

# BULLETIN OF MARINE SCIENCE OF THE GULF AND CARIBBEAN

VOLUME 14

1964

NUMBER 4

## *HARPACTICUS PULEX*, A NEW SPECIES OF COPEPOD FROM THE SKIN OF A PORPOISE AND A MANATEE IN FLORIDA

ARTHUR G. HUMES

*Boston University, Boston, Massachusetts*

### ABSTRACT

*Harpacticus pulex*, n. sp., a harpacticoid copepod, is described from the sloughed skin tissue of a porpoise, *Tursiops truncatus*, and a manatee, *Trichechus manatus latirostris*, both confined in the Seaquarium at Miami, Florida. Whether or not these copepods are associated with the mammals in the wild, unconfined state is unknown.

In September, 1962, a porpoise at the Seaquarium, a public aquarium at Miami, Florida, showed large ulcerated areas on the skin with much sloughing of tissue. These areas were spreading with astonishing rapidity. Since the victim was a highly trained porpoise, special efforts were made to determine the cause of this condition. A sample of the sloughed tissue, along with mucoid strands, was collected by officials of the Seaquarium and sent to Dr. Frederick M. Bayer, of the Institute of Marine Science, University of Miami, who in turn sent it to me. In this sample there were several hundred harpacticoid copepods of the genus *Harpacticus* belonging to the new species described below.

In February, 1963, a manatee at the Seaquarium developed an infection which, during treatment, became infested with the same species of copepod. The number of copepods in this instance, however, was much smaller.

This work was supported by a grant from the National Science Foundation. I wish to thank the officials of the Seaquarium and Dr. Bayer for making these specimens available to me for study. I also acknowledge the aid given by Dr. Richard U. Gooding in connection with certain bibliographic references.

### ***Harpacticus pulex*, n. sp.**

*Type material*.—99 females and 45 males from the sloughed surface of the skin of a porpoise, *Tursiops truncatus* (Montague), sex unknown, in the Seaquarium at Miami, Florida. Collected September 17, 1962. HOLO-

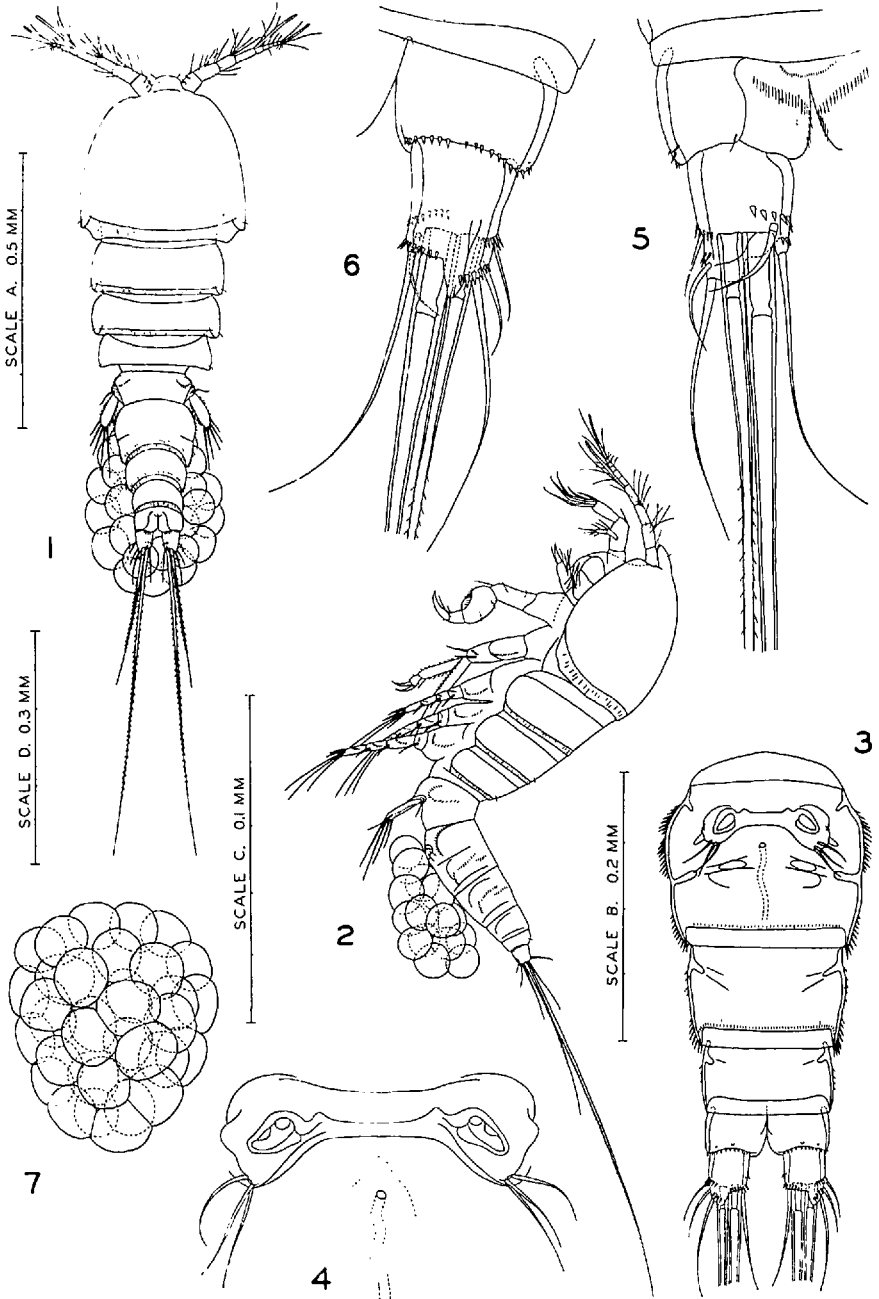
TYPE female, ALLOTYPE male, and 90 PARATYPES (60 females and 30 males) deposited in the United States National Museum. The remaining paratypes, including numerous specimens still entangled in the sloughed tissue and mucus, in the author's collection.

