

THE CAVERNICOLOUS FAUNA OF HAWAIIAN LAVA
TUBES, 2. TWO NEW GENERA AND SPECIES OF
BLIND ISOPOD CRUSTACEANS
(Oniscoidea : Philosciidae)¹

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Abstract: Two species of blind, pigmentless isopods are described from three different locations on the Hawaiian Island chain. They are inhabitants of lava tubes which are the caves of the Hawaiian Islands. Each species is described in a separate genus because they are widely different morphologically. The species, perhaps imported with soil, are most likely not endemic to the islands. Notes on other species are included.

Specimens of blind isopods collected from 4 islands of the Hawaiian chain—Hawaii, Kauai, Oahu and Maui—were sent to me for identification by Mr Francis G. Howarth of Bishop Museum in Honolulu, Hawaii. The blind species were included with many species of terrestrial isopods which were with 1 exception, not especially modified for life in the dark cave-like lava tubes where they were collected. The single exception was a collection of *Trichoniscus pusillus* Brandt caught by J. Jacobi and F. G. Howarth on 24 April 1972, on a rotting tree root in the dark zone of Hamakua Forest Reserve Cave (600 m alt.) (BBM 00778). The specimens were white, not wine red the usual color; they were not completely modified for cave life since 3 conspicuous, black ocelli, the normal number, were present. Vandel (1960: 313) gives information on modification for cave life among the species of *Trichoniscus*. A list of the isopods from Hawaiian caves is given in Table 1.

Specimens of *Porcellionides pruinosus* (Brandt), a cosmopolitan species, were collected in many lava tube locations. Those collected by F. D. Stone and F. G. Howarth from under rocks at Judd Street Cave (50 m alt.), Honolulu, Oahu (BBM 00789), were much lighter than specimens of other collections. However, light individuals of the species many times are present in populations from non-cave habitats, so that they only can be considered as true cave adapted forms if all or a large percentage of a large collection of specimens were pale.

Species of blind Philosciidae have been described before. *Anaphiloscia Racovitza* contains 3 small blind pigmentless species from Europe (Schmölzer 1965: 137). They are quite different from those described here. Two blind species of Philosciidae have been described from caves in Cuba. They are *Troglophiloscia silvestrii* Brian (see Van Name 1936: 182 and Rioja 1956: 437) and *Troglophiloscia* sp. also described from Cuba

1. Contribution No. 19. ISLAND ECOSYSTEMS IRP/IBP HAWAII. National Science Foundation Grant No. GB 23075.

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Table 1

Terrestrial Isopods from Hawaiian Caves
(The two species of *Philoscia* and *Reductoniscus* sp. ; (?)
will be more precisely identified in a later paper)

Trichoniscidae

Trichoniscus pusillus Brandt. HAWAII I. : Kaumana Cave ; Hamakua Forest Reserve Cave. KAUAI I. : Waikanaloo Cave.

Philoscidae

Haplophiloscia laevis Schultz. n. gen., n. sp., HAWAII I. : Kaumana Cave.

Hawaiioscia parvituberculata Schultz. n. gen., n. sp., MAUI I. : Kalua O Lapa Cave. KAUAI I. : Limestone Quarry Cave.

Philoscia (species one). MAUI I. : Offal Cave. OAHU I. : Judd Street Cave. KAUAI I. : Limestone Quarry Cave ; Knudsen Cave # 1 ; Knudsen Cave # 2 ; Koloa Cave # 3.

Philoscia (species two). KAUAI I. : Waikanaloo Wet Cave. HAWAII I. : Bird Park Cave # 3. MAUI I. : Offal Cave.

Squamiferidae

Trichorhina tomentosa (Budde-Lund). OAHU I. : Niu Burial Cave # 1. KAUAI I. : Koloa Cave # 2.

Porcellionidae

Metoponorthus pruinus (Brandt). OAHU I. : Niu Burial Cave # 1 ; Judd Street Cave.

Porcellio laevis Latreille. OAHU I. : Niu Burial Cave # 1. KAUAI I. : Knudsen Cave # 2.

Porcellio scaber Latreille. KAUAI I. : Water tunnel on Kokee Ditch.

