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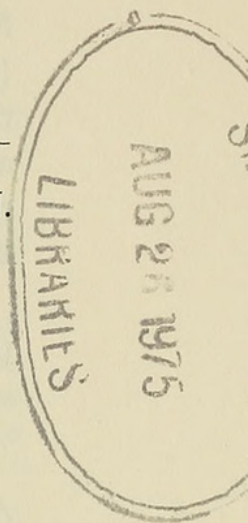
THE PYCNOGONIDA TYPES OF WILLIAM A. HILTON.
I. PHOXICHILIDIIDAE.

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William Atwood Hilton (1878-1971) proposed 66 new species of Pycnogonida in 19 papers on the group, giving mostly preliminary descriptions based primarily on eastern and northern Pacific material. Since the few published figures are poorly drawn and all of the descriptions are inadequate and in part erroneous by today's standards, it becomes increasingly necessary to redescribe and adequately figure most of his work before further Pacific taxonomic studies can proceed. The 66 species, including two pairs named twice under different genera, are deposited in three institutions: 56 types in the U.S. National Museum of Natural History (USNM); nine in the B. P. Bishop Museum, Honolulu, Hawaii (BPBM); and one in the Pomona College Museum, Claremont, California (PCM). The state of preservation for these specimens ranges from good to disintegrated with one type known to be lost. Unfortunately, many of the USNM types were at some time squashed flat under cover glass so that, although permanent slides were never made, the specimens often appear very different from fresh material of the same species. A note on the status of the type-specimen(s) will be found in the remarks under each species.

This paper is the first of three on Hilton's material. It treats 16 proposed species, including the two twice-named pairs, in the family Phoxichilidiidae. The other two papers will describe Hilton's species of the family Ammotheidae and



finally the remaining families except the Nymphonidae. The Nymphonidae have been described adequately by Hedgpeth (1949). Descriptions of the valid species will be given as if they were being described for the first time, unless subsequent authors have described the species in works cited here, and no reliance will be given upon Hilton's original descriptions except for any applicable comments in the remarks.

Half of the species treated in this section are synonyms of previously described species while the others appear to be valid or, in one case, an indeterminable juvenile.

Hilton's species	Present designation
<i>Anoplodactylus intermedius</i>	<i>Anoplodactylus batangensis</i> (Helfer)
<i>A. nodosus</i>	valid
<i>A. oculospinus</i>	valid
<i>A. pacificus</i>	valid
<i>A. projectus</i>	<i>A. portus</i> Calman
<i>A. robustus</i>	<i>A. portus</i> Calman
<i>A. unospinus</i>	<i>Phoxichilidium</i> sp. juvenile
<i>Phoxichilus compactus</i> (<i>Endeis compacta</i>)	<i>A. viridintestinalis</i> (Cole)
<i>Phoxichilidium compactum</i> (<i>Halosoma compactum</i>)	<i>A. compactus</i> (Hilton)
<i>P. micropalpidum</i>	valid
<i>P. parvum</i>	valid
<i>P. quadradentatum</i>	valid
<i>P. truncatum</i>	<i>A. robustus</i> (Dohrn)
<i>Pigrogromitus robustus</i>	<i>Pycnosoma strongylocentroti</i> Losina-Losinsky

A complete bibliography of Hilton's pycnogonid literature is given at the end of this paper, along with other literature cited. Hilton's literature will be omitted from the second and third papers as unnecessary duplication, and they will carry only other literature cited.

I wish to thank Dr. D. M. Devaney of the Bernice P. Bishop Museum, Honolulu, Hawaii, for arranging the loan of several of Hilton's Hawaiian types.

Family *Phoxichilidiidae* Sars, 1891

Genus *Anoplodactylus* Wilson, 1878

Anoplodactylus batangensis (Helfer)

Anoplodactylus intermedius Hilton, 1942d: 44–45, fig. 2.—1942f: 73.

Anoplodactylus batangensis.—Stock, 1968: 54 [literature].

Material examined: Female, holotype: Hawaiian Islands, coll. C. H. Edmondson. BPBM 4684. Hilton includes 2 other females and 2 males in his list of specimens. These were not seen.

Remarks: Hilton probably did not have access to Helfer's paper when he described this species although he seems to have ignored, at times, much of the non-American literature on the group. The species is now known to have an almost pantropical distribution. The type is in poor condition.

Anoplodactylus compactus (Hilton)

Figure 1

Phoxichilidium compactum Hilton, 1939a: 27–28.—1939b: 72.—Hedgpeth, 1941: 257 [key].

Halosoma compactum.—Marcus, 1940: 45–46 [list].—Hilton, 1942f: 74.—Hedgpeth, 1964: 205, fig. 93b.

Material examined: Juvenile, holotype: Laguna Beach, southern California, intertidal, coll. Hilton, USNM 79424. Male, paratype: Pacific Grove, Monterey Bay, California, col. Hilton. USNM 80521.

Description (paratype): Trunk only slightly longer than wide, unsegmented. Lateral processes contiguous for over half their length. Neck short, flanked by low tubercles above insertion of ovigers. Ocular tubercle large truncated cone, without spine or papillae. Eyes large, unpigmented in alcohol. Lateral processes armed with large blunt dorsodistal tubercle, about as wide as tall, each flanked by strong anterior and posterior spine. Abdomen robust, blunt, carried almost vertically, shorter than ocular segment, not extending to tips of 4th lateral processes.

Chelifores typical of genus with few scattered setae. Chela rather large, armed with few setae. Fingers as long as palm.

Oviger 6-segmented with trace of articulation proximally on 3rd segment. Second and 3rd segments subequal. Segments 4, 5, and 6 increasingly shorter, armed with setae equal to or longer than diameter of segments, on outer margins of segments.

Legs short, robust, no segment longer than 3 times its diameter. Coxae armed with few lateral and ventrodiscal setae. Coxa 2 with prominent ventrodiscal tubercle only on 4th leg, bearing genital pore, armed with tuft of setae. Femur with few scattered short setae and single long seta on short dorsodistal tubercle. Femur $\frac{1}{2}$ longer than tibiae. Femoral cement gland a very small low cup, halfway along

