Key and Notes to California Valviferan Isopods (Crustacea, Isopoda, Valvifera)

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1. Without eyes; body covered with minute hairs and dorsally and laterally projecting spines bearing beadlike spheres; transverse rows of at least 6 spines on pereonites VI-VII and pleonites 1-2 (fig. 1D) ..... *Antarcturidae incertae sedis tannerensis**

– Eyes present; body not as above 2

2. Cephalon fused with pereonite I; pereonite IV much longer (>2x) longer than other pereonites; pereopods 1-4 slender, fringed with setae, directed anteriorly against ventral body wall (filter feeding); pereopods 5-7 stout, prehensile 3

– Cephalon distinct from pereonite I; length of pereonite IV subequal to other pereonites; anterior pereopods not modified for filter feeding, mostly ambulatory and similar in size 5

3. Cephalon incompletely fused with pereonite I, indicated by a lateral incision posterior and ventral to eye; flagellum of antenna 2 with ventral blade-like setae; dorsum of pereonite IV smooth (males) or with medial, bilobed swelling or tubercle (females), dorsum of remaining pereonites mostly smooth; pleon composed of 3 segments, 2 pleonites plus the fused pleotelson (fig. 1C).....*Neastacilla californica*

– Cephalon completely fused with pereonite I, lateral margins entire; flagellum of antenna 2 without blade-like setae; dorsum of pereonites II-VII typically with 2-4 short to large dorsal spines in females or smooth in males; pleon composed of a single fused pleotelson with 2 anterodorsal median spines.....4

4. Pereonites IV-VI with acute posterolateral projections; pereonites II-VII each with a transverse row of 4 large posterodorsal spines, pereonite IV also with a 5th small middorsal spine at posterior border; dorsum of fused head and pereonite I with shallow groove (fusion line) posterior to eyes (fig. 1B) .....*Idarcturus hedgpethi*

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* Originally described as *Microarcturus tannerensis* Schultz, 1966 (see Endnote 1).

– Pereonite IV without posterolateral projections; pereonites III and V-VII with 2 small to large median posterodorsal spines and 2 smaller lateral spines, pereonites II and IV with only 2 small to large middorsal spines (spine size highly variable); dorsum of head and pereonite I without fusion line (fig. 1A).....*Idarcturus allelomorphus*

5. Pleon 5-segmented, comprised of pleotelson and 4 complete pleonites, pleotelson long and apically pointed; cephalon with deep anterolateral incisions; uropods biramous with minute endopod (fig. 1E) .....*Saduria entomon*

– Pleon comprised of 1-4 segments in dorsal view, with or without partial suture lines indicating presence of an additional coalesced segment; cephalon entire laterally; uropods uniramous.....6

6. Pleon comprised of a single fused segment (pleotelson), with or without partial suture lines or indentations 7

– Pleon comprised of 3-4 segments, plus 1 pair of partial sutures 25

7. Pleotelson without suture lines 8

– Pleotelson with 1 pair of partial suture lines or indentations.....9

8. Flagellum of antenna 2 multiarticulate; cephalon with distinct, slightly elongated dorsal tubercle; pereon smooth dorsally (fig. 2H) .....*Stenosoma wetzerae*

– Flagellum of antenna 2 uniarticulate, flagellar article large and clavate; cephalon with large, multilobed or conical tubercle or elevation; pereonites I-V with (♀) or without (♂) mediodorsal spines (fig. 2F).....*Erichsonella crenulata*

9. Antenna 2 shorter than (or subequal to) antenna 1, flagellum of A2 reduced to single vestigial article; maxillipedal palp of 3 articles; pleonal fusion indicated by 1 pair of lateral grooves instead of distinct incisions [Endnote 2] 10

– Antenna 2 much longer than antenna 1, flagellum of A2 multiarticulate or comprised of a single, large clavate article; maxillipedal palp of 3-4 articles; pleotelson with distinct lateral incisions.....11

10. Pleotelson with dorsal transverse ridge at mid-length; pleotelson distinctly longer than wide (L:W > 1.4) posterior to lateral incisions, relatively narrow, lateral margins tapering sharply to acute, slightly upturned apex; propodus of pereopods with 2 large proximal spines along inferior margins; pereonite IV margins of females angular, but do not form acute posterolateral projections (fig. 2E) .....*Edotia* sp B

– Dorsal surface of pleotelson rounded, without transverse ridge; pleotelson broad, about as long as wide (L:W = 1.0-1.2), lateral margins convex and curving posteriorly to obtuse point; propodus of pereopods without large spines; pereonite IV margins of females form acute posterolateral projections (fig. 2D.....*Edotia sublittoralis*

11. Antenna 2 flagellum uniarticulate, flagellar article large and clavate, subequal in length to peduncle segment 4; cephalon with large, median bifid tubercle projecting anteriorly over frontal margin; anterolateral margins of pereonite I produced into bilobed processes (fig. 2G) .....*Eusymmerus pseudoculata*

– Flagellum of antenna 2 multiarticulate; head and pereonite I not as above.....12

12. Maxillipedal palp 4-segmented.....13

– Maxillipedal palp 3-segmented.....15

13. Pleotelson lateral margins flare slightly outward to form obtuse posterolateral angles, then taper inward to a subacute posterior border; coxal plates not visible dorsally; frontal process concave (notched); eyes large (fig. 2A) .....*Colidotea findleyi*

– Pleotelson lateral margins convex, curving to an evenly rounded posterior margin; coxal plates of some posterior pereonites visible in dorsal aspect.....14

14. Cephalon with a medial, apically rounded, rostrum-like process; coxal plates visible dorsally on pereonites V-VII or VI-VII; frontal process concave (notched); eyes relatively large; commensal on sea urchins with body matching purple to dark red color of host (fading to bluish-gray in alcohol); terminal article of A2 flagellum unpigmented resembling tips of urchin spines (fig. 2B).....*Colidotea rostrata*

– Cephalon without medial process; coxal plates visible dorsally on pereonites IV-VII; frontal process convex (not notched); eyes small (fig. 2C) .....*Colidotea wallersteini*†

15. Pleotelson spatulate, rounded posteriorly [Endnote 3] 16

– Pleotelson emarginate, concave along posterior margin.....18

16. Lateral margins of adult body roughly parallel, widest part of pereon subequal in width to pleon; pleotelson widest medially to posteriorly; dorsal sculpturing generally reduced to low, conical tubercles on cephalon and medial row of tubercles along pereonites; eyes small and lightly pigmented (fig. 5C) .....*Synidotea calcarea*

– Lateral margins of adult body not parallel, generally widest at pereonites III-IV; pleotelson widest anteriorly; dorsal sculpturing variable, pereonites with 3-4 longitudinal rugae on lateral areas; eyes relatively large and heavily pigmented 17

17. Flange present on basis of pereopods 2-6 in adults, but very small, difficult or impossible to see in juveniles; anteromedial tubercles of cephalon generally large, highly variable with size, often asymmetrical, becoming broad, flattened, and forward projecting in large specimens; coxa of pereonite I not notched laterally; body surface appearing rough, brownish in color (fig. 5H) .....*Synidotea magnifica*

† Species presently known only from Northwest Baja California

– Flange absent on basis of pereopods; anteromedial tubercles not as above, typically smaller, narrowly rounded or conical; lateral margins of pereonite I deeply notched in lateral view, separating coxal margins into upper and lower lobes; body surface generally smooth and whitish (fig. 5I) ..... *Synidotea media*

