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NEW SPECIES OF *COPIDOGNATHUS* (ACARI, HALACARIDAE) FROM THE ALEUTIANS¹

BY IRWIN M. NEWELL²

The genus *Copidognathus* is well represented in the marine fauna of the Aleutian Islands and the Bering Sea, but only one species, *Copidognathus pseudosetosus* Newell, 1949, has been described from this region.

In the present paper four additional species are described, one of them being of considerable interest, not only because of certain unique structural characters, but also because it is related to species that are probably widespread in tropical and subtropical seas. The appearance of this group in subarctic waters in the form of *Copidognathus kagamii*, new species, was hardly to be expected.

This paper represents the first in a series of studies that will be devoted to the arctic Halacaridae, a research project being carried out with the generous assistance, financial and otherwise, of the Office of Naval Research and the Arctic Institute of North America. Most of the material was obtained by the writer during the summer of 1948 during the course of travels in the Aleutian Islands, Bering Sea, and Arctic Ocean, but additional material has been collected by others, especially Victor B. Scheffer of the United States Fish and Wildlife Service, Capt. Charles W. Thomas of the United States Coast Guard, and Gary and Helen Daetz of Kodiak, Alaska. The writer wishes to express his gratitude to these people for their assistance.

The standard abbreviations used in the monograph on the

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² University of Hawaii, Honolulu, Hawaii.

Halacaridae of eastern North America are used here for the following frequently recurring terms:

- AD, anterodorsal plate
- AE, anterior epimeral plate
- GA, genito-anal plate
- OC, ocular plate
- P-3, palpal segment three
- PD, posterodorsal plate
- PE, posterior epimeral plate
- I-6, segment six of leg I (or tarsus I)
- III-3, segment three of leg III (or femur three)

The figures were drawn by the author with the aid of a camera lucida. Scales are available for all figures, each subdivision of the scale representing $10\ \mu$, so that a scale with one division represents $10\ \mu$, one with three divisions represents $30\ \mu$, etc. In the scales that are 10 divisions long, a slightly longer mark has been made at the $50\text{-}\mu$ point.

The holotypes and some of the paratypes are in the collection of the American Museum of Natural History.

***Copidognathus kagamili*, new species**

Figures 1-12

The following description is based on specimens from the type locality, Kagamil Pass, Islands of the Four Mountains, Aleutian Islands, Alaska.

FEMALE: Body $376\text{--}408\ \mu$ long by $201\text{--}246\ \mu$ wide, length/width = $1.66\text{--}1.87$; average $388.8\ \mu$ by $220.3\ \mu$, length/width = 1.77 (three specimens). Dorsum as described for male (fig. 2).

AE (fig. 3) almost completely smooth and devoid of pores and panels except for the two areas of rosette pores on each side just anterior and posterior to the insertion of leg II. These are typical rosette pores, with gaping ostia and prominent canaliculi. PE of each side also with two areas of rosette pores, otherwise smooth; lateral portion expanded and apparently flattened. GA with one small area of rosette pores on each side of the genital opening, and a few panels anterior to these; otherwise smooth. Chaetography unique in the presence of six to seven setae on each side of the genital opening rather than the usual three. Genital sclerites (fig. 4) with one pair of setae. Ovipositor very long, reaching nearly to anterior margin of GA. Membranous areas

greatly restricted, striae few, parallel, indistinct. Internal apodemes of AE very long, filamentous.

Tips of palpi (fig. 2) reaching to end of I-4, tip of rostrum (fig. 6) reaching to or nearly to end of P-2. Base of capitulum with deeply depressed porose panels with prominent canaliculi. Two large pairs of maxillary setae in addition to the two small pairs at the tip of the rostrum. Rostral sulcus (fig. 6) 0.52 to 0.61 as long as rostrum, average 0.57; first pair of long setae 0.00 to 0.18 of the length of the sulcus from the posterior end of the sulcus, average 0.04 (three males, two females).

In one female the following measurements were obtained (for I-3, I-5, II-3, II-5, the height is also given):

	1 + 2	3	4	5	6	AMBU- LACRUM	TOTAL
I	43 μ	102/41	33	97/32	76	24	375
II	41	72/33	26	70/26	73	29	311
III	65	68	27	81	96	33	370
IV	67	75	30	85	99	35	391

CHAETOTAXY

I				II				III				IV			
d.	v.	l.	m.	d.	v.	l.	m.	d.	v.	l.	m.	d.	v.	l.	m.
1	—	—	1	—	—	—	1	—	1	—	—	—	—	—	—
2	1	1	—	1	1	—	—	1	1	—	—	1	1	—	—
3	2	1	2	2	1	2	—	2	—	—	—	2	1	—	—
4	1	1	1	1	1	1	1	1	1	1	—	2	1	—	—
5	2	1	2	3	1	1	2	2	2	1	—	3	2	1	—
6 ^a	3	3	—	3	—	—	—	4	—	—	—	3 ^b	—	—	—

^a These figures do not include the bacillum or the parambulacral seta at the distal extremity of the tarsus. These are discussed separately in the text.

^b Rarely 4. See text.