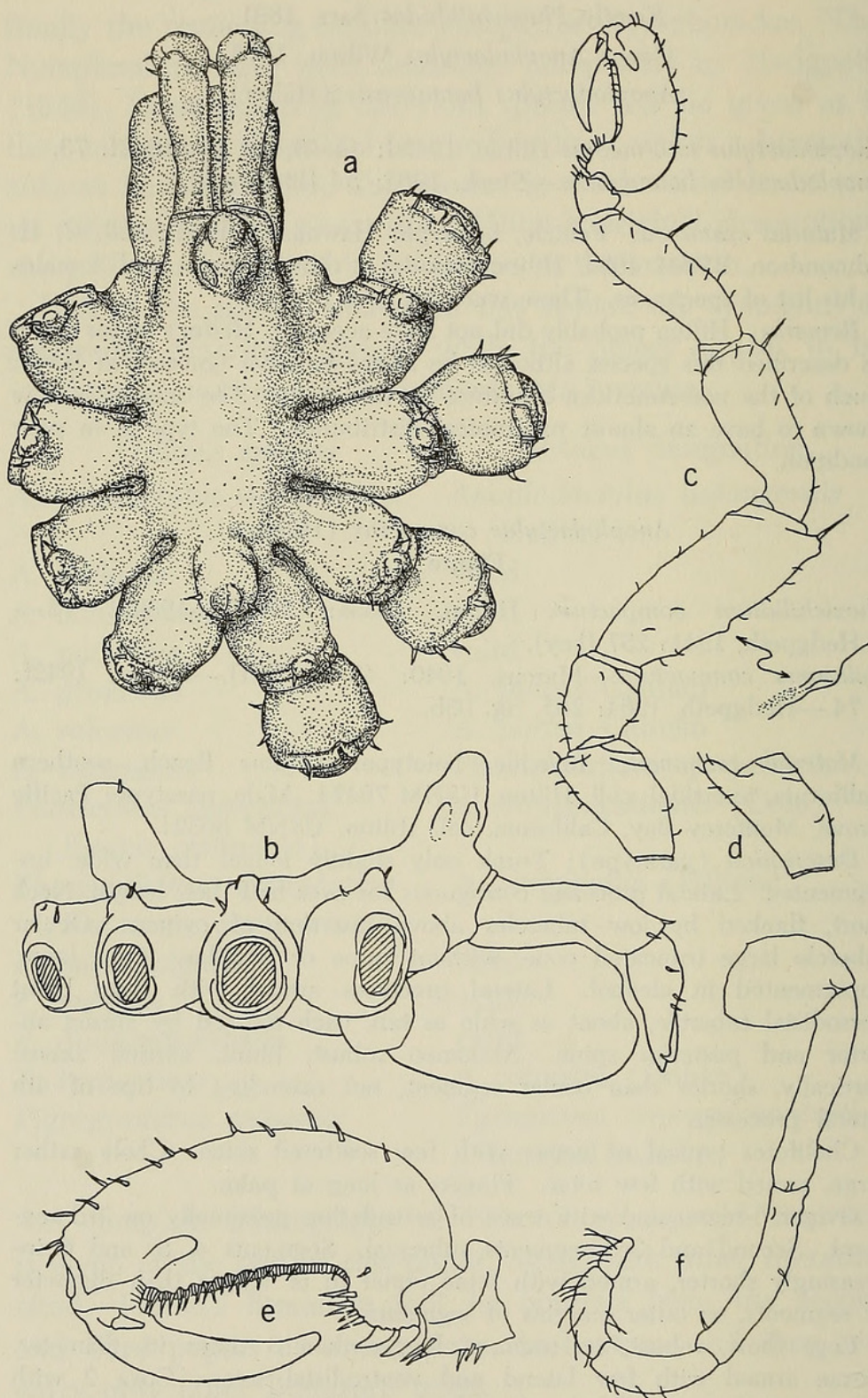


FIG. 1. *Anoplodactylus compactus*, paratype: a, Dorsal view of trunk; b, Lateral view of trunk; c, 3rd leg, femoral cement gland enlarged; d, 2nd coxa of 4th leg; e, Terminal segments of 3rd leg; f, Oviger.

segment dorsally. Tibia 1 slightly longer than tibia 2, both armed with few short dorsal and ventral setae and single long dorsal seta. Propodus with marked heel armed with 2 wide basal spines and field of 6 thin spines or setae. Sole with short spines increasing in number distally, flanking propodal lamina which extends entire length of sole. Small auxiliary claws present.

Measurements of paratype, in mm:

Trunk length (front of ocular segment to tip 4th lateral processes) ..	0.98
Trunk width (across 2nd lateral processes) .....	.88
Proboscis length (ventral) .....	.57

Third leg:		Tibia 1 .....	.59
Coxa 1	0.30	Tibia 2 .....	.58
Coxa 2 .....	.45	Tarsus .....	.13
Coxa 3 .....	.30	Propodus .....	.50
Femur .....	.72	Claw .....	.31

Distribution: Mid- and southern California coast.

Depth range: Intertidal, littoral.

Remarks: Hilton lists several specimens in his three references to this species; one from Santa Cruz Island, one from Pacific Grove, and several from Laguna Beach, one of which he named as type. His description, which is not too incorrect for this species, is based on an adult male, but for some reason he named a juvenile as the type. The holotype specimen illustrated by Hedgpeth (1964: 205, fig. 93b) shows this juvenile and does not reveal the lateral process tubercles or the propodal lamina. Unfortunately, the type has been badly damaged under a cover glass. The above redescription is based on the well preserved male paratype.

This species is superficially very much like the sympatric species, *A. viridintestinalis*. It also resembles *A. robustus* (Dohrn) (non Hilton, 1939), *A. arescus* Marcus, and other species previously synonymized under *Halosoma*. It is set apart from each of these by its prominent lateral process tubercles which make it an easily recognized species. Like others of the old *Halosoma* group, it has extremely long propodal lamina extending the length of the sole.

Anoplodactylus nodosus Hilton

Figure 2

Anoplodactylus nodosus Hilton, 1939a: 29.—Marcus, 1940: 41 [list].—Hedgpeth, 1941: 257 [key].—Hilton, 1942f: 72.

Material examined: Female, holotype, USNM 14260, and Male, paratype, USNM 124014: Catalina Harbor, Catalina Island, southern California, coll. William H. Dall, January, 1874.

Description: Female: trunk distinctly segmented except for 3rd and 4th segments. Lateral processes separated by slightly less than their

