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The California Freshwater Isopod, *Asellus tomalensis*, Rediscovered and Compared with *Asellus occidentalis*

by

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ABSTRACT

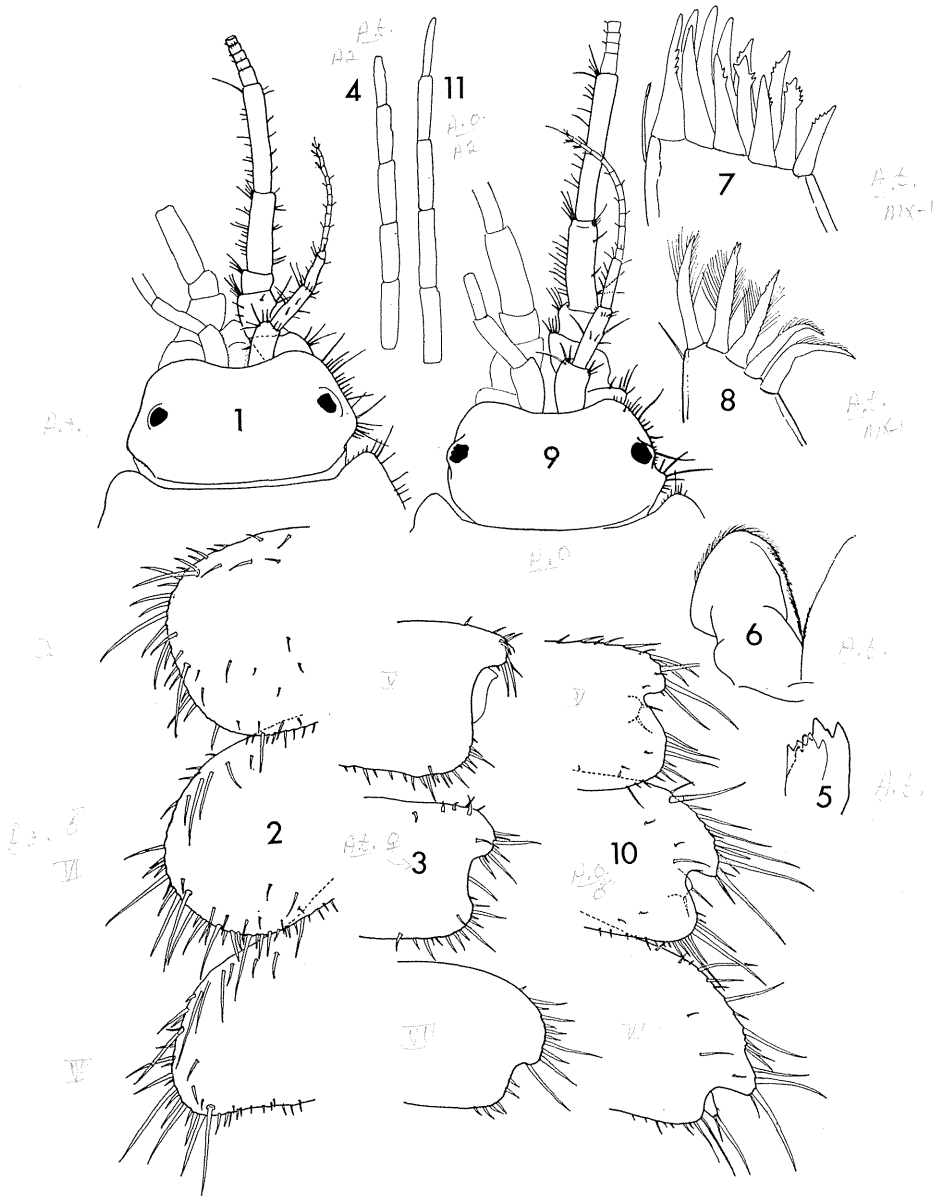
Asellus tomalensis is redescribed from topotypes collected near Bolinas Lagoon, California, and compared with *A. occidentalis*, the only other epigeal asellid restricted to the Pacific coast of North America. Both species show more resemblance to eastern North American species now assigned to *Conasellus* than to Asiatic genera or subgenera.