Leg I when naturally extended about 0.81 times as long as body (three specimens). Femora I and II not swollen, 2.48 and 2.13 times longer than high. Chaetotaxy in male and female identical (figs. 9, 10, 11). I-3 and II-3 with panels which are elongated and partially subdivided (fig. 7); pores few in number, scattered, minute, and in no significant way influencing the general pattern of the cuticle. Median setae of I-5 and II-5 long, slender, appearing smooth at low magnifications, pectination visible only with oil immersion and with the most favorable optics, but nevertheless present. Parambulacral setae and bacillum normal for genus. III-3 with two dorsal and no ventral setae, IV-5 with

two dorsal setae and one ventral seta. III-3 and IV-3 paneled, but the panels less distinct than on I-3, the walls of the panels rugose. Distimedial seta of III-5 apparently smooth at magnifications below 800, but pectinations faintly visible at 1500 \times . Both III-6 and IV-6 with three setae dorsally, III-6 rarely with 4. Of eight males and six females examined, one male had four setae dorsally on III-6 of both sides, one female had four setae dorsally on III-6 of one side (other IV-6 missing), while all of the 22 third tarsi on the remaining 12 specimens had the usual three dorsal setae. However, this is a variation which must be kept in mind, not only in this species, but perhaps others as well. All tarsi with a prominent claw fossa. Median claw bidentate, the two teeth long, slender, tapering to a sharp point. All lateral claws with a delicate pecten and a prominent "accessory tooth." The latter, as the writer has pointed out in detail elsewhere (Newell, 1947, p. 104), is an illusion and does not represent a single tooth, but is simply the terminal portion of the J-shaped pecten as it appears in side view. No "accessory tooth" can be seen in a ventral view of the claw.

MALE: Body (fig. 2) 324–363 μ long by 181–207 μ wide, length/width = 1.66–1.79; average 340.9 by 195.7 μ , length/width = 1.74 (five specimens). AD with only two areas of pycnotic, greatly reduced rosette pores, the posterior one bearing the first pair of setae of the dorsal series, these being well behind the middle of the plate. Second pair of dorsal setae in OC. Corneae feebly developed, but the posterior cornea is normal for the genus, showing no sign of subdivision. Third pair of dorsal setae in PD. Costae of PD narrow but very distinct, and bearing a single row of pycnotic rosette pores (fig. 8). In a glycerine dissection of the female, a very narrow band of rudimentary rosette pores was seen on the margins of the plate as well, but this was not present in the glycerine dissection of the male, nor could it be detected readily in whole mounts of males or females in Hyrax. It was seen in one male rotated at an angle of 45° in Hyrax, however, so its presence must be considered variable. The costae themselves are also variable in extent, sometimes reaching to both ends of PD, sometimes reaching to only one or the other end. All dorsal plates prominently paneled (fig. 8).

Capitulum and legs as described for the female; no sexual dimorphism present. GA (fig. 1) roughly but faintly paneled, except in the area in front of the genital opening. An area of ro-

sette pores, these having gaping ostia, and intermediate in form between typical rosette pores and typical porose panels. Genital sclerites with four pairs of setae, the first and second of the same length, slender, tapering; third pair shortest and heaviest; fourth pair longest and slender. A small chitinous shelf behind the genital opening. Twelve or 13 setae on each side of the opening. Penis reaching nearly to anterior margin of plate. Adanal setae on dorsal surface of anal papilla, short, inconspicuous, not visible in ventral view.

REMARKS: This species is perhaps the most easily distinguishable *Copidognathus* in Alaska. Its slender body, long appendages, bold paneling of the dorsal plates, narrow costae with the pycnotic rosette pores, the posteriorly displaced setae of AD, and the long ovipositor reaching nearly to the anterior end of GA mark this unmistakably as the fourth member of that interesting group of species including *C. hummelincki* (Viets), 1936; *C. tricornata* (Lohmann), 1938; *C. adriatica* (Viets), 1940; and *C. kagamili*, new species. The last possesses a number of unusual characters, perhaps the most outstanding being the neotrichy exhibited by the female genito-anal plate. An examination of my specimens of *C. hummelincki* from Miami, Florida, shows that two females had four setae on one side and three on the other. In a third female, the second seta of AE had been duplicated on one side, so variations from the normal number of setae, on the ventral plates at least, appear to be common in this species. It should also be pointed out in connection with this that in *C. hummelincki* there are only three setae on PE, the one found at the level of the insertion of leg III in perhaps all other species of *Copidognathus* being absent. Lohmann's drawings of *C. tricornata* showed only one ventral seta on one side and two on the other (Viets, 1938, p. 131, fig. 4), but unfortunately these figures were only crude sketches, and no reliance can be placed on them. Furthermore nothing was said in the text concerning this character. *C. adriatica* is provided with the usual three ventral setae on PE, as is the case in *C. kagamili*, new species. The four species are separable as follows:

Copidognathus kagamili, new species: Second pair of dorsal setae in OC. GA of female with six to seven pairs of setae exclusive of those on the genital sclerites. Fifth pair of dorsal setae lateral to the costae. PE with four pairs of setae, three of these on the ventral surface. Ovipositor occupying about 85 per cent

of the interval between genital opening and anterior margin of GA. III-6 with four, IV-6 with three, setae dorsally. Aleutian Islands.

Copidognathus hummelincki: Second pair of dorsal setae in OC, but female with only the usual three pairs of setae on GA, or perhaps rarely four (in view of the variability noted above). PE with only three pairs of setae, two of these on ventral surface. Fifth pair of dorsal setae medial to the costae. Ovipositor occupying about 85 per cent of the interval between genital opening and anterior margin of GA. III-6 and IV-6 each with four setae dorsally. Caribbean Sea; southeast Florida.

Copidognathus adriatica: Second pair of dorsal setae not in OC but in the membranous area. Female with only the usual three pairs of setae on GA. PE with four pairs of setae. Fifth pair of dorsal setae lateral to the costae. Ovipositor occupying about 85 per cent of the interval between genital opening and anterior margin of GA. III-6 with four, IV-6 with three, setae dorsally (per Viets, 1940, p. 57, fig. 95). Adriatic Sea.

Copidognathus tricornata: Second pair of dorsal setae in membranous area. GA of female with only three pairs of setae. Chaetotaxy of PE and PD inadequately known. Ovipositor extending beyond the anterior margin of GA. III-6 and IV-6 each probably with four setae dorsally (Lohmann's sketch, published by Viets, 1938, p. 131, fig. 8, shows four dorsal setae on IV-6; in all other species thus far checked, when IV-6 has four dorsal setae, III-6 also has four). Southwest Pacific (Sydney).