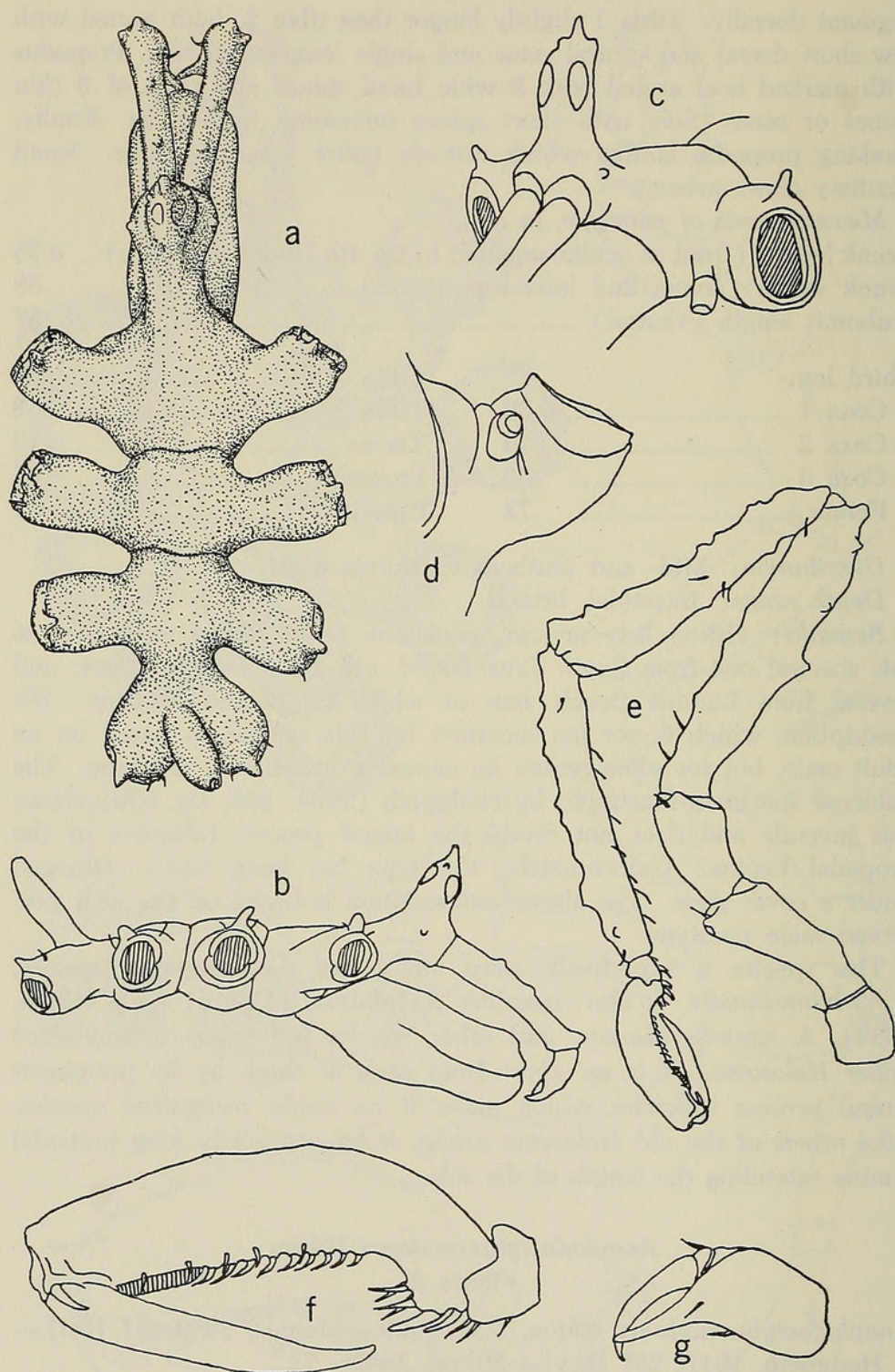


FIG. 2. *Anoplodactylus nodosus*, paratype: a, Dorsal view of trunk; b, Lateral view of trunk; c, Oblique view of trunk, anterior; d, Ventral first lateral process with oviger implantation; e, 3rd leg; f, Terminal segments of 3rd leg; g, Chela.

diameters, with thin dorsodistal tubercles flanked by single anterior and posterior setae. Ocular tubercle moderately tall, pointed, carried obliquely forward; eyes large, unpigmented, with 2 tiny (sensory?) tubercles flanking tip and 2 slightly larger tubercles flanking ocular tubercle at base. Abdomen cylindrical, glabrous, not longer than ocular tubercle, carried obliquely toward posterior, at same angle as ocular tubercle. Proboscis cylindrical, flaring at midlength.

Chelifore with scape overreaching proboscis, with 2 low tubercles along median dorsal surface and 2 dorsodistal low tubercles, glabrous. Fingers carried at slight angle to palm, overlap when closed. Palm slightly longer than fingers, armed with 3-4 short setae.

Legs of moderate length. Second coxa with raised ventrodistal tubercle bearing genital aperture, on all legs. Femur and tibiae with many small dorsal and ventral tubercles, blunt or pointed, only a few armed with seta at tip. Second tibia longest, subequal to femur. Femur and first tibia armed with several short setae laterally and ventrally. Second tibia with row of ventral short setae. Tarsus very short, with 3-4 ventral setae. Propodus long, thin, with distinct heel bearing 2 basal spines and 2 pairs of setae. Sole armed with row of curved setae flanked by several small setae. Distal propodal lamina equal to less than half sole length. Claw long, equal to length of sole. Auxiliaries present.

Male: slightly smaller than female, with female characters. Ovigera greatly reduced to single segment, as if atrophied (?). Femoral cement glands prominent on mid-dorsal surface, less than half segment diameter. Genital orifices on 2nd coxae of all available legs in same position as those of female. Propodal lamina slightly longer.

Measurements of male, in mm:

Trunk length (anterior of ocular segment to tip of fourth lateral processes)	2.36
Trunk width (across second lateral processes)	1.44
Proboscis length (laterally)	1.19
Third leg:	
Coxa 1	0.37
Coxa 2 .....	.89
Coxa 3 .....	.69
Femur	1.97
Tibia 1	1.6
Tibia 2	2.02
Tarsus .....	.16
Propodus .....	.89
Claw .....	.64

Distribution: Known only from the type-locality, Catalina Island, southern California.

Depth range: Unknown, but probably littoral or sublittoral.

Remarks: Hilton (1939a) listed the central California coast and islands as the distribution for this species, but never elaborated further on coastal records. It seems rather strange that this large species has never been collected since Dall's collection, but the pycnogonids of the California coast are less than perfectly known and even less perfectly recorded.

The male specimen may be aberrant, but if not, it contributes to the growing suspicion that some pycnogonids may be hermaphrodites or perhaps gynandromorphs. The ovigers do not appear to have been broken off, but instead assume a withered aspect or one of atrophy. The leg integument is thick, but the cement gland is complete and probably functional. No eggs can be seen in the male femur, nor is the female ovigerous. The male has definite genital pores on the four legs attached to the trunk, and they appear on all second coxae as with those of the female.

Hilton described the chelifores and legs as having more setae than they do. Very few of the leg tubercles have setae, but they may have broken off after many years in alcohol. These specimens are quite like *A. erectus*, particularly in the similar lateral process tubercles and propodus, but differ in the tuberculate legs. The type-specimens are in good condition except for the loss of some legs from each.

Anoplodactylus oculospinus Hilton

Figure 3

Anoplodactylus oculospinus Hilton, 1942f: 72-73.

Material examined: Female, holotype: Off Moss Landing, Monterey Bay, California, from rocks in 91 m, coll. E. Ricketts, no. 78.1, USNM 81494.

Description: Trunk fully segmented, covered with scattered tiny papillae. Lateral processes separated by slightly less than their diameter, armed with a pair of short thin tubercles distally, each bearing a seta, and a 3rd smaller tubercle, glabrous, between the 2 tubercles on the posterior 4 lateral processes. Neck widened laterally, almost to outer tips of 1st lateral processes. Ocular tubercle a large truncated cone capped with thin tubercle shorter than cone. Eyes large, unpigmented. Ocular tubercle flanked by pair of small lateral tubercles, each bearing single seta. Proboscis cylindrical, slightly bulbous proximally and flaring distally. Ventral proximal surface rough, but without tubercles. Abdomen short, curved posteriorly, reaching tips of 4th lateral processes, armed with distal seta.

