Crustaceana 47 (2) 1984, E. J. Brill, Leiden

FOUR SPECIES OF *ALLONISCUS* DANA, 1854, FROM THE WEST COAST OF NORTH AMERICA AND HAWAII (ISOPODA, ONISCOIDEA)

BY

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Six species of *Alloniscus* Dana (1854) have been described from the west coast of North America and from Hawaii: *A. perconvexus* Dana (1854), *A. mirabilis* (Stuxberg, 1875), *A. cornutus* Budde-Lund (1885), *A. oahuensis* Budde-Lund (1885), *A. floresianus* Dollfus (1898) and *A. thalassophilus* Rioja (1964). Of these six, only four (*A. perconvexus*, *A. mirabilis*, *A. oahuensis* and *A. thalassophilus*) are considered here to be valid.

Alloniscus was instituted by Dana (1854) on *A. perconvexus* from California (no more specific location was given). The second species, *Rhinoryctes mirabilis* Stuxberg (1875) was recorded from San Pedro (now part of Los Angeles). Stuxberg's species was later redescribed as *A. cornutus* by Budde-Lund (1885). Two species have been recorded from Hawaii—*A. oahuensis* Budde-Lund (1885) and *A. floresianus* Dollfus (1898), but *A. floresianus* is considered here to be a junior synonym of *A. oahuensis* so *A. oahuensis* is the only species known from Hawaii. Rioja (1964) subsequently described *A. thalassophilus* from the west coast of Mexico near Zihuatanejo, Guerrero, thus bringing to four the number of valid species of the genus from western North America and Hawaii. The four species are the only members of *Alloniscus* Dana considered here.

Other species of *Alloniscus* Dana from Africa were included in the extensive works of Ferrara (1974: 202) and Ferrara & Taiti (1979: 105). Roman (1977: 133) also did work on species from Africa and included a list of over 35 species considered to be in the genus. The above workers considered the family to be in the subfamily Scyphacinae or family Scyphacidae. Vandel (1973b) raised the Scyphacinae to full family, based in part on his limited considerations of *Alloniscus* Dana.

Apparently all species in the genus live in marine coastal habitats or along the shores of the lower reaches of rivers which enter directly into the sea. Some of the species have been recorded to burrow into the sand of beaches. They usually are considered to be scevangers and eat dead organic material present on the beach. A tentative redefinition of the genus is given here based mainly on the four species included in this work. The definition can be modified or expanded when specimens from other locations are more fully known.

Definition. — Body elliptical, moderately arched; surface generally smooth. Eyes conspicuous with anterolateral corners of cephalon moderately long. Antenna 1 with several to many aesthetascs. Antenna 2 shorter than one-third body length and with three flagellar articles. Maxilliped with large tufts of setae on palp articles. All peraeopods with dactylian organ and with many setae on inner margins of segments. Setae especially thick on inner margins of carpus and merus of male peraeopod I. Coxal sutures well defined on peraeonal segments II, III and IV in females of some species. Pleon not abruptly narrower than peraeon. Thin posterolateral borders with several to many setae present on pleopods 1 to 5. Uropods with flattened basis with short rami. Pleotelson triangular.

Type-species. — *Alloniscus perconvexus* Dana, 1854. Type by monotypy.

Derivation and gender of name. — The name is from the Greek "allos" meaning strange or different. The gender is masculine.

Alloniscus perconvexus Dana (figs. 1, 2, 5E)

Alloniscus perconvexus Dana, 1854: 176; Stimpson, 1857: 506; Harford, 1877: 54; Stuxberg, 1875: 49; Budde-Lund, 1879: 1; 1885: 224; 1908: 298, pl. 15 figs. 48, 49; Underwood, 1868: 360; Stebbing, 1893: 431; Richardson, 1899a: 864; 1899b: 332; 1900: 305; 1905: 596; figs. 652-654; Stafford, 1912: 124, figs. 69A-N; 1913: 170; Arcangeli, 1932: 132; 1958: 240; Van Name, 1936: 215, figs. 116-118; 1940: 131; Miller, 1938: 114, 116, 117; 1975: 310; Cockerell, 1940: 294; Mulaik & Mulaik, 1942: 6; Hatch, 1947: 194, figs. 40, 155, 156; Brusca, 1966: 148; Ricketts & Calvin, 1968: 214; Roman, 1977: 133.

Alloniscus (Alloniscus) perconvexus Dana: Arcangeli, 1959: 41, pl. 3 figs. 4, 5, pl. 4 figs. 21.

nec *Alloniscus perconvexus* Dana sensu Mulaik, 1960: 151, pl. 15 figs. 173-180; Hayes, 1974: 838 [see *A. cornutus*].

The species, the type-species of the genus, was described by Dana (1854) on specimens from "California". They were probably collected on the central coast of the state since many specimens of animals collected by John L. LeConte came from that region. Dana's descriptions, both of the genus and species, were brief. Three flagellar articles on antenna 2 were mentioned and the spines on the peraeopods were apparently conspicuous enough to be mentioned. Budde-Lund (1885), who had specimens from California, added, among other things, that antenna 2 was short (not as long as the width of the body). He stated that there was a protuberance on the frontal margin of the cephalon and the pleotelson was triangular. He also stated that the posterolateral angles of the cephalon were not well developed ("mediocres"). Later Budde-Lund (1908, pl. 15 fig. 48) illustrated the specimens of *A. perconvexus* and showed a broad posterolateral margin on the basis of the uropod. His illustration of *A. cornutus* in the same work (fig. 46) showed a narrower margin on the basis of the uropod.

Stafford (1912) redescribed what she called *A. perconvexus* on specimens from Laguna Beach, California. She illustrated what seems to be the species, but which in the text is described as having sutures cutting off coxal plates on