18. Pereon with dorsal tubercles 19

– Pereon without dorsal tubercles 22

19. Pereonites I-IV with low dorsal tubercles, pereonites V-VII without tubercles; eyes very large, pigmented areas occupying ≥ 1/2 length of head; anterolateral preocular horns low, not quite reaching frontal margin of head (fig. 5A) ..... *Synidotea angulata*

– All pereonites with dorsal tubercles; eyes normal in size, pigmented areas occupying ≤ 1/3 length of head; preocular horns extending to or beyond frontal margin 20

20. Lateral margins of pereonites II-VII contiguous, not separated laterally; preocular horns directed laterally, reaching just beyond frontal margin; dorsum of head with 2 small medial tubercles behind frontal notch, 2 minute tubercles between eyes, and a transverse row of 3 minute tubercles near posterior margin; dorsum of pereonites and pleotelson with scattered small tubercles (fig. 5B) ..... *Synidotea berolzheimeri*

– Lateral margins of at least pereonites I-IV separated laterally; dorsum of head and pereonites with large and conspicuous tubercles or rugae 21

21. Preocular horns extend well beyond frontal margin of head; pereonites I-III laterally rounded or straight; pereonites with strong dorsolateral rugae, with or without dorsal tubercles; pleotelson without dorsal tubercles (fig. 5K) ..... *Synidotea ritteri*

– Preocular horns directed laterally, extending no further than frontal margin of head; pereonites I-III laterally angular; each pereonite with transverse row of 3 tubercles; pleotelson with 2 medial tubercles anteriorly (fig. 5J) ..... *Synidotea pettiboneae*

22. Head with 1 pair of low preocular tubercles and 2 small tubercles between the eyes; pereonites I-VII with elevated or subtle transverse ridges or carinae (fig. 5D) ..... *Synidotea consolidata*

– Head and pereon smooth, without tubercles or transverse ridges 23

23. Pleotelson narrow, much longer than wide, L:W > 1.4; anterior median dorsal pattern of pereonites II-IV triangulate; frontal margin of head extending slightly forward of anterolateral angles; pereopods not densely setose (fig. 5E) ..... *Synidotea harfordi*

– Pleotelson relatively broad, L:W < 1.4; anterior median dorsal pattern of pereonites II-IV rounded posteriorly; frontal margin of head not extending forward of anterolateral angles; pereopods densely setose 24

24. Inferior margins of propodus, carpus and merus of pereopod 1 lobed, dactylus reaching carpus-merus suture; pereopodal articles with long setae (≥ 1/2 length of dactylus) along lower margins; lateral margins of pereonites II-III convex (not contiguous) compared to straight for pereonites IV-VII; color in alcohol bluish-gray with mid-dorsal stripe and dark chromatophores (fig. 5G).....*Synidotea laticauda*

– Pereopodal articles not lobed, inferior margin of propodus deeply concave, dactylus reaching middle of merus; pereopodal articles with short setae (< 1/2 length of dactylus) along lower margins; lateral margins of pereonites II-VII contiguous; color in alcohol an even brownish-tan (fig. 5F).....*Synidotea laevidorsalis*‡

25. Lateral margins of body with dense tufts of plumose setae; pleon composed of 4 segments, with a pair of elevated dorsal humps near posterior end; pereopod 4 greatly reduced, non-ambulatory (fig. 1F).....*Cleantioides occidentalis*

– Lateral margins of body without dense tufts of setae; pleon composed 3 segments without dorsal posterior humps; all pereopods ambulatory and generally similar in morphology and size.....26

26. Maxillipedal palp 4-segmented in adults, distal-most 4th article much larger than preceding article [Endnote 4].....27

– Maxillipedal palp 5-segmented in adults, distal-most 5th article much smaller than preceding article (article 5 may not be developed in juveniles) [Endnote 4].....31

27. Pleon rectangular with broadly truncate posterior margin; coxae II-VII visible in dorsal aspect, with each coxa extending the entire length of the lateral margin of its respective pereonite; all coxae becoming broader posteriorly to form distinct posterolateral angles (fig. 3B).....*Idotea metallica*

– Pleon and coxal plates not as above, although some to all coxae visible in dorsal aspect; visible coxae may or may not extend entire length of pereonites, but do not become broader posteriorly [Endnote 5].....28

28. Posterior margin of pleotelson concave with rounded posterolateral corners (i.e., compare to *Pentidotea resecata*); only coxae V-VII reach posterior edge of respective pereonites (fig. 3D).....*Idotea rufescens*

– Posterior margin of pleotelson acuminate, with or without a distinct median projection; coxae V-VII, VI-VII or just VII reach posterior edge of respective pereonites.....29

29. Posterior margin of pleotelson more or less broadly triangular, left and right sides relatively straight and converging to obtuse point but without a distinct elongate

‡ Introduced species whose presence in California is questionable – i.e., previous reports by Chapman & Carlton (1991, 1994) are considered misidentifications of *S. laticauda* (see Poore, 1996)

median projection; coxae VI-VII only reach posterior edge of respective pereonites; frontal process apically blunt (fig. 3E) .....*Idotea urotoma*

– Posterior margin of pleotelson with an elongate median projection; coxae V-VII or just coxa VII reach posterior edge of pereonites) 30

30. Pereon and pleon subequal in width, lateral margins parallel; head about as wide as pereonite I; only coxa VII reaches posterior edge of pereonite; frontal process narrow with pointed apex (fig. 3A).....*Idotea fewkesi*

– Pereon distinctly wider than pleon, lateral margins of pleotelson concave; pereonite I distinctly wider than head; coxae V-VII reaching posterior edge of respective pereonites (fig. 3C) ..... *Idotea ochotensis*

31. Posterior margin of pleotelson strongly concave with sharply acute posterolateral corners (i.e., compare to *Idotea rufescens*) (fig. 4D) .....*Pentidotea resecata*

– Posterior margin of pleotelson not concave.....32

32. Coxae not visible dorsally on pereonites II-III and usually not on pereonite IV (i.e., only visible on pereonites V-VII); posterior margin of pleotelson convex, without a median projection; body narrow and linear (filiform), with head, pereon and pleotelson subequal in width, lateral margins contiguous; apex of frontal process with a median notch (fig. 4B) ..... *Pentidotea kirchanskii*

– Coxae visible dorsally on pereonites II-VII; posterior margin of pleotelson with a short (sometimes poorly developed) to elongate median projection 33

33. Lateral margins of pleonite 1 curve and taper posteriorly to form narrow, acutely pointed posterolateral angles (i.e., left and right margins not parallel) 34

– Lateral margins of pleonite 1 truncate or convex, more or less parallel, not curving posteriorly to form acute points.....35

34. Pleotelson with rounded posterolateral shoulders curving to median projection; pereonites widely separated laterally, coxae II-VII reach posterior edge of pereonites, anterior margins of pereonite I separated from head; eyes rectangular or pyriform; apex of frontal process entire (fig. 4E) .....*Pentidotea schmitti*

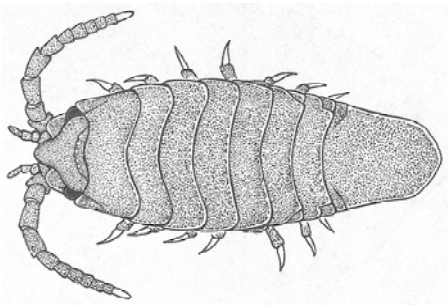
– Pleotelson without posterior shoulders, broadly rounded and curving gently to small median projection; pereonites not widely separated laterally, only coxae V-VII reach posterior edge of pereonites; anterior margins of pereonite I flush with head; eyes reniform; apex of frontal process entire (fig. 4G)..... *Pentidotea wosnesenskii*