Chelifores with low tubercles on dorsal and lateral surfaces of scape, each bearing short seta. Chela palm longer than fingers, armed with several endal setae. Fingers curved, crossing at tips, armed with field of setae proximally on immovable finger and 2-3 setae on movable finger.

Legs moderately long. First coxa with 2 dorsodistal thin tubercles matching those on lateral processes. Femur inflated, armed with few dorsal and lateral setae. First tibia slightly longer than second, armed with row of lateral setae and single long seta dorsodistally. Second tibia armed with rows of lateral and ventral setae and single long dorso-distal seta. Tarsus very short, armed with 2 ectal and 2 endal setae and

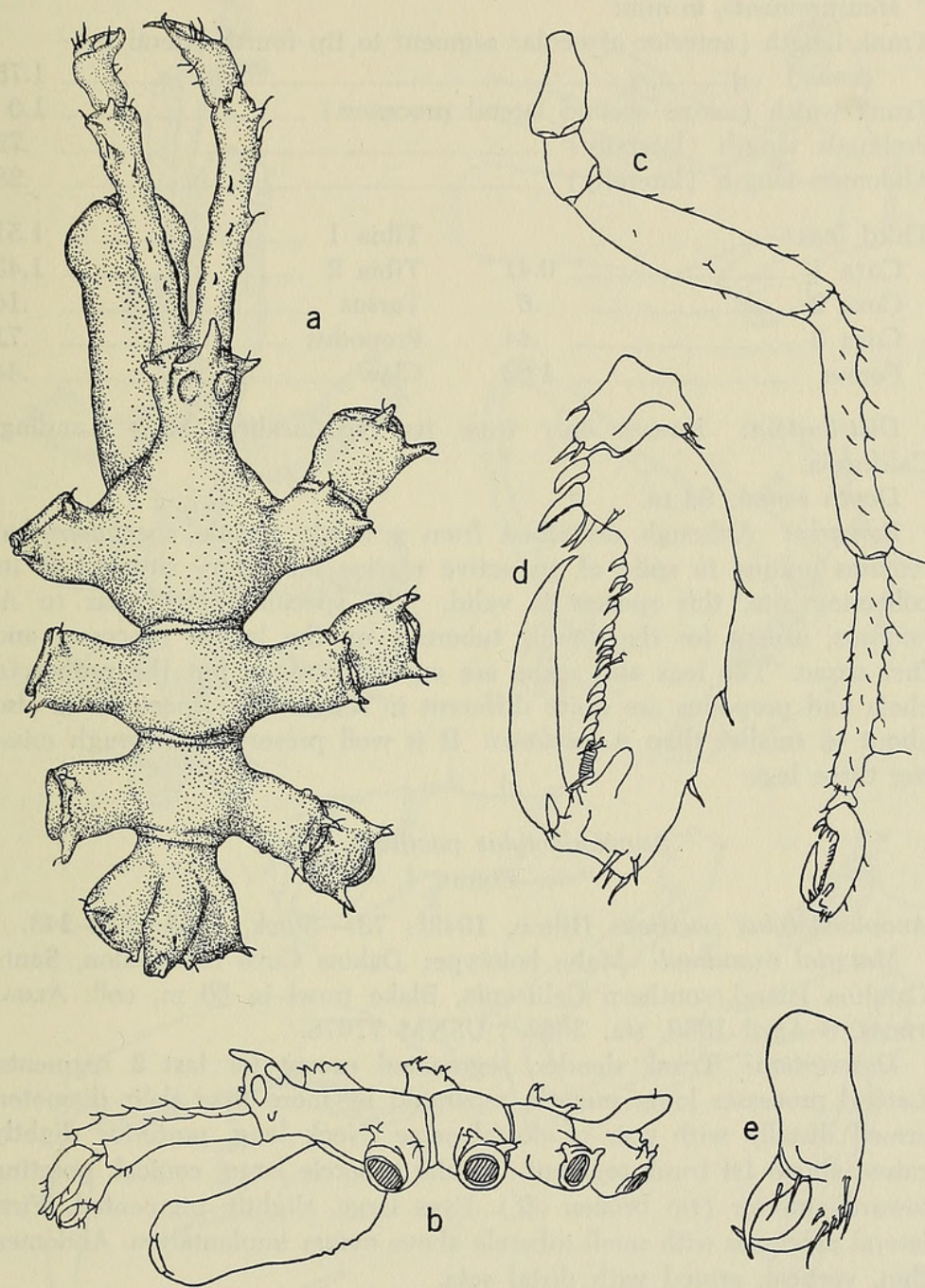


FIG. 3. *Anoplodactylus oculospinus*, holotype: a, Dorsal view of trunk; b, Lateral view of trunk; c, 3rd leg; d, Terminal segments of 3rd leg; e, Chela.

single endal spine. Propodus moderately long, with distinct heel armed with 2 curved basal spines and 2 setae. Sole with 10–11 short curved spines, flanked by 7–8 thin setae, and short propodal lamina distally. Claw robust, equal to sole length. Auxiliaries short, robust.

Measurements, in mm:

Trunk length (anterior of ocular segment to tip fourth lateral processes)	1.75
Trunk width (across second lateral processes)	1.0
Proboscis length (laterally) .....	.72
Abdomen length (laterally) .....	.28
Third leg:	
Coxa 1	0.41
Coxa 2 .....	.6
Coxa 3 .....	.44
Femur	1.62
Tibia 1	1.51
Tibia 2	1.43
Tarsus .....	.14
Propodus .....	.71
Claw .....	.44

Distribution: Known only from its type-locality, Moss Landing, California.

Depth range: 91 m.

Remarks: Although described from a single female specimen that remains unique in spite of an active marine laboratory situated at its collecting site, this species is valid. The specimen is similar to *A. nodosus*, except for the double tubercles on the lateral processes and first coxae. The legs and scape are equally nodose, but the proboscis, chela and propodus are quite different in shape. The specimen is also about $\frac{1}{3}$ smaller than *A. nodosus*. It is well preserved, although missing three legs.

Anoplodactylus pacificus Hilton

Figure 4

Anoplodactylus pacificus Hilton, 1942f: 73.—Stock, 1955: 242–243.

Material examined: Male, holotype: Dakins Cove off Avalon, Santa Catalina Island, southern California, Blake trawl in 86 m, coll. ALBATROSS, 8 April 1896, sta. 3662. USNM 77078.

Description: Trunk slender, segmented except for last 2 segments. Lateral processes long, smooth, separated by more than their diameter, armed distally with pair of dorsal setae. Neck long, posterior slightly raised above 1st trunk segment. Ocular tubercle large, conical, pointing toward anterior (tip broken off). Eyes large, slightly pigmented. First lateral processes with small tubercle above oviger implantation. Abdomen thin, vertical, armed with distal seta.

Proboscis cylindrical, curved dorsally, inflated at midlength. Mouth truncated, lips distinct.

Chelifores slender. Scape with row of dorsal setae and small tubercle at dorsodistal margin. Chela palm rectangular, with 2–3 dorsal setae. Fingers thin, as long as palm, curved, crossing at tips, armed with 8–9 dorsal and lateral setae on movable finger and single seta on immovable finger. Without teeth or spines.