*Other specimens.*—12 females and 2 males from the infected skin of a manatee, *Trichechus manatus latirostris* (Harlan), sex unknown, also in the Seaquarium. Collected February 7, 1963.

*Female.*—The body (Figs. 1 and 2) has in general a harpacticid form, although the cephalosome is relatively broader and less tapered anteriorly than in other species. The size (based on 10 specimens and not including the setae on the caudal rami) is 0.88 mm (0.84-0.94 mm)  $\times$  0.30 mm (0.28-0.32 mm), the width being taken at the broadest level of the prosome. The segment bearing leg 1 seems to be completely fused to the head region with no indication of separation dorsally or laterally. The posterior epimeral areas of the segments of legs 1-4 are slightly produced (noticeably on the segment of leg 4) and each bears a pair of dorsolateral hairs.

The segment of leg 5 bears on each side a crescentic row of minute spinules. The genital segment (Fig. 3) is wider than long,  $116 \times 159 \mu$ , and is slightly indented on each side, at which point there is an internal sclerotization, giving a bipartite appearance to the segment. Both anterior and posterior portions of the segment bear lateral rows of spinules. The posterior portion bears in addition ventrally a transverse row of very small spinules and dorsolaterally two rows of similar spinules. The area of attachment of the egg sac (Fig. 4) lies on the ventral surface of the anterior portion of the genital segment and bears on each side three slender setae (probably representing leg 6). The three postgenital segments diminish in size from anterior to posterior, being  $68 \times 121$ ,  $51 \times 102$ , and  $30 \times 92 \mu$  respectively. The first postgenital segment bears spinules similar to those on the genital segment, except that the anterior lateral group is less strongly developed. The second segment bears only a few spinules on each side. The third segment bears a row of spinules along the ventral and ventrolateral posterior margins near the insertions of the caudal rami, a pair of setules on the dorsal posterior margin, and hairs near the anal area as indicated in Figure 5. Two minute refractile knobs are present on the posterior ventral surface of this segment. The ratio of the length of the prosome to that of the urosome is about 1.8:1.