35. Eyes transversely (dorsoventrally) elongate, narrow; maxilliped with 1-3 coupling hooks; coxae II-VII contiguous with each other; apex of frontal process with a median notch (fig. 4F)..... *Pentidotea stenops*

– Eyes not transversely elongate and narrow; at least some coxae not contiguous with each other; maxilliped with 1 coupling hook.....36

36. Pleotelson median projection long; lateral margins of pereonite I convex; eyes circular to oval; apex of frontal process notched (fig. 4A)..... *Pentidotea aculeata*

– Pleotelson with small or poorly developed median projection, sometimes appearing more or less truncate; lateral margins of pereonite I barely rounded, almost parallel; eyes with straight anterior and convex posterior borders; apex of frontal process entire (fig. 4C) [Endnote 6] ..... *Pentidotea montereyensis*



Colidotea rostrata
(from Allen, 1976)

List of California Species of Valvifera

Family Antarcturidae
Antarcturidae incertae sedis tannerensis (Schultz, 1966) †
Family Arcturidae
Idarcturus allelomorphus Menzies & Barnard, 1959
Idarcturus hedgpethi Menzies, 1951
Neastacilla californica (Boone, 1918)
Family Chaetiliidae
Saduria entomon (Linnaeus, 1758)
Family Hognathidae
Cleantioides occidentalis (Richardson, 1899)
Family Idoteidae
Colidotea findleyi Brusca & Wallerstein, 1977
Colidotea rostrata (Benedict, 1898)
Colidotea wallersteini Brusca, 1983 ‡
Edotia sublittoralis Menzies & Barnard, 1959
Edotia sp. B MEC, 1984
Erichsonella crenulata Menzies, 1950
Eusymmerus pseudoculata (Boone, 1923)
Idotea fewkesi Richardson, 1905
Idotea metallica Bosc, 1802
Idotea ochotensis Brandt, 1851
Idotea rufescens Fee, 1926
Idotea urotoma Stimpson, 1864
Pentidotea aculeata Stafford, 1913
Pentidotea kirchanskii (Miller & Lee, 1970)
Pentidotea montereyensis Maloney, 1933
Pentidotea resecata (Stimpson, 1857)
Pentidotea schmitti (Menzies, 1950)
Pentidotea stenops Benedict,1898
Pentidotea wosnesenskii Brandt, 1851
*Stenosoma wetzerae (*Ormsby, 1991)
Synidotea angulata Benedict, 1897
Synidotea berolzheimeri Menzies & Miller, 1972
Synidotea calcarea Schultz, 1966
Synidotea consolidata (Stimpson, 1857)
Synidotea harfordi Benedict, 1897
Synidotea laevidorsalis (Miers, 1881) ‡
Synidotea laticauda Benedict, 1897
Synidotea magnifica Menzies & Barnard, 1959
Synidotea media Iverson, 1972
Synidotea pettiboneae Hatch, 1947
Synidotea ritteri Richardson, 1904

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† Formerly known as '*Microarcturus tannerensis*' (see Endnote 1)

‡ Species included in key, but presence in California not confirmed

Endnotes

1. Schultz (1966: p. 20, pl. 14, figs. 1-10) originally described *Microarcturus tannerensis* based on a single male specimen collected in deep waters (1298 m) of the Tanner Canyon in southern California. Although Schultz didn't describe the generic placement of this species in detail, he stated that it was most similar in appearance to *Microarcturus digitatus* Nordenstam (1933) [now = *Mixarcturus digitatus*] and *Antarcturus brunneus* Nordenstam (1933) [now = *Chaetarcturus brunneus spinulosus*]. However, *'Microarcturus'* was later determined to be a *nomen nudum* and not a valid genus (see Brandt, 1990, Poore, 1991, 2001, 2003). Briefly, *'Microarcturus'* was erected by Nordenstam (1933) to include a number of species, although the generic diagnosis was poorly defined and impossible to distinguish from *Neoarcturus* Barnard, 1914 (which would therefore have priority). Additionally, Nordenstam did not designate a type species for *'Microarcturus'* and the genus thus became a *nomen nudum*. Consequently, all species originally placed within *'Microarcturus'* have been reassigned to other genera (e.g., *Austroarcturus, Fissarcturus, Mixarcturus, Neoarcturus, Pseudidothea*) and families. As for *'M.' tannerensis*, it is presently considered to represent a new, as yet undiagnosed genus most likely within the Antarcturidae with a temporary name of *Antarcturidae incerate sedis tannerensis* (see Poore, 2003: p. 1842).

2. *Edotia* sp B is currently being described by T. Stebbins (in prep). This paper also includes a redescription of *E. sublittoralis*. *Edotia* sp B can be distinguished from *E. sublittoralis* based on differences in overall body shape and size, shape and morphology of the pleotelson, shape of the postero-lateral margins of pereonite IV in females, morphology of antennae 1, morphology of the pereopods, and habitat differences.

3. The three species of *Synidotea* in California characterized by an apically rounded or spatulate pleotelson are difficult to distinguish using the existing literature. *Synidotea magnifica* was described by Menzies and Barnard (1959) from shelf waters off southern California (55-92 m), although the description was brief and did not provide an adequate diagnosis of the species. Schultz (1966) described *S. calcarea* from deeper waters (813 m) of the Tanner Submarine Canyon and compared this species briefly to *S. magnifica*. Menzies and Miller (1972) provided a key to the California *Synidotea* that distinguished between *S. calcarea* and *S. magnifica*. Menzies and Miller also compared these two species to a similar species from deep waters (2300 m) of the Okhotsk Sea, *S. bogorovi* Gurjanova, 1955. Iverson (1972) described *S. media* from 183 m off Point Soberanes in central California and presented a table differentiating this species from *S. calcarea* and *S. magnifica*. Wetzer and Brusca (1997) reported *S. calcarea* and *S. media* from the Santa Maria Basin and extended the depth range of *S. calcarea* into shallower waters (54 m); these authors also provided a key to these two species and discussed how to distinguish *S. calcarea* from *S. magnifica*. However, to distinguish all three species, Wetzer and Brusca referred to the table of characters in Iverson (1972).

   I have examined the type material for all three species and have noted several errors, omissions or ambiguities in the original descriptions and subsequent comparisons that make identification of species difficult. For example, if one tries to identify *S. magnifica* using the key in Menzies and Miller (1972), they will likely end up at *S. calcarea* (although comparison of figs. 7-8 in the Menzies and Miller paper should reveal this error). In addition, *S. magnifica* has characters of all three species as listed in Iverson (1972). These problems are probably due to the incomplete original description of *S. magnifica*. Clearly, *S. magnifica*

is in need of redescription, perhaps especially since it is by far the most common species encountered in southern California. Following are comments on a few characters used by previous authors and those that I find useful for identifying these species.

- Body shape: *Synidotea calcarea* can be distinguished from either *S. magnifica* or *S. media* by overall body shape. The lateral margins of the body are generally parallel in *S. calcarea*, with the widest part of the pereon (~pereonite II) being subequal in width to the pleotelson. In contrast, *S. magnifica* and *S. media* have body outlines being distinctly wider at pereonites III-IV than the other pereonites or pleotelson.

