramous with basis bearing 2 setae. Exopodite 1-segmented, 3× longer than broad, with 3 setae. Endopodite 5-segmented, with armature as follows: 1 feathered hair + 1 setule, 2 setae + 1 feathered hair, 1 seta, 2 setae + 1 feathered hair, 5 setae + 1 feathered hair.

**Remarks.** This species can be distinguished from all other southern California tanaidaceans by the 5-segmented endopodite of the uropods in both the adult female and male. The endopodite of the neuter of this species is 3-segmented (Figure 3.10). Several characters in combination also are helpful in the diagnosis of *L. dubia*: (1) the spines on the second and third segments of the second antenna of the female, (2) the structure of the pars molaris of the mandible, (3) the unfused maxillipedal basis, (4) 3-5 setae on the distal end of the maxillipedal basis, (5) the armature of the maxillipedal endite, and (6) 2 setae on the merus of pereopod 1. The males can be distinguished from the females by the large chelipeds and the handcuff-like propodus/dactylus combination. Some males with a different number of flagellar segments (Figure 3.10, ♂1) were present in the collection.

This species inhabits a wide range of substrates from rocks and sand to mud and silt.

**Type Locality and Type Species.** See Krøyer (1842).

**Distribution.** *Leptochelia dubia* occurs in tropical and subtropical shallow waters throughout the world; it is known from Santa Maria Basin, California south to La Jolla, San Diego County, California.

Family Paratanaidae Lang, 1949

Genus *Paratanais* Dana, 1849

*Paratanais intermedius* Dojiri and Sieg, new species

Figure 3.11

**Type Material.** 1 female holotype (USNM 284721) from Sta. BRA-20, 35°15.72'N 121°04.68'W, 396 m, off Pt. Buchon, Santa Maria Basin, California, June 1985, originally identified as Paratanaidae sp. A; 1 female paratype (SBMNH 144121)(dissected) from Sta. BRC-1, 35°27.86'N 121°05.33'W, 98 m, off Pt. Estero, Santa Maria Basin, California, June 1985, originally identified as Paratanaidae sp. A.; 1 manca-II (paratype; SBMNH 144130) from Sta. BRA-16, 35°12.23'N 121°16.29'W, 591 m, southwest of Pt. Buchon, Santa Maria Basin, California, originally identified as Tanaidacea sp. A; 1 manca-II (paratype; SBMNH 144131) from Sta. 6, 35°20.88'N 120°59.62'W, 109 m, between Pt. Estero and Pt. Buchon, Santa Maria Basin, California, October 1984, originally identified as Tanaidacea sp. A.

**Description (female)** (Figure 3.11). Body, 2.16 mm long, about 6× longer than broad. Cephalothorax, 1.2× longer than broad, with posterior margin broader than anterior. Pereonites 1 and 6 similar in length; pereonite 1 broadest; pereonite 4 longest; all pereonites with convex lateral borders. Pleonites 1-5 similar lengths and widths; 4.4× broader than long.

First antenna 4-segmented; first segment about 2.5× longer than broad; second segment as long as broad; third segment smallest, annular; fourth segment 2.6× longer than broad; formula for armature: 1 seta + 5 feathered hairs, 1 seta + 4 feathered hairs, 1 seta, and 4 setae + 1 aesthetasc + 1 feathered hair.

Second antenna 6-segmented; segment 1 small and unarmed; armature formula of segments 2-6 as follows: 2 setae, 1 stout spine, 1 seta + 5 feathered hairs, 1 seta, and 5 setae.

Mandible with broad pars molaris; crushing area well-developed with serrations.

Maxilliped without coxae; basis fused to about midlength, bearing 1 distal seta near insertion of palpus. Endites each with 2 hyaline bulbs and 1 medial seta. Palpus 4-segmented; first segment stout and unarmed; second segment with 1 naked seta on outer border and 1 naked seta, 1 pinnate stout seta, and 1 denticulated spine on inner border; third segment with 3 pinnate setae and 1 naked seta; and fourth segment with 5 pinnate setae and 1 naked seta.

Cheliped carpus stout, 1.3× longer than broad (length measured along tergal margin), with 2 small tergal setae (1 proximal, another distal) and 2 sternal setae. Fixed finger with spiniform tip and bilobed protuberance (indicated by arrow in figure); tergal border with 3 setae and 1 seta (dotted seta in figure) near insertion of dactylus; sternal border with 1 seta. Dactylus stout with 1 small tergal seta and 1 sternal spiniform element.

Pereopod 1 with merus almost as long as carpus, bearing 1 tergal seta; carpus with 1 tergal seta and 2 sternal setae; propodus with 3 sternal setae; dactylus and terminal spine longer than propodus; dactylus with 1 seta. Pereopod 6 with carpus bearing 2 stout tergal spines, 1 small sternal seta, and 1 large clawlike spine; propodus with 2 stout tergal spines, 3 sternal pinnate spines, and 1 sternal feathered hair; dactylus with 2 minute sternal setules, and several curved rows of minute spinules; terminal spine relatively stout and curved.

Pleotelson, 2.5× broader than long, with rounded posterior margin.

Uropod biramous. Exopodite 1-segmented, 3.7× longer than broad, with 1 subterminal and 2 terminal setae. Endopodite 1-segmented with constriction at about midlength, approximately 2.4× longer than broad, and bearing 2 feathered hairs near constriction, and 5 setae at tip.



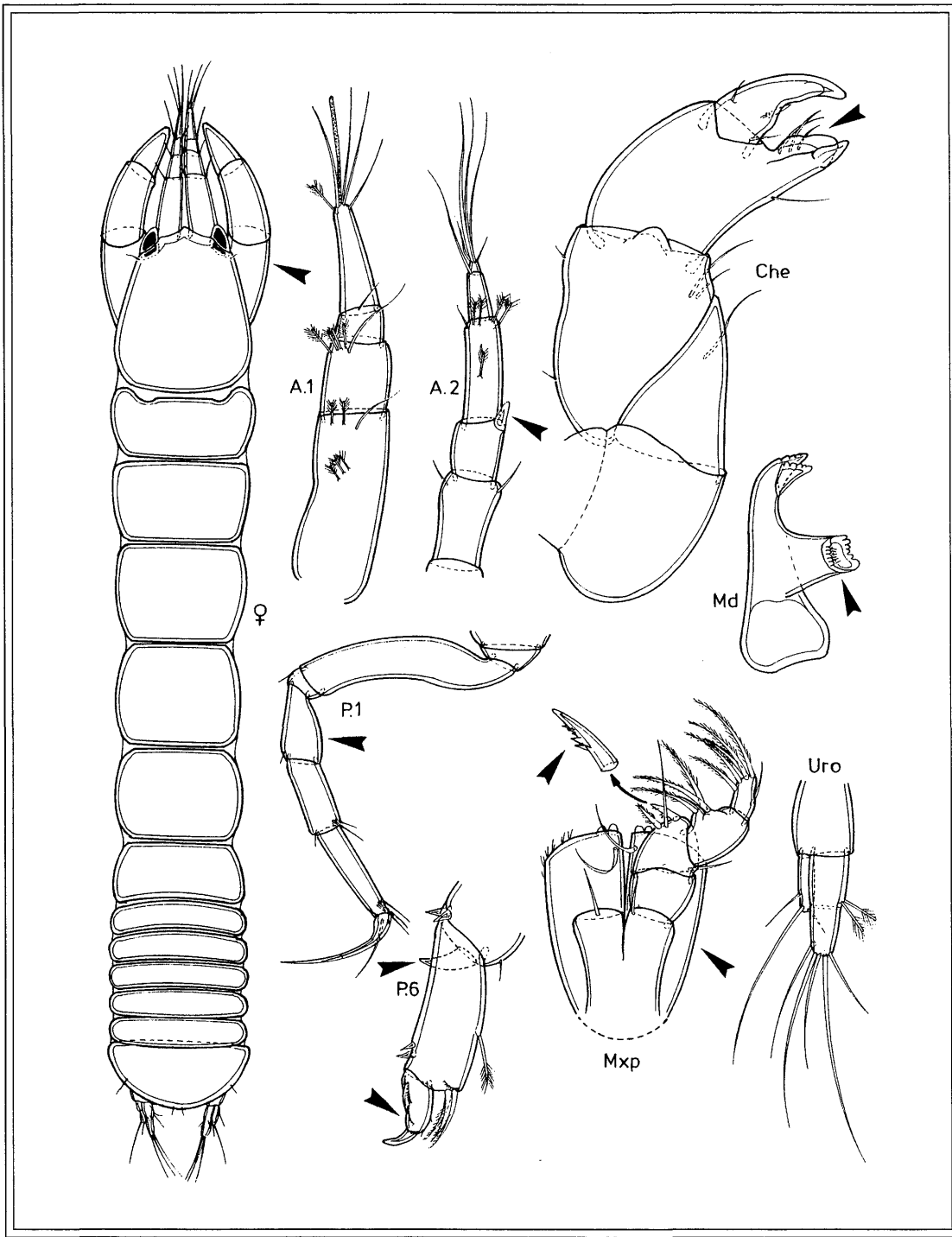


Figure 3.11. *Paratanais intermedius* Dojiri and Sieg, new species, female: ♀, general habitus of female; A.1, first antenna; A.2, second antenna; Md, mandible; Mxp, maxilliped; Che, cheliped; P.1, pereopod 1; P.6, pereopod 6; Uro, uropod.

**Remarks.** The genus *Paratanais* is readily identified by a combination of the following characters: a broad pars molaris, a pair of eyes, strong spine on the third segment of the second antenna, and a 2-segmented uropodal endopodite.

*Paratanais intermedius* appears to be morphologically related to *P. impressus* Kussakin and Tzareva and *P. spinanotandus* Sieg, but can be distinguished from these two species by the length of the merus relative to the carpus (about equal in length in *P. intermedius*) and by the serrated stout spine on the second palpal segment of the maxilliped.

This species was identified as Paratanaidae sp. A and Tanaidacea sp. A in the MMS voucher collection.

**Etymology.** The specific name *intermedius* alludes to the species morphological similarities to two species, *Paratanais impressus* and *P. spinanotandus*.

**Type Locality and Type Specimens.** Santa Maria Basin, California. Types deposited in the National Museum of Natural History (USNM 284721) and the Santa Barbara Museum of Natural History (SBMNH 144121, 144130, 144131); see "Type Material."

**Distribution.** So far known only from its type locality, Santa Maria Basin, California.

Family Anarthruridae Lang, 1971

Subfamily Anarthrurinae Lang, 1971

Genus *Siphonolabrum* Lang, 1972

***Siphonolabrum californiensis* Dojiri and Sieg, new species**

Figures 3.12, 3.13

**Type Material.** 1 female (holotype; USNM 284722), 2 paratypes (1 female; 1 dissected; SBMNH 144129), and 1 male (dissected) from Sta. BSR-79, 34°24.12'N 120°28.32'W, 98 m, off Pt. Conception, Western Santa Barbara Channel, California, originally identified as *Leptognathia* sp. F.

**Material Examined.** Santa Maria Basin and Western Santa Barbara Channel, phase I: 1 male from Sta. 79, 34°24.12'N 120°28.32'W, 98 m, off Pt. Conception, 09 November 1983, originally identified as *Cryptocope* sp. D; 2 neuters and 2 fragments from Sta. 39, 34°49.53'N 120°56.85'W, 294 m, off Pt. Sal, October 1984, originally identified as *Leptognathia* sp. F; 1 neuter from Sta. 59, 34°33.65'N 120°47.18'W, 216 m, off Pt. Arguello, October 1984, originally identified as *Leptognathia* sp. D. Santa Maria Basin, phase II: 4 neuters and 1 fragment from cruise 1-1, Sta. PJ-17 (rep.2), 34°56.56'N 120°48.98'W, 126 m, originally identified as *Araphura* sp. C; 4 neuters from cruise 2-3, Sta. R-4 (rep.1), 34°43.01'N 120°47.39'W, 92 m, off Purisima Pt., originally identified as *Araphura* sp. C; 7 neuters and 1 fragment from cruise 2-4, Sta. R-2 (rep. 1), 35°05.50'N 120°53.40'W, 161 m, off Pt. San Luis; 5 females from cruise 1-2, Sta. PJ-23 (rep.1), 34°56.33'N 120°49.90'W, 143 m, originally identified as *Araphura* sp. C; 6 females, 1 neuter, and 1 manca-II from cruise 1-1, Sta. PJ-7 (rep. 1), 34°55.79'N 120°48.60'W, 123 m, originally identified as *Leptognathia* sp. F; 11 females and 2 manca-II from cruise 1-1, Sta. PJ-1 (rep. 1), 34°55.79'N 120°49.91'W, 145 m, originally identified as *Leptognathia* sp. F; 11 females and 3 manca-III from cruise 1-1, Sta. R-2 (rep. 3), 35°05.30'N 121°00.90'W, 409 m, off Pt. San Luis, originally identified as *Leptognathia* sp. F; 4 females and 1 manca-II from cruise 1-1, Sta. PJ-2 (rep. 2), originally identified as *Leptognathia* sp. F; 9 females, 1 neuter, and 1 manca-II from cruise 1-3, Sta. PJ-8 (rep. 3), 34°56.87'N 120°49.91'W, 142 m, originally identified as *Araphura* sp. C; 8 females from cruise 1-3, Sta. R-4 (rep. 2), 34°43.01'N 120°47.39'W,

92 m, off Purisima Pt., originally identified as *Araphura* sp. C; 7 females and 2 neuters from cruise 1-3, Sta. PJ-7 (rep. 3), 34°55.79'N 120°48.60'W, 123 m, originally identified as *Araphura* sp. C; 5 females and 3 manca-II from cruise 1-1, Sta. R-6 (rep. 3), 34°41.40'N 120°57.90'W, 410 m, off Purisima Pt., originally identified as *Leptognathia* sp. F; 9 females and 3 neuters from cruise 1-3, Sta. PJ-1 (rep. 2), 34°55.79'N 120°49.91'W, 145 m, originally identified as *Araphura* sp. C; 10 females from cruise 1-3, Sta. R-1 (rep. 3), 35°05.83'N 120°49.16'W, 91 m, off Pt. San Luis, originally identified as *Araphura* sp. C; 6 females, 1 neuter, and 3 manca-II from cruise 1-3, Sta. PJ-23 (rep. 2), 34°56.33'N 120°49.90'W, 143 m, *Araphura* sp. C.

From Santa Monica Bay, California, collected by Biology Laboratory, Environmental Monitoring Division, City of Los Angeles: 1 fragment (neuter) from Sta. E2, 33°58'39"N 118°39'16"W, 150 m, 05 January 1989.

**Description (female)** (Figure 3.12). Body, 1.74-2.32 mm long, about 7× longer than broad. Cephalothorax, 1.2× longer than broad, with lateral margins convex. Pereonite 1 shortest of pereonal segments; all pereonites similar in width. Pleonites 1-5 similar in lengths and widths, approximately 3-3.7× wider than long.

First antenna 4-segmented; first segment about 2.4× longer than broad; second segment 1.3× longer than broad; third segment smallest, as long as broad; fourth segment 3.3× longer than broad; formula for armature: 1 seta + 4 feathered hairs, 2 setae + 3 feathered hairs, 2 setae, and 6 setae + 1 aesthetasc + 1 feathered hair.

Labrum with large patch of setules.

Mandible without pars molaris; pars incisiva tipped with several teeth.

Maxilliped without coxa; basis fused. Distal margin of endites each with 1 long seta. Palpus 4-segmented; first segment stout and unarmed; second segment with 3 medial setae; third segment with 4 setae; fourth segment with 4 inner and 1 small outer setae.

Cheliped with basis lacking enlarged protuberance (projection); proximal basal margin articulating with ventral surface of cephalothorax. Merus slightly enlarged and bearing protuberance on sternal surface immediately distal to single seta. Carpus stout, about 1.3× longer than broad, bearing 1 proximal tergal seta, 1 distal tergal seta, and 2 proximal sternal setae. Fixed finger with spiniform tip, bicuspid tooth (indicated by arrow in figure) near tip, and 1 single tooth near midlength of finger; tergal border with 3 setae near midlength and 6 setae near insertion of dactylus; sternal border with 1 seta. Dactylus with 1 large seta near midlength.

Pereopod 1 with merus about as long as carpus and bearing no setae or spines; carpus with 3 setae; propodus with 1 seta; dactylus with long whiplike seta. Pereopod 6 with carpus bearing 3 stout plumose spines and 1 sternal setule; propodus with 2 plumose tergal spines and 1 plumose sternal spine on distal margin; dactylus slender.

Pleotelson, 1.6× broader than long, with convex posterior margin.

Uropod "pseudobiramous." Exopodite fused to basis with 1 subterminal and 2 long setae and 1 terminal feathered hair. Endopodite 2-segmented; first segment 2.5× longer than broad and carrying 1 seta and 2 feathered hairs; second segment 1.9× longer than broad and bearing 5 setae and 1 feathered hair.

**Description (male)** (Figure 3.13). Body 4.8× longer than broad. Cephalothorax 1.5× broader than long, broadest in posterior half. Pereonites 1, 2, and 6 similar in length and width, 3.3-3.5× broader than long; pereonites 3-5 similar, 2.2-2.5× broader than long. Pleonites 1-5 approximately 3× broader than long.

First antenna with 2-segmented peduncle and 4- or 5-segmented flagellum. Formula for armature as follows: 1 seta + 3 feathered hairs, 2 setae + 2 feathered hairs, 2 setae + 1 feathered hair, numerous (~10) aesthetascs, numerous (~10) aesthetascs, 5 setae + 1 aesthetasc.

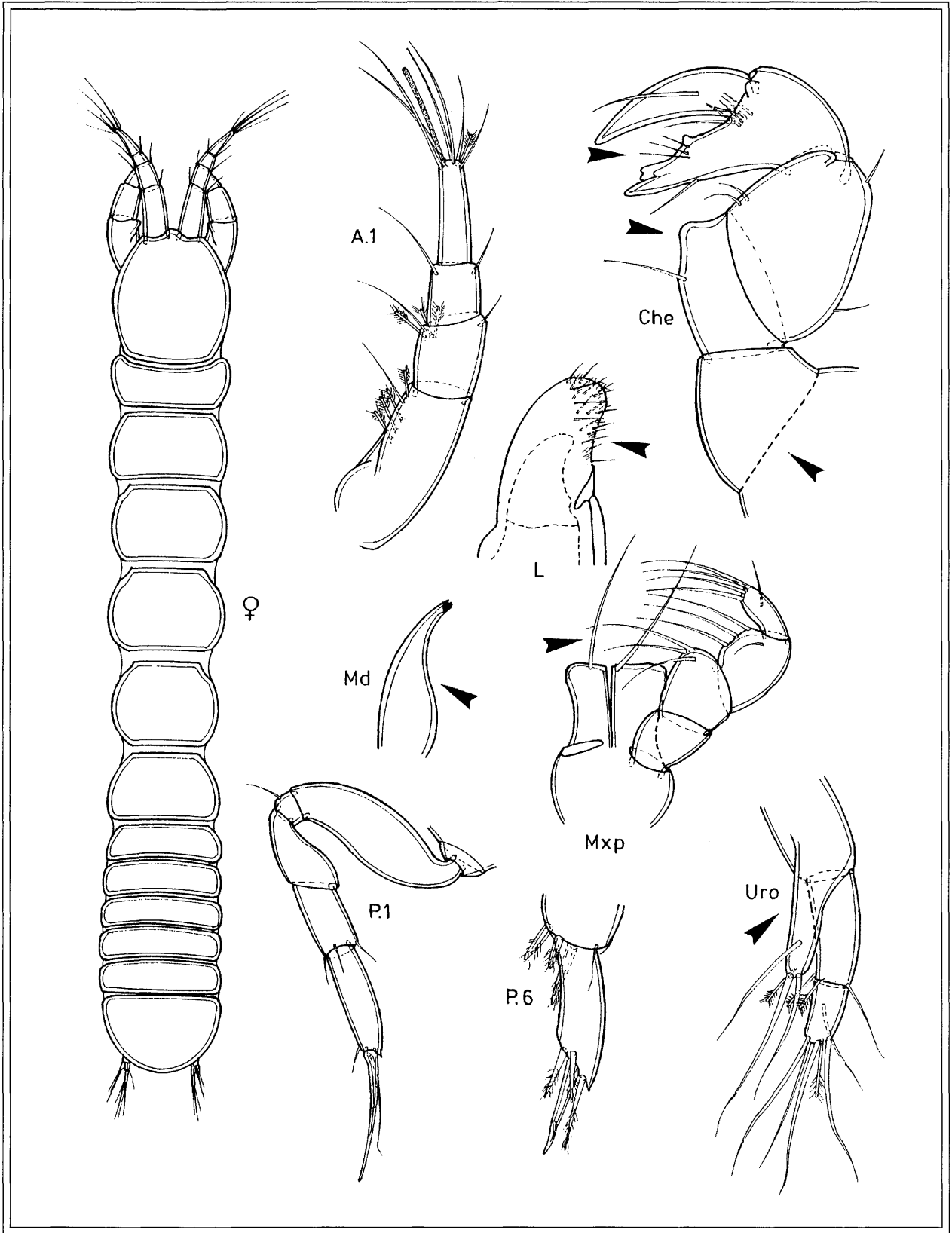


Figure 3.12. *Siphonolabrum californiensis* Dojiri and Sieg, new species, female: ♀, general habitus of female; A.1, first antenna; L, labrum; Md, mandible; Mxp, maxilliped; Che, cheliped; P.1, pereopod 1; P.6 pereopod 6; Uro, uropod.

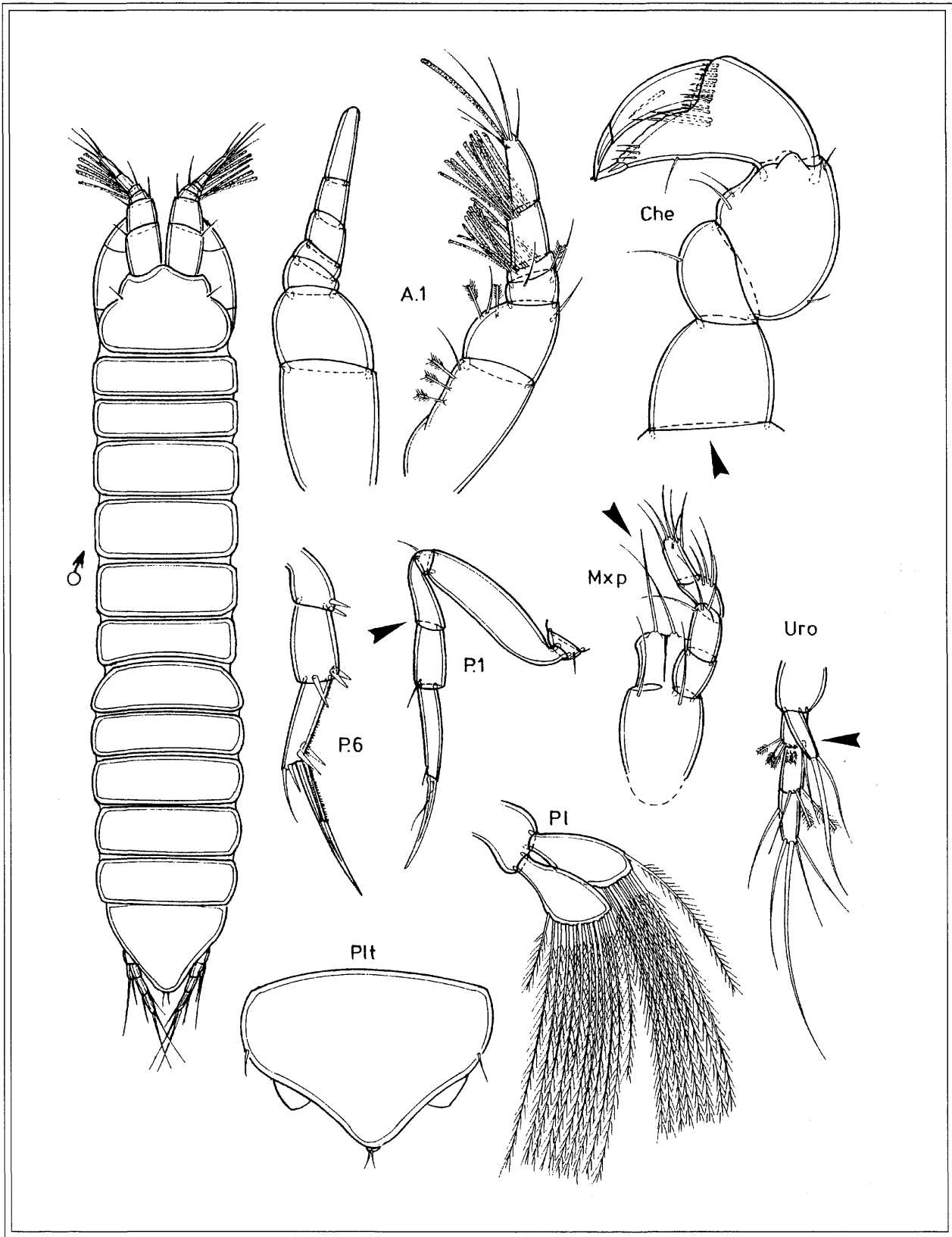


Figure 3.13. *Siphonolabrum californiensis* Dojiri and Sieg, new species., male: ♂, general habitus of male; A.1, first antenna; Mxp, maxilliped; Che, cheliped; P.1, pereopod 1; P.6, pereopod 6; Pl, pleopod; Plt, pleotelson; Uro, uropod.

Maxilliped basis fused medially and bearing 1 seta near insertion of each palpus. Endites each with 1 seta. Palpus 4-segmented; first segment unarmed; second segment with 3 distal setae; third segment with 3 setae; and fourth segment with 6 setae.

Cheliped basis as in female. Merus with 1 sternal seta at about midlength. Carpus about 1.3× longer than broad, bearing 1 proximal tergal seta and 1 distal tergal seta and 2 sternal setae. Propodus with 1 rostral seta, 2 longer caudal setae, and comb consisting of several (about 10) setae. Fixed finger with rugose (irregular) tergal margin and bearing 3 setae near spiniform tip; sternal margin with 1 seta at about midlength. Dactylus with 1 large caudal seta near midlength.