The term "rostral sulcus" is introduced here for the first time, for preliminary studies by the writer show that the relative extent of this division between right and left halves of the tip of the rostrum will be of some systematic value. It is probably a relatively conservative character, being of roughly equal relative extent in closely related members of species groups. Certainly this is true in *C. kagamili*, new species, and *C. hummelincki*, for in both of these close relatives 95 to 100 per cent of the rostral sulcus is anterior to the first pair of long maxillary setae.

DISTRIBUTION: Kagamil Pass, Islands of the Four Mountains, Aleutian Islands, Alaska (latitude $52^{\circ} 56' N.$, longitude $169^{\circ} 44' W.$), female holotype at 245 feet depth. Boulder and gravel bottom covered with corals, sponges, and Hydrozoa. I. M. Newell.

Copidognathus thomasi, new species

Figures 13-37

The following description is based on specimens from Rocky Point, Kuluk Bay, Adak Island, Alaska, the type locality.

FEMALE: A large species, with a body 616-680 μ long by 337-421 μ wide, length/width = 1.54-1.83; average 639.6 by 378.4 μ , length/width = 1.70 (10 specimens, measured to the tip of AD). AD (fig. 13) with three large circular areas of rosette pores (fig. 19), the posterior two coalesced. Setae anterior to the posterior groups of rosette pores. Second pair of setae of dorsal series in the membranous area between AD and OC. OC with one large group of rosette pores, enclosing two very feebly developed corneae, more readily visible in dissections in glycerine than in whole mounts in Hyrax, the corneae not joined. There are also two refractile spots or pores on the margin of OC behind the posterior cornea. Setae 3, 4, and 5 of the dorsal series are all enclosed within PD. The third pair is in the very margin of the plate but has never been found in the membranous area. Four rows of rosette pores present, the intervening spaces paneled (fig. 20), with numerous minute pores opening into the floor of the panels. Rosette pores not well developed, the ostia wide, and the canaliculi variable in size and distribution. Costae of PD slightly swollen just anterior to the fifth pair of dorsal setae. Striae of membranous area very delicate and numerous.

Ventral plates (fig. 15) almost completely covered with prominent depressed porose panels (fig. 18). These panels differ in their appearance at deep and shallow focus, appearing to be profusely and minutely pitted at shallow focus, but at deep focus a number of distinct canaliculi appear as shown in the figure. Typical rosette pores not developed, but some of the porose panels lateral to the genital opening are quite deep. AE with three pairs of setae; PE with three setae ventrally and one dorsally. GA with the usual three pairs of long setae; a pair of small setae on the genital sclerites, and a second pair on the anal papilla. Ovipositor very short, scarcely reaching beyond the anterior end of the genital opening (fig. 15).

Capitulum (fig. 17) with two large and two small (fig. 16) pairs of maxillary setae, the proximal pair being posterior to the insertions of the palpi. Tip of rostrum reaching to end of P-2. Palpi and chelicerae as shown in figures 23 and 24. Base of capitulum covered with depressed porose panels.

Rostral sulcus 0.66 to 0.72 as long as rostrum, average 0.69; first pair of long maxillary setae 0.34 to 0.38 of the length of the sulcus from the posterior end of the sulcus, average 0.36 (three males, three females).

In one female the following measurements were obtained (for I-3, I-5, II-3, II-5 the height is also given):

	1 + 2	3	4	5	6	AMBU- LACRUM	TOTAL
I	62 μ	152/72	50	145/44	93	33	535
II	81	137/59	46	128/43	110	38	540
III	114	129	52	139	131	38	603
IV	122	146	52	143	134	55	652

CHAETOTAXY

	I				II				III				IV			
	d.	v.	l.	m.	d.	v.	l.	m.	d.	v.	l.	m.	d.	v.	l.	m.
1	—	—	—	1	—	—	—	1	—	1	—	—	—	—	—	—
2	1	1	—	—	1	1	—	—	1	1	—	—	1	1	—	—
3	3	1	1	—	3	1	1	—	2	—	—	—	2	1	—	—
4	1	1	1	1	1	1	1	1	2	1	—	—	2	1	—	—
5	3	1	1	2	3	1	1	2	2	2	1	—	2	2	1	—
6	3	3	—	—	3	—	—	—	4	—	—	—	3	—	—	—

Leg I (fig. 21), when naturally extended, about 0.65 to 0.75 times as long as the body (4 specimens). Femora I and II not swollen, 2.11 and 2.32 times as long as high, no lamellae present, prominently paneled, the panels profusely marked with minute cuticular canals (fig. 26). Remainder of segments of legs I and II with numerous canaliculi, but paneling only feebly developed at most. Medial setae of I-5 distinctly pectinate and, as is the ventral seta (fig. 27), guarded at the base by a projection of the cuticle (fig. 28). I-6 with the usual three dorsal and three ventral setae in addition to the bacillum and the divaricate parambulacral setae. The distiventral setae are closely applied to the end of the tarsus. Bacillum on lateral membrane of the moderately developed claw fossa. Just anterior to the bacillum is apparently a rudimentary alveolus (dotted structure in fig. 29), provided with a cuticular canal, and evidently the homologue of the prebacillum. No seta is evident, however. Median claw well developed, bidentate; lateral claws pectinate, and with an apparent "accessory tooth." Leg II like I except for the differences noted in the tables. Also the cuticular processes at the bases of the ventral and medial setae of II-5 are not so well developed as those on I-5, and the

prebacillar rudiment on I-6 is absent. Divaricate parambulacral setae present as on I-6. III-1, IV-1, III-3, and IV-3 moderately paneled, and other segments distinctly porose. III-3 with no ventral seta. Ventromedial seta of III-5 very heavy and faintly pectinate. In addition to the four dorsal setae of III-6 (fig. 22), there are the parambulacral setae, the lateral one rather bacilli-form, long, reaching to the end of the median claw, the median one shorter, stouter, and possibly palmate. IV-5 with distimedial seta elongate, smooth, not pectinate. IV-6 with both parambulacral setae stout; only three dorsal setae.