Armadillidae

Reductoniscus sp. (?). OAHU I. : Niu Burial Cave # 1.

by Rioja (p. 441). Vandel (1968: 97) described 2 blind species which he placed in the genus *Colombophiloscia* Vandel. *Colombophiloscia cavernicola* Vandel is from a cave in northeastern Venezuela and *C. naevigesta* Vandel is from Santa Cruz Island, Galápagos. There the species inhabited a deep crevice (650 m alt. — perhaps of volcanic origin) near the summit of the island.

The type-specimens and paratypes of the following species have been deposited in the Bernice Bishop Museum, Honolulu, Hawaii.

Hawaiioscia Schultz, new genus

Blind, pigmentless. Frontal line distinct ; superantennal line not distinct. Body covered with low tubercles and short setae. Edges of pleonal segments not closely adherent to sides of pleon ; posterior edge of pleotelson produced into broadly rounded margin. Mandible with long double molar setae. Inner margins of dactylus, propodus and carpus of peraeopods I and II with many long, bifid sensory setae. Large dactylian organ on all peraeopods.

The species of the genus differs from *Colombophiloscia cavernicola* and *C. naevigesta* which it in many ways resembles in that it has low tubercles and short setae on the dorsum. No preening organ (Vandel 1968: 101, fig. 29a) is present on peraeopod I of the species in the new genus. The mandibles of the species of each genus have the same number of setae on them.

Hawaiioscia parvituberculata Schultz, new species Fig. 1-33.

Dorsum covered with low tubercles and short setae. Cephalon with moderately large anterolateral angles (fig. 3). Frontal line on forehead distinct. Cephalon almost completely enveloped into pleonal segment I. Posterior border of peraeonal segment I broadly rounded. Posterior borders of peraeonal segments III and VI also rounded. Peraeonal segments IV to VII with posterolateral margins increasingly more pointed until most pointed peraeonal segment VII. (Peraeonal segment IV damaged.) Peraeonal segment VII envelops first 3 pleonal segments. Pleonal segments III to V with posterolateral borders elongate and visible in dorsal view. Posterior border of pleotelson broadly rounded. Uropods long extending well beyond posterior margin of pleotelson. Subanal plate (fig. 8) present, extending ventrally beyond tip of pleotelson.

Antenna I with 4 aesthetascs; apical segment longest. Antenna II with flagellum about as long as peduncular segment 5. Clypeus rounded. Each mandible with 4 teeth on incisor process; right mandible with 4 setae; left mandible with 3 setae. Maxilla I with exopod with 9 plain teeth; endopod with 2 pectinate groups of setae with other setae on apex. Maxilla II with simple apical notch. Maxilliped with 2 pectinate groups of setae on palp; 2 long setae on antipenultimate segment. Sensory edge of endite with many very small hair-like setae. Outer surface of maxilliped with many long setae.

Peraeopod I of ♂ shortest; dactylus with long sensory setae; propodus, carpus and merus with many modified setae (fig. 15) on inner margin. (There are more setae on the inner margins of the first 3 segments of the peraeopods than are represented in the illustrations since they were difficult to draw at the scale used.) Peraeopod VII longest. Ischium and basis with relatively few setae. Peraeopod II about the same as peraeopod I. Peraeopod VII with large number of slightly modified and normal setae. Pleopods of ♂ (♀ not known) with exopod of pleopod I simple crescent-shaped; endopod short and broad with apex slightly produced laterally (fig. 6). Pleopod II with exopod with elongate mediolateral margin with 3 subapical setae on outer margin; endopod slightly longer than exopod with subapical extension laterally near apex. Pleopod III with 3 setae; pleopod IV with 4 setae, and pleopod V with medioposterior corner greatly produced with 3 setae on inner margin. Uropod with endopod about 2/5 length of exopod and tipped with 3 setae; posterolateral corner of basis produced into point.

Length: holotype 6.7 mm; paratype 5.9; immature ♂ 3.5.

Holotype ♂ (BISHOP S8042), MAUI I.: La Perouse Bay, Keoneoio Kalua O Lapa Cave, dark zone on ceiling near drip point, 120 m, 11.XII.1971, W. C. Gagné & F. G. Howarth. (BBM 00449). Paratype: 1 ♂ same data as holotype.