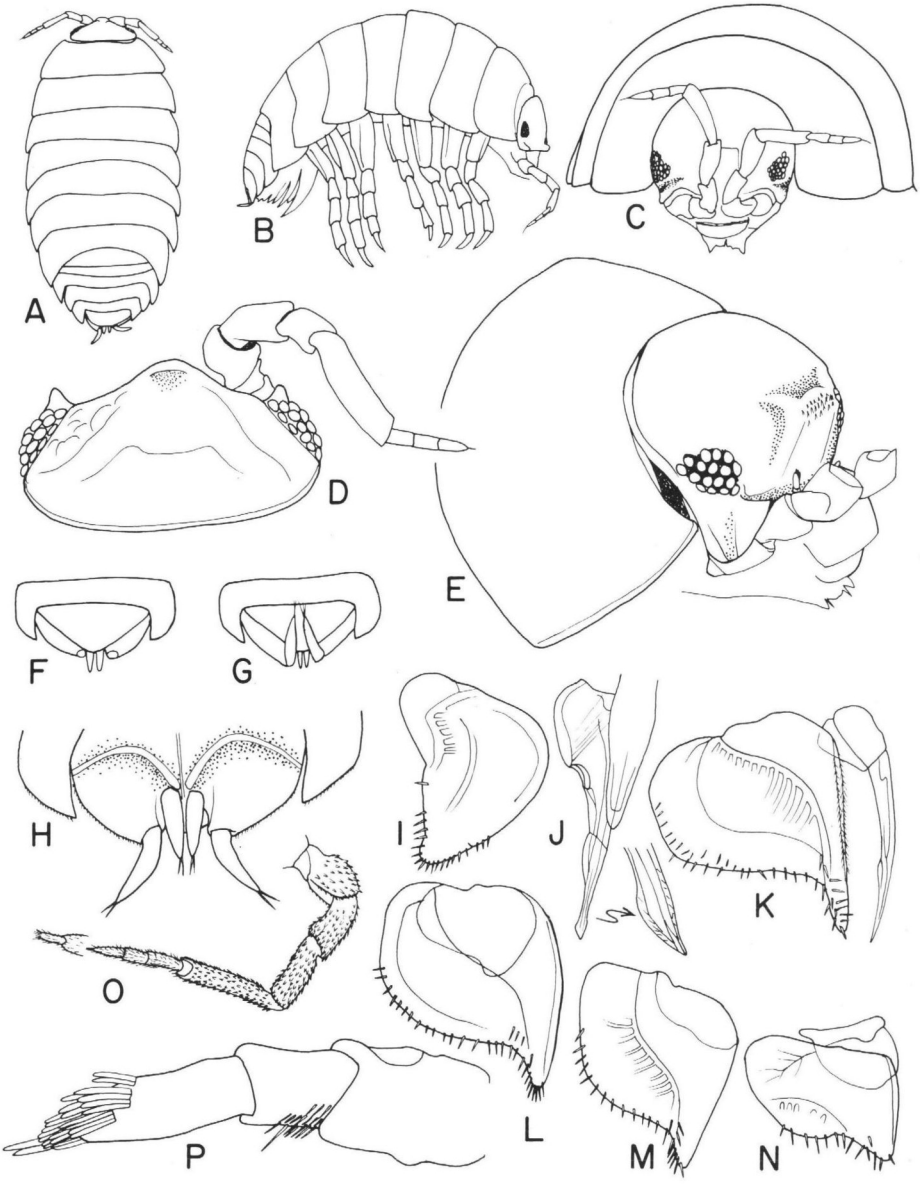

Fig. 1. *Alloniscus perconvexus* Dana. A, dorsal view male 12 mm long; B, lateral view; C, anterior view; D, dorsal view cephalon; E, dorsolateral view anterior part; F, pleotelson posterior part (exopods of uropods missing); G, pleotelson posterior part (exopods present); H, underside uropods; I, exopod pleopod 1 male; J, endopod pleopod 1 male; K-N, pleopods 2-5 male respectively; O, antenna 2; P, antenna 1.

peraeonal segments II, III and IV. She stated that the anterolateral corner on the cephalon extends into a short "acute process extending slightly beyond the eye." Her drawings show the expanded, but not produced, posterolateral edge on the basal segment of the uropods which is characteristic of *A. perconvexus*. However, in her illustration, there is no "brush" of setae on any segment of peraeopod I. Indeed, her illustrations of peraeopods I and VII for both *A. perconvexus* (1912, fig. 69F, E) and *A. cornutus* (1913, fig. 5A, C) show no real differences so that her illustrations of peraeopods must all have been made from females. The "brush" of setae is an unmistakable male characteristic. Distinct coxal plates separated by sutures are present on the anterior peraeonal segments of females of *A. cornutus* and they are not present on either males or females (or even gravid females) of *A. perconvexus* examined here. This suggests that Stafford had specimens of both species when she wrote her redescriptions and that she might have mixed them up.

Van Name (1936), in his comprehensive work on oniscoids, repeated Stafford's redescription of *A. cornutus*, but used Richardson's (1905) redescription of *A. perconvexus*. Perhaps this was because he could not easily distinguish the two species as redescribed by Stafford. Miller (1938, 1975) and Mulaik & Mulaik (1942) recorded *A. perconvexus* from the coast of central California, but gave no specific information on how they identified the specimens as *A. perconvexus*.

Hatch (1947) reproduced Richardson's (1899a) illustration of the dorsal view of the animals and Stafford's view of the pleopods so his records of the species from the region north of San Francisco to Vancouver Island, British Columbia, cannot be used with complete assurance. However, specimens kindly supplied by Dr. E. L. Bousfield (National Museum of Canada) from Oregon, Washington and Vancouver Island are without doubt *A. perconvexus* so that the records of Hatch (except perhaps from San Diego) most probably are also of *A. perconvexus*.

Arcangeli (1959: 42) stated that there were distinct coxal sutures and plates on peraeonal segments II, III and IV, but he did not illustrate them. In a footnote (p. 42) he stated that he doubted that coxal sutures were present on *A. perconvexus*, and also stated that sutures were not mentioned by Budde-Lund. Mulaik (1960: 151) described what he called *A. perconvexus*, but stated that there were distinct coxal sutures on the anterior peraeonal segments. Mulaik's illustration of male peraeopod VII (fig. 174) shows only a few setae on the inner margin which indicates that he described *A. cornutus*, not *A. perconvexus*. The following new description of *A. perconvexus* Dana is based on many specimens from Pacific Grove, California (USNM 88413).

Description. — Body elliptical, smooth, arched, covered with many tiny scales. Cephalon with large medial dorsally excavate projection on frontal margin. Anterolateral extensions of cephalon small but well defined, extending only slightly beyond margin. Eyes of about 17 ocelli. Antenna 1 with

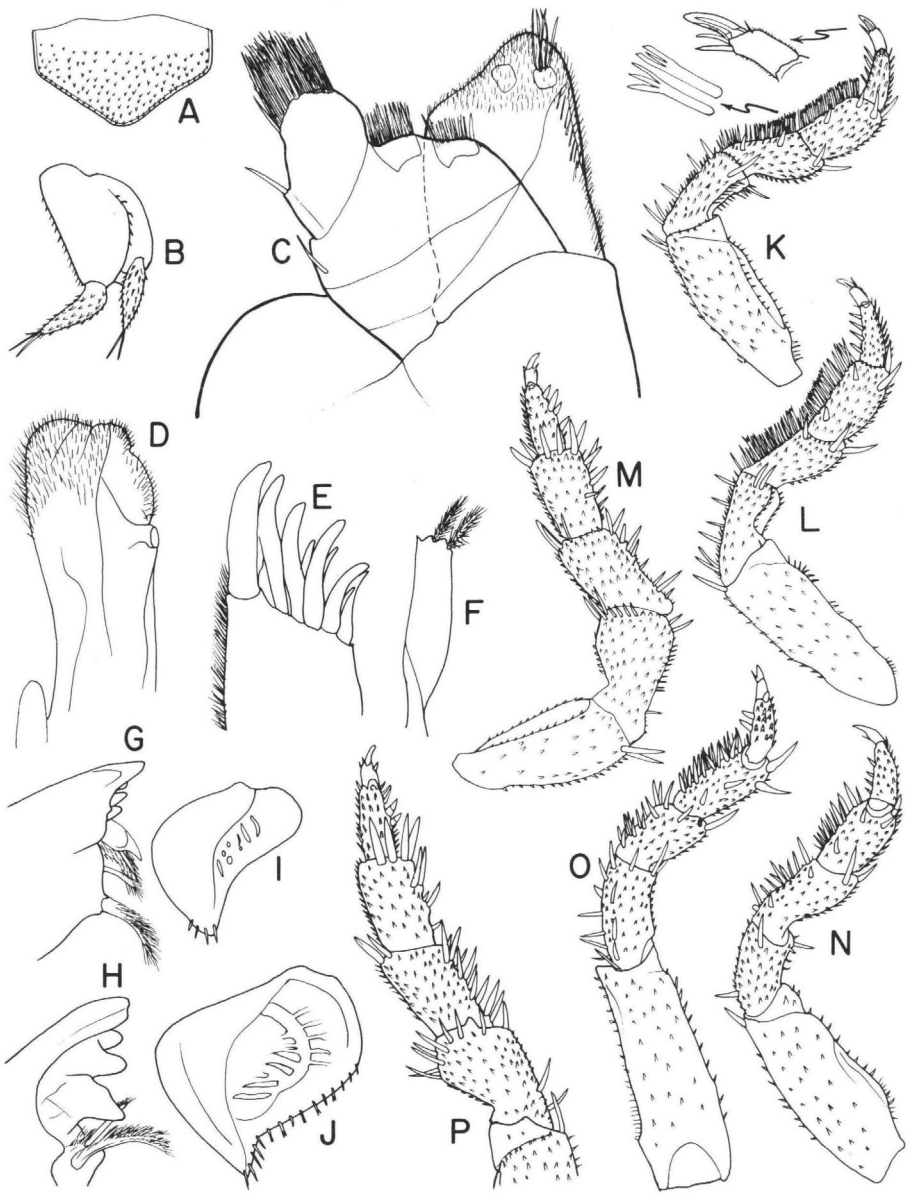

Fig. 2. *Alloniscus perconvexus* Dana. A, pleotelson; B, upper side uropod; C, detail maxillipedal palp; D, maxilla 1; E, exopod maxilla 2; F, endopod maxilla 2; G, right mandible; H, left mandible; I, J, pleopods 1 and 2 female; K-M, peraeopods I, II and VII male respectively; N-P, peraeopods I, II and VII female.

aesthetascs arranged in tiers on apical article. Pointed scales cover peraeopods and peduncular segments of antenna 2. Antenna 2 short, extending posteriorly to just beyond posterior margin of peraeonal segment I. Antenna 2 with three-segmented flagellum about as long as preceding peduncular segment.