In his recent revision of North American epigeal species of *Asellus*, WILLIAMS (1970) listed 14 species of which only 1, *A. occidentalis*, was restricted to the Pacific coast (Oregon, Washington, British Columbia). Two eastern species were reported from Echo Lake, Washington, but since they may have been introduced, have clear affinities with other eastern species, and are widely separated taxonomically from *A. occidentalis*, they are not considered further in this paper.

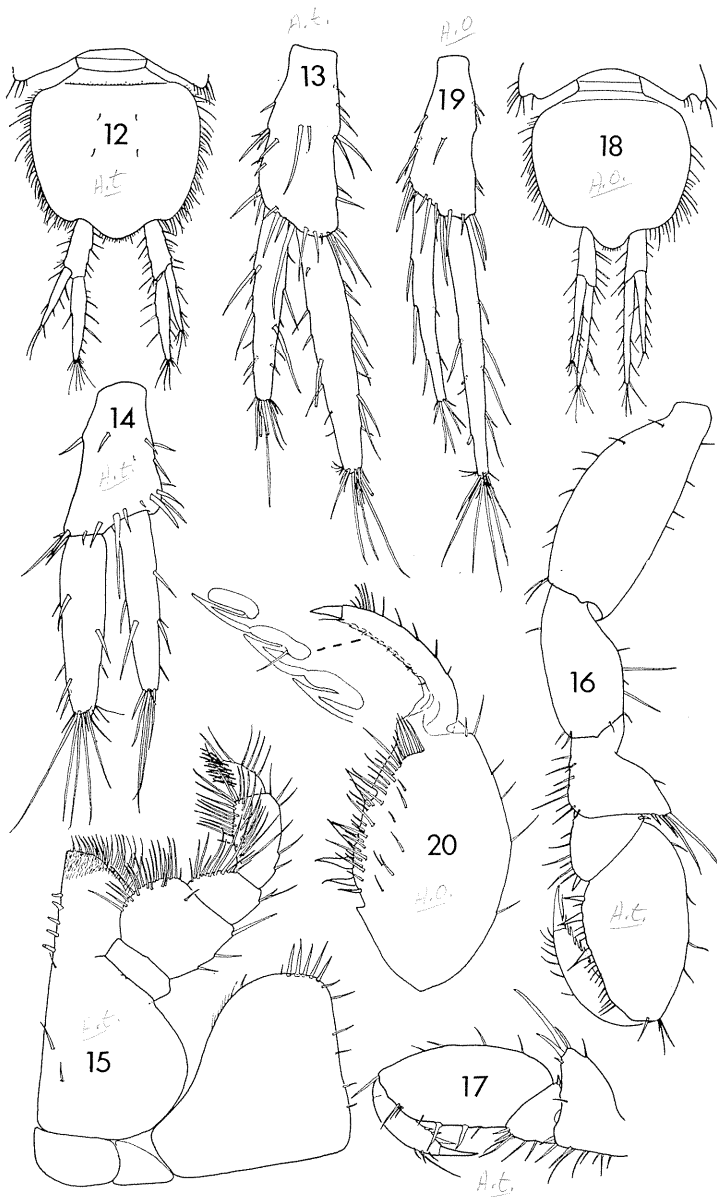
WILLIAMS (loc. cit.) chose to designate his Pacific coast *Asellus* as a new species (*A. occidentalis*) rather than to identify it as *A. tomalensis* HARFORD (1877) as others had done (FEE, 1926; CARL, 1937; HATCH, 1947; ELLIS, 1971). His justification was that published descriptions of *A. tomalensis* were entirely inadequate for diagnostic purposes; the single type-specimen in the California Academy of Sciences had been destroyed in the 1906 San Francisco fire and earthquake, and attempts by colleagues to collect specimens from the type-locality had been unsuccessful.

WILLIAMS indicated that *A. occidentalis* was possibly conspecific with *A. tomalensis*, but that the question could not be resolved until topotypes of the latter became available for comparison.

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Figs. 1—8. *Asellus tomalensis* 1. Head, male. 2. Pereonites 5—7, male. 3. Pereonites 5—7, female. 4. Antenna 2, distal segments (setae omitted). 5. Incisor of left mandible. 6. Labium. 7. Maxilla 1, apex of outer ramus. 8. Maxilla 1, apex of inner ramus. Figs. 9—11. *Asellus occidentalis*. 9. Head, male. 10. Pereonites 5—7, male. 11. Antenna 2, distal segments.