Pereopod 1 more slender than in female; merus unarmed; carpus with 1 distal tergal seta; propodus with small distal tergal seta; dactylus with 1 seta. Pereopod 6 merus with 2 stout tergal spines; carpus with 3 stout spines; propodus with 3 spines and 1 seta; propodus and dactylus with row of spinules (or denticulations).

Pleopod biramous; exopodite and endopodite about 2× longer than broad and bearing numerous pinnate setae.

Pleotelson about 1.4× broader than long, with protuberant posteromedial margin; tip of posteromedial protuberance with 2 small setae.

Uropod biramous. Exopodite 1-segmented, 3× longer than broad, with 3 (?) setae. Endopodite 3-segmented, with armature as follows: 5 feathered hairs, 1 seta + 2 feathered hairs, and 5 setae.

**Remarks.** The genus *Siphonolabrum* can be easily recognized from the other tanaid genera inhabiting the Santa Maria Basin and Western Santa Barbara Channel by the proximal margin of the chelipedal basis articulating directly with the cephalothorax; in other genera the cheliped articulates with the cephalothorax via a sclerotized plate known as the “side-piece.”

The large patch of setules on the labrum, the absence of the pars molaris, the presence of long setae on the maxillipedal endites, the humplike process on the sternal surface of the chelipedal merus of the female, and the bicuspid tooth on the tergal border of the fixed finger of the cheliped of the female distinguishes this species from all known taxa.

**Etymology.** The specific name alludes to the state from which the new species was collected.

**Type Locality and Type Specimens.** Santa Maria Basin and Western Santa Barbara Channel, California. Types deposited in the National Museum of Natural History (USNM 284722) and the Santa Barbara Museum of Natural History (SBMNH 144129); see “Type Material.”

**Distribution.** Reported from its type locality, Santa Maria Basin and Western Santa Barbara Channel, California south to Santa Monica Bay and San Pedro, California.

#### Subfamily Akanthophoreinae Sieg, 1986

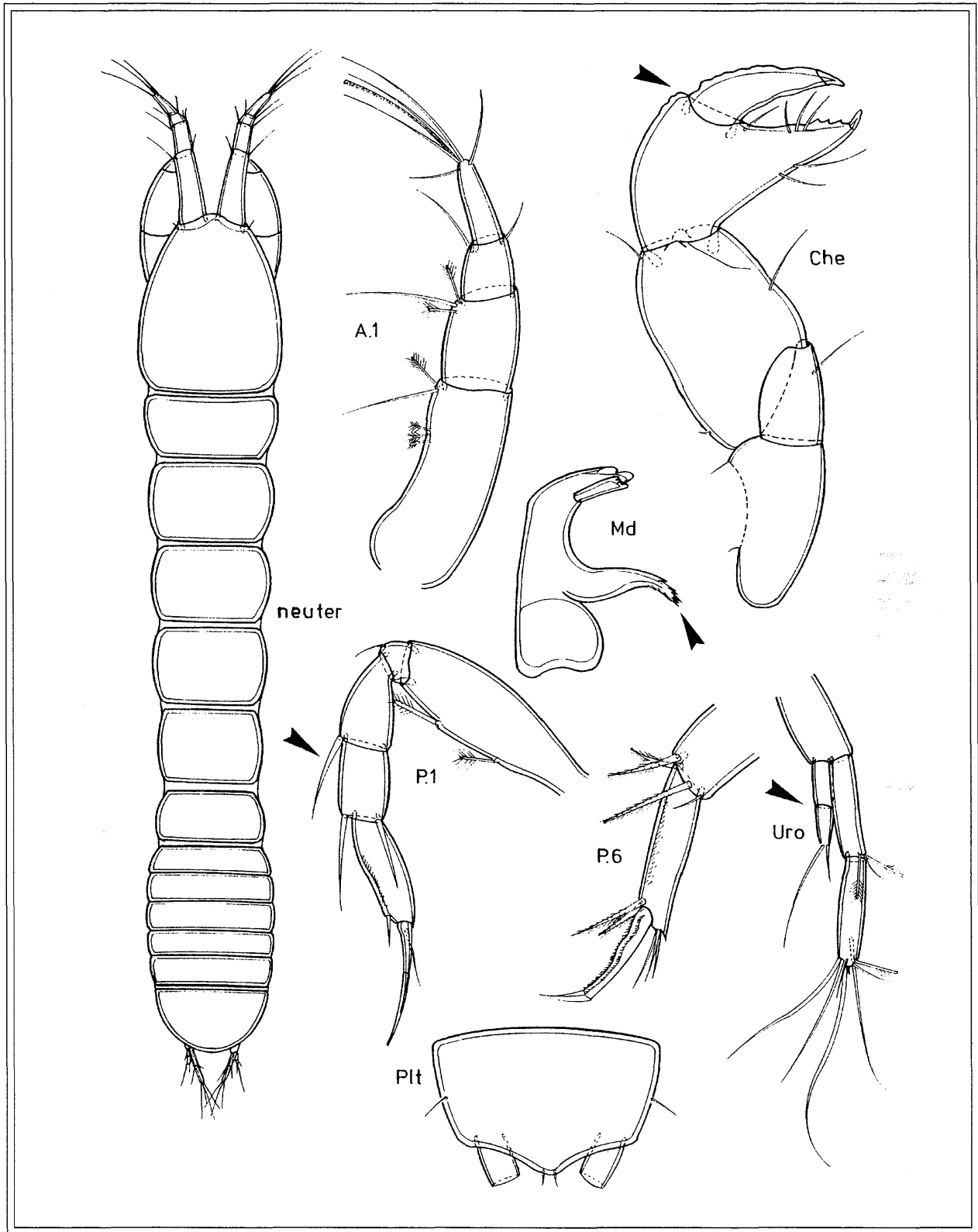
#### Genus *Paraleptognathia* Kudinova-Pasternak, 1981

#### *Paraleptognathia* cf. *gracilis* (Krøyer, 1842)

Figure 3.14

**Material Examined.** 1 neuter (dissected on slides) from phase II, cruise 1-1, Sta. PJ-2 (rep. 1), 34°55.30'N 120°45.90'W, Santa Maria Basin, California.

**Description (neuter)** (Figure 3.14). Body, 1.5 mm long, about 6× longer than broad. Cephalothorax, approximately 1.3× longer than broad, with convex lateral margins. Pereonites with convex lateral borders, and decreasing in width posteriorly with pereonite 1 broadest and pereonite 5 narrowest; pereonite 6 shortest



**Figure 3.14.** *Paraleptognathia cf. gracilis* (Krøyer, 1842), neuter: neuter, general habitus of neuter; A.1, first antenna; Md, mandible; Che, cheliped; P.1, pereopod 1; P.6, pereopod 6; Plt, pleotelson; Uro, uropod.

and slightly broader than pereonite 5. Pleonites 2-5 similar in size, each about 4-5× broader than long; pleonite 3 widest of pleonites.

First antenna 4-segmented with armature as follows: 1 seta + 4 feathered hairs, 1 seta + 2 feathered hairs, 2 setae, and 5 setae + 1 aesthetasc, respectively.

Mandible with pars molaris bearing several (9?) pointed processes at tip.

Cheliped carpus moderately stout, about 1.5× longer than broad (length measured along tergal border); tergal border without pointed protrusion proximally; sternal border without platelike projection. Propodus with crenulations on distal end of tergal margin near insertion of dactylus. Fixed finger with 3 spiniform processes ("teeth") and sclerotized tip; tergal border with 3 setae and 1 seta near articulation of dactylus; sternal border with 2 setae. Dactylus with crenulations along tergal border.

Pereopod 1 with merus bearing 1 large spine; carpus with 1 tergal and 1 sternal spines; propodus with row of minute setules along tergal border and tergal spine at tip; dactylus with 1 seta. Pereopod 6 with carpus equipped with 3 pilose spines and 1 small naked seta; propodus with row of minute setules, 2 tergal pilose spines and 3 sternal naked setae.

Pleotelson, 1.5× broader than long, with slightly convex lateral borders, each with 1 seta at about midlength; posterior margin with protuberant median area bearing 2 small setae.

Uropods biramous. Exopodite 2-segmented, slightly shorter than first endopodal segment; first segment, about 2× longer than broad, naked; second segment, with proportion similar to that of first segment, having 2 setae at tip. Endopodite 2-segmented; first segment, 3.8× longer than broad, with 2 feathered hairs and 1 seta; second segment, 4× longer than broad, with 1 feathered hair, 1 subterminal seta, and 2 small and 3 long terminal setae.

**Remarks.** This single specimen was originally identified as *Leptognathia* sp. C. The original description of *Leptognathia gracilis* by Krøyer (1842) is not adequate for comparative purposes. This specimen may represent a new species, but should be carefully compared to specimens positively identified as *Paraleptognathia gracilis* (Krøyer, 1842) before a final decision on its taxonomic status is made.

This species can be distinguished from *Paraleptognathia bisetulosa* new species, described below, by the shape of the cephalothorax, the presence of crenulations on the tergal border of the propodus of the cheliped, and the number of setae on the merus of pereopod 1.

**Distribution.** In addition to its type locality, this species has so far only been collected from the Santa Maria Basin at Sta. PJ-2, California.

### *Paraleptognathia bisetulosa* Dojiri and Sieg, new species

Figure 3.15

**Type Material.** 1 female holotype (on slides; USNM 284723) from cruise 1-3, Sta. R-6 (rep. 1), 34°41.40'N 120°57.90'W, 410 m, off Purisima Pt., Santa Maria Basin, California, May 1987, collected by Battelle.

**Description (female)** (Figure 3.15). Body, 2 mm long, about 6× longer than broad. Cephalothorax, slightly longer than broad, with nearly straight parallel borders, and markedly tapered at anterior end. Pereonites 2-4 with convex lateral borders; pereonite 6 narrowest of pereonites, with concave lateral borders. Pleonites 1-5 similar in length and width to each other, and about as broad as pereonites 2-4.

First antenna 4-segmented with armature as follows: 2 setae + 4 feathered hairs, 2 setae + 4 feathered hairs, 2 setae, and 4 long and 1 short setae + 1 feathered hair + 1 aesthetasc.

Mandible with pars molaris bearing several pointed processes at tip.



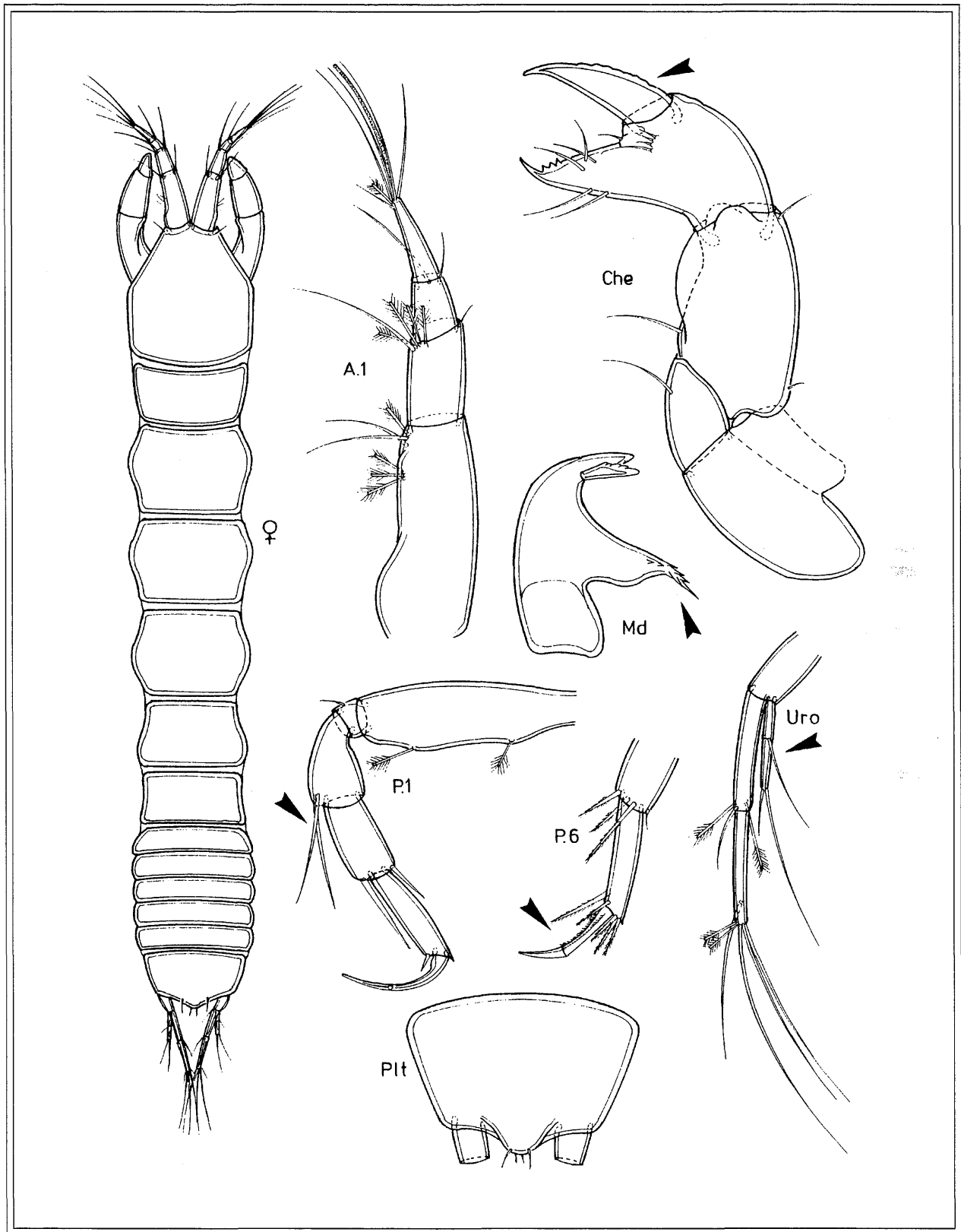


Figure 3.15. *Paraleptognathia bisetulosa* Dojiri and Sieg, new species, female: ♀, general habitus of female; A.1, first antenna; Md, mandible; Che, cheliped; P.1, pereopod 1; P.6, pereopod 6; Plt, pleotelson; Uro, uropod.

Cheliped carpus about 1.8× longer than broad (length measured along tergal border), with small platelike projection on sternal border; tergal border without pointed protrusion proximally; palm bearing comb with 1 long and 3 short setae on caudal surface. Fixed finger with slender spiniform tip and 3 smaller “teeth;” tergal border with 1 seta near insertion of dactylus and 3 setae near midlength; sternal border with 2 long setae. Distal part of propodus and dactylus with slight crenulations along tergal border.

Pereopod 1 with merus bearing 2 long, strong setae instead of spines; carpus with 1 tergal and 1 sternal setae; propodus with spiniform sternal corner and 1 tergal spine. Pereopod 6 with carpus carrying 3 pilose setae and 1 small sternal seta; propodus with 2 tergal pilose setae and 3 sternal pilose setae.

Pleotelson, 1.5× broader than long; posterior margin with protuberant median area bearing 4 minute setae.

Uropods biramous. Exopodite 2-segmented and slightly shorter than first endopodal segment; first segment, about 3× longer than broad, with 1 long slender seta; second segment longer than first, about 4.5× longer than broad, bearing 1 long and 1 short setae. Endopodite 2-segmented; first segment 6× longer than broad, and having 1 seta and 2 feathered hairs; second segment 8× longer than broad, as long as first segment, but more slender, and carrying 1 subterminal and 3 long slender setae and 2 feathered hairs.

**Remarks.** This species can be distinguished from *Paraleptognathia* cf. *gracilis* by the characters outlined above in the Remarks section for the former species. The presence of two setae on the merus of pereopod 1 distinguishes *P. bisetulosa* from its congeners. In addition, the single seta on the first exopodal segment of the uropod helps to separate this species from *P.* cf. *gracilis*.

**Etymology.** The specific name refers to the two setae on the merus of pereopod 1.

**Type Locality and Type Specimen.** Santa Maria Basin, California. Types deposited in the National Museum of Natural History (USNM 284723) and the Santa Barbara Museum of Natural History (SBMNH); see “Type Material.”

**Distribution.** This species is so far known only from its type locality, Santa Maria Basin, California.

Genus *Scoloura* Sieg and Dojiri, 1991

*Scoloura phillipsi* Sieg and Dojiri, 1991

Figure 3.16

*Scoloura phillipsi* Sieg and Dojiri, 1991: 1495-1501, figs. 1-4.

**Material Examined.** Phase I: 4 females from Sta. 50, 34°37'48"N 121°01'40"W, 591 m, off Purisima Pt; 1 neuter from Sta. 79, 34°24'07"N 120°28'19"W, 98 m, off Pt. Conception, Western Santa Barbara Channel; 1 female from Sta. 73, 34°28'13"N 120°36'48"W, 98 m, between Pt. Conception and Pt. Arguello; 1 fragment from Sta. 3, 35°27.07'N 121°10.20'W, 291 m, off Pt. Estero, Santa Maria Basin, California.

From Santa Monica Bay, California, collected by Biology Laboratory, Environmental Monitoring Division, City of Los Angeles: 1 female from Sta. 7B, 33°54'45"N 118°35'25"W, 138 m, 18 January 1977; 1 female from Sta. 7B, 33°54'45"N 118°35'25"W, 180 m, 12 July 1984; 1 female from Sta. 8C, 33°58'47"N 118°36'17"W, 125 m, 19 January 1977; 1 female from Sta. E2, 33°58'39"N 118°39'16"W, 150 m, 05 January 1989; 2 females from Sta. 8C, 33°58'47"N 118°36'17"W, 120 m, 22 July 1977; 2 females from Sta. 4C, 33°50'40"N 118°26'22"W, 77 m, 24 July 1986; 1 female from Sta. 4C, 33°50'40"N 118°26'22"W, 08 January 1987; 1 female from Sta. 7B, 33°54'45"N 118°35'25"W, 172 m, 29 July 1985; 3 females (1 dissected) from Sta. 4C, 33°50'40"N 118°26'22"W, 76 m, 13 January 1977; 1 female from Sta. 7B, 33°54'45"N 118°35'25"W, 11 July 1985; 1 female from Sta. 7B, 33°54'45"N 118°35'25"W, 190 m, 09 July 1982.

From Los Angeles County Museum of Natural History: 5 females and 1 neuter (LACM 54-54) 7.8 mi 298° T (true north) from Palos Verdes Pt., 33°49'59"N 118°34'06"W, 165 m, sandy blue-gray mud, R/V *Velero IV* (AHF 2789-54), 22 May 1954; 2 females (LACM 60-100) 4.7 mi 349.5° T from Pt. Fermin Light to midpoint, 33°37'48"N 118°16'44"W, 219 m, R/V *Velero IV* (AHF 7161-60), 08 October 1960; 1 female (LACM 55-67) 7.4 mi 229° T from end of El Segundo Pier, 33°50'00"N 118°32'23"W, 119 m, sand and mud, R/V *Velero IV* (AHF 3385-55), 23 August 1955; 2 females and 1 fragment (LACM 53-126) from 6.3 mi 184° T from L.A. Breakwater Lighthouse, 33°36'14"N 118°15'30"W, 75 m, sand, R/V *Velero IV* (AHF 2355-53), 11 July 1953; 1 neuter (LACM 52-51) 9.2 mi 156.5° T from L.A. Lighthouse, 33°34'05"N 118°10'41"W, 88 m, R/V *Velero IV* (AHF 2126-52), 25 June 1952; 2 females (LACM 54-40) 6.4 mi 304° T from Palos Verdes Pt., 33°50'00"N 118°32'00"W, 121 m, green sticky mud, R/V *Velero IV* (AHF 2727-54), 08 May 1954; 2 females and 2 neuters (LACM 54-38) 4.1 mi 331° T from Palos Verdes Pt., 33°50'00"N 118°28'00"W, 11 m, mud with stones, R/V *Velero IV* (AHF 2725-54), 08 May 1954; 1 female (LACM 53-125) 6.4 mi 239° T, end of Redondo Beach Pier, 33°47'03"N 118°30'07"W, 229 m, sand, R/V *Velero IV* (AHF 2789-53), 08 July 1953; 1 neuter (LACM 60-83), 172 m, sandy mud, Coronado Canyon, 3.7 mi 013° T from N. Coronado Id., San Diego County, California, 32°30.27'N 117°16.80'W, R/V *Velero IV* (AHF 6845-60), 01 February 1960, EX\_AHF [60-83].

**Description (female)** (Figure 3.16). Body, 3.60-5.00 mm long, about 7× longer than broad. Cephalothorax 1.3× longer than broad; anterior 1/3 narrowed, posterior 2/3 with parallel borders; posterolateral corners with a pair of rounded dorsal lobes. Pereonites 1, 5, and 6 quadrangular; pereonites 2-4 hexagonal with lateral margins noticeably convex in dorsal view. First pereonite 1.9× broader than long and narrowed posteriorly. Pereonite 2 about 1.2× broader than long with broadest area in anterior third. Pereonites 3 and 4 about as long as broad, and broadest at about midlength of each somite. Pereonite 5, narrowest of pereonal somites, subrectangular, about as long as broad, and widest in posterior region. Pereonite 6 short, 1.8× broader than long, widest across posterior margin. Pleonites with 5 tergites visible dorsally; sternites with keel-like mid-longitudinal ridge; all somites of similar size, broader than pereonites and each about 4.5× broader than long.

First antenna 4-segmented with armature of segments as follows: 1 seta + 4 feathered hairs; 2 setae + 2 feathered hairs; 2 setae + 1 feathered hair; and 7 setae + 1 aesthetasc, respectively.

Mandible with pars molaris terminating in 9-10 pointed processes.

Cheliped palm bearing row of crenulations along tergal border and caudal surface with comb consisting of 5 setae. Fixed finger with strongly sclerotized tip; tergal border with 3-4 setae, 3 pointed teeth, and 1 seta near articulation of dactylus; sternal border with 2 setae; rostral surface of fixed finger with row of blunt protuberances. Dactylus curved, bearing a sclerotized tip; tergal border crenulated.

Merus of pereopod 1 subtriangular, wider in distal region, and bearing 1 spine and 1 seta distally. Dactylus of pereopods 4-6 elongate, with longitudinal groove lined with 2 rows of minute setules.

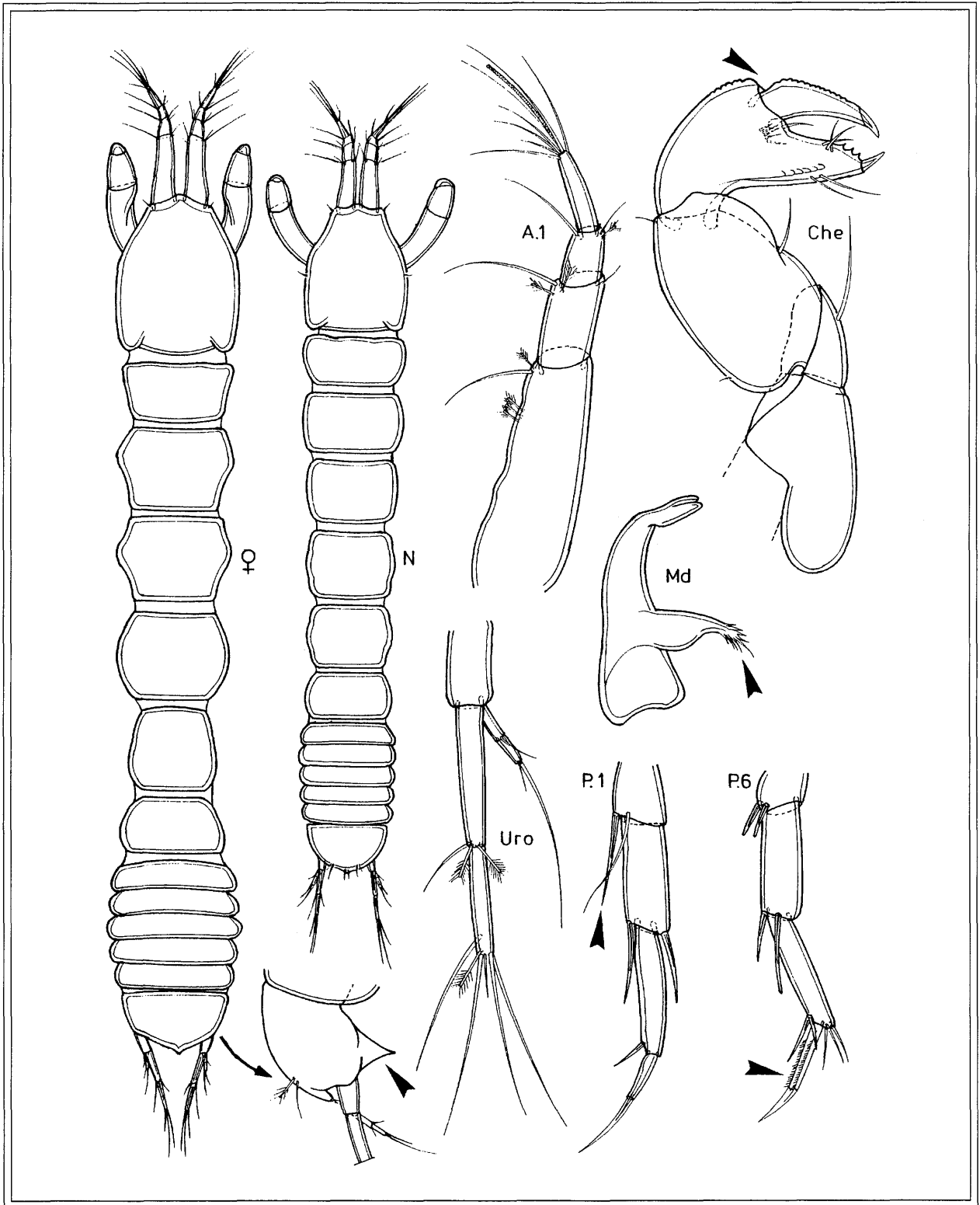
Pleotelson bearing pair of large, ventrolateral, triangular-shaped processes; caudal point protuberant and bent ventrally.