Oviger thin, with 6 segments. Second segment 9 times its diameter, half as long as 3rd segment. Fourth and 5th segments subequal, half

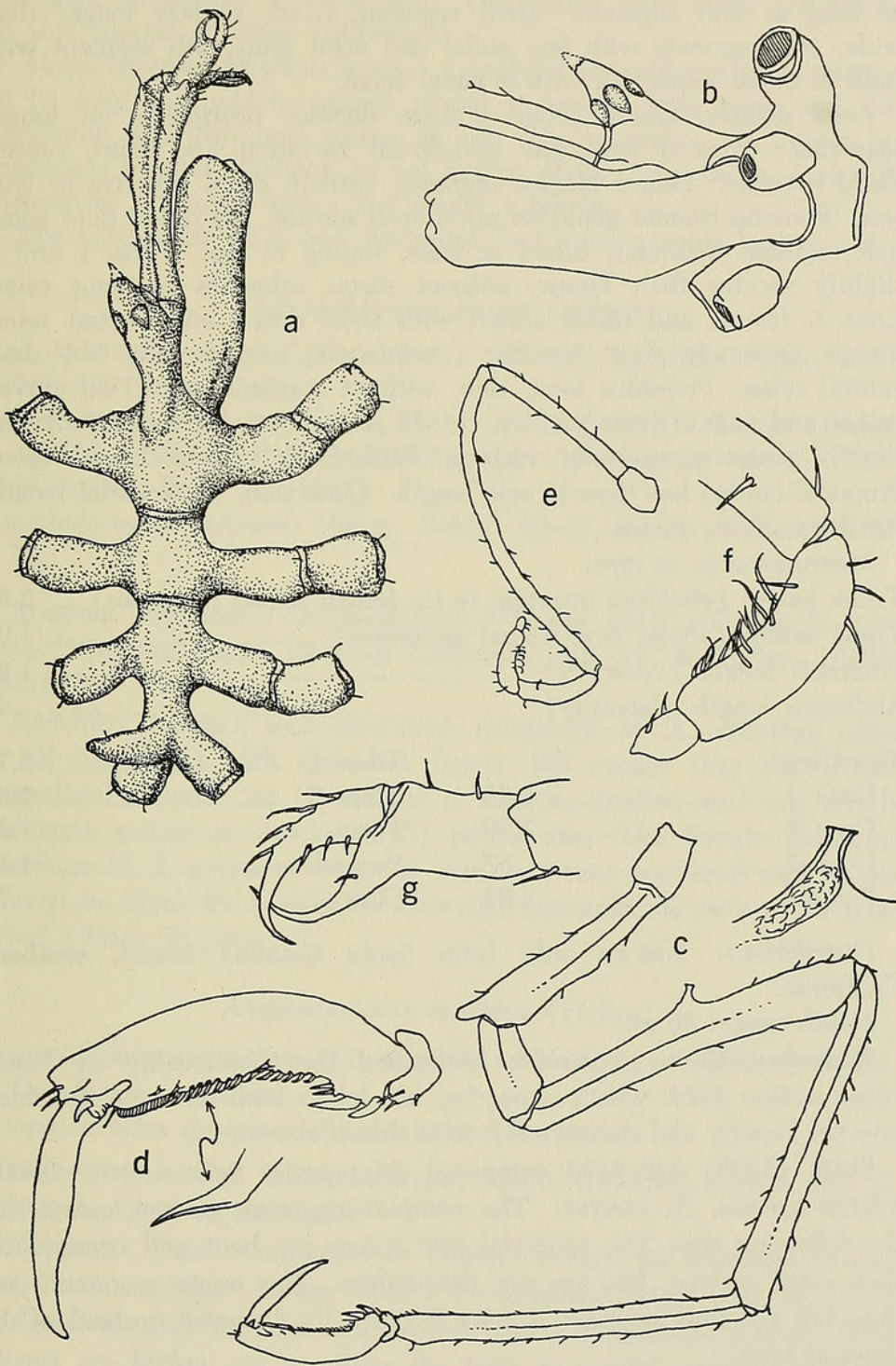


FIG. 4. *Anoplodactylus pacificus*, holotype: a, Dorsal view of trunk; b, Ventral oblique view of trunk anterior; c, 3rd leg, with enlargement of femoral cement gland; d, Terminal segments of 3rd leg, with enlargement of sole spine; e, Oviger; f, Oviger terminal segments; g, Chela.

as long as 2nd segment. Sixth segment ovoid, slightly longer than wide. All segments with few endal and ectal setae; 5th segment with field of endal setae, 6th with 2 endal setae.

Legs slender, lateral moult sutures distinct proximally on longer segments. Coxa 2 with low mid-dorsal elevation and short ventro-distal tubercle. Femur longest segment, without distal tubercle or long seta. Femoral cement gland on mid-dorsal surface, the raised duct about half segment diameter, broad at base, flaring at tip. Tibia 1 and 2 slightly shorter than femur, without distal tubercles or long setae. Coxa 2, femur, and tibiae armed with short dorsal and ventral setae. Tarsus extremely short, merely a semicircle, armed with 3-4 short ventral setae. Propodus long, thin, without marked heel. Two curved spines and pair of setae on heel, 14-15 sole spines, bent anteriorly and slightly concave on outer surface, flanked by several lateral setae. Propodal lamina less than $\frac{1}{3}$ sole length. Claw thin, $\frac{2}{3}$ propodal length. Auxiliary claws minute.

Measurements, in mm:

Trunk length (chelifore insertion to tip fourth lateral processes) ---	2.68
Trunk width (across first lateral processes) -----	1.92
Proboscis length (ventrally) -----	1.95
Abdomen length (laterally) -----	.48

Third leg:		Tibia 1 -----	2.77
Coxa 1 -----	.48	Tibia 2 -----	2.68
Coxa 2 -----	1.86	Tarsus -----	.27
Coxa 3 -----	.87	Propodus -----	1.12
Femur -----	2.82	Claw -----	.76

Distribution: Known only from Santa Catalina Island, southern California.

Depth range: 86 m.

Remarks: Hilton incorrectly published the type-locality as ALBATROSS station 4424, which is nearby, but labels with the type specimen give the locality and station number as shown above.

Stock (1955: 242-243) compared this species with a very closely related species, *A. erectus*. The comparisons were correct except for the following two. The propodal sole spines are bent and concave on their ectal surface, but are not denticulate. The oviger segments are thin, but the 2nd segment is only 9 times its diameter, instead of 12 times as long.

This species probably exists in several California collections as *A. erectus*, and has remained unrecognized because of Hilton's sketchy preliminary description. Hilton (1942f: 73) listed "lateral spines and terminal spines on the ocular tubercle." The lateral spines are missing and I can find no evidence of their ever having been present. The ocular tubercle spines (setae?) are missing because the tubercle tip

has been broken off at some time. Verification must await recognition of this species in other collections.

Anoplodactylus pacificus bears a superficial resemblance to *A. gestiens* in its long and widely spaced lateral processes, long neck and thin chelifores, and two heel spines on the thin propodus. It differs immediately from *A. gestiens*, in not having chela finger teeth, a straight cylindrical proboscis, and a low ocular tubercle.