The caudal ramus (Figs. 5 and 6) is clearly longer than wide, measuring  $34 \mu$  along its inner margin,  $38 \mu$  along its outer margin,  $44 \mu$  in greatest length (to the tip of the distal process), and  $30 \mu$  in width at the middle. The ratio of greatest length to the width is about 1.47:1. The small pedicellate dorsal seta is situated near the inner distal corner of the ramus.



FIGURES 1-7. *Harpacticus pulex*, n. sp., female: 1 body dorsal (A); 2, body, lateral (A); 3, genital and postgenital segments, ventral (B); 4, region of attachment of egg sac, ventral (C); 5, caudal ramus, dorsal (C); 6, caudal ramus, ventral (C); 7, egg sac, ventral (D). Letters in parentheses indicate the scale at which the figures were drawn.

Proximal to its insertion there is a dorsal transverse row of rather stout spinules. On the inner distal corner there is a longer seta, with an inner and ventral row of spinules near its insertion. On the distal part of the outermargin there are two small setae, each with an outer and ventral row of spinules near their insertions. On the outer distal corner there is a long seta similar to that on the inner distal corner. All these five setae are naked. The two long terminal setae, 600 and 250  $\mu$  in length respectively, are inserted dorsally and both are finely barbed as indicated in Figure 1. The outer half of the distal margin of the ramus is produced dorsally in a subconical, somewhat irregular process (see Fig. 6).

The egg sac (Figs. 1, 2, and 7), measuring  $327 \times 271 \mu$ , is flattened, slightly convex on its ventral surface and concave on its dorsal surface to fit the contour of the ventral surface of the urosome.

The rostrum (Figs. 8 and 9) is broad and in lateral view extends forward nearly to the second segment of the first antenna. It bears two pairs of slender setules as shown in the figure.

The first antenna (Fig. 10) is 9-segmented, the lengths of the segments (measured along their posterior margins, beginning at the base) being 31, 38, 39, 45, 15, 15, 9, 8, and 10  $\mu$  respectively. The setae of these segments and their aesthetes are arranged as follows: 1, 10, 10, 4 + one aesthete, 2, 4, 2, 2, and 7 + one aesthete. All the setae are naked.

The second antenna (Fig. 11) has a 2-segmented exopod, the first segment bearing two feathered setae, and the second, two feathered setae and three naked setae. The distal area of the endopod bears five angulate setae each with a small recurved tip, three weakly pectinate spines each with a small spinule near the recurved tip, and two slender setules. Other armature of the second antenna is indicated in the figure.