Uropod biramous with very slender rami; exopodite 2-segmented and extending about 1/2 length of first endopodal segment; endopodite also 2-segmented.

**Description (neuter)** (Figure 3.16). Total length less than that of adult female. Pereonites with lateral margins not as convex and pleonites not as expanded as those of female.

**Remarks.** This species was described by Sieg and Dojiri (1991) as a new genus and species based on specimens obtained from this study and from the Southern California Association of Marine Invertebrate Taxonomists (SCAMIT) who identified these specimens originally as *Leptognathia* sp. C. It can be distinguished from all known species by the presence of a pair of ventrolateral triangular-shaped processes on the pleotelson.

This species appears to inhabit substrates consisting of sandy mud and sandy silt.



**Figure 3.16.** *Scoloura phillipsi* Sieg and Dojiri, 1991, female: ♀, general habitus of female; A.1, first antenna; Md, mandible; Che, cheliped; P.1, pereopod 1; P.6, pereopod 6; Uro, uropod. Neuter: N, general habitus of neuter.

**Type Locality and Type Specimens.** Holotype female (LACM 81-134.1) and 4 female paratypes (LACM 81-134.2; 1 dissected) from Sta. 4C, 33°50'40"N, 118°26'22"W, 89 m, sandy silt, Santa Monica Bay, California, collected by the Biology Laboratory, Hyperion Treatment Plant, 22 July 1981, deposited in the Natural History Museum of Los Angeles County.

**Distribution.** Pt. Sal (Santa Maria Basin) to Coronado Island (Mexico), 11-519 m (Sieg and Dojiri, 1991).

### Genus *Chaulioleona* Dojiri and Sieg, new genus

**Type species (here designated):** *Chaulioleona dentata* Dojiri and Sieg, new species.

**Diagnosis.** Pleonite 5 with prominent, posteriorly-directed, sternal spiniform process.

**Remarks.** *Leptognathia armata*, *L. hastata*, *L. amdrupii*, and the new species described below are morphologically related, but generic transfer of the three *Leptognathia* species into this new genus is postponed until detailed redescriptions are done for these species. A generic diagnosis can only be determined after a detailed study is completed.

**Etymology.** The generic name is a combination of the Greek words *chaulios*, meaning prominent, and *pleo*, meaning swim, and alludes to the prominent tooth on the pleon.

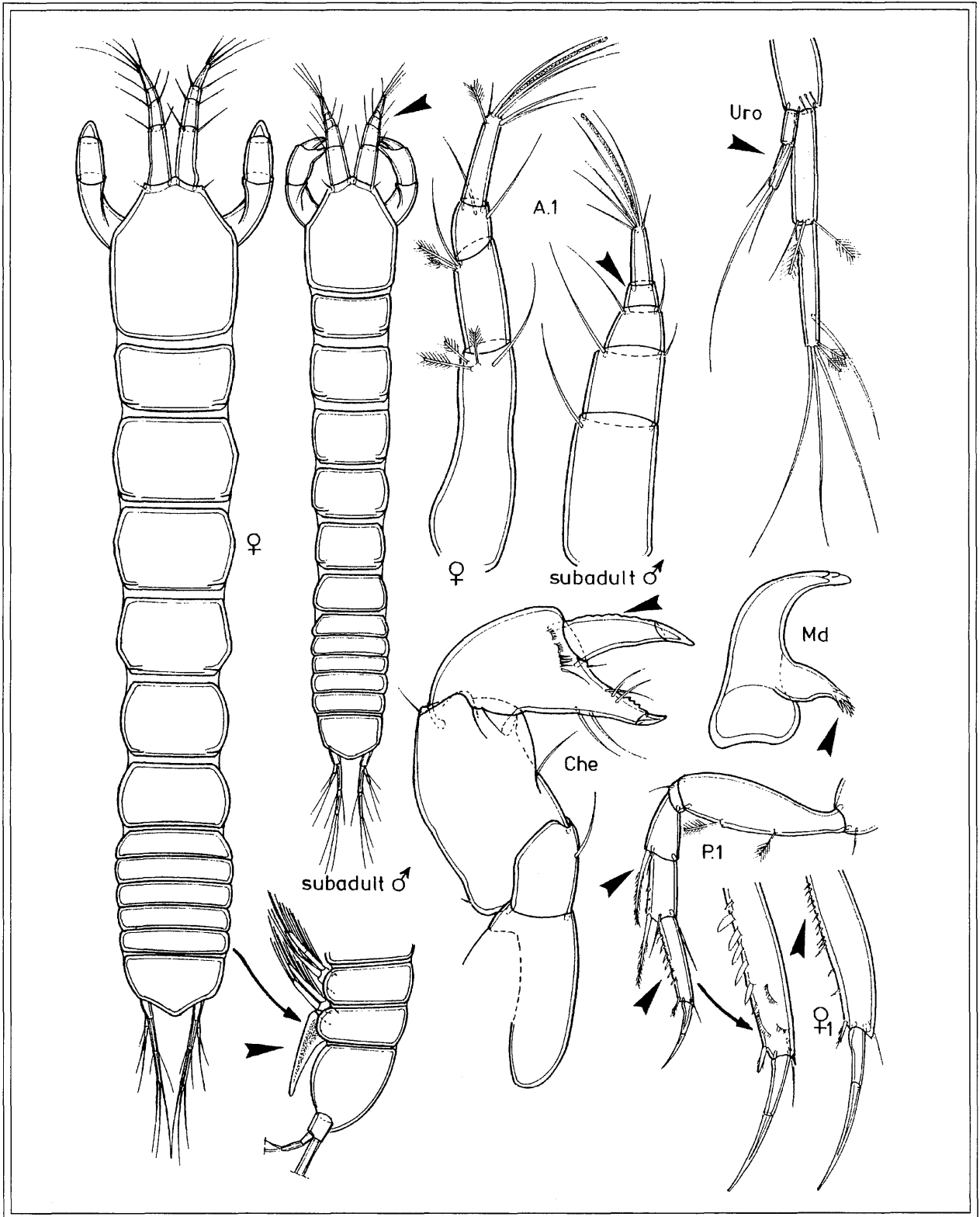
### *Chaulioleona dentata* Dojiri and Sieg, new species

Figure 3.17

**Type Material.** 1 female holotype (USNM 284724) and 6 paratypes (SBMNH 144123; 5 females, 1 subadult male; 1 female and 1 subadult male dissected) from Sta. 4C, 33°50'40"N 118°26'22"W, 76 m, Santa Monica Bay, California, collected by Biology Laboratory, Environmental Monitoring Division, 08 January 1987.

**Material Examined.** Phase I: 1 female and 1 subadult male from Sta. 42, 34°48.04'N 120°47.50'W, 100 m, off Purisima Pt., Santa Maria Basin, California, 09 January 1984; 2 females and 2 neuters from Sta. 79, 34°24.12'N 120°28.32'W, 98 m, off Pt. Conception, Western Santa Barbara Channel, California. Phase II: 2 females, 1 subadult male, and 4 neuters from cruise 1-2, Sta. R-4 (rep. 3), 34°43.01'N 120°47.39'W, 92 m, off Purisima Pt., Santa Maria Basin, California, collected by Battelle in January 1987 on board *M/V Aloha*; 8 females, 4 neuters, and 1 manca-II (dissected) from cruise 2-3, Sta. R-4 (rep. 1), 34°43.01'N 120°47.39'W, 92 m, off Purisima Pt., Santa Maria Basin, California, collected by Battelle in January 1988 on board *M/V Aloha*; 5 females and 2 neuters from cruise 1-3, Sta. R-4 (rep. 3), 34°43.01'N 120°47.39'W, 92 m, off Purisima Pt., Santa Maria Basin, California, collected by Battelle on May 1987 on board *M/V Aloha*.

From Santa Monica Bay, California, collected by Biology Laboratory, Environmental Monitoring Division, City of Los Angeles: 1 female and 1 subadult male from Sta. 4C, 33°50'40"N 118°26'22"W, 76 m, sandy silt, 13 January 1977; 5 females from Sta. 4C, 33°50'40"N 118°26'22"W, approximately 76 m, 24 July 1986; 1 female from Sta. 6B, 33°52'27"N 118°34'12"W, 75 m, 30 July 1986; 1 subadult male from Sta. 6B, 33°52'27"N 118°34'12"W, 79 m, 07 February 1986; 3 females, 1 subadult male, and 1 neuter from Sta. D2, 33°53'40"N 118°35'20"W, 80 m, 08 January 1990; 2 females from Sta. D4, 33°51'07"N 118°31'30"W, 80 m, 11 January 1990; 1 female from Sta. D3, 33°51'47"N 118°35'15"W, 80 m, 17 July 1989; 1 female from Sta. 4C, 33°50'40"N 118°26'22"W, 76 m, 08 January 1987; 2 females from Sta. D2, 33°53'40"N 118°35'20"W, 80 m, 03 September 1987; 1 female from Sta. D4, 33°51'07"N 118°31'30"W, 81 m, 20 July 1990; 2 females from Sta. D4, 33°51'07"N 118°31'30"W, 80 m, 03 September 1987; 1 female from Sta. 6B, 33°52'27"N 118°34'12"W, 79 m, 21 January 1987; 2 females from Sta. D4, 33°51'07"N 118°31'30"W, 80 m, 26 July 1990.



**Figure 3.17.** *Chauliopleona dentata* Dojiri and Sieg, new species, female: ♀, general habitus of female; ♀ A.1, first antenna of female; Md, mandible; Che, cheliped; P.1, pereopod 1; ♀ 1, terminal segment of pereopod 1 of neuters and some variant females; Uro, uropod. Subadult ♂, general habitus of subadult male; subadult ♂ A.1, first antenna of subadult male.

From Los Angeles County Museum of Natural History: 1 female (LACM 59-147), 205 m, rocks, 2.45 mi, 249.5° T from Gull Island, Santa Cruz Channel, Santa Barbara County, California, 33°56.10'N 119°52.28'W, R/V *Velero IV* (AHF 6806-59), 22 December 1959; 1 neuter (LACM 55-46), 53 m, 4.25 mi, 273° T from base of El Segundo Pier, Los Angeles County, California, 33°53.00'N 115°30.63'W, R/V *Velero IV* (AHF 2994-55), 05 February 1955; 1 female (LACM 55-67), 119 m, sand and mud, 7.4 mi, 229° T from end of El Segundo Pier, Los Angeles County, California, 33°50.00'N 118°32.38'W, R/V *Velero IV* (AHF 3385-55), 23 August 1955; 1 female (LACM 54-38), 11 m, mud with stones, 4.1 mi, 331° T from Palos Verdes Pt., Los Angeles County, California, 33°50.00'N 118°28.00'W, R/V *Velero IV* (AHF 2725-54); 1 female (LACM 54-54), 165 m, sandy blue-gray mud, 7.8 mi, 298° T from Palos Verdes Pt., Los Angeles County California, 33°49.98'N 118°34.10'W, R/V *Velero IV* (AHF 2789-54), 22 May 1954; 2 females (LACM 60-100), 219 m, 4.7 mi, 349.5° T from Pt. Fermin Light to midpoint, Los Angeles County, California, 33°37.80'N 118°16.73'W, R/V *Velero IV* (AHF 7161-60), 08 October 1960; 1 female (LACM 60-86), 949 m, mud over sand, 14.95 mi, 264° T from Pt. La Jolla, San Diego County, California, 32°49.62'N 117°35.20'W, R/V *Velero IV* (AHF 7049-60), 07 May 1960; 1 female and 1 neuter (LACM 60-110), 585 m, mud, 31.5 mi, 254° T from China Point Light, Tanner Canyon, San Clemente Island, California Channel Islands, California, 32°39.55'N 119°01.40'W, R/V *Velero IV* (AHF 6834-60), 29 January 1960; 1 female (LACM 60-84), 225 m, mud, 34.1 mi, 246° T from China Point Light, San Clemente Island, Tanner Bank, California Channel Islands, California, 32°34.47'N 119°02.70'W, R/V *Velero IV* (AHF 6837-60), 29 January 1960; 1 female (LACM 60-183), 108 m, muddy sand, 3.85 mi, 024° T from Coronado Norte, Islas de Los Coronados, Baja California, Mexico, 32°30.30'N 117°16.07'W, R/V *Velero IV* (AHF 6846-60), 01 February 1960.

**Description (female)** (Figure 3.17). Body, 2-4 mm long, about 6.7× longer than broad. Cephalothorax, 1.3× longer than broad, with relatively straight parallel lateral margins, abruptly tapered anteriorly. Pereonites 1-4 similar in width; pereonite 5 narrowest; pereonite 6 shortest. Pleonites 1-5 similar in size, 4-5× broader than long; pleonite 5 with large, posteriorly-directed, sternal, spiniform process.

First antenna 4-segmented with armature as follows: 1 seta + 3 feathered hairs, 1 seta + 2 feathered hairs, 2 setae, and 6 setae + 1 feathered hair + 1 aesthetasc.

Mandible with pars molaris bearing approximately 10 pointed processes at tip.

Cheliped carpus about 1.7× longer than broad; palm with comb bearing 2 small rows of spinules, 4 short setae, and 1 longer seta. Fixed finger with sclerotized tip and 3 small teeth; tergal border with 3 long and 1 shorter setae near articulation of dactylus; sternal border with 2 setae. Dactylus with crenulations along tergal margin.

Pereopod 1 with merus bearing 1 pinnate spine; carpus with tergal row of spinules, 1 tergal spine, and 2 setae; propodus with 1 tergal row of hyaline spatulate spinules in females with marsupia, other females and neuters with attenuate spinules (see female 1 in figure), curved rows of minute setules, 1 stout pinnate spine, and 1 slender seta.

Pleotelson, 1.7× broader than long, with protuberant posteromedian area.

Uropods biramous. Basis with 3 small setae near insertion of endopodite. Exopodite 2-segmented, distinctly shorter than first endopodal segment; first segment about 2.7× longer than broad, with 1 distal seta; second segment 4× longer than broad, and bearing 1 long and 1 short setae at tip. Endopodite 2-segmented; first segment 4.5× longer than broad, and equipped with 1 seta and 2 feathered hairs; second segment 6.5× longer than broad, with 1 subterminal and 3 long setae and 2 feathered hairs terminally.

**Description (subadult male)** (Figure 3.17). Body smaller than that of adult female, but proportions of body somites similar. Cephalothorax similar in shape, about 1.25× longer than broad.

First antenna 5-segmented with armature formula as follows: 1 seta, 2 setae, 2 setae, 0, 6 setae + 1 aesthetasc.

**Remarks.** The posteriorly-directed spiniform process on the ventral (sternal) surface of the last pleonite helps distinguish *Chaulioleona dentata* from all other tanaidacean species collected in the Santa Maria Basin and Western Santa Barbara Channel. This species appears to be closely related to *Leptognathia armata*, *L. hastata*, and *L. amdrupeii*, which may eventually be transferred to *Chaulioleona* (see generic "Remarks" section above). Unfortunately, the descriptions of these three species are not adequate for a detailed comparison with *C. dentata*. The crenulation along the chelipedal dactylus helps distinguish *C. dentata* from the above three species.

Specimens collected by the Environmental Monitoring Division were previously identified as "*Leptognathia* sp. E" of SCAMIT.

**Etymology.** The specific name refers to the numerous spatulate spinules on the propodus of pereopod 1 in females with marsupia.

**Type Locality and Type Specimens.** Santa Monica Bay, California. Types deposited in the National Museum of Natural History (USNM 284724) and the Santa Barbara Museum of Natural History (SBMNH 144123); see "Type Material."

**Distribution.** This species has been collected from Santa Maria Basin south to Coronado Norte, Islas de Los Coronados, Baja California, Mexico.

Genus *Araphura* Bird and Holdich, 1984

*Araphura breviararia* Dojiri and Sieg, new species

Figure 3.18

**Type Material.** 1 female holotype (USNM 284725) and 3 paratypes (1 female, 2 neuters; SBMNH 144132) from Sta. 4C, 33°50'40"N 118°26'22"W, 76 m, Santa Monica Bay, California, 08 January 1987.

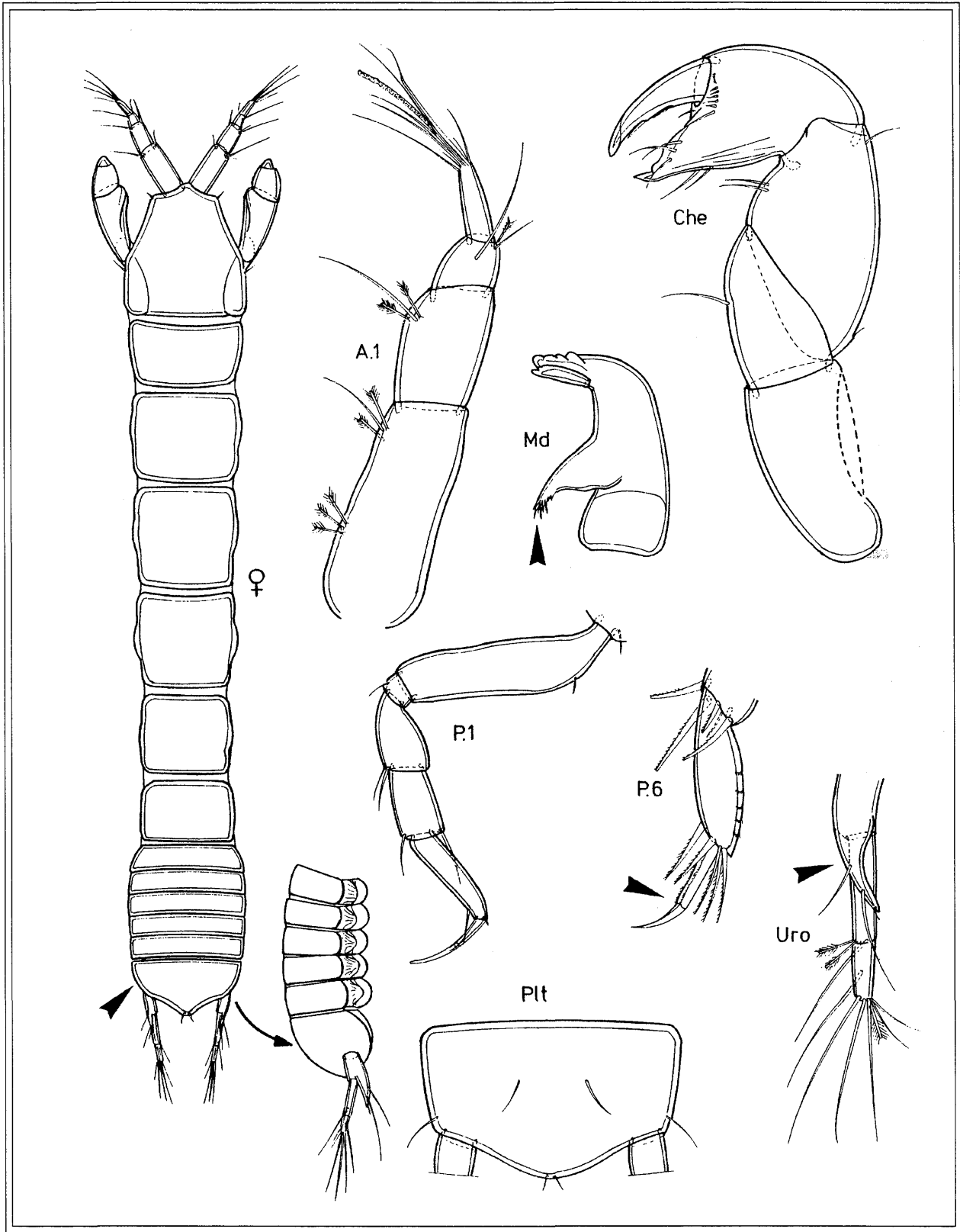
**Material Examined.** Santa Maria Basin, California, phase I: 2 females from Sta. 54, 34°36'34"N 120°52'01"W, 396 m, between Pt. Arguello and Purisima Pt., November 1984; 2 females from Sta. 61, 34°33'01"N 120°48'53"W, 345 m, off Pt. Arguello, November 1984. Phase II: 20 neuters, 3 manca-I, 4 manca-II, and 6 fragments from cruise 2-4, Sta. R-4 (rep. 2), 34°43'01"N 120°47'23"W, off Purisima Pt.; 14 neuters, 4 manca-II, and 1 manca-I from cruise 1-3, Sta. R-4 (rep. 3), 34°43'01"N 120°47'23"W, off Purisima Pt.

From Santa Monica Bay, California, collected by Biology Laboratory, Environmental Monitoring Division, City of Los Angeles: 2 females from Sta. E1, 33°59'03"N 118°42'50"W, 150 m, 09 July 1990; 1 female and 1 neuter from Sta. B5, 33°58'00"N 118°31'45"W, 45 m, 11 August 1987; 2 females from Sta. 2B, 33°56'25"N 118°29'14"W, 37 m, silt; 1 female from Sta. 4C, 33°50'40"N 118°26'22"W, 76 m, sandy silt; 3 females (2 dissected) from Sta. 3B, 33°54'45"N 118°28'29"W, 40 m, silt with organic debris; 2 females from Sta. OC, 34°01'17"N 118°36'00"W, 29 m, clay silt.

From LACM: 3 females and 1 neuter (LACM 55-35), 9.9 mi, 203° T from Santa Monica Pier Light, Los Angeles County, California, 33°51'22"N 118°34'42"W, 73 m, mud, R/V *Velero IV* (AHF 2998-55), 06 February 1955; 2 females (LACM 55-36) 14.3 mi., 345° T from Aero Beacon, San Nicolas Island, Ventura County, California, 33°28'04"N 119°34'41"W, 732 m, rock, sand, and mud, R/V *Velero IV* (AHF 3031-55), 07 May 1955; 1 female (LACM 52-51) 9.2 mi., 156.5° T from L.A. Lighthouse, Los Angeles County, California, 33°34'05"N 118°10'41"W, 88 m, R/V *Velero IV* (AHF 2126-52), 25 June 1952.

**Description (female)** (Figure 3.18). Body, 2.45-3.64 mm long, about 7× longer than broad. Cephalothorax, stout, 1.1× longer than broad, anterior half narrowed, posterior half with parallel sides. Pereonites subquadangular; pereonites 2-5 with irregular, slightly convex lateral borders. First pereonite 1.6× broader than long and tapered posteriorly. Pereonite 2 about 1.2× broader than long. Pereonites 3-5





**Figure 3.18.** *Araphura breviarua* Dojiri and Sieg, new species, female: ♀, general habitus of female; Md, mandible; Che, cheliped; P.1, pereopod 1; P.6, pereopod 6; Plt, pleotelson; Uro, uropod.

about as long as broad. Pereonite 6 shortest of pereonal somites, 1.4× broader than long. Pleonites 1-5 similar in size, about as broad as pereonites 1 and 2, and each about 5.6× broader than long.

First antenna 4-segmented with armature as follows: 1 seta + 5 feathered hairs; 1 seta + 2 feathered hairs; 2 setae + 1 feathered hair; and 8 setae + 1 aesthetasc, respectively.

Mandible with pars molaris terminating in 7 pointed processes.

Cheliped palm bearing comb of 5 short setae and 1 longer seta on caudal surface. Fixed finger with strongly sclerotized tip; tergal border with 3 setae and 1 seta near articulation of dactylus; sternal border with 2 setae. Dactylus with 1 sternal (or 2 sternal ?) setae.

Pereopod 1 with merus bearing 1 seta and 1 spiniform seta tergally; carpus with 1 tergal spiniform seta and 1-2 sternal setae; propodus with 1 tergal seta. Pereopod 6 with carpus bearing 2 barbed spines tergally and 2 barbed spines and 1 seta sternally; propodus having several rows of minute spinules along sternal border and bearing 2 barbed spines tergally and 3 barbed spines sternally; dactylus with longitudinal groove lined with 2 rows of minute setules.

Pleotelson short, 1.6× broader than long, with relatively straight lateral borders.

Uropod “pseudobiramous;” exopodite fused with basis. Fused exopodite reaching beyond midlength of first endopodal segment and bearing 2 long lateral setae and 1 short subterminal seta. Endopodite 2-segmented; first segment 4.3× longer than broad, with 1 long seta and 2 feathered hairs; second segment about 1/2 length of first, 2.5× longer than broad, and bearing 1 long subterminal seta and 1 feathered hair, 2 short setae, and 3 long setae at tip.

**Remarks.** *Araphura breviararia* is described from MMS specimens and from specimens in the SCAMIT collections. These specimens were originally identified as “*Araphura* sp. A” and “*Leptognathia* sp. A”. It can be distinguished from *A. cuspirostris* new species by the short pleotelson, straight lateral borders of the pleotelson, and absence of the conical knob on the posterior border of the pleotelson.

This species has been collected from various types of sediments (e.g., sandy silt, silt, and silty clay) ranging in depth from 29-732 m.

**Etymology.** The specific name is from Latin meaning abridged or shortened and alludes to the short pleotelson of this species.

**Type Locality and Type Specimens.** Santa Monica Bay, California. Types deposited in the National Museum of Natural History (USNM 284725) and the Santa Barbara Museum of Natural History (SBMNH 144132); see “Type Material.”

**Distribution.** Santa Maria Basin south to Los Angeles Light, Los Angeles County.

### *Araphura cuspirostris* Dojiri and Sieg, new species

Figure 3.19

**Type Material.** 1 female holotype (USNM 284726), 13 female paratypes (2 females dissected on slides; SBMNH 144127) from Sta. 55, 34°33'40"N 120°56'19"W, 590 m, west of Pt. Arguello, Santa Maria Basin, California, September 1984.

**Material Examined.** Santa Maria Basin, phase I: 4 females, 7 neuters from Sta. 59, 34°33'39"N 120°47'11"W, 216 m, southwest of Pt. Arguello, October 1984. Phase II: 7 neuters, 1 manca-I from cruise 1-3, Sta. R-4 (rep. 3), 34°43'01"N 120°47'23"W, 92 m, southwest of Purisima Point; 8 females, 4 neuters, 3 manca-I, 3 manca-II, 3 fragments from cruise 2-4, Sta. R-4 (rep. 2), 34°43'01"N 120°47'23"W, southwest of Purisima Point; 2 neuters from cruise 1-3, Sta. R-4 (rep. 3), 34°43'01"N 120°47'23"W, 92 m, southwest of Purisima Point.