Maxillipedal palp with two masses of setae on inner margin in addition to large tuft of setae on apical article. Endite with some long and numerous short setae. Apical edge without compound setae or sensory structures. Maxilla 1 with slight indentation in apical margin; apex covered with short setae; "sensory bulb" conspicuous on inner margin. Exopod of maxilla 2 with eight large teeth; endopod with two penicillate setae on incisor process; lacinia mobilis small with many tiny setae. Left mandible with three cusps on incisor process; lacinia mobilis "bulky," without large setae. Setal row with one large and one smaller setae.

Peraeonal segments arched, not recurved. Posterolateral borders of peraeonal segment I rounded; II only slightly produced posteriorly; II straight; IV-VII increasingly more produced to segment VII which is most produced. Suture lines separating coxa not evident on peraeonal segments on either sex.

Peraeopod I and II of male each with dense row of setae on internal margins on merus and carpus. Peraeopods VI and VII of male with large setae on internal margins of merus and carpus. Small swelling on inner margin of proximal part of carpus. Peraeopods I and II of female moderately setose, but with fewer setae than male on inner margin of merus and carpus. Setal pattern of peraeopod VII of male and female similar.

Pleon with pleonal segments 1 and 2 enclosed within extended posterolateral borders of peraeon VII. Segments 3 to 5 with lateral margins extended to form part of general body outline; only slightly, if at all, recurved. Pleotelson broader than long; triangular, with posterior margin rounded. Basis of uropod with posterolateral margin thin and extended almost to general elliptical body outline. Exopod small, shorter than basis, inner margin bulged with apex directed laterally. Endopod staight, slightly shorter than exopod. Endopod exits ventrally from basis and extends only slightly beyond posterior margin of basis.

Pleopod 1 of male with triangular exopod; endopod greatly produced with subapical bulge on blade-like margin, extending well beyond medial margin of exopod. Pleopod 2 of male with medial border of exopod produced; endopod thin produced to acute point extending only slightly beyond medial margin of exopod. Pleopod 1 of female much smaller than pleopod 2; pleopods 3 to 5 similar to respective male pleopods. Exopods of pleopods 1 to 5 of both sexes with many setae on posterolateral borders; thin "pseudotracheae" present on lateral parts.

Specimens. — National Museum of Canada, Ottawa: Nine collections from Cape Kiwanda, Oregon, north to Ferrar Point, Vancouver Island (kindly sent by Dr. E. L. Bousfield). National Museum of Natural History, Washington,

D.C.: Many from Pacific Grove, California, collected by J. Benedict, July 1905 (USNM 88413). Personal collection: Several from Oxnard (beach), California, collected by W. J. and J. W. Gertsch, July 6, 1953.

Distribution. — The range of *A. perconvexus* is from Laguna Beach, California, north to Ferrer Point on the southern shore of Vancouver Island, British Columbia. It shares its range with *A. mirabilis* from at least Laguna Beach north to Pacific Grove.

Ecology. — Brusca (1966: 148) stated that *A. perconvexus* lives on the upper beach (at Dillon Beach) above the berm where it burrows from 7.5-15 cm below the surface of the sand. Here the moisture content is from 2.9-5.5%. Ricketts & Calvin (1968: 214) stated that the species lives in the supratidal zone where it makes mole-like burrows just under the surface of the sand.

Alloniscus mirabilis (Stuxberg) (figs. 3, 4, 5A-D)

Rhinoryctes mirabilis Stuxberg, 1875: 51; Underwood, 1886: 363.
Rhynoryctes mirabilis Stuxberg: Arcangeli, 1958: 240.
Alloniscus mirabilis (Stuxberg): Budde-Lund, 1879: 1; 1885: 229; Stebbing, 1893: 431; Richardson, 1899a: 864; 1899b: 332; 1900: 305; 1905: 594; Pratt, 1951: 442; Van Name, 1936: 217; Miller, 1938: 114; Roman, 1977: 133.
Alloniscus (Alloniscus) mirabilis Dana: Arcangeli, 1959: 45.
Alloniscus cornutus Budde-Lund, 1879: 1 (nomen nudum); 1885: 228; 1908: 298, pl. 15 figs. 43-47; Stebbing, 1893: 431; Richardson, 1899a: 864; 1899b: 332; 1900: 305; 1905: 595; Kraepelin, 1901: 204; Stafford, 1912: 124, fig. 69A-N; 1913: 170, figs. 4, 5A-L; Van Name, 1936: 215, figs. 119, 120; 1940: 131; Cockerell, 1940: 294; Arcangeli, 1958: 240; Roman, 1977: 135.
Alloniscus (Alloniscus) cornutus Budde-Lund: Arcangeli, 1959: 43, pl. 1 fig. 1.
Alloniscus perconvexus Dana: Mulaik, 1960: 151, pl. 15 figs. 173-180; Hayes, 1974: 838.

Stuxberg (1875) placed *A. mirabilis* in a new genus, *Rhinoryctes*, even though he cited *Alloniscus perconvexus* Dana in the same work (p. 49) and therefore was familiar with at least the description of *Alloniscus*. His description (as translated by Richardson, 1905: 594), however, is of a species different from *A. perconvexus*. He stated that the "lateral lobes" (anterolateral lobes) on the cephalon were "produced, conical, anteriorly rounded, equal to the eyes in length". He did not discuss the shapes of the peraeonal segments or peraeopods.

The species was redescribed later on the basis of two specimens from "California" by Budde-Lund (1885: 228) who included *R. mirabilis* as a synonym of *A. cornutus*. The generic name of Stuxberg, *Rhinoryctes*, means "nose is a tool for digging," thus Stuxberg and Budde-Lund recognized that there was a large protrusion on the frontal margin of the cephalon. Stuxberg also was apparently familiar with the burrowing habits of the species. Budde-Lund did not indicate whether coxal sutures or plates were indicated or not. Stuxberg stated that there were serrations on the anterior margins of the epimeres, but he also did not specifically state if coxae were indicated. The serrations on the anterior margins of the epimeres were used by Richardson