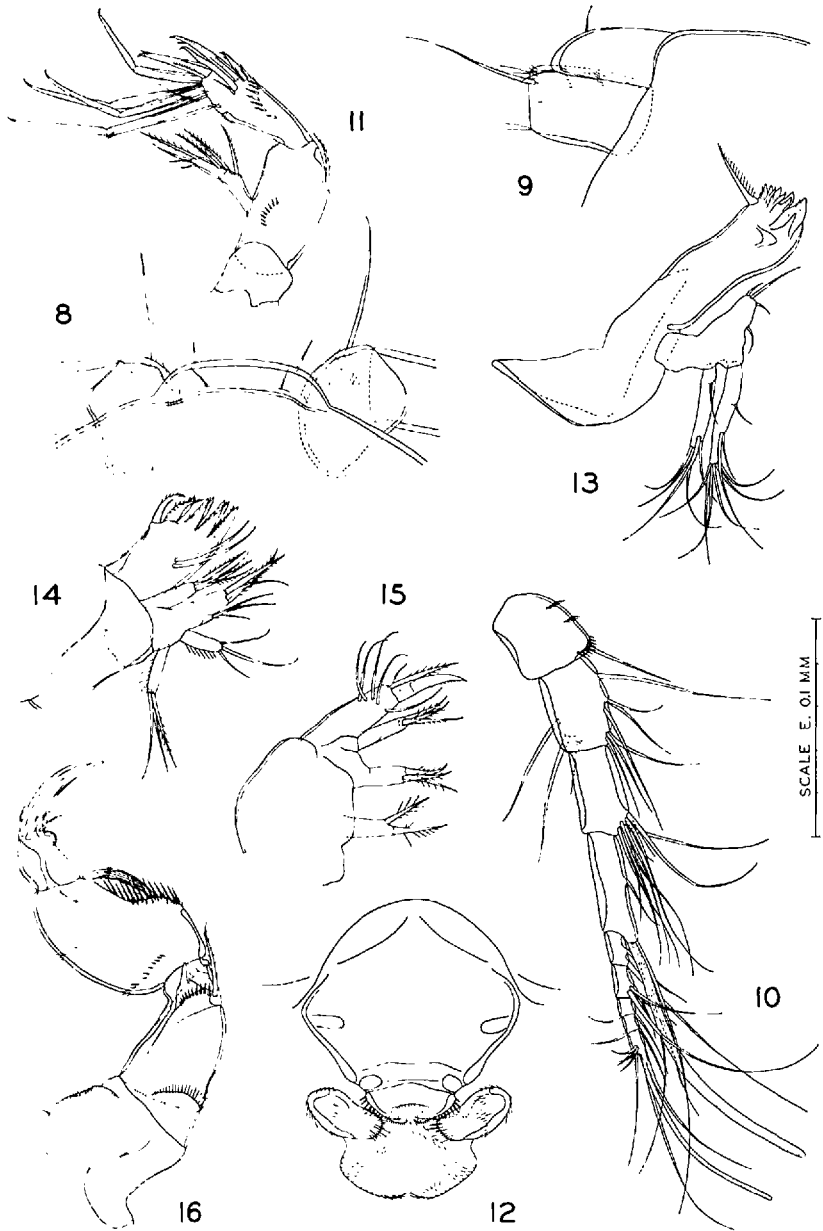
The posterior margin of the labrum (Fig. 12) is slightly indented and bears spinules and hairs as indicated in the figure. The area behind the mouth region bears groups of hairs as shown in Figure 12.

The blade of the mandible (Fig. 13) bears distally nine teeth and a unilaterally pectinate seta, and subterminally shows a sclerified process. The mandibular palp bears four setae on the basipod, nine on the endopod, and six on the exopod. All the palpal setae are naked.

The paragnath (Fig. 12) consists of a small lobe ornamented with hairs as in the figure.

The first maxilla (Fig. 14) and the second maxilla (Fig. 15) are armed with spines and setae as shown in the figures.

The maxilliped (Fig. 16) is prehensile. The third segment has an inner concavity, bordered by a row of spinules and by a somewhat hyaline



FIGURES 8-16. *Harpacticus pulex* n. sp., female: 8, rostrum, dorsal (C); 9, rostrum, lateral (C); 10, first antenna, ventral (E); 11, second antenna, posterior and ventral (E); 12, labrum, area behind mouth, and paragnaths, ventral (C); 13, mandible (C); 14, first maxilla (C); 15, second maxilla (C); 16, maxilliped, anterior surface (E). Letters in parentheses indicate the scale at which the figures were drawn.

striated lamella; a delicate finger-like process arises near the distal end of the concavity. Near the base of the terminal claw there is a small spinulose pad, a short slender process, and three naked setae (two of them short, the third nearly as long as the claw). Other armature of the maxilliped is indicated in the figure.