Figs. 12—17. *Asellus tomalensis*. 12. Telson and uropods, male. 13. Right uropod, male, ventral. 14. Left uropod, female ventral. 15. Maxilliped male. 16. Pereopod 1, male. 17. Pereopod 1, female, distal segments. 18—20. *Asellus occidentalis*. 18. Telson and uropods, male. 19. Right uropod, male, ventral. 20. Pereopod 1, male, distal segments.

The type-specimen of *A. tomalensis* was obtained by LOCKINGTON while collecting in "Tomales Bay and vicinity". Tomales Bay, in Marin County, California (north of San Francisco) is a narrow bay about 23 km long and 1.6 km wide (Figure 38). Its water is fully saline and a freshwater isopod could not live in it. HARFORD's specimen must have come from a freshwater source in the vicinity of Tomales Bay and not from the Bay itself.

During a visit to San Francisco and Berkeley in December 1971 I searched for *Asellus* in several streams that feed into Tomales Bay (Figure 38): Stemple Creek, Keys Creek, Walker Creek, Millerton Gulch Creek and a creek north of it, and Lagunitas Creek. My search was unsuccessful as had been that of WILLIAMS' colleagues. Fortunately, however, I later received specimens of an *Asellus* collected from a shallow pond adjacent to nearby Bolinas Lagoon (Figure 38, inset), sent to me by ERNEST IVERSON, California Academy of Sciences. Since this pond is less than 24 km from Tomales Bay, it may be considered part of "Tomales Bay and vicinity", hence the isopods collected by IVERSON are topotypes of *A. tomalensis*. Subsequently 2 additional samples of *A. tomalensis* in the collections of the California Academy of Sciences were loaned to me by Mr. IVERSON (see Material examined, below).

IVERSON's specimens proved to be very similar to *A. occidentalis* but clearly distinct in several important characters, thus vindicating WILLIAMS' decision not to identify his specimens as *A. tomalensis*. Since *A. tomalensis* has never been described adequately, it is described below and compared with *A. occidentalis*.