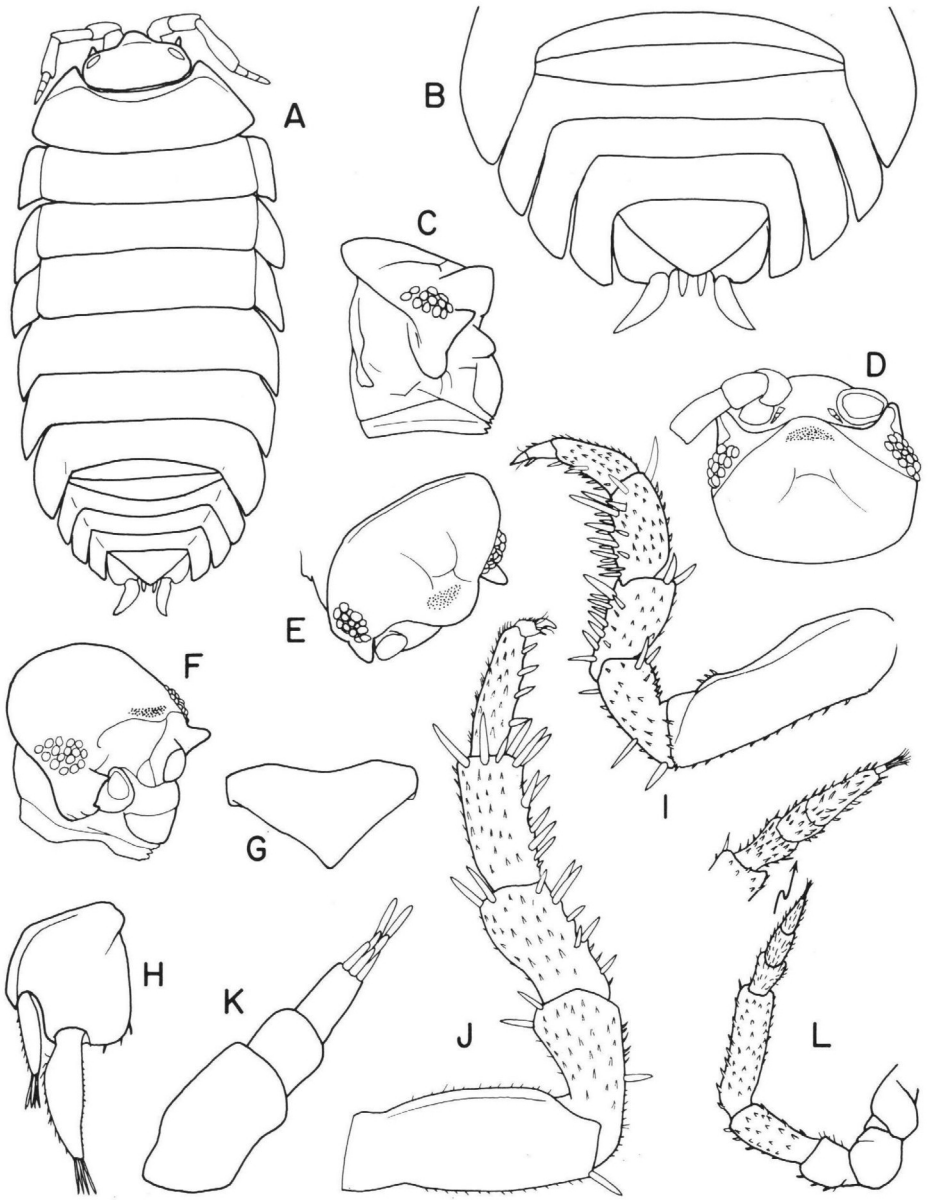

Fig. 3. *Alloniscus mirabilis* (Stuxberg). A, dorsal view female 9.4 mm long; B, dorsal view pleon; C, lateral view cephalon; D, dorsal view cephalon; E, dorsal oblique view cephalon; F, frontal oblique view; G, pleotelson; H, underside uropod; I, peraeopod I female; J, peraeopod VII female; K, antenna 1; L, antenna 2.

(1905: 594) as a character in a key to separate *A. mirabilis* from *A. perconvexus* but she did not mention if she actually saw specimens of *A. mirabilis*. Thus it is not known if the coxal sutures were distinct on specimens viewed by the early observers of the species. However, both workers recognized that there were large anterolateral corners on the cephalon. Budde-Lund (1885) stated that the basal article of the uropod was "depressed," while Stuxberg stated that "the basal article is almost as wide as long, depressed, with the post-lateral margin very little elevated, circularly rounded, serrate". Both workers obviously recognized that the basis of the uropod was broadened and flattened, and not like that of *A. perconvexus*.

The "serrate" border of the epimeres in the description by Stuxberg cannot be much more than the small scales or small crenulations found on the peraeonal and pleonal borders of many species of oniscoids, but more conspicuous in some than in others. They rarely if at all can be used to separate any species of isopod let alone species of *Alloniscus*. They were used by Richardson (1899ab, 1905), however, and led to the confusion in the identity of the two species. The species *A. perconvexus* and *A. mirabilis* can be separated by comparing the configurations of the anterolateral corners and by noting the large protrusions on the frontal margin of the cephalon on *A. mirabilis*. The broadened, extended basis of the uropod is also characteristic of *A. mirabilis*.

Budde-Lund (1908) included illustrations of the cephalon with large anterolateral corners and expanded bases on the uropods confirming that the shapes of those structures were as stated in his original description. His illustrations are the first of the species. The specimens described, illustrated and called *A. cornutus* by Stafford (1913) are considered here to be *A. mirabilis* (see also under *A. perconvexus*). Stafford did not directly refer to the work of any other person. She called the specimens which she examined *A. cornutus*, variety *lagunae*, and based her variety on the lack of "sinuated thoracic margins," lack of a "carinated" ramus on the uropod and differences in lengths of the flagellar articles when compared to the peduncular segments. Until a series of specimens is examined from a wide geographic range, her variety *lagunae* should be disregarded. Her statement that coxal plates were present indicates that she examined females, because coxal plates are present only on females in *A. mirabilis*.

The works of Arcangeli (1932, 1958, 1959) contain no original descriptions or illustrations of *A. mirabilis*. Mulaik (1960) definitely illustrated what are *A. mirabilis*, and the specimens examined by him were obtained well within its range, northern Baja California. Hayes (1974) briefly mentioned what he called *A. perconvexus*. Since the specimens were described as being present on the beaches of southern California and northern Baja California, they too are probably *A. mirabilis*. The species is newly described here on specimens from Oxnard, California.

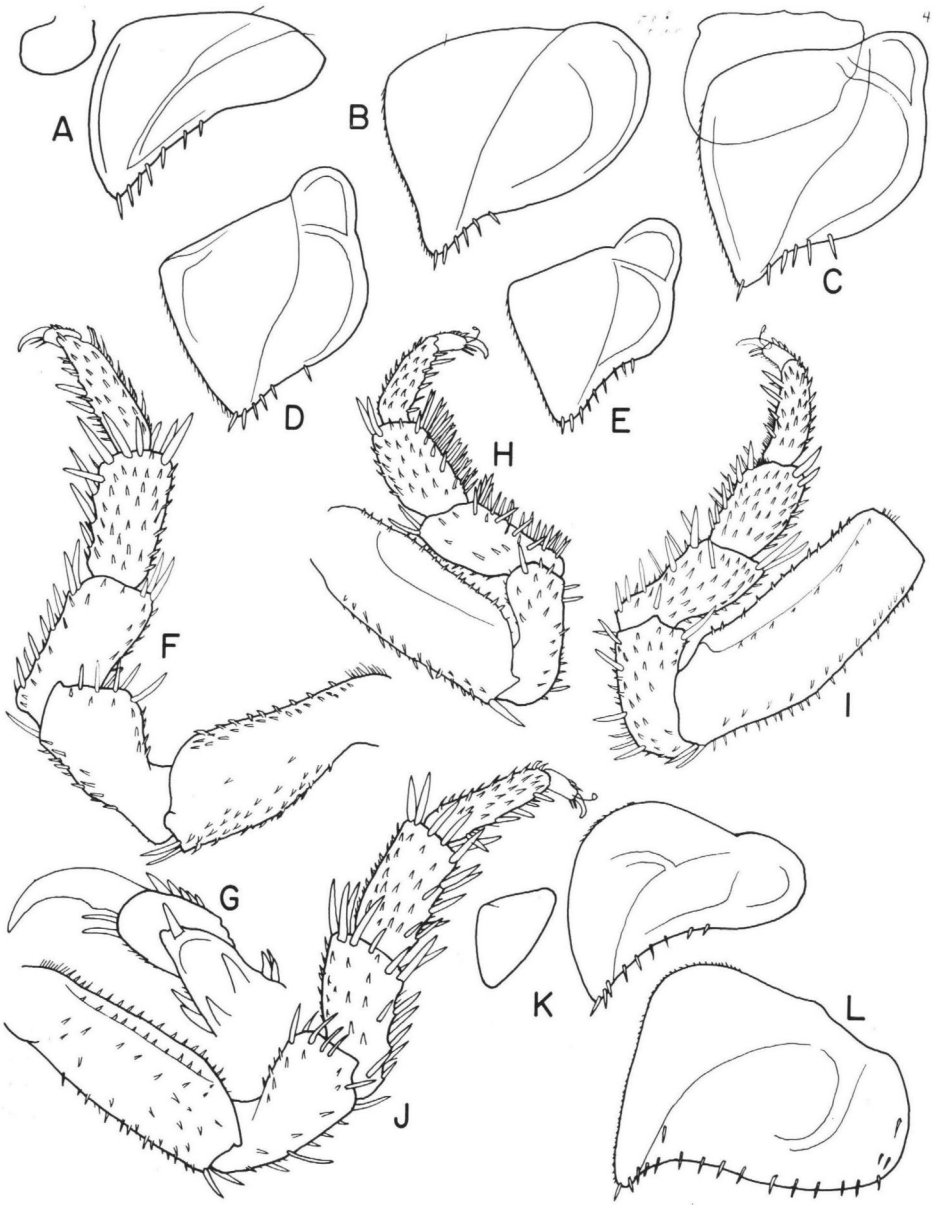

Fig. 4. *Alloniscus mirabilis* (Stuxberg). F-L, from Magdalena Bay, Baja California. A-E, pleopods 1-5 female, respectively; F, peraeopod VII male; G, detail dactylus peraeopod VII; H, peraeopod I male; I, peraeopod I female; J, peraeopod VII female; K, L, pleopods 1 and 2 female.