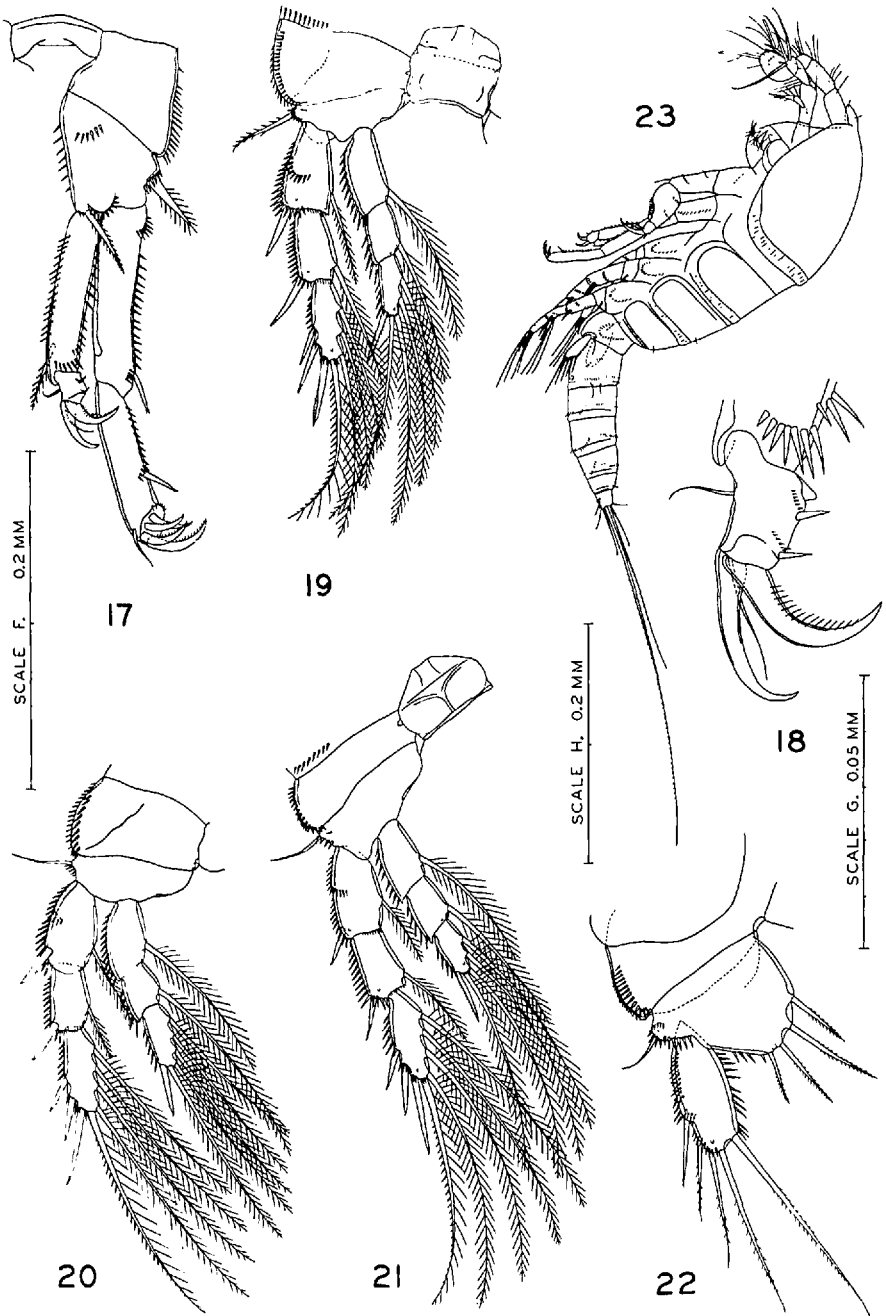
The rami of leg 1 are 2-segmented; those of legs 2-4 are 3-segmented. The spine and setal formula of legs 1-4 is as follows (the Arabic numerals indicating the setae, the Roman numerals the spines):

leg 1	exp	I:0	I, IV	1
	end	0:1	2, II	1, 1
leg 2	exp	I:1	I:1	II, I 2, 2
	end	0:1	0:1	I, 2, 2
leg 3	exp	I:1	I:1	II, I 2, 3
	end	0:1	0:1	I, 2, 3
leg 4	exp	I:1	I:1	II, I 2, 3
	end	0:1	0:1	I, 2, 2

The outer margin of the coxopods of all four legs bears rows of spinules. The basipod of leg 1 bears an inner ( $42 \mu$  long) and outer ( $34 \mu$  long) spine with a row of spinules near the base of each spine; the inner border of the basipod bears a row of spinules. On the basipod of legs 2-4 only an outer seta is present, with spinules near its insertion; the inner border of these basipods is unarmed.