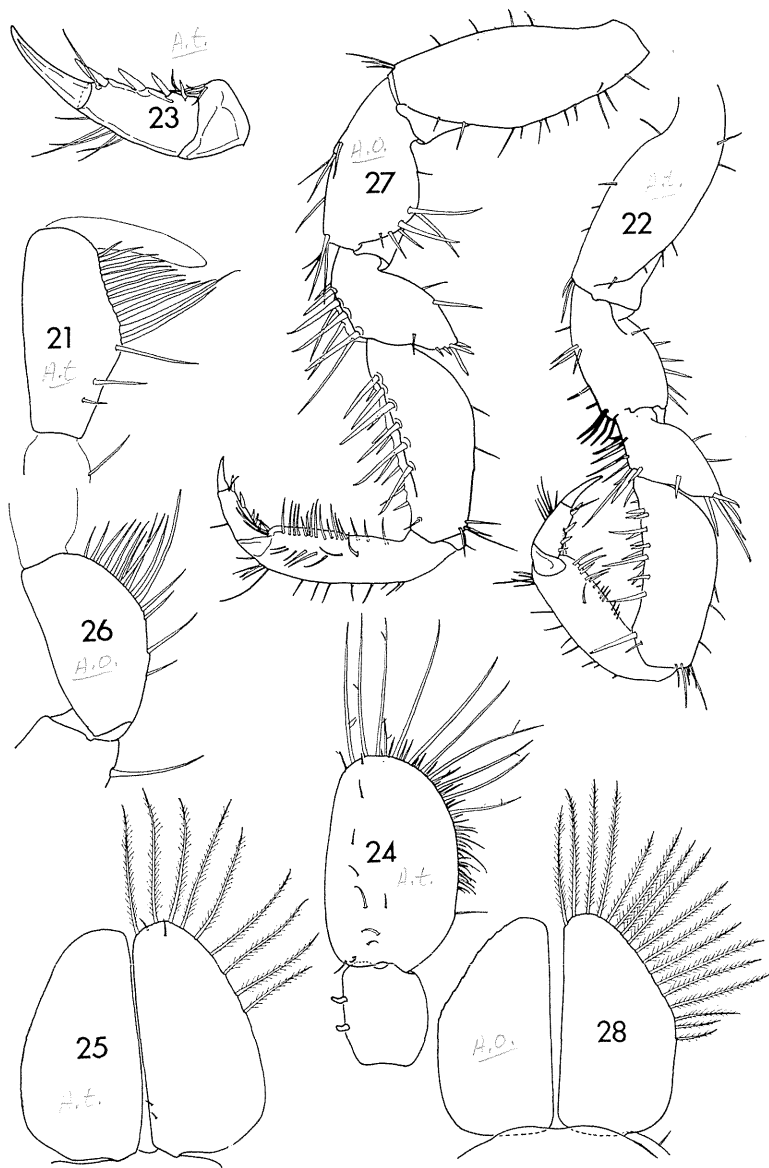
Asellus tomalensis HARFORD

Figures 1—8, 12—17, 21—25, 31—34

Asellus tomalensis HARFORD, 1877, pp. 54—55. — HOLMES, 1904, pp. 321—322, pl. 37, figs. 39—42. — VAN NAME, 1936, pp. 459—461, fig. 288 (part).

Material examined

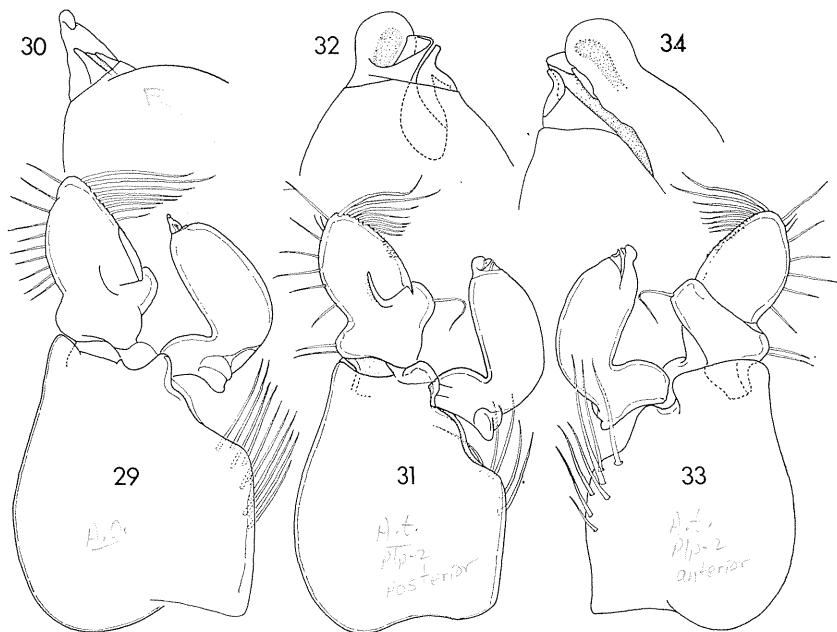
California: Marin County, shallow freshwater pond on Audubon Canyon Ranch, Volunteer Canyon (one of several canyons leading from Bolinas Ridge to Bolinas Lagoon; see Figure 38). 21 February 1972, 10♂, 4♀, collected by E. IVERSON and J. CARLETON (USNM 141809); 1 December 1971, 5♂, 2♀, collected by MOLLY SCHNEIDER (California Academy of Sciences). San Francisco County, Lake Merced, NE side of north lake, 16 January 1971, 1♂, collected by ERIC BOGATIN (California Academy of Sciences). San Mateo County, unnamed pond adjacent to Skyline Boulevard, about 100 m S of Kings Drive, 1 April 1966, 13♂♀, collected by D. CHIVERS (California Academy of Sciences).



Figs. 21—25. *Asellus tomalensis* 21. Mandibular palp, 2nd. segment, male. 22. Pereopod 4, male. 23. Dactyl of pereopod 4, male. 24. Pleopod 1, male. 25. Pleopod 2, female. 26—28. *Asellus occidentalis*. 26. Mandibular palp, 2nd. segment, male. 27. Pereopod 4, male. 28. Pleopod 2, female.