Description. — Cephalon with large medial, dorsally hollow projection on frontal margin. Anterolateral extension of cephalon large, well developed and extending far beyond eyes. Eyes of 12 or 13 ocelli. Antenna 1 with several aesthetascs (fewer than in *A. perconvexus*). Mouthparts similar to those of *A. perconvexus*.

Peraeonal segments somewhat arched, recurved slightly, especially posterior ones. Posterolateral margins of peraeonal segments I rounded. Posterolateral corners of peraeonal segments II-VII progressively more projected posteriorly to segment VII. Conspicuous sutures separate coxal plates on peraeonal segments II, III and IV on female only.

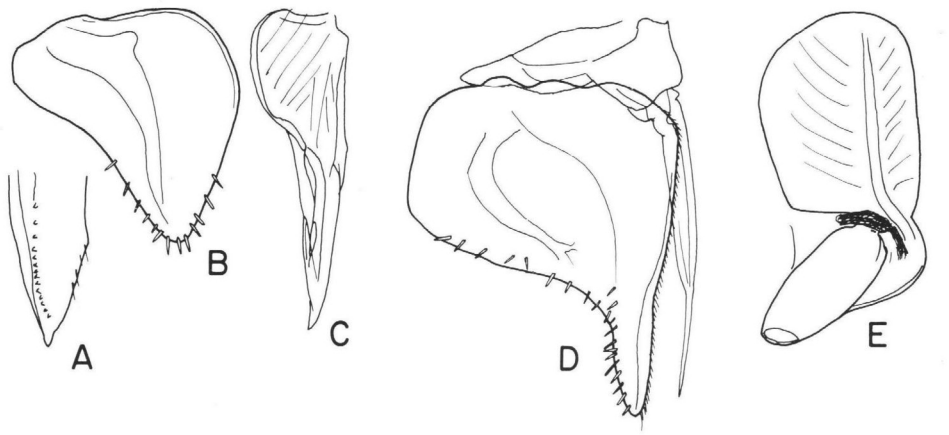

Fig. 5. A-D, *Alloniscus mirabilis* (Stuxberg), from Magdalena Bay, Baja California. A, apex endopod pleopod 1 male; B, exopod pleopod 1 male; C, pleopod 2 male. E, *A. perconvexus* Dana, oostegite.

Peraeopod I of female with few setae on inner margin of propodus; many long and short setae on inner margins of carpus and merus. Mass of setae on inner margins of carpus and merus on peraeopods I and II of male from Magdalana Bay, Baja California. Peraeopod VII of female with few spines on inner margin of propodus, many on carpus and merus. Peraeopod VII of male from Baja California with no tubercles or swelling on inner margin of proximal part of carpus.

Margins of pleonal segments 3 to 5 definitely recurved. Pleotelson broader than long; triangular, with posterior margin pointed. Basis of uropod with posterolateral margin broadly expanded out to or just beyond general body margin.

Endopod of pleopod 1 of male from Baja California produced into sharp point. Exopod and endopod of pleopod 2 of male greatly produced when compared to pleopod 2 of males of *A. perconvexus*.

Specimens. — Personal collection: several from San Simeon, California, collected by Jean and Wilton Ivie, September 23, 1965. One from Pacific Grove, collected by W. J. and J. W. Gertsch, July 19, 1953. National Museum of Natural History: several, Mangrove Island, Magdalena Bay, Baja California, Mexico, from "Albatross," March 20, 1911 (USNM 44471). The American Museum of Natural History: one from San Nicolas Island (Channel Islands), California (AMNH 8989).

Distribution and ecology. — *Alloniscus mirabilis* has been recorded from Pacific Grove, California, south to Magdalena Bay, Mexico. Its range overlaps that of *A. perconvexus* from at least Pacific Grove south to Laguna Beach. Hayes (1974) stated that the species was a beach scavenger.

Alloniscus thalassophilus Rioja

Alloniscus thalassophilus Rioja, 1964: 285, figs. 1-36.

The species was described by Rioja (1964) from a few specimens from a beach on Isla de Ixtapan, near Zihuatanejo, Guerrero, Mexico. It has not been taken elsewhere. Rioja's complete description included details of the morphology of males and females so only a short diagnosis is included here to show how *A. thalassophilus* differs from the three other species included here.

Diagnosis. — Cephalon with small anterolateral extensions and without conspicuous projections on somewhat pointed frontal margin of cephalon. Eyes of 21 to 25 ocelli. Coxal sutures absent on both sexes. Peraeopod VII of male without spur on carpus. Uropod with posterolateral margins of basis not extended to margin of body.

Remarks. — The species closely resembles *Alloniscus oahuensis* in morphology. Both lack the medial projection on the cephalon and the expansion of the posterolateral border of the basis of the uropod. Both have between 21 and 25 ocelli. Females of *A. oahuensis* can be distinguished by the conspicuous sutures separating the coxa on peraeonal segments II-IV. Males of *A. oahuensis*, however, have a spur on the carpus of peraeopod VII which is absent on males of *A. thalassophilus* (Rioja, 1964: 301, fig. 26). It is possible that Rioja did not see the spur. Unfortunately, specimens of *A. thalassophilus* were not available, so peraeopod VII of the male must be reexamined to confirm the absence of spurs.

Alloniscus oahuensis Budde-Lund (figs. 6-8)

Alloniscus oahuensis Budde-Lund, 1879: 1 (nomen nudum); 1885: 225; Jackson, 1941: 13 (partim: Hawaiian locations only); Arcangeli, 1958: 240; Roman, 1977: 133.

Alloniscus (*Metalloniscus*) *oahuensis* Budde-Lund: Arcangeli, 1959: 72 (nec pl. 14 fig. 22a-h).

Alloniscus floresianus Dollfus: Dollfus, 1900: 524; Roman, 1977: 133.

Alloniscus oahuensis Budde-Lund (partim: Hawaiian locations only). Jackson, 1933: 153; 1938: 181; 1941: 13; Vandel, 1970: 140; 1973a: 23; 1973b: 30.

The type-locality of the species is Oahu, Hawaii (Budde-Lund, 1885: 225). Jackson (1927) incorrectly reported what he called *Alloniscus brevis* Budde-Lund (1879) from Samoa, and claimed that it was a senior synonym of *A. oahuensis*. However, *A. brevis* is not included in Budde-Lund's (1879) list, and *A. oahuensis* is a nomen nudum there. In Budde-Lund's (1885) work, *A. brevis* is listed from the "Indes" which is the East Indies. As first reviser of *Alloniscus*, Jackson (1933) gave the species name validity as the senior synonym. Arcangeli (1959) considered *A. brevis* Budde-Lund of Jackson (1927) as a junior synonym of *A. oahuensis*. Arcangeli considered other records of *A. brevis* as valid and placed *A. brevis* and *A. oahuensis* in separate subgenera. Vandel (1970, 1973a, 1973b) considered *A. oahuensis* to be widespread on the islands of the Pacific, but gave no morphological or specific distributional evidence to support his claim so they are not considered here any further. However, there is no reason to believe that the species is confined to the Hawaiian Islands.

Dollfus (1900: 524), without morphological evidence, stated that *A. floresianus* which he had described in 1898 from Flores, in the East Indies was present at Monts Koele, Lanai, Hawaii. If the record is indeed of an *Alloniscus*, it would seem more likely that it is *A. oahuensis* rather than a species described from over 5800 miles away. Dollfus apparently overlooked Budde-Lund's (1885) reference to species of *Alloniscus* from Hawaii even though the subject of his work was the oniscoids from the islands. The following new description is based on specimens from Halawa Valley, Molokai Island, Hawaii (USNM 86861).

Description. — Cephalon with frontal margin convex, but without large projection or large bulge. Anterolateral extensions on cephalon small. Eyes of 22 to 24 ocelli. Antenna 1 with about six aesthetascs. Antenna 2 extending posteriorly to reach about to posterior margin of peraeonal segment II; flagellum slightly longer than preceding peduncular segment. Mouthparts essentially like those of *A. perconvexus*, but with slight differences in configurations of distal parts of maxilliped (cf. fig. 2C, fig. 8A) and other details.