From Santa Monica Bay, California, collected by Biology Laboratory, Environmental Monitoring Division, City of Los Angeles: 1 female from Sta. E3, 33°58'21"N 118°36'44"W, 149 m, 10 July 1989.

From LACM: 1 female (LACM 59-264) 8.75 mi., 235° T from Santa Monica Pier Light, Los Angeles County, California, 33°55'29"N 118°38'32"W, 457 m, sand, R/V *Velero IV* (AHF 6779-59), 19 December 1959; 3 females and 3 neuters (LACM 55-96) 7.1 mi., 226° T from Santa Monica Pier Light, Los Angeles County, California, 33°55'30"N 118°35'55"W, 293 m, mud and silt, R/V *Velero IV* (AHF 3180-55), 05 July 1955; 2 females (LACM 54-55) 5.5 mi., 287.5° T from Palos Verdes Point, Los Angeles County, California, 33°48'00"N 118°32'00"W, 459 m, blue-grey mud, R/V *Velero IV* (AHF 2793-54), 22 May 1954; 1 female (LACM 53-127) 8.45 mi., 184° T from L.A. Breakwater Lighthouse, Los Angeles County, California, 33°34'07"N 118°15'44"W, 366 m, clay, R/V *Velero IV* (AHF 2354-53), 02 July 1953; 1 female (LACM 60-101) 3.8 mi., 163.5° T from Pt. Fermin Light, Los Angeles County, California, 33°38'36"N 118°16'16"W, 214 m, mud, R/V *Velero IV* (AHF 7174-60), 09 October 1960; 1 female (LACM 55-101) 11.7 mi., 257° T from end of El Segundo Pier, Los Angeles County, California, 33°52'08"N 118°39'18"W, 457 m, mud, R/V *Velero IV* (AHF 3399-55), 23 August 1955; 1 female (LACM 60-108) 0.2 mi., 254.5° T from base of Newport Pier, Newport Canyon, Orange County, California, 33°36'24"N 117°55'54"W, 16 m, silt, R/V *Velero IV* (AHF 7031-60), 05 May 1960; 1 female (LACM 60-124) 4.8 mi., 019° T from Port Hueneme Light, Ventura County, California, approximately 34°03'55"N 119°13'W, 428 m, mud, sand, and pebbles, R/V *Velero IV* (AHF 6899-60), 11 March 1960; 4 females and 1 neuter (LACM 53-128) 3.4 mi., 301° T from Pt. Vicente Light, Los Angeles County, California, 33°44'08"N 118°25'48"W, 183 m, sand, R/V *Velero IV* (AHF 2357-53), 08 July 1953; 1 female (LACM 53-125) 6.4 mi., 239° T end of Redondo Beach Pier, Los Angeles County, California, 33°47'03"N 118°30'07"W, 229 m, sand, R/V *Velero IV* (AHF 2789-53), 08 July 1953; 1 female (LACM 60-86) 14.95 mi., 264° T from Pt. La Jolla, San Diego County, California, 32°49'37"N 117°35'12"W, 949 m, mud over sand, R/V *Velero IV* (AHF 7049-60), 07 May 1960; 1 female (LACM 59-147) 2.45 mi., 249.5° T from Gull Island, Santa Cruz Channel, Santa Barbara County, California, 33°56'06"N 119°52'17"W, 205 m, rocks, R/V *Velero IV* (AHF 6806-59), 22 December 1959.

**Description (female)** (Figure 3.19). Body, 2.73-3.49 mm long, about 9.2× longer than broad. Cephalothorax, slender, 1.4× longer than broad, and tapered anteriorly. Pereonites subquadrangular; pereonites 1 and 6 similar in length and width, about 1.2× broader than long. Pereonites 2-5 similar in length, but pereonites 4 and 5 narrower than preceding somites. Pleonites 1-5 similar in size, each about 4× broader than long.

First antenna 4-segmented with armature as follows: 1 seta + 4 feathered hairs; 1 seta + 4 feathered hairs; 2 setae; and 6 setae + 1 aesthetasc, respectively.

Mandible with pars molaris bearing 6 pointed processes at tip.

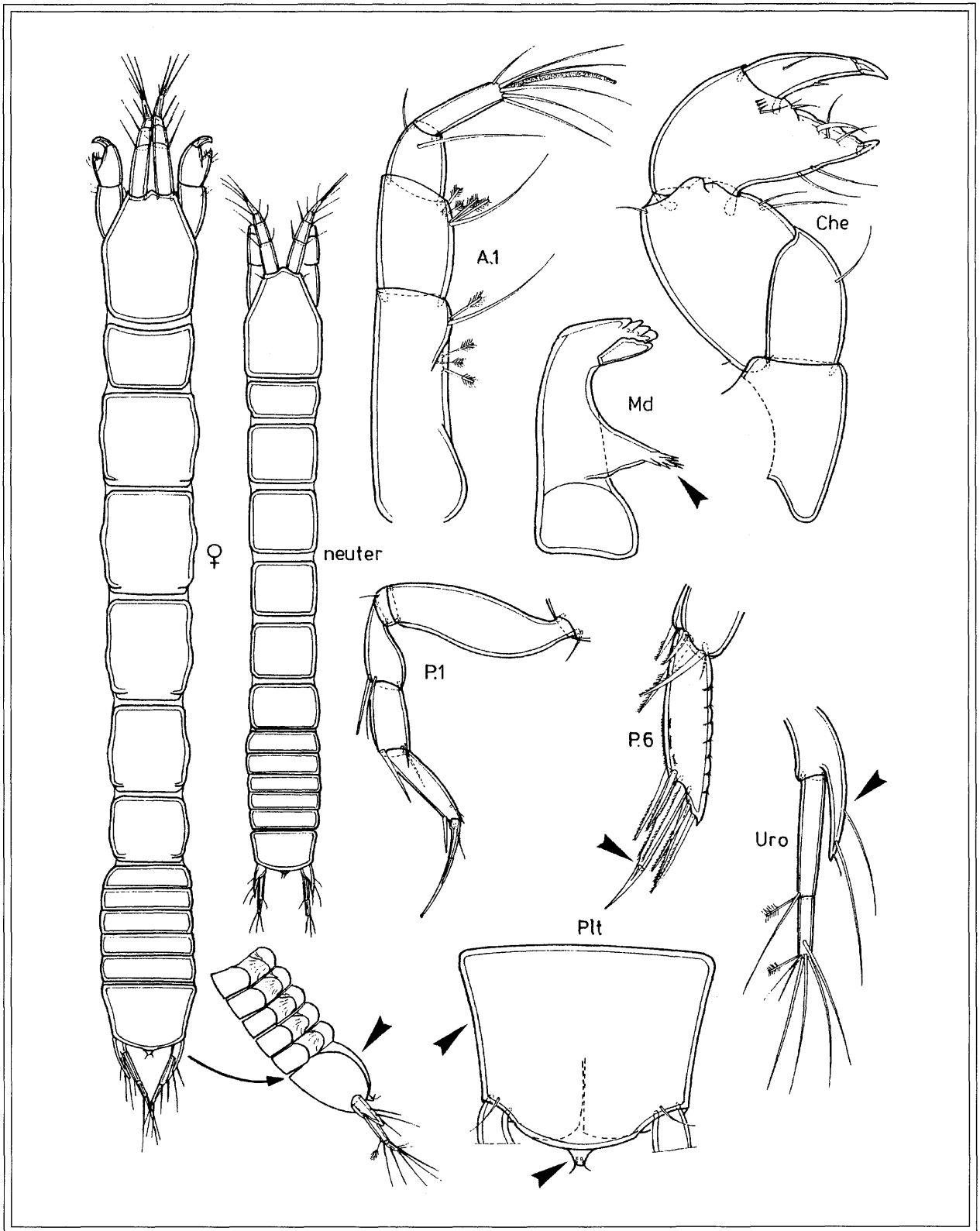
Cheliped palm bearing comb of 3 short and 1 long setae on caudal surface. Fixed finger with strongly sclerotized tip; tergal border with 3 long and 1 shorter setae near articulation of dactylus; sternal border with 2 long setae. Dactylus with 1 caudal seta and 1 sternal seta.

Pereopod 1 with merus bearing 1 seta and 1 spiniform seta tergally; carpus with 1 tergal spiniform seta and 1-2 sternal setae; propodus with 3 setae. Pereopod 6 with carpus bearing 2 barbed spines tergally and 2 barbed spines and 1 seta sternally; propodus having several rows of minute spinules on sternal border and bearing 2 barbed spines tergally and 3 barbed spines sternally; dactylus with longitudinal groove lined with 2 rows of minute setules.

Pleotelson subquadrate, 1.2× broader than long, with slightly concave lateral borders, and bearing small conical or digitiform process on posterior border.

Uropod "pseudobiramous." Fused exopodite reaching about 3/4 length of proximal endopodal segment and carrying 3 setae. Endopodite 2-segmented; first segment slender, 5.3× longer than broad, with 1 long seta and 1 feathered hair distally; second segment about 1/2 length of first, with 1 long subterminal seta, 1 feathered hair, 2 short setae, and 3 long setae at tip.

**Description (neuter)**. Total length less than that of adult female; habitus as in figure. Lateral borders of pleotelson slightly concave.



**Figure 3.19.** *Araphura cuspirostris* Dojiri and Sieg, new species, female: ♀, general habitus of female; A.1, first antenna; Md, mandible; Che, cheliped; P.1, pereopod 1; P.6, pereopod 6; Plt, pleotelson; Uro, uropod. Neuter, general habitus of neuter.

**Remarks.** *Araphura cuspirostris* is described from specimens originally obtained for MMS and from specimens belonging to SCAMIT. These specimens were originally identified as *Araphura* sp. B and *Leptognathia* sp. D. It can be distinguished from *A. breviararia* by the general shape (subquadrate) of the pleotelson, the slightly concave lateral borders of the pleotelson, and the presence of the conical or digitiform process on the posterior border of the pleotelson.

*Araphura cuspirostris* has been collected from a wide variety of sediments including rocks, pebbles, sand, mud, muddy silt, and silt.

**Etymology.** The specific name is a combination of the Latin words *cuspi*, meaning point, and *rostrum*, meaning beak, and alludes to the small conical process on the pleotelson.

**Type Locality and Type Specimens.** Santa Maria Basin, California. Types deposited in the National Museum of Natural History (USNM 284726) and the Santa Barbara Museum of Natural History (SBMNH 144127); see "Type Material."

**Distribution.** Santa Maria Basin south to Pt. La Jolla (San Diego County).

Genus *Tanaella* Norman and Stebbing, 1886

### *Tanaella propinquus* Dojiri and Sieg, new species

Figure 3.20

**Type Material.** 1 female holotype (USNM 284727) and 4 paratypes (SBMNH 144124; 3 females and 1 neuter) from Sta. E7, 33°54'44"N 118°34'17"W, 150 m, Santa Monica Bay, California, collected by Biology Laboratory, Environmental Monitoring Division, 16 July 1990.

**Material Examined.** Santa Maria Basin and Western Santa Barbara Channel, phase I: 1 female and 7 neuters from Sta. 84, 34°13'32"N 120°31'11"W, 394 m, south of Pt. Conception, Western Santa Barbara Channel, California, February 1985; 2 females from Sta. 73, 34°28'13"N 120°36'48"W, 98 m, between Pt. Conception and Pt. Arguello, Santa Maria Basin, California, January 1985. Phase II: 7 females, 6 neuters, and 21 manca-I from cruise 3-1, Sta. R-4 (rep. 3), 34°43'01"N 120°47'23"W, 92 m, off Purisima Pt., Santa Maria Basin, California; 7 females, 4 neuters, 4 fragments, and 58 manca-I from cruise 2-3, Sta. R-4 (rep. 1), 34°43'01"N 120°47'23"W, 92 m, off Purisima Pt., Santa Maria Basin, California.

From Santa Monica Bay, California, collected by Biology Laboratory, Environmental Monitoring Division, City of Los Angeles: 2 females from Sta. E2, 33°58'39"N 118°39'16"W, 150 m, 04 January 1989; 2 females from Sta. E3, 33°58'21"N 118°36'44"W, 149 m, 10 July 1989; 1 female from Sta. 7B, 33°54'45"N 118°35'25"W, 168 m, 11 February 1986; 2 females from Sta. 7B, 33°54'45"N 118°35'25"W, 21 January 1987; 1 female from Sta. E8, 33°54'32"N 118°35'49"W, 150 m, 17 January 1989; 2 females and 1 manca-I from Sta. E8, 33°54'32"N 118°35'49"W, 150 m, 20 August 1987; 1 female from Sta. E7, 33°54'44"N 118°34'17"W, 148 m, 17 July 1989; 1 female from Sta. E8, 33°54'32"N 118°35'49"W, 149 m, 17 July 1989; 2 females from Sta. E3, 33°58'21"N 118°36'44"W, 150 m, 11 August 1987; 1 specimen from Sta. E8, 33°54'32"N 118°35'49"W, 150 m, 08 January 1990; 1 female from Sta. E8, 33°54'32"N 118°35'49"W, 151 m, 25 January 1988; 4 females from Sta. E7, 33°54'44"N 118°34'17"W, 150 m, 14 July 1988; 3 specimens from Sta. 8C, 33°58'47"N 118°36'17"W, 116 m, 08 January 1987; 1 female from Sta. C7(2), 33°53'35"N 118°32'15"W, 59 m, 16 July 1990; 1 female from Sta. E2, 33°58'39"N 118°39'16"W, 152 m, 28 January 1988; 4 females from Sta. E1, 33°59'03"N 118°42'50"W, 150 m, 09 July 1990.

From LACM: 4 females (LACM 55-67) 7.4 mi, 229° T (true north) from end of El Segundo Pier, 33°50'00"N 118°32'23"W, 119 m, sand and mud, R/V *Velero IV* (AHF 3385-55), 23 August 1955; 1 female (LACM 54-40) 6.4 mi, 304° T from Palos Verdes Pt., 33°50'00"N 118°32'00"W, 121 m, green sticky mud, R/V *Velero IV* (AHF 2727-54), 08 May 1954; 2 females (LACM 53-78) 1.55 mi, 002° T from Long Pt. Light, Santa Catalina Island, California Channel Islands, 33°25'57"N 118°21'54"W, 320 m, clay mixed

with broken shell sand, R/V *Velero IV* (AHF 2423-53), 29 September 1953; 9 females and 3 neuters (LACM 54-54) 7.8 mi, 298° T from Palos Verdes Pt., 33°49'59"N 118°34'06"W, 165 m, sandy blue gray mud, R/V *Velero IV* (AHF 2789-54), 22 May 1954; 3 females and 1 neuter (LACM 55-96) 7.1 mi, 226° T from Santa Monica Pier Light, 33°55'30"N 118°35'55"W, 293 m, mud and silt, R/V *Velero IV* (AHF 3180-55), 05 July 1955; 4 females and 5 neuters (LACM 53-125) 6.4 mi, 239° T from end of Redondo Beach Pier, 33°47'03"N 118°30'07"W, 229 m, sand and mud, R/V *Velero IV* (AHF 2361-53), 08 July 1953; 13 females and 4 neuters (LACM 60-101), 3.8 mi, 163.5° T from Pt. Fermin Light, 33°38'36"N 118°16'16"W, 214 m, mud, R/V *Velero IV* (AHF 2361-53), 08 July 1953. From San Diego County: 3 females (LACM 60-83) 3.7 mi, 013° T from N. Coronado Island, 32°30'16"N 117°16'48"W, 172 m, sandy mud, R/V *Velero IV* (AHF 6845-60), 01 February 1960. From Mexico: 3 females (LACM 60-183) 3.85 mi, 024° T from Coronado Norte, Islas de Los Coronados, Baja California, 32°30'18"N 117°16'04"W, 108 m, muddy sand, R/V *Velero IV* (AHF 6846-60), 01 February 1960.

**Description (female)** (Figure 3.20). Body, 2.78-3.31 mm long, about 7.9× longer than broad. Cephalothorax, 1.4× longer than broad, narrowed anteriorly. Pereonites with convex lateral borders; pereonites 1, 2, and 3 similar in width; pereonite 3 longest and broadest of pereonites; pereonite 6 shortest, with small ventrally-directed spiniform process on sternite; pereonites 5 and 6 similar in width and narrowest of pereonites. Pleonites 1-5 similar in size, each about 5× broader than long, and bearing ventral hyaline keel along its length.

First antenna 4-segmented with armature as follows: 1 seta + 4 feathered hairs; 1 seta + 2 feathered hairs; 2 setae; and 6 setae + 1 aesthetasc, respectively.

Mandible with pars molaris bearing several pointed processes at tip.

Cheliped carpus relatively slender; palm bearing comb of 4 short and 1 long pinnate setae on caudal surface. Fixed finger with strongly sclerotized tip; tergal border with 3 long and 1 shorter setae near articulation of dactylus; sternal border with 2 long setae. Dactylus with 1 caudal seta and 1 sternal seta.

Pereopod 1 with merus bearing 1 seta and 1 barbed spine; carpus with 1 seta and 2 barbed spines; propodus slender, with 2 setae and 1 barbed spine. Pereopod 6 with propodus bearing several rows of minute spinules and 4 spiniform setae; dactylus with longitudinal groove lined with 2 rows of minute setules.

Pleotelson, 1.7× broader than long, with convex lateral borders; posterior margin concave on either side of very slightly protuberant median area which bears 2 small setae; posterior margin with posteriorly-directed spiniform process.

Uropods curved inwards, giving "bow-legged" appearance; 4.4× longer than broad. Exopodite presumably represented by 3 naked setae at distal end of basis. Endopodite 2-segmented; first segment 1.9× longer than broad, with 1 seta and 2 feathered hairs; second segment 2.2× longer than broad and bearing 1 short and 4 long setae.

**Remarks.** *Tanaella propinquus* is described from specimens originally obtained for MMS, SCAMIT, and the Los Angeles County Museum of Natural History. SCAMIT specimens were identified as *Leptognathia* sp. B and later simply as *Tanaella* sp. It can be distinguished from all other tanaidaceans from the MMS survey by the "bow-legged" appearance of the paired uropods. This species has been collected from a variety of substrates (e.g., sandy mud, clay mixed with broken-shell sand, silty mud, and mud).

**Etymology.** The specific name is from the Latin word meaning "near" and alludes to its morphological similarity to other species of its genus.

**Type Locality and Type Specimens.** Santa Monica Bay, California. Types deposited in the National Museum of Natural History (USNM 284727) and the Santa Barbara Museum of Natural History (SBMNH 144124); see "Type Material."

**Distribution.** This species has so far been collected from Santa Maria Basin south to Coronado Norte, Islas de Los Coronados (Baja California).

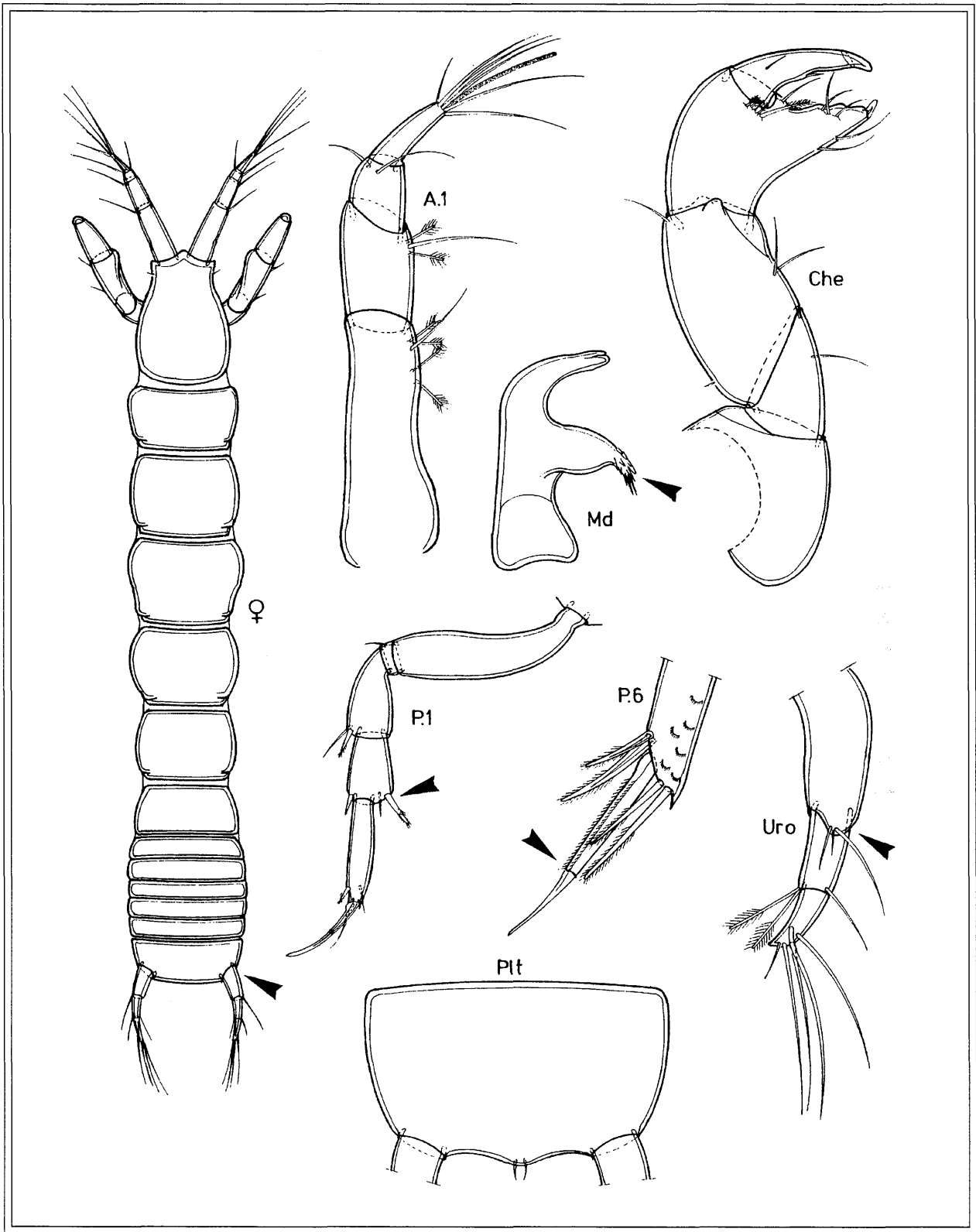


Figure 3.20. *Tanaella propinquus* Dojiri and Sieg, new species, female: ♀, general habitus of female; A.1, first antenna; Md, mandible; Che, cheliped; P.1, pereopod 1; P.6, pereopod 6; Plt, pleotelson; Uro, uropod.

Genus *incertae sedis*

**Male species 1**

Figure 3.21

**Material Examined.** 1 male from, Sta. 42 (phase I), 34°48.04'N 120°47.50'W, 100 m, west of Purisima Pt., Santa Maria Basin, California, 06 January 1984, originally identified as *Cryptocope* sp. C.

**Description (male)** (Figure 3.21). Body about 4× longer than broad. Cephalothorax, about as long as broad, narrowed anteriorly. Pereonites 1-3 about 4-5.5× broader than long; pereonites 4 and 6 approximately 3× broader than long; pereonite 5 longest of pereonites, 2.5× broader than long. Pleonites 3-3.5× broader than long, except pleonite 4 about 2.6×.

First antenna 7-segmented with numerous aesthetascs on segments 4-6; terminal segment with 5 setae and 1 aesthetasc.

Maxilliped with fused basis bearing 1 distal seta near insertion of palpus. Endites each with 1 distal seta. Palpus 4-segmented; first segment unarmed; second segment with 2 setae; third segment with 4 setae; and fourth segment bearing 6 setae.

Chelipedal carpus robust, about 1.6× longer than broad, distally inflated (segmental margin indicated by dotted line and arrow in figure; area above dotted line depicts inflated portion), and bearing 1 tergal and 1 sternal setae. Fixed finger with spiniform tip; tergal border with 3 setae; area near insertion of dactylus with 1 small seta; comb with 3 relatively long setae (or spines) and a row of several spines; sternal margin with 2 setae.

Pereopod 1 with merus bearing 1 spine and 1 seta; carpus with 2 spines and 1 seta; propodus with several rows of minute spinules. Tergal spines of merus and carpus of pereopods 1-3 long, reaching to about midlength of following segment. Pereopod 6 with long slender dactylus bearing long rows of spinules.

Pleopods without serrations along outer margin of exopodite.

Pleotelson, 1.2× broader than long, somewhat triangular in outline.

Uropod biramous. Exopodite 2-segmented; first segment, 2.3× longer than broad, bearing 1 long seta; second segment 3.6× longer than broad, carrying 1 long and 1 shorter setae. Endopodite 2-segmented; first segment longer than entire exopodite, about 4× longer than broad, and bearing 1 seta and feathered hairs; second segment, 4.3× longer than broad, with 1 subterminal and 4 terminal setae and 1 feathered hair.

**Remarks.** Male species 1 differs from the other two unidentified males (species 2 and 3) by having 2-segmented rami of the uropod (exopodite 1-segmented and endopodite 3-segmented in species 2 and 3), an inflated distal margin of the chelipedal carpus, and tergal spines of the merus and carpus of pereopods 1-3 reaching to about midlength of following segment. This male may belong to the new genus *Chauliopeleona*.