The type-specimen is well preserved, but missing some legs.

Anoplodactylus portus Calman

Anoplodactylus portus Calman, 1927: 405-408, fig. 103.—Stock, 1955: 238-239 [literature].

Anoplodactylus robustus Hilton, 1939a: 28-29 [non *A. robustus* (Dohrn, 1881)].—Hilton, 1942b: 288-291, pl. 39.—Hilton, 1942f: 72.—Hedgpeth, 1941: 257 [key].

Anoplodactylus projectus Hilton, 1942d: 45-47, fig. 3.—Hilton, 1942f: 73.

Material examined: *Anoplodactylus robustus*, male and female, syntypes: Laguna Beach, southern California, coll. W. A. Hilton. USNM 79416.

Remarks: Hilton's well preserved specimens of *A. robustus* agree in all particulars with Calman's figure 103 except that the female dorsodistal tubercle on the femur is slightly smaller, and are clearly Calman's species as Stock (1955) points out. The female Hawaiian specimen of *A. projectus* was not seen, but was examined and synonymized by Stock for a work on Hawaiian pycnogonids soon to be published (Stock, in press).

Anoplodactylus robustus (Dohrn)

Phoxichilidium truncatum Hilton, 1942d: 48-49, fig. 5.—Hilton, 1942f: 71.—Stock, [in press].

Anoplodactylus robustus.—Stock, 1955: [literature].

Material examined: Male, holotype: Oahu, Hawaiian Islands, coll. C. H. Edmondson?. BPBM 4691.

Remarks: Close examination of Hilton's broken up specimen reveals it to be *A. robustus*. Hilton listed a 6-segmented oviger, but may have confused the 3rd segment constriction with a segmentation line. Both ovigers are broken off at either the base or second segment and are missing. Hilton also described the propodus as having three heel spines, but all legs available have two propodal heel spines with a single seta distal to the spines. The specimen has been squashed under cover glass at some time. Hilton listed five other specimens in the type lot and another from Kawaihoa, a beach on NW Oahu Island. None of these specimens were examined.

Anoplodactylus viridintestinalis (Cole)

Phoxichilus compactus Hilton, 1939a: 35.—Hedgpeth, 1941: 254 [key].

Endeis compacta Hilton, 1943b: 19.—Hedgpeth, 1952: 430.

Anoplodactylus viridintestinalis.—Stock, 1955: 239 [literature].

Material examined: Female, holotype: Dillon Beach, Marin County, California, on bryozoans, coll. O. Hartman, 20 December 1934. USNM 81529.

Remarks: Hilton was confused about this specimen. In 1939 he described it as *Phoxichilus compactus*, new species, and again in 1943 described it as another new species, *Endeis compacta*. The specimen was to be deposited in the USNM collections in 1939, but was withheld until after he had redescribed it in 1943. The single specimen is badly damaged, with the ocular tubercle and chelifores lacking. The remainder of the specimen conforms exactly with *A. viridintestinalis*. Hedgpeth (1952) was the first to recognize the specimen for what it is. It comes from Cole's type-locality.

Phoxichilidium micropalpidum Hilton

Figure 5

Phoxichilidium micropalpidum Hilton, 1942f: 72.—Hedgpeth, 1949: 283 [text].

Material examined: Male, holotype: Off Cape Monati, Bering Island, Commander Islands, Russian Arctic, 54°36'15"N., 166°57'15"E., 132 m, coll. ALBATROSS, sta. 4792, 14 June 1906. USNM 81522.

Description: Trunk completely segmented, lateral processes separated by slightly less than their diameter, without tubercles, armed distally with 1–2 setae on anterior and posterior surfaces. Ocular segment with 2–3 setae laterally just posterior to chelifore insertion. Eye tubercle cylindrical with conical apex. Eyes slightly pigmented. Proboscis cylindrical, half trunk length, slightly constricted behind mouth, oral surface convex. Abdomen small, glabrous, blunt at tip.

Scape downcurved, finely pilose distally, armed with few short setae dorsodistally. Chela of moderate size, fingers overlap when closed, palm with many fine setae distally, fringe of fine setae on ectal surface of movable finger. Fingers without teeth.

Palp a small bud anterior to and above oviger insertion.

Oviger 5-segmented, 3rd segment longest, constricted near proximal end, with scattered ectal and endal setae. Second and 5th segments equal, setose distally. Fifth segment with linear ectal, lateral, and endal setae, mostly recurved, terminal segment slightly spatulate.

Third leg long, surfaces pilose with tiny setae. First coxa slightly over half length of 3rd. Second coxa longer than 1st and 3rd together, with low dorsal swelling toward proximal end and larger ventrodistal swelling with genital pore. Femur with 4–5 low tiny ventral tubercles,