Peraeonal segments somewhat arched, but edges recurved. Posterior margin of peraeonal segment I rounded, of peraeonal segments II to VII straight to greatly produced; segment VII most produced. Coxal sutures present on peraeonal segments II to IV of females only.

Peracopods I and II of male each with dense row of setae on internal margins of merus and carpus. Peraeopod I of female with several setae on propodus and many on merus and carpus. Peraeopod VII of male with large, spined, tubercle on inner proximal margin of carpus; female without such tubercle, otherwise peraeopod VII is similar to that of male.

Pleon with lateral borders of segments 3 to 5 recurved. Pleotelson broader than long, triangular, with pointed posterior margin. Basis of uropod with margin not broadened and extended to general body margin; both rami curved, projecting laterally and both extending beyond general body margin.

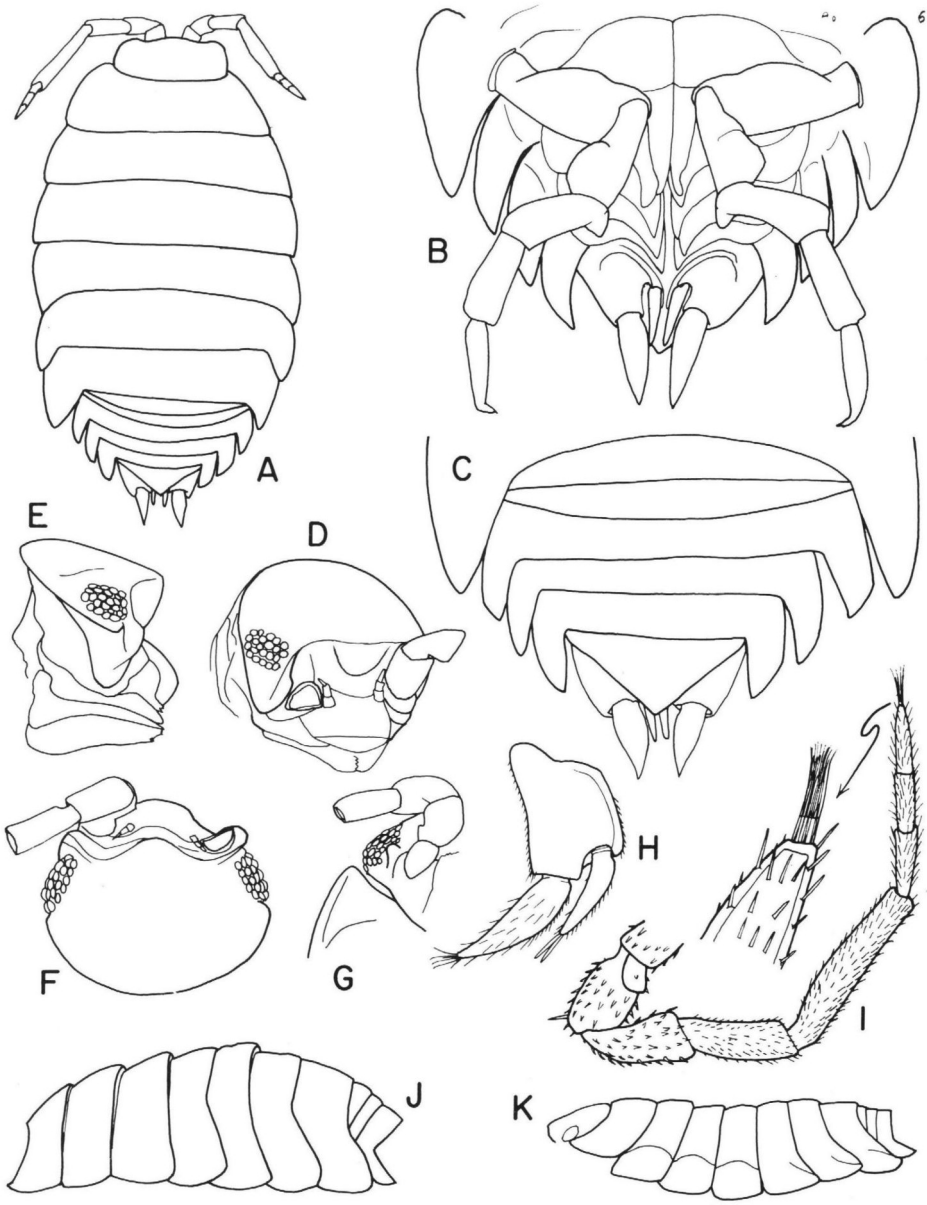

Fig. 6. *Alloniscus oahuensis* Budde-Lund. A, dorsal view male 7.3 mm long; B, underside posterior part; C, dorsal view pleon; D, frontal oblique view cephalon; E, lateral view cephalon; F, dorsal view cephalon; G, ventral view cephalon; H, underside uropod; I, antenna 2; J, lateral view male; K, lateral view female.

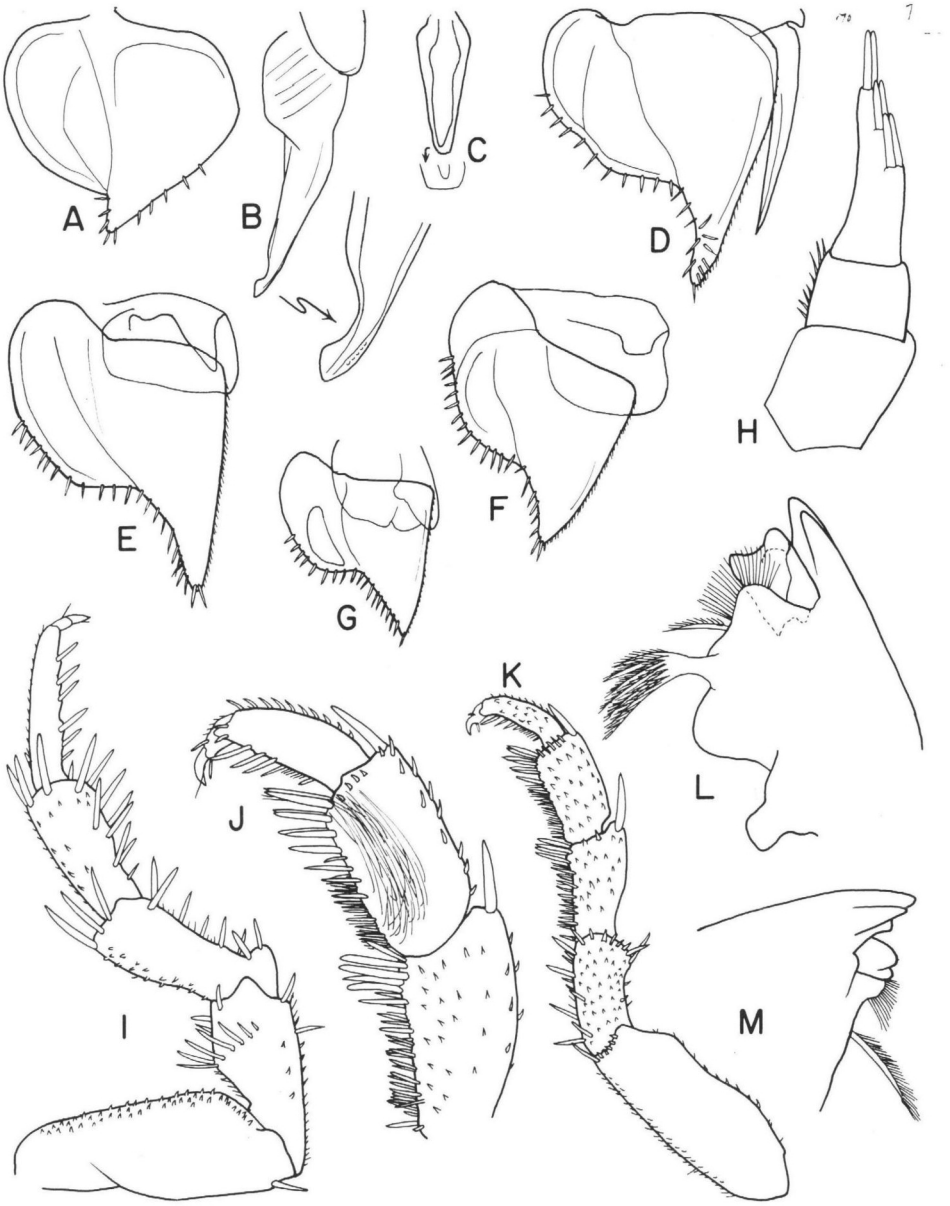

Fig. 7. *Alloniscus oahuensis* Budde-Lund. A, exopod pleopod 1 male; B, endopod pleopod 1 male; C, genital apophysis; D-G, pleopods 2-5 male respectively; H, antenna 1; I, peraeopod VII male; J, detail peraeopod I male; K, peracopod I male; L, left mandible; M, right mandible.