A third immature ♂ (fig. 28-33) was taken by W. C. Gagné and F. G. Howarth on Kauai at Koloa, in Limestone Quarry Cave (5 m alt.) on debris in the dark zone (BBM 00793). Small, low tubercles (*parvus*-Latin for small) and short setae are present on the dorsum, the setation on the peraeopod is similar and the configuration of the cephalon is the same so most probably it is a specimen of *H. parvituberculata*. The immature ♂ was caught on a different island than the type-specimen so mature males should be examined to confirm or deny that they are *H. parvituberculata*.

Haplohiloscia Schultz, new genus

Blind, pigmentless. Frontal line not distinct; superantennal line developed. Dorsum of body smooth (*Hapl* - Greek for simple). Edges of pleonal segments closely adhere to sides of pleon; posterior margin of pleotelson pointed or obtusely rounded. Mandibles with 2 setae on right and 3 on left. Inner margin of long clawed dactylus and propodus with moderately

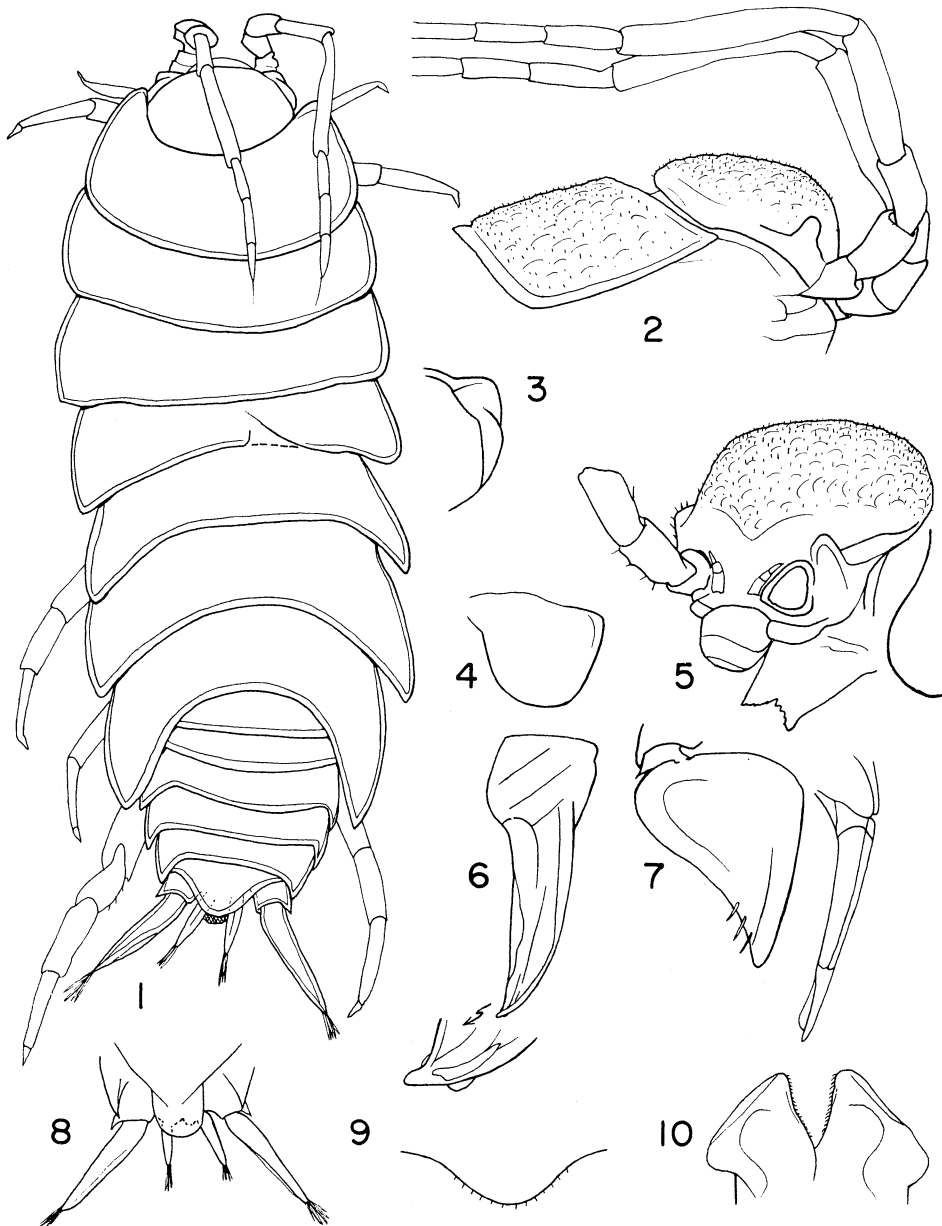


Fig. 1-10. *Hawaiiisocia parvituberculata* n. gen., n. sp.: 1, dorsal view holotype ♂; 2, lateral view cephalon and pereopod I; 3, dorsal view lateral part of cephalon; 4, exopod pleopod I; 5, oblique view cephalon; 6, endopod pleopod I; 7, exopod and endopod pleopod II; 8, ventral view uropods and anal plate; 9, posterior margin pleotelson; 10, hypopharynx.