Description

Length (excluding antennae and uropods), ♂ up to 10 mm, ♀ up to 7.5 mm. Body gradually increasing in width to pereonite 7; greatest width about 1/3 length. Head twice as wide as long; anterior margin moderately concave; postmandibular lobes short, obtuse; eye oval, moderate-sized. Pereonal epimera rounded, not posteriorly excavate in ♂, with broad, shallow posterior excavations in ♀ pereonites 5—7. Telson about as long as wide; caudomedial lobe rather low; lateral margins densely setose. Antenna 1 reaching distal third of last segment of antenna 2 peduncle; flagellum 11-merous in ♂, 7—8-merous in ♀. Antenna 2 about as long as head and pereonites 1—4 combined; flagellum 35—45-merous. Mandible with 4-toothed incisors and lacinia mobilis; spine-row of 11 spines plus 2 small setae at molar end; second segment of palp moderately broad. Maxilla 1, outer ramus with 12 apical spines and 1 subterminal seta; inner ramus with 5 terminal spines. Maxilla 2, outer ramus with 22 setae on outer lamina and 14 setae on inner lamina. Maxilliped with 5 retinaculæ on endite; first segment of palp unarmed, second to fifth segments densely setose medially. ♂ pereopod 1, propus about twice as long as wide, palm slightly convex, without processes, with 3 robust spines in proximal half; dactyl armed with teeth on posterior margin. ♀ pereopod 1 similar, but palm nearly straight, bearing 2 robust spines. Pereopod 4 sexually dimorphic, shorter in male, with posterior margin of merus thickened and more spinose. ♂ pleopod 1 a third longer than pleopod 2; protopod half as long as exopod, with 2 retinaculæ; exopod suboval with nearly straight medial margin, bearing about 10 long plumose setae and numerous shorter setae on distal and lateral margins; anterior surface also with few setae. Male pleopod 2, protopod about ¼ longer than wide, bearing 5—6 distomedial setae; exopod slightly more than half as long as protopod, proximal segment with 2 lateral and 1 medial marginal setae; distal segment ovate, with about 6 straight lateral and 8 retrorse medial setae; endopod bent abruptly above base, outer basal apophysis nearly quadrate, inner basal apophysis subconical; tip of endopod with orbicular lateral process partly covering cannula, cannula reaching distal third of lateral process, its lateral lip broadened and fixed to lateral process. Female pleopod 2 semioval, apex and distal half of lateral margin with about 9 setae. Pleopod 3, exopod 2-merous, with setae on distal and lateral margins; endopod fleshy, narrowly obovate. Pleopods 4—5, exopods unarmed except for a few proximolateral setae. Male uropod, exopod and protopod subequal in length; endopod linear, 6.5 times as long as wide, 1.3 times as long as protopod. Female uropod, endopod only slightly longer than exopod, 4.2 times as long as wide, 1.2 times as long as protopod.



Figs. 29—30. *Asellus occidentalis*. 29. Pleopod 2, male, posterior. 30. Same, tip of endopod. 31—34. *Asellus tomalensis*. 31. Pleopod 2, male, posterior. 32. Same, tip of endopod. 33. Pleopod 2, male, anterior. 34. Same, tip of endopod.

Habitat

The shallow pond on Audubon Canyon Ranch contains essentially still water; there was only a slight inflow of fresh water from the adjacent Volunteer Canyon. Mr. IVERSON did not find *Asellus* in Olima Creek; he suggested that its absence from this creek and the creeks that I examined indicates a requirement for slowly moving water containing considerable vegetation. The closely related *A. occidentalis* appears to have similar requirements according to ELLIS (1971), who found it in an intermittent pond adjoining the South Fork of the Klaskanin River in Clatsop County, Oregon, but not in apparently favorable habitats of the South Fork above and below the pond.