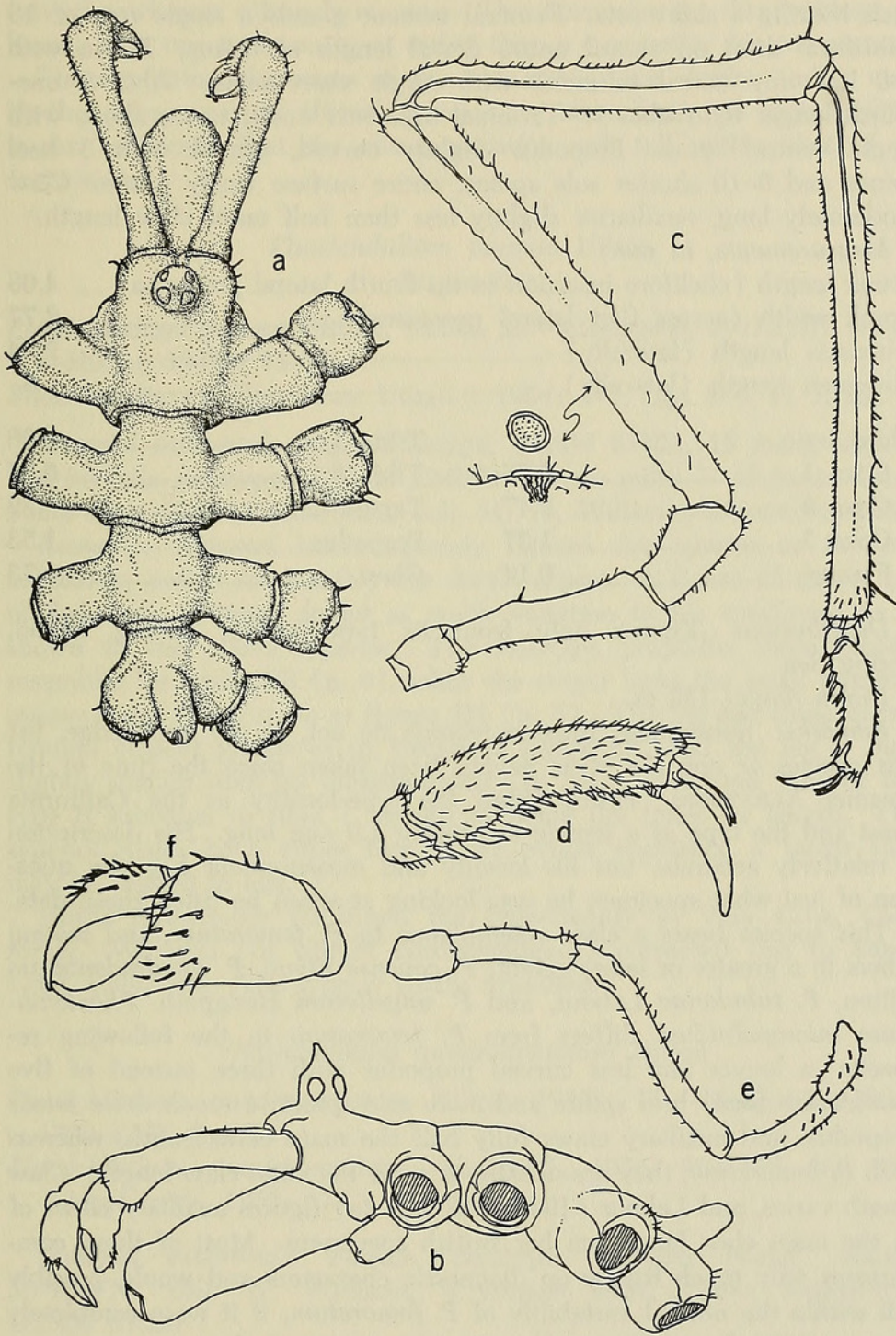


FIG. 5. *Phoxichilidium micropalpidum*, holotype: a, Dorsal view of trunk; b, Lateral view of trunk; c, 3rd leg, with enlargement of one femoral cement gland; d, Terminal segments of 3rd leg; e, Oviger; f, Chela.

each bearing a short seta. Femoral cement glands a single row of 18 cribriform discs on almost entire dorsal length of femur. Tibiae with 7-8 low tiny dorsal tubercles with single short setae. Tibia 2 one-fourth longer than tibia 1. Terminal segments small; tarsus short, with single ventral spine. Propodus slightly curved, armed with 3 heel spines and 9-10 shorter sole spines, entire surface finely pilose. Claw moderately long, auxiliaries slightly less than half main claw length.

Measurements, in mm:

Trunk length (chelifore insertion to tip fourth lateral processes)	4.08
Trunk width (across first lateral processes)	2.77
Proboscis length (laterally)	2.04
Abdomen length (laterally) .....	.5

Third leg:		Tibia 1	5.06
Coxa 1	0.78	Tibia 2	6.57
Coxa 2	2.47	Tarsus .....	.32
Coxa 3	1.37	Propodus	1.53
Femur	6.14	Claw .....	.73

Distributions Known only from its type-locality, Bering Island, Bering Sea.

Depth range: 132 m.

Remarks: Subsequent Russian records do not, to my knowledge, list this species or one like it as having been taken since the time of the Steamer ALBATROSS. Hilton listed the type-locality as the California coast and the type as a female measuring 1.9 mm long. His description is relatively accurate, but his locality and measurement beg the question of just what specimen he was looking at when he listed these data.

This species bears a close resemblance to *P. femoratum*, and several others to a greater or lesser extent; *P. capense* Flynn, *P. quadridentatum* Hilton, *P. tubulariae* Lebour, and *P. ungelatum* Hedgpeth. *Phoxichilidium micropalpidum* differs from *P. femoratum* in the following respects: a longer and less curved propodus with three instead of five (sometimes four) heel spines and more sole spines; a much more setose propodus; and auxiliary claws fully half the main claw length, whereas with *P. femoratum*, they are usually $\frac{1}{4}$ or $\frac{1}{5}$ the main claw length. Claw length varies, and Lebour (1945: 148, fig. 2a) figures auxiliary claws of $\frac{1}{3}$ the main claw length on her British specimens. Most of these comparisons only touch lightly on diagnostic characters and would possibly fall within the normal variability of *P. femoratum*, if it were completely known. Hilton's type is much more pilose over all than are specimens of *P. femoratum* examined for comparison, and its size is larger. The movable finger of *P. femoratum* is consistently more swollen than the fingers of Hilton's type, and the palp tubercles are smaller and of a different shape. The conical capped ocular tubercle is taller on *P. micropalpidum*, and the lateral processes are without tubercles. Several specimens examined of *P. femoratum* have small distal lateral process

tubercles whereas others have none. This illustrates the disadvantage of having only one type-specimen rather than a type-series for comparison.

The remaining characters of the two species are similar and it may be that when more of Hilton's species are taken from the type-locality, it can be shown that the above variation will fall within that of *P. femoratum*.

Phoxichilidium parvum Hilton

Figure 6a

Phoxichilidium parvum Hilton, 1939a: 28.—Hedgpeth, 1941: 257 [key].

—Hilton, 1942f: 71–72.

Phoxichilidium hokkaidoense Utinomi, 1954: 4–7, figs. 2–3, Pl. I, fig. 1.

Material examined: Male, holotype, USNM 81521, 18 male, female, and juvenile paratypes, USNM 124023: Three miles N of Santa Cruz, Santa Cruz County, California, coll. M. W. Williams, December, 1938.

Remarks: Utinomi has adequately figured this species as *P. hokkaidoense*, except for possibly the dorsal aspect. A figure of this is included here. Utinomi found as much variation in his specimens as is shown in the above type-lot. The holotype propodus more closely resembles his figure 3B (p. 6), while the oviger lacks the small terminal segment and is the same as figure 2H (p. 5). The leg has three dorsal femoral cement glands as in Utinomi's figure 2F, and the leg is only slightly smaller than his measurements (p. 7). The second tibia of the type is subequal to tibia 1 instead of being 0.9 times its length. The type-lot males have either five or six oviger segments, a factor that may be related to age.

Hilton erroneously published the type-locality as Vera Cruz, California. Williams (in USNM correspondence) corrected this to Santa Cruz, California. The type is partly squashed.

Phoxichilidium quadridentatum Hilton

Phoxichilidium quadridentatum Hilton, 1942f: 71.—Hedgpeth, 1963: 1336–1337, fig. 9.

Phoxichilidium quadridentatum.—Hedgpeth, 1954: 204–205, fig. 93c. —MacGinitie, 1955: 171.

Material examined: Female, holotype: Stewart Island, Alaska, 50°23.5'N., coll. W. Williams, 4 August 1937, Lewis Expedition. USNM 81520.

Remarks: Latitude 50° N is not in Alaska, but corresponds with the latitude of Stuart Island, Strait of Georgia, British Columbia, Canada. There is also a Stuart Island, Bering Sea, Alaska, but Stewart Island eludes my geographical searches. Either location falls well within the species known distribution from San Francisco, California, to Point Barrow, Alaska.