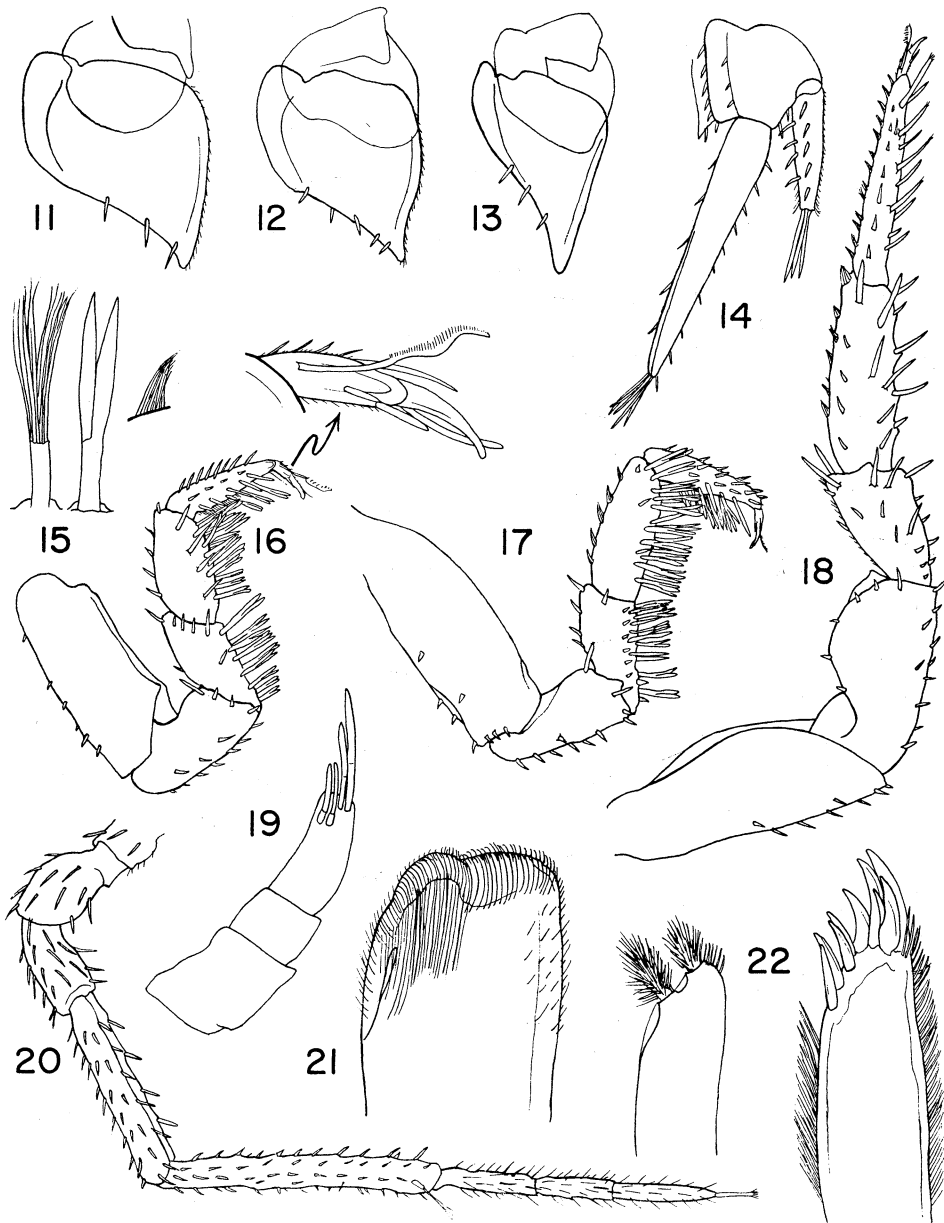


Fig. 11-22. *Hawaiiisocia parvituberculata* n. gen., n. sp.: 11, pleopod III; 12, pleopod IV; 13, pleopod V; 14, uropod; 15, sensory setae of inner margin of peraeopods; 16, peraeopod I; 17, peraeopod II; 18, peraeopod VII; 19, antenna I; 20, antenna II; 21, maxilla II; 22, maxilla I endopod and exopod.

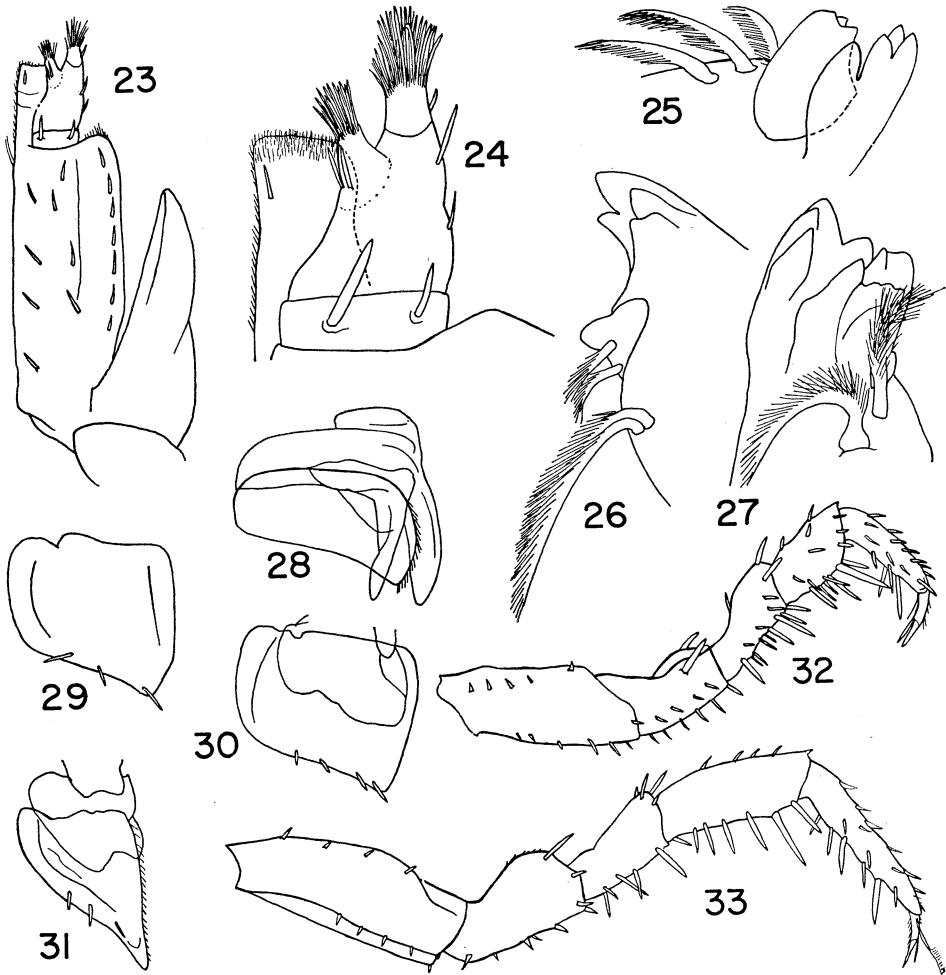


Fig. 23-33. *Hawaiiisocia parvituberculata* n. gen., n. sp.: 23, maxilliped; 24, detail palp and sensory edge maxilliped; 25, left mandible; 26, right mandible; 27, left mandible; Fig. 28-33. Immature ♂: 28, endopod pleopod I, exopod and endopod pleopod II; 29, pleopod III; 30, pleopod IV; 31, pleopod V; 32, peraeopod I; 33, peraeopod VII.

developed (carpus not indented, but short, scale-like setae present) preening organ. Moderate number of setae on inner margin of peraeopods II and VII.