Asellus occidentalis WILLIAMS

Figures 18—20, 26—30, 35—37

Asellus tomalensis HARFORD. — RICHARDSON, 1904a, pp. 224—226, figs. 110—112; 1904b, pp. 668—669, figs. 15—17; 1905, pp. 431—433, figs. 487—489. — JOHANSEN, 1922, p. 156. — FEE, 1926, pp. 20—21. — VAN NAME, 1936, pp. 459—461, fig. 288 (part); 1940,

p. 133. — CARL, 1937, p. 451. — HATCH, 1947, pp. 170—171, figs. 31—32. — ELLIS, 1971, passim.

Asellus occidentalis WILLIAMS, 1970, pp. 69—73, figs. 53—56.

The above synonymy assumes that *A. tomalensis* does not occur north of California, that none of the above records are of the eastern species reported from Washington (*A. communis*, *A. racovitzai racovitzai*, see WILLIAMS, 1970), and that no undescribed species occur within the range of *A. occidentalis*. Additional collecting is needed to test these assumptions.

Material examined

Oregon: Clatsop County, about 4 km S of Olney, intermittent pond within an abandoned channel of the South Fork of the Klaskanine River, many specimens collected by ROBERT J. ELLIS (see ELLIS, 1971). Kimball State Park, in pond at headwater of Wood River, 6 September 1968, 6 ♂♀ collected by BILL LIGHT and RUTH STEWART.

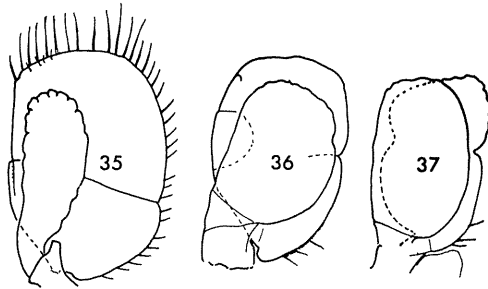
	<i>A. occidentalis</i>	<i>A. tomalensis</i>
Head width/length	<2	ca. 2
Head, postmandibular lobes	rather acute	blunt
♂ pereonites 5—7, lateral margins	with incisures	without incisures
Telson, median caudal lobe	sides steeply inclined	sides gradually inclined
♂ uropod, endopod/protopod	1.5	1.3
♂ uropod, endopod length width	ca. 6.0	ca. 6.5
Antenna 2 flagellar segments	more elongate	less elongate
♂ pleopod 1 exopod, anterior surface	without setae	with setae
♂ pleopod 2 exopod, setae on proximal segment	0—1 lateral, 0 medial	2 lateral, 1 medial
♂ pleopod 2 protopod, medial setae	ca. 10	ca. 7
♂ pleopod 2 endopod, lateral process	triangular, bent at apex	circular
♂ pleopod 2 endopod, cannula	outer lip narrow	outer lip broad
♀ pleopod 2, lateral margin	angular, with 10—17 setae	evenly rounded, with ca. 9 setae

Since this species was described in some detail by WILLIAMS (1970), it will suffice to point out in the table above the most obvious differences between *A. occidentalis* and *A. tomalensis* and to give a few illustrations to supplement those of WILLIAMS.

Relationships of Asellus tomalensis and A. occidentalis

BIRSTEIN (1951) and HENRY & MAGNIEZ (1970) both maintained that neither *A. tomalensis* nor the subterranean *A. californicus* MILLER

(1933) was related to the eastern North American species assigned by STAMMER (1932) to the subgenus *Conasellus*. STAMMER stated that *A. tomalensis* did not fall into *Conasellus* because the male pereopod I lacked an apophysis on the palm, but did not assign it to a subgenus because the structure of the male pleopod was unknown. BIRSTEIN



Figs. 35—37. *Asellus occidentalis*, female, posterior views of pleopods. 35. Pleopod 3. 36. Pleopod 4. 37. Pleopod 5.