**Distribution.** Santa Maria Basin, California.

**Male species 2**

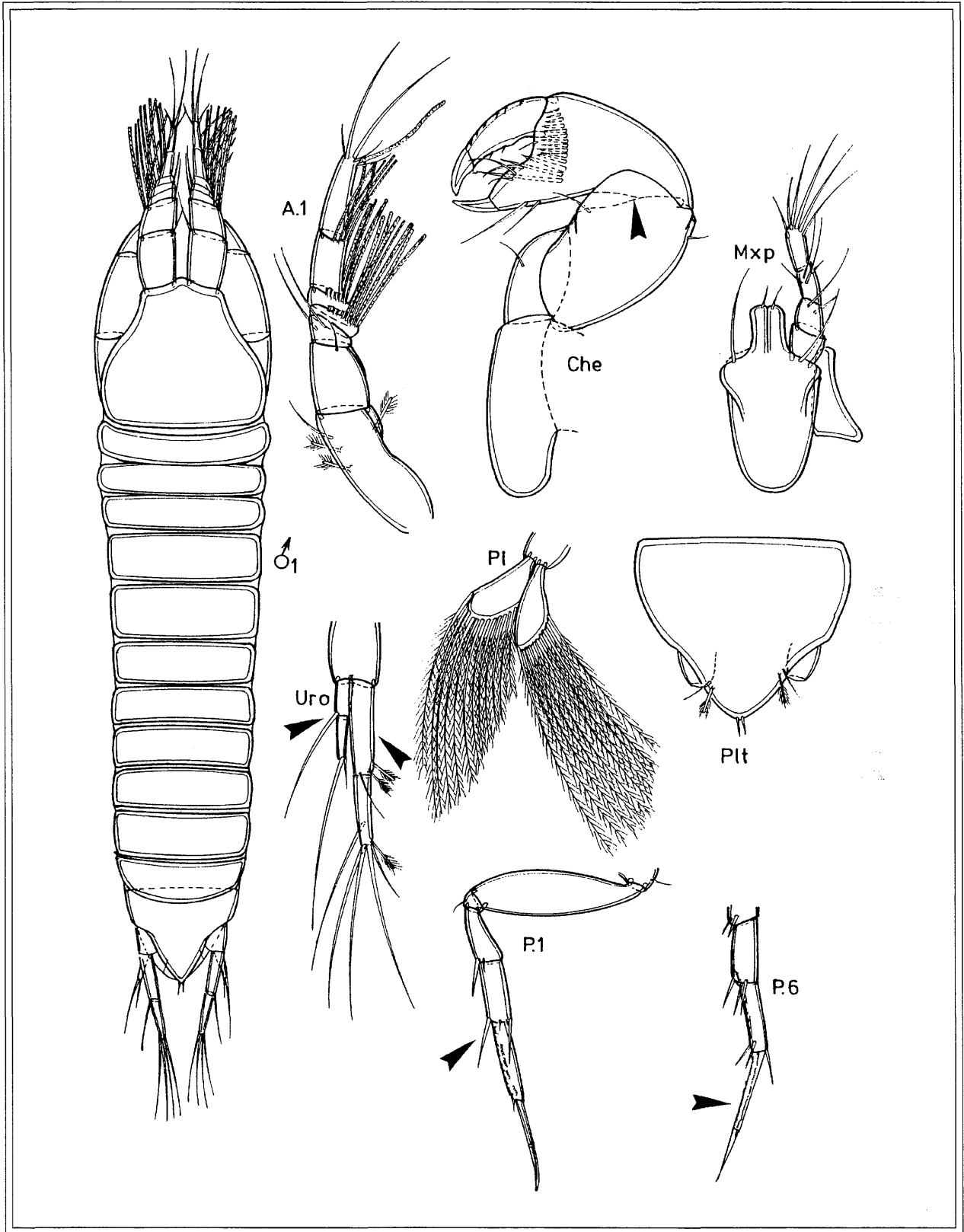
Figure 3.22

**Material Examined.** 1 male from Sta. 42 (phase I), 34°48.04'N 120°47.50'W, 100 m, west of Purisima Pt., Santa Maria Basin, California, October 1984, originally identified as *Cryptocope* sp. C.

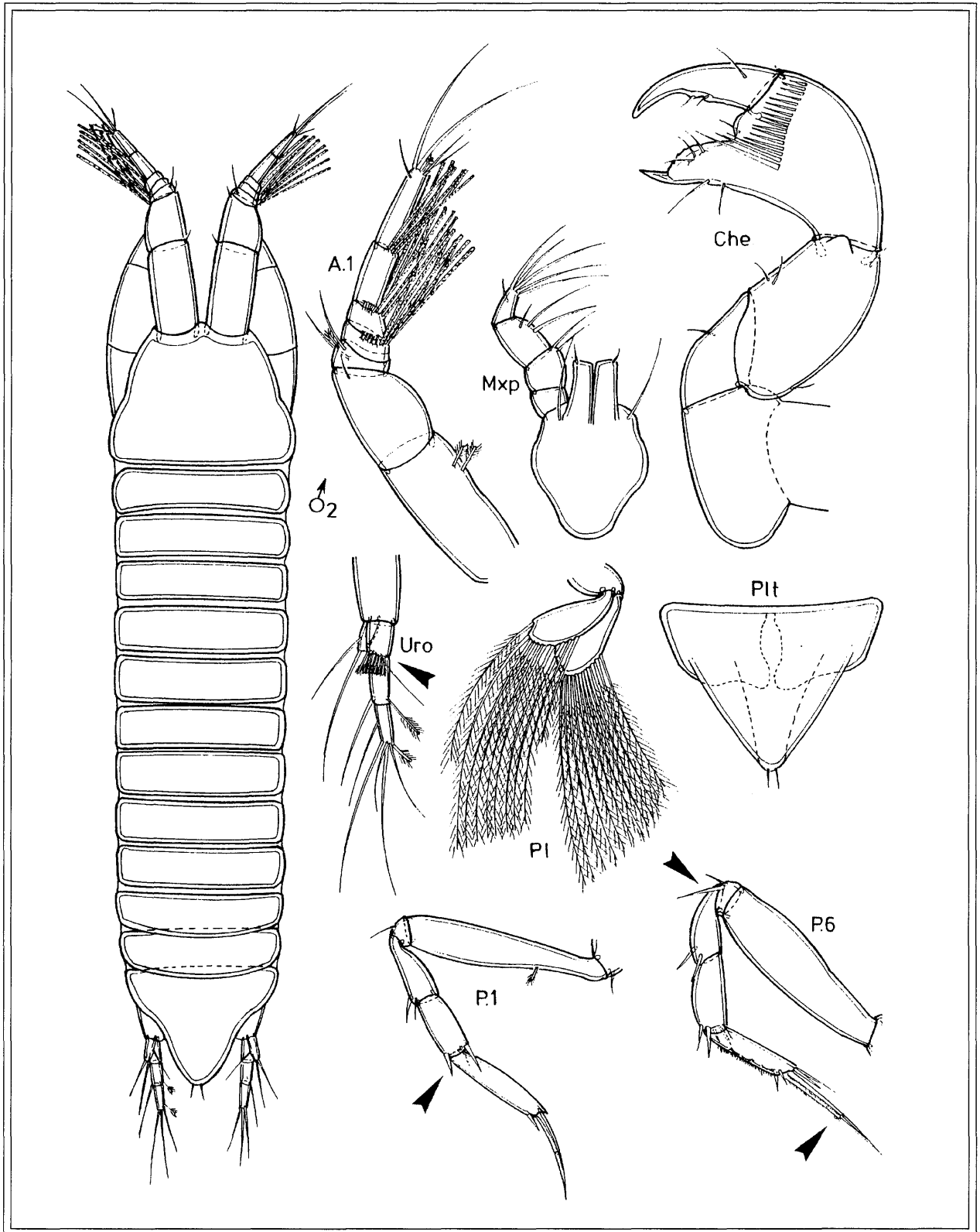
**Description (male)** (Figure 3.22). Body about 4× longer than broad. Cephalothorax, 1.3× broader than long, constricted at about midlength, anterior portion narrower than posterior. Pereonites 1-6 similar in length/width ratios, ranging from 3.5× to 4.1× broader than long. Pleonites 1-5 similar to each other.

First antenna 7-segmented with numerous aesthetascs on segments 4-6; terminal segment with 5 setae and a feathered hair.





**Figure 3.21.** Genus *incertae sedis*, male species 1: ♂1, general habitus of male; A.1, first antenna; Mxp, maxilliped; Che, cheliped; P.1, pereopod 1; P.6, pereopod 6; Pl, pleopod; Plt, pleotelson; Uro, uropod.



**Figure 3.22.** Genus *incertae sedis*, male species 2: ♂<sup>2</sup>, general habitus of male; A.1, first antenna; Mxp, maxilliped; Che, cheliped; P.1, pereopod 1; P.6, pereopod 6; Pl, pleopod; Plt, pleotelson; Uro, uropod.

Maxilliped similar to that of male species 1; palpus with third segment bearing 3 setae.

Cheliped as in male species 1 except inflated area on distal margin of carpus lacking.

Pereopods 1-3 with tergal spines on merus and carpus short, not reaching to midlength of following segment. Pereopod 6 with 1 spine and 1 seta on ischium and rows of spinules along length of dactylus.

Pleopods as in male species 1.

Pleotelson 1.4× broader than long, with posterior portion triangular in outline.

Uropod biramous. Exopodite 1-segmented, 2.3× longer than broad, and bearing 3 setae. Endopodite 3-segmented; first segment 1.3× longer than broad, with several feathered hairs; second segment 2.5× longer than broad, with 1 seta and a feathered hair; third segment 3× longer than broad, with 1 subterminal seta, 4 terminal setae, and feathered hair.

**Remarks.** Male species 2 can be distinguished from male species 1 by the 1-segmented exopodite and 3-segmented endopodite of the uropod and from male species 3 by the shape of the cephalothorax and pleotelson, the absence of denticles on the outer margin of the pleopodal exopodite, and the presence of 1 spine and 1 seta on the ischium of pereopod 6.

**Distribution.** Santa Maria Basin, California.

### Male species 3

Figure 3.23

**Material Examined.** 1 male from Sta. 42 (phase I), 34°48.04'N 120°47.50'W, 100 m, west of Purisima Pt., Santa Maria Basin, California, 06 January 1984, originally identified as *Cryptocope* sp. C.

**Description (male)** (Figure 3.23). Body about 3.8× longer than broad. Cephalothorax, 1.2× broader than long, with distinctly narrower anterior portion. Pereonite 1 with concave rostral (anterior) margin; pereonites 2-4 about 5× broader than long; pereonites 5 and 6 about 3.7× broader than long. Pleonites approximately 4× broader than long, except pleonite 5 about 3.2× broader than long.

First antenna 7-segmented with numerous aesthetascs on segments 4-6; terminal segment with 3 setae.

Maxilliped similar to those of male species 1 and 2; palpus with second segment bearing 3 setae, third segment with 4 setae, and fourth segment with 1 subterminal and 4 terminal setae.

Cheliped similar to male species 2 with carpus about 1.6× broader than long.

Pereopods 1-3 similar to those in male species 2: tergal spines on merus and carpus short. Pereopod 6 with rows of spinules along length of dactylus.

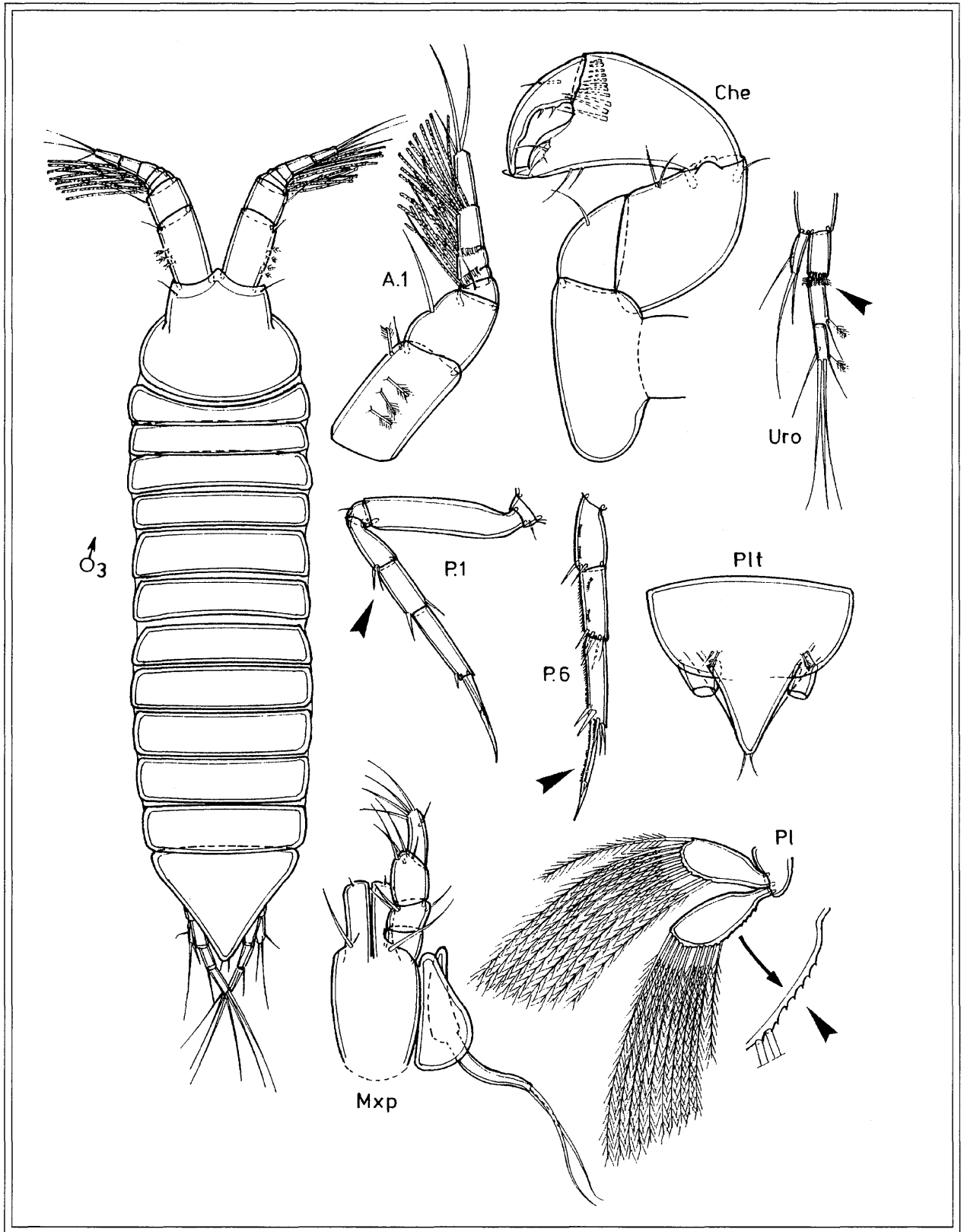
Pleopods with exopodite serrated along outer margin.

Pleotelson 1.2× broader than long; posterior projection triangular in outline.

Uropod biramous. Exopodite 1-segmented, 3.2× longer than broad, and bearing 3 setae. Endopodite 3-segmented; first segment 2× longer than broad with several feathered hairs; second segment 2.7× longer than broad, with 1 seta and a feathered hair; third segment 2.7× longer than broad, with 5 setae and a feathered hair.

**Remarks.** Male species 3 can be distinguished from male species 1 by the 1-segmented exopodite and 3-segmented endopodite of the uropod. Male species 3 differs from both male species 1 and 2 by the narrow anterior portion of the cephalothorax, the attenuate posterior projection of the pleotelson, and the serrate outer margin of the pleopodal exopodite.

**Distribution.** Santa Maria Basin, California.



**Figure 3.23.** Genus *incertae sedis*, male species 3: ♂<sub>3</sub>, general habitus of male; A.1, first antenna; Mxp, maxilliped; Che, cheliped; P.1, pereopod 1; P.6, pereopod 6; Pl, pleopod; Plt, pleotelson; Uro, uropod.

Subfamily Leptognathiinae Sieg, 1973

Genus *Leptognathia* G.O. Sars, 1882

*Leptognathia* cf. *breviremis* (Lilljeborg, 1864)

Figure 3.24

**Material Examined.** Santa Maria Basin, 2 neuters from phase II, cruise 1-3, Sta. PJ-1, (rep. 3), 34°55.79'N 120°49.91'W, 145 m, off Point Sal; 7 females from cruise 2-4, Sta. R-2 (rep. 1) 35°05.50'N 120°53.40'W, 161 m, southwest of Pt. San Luis, Santa Maria Basin, California; 1 female from cruise 2-4, Sta. R-4 (rep. 2), 34°43.01'N 120°47.39'W, 93 m, off Purisima Point, Santa Maria Basin, California.

**Description (female)** (Figure 3.24). Body, 0.84 - 0.90 mm long, about 4.3× longer than broad. Cephalothorax, 1.2× broader than long, with convex lateral margins. Pereonites 1-3 similar in length and width, 2.6× broader than long; pereonites 4-6 about 2.4× broader than long. Pleonite 1 longest, about 4.3× broader than long; pleonite 2 broadest, 6.3× broader than long; pleonites 3 and 4 about 5.8× broader than long; pleonite 5 narrowest, 4.8× broader than long.

First antenna 4-segmented; first segment 1.4× longer than broad; second segment about as long as broad; third segment 2.4× broader than long; fourth segment 1.8× longer than broad; formula for armature: 1 seta + 3 feathered hairs, 1 seta + 2 feathered hairs, 2 setae, and 5 setae + 1 aesthetasc.

Mandible with attenuate pars molaris with bifid tip.

Chelipedal carpus 1.9× longer than broad, with 2 small tergal setae (1 proximal, another distal) and 2 sternal setae. Palm comb consisting of 2 small setae with 1 additional larger seta. Fixed finger with spiniform tip and several denticles; tergal border with 3 setae; sternal border with 1 long seta. Dactylus curved and stout.

Pereopod 1 with merus bearing 1 tergal seta; carpus with 1 spiniform tergal seta, with 1 long spiniform seta and 1 small seta on sternal margin; propodus with 1 tergal spiniform seta and 2 sternal setae; dactylus and terminal spine about as long as propodus. Pereopod 6 with carpus bearing 3 spines and 1 seta; propodus with 2 tergal and 3 sternal spines; dactylus and terminal spine shorter than propodus.

Pleotelson, 1.4× broader than long; posterior margin with protuberant median area bearing 2 pairs of setae.

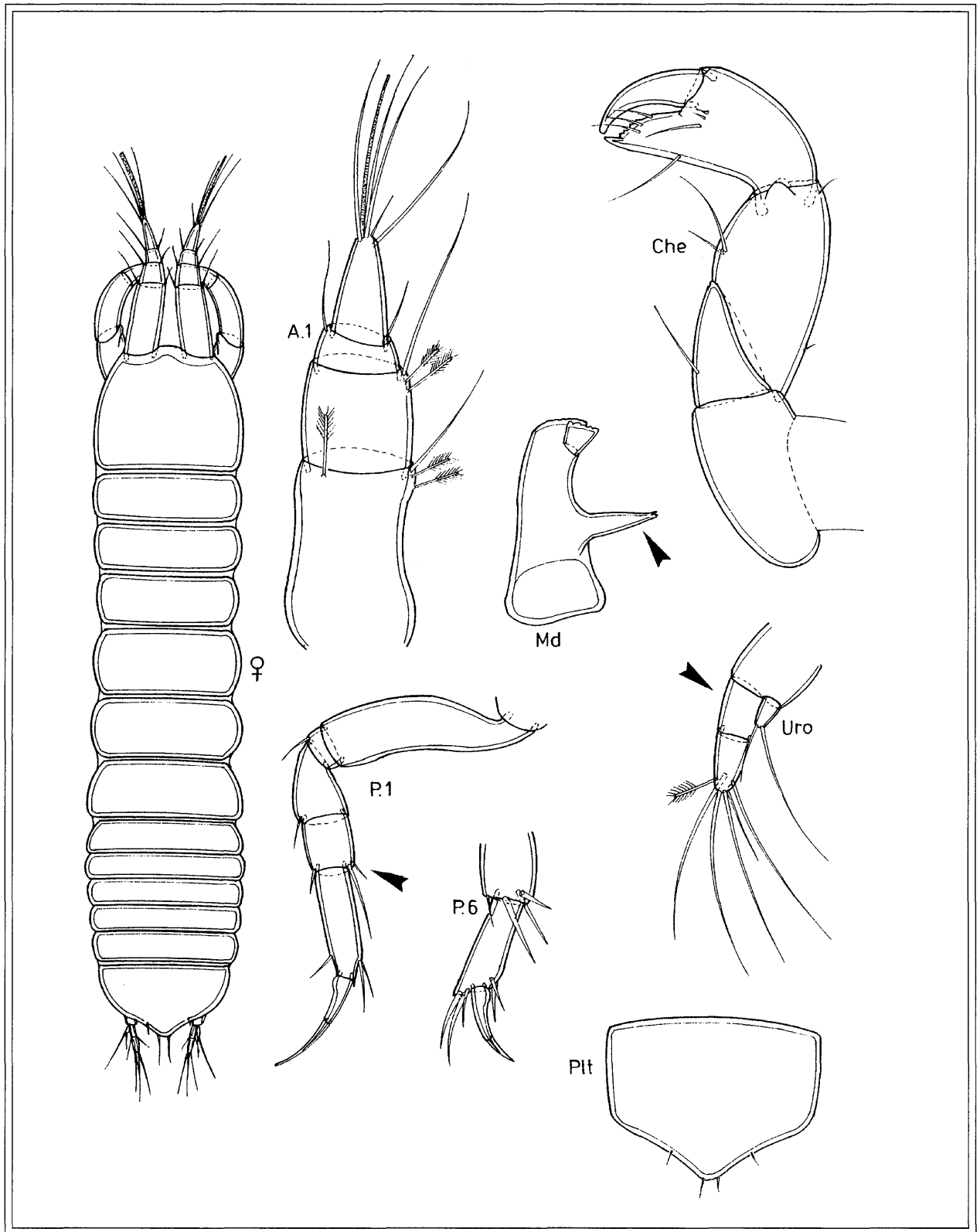
Uropod biramous. Exopodite 1-segmented, 1.8× longer than broad, with 2 terminal setae. Endopodite 2-segmented; first segment 1.3× longer than broad, naked; second segment 1.9× longer than broad, bearing 5 setae and 1 feathered hair.

**Remarks.** The two specimens of *Leptognathia* in the MMS voucher collection are both neuters and are in poor condition. Both specimens appear to be related to *L. breviremis* (Lilljeborg, 1864), but, without additional material, a positive identification and detailed description are not possible. We have retained the original identification of the material as *Leptognathia* cf. *breviremis*.

This species can be distinguished from the other MMS/Santa Maria Basin and Western Santa Barbara Channel tanaidaceans by the combination of a stout body, stout 4-segmented first antenna, attenuate pars molaris of the mandible, one long and one short sternal setae on carpus of pereopod 1, and an unarmed stout first endopodal segment of the uropod.

**Type Locality and Type Specimens.** Type material was collected in Norway.

**Distribution.** The specimens described here were collected from the Santa Maria Basin, California.



**Figure 3.24.** *Leptognathia cf. breviremis* (Lilljeborg, 1864), female: ♀, general habitus of female; A.1, first antenna; Md, mandible; Che, cheliped; P.1, pereopod 1; P.6, pereopod 6; Plt, pleotelson; Uro, uropod.

Genus *Tanaopsis* G.O. Sars, 1896

*Tanaopsis cadieni* Sieg and Dojiri, 1991

Figures 3.25, 3.26

*Tanaopsis cadieni* Sieg and Dojiri, 1991: 1501-1511, figs. 5-10.

**Material Examined.** From Santa Maria Basin and Western Santa Barbara Channel, phase I: 9 females, 1 male, 6 neuters, 3 manca-II, 2 fragments from Sta. 67, 34°30'17"N 120°45'30"W, 282 m, off Pt. Arguello; 1 manca-II from Sta. 73, 34°28'13"N 120°36'48"W, 98 m, between Pt. Conception and Pt. Arguello; 2 neuters, 1 manca-II from Sta. 59, 34°33'39"N 120°47'11"W, 216 m, off Pt. Arguello; 5 females from Sta. 71, 34°29'02"N 120°44'01"W, 306 m, southwest of Pt. Arguello. Phase II: 3 neuters, 9 manca-I from cruise 1-3, Sta. PJ-7 (rep. 3), 34°55'48"N 120°48'36"W, 123 m, May 1987; 2 neuters, 1 manca-I from cruise 1-1, Sta. PJ-13 (rep. 2), 34°56'01"N 120°49'55"W, 144 m, October 1986; 1 manca-I from cruise 2-3, Sta. R-8 (rep.2), 34°55'18"N 120°45'52"W, 90 m, west of Pt. Sal, January 1988.

From Santa Monica Bay, California, collected by Biology Laboratory, Environmental Monitoring Division, City of Los Angeles: 1 male from Sta. B5, 33°58'00"N 118°31'45"W, 45 m, 11 August 1987; 6 females from Sta. E7, 33°54'44"N 118°34'17"W, 150 m, 16 July 1990.

From LACM: 1 female (LACM 53-125) 6.4 mi., 239° T end of Redondo Beach Pier, 33°47'30"N 118°30'07"W, 229 m, sand and mud, R/V *Velero IV* (AHF 2361-53), 08 July 1953. From Orange County, California: 1 female from B44, 33°34'34"N 118°05'22"W, 242 m, Newport Canyon, off Huntington Beach, collected by County Sanitation Districts of Orange County, 23 September 1983; 3 females and 1 male (1 female and 1 male dissected on slide) from Sta. B39, 33°33'18"N 117°58'27"W, 200 m, Newport Canyon, off Newport Beach, collected by County Sanitation Districts of Orange County, 18 July 1983; 2 manca-I from Sta. 32, 33°34'43"N 117°57'42"W, 59 m, Newport Beach, collected by County Sanitation Districts of Orange County, 21 July 1982; 2 females from Sta. B24, 33°33'36"N 118°01'03"W, 200 m, off Huntington Beach, collected by Sanitation Districts of Orange County, 03 August 1984; 1 female from Sta. B44, 33°34'30"N 118°05'22"W, 242 m, Newport Canyon off Huntington Beach, collected by County Sanitation Districts of Orange County, 23 September 1983; 1 neuter (LACM 62-172) 73 mi 192.5° T from Dana Point, 33°20'30"N 117°44'52"W, 719 m, mud, R/V *Velero IV* (AHF 7728-62), 10 April 1962. From San Diego County, California: 1 female (LACM 60-85) 1.6 mi, 354.5° T from Pt. La Jolla, 32°52'48"N 117°16'32"W, 104 m, muddy silt, R/V *Velero IV* (AHF 7038-60), 06 May 1960.