MALE: Resembling the female in nearly all respects noted above, except structure of GA. Body somewhat smaller, 590–629 μ long by 337–389 μ wide, length/width = 1.62–1.83; average 611.1 by 349.9 μ , length/width = 1.75 (7 specimens). Distidorsal setae of III-3 faintly pectinate, but chaetotaxy of legs and capitulum essentially identical in male and female; posterior maxillary setae in same position in both sexes.

GA (fig. 14) like that of the female in outline, differing chiefly in the form of the genital opening and the chaetotaxy. Genital opening surrounded by about 50 long, slender setae (fig. 25); genital sclerites with the usual four pairs of setae, the anterior two pairs long and reaching to or nearly to the ends of the genital sclerites. Rosette pores absent, but cuticle marked with prominent porose panels of a complex nature, as in the case of the female. At low focus there are a number of discrete canaliculi in each panel (fig. 30), but the external ends of the canaliculi appear to be branched or distorted. The panel indicated by the arrow in figure 30 has been redrawn separately in figure 31 in which the deep focus image is represented by the seven dotted circles, while the shallow focus image is shown in solid black. Finally, the canaliculus indicated by the arrow in figure 31 has been drawn at several different levels below the surface of the cuticle (figs. 32 to 37), showing its approximate appearance in glycerine at six levels (0, 1, 2, 3, 4, 5 μ). While their small size and diffraction images obtained make it difficult to study and interpret these canaliculi, it is evident that their openings are either multiple or enlarged, and usually both types of modification are found in a single panel. The canaliculi appear larger in Hyrax preparations than in glycerine, doubtless owing to differences in relative refractive indices of mountant and cuticle.

REMARKS: This species is named for Capt. Charles W. Thomas,

commanding officer of the United States Coast Guard Cutter "Northwind" during that ship's Arctic cruise of 1948. It was his sincere interest in marine biology and oceanography that enabled me to procure valuable deep-water collections in the Arctic Ocean, Bering Sea, and Gulf of Alaska. Several of these were obtained by Captain Thomas himself after the writer had left the ship.

This species is one of the largest in the genus and is over half again the size of the largest species seen to date by the writer.

DISTRIBUTION: Rocky Point, Kuluk Bay, Adak Island, Alaska (latitude $51^{\circ} 51' N.$, longitude $176^{\circ} 36' W.$). Intertidal, on mixed red algae. I. M. Newell.

***Copidognathus punctatus*, new species**

Figures 39–54

The description is based on specimens from Rocky Point, Kuluk Bay, Adak Island, Alaska, the type locality.

FEMALE: Body (fig. 42) as in male, 382–434 μ long by 227–253 μ wide, length/width = 1.64–1.80; average 410.2 μ by 236.5 μ , length/width = 1.74 (nine specimens). Sides and posterior margin of AD relatively straight; a pair of prominent pores just anterior to the setae. Second pair of setae of dorsal series in the membranous area between AD and OC. OC with a pore and a transversely oriented refractile spot posterior to the irregular and sometimes indistinct corneae. Setae 3, 4, and 5 of dorsal series all in PD. Costae absent, but lateral portions of plate usually deflected downward sharply, forming a distinct line, but this is always lateral to the setae, whereas true costae are medial to the setae. All dorsal plates profusely and uniformly marked with minute cuticular canals (fig. 39); paneling sometimes feebly developed, but more often absent. Membranous areas restricted, marked with prominent parallel striae which only rarely anastomose.

GA elongate, nearly parallel sided, the three pairs of long setae all well behind the middle of the plate. Genital opening displaced far posteriorly, the tips of the genital sclerites reaching beyond the anus (fig. 43). AE (fig. 42), PE, and GA completely devoid of rosette pores, uniformly canaliculate like AD and PD, paneling feebly developed when present. PE with three ventral setae and one dorsal.

Tip of rostrum (fig. 51) not reaching to end of P-2. Two pairs of large maxillary setae, and two pairs of small ones near the end of the rostrum. Base of capitulum and most of rostrum minutely punctate. Rostral sulcus 0.65 to 0.77 as long as rostrum, average 0.73; first pair of long maxillary setae 0.39 to 0.62 the length of the sulcus from the posterior end of the sulcus, average 0.50 (two males, three females). Legs as in male.

MALE: Resembling the female in most respects except the characters of GA. Body (fig. 38) 408–415 μ long by 220–246 μ wide, length/width = 1.66–1.85; average 410.2 by 235.2, length/width = 1.75. GA (figs. 50, 54) of same relative extent as in female, but genital opening not displaced so far posteriorly, and surrounded by about 12 setae on each side. Genital sclerites with the usual four pairs of setae, the anterior two pairs somewhat more slender and tapering than the last two which are spiniform. Cuticle as described for the female (figs. 39, 40). Capitulum (fig. 41) as described for female, except that the posterior maxillary setae are relatively farther from the base of the palp (two specimens). Palpi and chelicerae as shown in figures 47 and 53.