- Cephalic sculpturing: Several descriptions or comparisons rely on differences in the size and shape of three pairs of cephalic tubercles, including: 1) an anterolateral or preocular pair; 2) an anteromedial pair; and 3) an interocular pair. For example, Schultz (1966) refers to "two very large rounded, conical tubercles" between the eyes of *S. calcarea* in separating this species from *S. magnifica*. Menzies and Miller (1972) also distinguish between *S. calcarea* and *S. magnifica* partly on the basis of the relative size of the interocular and preocular tubercles. Iverson (1972) provides the only comparison of all three species and bases this partly on whether the anteromedial tubercles are broadly rounded and tall (*S. magnifica*), narrowly rounded and tall (*S. media*), or conical and low (*S. calcarea*). Iverson also distinguishes between the interocular tubercles being small and narrowly rounded (*S. magnifica*) or large and conical (*S. media*, *S. calcarea*). Wetzer and Brusca (1997) also refer to the relative sizes of the anteromedial and interocular tubercles in distinguishing between *S. calcarea* and *S. media*. However, these authors separate these two species also on the presence (*S. media*) or absence (*S. calcarea*) of an additional dorsomedial tubercle in the maxillipedal region of the cephalon, a character not mentioned previously for any of these species. Although this posterior cephalic tubercle was not mentioned in the original description of *S. media*, it was illustrated (see Iverson 1972, fig. 1b). I find most of these descriptions difficult to interpret even when examining specimens of all three species, including the type material. In addition, the cephalic sculpturing appears to vary with size of individual isopods, especially the anteromedial tubercles of *S. magnifica*, making them of dubious diagnostic value. However, the relatively large, expanded and asymmetric anteromedial tubercles of adult *S. magnifica* do appear quite distinct when present. These are not well illustrated or described anywhere. Finally, the posterior medial cephalic tubercle described by Wetzer and Brusca (1997) for *S. media* is also present in *S. magnifica*.

- Eyes: *S. calcarea* can be easily distinguished from *S. magnifica* and *S. media* by the size and placement of the eyes as indicated by previous authors. In *S. calcarea*, the eyes are small, lightly pigmented, and restricted to small ocular lobes located midway along the lateral edges of the cephalon. In contrast, the eyes are relatively large and heavily pigmented in *S. magnifica* and *S. media*, and bulge outward along most of the mid- to posterior lateral edges of the cephalon.

- Lateral margins of cephalon and pereon: Menzies and Miller (1972) describe the margins of the cephalon and pereon as being minutely serrated in *S. calcarea* compared to smooth in *S. magnifica*. My examination of the holotype of *S. magnifica* and additional specimens indicate that the lateral margins are minutely serrated in this species as well.

- Lateral margins of pereonite I: Iverson (1972) uses whether or not the lateral margins of pereonite I are "bifurcate" (*S. media*) or "entire" (*S. magnifica*, *S. calcarea*) to distinguish these species (see Iverson's Table 1). Wetzer and Brusca (1997) refer to the coxa of pereonite I being notched in *S. media* and entire in *S. calcarea*. At this time, it is not entirely clear to me if these authors are referring to the same character. First, in his detailed description of *S. media*, Iverson (1972, p. 544) states: "Lateral margin of first pereonite split into an upper and lower lobe." This appears to be visible in dorsal view of the cephalon and first pereonite of an immature male (see Iverson's fig. 1b), but not in dorsal view of the female holotype (see Iverson's fig. 1a; Wetzer's and Brusca's fig. 1.25). I have not been able to see this in dorsal view of the holotype or the few other specimens of *S. media* I have examined. On the other hand, I have been able to see a notch in the coxa of *S. media* when viewed laterally. A similar notch, however, is also present in *S. magnifica,* although it is difficult to see in the holotype specimen. Preliminary examination also suggests that the shape of the lateral and anterolateral margins of pereonite I may differ between these three species. The lateral margins appear acute in *S. calcarea* and *S. media* compared to blunt in *S. magnifica*, while the anterolateral margins are relatively straight in *S. calcarea* compared to concave in *S. magnifica* and *S. media*.

- Pereopodal flange: Menzies and Barnard (1959), Menzies and Miller (1972), and Iverson (1972) all mention the presence of a flange on the posterior upper third of the basis of pereopods II-VI in *S. magnifica*, although this structure has never been illustrated. This flange or projection is quite distinct and is the best character to definitively distinguish *S. magnifica* from the other species of *Synidotea*. However, the flange does vary with size in this species and may be poorly developed and difficult or impossible to see in juveniles and mancas.

- Shape of the pleon and pleotelson: The morphology of the abdominal region is useful for distinguishing all three species, especially *S. calcarea* from either *S. magnifica* or *S. media*. Although Wetzer and Brusca (1997: pp. 56-57, fig. 1.24) indicated that the pleon of *S. calcarea* lacked "clearly discernable lateral incisions," [which would distinguish it from *S. magnifica* and *S. media*] examination of the holotype and comparison to the original type illustration (Schultz, 1966: p. 53, pl. 15, fig. 1) reveals that this is not true. Instead, each of these species has a pleon with one distinct pair of anterolateral incisions. The pleotelson of *S. calcarea* is widest medially or posteriorly and has convex lateral margins. In contrast, the pleotelsons are widest near the anterolateral incisions in both *S. magnifica* and *S. media*. In *S. media*, the pleotelson tapers gradually after its widest point to form a bluntly rounded posterior apex. In *S. magnifica*, however, the lateral margins remain roughly parallel for about half

the length of the pleotelson before rounding off to a broadly blunt apex; this gives the appearance of a broader pleotelson in *S. magnifica* compared to *S. media*.

- Posterolateral margins of pleotelson: The presence or absence of teeth or serrations on the posterolateral margins of the pleotelson has been used to distinguish these species. Menzies and Barnard (1959) made no mention of this condition in their description of *S. magnifica*, while Schultz (1966) described the pleotelson of *S. calcarea* as having several small teeth on the posterolateral margins. Menzies and Miller (1972) subsequently described this region as denticulate in *S. calcarea* and smooth in *S. magnifica*. Iverson (1972, Table 1) listed *S. media* as having 1-2 teeth in this area compared to several teeth in *S. calcarea* and smooth margins in *S. magnifica*. Wetzer and Brusca (1997) described "several (usually 3 or more) minute posterolateral serrations" for *S. calcarea* and "1-2 minute serrations" for *S. media*, and referred to the table in Iverson's paper for distinguishing characters relevant to *S. magnifica*. Although these descriptions fit *S. calcarea* and *S. media* fairly well, they do not accurately describe the condition in *S. magnifica*. Based on examination of the holotype and additional specimens, *S. magnifica* also possess 1-2 small serrations or teeth on the posterolateral margins of the pleotelson. These serrations are more pronounced and easier to see in small juveniles and mancas (i.e., very similar to the *S. media* condition) than in adults, where they may become obscured and difficult to see without the use of substage lighting.
- Body rugosity and coloration: There does appear to be a general gradient in overall rugosity of both the cephalon and pereon as discussed by Menzies and Miller (1972) and Iverson (1972), with *S. magnifica* being the most heavily sculptured, *S. media* of intermediate sculpturing, and *S. calcarea* with the least sculpturing. However, this sculpturing varies with size, with small *S. magnifica* appearing no more sculptured than *S. media*. In addition, the surface of the body generally appears brownish in coloration and very rough in *S. magnifica*, as if covered with a coating of sediment (Note: these characteristics may not be apparent in small juveniles or mancas). In contrast, the surfaces appear smoother (i.e., not covered with "debris") and whitish in coloration in *S. calcarea* and *S. media*.