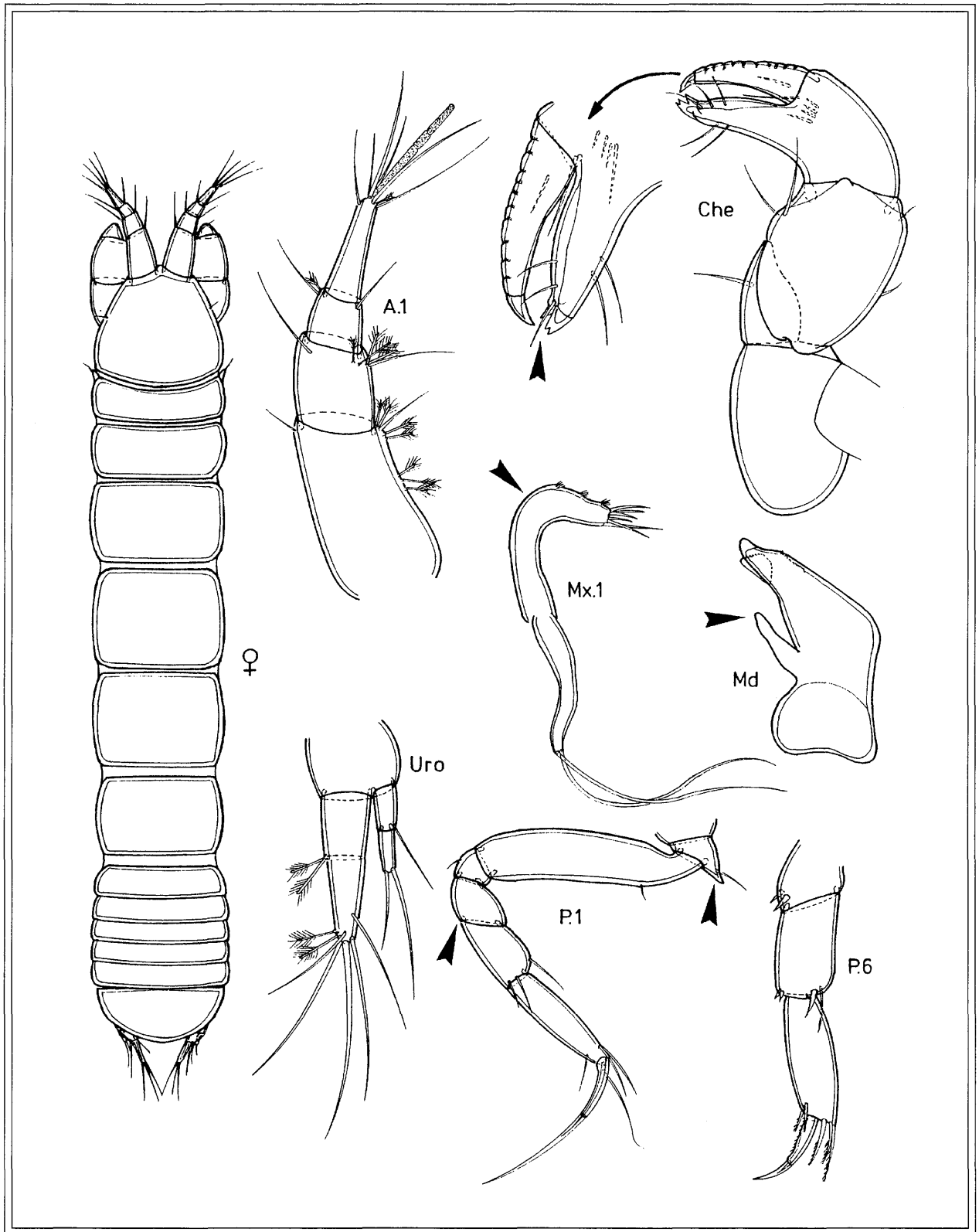
**Description (female)** (Figure 3.25). Body, 3.01-3.97 mm long, about 5.5× longer than broad. Cephalothorax about as long as broad; widest in posterior region; posterior border curved. Lateral margins of all pereonites rounded. First pereonite 3.8× broader than long, with rostral border concave. Pereonite 2 about 2.6× broader than long. Pereonites 2 and 6 about 1.6× broader than long, similar in shape. Pereonites 4 and 5 about 1.3× broader than long. All pereonites similar in width. Pleonites all of similar size, similar in width to pereonites.

First antenna 4-segmented with armature of segments as follows: 2 setae + 7 feathered hairs; 2 setae + 4 feathered hairs; 2 setae + 1 feathered hair; 6 setae, 1 feathered hair, 1 aesthetasc.

Mandible with pars molaris an unornamented spiniform process.

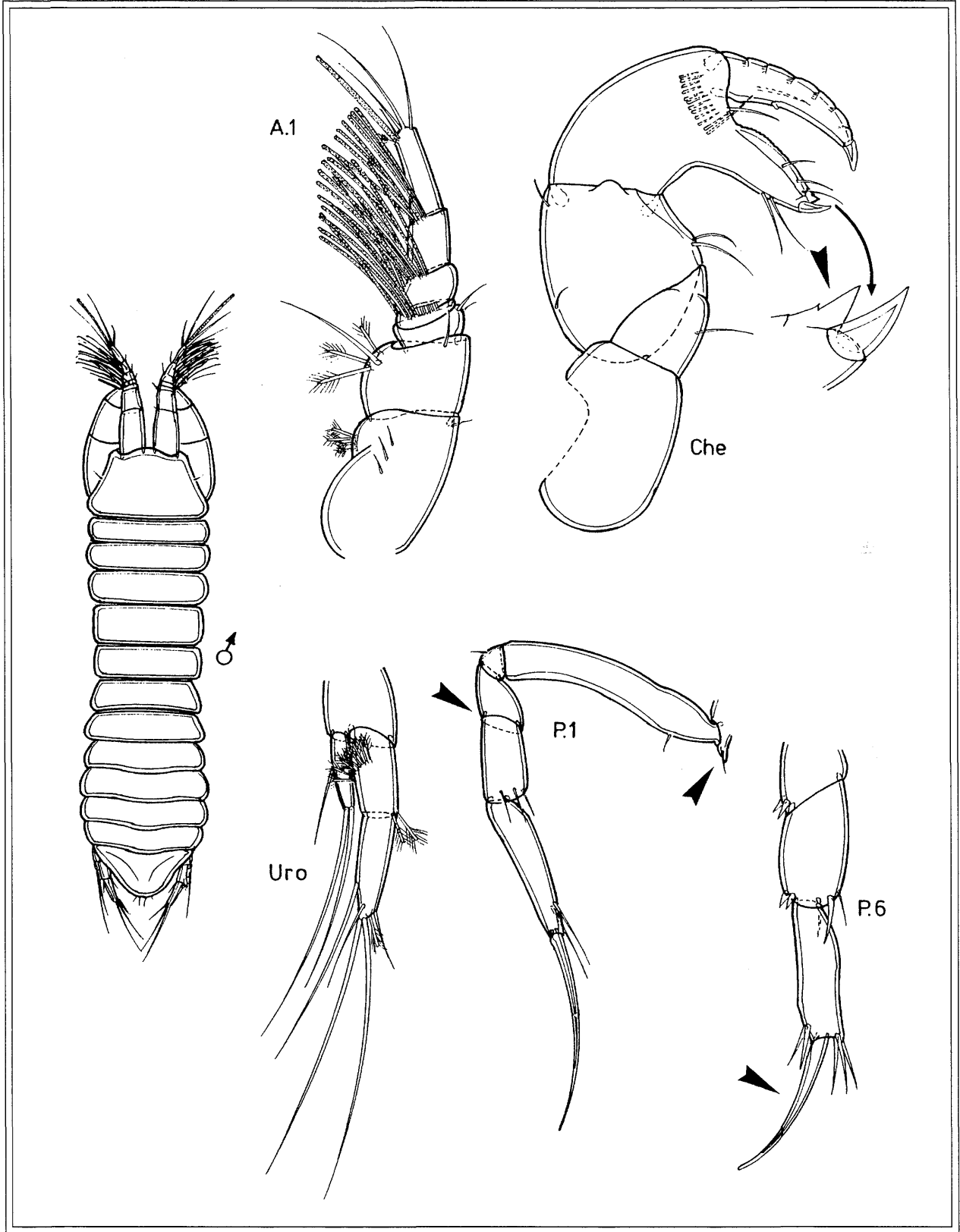
First maxilla with strongly curved endite equipped with 3 short rows of minute setules and tipped with 6 spines.

Cheliped palm with comb consisting of 1 long and 3 shorter setae. Fixed finger with usual seta near base of dactylus, terminating in bifid spiniform process; tergal border with 3 setae and 1 spiniform process having a small accessory process at its base; sternal border with 2 setae; rostral surface with longitudinal ridge extending from articulation point of dactylus to near base of spiniform process. Dactylus crenulated along tergal margin, bearing 1 proximal seta, and terminating in heavily sclerotized spine.



**Figure 3.25.** *Tanaopsis cadieni* Sieg and Dojiri, 1991, female: ♀, general habitus of female; A.1, first antenna; Md, mandible; Mx.1, first maxilla; Che, cheliped; P.1, pereopod 1; P.6, pereopod 6; Uro, uropod.





**Figure 3.26.** *Tanaopsis cadieni* Sieg and Dojiri, 1991, male: ♂, general habitus of male; A.1, first antenna; Che, cheliped; P.1, pereopod 1; P.6, pereopod 6; Uro, uropod.

Pereopod 1 with coxa bearing rostrally-directed triangular process; merus unarmed; propodus elongate, about 3.7× longer than broad with 1 tergal and 2 sternal setae; dactylus armed with 1 long seta and not fused to terminal spine. Dactylus and terminal spine of pereopods 1-3 longer than propodus. Pereopods 4-6 with dactylus and terminal spine combined shorter than propodus. Dactylus without long proximal seta.

Pleotelson, 1.5× broader than long, with 1 pair of setae at caudal corners, 1 pair subapically, and 2 pairs (1 long, 1 short) apically.

Uropod biramous with stout rami. Exopodite 2-segmented and extending slightly beyond midlength of endopodite. Endopodite 1-segmented, but with constriction (segmental suture ?) at midlength, 3× longer than broad.

**Description (male)** (Figure 3.26). Body, 1.49-2.18 mm long, stout. Cephalothorax 1.5× broader than long, with relatively straight posterior margin. Pereonites and pleonites similar in appearance; pereonites 3-6 slightly longer and a bit narrower than remaining body somites.

First antenna 6-segmented with curved rows of numerous aesthetascs on segments 4 and 5; terminal segment with 4 setae, 1 feathered hair, and 1 aesthetasc.

Mandible as in female.

Cheliped palm with comb composed of 11 stiff setae (spines ?) and 2 longer setae. Fixed finger terminating in simple spine; tergal border serrate. Dactylus with 2 small spines on sternal border.

Pereopod 1 with propodus missing 1 tergal seta; long seta on dactylus absent. Pereopod 6 with dactylus and terminal spine combined as long as propodus.

Pleotelson as in female, except caudal point more slender and 1 pair of feathered hairs.

Uropod as in female, except curved row of feathered hairs near base of endopodite.

**Remarks.** This species was described by Sieg and Dojiri (1991) based on specimens collected for the present study and from the Southern California Association of Marine Invertebrate Taxonomists (SCAMIT). The specimens had been previously identified by MMS as *Cryptocope* spp. A and B and by SCAMIT as "*Leptognathia* sp. B" and later as *Tanaopsis* sp. A. This species can be distinguished from all other known California tanaidaceans by its stout body shape, short uropod, and by the detailed morphology of the mandible, first maxilla, cheliped, triangular process on the coxa of pereopod 1, and absence of elements (spines and/or setae) on the merus of pereopod 1.

This species appears to inhabit substrates consisting of mud and muddy silt.

**Type Locality and Type Specimens.** Female holotype (LACM 60-173.2) and 13 female paratypes (LACM 60-173.3) 2.25 mi 156.5°T (true north) from Catalina Head, Santa Catalina Island, California Channel Islands, 33°23'12"N, 118°29'38"W, 86 m, mud, R/V *Velero IV* (AHF 6823-60), 27 January 1960. Types deposited in the Natural History Museum of Los Angeles County.

**Distribution.** Santa Maria Basin to La Jolla (San Diego), California, 45-719 m (Sieg and Dojiri, 1991).

Family Typhlotanaidae Sieg, 1984

Genus *Typhlotanais* G.O. Sars, 1882

*Typhlotanais williamsae* Dojiri and Sieg, new species

Figure 3.27

**Type Material.** 1 female holotype (USNM 284728) and 34 paratypes (SBMNH 144126; 20 females [4 ovigerous], 7 neuters, 4 fragments, and 3 manca-I) from cruise 1-1, Sta. PJ-15 (rep. 1), 34°55.80'N 120°50.60'W, 155 m, M/V *Aloha*, October 1986;

**Material Examined.** Santa Maria Basin, phase I: 2 neuters from Sta. 73, 34°28.21'N 120°36.80'W, 98 m, originally identified as *Leptognathia* sp. H; 1 neuter from Sta. 58, 34°34.35'N 120°45.18'W, 99 m, November 1984; 1 female (ovigerous) from Sta. 71, 34°29.04'N 120°44.01'W, 306 m, originally identified as *Leptognathia* sp. H; 2 neuters from Sta. 42, 34°48.40'N 120°47.50'W, 100 m; 2 females and 1 neuter from Sta. 54, 34°36.57'N 120°52.02'W, 396 m, originally identified as *Leptognathia* sp. H, March 1985; vial with label reporting 2 females from Sta. 42, 34°48.04'N 120°47.50'W, 100 m, with 1 dried specimen. Santa Maria Basin, phase II: 42 neuters, 3 mancas, and 8 fragments from cruise 1-3, Sta. R-4 (rep. 3), 34°43.00'N 120°47.40'W, 92 m, M/V *Aloha*, May 1987; 32 females and 6 neuters from cruise 1-2, Sta. PJ-7 (rep. 2), 34°55.79'N 120°48.60'W, 123 m, originally identified as *Typhlotanais* sp.; 96 females, 4 neuters, 4 manca-II, and 1 manca-I from cruise 1-2, Sta. PJ-7 (rep. 3), 34°55.79'N 120°48.60'W, 123 m, originally identified as *Typhlotanais* sp.; 25 females and 2 neuters from cruise 1-1, Sta. PJ-4 (rep. 2), originally identified as *Leptognathia* sp. H; 16 females, 1 neuter, and 1 manca-I from cruise 1-1, Sta. PJ-6 (rep. 1), 34°54.71'N 120°49.91'W, 148 m, originally identified as *Leptognathia* sp. H; 14 females, 1 neuter, 1 manca-II, and 4 manca-I from cruise 1-1, Sta. PJ-8 (rep. 2), 34°56.80'N 120°49.91'W, 142 m, originally identified as *Leptognathia* sp. H; 27 females and 2 neuters from cruise 1-1, Sta. PJ-2 (rep. 3), originally identified as *Leptognathia* sp. H; 54 females, 3 neuters, and 1 manca-I from cruise 1-2, Sta. PJ-23 (rep. 2), 34°56.33'N 120°49.90'W, 143 m, originally identified as *Typhlotanais* sp.; 28 females, 1 neuter, and 7 manca-I from cruise 1-2, Sta. PJ-6 (rep. 3), 34°41.40'N 120°57.90'W, 410 m, originally identified as *Typhlotanais* sp.; 28 females, 20 neuters, and 1 manca-I from cruise 1-1, Sta. PJ-8 (rep. 1), 34°56.87'N 120°49.91'W, 142 m, originally identified as *Leptognathia* sp. H; 26 females from cruise 1-1, Sta. PJ-4 (rep. 3), originally identified as *Leptognathia* sp. H; 32 females and 7 neuters from cruise 1-2, Sta. PJ22 (rep. 3), 34°55.25'N 120°49.93'W, 143 m, originally identified as *Typhlotanais* sp.

From LACM: 1 female (LACM 54-94), 457 m, gravel and mud, 13.1 mi, 301° T from North Light, Santa Barbara Island, Channel Islands, California, 33°35.98'N 119°15.18'W, R/V *Velero IV* (AHF 2969-54), 31 October 1954; 1 female and 1 neuter (LACM 55-35), 73 m, mud, 9.9 mi, 203° T from Santa Monica Pier Light, Los Angeles County, California, 33°51.37'N 118°34.70'W, R/V *Velero IV* (AHF 2998-55), 06 February 1955; 1 female (LACM 55-36), 732 m, rock, sand, and mud, 14.3 mi, 345° T from Aero Beacon, San Nicolas Island, Ventura County, California, 33°28.07'N 119°34.68'W, R/V *Velero IV* (AHF 3031-55), 07 May 1955; 3 females (LACM 60-77), 415 m, coarse muddy sand, Tanner Canyon, 35.3 mi, 249° T from China Point Light, San Clemente Island, California Channel Islands, California, 32°35.80'N 119°04.92'W, R/V *Velero IV* (AHF 6836-60); 1 neuter (LACM 60-84), 225 m, mud, 34.1 mi, 246° T from China Pt. Light, San Clemente Island, Tanner Bank, California Channel Islands, California, 32°34.47'N 119°02.70'W, R/V *Velero IV* (AHF 6837-60), 29 January 1960; 1 neuter (LACM 60-186), 814 m, mud, 265 mi, 204° T from Ribbon Rock, Santa Catalina Island, California Channel Islands, California, 33°22.78'N 118°36.20'W, R/V *Velero IV* (AHF 6829-60), 28 January 1960.

**Description (female)** (Figure 3.27). Body, 1.40-1.62 mm long, about 7× longer than broad. Cephalothorax, 1.3× longer than broad, with lateral margins nearly parallel (only slightly convex). Pereonites 1-6 subquadrangular; pereonites 1 and 6 with similar length/width ratio: 1.8× broader than long; pereonites 2, 3, and 5 about 1.3× as wide as long; pereonite 4 as long as broad. Pleonites 1-5 about 4-5× broader than long.

First antenna 3-segmented; first segment about 2.5× longer than broad; second segment smallest, as long as broad; third segment more than 3× longer than broad; formula for armature: 1 seta + 8 feathered hairs, 2 setae, and 5 setae + 1 aesthetasc + 1 feathered hair.

Mandible with truncate pars molaris; crushing area with crenulated wall.

Maxilliped with basis fused and bearing 1 distal seta each near insertion of palpus. Endites each with 2 distal setae and 2 bulbs. Palpus 4-segmented; first segment unarmed; second segment with 1 lateral and 3 medial setae (2 of them spiniform); third segment with 3 medial setae; fourth segment with 1 medial and 5 terminal inner setae.

Chelipedal carpus slender, about 3× longer than broad (length measured along tergal margin), with 2 small tergal setae (1 proximal, another distal), and 3 sternal setae. Fixed finger with spiniform tip; tergal border with 3 setae; area near insertion of dactylus comb with 1 small seta and row of spinules; sternal margin with 2 setae.

Pereopod 1 with merus longer than carpus and bearing 2 tergal setae; carpus with 2 tergal and 1 sternal setae; propodus with 3 sternal setae. Pereopod 6 merus with 2 stout tergal spines; carpus with hooklike protuberance (indicated by arrow in figure) and 1 sternal seta; propodus with 2 stout tergal spines, a few setules along sternal margin, and 3 long sternal spiniform setae at distal end; dactylus with rows of spinules along tergal margin, fused with terminal spine.

Pleopods 1-5 similar. Exopodite with proximal pilose seta (indicated by arrow in figure) on outer margin. Endopodite with 1 distal seta (indicated by arrow in figure) on inner border.

Pleotelson, 1.8× wider than long, with rounded protuberance on posterior margin.

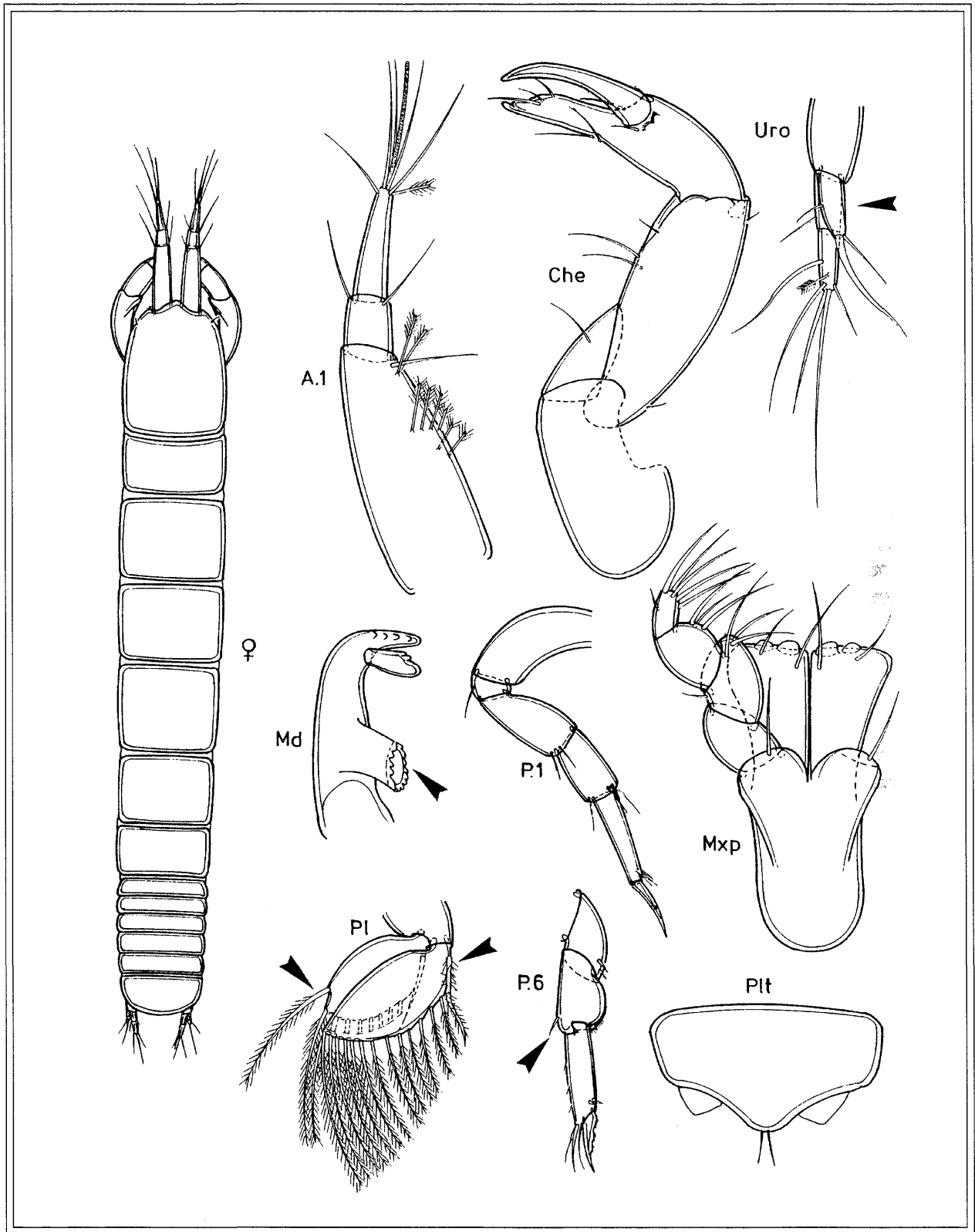
Uropod biramous. Exopodite indistinctly 2-segmented, 2.6× longer than broad, 1 seta at midlength, and 1 large and 1 small setae terminally. Endopodite indistinctly 2-segmented; first segment, about 2× longer than broad, bearing 1 distal seta; second segment about 3× longer than broad, with 1 subterminal seta and 4 setae and 1 feathered hair terminally.

**Remarks.** *Typhlotanais williamsae* can be distinguished from other Santa Maria Basin and Western Santa Barbara Channel tanaid species by the presence of a 3-segmented first antenna in the female, a broad crushing area of the pars molaris surrounded by a crenulated wall, a slender cheliped, and normal-sized pereonites 1 and 2 (combined longer than pereonite 3). *Typhlotanais williamsae* differs from *T. crassus* by the characters listed in the Remarks section for the latter species.

**Etymology.** This species is named in honor of Ms. Isabelle “Izzie” Williams, Woods Hole, MA, who assisted in putting the finishing touches on this chapter and who critically reviewed the entire manuscript. Without her efforts, this manuscript would not have been completed.

**Type Locality and Type Specimens.** Santa Maria Basin, California. Types deposited in the National Museum of Natural History (USNM 284728) and the Santa Barbara Museum of Natural History (SBMNH 144126); see “Type Material.”

**Distribution.** Santa Maria Basin, California to San Clemente Island, California.



**Figure 3.27.** *Typhlotanais williamsae* Dojiri and Sieg, new species, female: ♀, general habitus of female; A.1, first antenna; Md, mandible; Mxp, maxilliped; Che, cheliped; P.1, pereopod 1; P.6, pereopod 6; Pl, pleopod; Plt, pleotelson; Uro, uropod.

### *Typhlotanais crassus* Dojiri and Sieg, new species

Figure 3.28

**Type Material.** 1 neuter holotype (USNM 284729) and 3 paratypes (neuters; SBMNH 144133) from Sta. D3, 33°52'47"N 118°35'15"W, 80 m, Santa Monica Bay, California, collected by Biology Laboratory, Environmental Monitoring Division, City of Los Angeles, 14 July 1988.

**Material Examined.** From Santa Monica Bay, California, collected by Biology Laboratory, Environmental Monitoring Division, City of Los Angeles: 4 females and 1 neuter from Sta. D3, 33°52'47"N 118°35'15"W, 79 m, 16 January 1992; 3 females and 2 neuters from Sta. D3, 33°52'47"N 118°35'15"W, 80 m, 23 January 1993; 1 female from Sta. D3, 33°52'47"N 118°35'15"W, 77 m, 18 July 1991.