This species has been figured by Hedgpeth (1954, 1963, 1964),

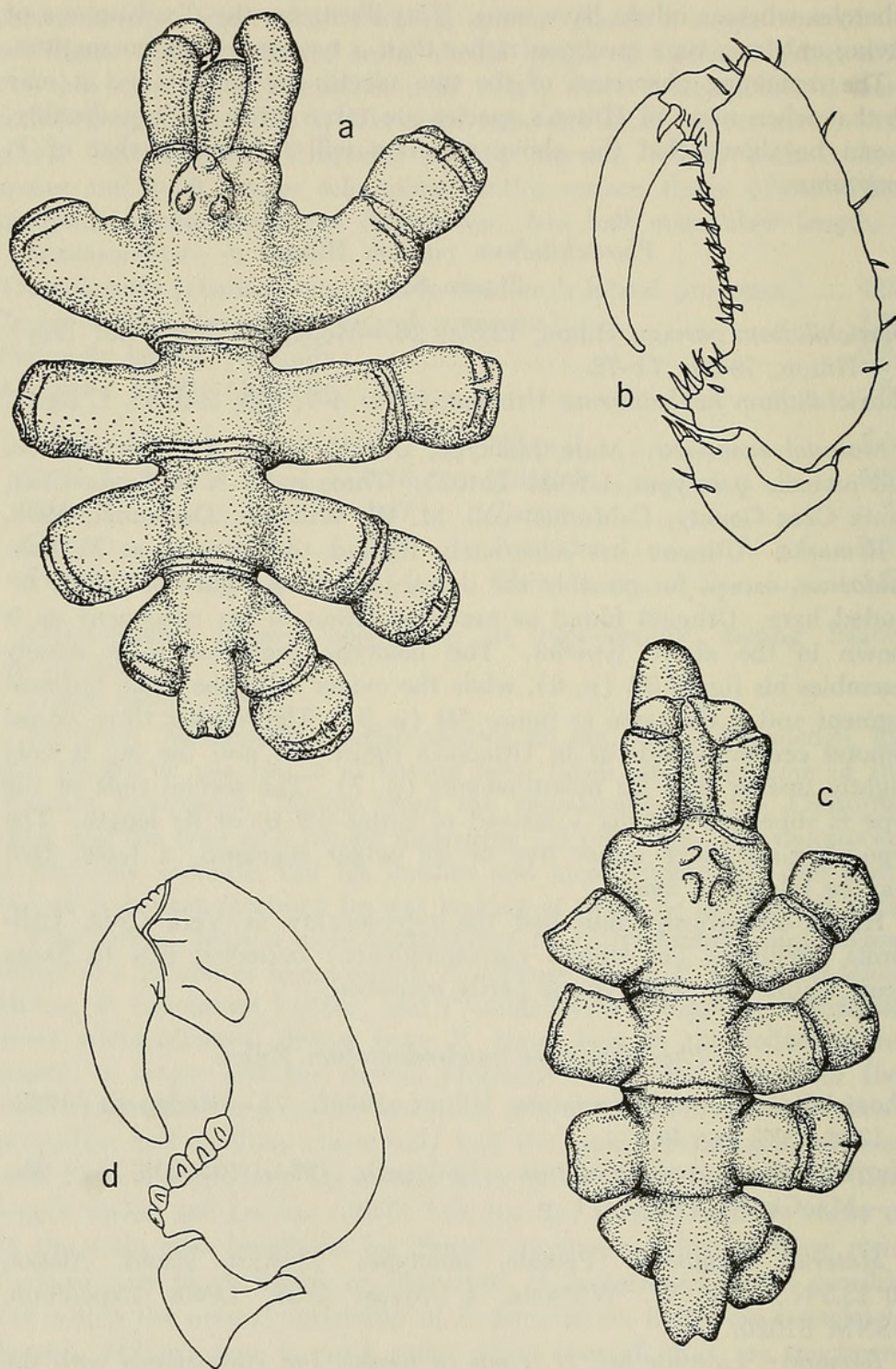


FIG. 6. a, *Phoxichilidium parvum*, holotype: Dorsal view of trunk; b, *Phoxichilidium* sp.: terminal segments of 3rd leg; c, d, *Pycnosoma stronglylocentroti*: c, Dorsal view of trunk; D, terminal segments of 3rd leg.

but his propodus figure does not show the field of many median and lateral sole spines. The spines are mostly short and thick and extend proximally to the tarsus. Other specimens identified by Hilton and Hedgpeth were examined for comparison. The four heel spines appear to be constant, but the auxiliary claws vary from minute to just less than $\frac{1}{4}$ the main claw length. The femur has from 17 to 18 tiny dorsal cement glands in a single row.

Phoxichilidium sp.

Figure 6b

Anoplodactylus unospinus Hilton, 1942f: 73.—Stock, 1955: 243 [text].

Material examined: Juvenile male, holotype: Laguna Beach, southern California, coll. W. A. Hilton, low tide, August, 1917. USNM 81530. Includes another juvenile, paratype.

Remarks: It is possible this is a new species. The holotype is probably one moult away from an adult, and has most of the characters of the genus *Phoxichilidium*. The ovigers are about $\frac{2}{3}$ formed. The specimen could be a juvenile *P. quadridentatum*, except for the single heel spine. The propodus should be fully formed by this late juvenile stage. There is no propodal lamina.

Hilton lists this species as if he described it in 1939, but no literature has been found from that year in which *A. unospinus* is listed. This may be a *lapsus* due to haste in publishing new species.

Pycnosoma strongylocentroti Losina-Losinsky

Figure 6c, d

Pycnosoma strongylocentroti Losina-Losinsky, 1933: 43–47, fig. 1.—

Hedgpeth, 1947: 7 [footnote 2].—Hedgpeth, 1949: 239 [text].—

Losina-Losinsky, 1961: 86.

Pigrogromitus robustus Hilton, 1942c: 40.

Material examined: Female, holotype: Captains Harbor, Unalaska Island, Aleutian Islands, Alaska, 16 m, coll. William H. Dall, 1874, no. 850(1189). USNM 13358.

Remarks: Losina-Losinsky has adequately illustrated (p. 45, Fig. 1) this species, but her figures do not show trunk segmentation nor do they emphasize the peculiar propodal heel spines. I have included figures of the trunk dorsally, and propodus for this reason, and because her paper is not always available to western specialists. Hilton's specimen is very robust, as his proposed name suggests, and is entirely glabrous except for the heel spines. The species superficially resembles *Pigrogromitus* in some particulars. Both genera lack palps, are robust with closely spaced lateral processes, have short and thick leg segments, and lack auxiliary claws. Hilton's specimen, as Hedgpeth (1947) pointed out, is not in the same genus because it has ovigers of six segments rather than 10, it has a one-segmented scape instead of two-

segmented, and a curved propodus with a very broad heel bearing six extremely broad blunt spines shaped like shovels. This last character alone is sufficient to distinguish *P. stronglylocentroti* (and Losina-Losinsky's other species, *P. tuberculata*) from any other pycnogonid known to me.

Losina-Losinsky's types from Tatory Strait, Russian Siberia, and Hilton's specimen from Unalaska, appear to be the only records of *P. stronglylocentroti*. The two recorded depths are 16 and 75 m.

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