4. The number of maxillipedal palp articles was originally used by Richardson (1905) to separate *Idotea* (four articles; i.e., articles 4 and 5 fused) and *Pentidotea* (five articles) into separate genera. Menzies (1950), however, considered this an unreliable generic character, noting that juvenile *P. resecata* have only four articles, and he considered *Pentidotea* a subgenus of *Idotea*. Most subsequent authors (e.g., Brusca 1984, Rafi and Laubitz 1990) concurred with this opinion. In addition, I have seen idoteid (i.e., *Pentidotea*) specimens where the number of articles varies between right and left maxillipeds, resulting in a count of four articles on one side and five on the other. Consequently, a 4-segmented count on one side should be verified by examining the other maxilliped. Although Poore and Lew Ton (1993) agreed with this assessment of the maxilliped, they noted other differences regarding fusion of the pleonites, setation of the pereopods, and fusion of the penes, which they felt

were sufficient as generic criteria. In so doing, they provided a more restrictive diagnosis of *Idotea* and raised *Pentidotea* back to full generic status. Consequently, species formerly assigned to *I*. (*Idotea*) and *I*. (*Pentidotea*) were placed in the genera *Idotea* and *Pentidotea*, respectively; this classification is followed herein in agreement with the current treatment in WoRMS (see Poore & Schotte, 2010, 2011) and SCAMIT (2011). The major differences between these genera are:

- *Idotea*: pleonites 1-2 articulating, free; pereopods with spiniform setae on anterior margins of distal articles; penes separate but contiguous at base.
- *Pentidotea*: pleonites 1-2 not articulating, fused; pereopods without spiniform setae on anterior margins of distal articles; penes partially fused at base.

Although the above classification has been followed for all the California species, the proper affinities of some species (e.g., *I. fewkesi* and *I. urotoma*) are uncertain at this time. In fact, Poore and Lew Ton (1993) point out that the correct generic placement of many species presently assigned to *Idotea* is undecided. For example, both *I. fewkesi* and *I. urotoma* have reduced coxal plates, partially fused penes, fused anterior pleonites, and lack anterodistal spiniform setae on the pereopods, thus excluding them from *Idotea* as diagnosed by Poore and Lew Ton. Whether these species belong to *Pentidotea* or another existing or new genus awaits further investigation. In addition, Poore and Lew Ton describe the pleotelson as apically acute under the diagnosis for *Pentidotea*. This does not match the condition in *P. resecata* where the posterior margin of the pleotelson is distinctly concave.

5. Whether or not the coxal plates of pereonites II-VII are visible in dorsal view, and if so, whether they extend part way or along the entire length of their respective pereonites is useful for distinguishing between California species of *Idotea* and *Pentidotea* (see Table 1). However, since most combinations are not unique to any one species, additional traits should be used to confirm species identifications.

TABLE 1. Dorsal visibility of coxal plates (C) on pereonites I-VII in California species of *Idotea* and *Pentidotea.* VE = visible dorsally along entire lateral margins of respective pereonites (i.e., reaching posterior edges); VP = visible dorsally only along part of lateral margins of respective pereonites (i.e., not reaching posterior edges); NV = not visible dorsally.

SPECIES	C-I	C-II	C-III	C-IV	C-V	C-VI	C-VII
I. fewkesi	NV	VP	VP	VP	VP	VP	VE
I. metallica	NV	VE	VE	VE	VE	VE	VE
I. ochotensis	NV	VP	VP	VP	VE	VE	VE
I. rufescens	NV	VP	VP	VP	VE	VE	VE
I. urotoma	NV	VP	VP	VP	VP	VE	VE
P. aculeata	NV	VE	VE	VE	VE	VE	VE
P. kirchanskii	NV	NV	NV	(NV)*	VE	VE	VE
P. montereyensis	NV	VP	VP	VP	VP	VE	VE
P. resecata	NV	VP	VP	VP	VE	VE	VE
P. schmitti	NV	VE	VE	VE	VE	VE	VE
P. stenops	NV	VE	VE	VE	VE	VE	VE
P. wosnesenskii	NV	VP	VP	VP	VE	VE	VE

* Coxa IV may occasionally be visible dorsally in *P. kirchanskii*.

6. There has long been some confusion regarding the status of *Pentidotea montereyensis* Maloney, 1933 and *P. gracillima* (Dana, 1854), and whether or not the two species were synonymous. The first mention of this (or these) species was that of Dana (1854) who provided a brief description of *Stenosoma (Idotea) gracillimum* based on specimens collected by Prof. J. Le Conte on the California coast, but with no illustrations or any known type specimens. Although this species was subsequently referred to in other publications as either *S. gracillimum* (e.g., Stimpson, 1857) or *Idothea gracillima* (e.g., Miers, 1881; Richardson, 1899, 1900, 1904), little additional descriptive information was provided until Richardson's (1905) monograph on the isopods of North America. In this monograph, Richardson provided an expanded description of *Idothea gracillima* (Dana) based on specimens collected at Bolinas, California by Prof. W. E. Ritter. However, Richardson also commented on the "very short and rather vague" description provided by Dana and only considered his species identical with the specimens she examined until "evidence can be given of their distinctness" (see Richardson, 1905; p. 356-357). §

   Pentidotea montereyensis was first described by Maloney (1933) based on specimens collected from Monterey Bay by Dr. G. E. MacGinitie. Although Maloney was clearly aware of Richardson's monograph having cited it earlier in his paper in regards to his description of *Synidotea macgintiei* (see Maloney, 1933; p. 144), he made no reference to Richardson's description and discussion of *I. gracillima*. Instead, Maloney's only comparison was to *Pentidotea aculeata* Stafford, 1913. In his treatment of northern California idoteids, Menzies (1950) compared Maloney's paratypes of *P. montereyensis* to Richardson's specimens of *I. gracillima* and concluded that the two species were identical and similar to 275 additional specimens from northern California to Washington that he examined. Menzies also questioned how Richardson was able "to assign any form to Dana's species" given the incomplete description of *S. gracillimum,* which he therefore considered to be a *species inquirenda* (see Menzies, 1950; p. 185). Consequently, Menzies accepted *Idothea (Pentidotea) montereyensis* as the valid name for the species since he also considered *Pentidotea* to be of subgeneric rank (see endnote #4 above). Most subsequent workers have also accepted "*montereyensis*" as the common name for this species (e.g., Miller, 1975; Lee & Miller, 1980; Kozloff, 1983, 1996; Ricketts et al., 1985; Rafi & Laubitz, 1990; Lamb & Hanby, 2005; Brusca et al., 2007), although Schultz erroneously included both *P. montereyensis* and *I. gracillima* in his handbook to marine isopods (see Schultz, 1969; pp. 72 and 80, respectively).