The species is closely related to those of *Troglophiloscia* Brian. Species of *Troglophiloscia* have the edges of the pleonal segments closely adherent to the sides of the pleon; they have a preening organ on peraeopod I and the pattern of setation on the maxilliped is almost exactly alike so the species have many similarities. There are however differences in the covering of the dorsum—in species of *Troglophiloscia* it is scaled; in the new species setae and tubercles are absent. There are also differences in the

structure of antenna I — species of *Troglophiloscia* have 2 aesthetascs; the new species has at least 10. The number of molar setae is 3 or 4 in species of *Troglophiloscia*. There is only 1 in the new species. Maxilla II has the sensory tuft produced and directed slightly to the side in the new species, whereas, it is more conventional in shape in species of *Troglophiloscia*.

Haplophiloscia laevis Schultz, new species Fig. 34-52.

Dorsum smooth (*laevis* — Latin for smooth). Cephalon with well defined anterolateral angles. Superantennal line distinct and continuous across front of cephalon. Cephalon set out in front of peraeonal segment I. Most of medial length of posterior border of peraeonal segment I straight or only moderately curved (according to point of view). Posterior borders of peraeonal segments I to III moderately well rounded. Peraeonal segments IV to VII with posterolateral margins increasingly more pointed until most pointed peraeonal segment VII. Peraeonal segment VII envelops only pleonal segment I and part of segment II. All pleonal segments with pleural edges closely adherent to pleon, not visible in dorsal view. Posterior border of pleotelson obtusely pointed. Uropods short and not as long as lengths of 3 pleonal segments combined.

Antenna I with at least 10 aesthetascs. Antenna II with flagellum about as long as peduncular segment V. Clypeus rounded. Each mandible with 4 teeth on incisor process. Left mandible with 3 setae; right mandible with 2 setae. Maxillae I with exopod with 9 plain teeth; endopod with 2 pectinate groups of setae with 1 small sensory seta on second small lobe of apex. Maxilla II with sensory region produced. Maxilliped with 2 pectinate groups of setae on palp; 2 long setae on antepenultimate palp segment. Sensory edge of maxilliped with 1 very large medial seta just below edge. Many small setae on sensory edge. Outer surface of maxilliped with many long setae.

Peraeopod I shortest; preening organ present between propodus and carpus. Peraeopod I to III with moderate amount of setae none of which are greatly modified as sensory setae. Pleopods of ♀ (no ♂ are known) simple. Pleopod I simple crescent-shaped; pleopod II with single seta, and pleopod III with 2 setae. Uropod with endopod about 1/2 length of exopod, tipped with 3 long setae. Endopod as high as broad with many large setae. Basis about as long as endopod.

Length: holotype 5.5 mm; paratype 5.0-6.4

Holotype ♀ (BISHOP S8041), HAWAII I., Kaumana, Kaumana Cave, dark zone on rock 100 m in cave, 290 m alt., 27.VII.1971, F. G. Howarth (BBM 00289). Paratypes: 2 ♀♀ same data as holotype. The holotype, length 5.5 mm, was used for all drawings except for the uropod which was missing. The diagram of the uropod was based on the 6.4 mm specimen, which had 8 embryos in an intact marsupium. The third ♀ about 5.0 mm long was damaged.

The 2 new genera and new species of isopods described here are in 2 very different subgroups (higher than genus) within the family Philosciidae. *Haplophiloscia laevis* has the ends of the pleonal segments closely adherent to its body. *Hawaiioscia parvituberculata* has the edges of the last 3 pleonal segments visible in the dorsal view. The dorsum of *H. laevis* is smooth; the dorsum of *H. parvituberculata* is covered with small tubercles and setae. There is a preening organ on peraeopod I in *H. laevis*, and in *H. parvituberculata* the inner margins of the peraeopods including peraeopod I are densely covered with many special, bifid, sensory setae. The configurations of the cephalons are different.