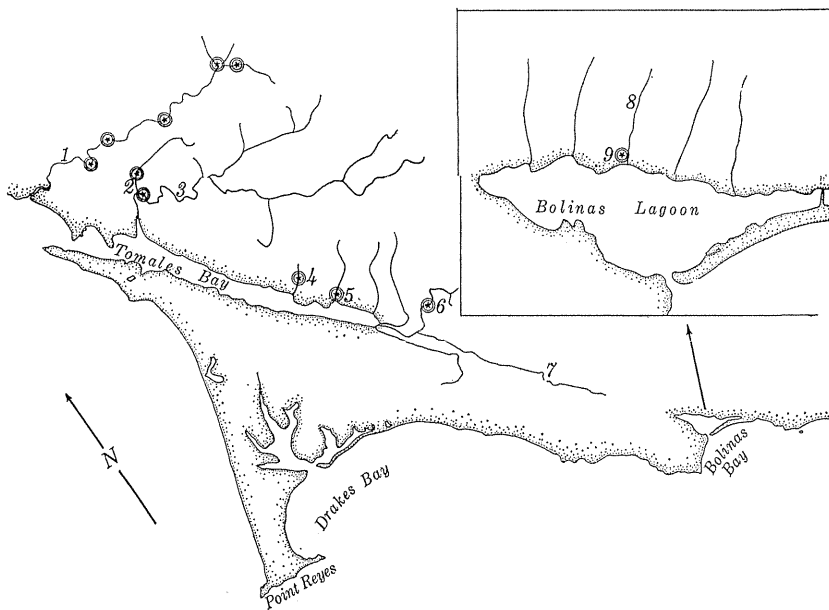


Fig. 38. Map of Tomales Bay and vicinity, showing sites where *Asellus tomalensis* was searched for unsuccessfully. 1. Stemple Creek. 2. Keys Creek. 3. Walker Creek. 4. Creek, name not known. 5. Millerton Gulch Creek. 6. Lagunitas Creek. 7. Olema Creek. Inset. Bolinas Lagoon and vicinity. 8. Volunteer Canyon. 9. Audubon Canyon Ranch, where *A. tomalensis* was collected.

(1951) stated that *A. californicus* undoubtedly belongs to the subgenus *Mesoasellus*, which at that time contained Japanese species now placed in the subgenus *Phreatoasellus* MATSUMOTO (1962). For this reason he maintained that *A. californicus* is derived from Asian ancestors that migrated across the Bering Strait. Like STAMMER, BIRSTEIN regarded the taxonomic position of *A. tomalensis* as uncertain, but was certain that it did not belong to *Conasellus*. HENRY & MAGNIEZ (1970) thought it likely that the 2 Californian species were related to Far Eastern asellids, perhaps *Asellus* (*Asellus*) or *Nipponasellus* MATSUMOTO (1962).

While the relationship of *A. californicus* to oriental asellids is apparent, it is difficult to relate *A. tomalensis* and *A. occidentalis* to Asiatic forms. All the genera occurring in Japan (*Asellus*, including the subgenera *Asellus* and *Phreatoasellus*; *Nipponasellus*; *Uenasellus*) have a long medial basal apophysis on the endopod of the male pleopod 2. *Asellus* (*Asellus*) differs further from *A. tomalensis* and *A. occidentalis* in having 5 terminal setae on the endopod of maxilla 1 and in the oval female 2nd pleopods that overlap medially. *Nipponasellus* differs in having a 1-merous mandibular palp.

Except for the absence of an apophysis on the palm of pereopod 1, the Pacific coast species fit into *Conasellus* as defined by HENRY & MAGNIEZ (1970). But until the generic partition of the North American species is more satisfactorily established, it seems premature to assign the western North American species other than to *Asellus* *sensu lato*.

SUMMARY

Asellus tomalensis is redescribed from topotypes collected near Bolinas Lagoon, California, and compared with *A. occidentalis*, the only other epigeal asellid restricted to the Pacific coast of North America. Both species show more resemblance to eastern North American species now assigned to *Conasellus* than to Asiatic genera or subgenera.

ACKNOWLEDGMENTS

ERNEST IVERSON, California Academy of Sciences, provided me with specimens of *Asellus tomalensis* and information about the locality where they were collected. ROBERT J. ELLIS, National Marine Fisheries Service Biological Laboratory, Auke Bay, Alaska, contributed specimens of *A. occidentalis*. MARY JO BOWMAN, JUDY BOWMAN, SUSAN BOWMAN, RICHARD JANOSKO, and KEITH PARSONS aided me in searching for *A. tomalensis* in the field. HORTON H. HOBBS, Jr., JOHN R. HOLSINGER, and E. L. BOUSFIELD read the manuscript and offered helpful suggestions.

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