In one male the dorsal lengths of the various leg segments were as follows (for I-3, I-5, II-3, II-5, the height is also given):

	1 + 2	3	4	5	6	AMBU- LACRUM	TOTAL
I	44 μ	68/43	27	70/26	41	17	267
II	46	62/35	24	56/27	50	24	262
III	67	56	26	62	58	26	295
IV	70	58	26	60	56	26	296

CHAETOTAXY

	I				II				III				IV			
	d.	v.	l.	m.	d.	v.	l.	m.	d.	v.	l.	m.	d.	v.	l.	m.
1	—	—	—	1	—	—	—	1	—	1	—	—	—	—	—	—
2	1	1	—	—	1	1	—	—	1	1	—	—	1	1	—	—
3	3	1	1	—	3	1	1	—	2	—	—	—	2	—	—	—
4	1	1	1	1	1	1	1	1	1	1	1	—	2	1	—	—
5	2	1	2	2	3	1	1	2	2	2	1	—	2	2	1	—
6	3	3	—	—	3	—	—	—	4	—	—	—	3	—	—	—

Leg I, when naturally extended, about 0.58 to 0.62 times as long as body (three specimens). Femora I and II swollen, only 1.59 and 1.77 times as long as high, no lamellae or keels present, paneling feebly developed, the panels small when present. Cuticle of leg segments minutely canaliculate (fig. 48), the canaliculi

smaller than those on the body plates. Ventromedial setae of I-5 and II-5 pectinate, also the seta on III-5 (figs. 45, 44, 46).

Positions of pectinate setae of I-5 and II-5 somewhat variable, but usually as shown in the figures. Chaetotaxy of I-6 and II-6 typical for the genus, and as described for *Copidognathus thomasi*, new species, except that no rudimentary prebacillar alveolus was found. III-3 and IV-3 with only two setae, these dorsal in position. In all favorably oriented specimens, two setae were found on III-3, but in some that were not so favorably oriented, only one was found. However, one of the setae is so small (fig. 46) that it might easily escape detection. Its alveolus is considerably smaller than usual, also, making it doubly difficult to find. III-6 with four, IV-6 with three, setae dorsally. Parambulacral setae of III-6 (fig. 52) differing considerably in form, the medial one slender, bacilliform, the lateral one much shorter, spiniform, and pectinate (ventral view, fig. 49). On IV-6, both parambulacral setae are flattened and coarsely pectinate; this is also true of the female. All tarsi with fossa and lateral membranes, all claws distinctly pectinate and with an apparent "accessory tooth." Median claws small, bidentate.

REMARKS: This species varies appreciably in the degree of development of the paneling, some individuals appearing completely unpaneled, while in others paneling is clearly evident, although never prominent as, for example, in *Copidognathus thomasi*, new species. Both sexes show this variability.

DISTRIBUTION: Rocky Point, Kuluk Bay, Adak Island, Alaska (latitude 51° 51' N., longitude 176° 36' W.). Intertidal, on mixed red algae. I. M. Newell.

***Copidognathus parapunctatus*, new species**

Figure 38

This species is very similar to *Copidognathus punctatus*, new species, in many respects, and for a while the writer had considered it a simple variant. However, close study shows that there are a number of consistent differences between these two forms, and once these have been detected, the two species can be separated quickly and with certainty. Only a brief diagnosis will be given here, pointing out the critical characters which can be used to differentiate the new species from *C. punctatus*.

AD marked with widely spaced porose panels, not uni-

formly punctate. Dorsal plates usually, if not always, closer together than in *C. punctatus*. I-3 and I-5 more heavily paneled, relatively shorter and higher, I-5 and II-5 more distinctly clavate than in *C. punctatus*. Dorsal setae of III-6 always more widely separated, the distance from the base of the tarsus to the first seta between one and two times as great as the distance from the first seta to the second. In *C. punctatus* (fig. 46), the ratio of these respective distances is about 3:1 and usually greater.

DISTRIBUTION: Attu Island, Alaska, 1.5 miles northeast of Alexai Point, female holotype. Intertidal, on red algae. I. M. Newell.