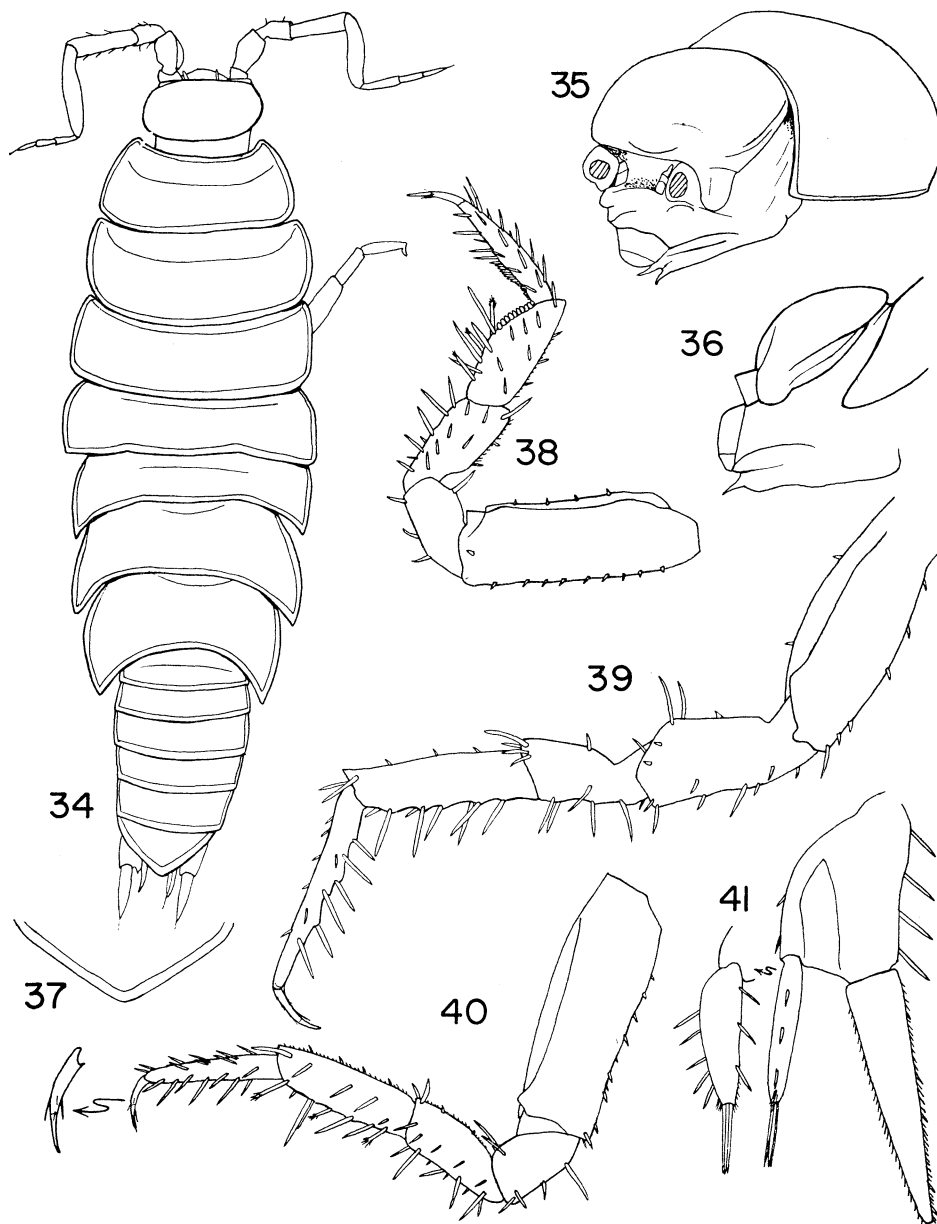


Fig. 34-41. *Haplophiloscia laevis* n. gen., n. sp.: 34, dorsal view holotype ♀; 35, oblique view cephalon; 36, lateral view cephalon; 37, posterior margin pleotelson; 38, peraeopod I; 39, peraeopod VII; 40, peraeopod II; 41, uropod.