   More recently (i.e., through December 2011), *Pentidotea gracillima* was listed as the accepted name on WoRMS and the Smithsonian List of World Isopods with *P. montereyensis* listed as a junior synonym. This was likely due to the assumption that Richardson's species, as well as Maloney's *P. montereyensis*, was indeed the same as described by Dana in that no other eastern Pacific species could be easily confused with it. Although Maloney compared *P. montereyensis* to another species of *Pentidotea* (*P. aculeata* Stafford, 1913) not recognized at the time of Richardson's monograph, that species does not appear to be consistent with the vague description provided by Dana. If the above assumption concerning Dana's and Richardson's specimens is true, however, then a neotype should be selected and published for Dana's species in order to formally resolve the issue (G. C. B. Poore, pers. comm.). Doing this, however, is cast into doubt by the presence of another

§ Note: *Idothea* is an unaccepted misspelling of *Idotea* Fabricius, 1798 (see WoRMs)

species (*P. kirchanskii* Miller & Lee, 1970) that co-occurs with and bears many similarities to *P. montereyensis*. In light of this information, it would be difficult to justify designating a neotype for Dana's species, and it is therefore likely that *Stenosoma gracillimum* will remain a *species inquirenda.* Consequently, WoRMS and the Smithsonian List were updated by G. C. B. Poore on January 5-7, 2012 to reflect these conclusions and with *P. montereyensis* now listed as the accepted species name, although it should be noted that a similar update has not been done to ITIS where both *P. gracillima* and *P. montereyensis* are listed as valid species (TDS, 1/15/12).

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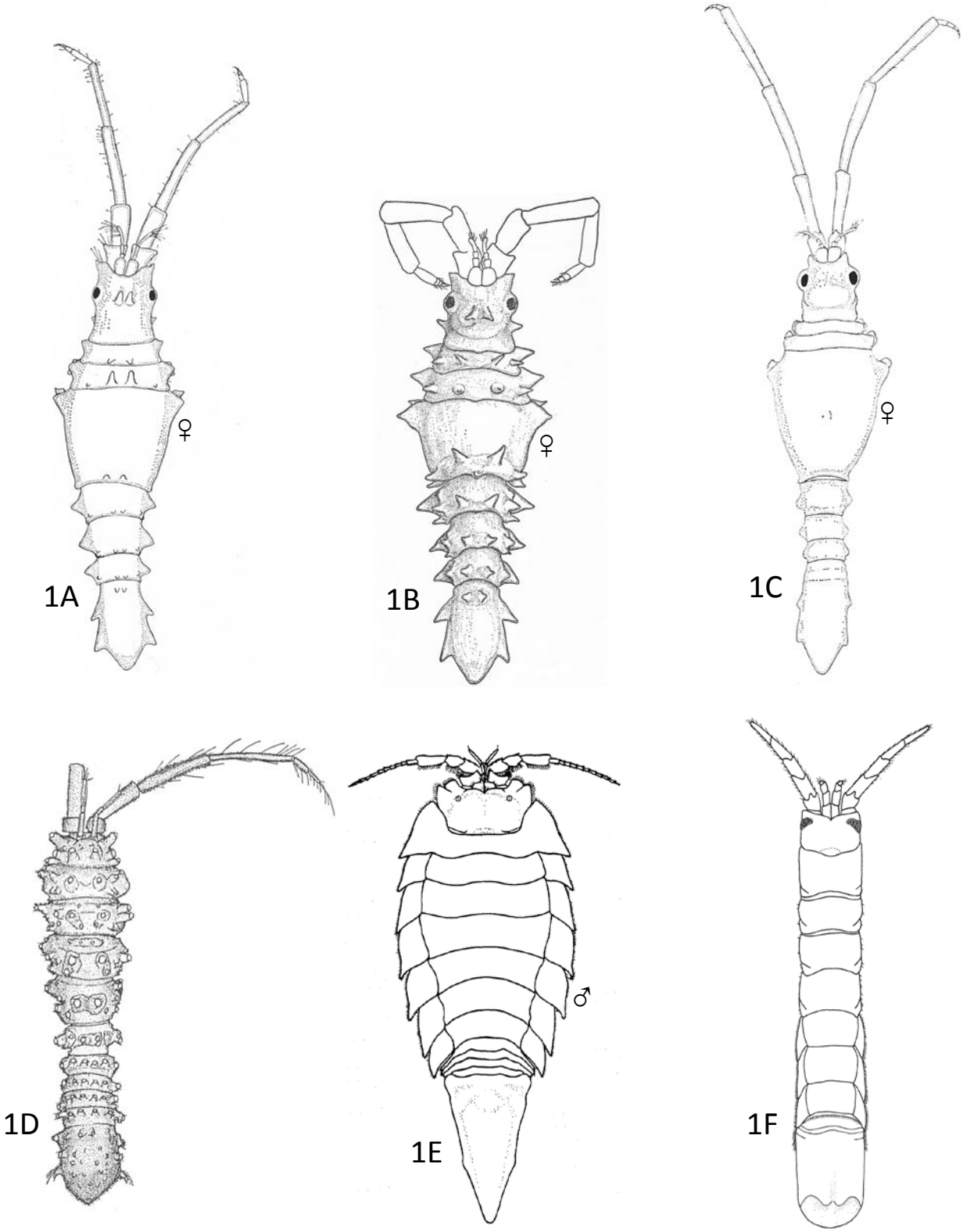

FIGURE 1. California Isopoda, Valvifera – Antarcturidae, Arcturidae, Chaetiliidae, Holognathidae: (A) *Idarcturus alleomorphus*; (B) *Idarcturus hedgpethi*; (C) *Neastacilla californica*; (D) *Antarcturidae incertae sedies tannerensis*; (E) *Saduria entomon*; (F) *Cleantioides occidentalis*.