**Description (neuter)** (Figure 3.28). Body, 1.20-1.32 mm long, about 5× longer than broad. Cephalothorax about as long as broad, with anterior 2/3 tapered. Pereonites 1-6 with convex lateral margins; pereonite 1 about 8.3× broader than long; pereonite 4 longest of pereonites and 1.6× broader than long. Pleonites 1-5 about 5-6× broader than long.

First antenna 3-segmented; first segment about 2.4× longer than broad; second segment shortest, about as long as broad; third segment almost 4× longer than broad; formula for armature: 6 setae + 5 feathered hairs, 2 setae + 1 feathered hair, and 5 setae + 1 aesthetasc.

Mandible with truncate pars molaris; crushing area with crenulate wall and spiniform processes.

Maxilliped with basis fused and bearing 1 distal seta near insertion of each palpus. Endites each with 2 distal setae. Palpus 4-segmented; first segment unarmed; second segment with 1 lateral and 3 medial setae (2 of them spiniform); third segment with 4 medial setae; fourth segment with 1 lateral and 5 terminal inner setae.

Cheliped with sternal protuberance, articulating with side-piece. Merus small, with distal margin bearing 1 sternal seta. Carpus slender, about 2.2× longer than broad (length measured along tergal margin), with 2 small tergal setae (1 proximal, another distal), and 2 sternal setae. Fixed finger with spiniform tip; tergal border with 3 setae; sternal margin with 2 setae. Dactylus as long as fixed finger and lacking seta.

Pereopod 1 with basis bearing several (about 4) setae along sternal border; merus about as long as carpus and bearing 2 setae; carpus with 1 tergal and 3 sternal setae; propodus with 3 setae. Pereopod 6 merus with stout, pinnate, tergal seta, 1 tergal naked seta (indicated by dotted lines in figure) and several rows of minute spinules; carpus with several rows of minute spinules, a hooklike protuberance, and 1 sternal seta; propodus with 2 stout tergal spines, a few setules along sternal margin, and 3 distal spiniform setae; dactylus and terminal spine fused; dactylus with minute spinules; terminal spine serrated along tergal margin.

Pleopods 1-5 similar. Exopodite with proximal pilose seta (indicated by arrow in figure) on outer margin. Endopodite with distal pilose seta (indicated by arrow in figure) on inner border.

Pleotelson, 1.9× broader than long, with conical protuberance on posterior margin.

Uropod biramous. Exopodite 1-segmented, 4.5× longer than broad, with 1 seta at about midlength and 1 small and 1 long setae terminally. Endopodite 1-segmented, about 3.8× longer than broad, bearing 5 distal setae and 4 feathered hairs.

**Remarks.** *Typhlotanais crassus* differs from *T. williamsae* by the combination of several characters: (1) cephalothorax with anterior 2/3 tapered (nearly parallel lateral margins in *T. williamsae*); (2) convex lateral borders of the pereonites (relatively straight in *T. williamsae*); (3) exopodite and endopodite of uropod 1-segmented (indistinctly 2-segmented in *T. williamsae*); (4) exopodite reaching about 2/3 length of endopodite (only slightly longer than midlength of endopodite in *T. williamsae*); and (5) two setae on sternal border of propodus of leg 2 unequal in size (these two setae equal in size in *T. williamsae*). These specimens were previously identified by SCAMIT as "*Leptognathia* sp. H" and later as "*Typhlotanais* sp. A."

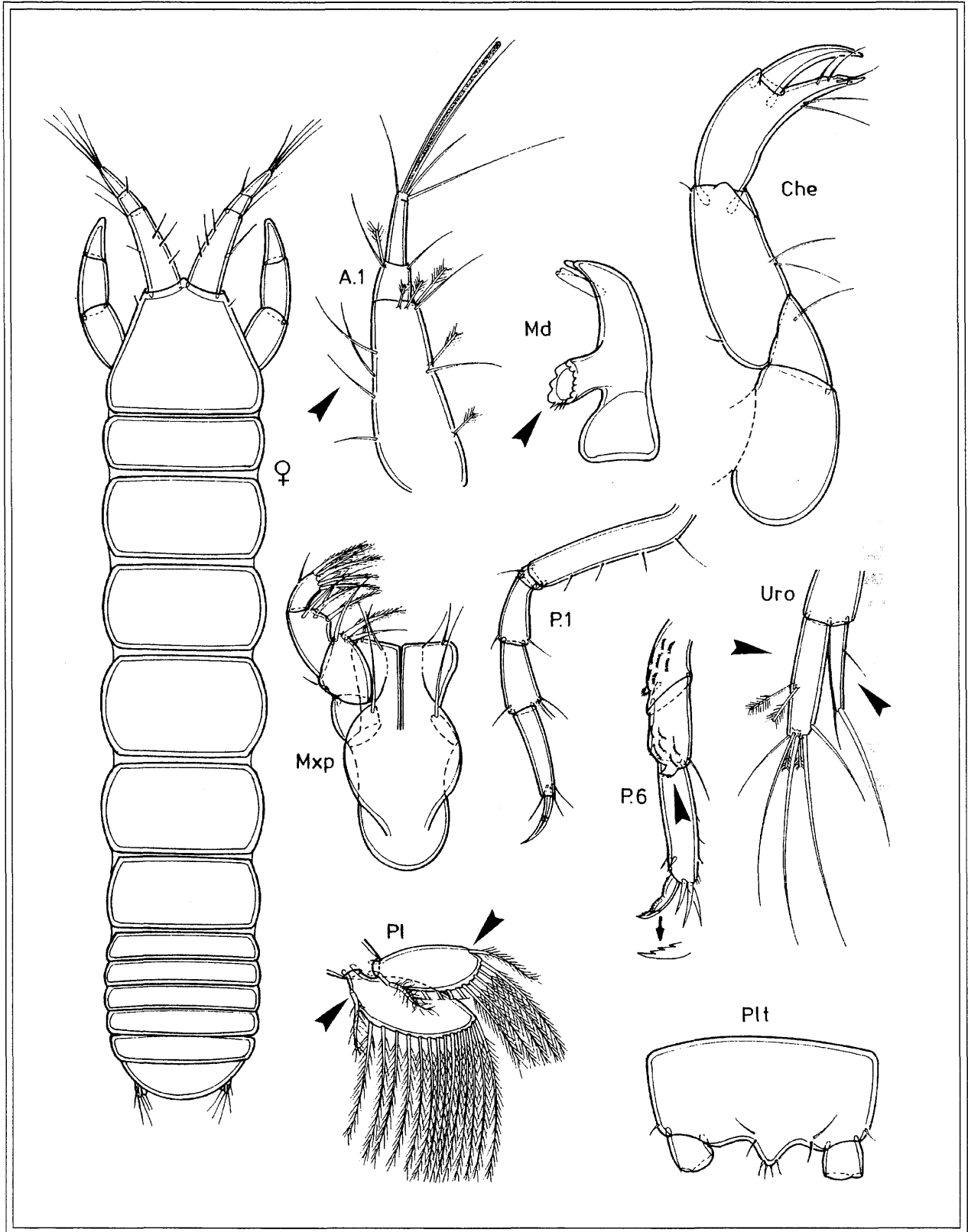


Figure 3.28. *Typhlotanais crassus* Dojiri and Sieg, new species, female: ♀, general habitus of female; A.1, first antenna; Md, mandible; Mxp, maxilliped; Che, cheliped; P.1, pereopod 1; P.6, pereopod 6; Pl, pleopod; Plt, pleotelson; Uro, uropod.

**Etymology.** The specific name *crassus* is Latin meaning “fat” and alludes to the stout body of this species.

**Type Locality and Type Specimens.** Santa Monica Bay, California. Types deposited in the National Museum of Natural History (USNM 284729) and the Santa Barbara Museum of Natural History (SBMNH 144133); see “Type Material.”

**Distribution.** Presently, this species has been reported only from Santa Monica Bay, California, but may be expected to inhabit the Santa Maria Basin and Western Santa Barbara Channel.

Family Pseudotanaidae Sieg, 1973

Genus *Pseudotanais* G.O. Sars, 1882

*Pseudotanais makrothrix* Dojiri and Sieg, new species

Figure 3.29

**Type Material.** 1 female holotype (USNM 284730) and 1 paratype (SBMNH 144128; dissected female) from Sta. 4, 35°26.56'N 121°14.93'W, 393 m, off Pt. Estero, Santa Maria Basin, California, March 1985, originally identified as Tanaidacea sp. B

**Material Examined.** 1 female from Sta. BRC-1, 35°27.86'N 121°05.33'W, 98 m, off Pt. Estero, Santa Maria Basin, California, March 1985, originally identified as Tanaidacea sp. B.

**Description (female)** (Figure 3.29). Body about 3.6× longer than broad. Cephalothorax, 1.2× broader than long, broadest at posterior end, and bearing a pair of eyes. Pereonites 1 and 2 combined shorter than pereonite 3; pereonites 4 and 5 longest of pereonites and about 2× broader than long; pereonite 6 with curved posterior margin. Pleonite 1 longest of pleonites, 3.6× broader than long; pleonites 2-5 approximately 4-5× broader than long.

First antenna 3-segmented; first segment long and slender, about 5× longer than broad; second segment shortest of 3 segments, 2× longer than broad; third segment 4.4× longer than broad; formula for armature: 2 setae, 2 setae + 1 feathered hair, and 5 setae + 1 aesthetasc.

Mandible with pars molaris whiplike; pars incisiva and lacinia mobilis denticulate.

Maxilliped with basis fused medially and carrying 1 seta near insertion of each palpus. Endites fused and bearing a pair of short distal setae and a few setules. Palpus 4-segmented; first segment stout and unarmed; second segment with 1 spiniform seta and 1 long seta; third segment with 3 spiniform setae and 1 short seta; terminal segment with 1 outer seta near midlength and 5 distal spiniform setae.

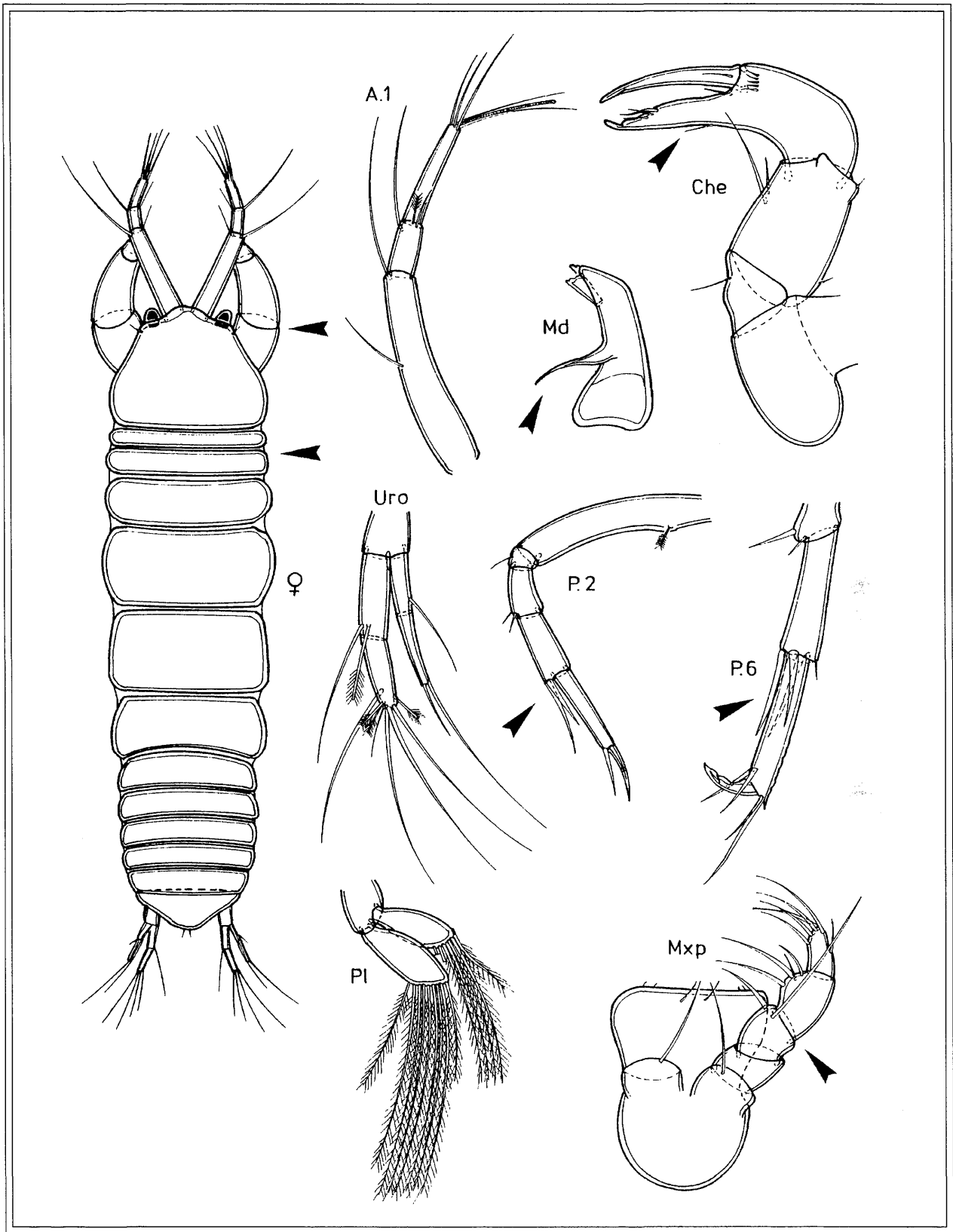
Cheliped of typical shape. Merus triangular and bearing sternal seta. Carpus about 1.5× longer than broad, with 1 proximal tergal seta, 1 distal tergal seta, and 2 sternal setae. Propodus with 1 seta near insertion of dactylus and comb consisting of about 5 setae. Fixed finger elongate, with 3 distal tergal setae and 1 sternal seta. Dactylus with 1 proximal seta and fused terminal spine.

Pereopod 2 with ischium bearing 1 feathered hair; merus with 2 distal tergal setae; carpus with 1 large spine and 1 large seta on distal tergal margin; propodus with 1 distal tergal seta. Pereopod 6 carpus with 3 large spines and 1 small, distal, sternal seta. Propodus with 2 terminal spiniform setae, with 1 long terminal spine and 1 shorter spiniform seta.

Pleopods with exopodite and endopodite about 2.4× longer than broad; exopodite with 9 pinnate setae; endopodite with 7 pinnate setae.

Pleotelson about 2.4× broader than long, with protuberant median posterior margin.





**Figure 3.29.** *Pseudotanais makrothrix* Dojiri and Sieg, new species, female: ♀, general habitus of female; A.1, first antenna; Md, mandible; Mxp, maxilliped; Che, cheliped; P.2, pereopod 2; P.6, pereopod 6; Pl, pleopod; Uro, uropod.

Uropods biramous. Exopodite indistinctly 2-segmented; first segment with 1 distal seta; second segment with 2 distal setae. Endopodite indistinctly 2-segmented; first segment with 1 seta and 1 feathered hair; second segment with 4 large setae, 1 smaller seta, and 3 feathered hairs.

**Remarks.** *Pseudotanaïs makrothrix* is characterized by possessing a pair of eyes, typical (not modified to bladelike elements) carpal spines on pereopods 2-6, and a whiplike pars molaris of the mandible. Additionally, the merus of pereopod 4 has two spines of unequal size and the second segment of the maxillipedal palpus bears a very long seta on the inner margin. This latter character is shared with the subantarctic species *P. guillei* Shiino, 1978 which was redescribed by Sieg (1986a). However, *P. makrothrix* may be distinguished from this species by its slender and longer propodal spines, most noticeable on pereopod 6: in *P. makrothrix* these spines are more than half as long as the propodus, but in *P. guillei* they are less than half the propodal length. Also, in *P. guillei* the third spine (sternal spine) is conspicuously smaller than the other two, while in *P. makrothrix* all three spines are similar in size.

**Etymology.** The specific name is a combination of the Greek words *makros*, meaning long or large, and *trichos* (=thrix), meaning hair, and alludes to the long and slender propodal spines, most noticeable on pereopod 6.

**Type Locality and Type Specimens.** Off Pt. Estero, Santa Maria Basin, California. Type deposited in the National Museum of Natural History (USNM 284730) and the Santa Barbara Museum of Natural History (SBMNH 144128); see "Type Material."

**Distribution.** Off Pt. Estero in the Santa Maria Basin, California.

### *Pseudotanaïs californiensis* Dojiri and Sieg, new species

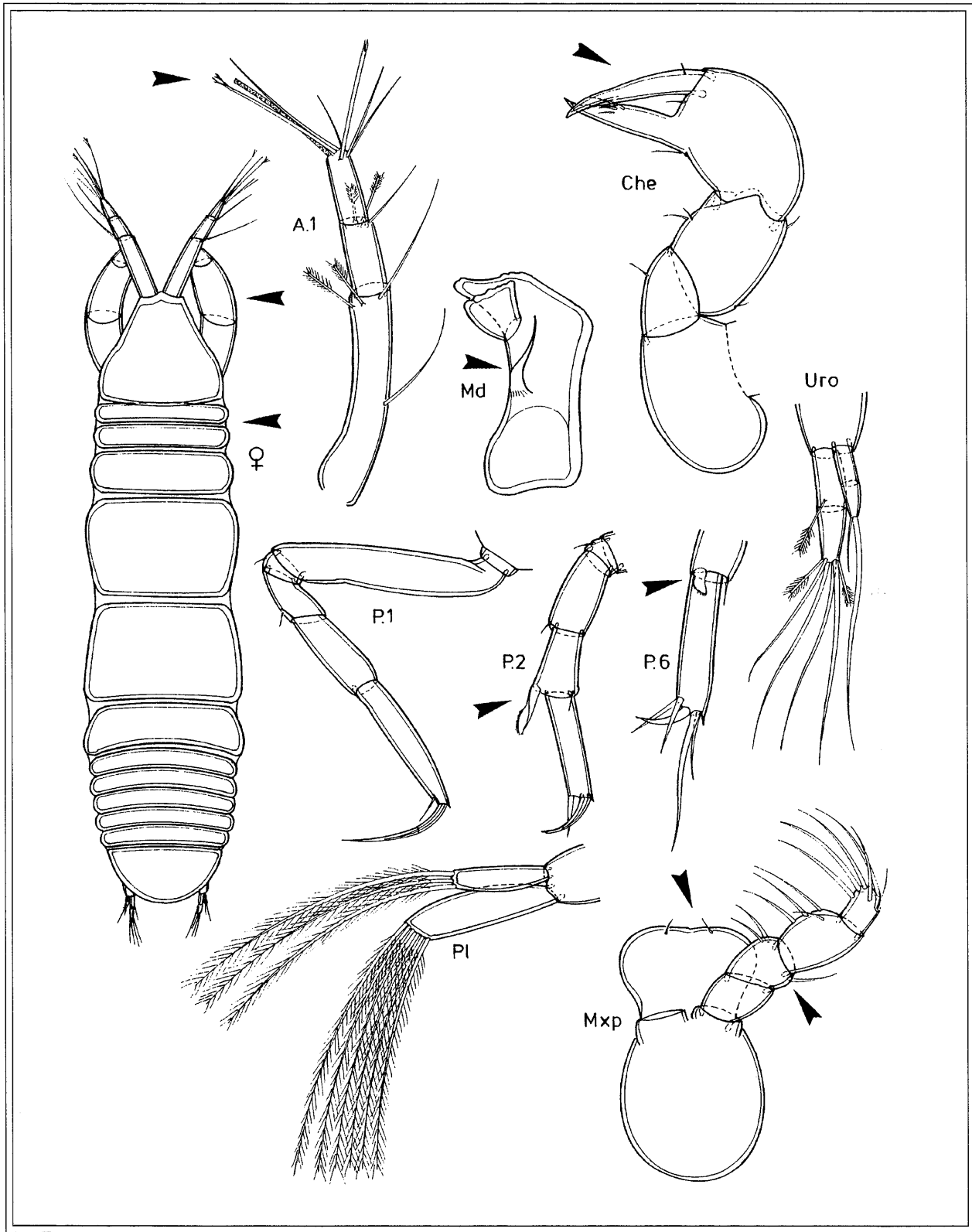
Figure 3.30, 3.31

**Type Material.** 1 female holotype (USNM 284731) and 31 paratypes (SBMNH 144125; 16 females, 1 male and 14 neuters; 1 female and 1 male dissected) from cruise 2-3, Sta. R-5, 34°42.70'N 120°50.80'W, 154 m, southwest of Purisima Pt., Santa Maria Basin, California, M/V *Aloha*, October 1987, originally identified as *Pseudotanaïs* sp. A by J. Toal.

**Material Examined.** Santa Maria Basin, phase I: 4 females, 1 neuter, and 1 fragment from Sta. 3, 35°27.07'N 121°10.20'W, 291 m, originally identified as *Cryptocope* sp. A. Santa Maria Basin, phase II: 4 females and 1 neuter from cruise 1-1, Sta. PJ 15 (rep. 1), 34°55.80'N 120°50.60'W, 155 m, M/V *Aloha*, October 1986, originally identified as *Pseudotanaïs* sp. A by G. Gillingham; 17 females, 4 neuters, 1 fragment, and 1 male (poor condition) from cruise 2-3, Sta. R-8 (rep. 1), 34°55.30'N 120°45.90'W, 90 m, M/V *Aloha*, January 1988, originally identified as *Pseudotanaïs* sp. A by J. Toal; 39 females and 9 neuters from cruise 2-4, Sta. R-4 (rep. 3), 34°43.01'N 120°47.39'W, 93 m, off Purisima Point, Santa Maria Basin, California; 16 females from cruise 2-4, Sta. R-4 (rep. 1), 34°43.01'N 120°47.30'W, 92 m, off Purisima Point, Santa Maria Basin, California; 32 females from cruise 2-4, Sta. R-5 (rep. 3), 34°42.69'N 120°50.83'W, 154 m, off Purisima Point, Santa Maria Basin, California; 26 females from cruise 2-4, Sta. R-5 (rep. 2), 34°42.69'N 120°50.83'W, 154 m, off Purisima Point, Santa Maria Basin, California; 1 female from cruise 1-1, Sta. PJ-4 (rep. 3); 32 females and 7 neuters from cruise 2-4, Sta. R-4 (rep. 2), 34°43.01'N 120°47.39'W, 92 m, off Purisima Point, Santa Maria Basin, California.

**Description (female)** (Figure 3.30). Body, 0.90-1.10 mm long, 3.8× longer than broad. Cephalothorax, about as long as broad, with tapered anterior end. Pereonites 1 and 2 short, 7.2× and 5.5× broader than long, respectively; pereonites 3 and 6 about 3× broader than long; pereonites 4 and 5 about 1.5× broader than long. Pleonites 1-5 approximately 6-7× broader than long.

First antenna 3-segmented; first segment long and slender, 5× longer than broad; second segment 2× longer than broad; third segment about 3× longer than broad; formula for armature: 2 setae + 2 feathered hairs, 1 seta + 2 feathered hairs, and 6 setae (2 have dendriform tips) + 1 aesthetasc.



**Figure 3.30.** *Pseudotanaïs californiensis* Dojiri and Sieg, new species, female: ♀, general habitus of female; A.1, first antenna; Md, mandible; Mxp, maxilliped; Che, cheliped; P.1, pereopod 1; P.2, pereopod 2; P.6, pereopod 6; Pl, pleopod; Uro, uropod.

Mandible with pars molaris whiplike.

Maxilliped with basis and endites fused, bearing 1 pair of small distal setae. Palpus 4-segmented; first segment unarmed; second segment with 1 outer distal seta and 2 inner distal setae; third segment with 3 long setae and 1 small seta; terminal segment with 5 long inner setae and 1 smaller outer seta.

Cheliped basis with protuberance. Merus triangular and carrying 1 sternal seta. Carpus about 1.3× longer than broad with 1 proximal tergal seta, 1 distal tergal seta, and 2 sternal setae. Chela having distinct gap between fixed finger and dactylus. Propodus with 1 sternal seta and 1 seta near insertion of dactylus. Fixed finger with 3 tergal setae. Dactylus with 1 small tergal seta.

Pereopods 2-6 with modified (bladelike) spine on carpus.

Pleopods with exopodite about 2/3 length of endopodite and bearing 3 terminal pinnate setae; endopodite with 6 pinnate setae.

Pleotelson 2× broader than long, with rounded posterior margin.

Uropod with exopodite indistinctly 2-segmented; first segment unarmed; second segment with 2 terminal setae. Endopodite indistinctly 2-segmented; first segment with feathered hair; second segment bearing 4 setae and 2 feathered hairs.

**Description (male)** (Figure 3.31). Body 4.3× longer than broad. Cephalothorax about as long as broad, broadest in posterior half. Pereonites 1 and 2 similar, 6× broader than long; pereonites 3 and 6 about 3.6× broader than long; pereonites 4 and 5 about 1.8-1.9× broader than long. Pleonites 1-4 about 4× broader than long; pleonite 5 narrowest of all pleonites, about 3.6× broader than long.

First antenna 7-segmented, bearing numerous aesthetascs on segments 4-6, and carrying 5 setae and 1 aesthetasc at tip of terminal segment.

Maxilliped with basis and endites completely fused; basis partially fused to cephalothorax.

Cheliped, with rounded protuberance, articulating with side-piece. Merus with sternal seta at about midlength. Carpus, about 1.3× longer than broad, bearing 1 proximal and 1 distal tergal seta and 1 long sternal seta. Propodus with 1 distal tergal seta near comblike row of spinules. Fixed finger with 1 proximal seta and 3 tergal setae. Dactylus slightly expanded proximally and attenuate distally.

Pereopod 1 with unarmed merus; carpus with small distal seta. Pereopod 2 with distal seta on merus; carpus with 1 seta and 1 spine distally. Pereopod 6 ischium with conspicuous spine.