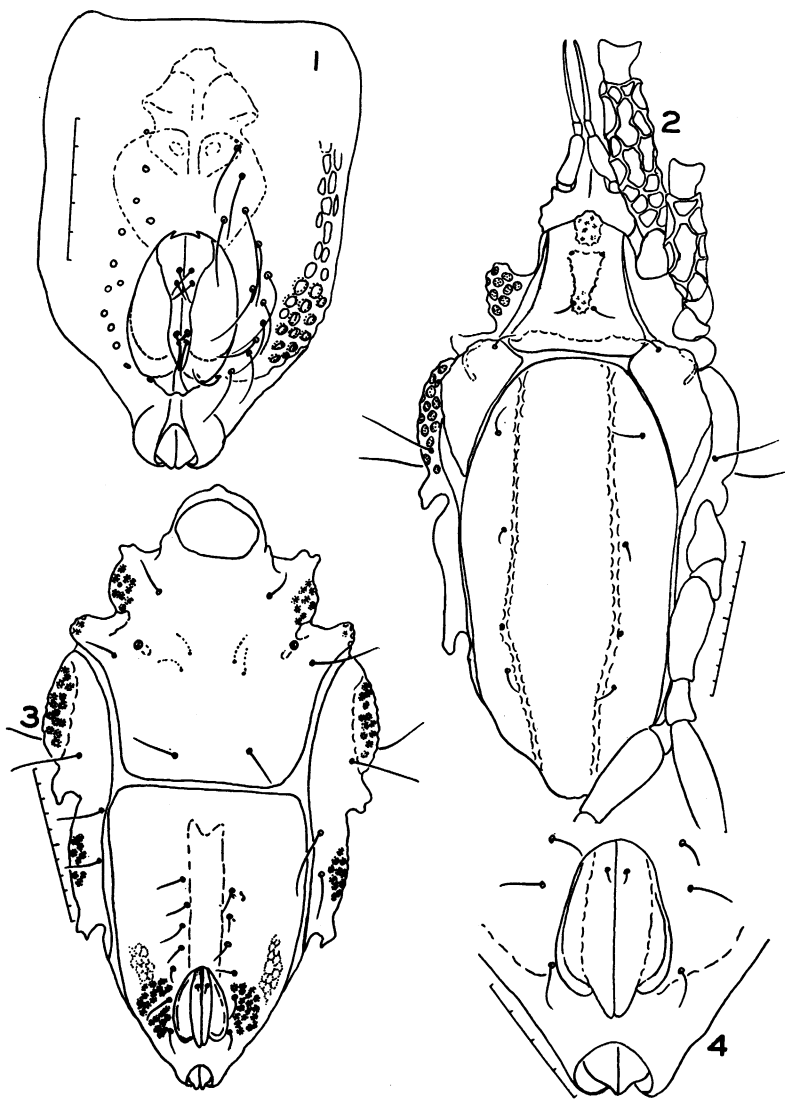
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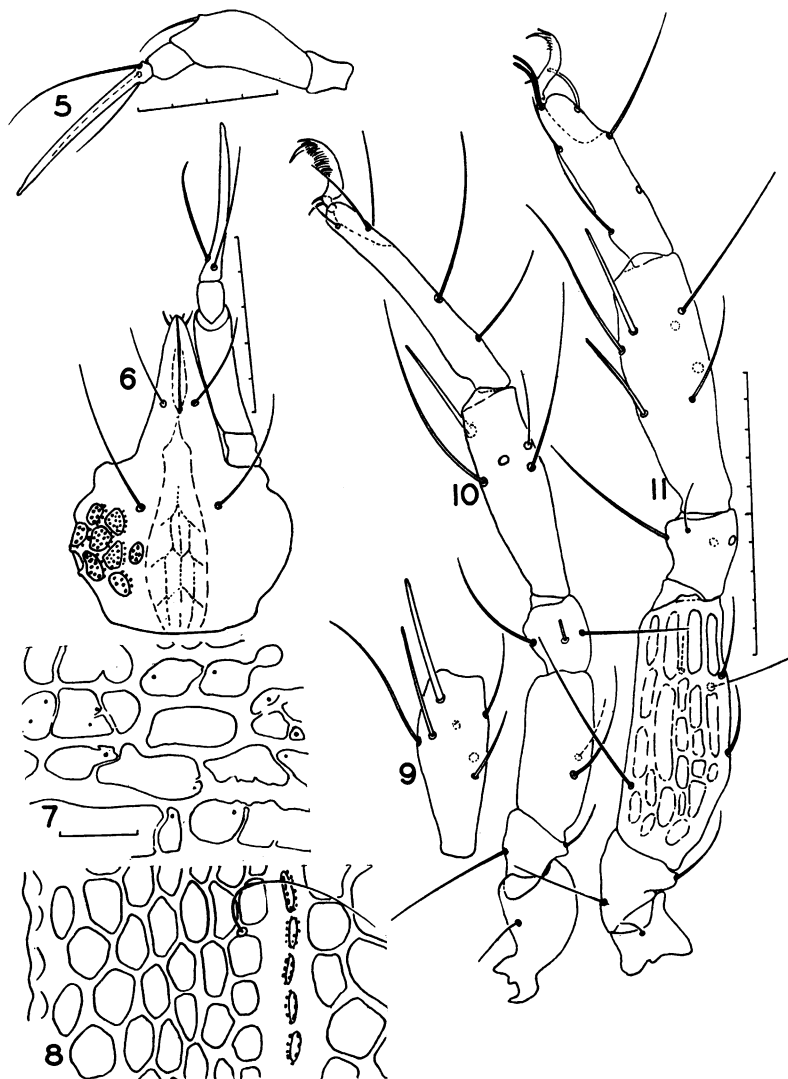
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FIGS. 1-4. *Copidognathus kagamili*, new species. 1. Male, GA. 2. Male, dorsum. 3. Female, venter. 4. Female, genital area.



FIGS. 5-11. *Copidognathus kagamili*, new species. 5. Female, palp. 6. Female, capitulum. 7. Female, paneling on I-3. 8. Male, PD at level of left fourth dorsal seta, same scale as figure 7. 9. Male, II-5, medial view, same scale as figures 10 and 11. 10. Male, leg III, lateral. 11. Male, leg I, medial.