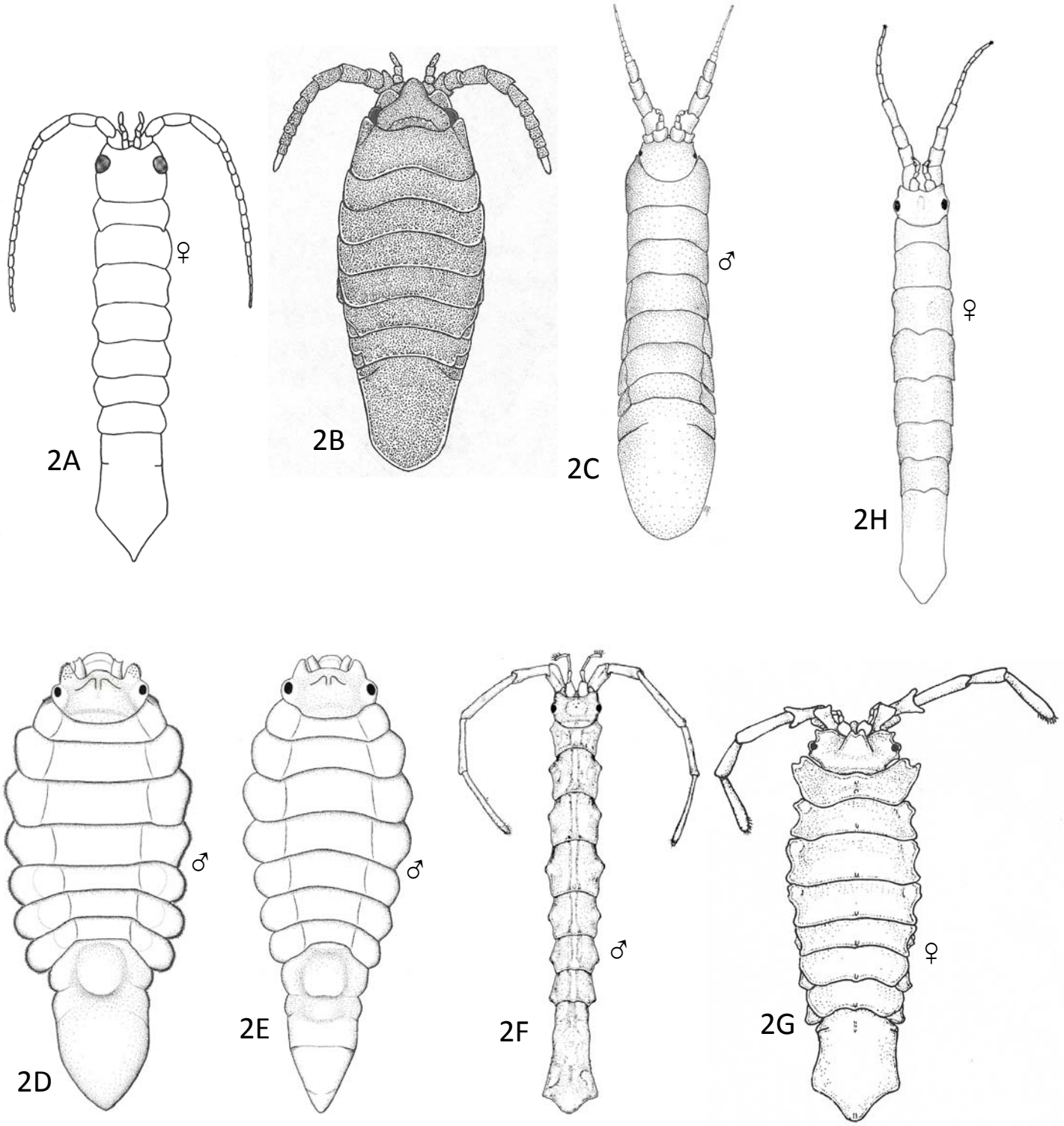

FIGURE 2. California Isopoda, Valvifera – Idoteidae: (A) *Colidotea findleyi*; (B) *Colidotea rostrata*; (C) *Colidotea wallersteini*; (D) *Edotia sublittoralis*; (E) *Edotia* sp. B; (F) *Erichsonella crenulata*; (G) *Eusymmerus pseudoculata*; (H) *Stenosoma wetzerae*.

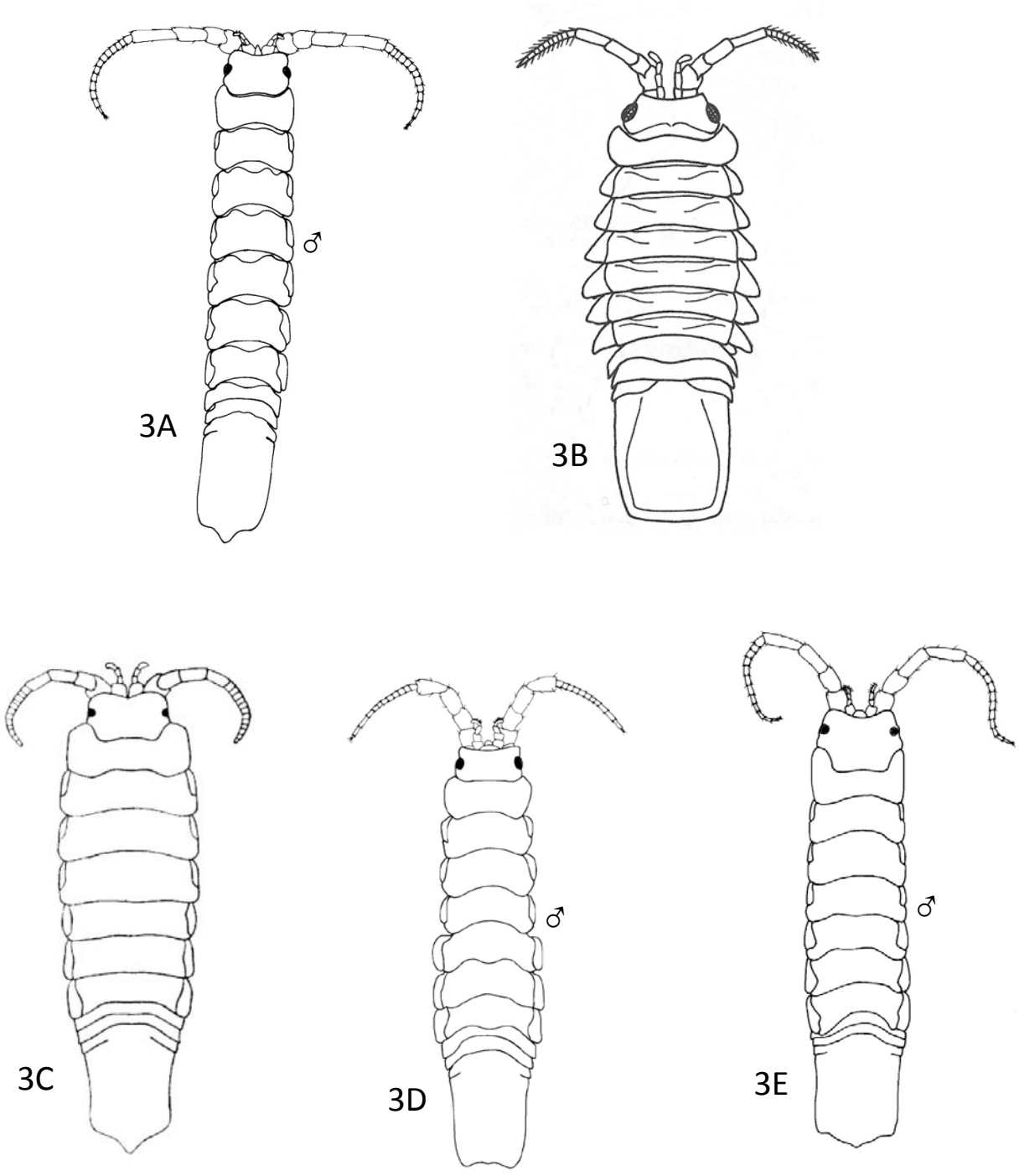

FIGURE 3. California Isopoda, Valvifera – Idoteidae: (A) *Idotea fewkesi*; (B) *Idotea metallica;* (C) *Idotea ochotensis*; (D) *Idotea rufescens*; (E) *Idotea urotoma*.