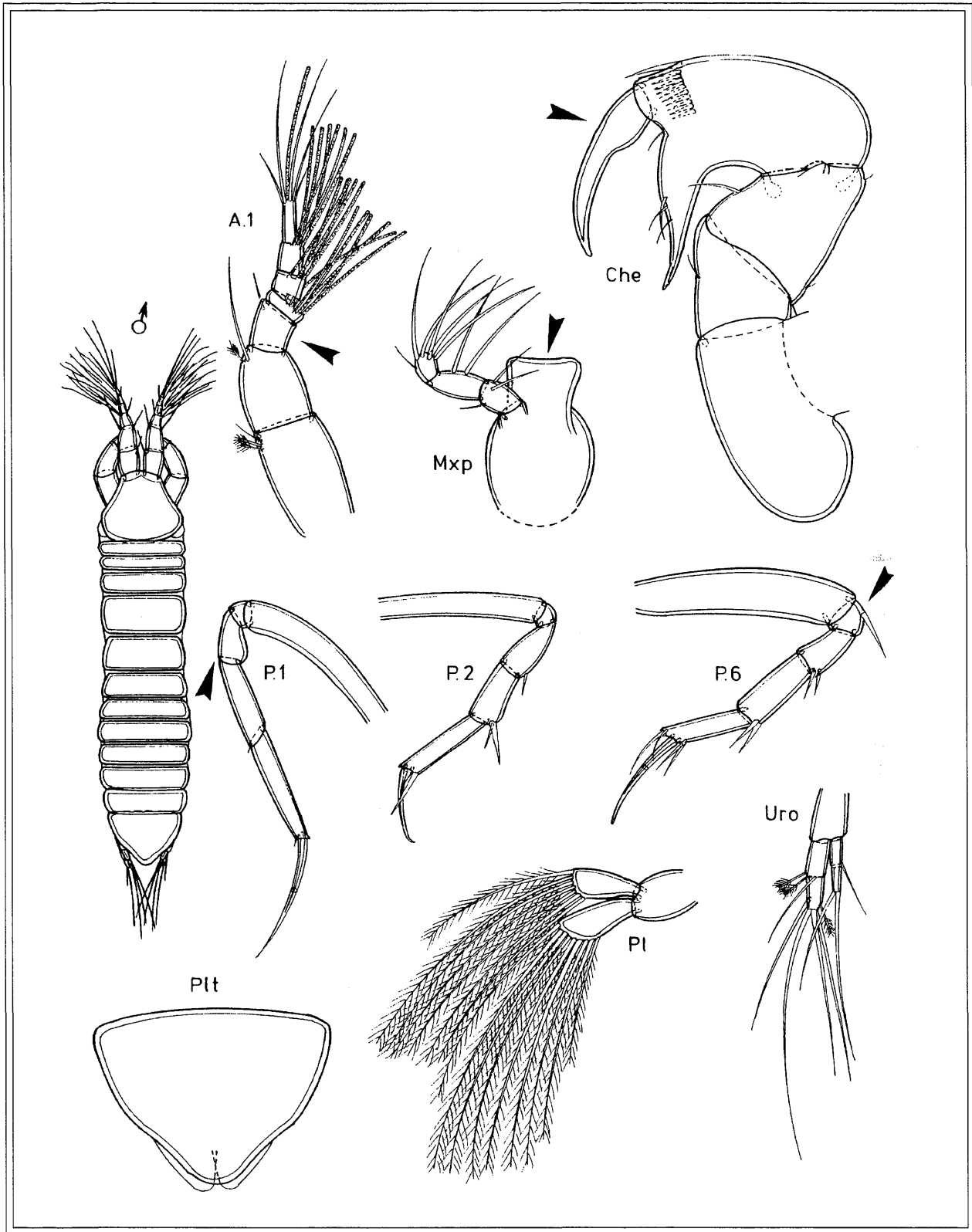
Pleopod with unarmed basis; exopodite and endopodite with several pinnate setae.

Pleotelson triangular, 1.3× broader than long.

Uropod biramous. Exopodite 2-segmented; first segment with 1 seta; second segment with 2 terminal setae. Endopodite 2-segmented; first segment with 1 seta and 2 pinnate setules; second segment with 4 setae and 1 pinnate setule.

**Remarks.** The transformed bladelike carpal spines on pereopods 2-6 places this species in the subgenus *Pseudotanais* (*Pseudotanais*) sensu stricto. Additional important characters are the absence of eyes, the structure of the pleopods, and the pointed whiplike pars molaris of the mandible. The gap between the fixed finger and the articulation of the dactylus in the cheliped indicate that *P. californiensis* is morphologically similar to *P. jonesi* Sieg, 1977 and *P. abyssi* Hansen, 1913. All three species also share the dendritic (or split) setal tips on the third antennal segment. *Pseudotanais californiensis* can be distinguished from these two congeners by the strong distal tergal spine on the propodus of pereopods 2 and 3.

The general outline of this male provides additional evidence that determination of the swimming male-type specimens may be quite difficult, but not impossible under certain conditions. Firstly, only a detailed examination of all appendages will allow the assignment of the specimens under study to the appropriate family. Secondly, if the male is accompanied by only one species of females of the same genus, as in the present case of *P. californiensis*, it is even possible to identify the specimens to species.



**Figure 3.31.** *Pseudotanaeis californiensis* Dojiri and Sieg, new species, male: ♂, general habitus of male; A.1, first antenna; Mxp, maxilliped; Che, cheliped; P.1, pereopod 1; P.2, pereopod 2; P.6, pereopod 6; Pl, pleopod; Plt, pleotelson; Uro, uropod.

The present male does not differ from the general habitus of “swimming males.” The second antenna, pereopods, pleopods, and uropods provide no special information since they are very similar within the Anarthruridae, Pseudotanaidae, and Typhlotanaidae. But, the elongate third segment in the 7-segmented first antenna, as well as the totally fused maxillipedal endites are characteristic of the Pseudotanaidae. Since the cheliped is articulated with the cephalothorax via a side-piece and the chela shows the typical “pseudotanaid” shape, there is no doubt that the specimen represents a species of *Pseudotanais*. Finally, the male corresponds to the accompanying *Pseudotanais* females by lacking eyes and having a gap between the fixed finger and the dactylus of the cheliped. Therefore, the specimen is identified herein as the male of the new species *P. californiensis*.

In the case of *P. californiensis*, the armament of the pereopods is misleading. Pereopod 1 fits the general scheme by having no meral spines. However, pereopods 2-6 are misleading. The carpus of these appendages do not bear the expected transformed spine. All pereopodal segments exclusively bear strong spines. Only looking at the pereopods and not knowing the female, the male would have been placed within the subgenus *Akanthinotanais* and not *Pseudotanais* sensu stricto. This shows once more that in “swimming males” quite often ancestral characters may “reappear” (as the re-segmentation of the uropodal endopodite or the 3-segmented uropodal endopodite in some anarthrurid species).

Finally, the ischium of pereopod 6 bears a spine similar to that of the akanthophoreid male-type 2 (see above). But taking into account the details mentioned above, distinguishing the two species should not be difficult.

**Etymology.** The specific name alludes to the state where the specimens were collected.

**Type Locality and Type Specimens.** Off Purisima Pt., Santa Maria Basin, California. Types deposited in the National Museum of Natural History (USNM 284731) and the Santa Barbara Museum of Natural History (SBMNH 144125); see “Type Material.”

**Distribution.** Off Pt. Estero, Purisima Pt., Pt. Sal, Santa Maria Basin, California.

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# Appendix

## Lists and Maps of Stations

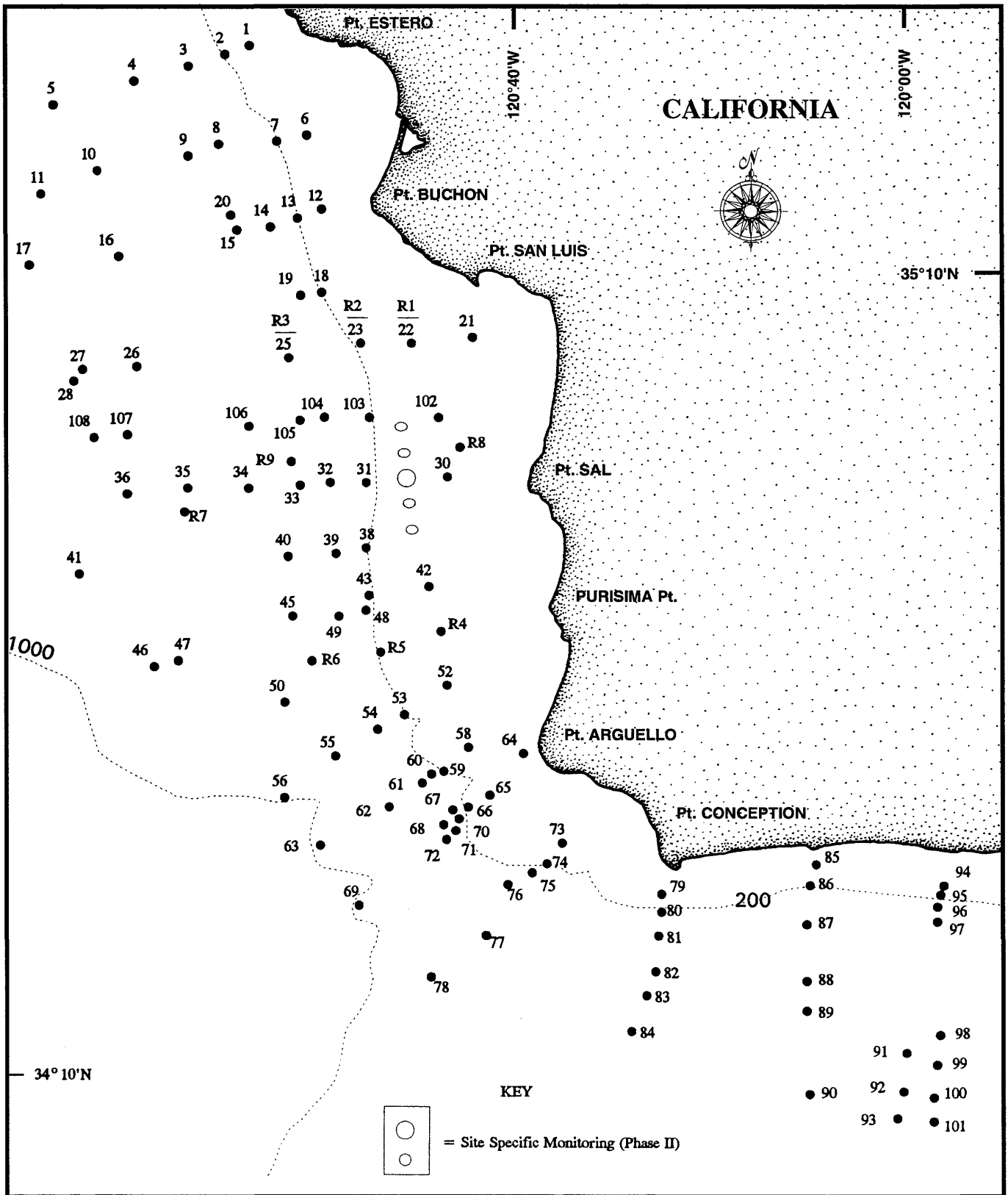
**Table A.1.** Position of soft-substrate stations taken during the Phase I Reconnaissance.

Station	Latitude	Longitude	Depth (m)
1	35°27.86'N	121°05.33'W	98
2	35°27.70'N	121°06.52'W	200
3	35°27.07'N	121°10.20'W	291
4	35°26.56'N	121°14.93'W	393
5	35°25.77'N	121°21.69'W	585
6	35°20.88'N	120°59.62'W	109
7	35°20.65'N	121°02.57'W	197
8	35°20.00'N	121°06.58'W	308
9	35°19.48'N	121°10.06'W	398
10	35°18.28'N	121°18.65'W	591
11	35°17.80'N	121°22.13'W	690
12	35°15.03'N	120°57.31'W	98
13	35°14.54'N	120°59.77'W	197
14	35°14.15'N	121°02.04'W	299
15	35°13.98'N	121°04.54'W	393
16	35°12.23'N	121°16.29'W	591
17	35°11.61'N	121°22.55'W	654
18	35°09.08'N	120°56.55'W	197
19	35°08.93'N	120°59.66'W	296
20	35°15.72'N	121°04.68'W	396
21	35°06.11'N	120°44.82'W	49
22	35°05.85'N	120°50.23'W	99
23	35°05.60'N	120°55.18'W	195
25	35°05.07'N	121°00.75'W	390
26	35°04.38'N	121°15.99'W	590
27	35°04.30'N	121°19.27'W	611
28	35°04.22'N	121°19.65'W	603
30	34°54.19'N	120°47.07'W	98
31	34°53.76'N	120°52.96'W	200
32	34°53.56'N	120°56.81'W	297
33	34°53.43'N	120°59.66'W	396
34	34°53.15'N	121°04.40'W	492
35	34°52.96'N	121°10.30'W	548
36	34°52.77'N	121°15.37'W	492
38	34°49.81'N	120°52.66'W	197
39	34°49.53'N	120°56.85'W	294
40	34°49.24'N	121°00.81'W	392
41	34°48.35'N	121°19.14'W	495
42	34°48.04'N	120°47.50'W	100
43	34°46.59'N	120°52.92'W	197
45	34°44.91'N	120°59.59'W	395
46	34°41.22'N	121°13.56'W	597
47	34°41.99'N	121°10.81'W	378
48	34°45.11'N	120°52.85'W	196
49	34°45.03'N	120°56.31'W	290
50	34°37.80'N	121°01.66'W	591
52	34°39.56'N	120°47.64'W	98
53	34°37.69'N	120°50.38'W	196
54	34°36.57'N	120°52.02'W	396
55	34°33.66'N	120°56.31'W	590
56	34°30.32'N	121°01.02'W	900

Table A.1 (Continued)

Station	Latitude	Longitude	Depth (m)
58	34°34.35'N	120°45.18'W	99
59	34°33.65'N	120°47.18'W	216
60	34°33.25'N	120°48.34'W	275
61	34°33.01'N	120°48.89'W	345
62	34°30.46'N	120°52.13'W	582
63	34°26.29'N	120°58.08'W	930
64	34°33.15'N	120°40.90'W	59
65	34°31.27'N	120°43.27'W	107
66	34°30.46'N	120°44.55'W	201
67	34°30.29'N	120°45.50'W	282
68	34°29.24'N	120°45.99'W	390
69	34°22.88'N	120°54.20'W	927
70	34°29.67'N	120°43.70'W	200
71	34°29.04'N	120°44.01'W	306
72	34°28.41'N	120°44.76'W	401
73	34°28.21'N	120°36.80'W	98
74	34°26.84'N	120°38.61'W	201
75	34°26.08'N	120°39.65'W	293
76	34°25.59'N	120°40.98'W	387
77	34°22.62'N	120°44.02'W	578
78	34°18.78'N	120°49.30'W	762
79	34°24.12'N	120°28.32'W	98
80	34°22.86'N	120°28.34'W	196
81	34°21.26'N	120°28.83'W	294
82	34°18.71'N	120°29.55'W	394
83	34°17.20'N	120°30.20'W	444
84	34°13.54'N	120°31.19'W	394
85	34°25.88'N	120°16.31'W	113
86	34°24.45'N	120°17.02'W	197
87	34°21.60'N	120°17.11'W	299
88	34°17.89'N	120°16.86'W	393
89	34°13.79'N	120°16.56'W	471
90	34°09.44'N	120°16.30'W	375
91	34°11.73'N	120°07.43'W	540
92	34°08.70'N	120°07.50'W	444
93	34°07.63'N	120°07.51'W	357
96	34°22.91'N	120°05.42'W	296
94	34°24.54'N	120°05.47'W	96
95	34°23.70'N	120°05.47'W	198
97	34°22.28'N	120°05.49'W	393
98	34°12.87'N	120°05.59'W	561
99	34°11.22'N	120°05.86'W	540
100	34°08.67'N	120°05.50'W	443
101	34°07.51'N	120°05.65'W	357
102	34°59.71'N	120°48.22'W	99
103	34°59.63'N	120°53.56'W	197
104	34°59.45'N	120°56.49'W	294
105	34°59.23'N	120°59.60'W	392
106	34°58.95'N	121°04.42'W	492
107	34°58.65'N	121°15.08'W	573
108	34°58.21'N	121°17.88'W	492

Note: Sample labels from the Soft-substrate stations have several identification codes which include a station number, sample type, replicate number, and analysis type. These are as follows: 001 to 200 = the range of station numbers; BSS = Benthic Sediment Single (i.e., a non-replicated station); BSR = Benthic Sediment Replicate (three replicates taken at this station); BSV = Benthic Sediment Variance (subsamples); 01-09 = replicate numbers; TX = a taxonomy sample. Sample labels having the designation BRA, represents a sample from rocks taken as part of the hard bottom survey.



**Figure 1.1.** Map showing location of soft-substrate stations from the Phase I Reconnaissance and Phase II Monitoring Programs.

**Table A.2.** Location of soft-substrate stations taken during the Phase II Monitoring Program.

Station	Latitude	Longitude	Depth (m)
R-1	35°05.83'N	120°49.16'W	91
R-2	35°05.50'N	120°53.40'W	161
R-3	35°05.30'N	121°00.90'W	409
R-4	34°43.01'N	120°47.39'W	92
R-5	34°42.69'N	120°50.83'W	154
R-6	34°41.40'N	120°57.90'W	410
R-7	34°52.90'N	121°10.30'W	565
R-8	34°55.30'N	120°45.87'W	90
R-9	34°53.68'N	120°59.12'W	410
PJ-1	34°55.79'N	120°49.91'W	145
PJ-2	34°55.32'N	120°49.59'W	142
PJ-3	34°56.26'N	120°49.58'W	138
PJ-4	34°56.26'N	120°50.24'W	150
PJ-5	34°55.32'N	120°50.24'W	152
PJ-6	34°54.71'N	120°49.91'W	148
PJ-7	34°55.79'N	120°48.60'W	123
PJ-8	34°56.87'N	120°49.91'W	142
PJ-9	34°55.79'N	120°51.23'W	169
PJ-10	34°53.63'N	120°49.91'W	147
PJ-11	34°57.95'N	120°49.91'W	136
PJ-12	34°55.58'N	120°49.91'W	145
PJ-13	34°56.01'N	120°49.91'W	144
PJ-14	34°55.79'N	120°49.26'W	134
PJ-15	34°55.79'N	120°50.57'W	155
PJ-16	34°55.03'N	120°48.99'W	130
PJ-17	34°56.56'N	120°48.98'W	126
PJ-18	34°56.56'N	120°50.84'W	158
PJ-19	34°55.03'N	120°50.84'W	167
PJ-20	34°50.38'N	120°49.91'W	148
PJ-21	35°01.23'N	120°51.15'W	143
PJ-22	34°55.25'N	120°49.93'W	143
PJ-23	34°56.33'N	120°49.90'W	143

**Table A.3.** Sampling dates of MMS Phase II Monitoring Program.

Cruise	Date
1-1	October 1986
1-2	January 1987
1-3	May 1987
2-1	July 1987
2-3	October 1987
2-4	January 1988
2-5	May 1988
3-1	October 1988
3-4	May 1989

**Table A.4.** MMS Phase I - Locations of hard-substrate transects.

Station	Beginning Latitude	Longitude	End Latitude	Longitude	Depth (m)
1 A/B	34°24.454'N	120°01.876'W	34°24.464'N	120°00.878'W	69-73.5
1 C/D	34°24.076'N	120°00.443'W	34°24.184'N	120°01.480'W	73.5-78
2 A/B	34°11.377'N	120°29.318'W	34°11.289'N	120°28.774'W	110-126
2 C/D	34°10.984'N	120°28.094'W	34°10.780'N	120°27.554'W	120-123
4 A/B	34°27.539'N	120°40.364'W	34°28.162'N	120°40.189'W	168-237
6 A/B	34°30.246'N	120°35.555'W	— — —	— — —	54-63
6 C/D	— — —	— — —	34°30.421'N	120°34.315'W	54-63
13 A/B	34°42.570'N	120°47.899'W	34°42.107'N	120°48.253'W	92-100
13 C/D	34°42.556'N	120°48.147'W	34°42.974'N	120°47.424'W	88.5-100.5
14 A/B	34°43.589'N	120°49.093'W	34°42.826'N	120°48.370'W	96-105
14 C/D	34°43.244'N	120°49.406'W	34°42.893'N	120°48.822'W	105-117
16 A/B	34°46.544'N	120°50.197'W	34°45.912'N	120°49.726'W	91.5-123
17 A/B	34°49.382'N	120°50.768'W	34°49.600'N	120°50.688'W	160.5-168
19 A/B	34°47.833'N	120°51.425'W	34°47.097'N	120°50.793'W	148.5-177
20 A/B	34°46.470'N	120°50.289'W	34°46.140'N	120°49.885'W	90-130.5
21 A/B	34°47.335'N	120°45.903'W	34°47.548'N	120°46.123'W	75-90
22 A/B	34°50.365'N	120°48.221'W	34°50.990'N	120°48.365'W	114-115.5
23 A/B	34°49.868'N	120°47.393'W	34°50.003'N	120°47.480'W	93-102
25 A/B	35°05.662'N	120°47.562'W	35°06.036'N	120°47.652'W	64.5-72
26 C/D	35°11.586'N	120°55.556'W	35°11.555'N	120°55.233'W	108-111
27 A/B	35°20.906'N	120°59.657'W	35°21.035'N	120°59.603'W	96-126
28 A/B	35°21.539'N	120°59.641'W	35°21.867'N	120°59.299'W	96-105
29 A/B	35°27.864'N	121°05.331'W	35°27.805'N	121°05.277'W	102-106.5

**Table A.5.** MMS Phase II - Locations of hard-substrate photosurvey stations.

Station	Latitude	Longitude	Depth (m)
PH-E	34°30.26'N	120°42.76'W	119
PH-F	34°30.81'N	120°42.36'W	105
PH-I	34°29.96'N	120°41.68'W	107
PH-J	34°29.82'N	120°41.82'W	117
PH-K	34°29.37'N	120°42.26'W	160
PH-N	34°29.21'N	120°42.05'W	166
PH-R	34°29.11'N	120°42.67'W	213
PH-U	34°31.48'N	120°43.51'W	113
PH-W	34°31.52'N	120°45.86'W	195

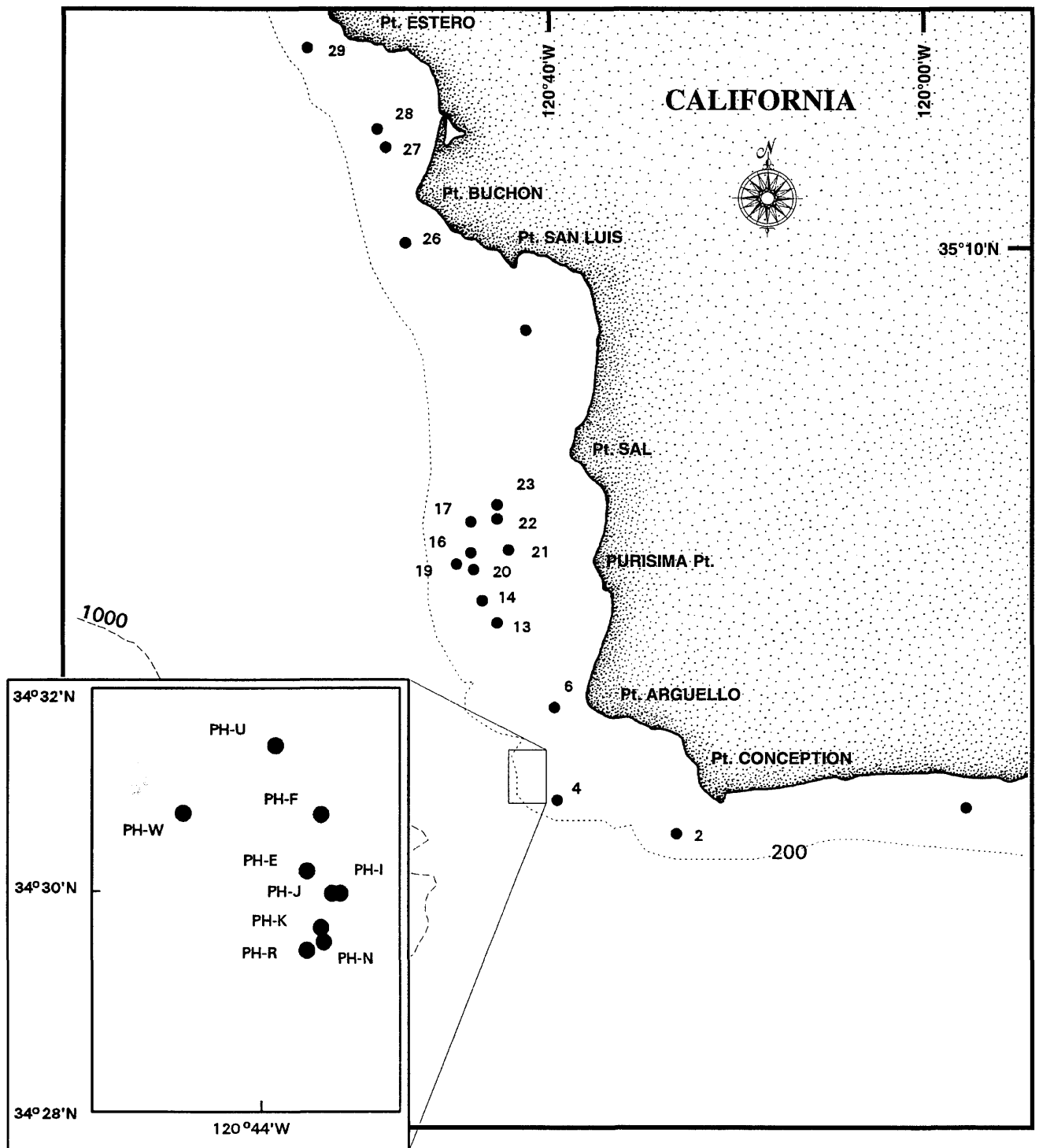


Figure 1.2. Map showing location of hard-substrate stations from the Phase I Reconnaissance and



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