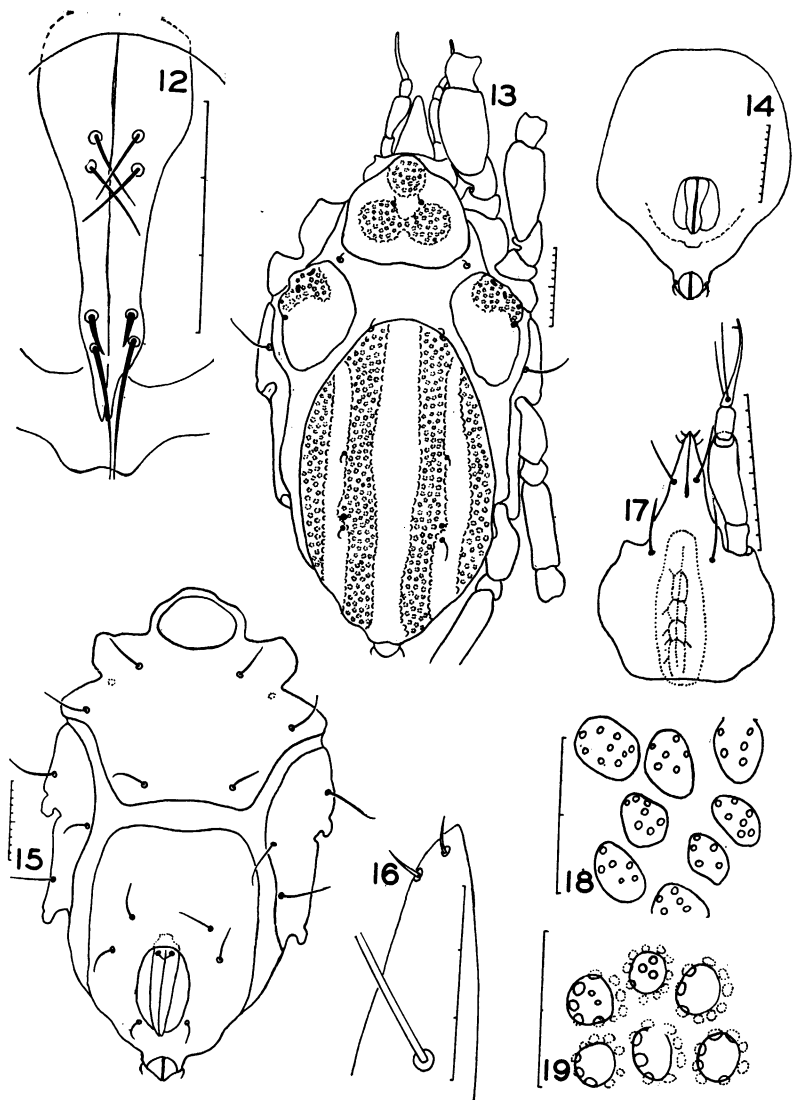
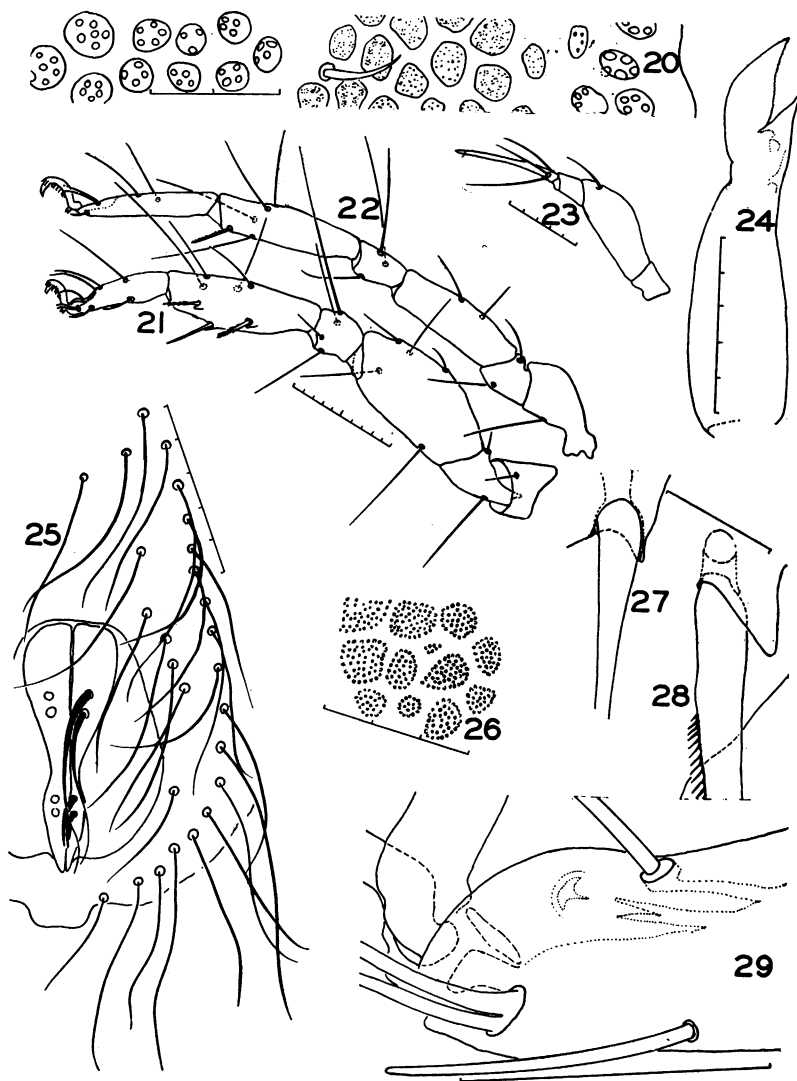
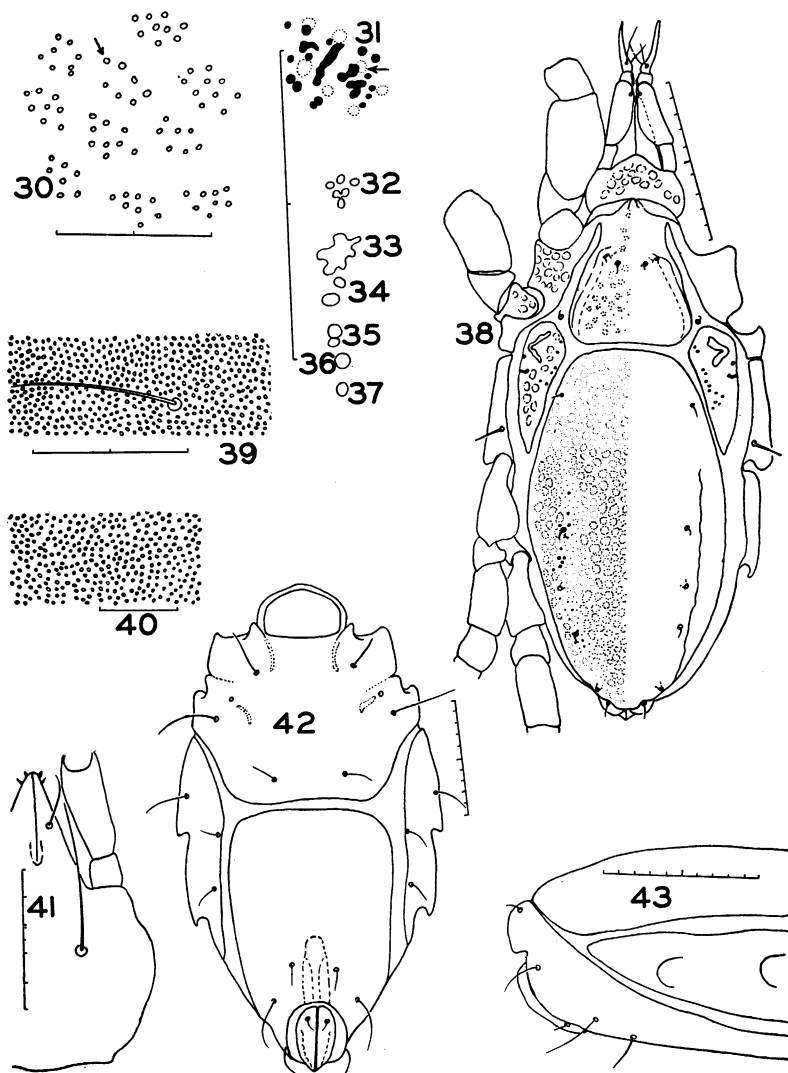