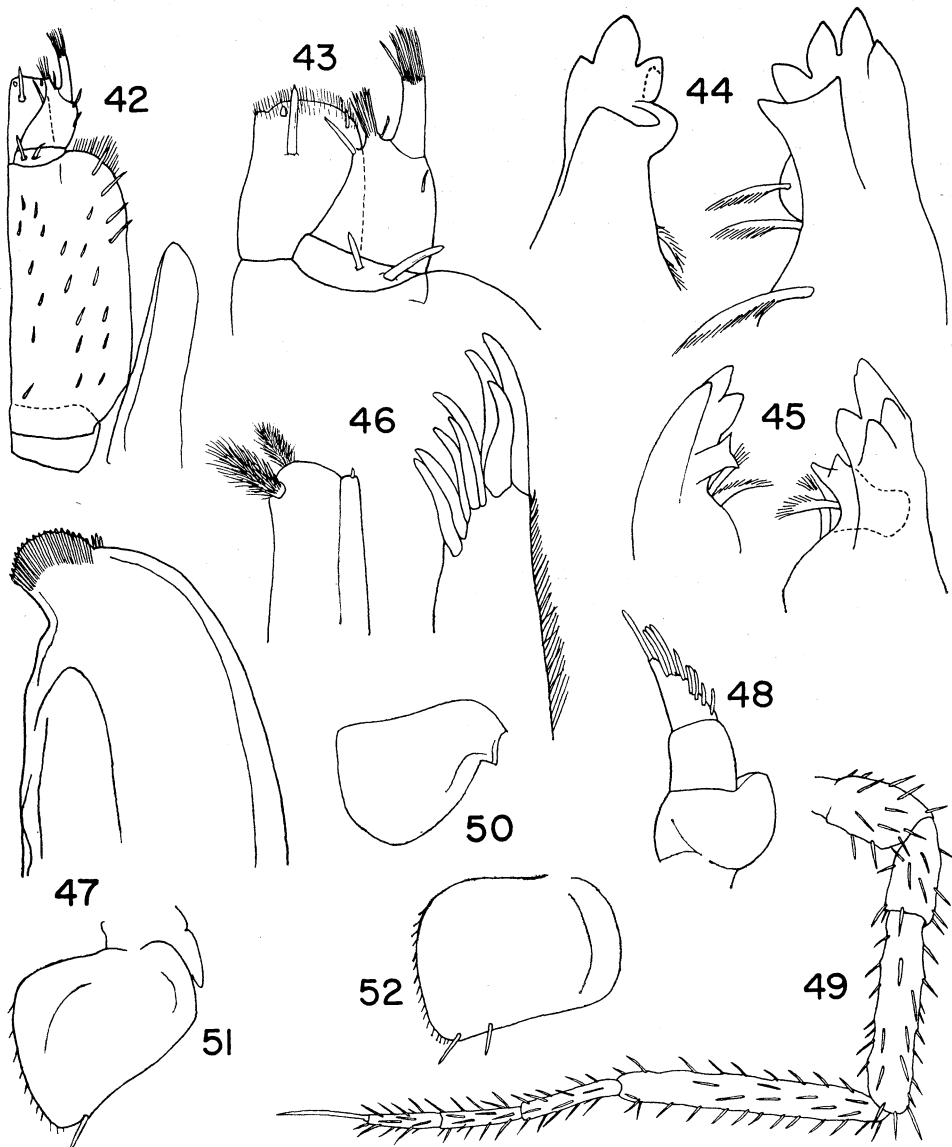


Fig. 42-52. *Haplophiloscia laevis* n. gen., n. sp.: 42, maxilliped; 43, detail palp and sensory edge maxilliped; 44, two views right mandible; 45, two views left mandible; 46, maxilla I endopod and exopod; 47, maxilla II; 48, antenna I; 49, antenna II; 50, pleopod I; 51, pleopod II; 52, pleopod III.

A superantennal line is prominent in *H. laevis* and suppressed or absent in *H. parvituberculata*. Since the species of the 2 genera are so distinct even though they both are blind and pigmentless, it is probable that they were transported to the islands in soil of potted plants before the days of plant quarantine. Most, perhaps all, of the truly terrestrial epigeal species (*Ligia hawaiiensis* Dana excluded) of terrestrial isopods are not endemic to the Hawaiian Islands. The blind, pigmentless species probably are not directly evolved from the eyed, pigmented epigeal species of Philosciidae on the islands. There has been little or no ecological study of the economically important, common widespread species of Philosciidae, members of which are very common in the subtropics and tropics let alone any study of the blind cave species of the family.

I wish to thank Mr Francis G. Howarth for sending me these specimens and many other terrestrial isopods which are to be the subject of another paper.

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