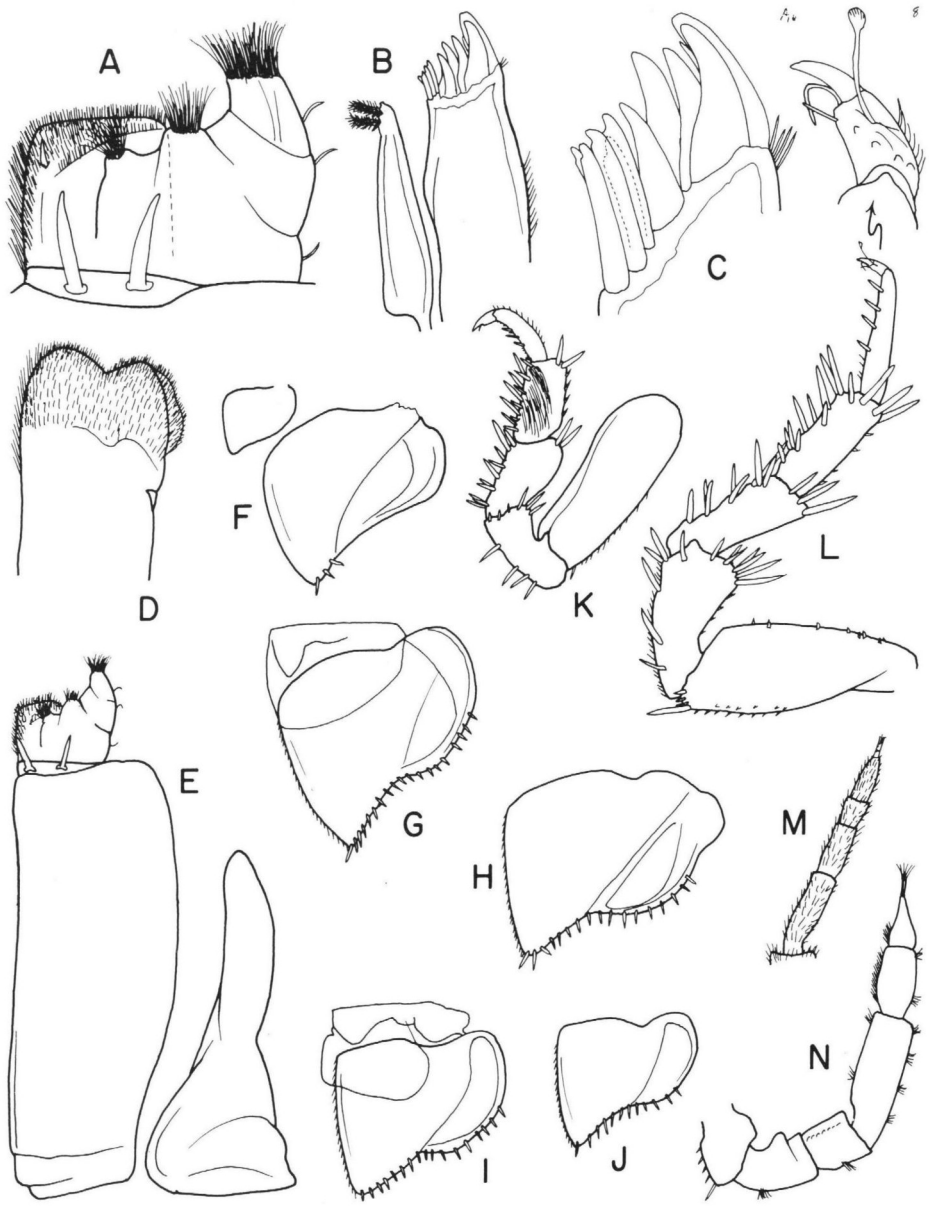

Fig. 8. *Alloniscus oahuensis* Budde-Lund. A, detail apex maxilliped; B, maxilla 2; C, detail apex exopod maxilla 2; D, maxilla 1; E, maxilliped; F-J, pleopods 1-5 female respectively; K, peraeopod I female; L, peraeopod VII female; M, anomalous flagellum antenna 2; N, antenna 2 manca.

Exopods of all pleopods with distal medial margins produced more than on exopods of *A. perconvexus*. Produced endopod of pleopod 1 of male with subapical indentation on outer margin. Endopod of male pleopod 2 acutely pointed, much shorter than medial margin of exopod.

Ecology. — Other than collections from on and near marine beaches and along the margin or rivers which empty into the sea, little is known about the habitat selection of *A. oahuensis*.

Specimens and distribution. — Until such times as it can be shown that specimens from other locations are identical to specimens of *A. oahuensis* from Oahu, Hawaii (type-locality), the range of the species should be restricted to the main islands of the Hawaiian chain. Morphological evidence is also needed to see if *A. brevis* is also a synonym. Records on the Hawaiian Islands include Oahu (USNM 86861), Lani (Dollfus, 1898, as *A. floresianus*), Hawaii (USNM 86863), Molokai (USNM 86861) and Kauai (USNM 86862).

Affinities. — *Alloniscus oahuensis* most closely resembles *A. mirabilis* (Stuxberg) as redescribed here. Females of both species have well defined coxal sutures on the edges of peraeonal segments II to IV. The male of *A. oahuensis* has a well developed spur on the carpus of peraeopod VII which is absent in males of *A. mirabilis*.

DISCUSSION

Species of *Alloniscus* have been recorded from Indonesia, the Pacific shores and islands and the east coast of Africa. The list of about 35 species made by Roman (1977) included several species which probably do not belong in the genus. The actual identity of the poorly described species can only be known if they are carefully examined and properly described. The four species newly described or diagnosed here (including *Alloniscus perconvexus* Dana, 1854, the type-species) can serve as a guide to the redescription of other species. It is hoped that other workers will describe or redescribe species from their regions, and from the new descriptions the tentative definition of *Alloniscus* Dana included here can be made more inclusive.

Key to four species of *Alloniscus* Dana from the Pacific Coast of North America and Hawaii

1a. Expanded shelf on frontal margin of cephalon (fig. 1D); posterolateral margin of basis of uropod broadened to form part of general body outline (fig. 1H) 2

1b. Expanded shelf on frontal margin of cephalon absent; posterolateral margin of basis of uropod narrow (not part of general body outline) 3

2a. Coxal sutures evident on peraeonal segments II-VI in both males and females; posterolateral margin of basis of uropod not greatly produced; small spur present on proximal interior border of carpus of male peraeopod VII (sometimes inconspicuous) ..... *A. perconvexus*

2b. Coxal sutures evident on peraeonal segments II-IV in females only (fig. 3A); posterolateral margins of basis of uropod usually produced; spur absent on carpus of male peraeopod VII ..... *A. mirabilis*

3a. Coxal sutures on peraeonal segments II-IV in females only; well developed spur present on proximal interior border of carpus of male peraeopod VII (fig. 7A) ..... *A. oahuensis*
3b. Coxal sutures always absent on peraeonal segments II-IV; spur absent from carpus of male peraeopod VII ..... *A. thalassophilus*

RÉSUMÉ

Description ou diagnose, et distribution de quatre espèces du genre *Alloniscus* Dana, provenant de l'Amérique du Nord occidentale et des Hawaï. D'après les données incluses dans la description de ces espèces, et spécialement de l'espèce-type *A. perconvexus* Dana, un essai de redéfinition du genre est proposé. Une clef est fournie pour les quatre espèces.