FIG. 12. *Copidognathus kagamili*, new species. Male, genital opening.

FIGS. 13-19. *Copidognathus thomasi*, new species. 13. Female, dorsum. 14. Male, GA. 15. Female, venter. 16. Female, right half of tip of rostrum, ventral view. 17. Female, capitulum, ventral view. 18. Female, porose panels near middle of AE. 19. Female, rosette pores of AD.



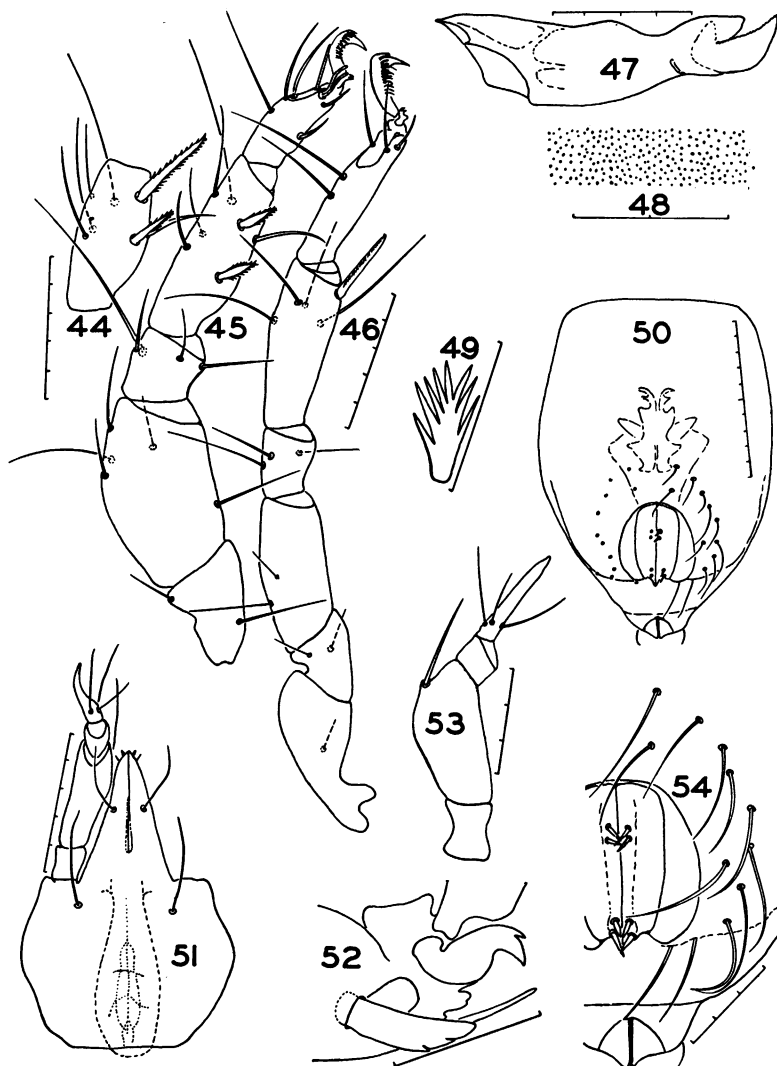
FIGS. 20-29. *Copidognathus thomasi*, new species. 20. Female, PD at level of fourth dorsal seta. 21. Female, leg I, medial view. 22. Female, leg III, medial view, same scale as figure 21. 23. Female, palp, medial view. 24. Female, chelicera. 25. Male, genital area. 26. Female, porose panels of I-3. 27. Female, ventral seta of I-5. 28. Female, posterior medial seta of I-5. 29. Female, II-6, lateral view.



FIGS. 30-37. *Copidognathus thomasi*, new species. 30. Male, porose panels of GA at deep focus. 31. Male, porose panel indicated by arrow in figure 30; explanation in text. 32-37. Male, pore indicated by arrow in figure 31, drawn at progressively deeper focus; explanation in text.

FIG. 38. *Copidognathus parapunctatus*, new species. Male, dorsum.

FIGS. 39-43. *Copidognathus punctatus*, new species. 39. Female, cuticular detail at level of fourth dorsal seta. 40. Female, AE near middle of plate. 41. Male, capitulum, ventral view. 42. Female, venter. 43. Female, lateral view of end of body.



FIGS. 44-54. *Copidognathus punctatus*, new species. 44. Male, II-5. 45. Male, leg I. 46. Male, leg III. 47. Male, chelicera. 48. Male, cuticular details, I-3. 49. Female, medial parambulacral seta of III-6, ventral view. 50. Male, GA. 51. Female, capitulum, ventral view. 52. Male, III-6, lateral view. 53. Male, palp. 54. Male, genital area.