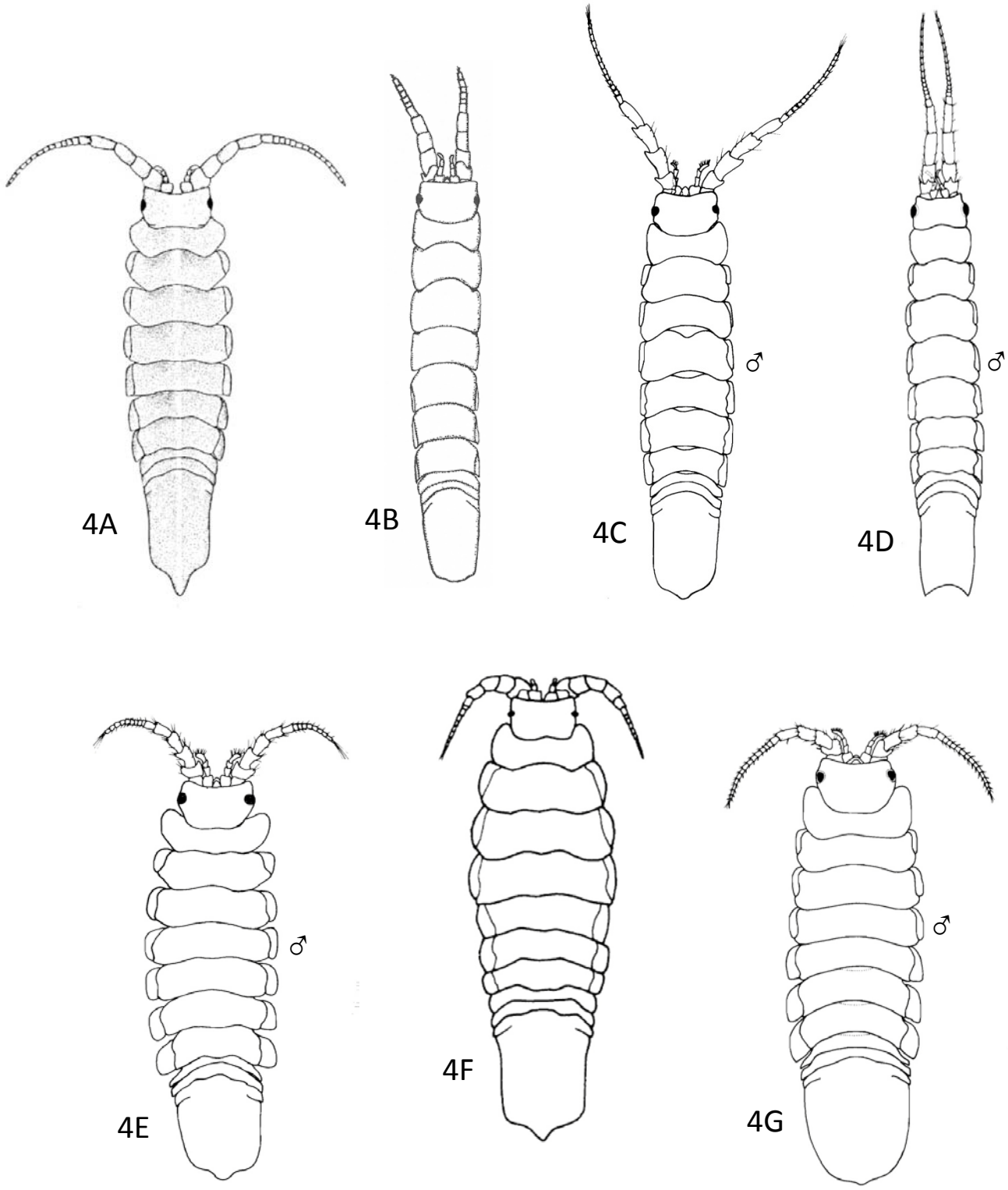

FIGURE 4. California Isopoda, Valvifera – Idoteidae: (A) *Pentidotea aculeata*; (B) *Pentidotea kirchanskii;* (C) *Pentidotea montereyensis*; (D) *Pentidotea resecata*; (E) *Pentidotea schmitti*; (F) *Pentidotea stenops*; (G) *Pentidotea wosnesenskii*.

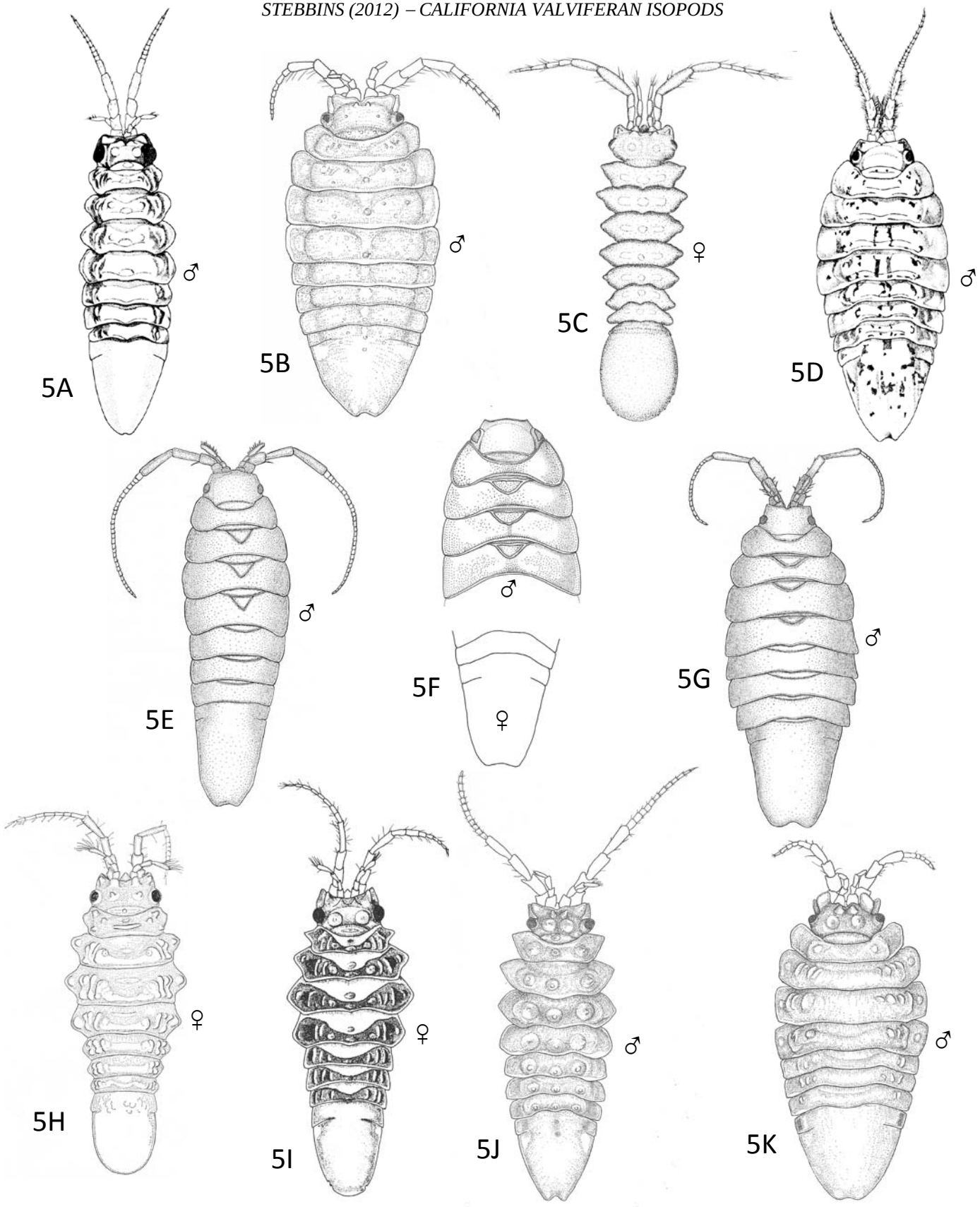

FIGURE 5. California Isopoda, Valvifera – Idoteidae: (A) *Synidotea angulata*; (B) *Synidotea berolzheimeri*; (C) *Synidotea calcarea;* (D*) Synidotea consolidata*; (E) *Synidotea harfordi*; (F) *Synidotea laevidorsalis*; (G) *Synidotea laticauda*; (H) *Synidotea magnifica*; (I) *Synidotea media*; (J) *Synidotea pettiboneae*; (K) *Synidotea ritteri*.