LITERATURE CITED

ARCANGELI, A., 1932. Isopodi terrestri raccolti dal Prof. Silvestri nel Nord-America. Boll. Lab. Zool. Gen. Agar. Portici, **26**: 121-141.
——, 1958. Le specie di isopodi terrestri che furono erroneamente assegnate al genere Alloniscus Dana. Mem. Mus. Civ. Stor. Nat. Verona, **6**: 239-252.
——, 1959. Revisione del genere Alloniscus Dana. Il sistema respiratorio speciale agli exopoditi dei pleopodi delle specie appartenenti allo stesso genere (Crustacei Isopodi terrestri). Boll. Ist. Mus. Zool. Univ. Torino, **6**: 17-79.
BRUSCA, G. J., 1966. Studies on the salinity and humidity tolerances of five species of isopods in a transition from marine to terrestrial life. Bull. S. California Acad. Sci., **65**: 146-154.
BUDDE-LUND, G., 1879. Prospectus generum specierumque Crustaceorum Isopodum terrestrium: 1-10. (Copenhagen).
——, 1885. Crustacea Isopoda terrestria per familias et genera et species descripta: 1-319. (Haunia).
——, 1908. Isopoda von Madagaskar und Ostafrika, mit Diagnosen verwandter Arten. In: A. VOELTZKOW, Reise in Ostafrika in den Jahren 1903-05 mit Mitteln der Hermann und der Elise geb. Heckmann Wentzel-Stiftung ausgeführt. Wissenschaft. Ergeb., **2** (Syst. Arb.): 263-308.
COCKERELL, T. D. A., 1940. The insects of the California islands. Proc. 6th Pacific Sci. Congr., **4**: 283-295.
DANA, J., 1853. Crustacea. United States Exploring Expedition during the years 1838, 1839, 1840, 1841, 1842, under the command of Charles Wilkes, U.S.N., **13** (2): 687-1618. (Sherman, Philadelphia).
——, 1854. Catalogue and descriptions of Crustacea collected in California by Dr. John L. LeConte. Proc. Philadelphia Acad. Nat. Sci., **7**: 175-177.
DOLLFUS, A., 1898. Isopodes terrestres des Indes Néerlandaises. In: M. WEBER, Zoologische Ergebnisse einer Reise in Niederländisch Ost-Indien, **4**: 357-382. (E. J. Brill, Leiden).
——, 1900. Crustacea Isopoda. Fauna Hawaiiensis, **2**: 521-526.
FERRARA, F., 1974. On some terrestrial isopods from Tanzania. Monit. Zool. Italiano, (n. ser.) **5** (suppl.) (18): 309-324.
FERRARA, F. & S. TAITI, 1979. A check-list of terrestrial isopods from Africa (south of the Sahara). Monit. Zool. Italiano, (n. ser.) **12** (suppl.) (10): 89-215.
HARFORD, W. G. W., 1877. Description of a new genus and three new species of sessile-eyed Crustacea. Proc. California Acad. Sci., **7**: 53-54.
HATCH, M. H., 1947. The Chelifera and Isopoda of Washington and adjacent regions. Univ. Washington Pub. Biol., **10**: 155-274.
HAYES, W. B., 1974. Sand-beach energetics: importance of the isopod Tylos punctatus. Ecology, **55**: 838-847.
JACKSON, H. G., 1927. Isopoda terrestria. Terrestrial Arthropoda other than insects, 1. Insects of Samoa, **8**: 1-11. (British Museum, Natural History, London).
——, 1933. Marquesan terrestrial Isopoda. Bull. Bernice P. Bishop Mus., **114**: 145-162.
——, 1938. Terrestrial isopods of southeastern Polynesia. Occas. Pap. Bernice P. Bishop Mus., **14**: 167-192.

——, 1941. Check-list of the terrestial and fresh-water Isopoda of Oceania. Smithson. Misc. Coll., **99**: 1-35.

KRAEPELIN, K., 1901. Ueber die durch den Schiffsverkehr in Hamburg eingeschleppten Tiere. Mitt. naturh. Mus. Hamburg, **18**: 185-209.

MILLER, M. A., 1938. Comparative ecological studies of the terrestrial isopod Crustacea of the San Francisco Bay region. Univ. California Pub. Zool., **43**: 113-142.

——, 1975. Phylum Arthropoda: Crustacea, Tanaidacea and Isopoda. In: R. I. SMITH & J. T. CARLTON (eds.), Light's Manual: Intertidal invertebrates of the central California coast, (ed. 3): 277-312. (Univ. California Press).

MULAIK, S. B., 1960. Contribución al conocimiento de los isopodos terrestres de Mexico (Isopoda, Oniscoidea). Rev. Soc. Mexicana Hist. Nat., **21**: 79-220.

MULAIK, S. B. & D. MULAIK, 1942. New species and records of American terrestrial isopods. Bull. Univ. Utah (Biol. ser.), **6**: 1-23.

PRATT, H. S., 1951. A manual of the common invertebrate animals exclusive of insects: 1-854. (The Blakiston Co., Philadelphia).

RICHARDSON, H., 1899a. Key to the isopods of the Pacific coast of North America, with descriptions of twenty-two new species. Proc. U.S. Nat. Mus., **21** (1175): 815-869. (also 1899b Ann. Mag. nat. Hist., (7) **4**: 157-187, 260-277, 321-338).

——, 1900. The Isopoda. Synopses of North American invertebrates. Amer. Nat., **34**: 207-230, 295-309.

——, 1905. Monograph on the isopods of North America. Bull. U.S. Nat. Mus., **54**: i-liv, 1-727.

RICKETTS, E. F. & J. CALVIN, 1968. Between Pacific tides, (ed. 4, revised by J. W. Hedgpeth): 1-614. (Stanford Univ. Press).

RIOJA, E., 1964. Descripción y algunos datos morfológicos de Alloniscus thalassophilus n. s. (Isopoda Oniscoidea) del piso supralitoral de las costas Mexicanas del Pacifico. Estudios carcinologicos XXXVII. Anal. Inst. Biol. Univ. Mexico, **34**: 285-306.

ROMAN, M.-L., 1977. Les Oniscoides halophiles de Madagascar (Isopoda, Oniscoidea). Beaufortia, **26** (334): 107-152.

SCHULTZ, G. A., 1972. A review of the species of the family Scyphacidae in the New World (Crustacea, Isopoda, Oniscoidea). Proc. Biol. Soc. Washington, **84**: 477-488.

STAFFORD, B. E., 1912. Studies in Laguna Isopoda. Ann. Rept. Laguna Mar. Lab., **1**: 118-133.

——, 1913. Studies in Laguna Beach Isopoda, II. Pomona College Jour. Entom. Zool., **5**: 161-172.

STEBBING, T. R. R., 1893. A history of Crustacea. Recent Malacostraca. Int. Sci. Ser., **74**: 1-466. (London).

STIMPSON, W., 1857. The Crustacea and Echinodermata of the Pacific shores of North America. Boston Jour. Nat. Hist., **6**: 503-513.

STUXBERG, A., 1875. Om Nord-Amerikas Oniscider. Ofversigt af Kongl. Vetensk.-Akad. Forhand., **32**: 43-63.

UNDERWOOD, L., 1886. List of the described species of fresh water Crustacea from America, north of Mexico. Bull. Illinois State Lab. nat. Hist., **2**: 233-386.

VANDEL, A., 1970. Les isopodes terrestres des Iles Rennel et Bellona. Natural History of Rennel Island, British Solomon Islands, **6**: 139-153.

——, 1973a. Les isopodes terrestres (Oniscoidea) de la Mélanesie. Zool. Verhand., Leiden, **125**: 1-160.

——, 1973b. Les isopodes terrestres de l'Australie, étude systématique et biogéographique. Mem. Mus. Nat. Hist. nat., (n. ser.) (A, Zool.) **82**: 1-171.

VAN NAME, W. G., 1936. The American land and fresh-water isopod Crustacea. Bull. Amer. Mus. Nat. Hist., **71**: 1-535.

——, 1940. A supplement to American isopod Crustacea. Bull. Amer. Mus. Nat. Hist., **77**: 109-142.

Received for publication 3 January 1983.