Leg 1 (Fig. 17) has the following dimensions: first segment of the exopod  $104 \times 21 \mu$  (the length taken along the inner margin) with its spine  $22 \mu$  long, second segment  $99 \times 18 \mu$  (similarly measured) with its spine  $20 \mu$  long; first segment of the endopod  $104 \times 19 \mu$  (the length taken along the inner margin) with its seta  $41 \mu$  long, second segment  $18 \times 13 \mu$  with its inner seta  $12 \mu$  long and the two outer setae about  $6 \mu$  long. On the distal end of the exopod there are four recurved claws, the longest  $39 \mu$  along its axis (three of these claws pectinate, the fourth apparently naked), and a slender seta. The second segment of the endopod (Fig. 18) bears a slender inner seta on its inner margin, a basal process and two small setae (each with an oblique row of spinules near its base) on its outer margin, and two recurved claws (one of them pectinate) and a slender seta on its distal end.

The spines on the exopods of leg 2 (Fig. 19), leg 3 (Fig. 20), and leg 4 (Fig. 21) appear to be naked, though the terminal spine on leg 2 shows a minute lamella. The distal outer seta on the third segment of these exopods is pectinate along its outer margin and coarsely feathered along its inner margin. The remaining setae on the third exopod segment are feathered but the first few inner basal setules are more erect than the succeeding ones (a condition seen also on the feathered setae of the third endopod segments of legs 2-4).



FIGURES 17-23. *Harpacticus pulex* n. sp. 17-22, female: 17, leg 1 with intercoxal plate, anterior (F); 18, second segment of endopod of leg 1, anterior (G); 19, leg 2 with intercoxal plate, anterior (F); 20, leg 3, posterior (F); 21, leg 4 with intercoxal plate, anterior (F); 22, leg 5, anterior (H). 23, Male: body, lateral (A). Letters in parentheses indicate the scale at which the figures were drawn.

Leg 5 (Fig. 22) has an expanded inner basal area bearing four barbed setae, from innermost to outermost 47, 62, 47, and 34  $\mu$  in length, external to which there is a row of four small spinules. The outer angle of the basal area bears a slender naked seta about 34  $\mu$  long near whose insertion there is a row of spinules. The suboval free segment of leg 5 measures 83 (the greatest length)  $\times$  31  $\mu$  and is armed with five long setae, the innermost the longest (143  $\mu$ ), the others progressively shorter (101, 70, 50, and 36  $\mu$ ), and with rows of spinules on each side as indicated in the figure. Of the five setae the inner four are weakly barbed, but the outermost is naked and has a minute flagellum at the tip giving it a bifurcated appearance.

Leg 6 is probably represented by the three setae near the attachment of the egg sac.

The color in life is unknown since only specimens in alcohol were available for study.

*Male.*—The general body form (Fig. 23) resembles that of the female. The size (based on 10 specimens and not including the setae on the caudal rami) is 0.90 mm (0.81-1.02 mm)  $\times$  0.32 mm (0.29-0.36 mm), the width being taken at the broadest level of the prosome. The genital segment (Fig. 24) is much wider than long, 58  $\times$  122  $\mu$ . Each slightly rounded lateral margin bears in its anterior half a row of spinules and in its posterior half the two setae of leg 6. Dorsally on the posterior half there are transverse rows of spinules as indicated in the figure, but ventrally these spinules are absent. The four postgenital segments measure from anterior to posterior 54  $\times$  110, 54  $\times$  104, 41  $\times$  95, and 30  $\times$  97  $\mu$  respectively. The first postgenital segment in its posterior half bears on each side a row of spinules and dorsally and ventrally two rows of smaller spinules as shown in the figure. Two hairs arise from the posterior dorsal surface. The second segment is similarly ornamented, with the addition of a few lateral spinules on the anterior half. The third segment bears only a few lateral spinules. The fourth postgenital segment is similar to that of the female. The ratio of the length of the prosome to that of the urosome is about the same as in the female.

The caudal ramus (Fig. 25) is similar to that of the female, but is slightly shorter and wider (42  $\times$  35  $\mu$ ) and the spinules in the row on the ventral surface at the level of the dorsal seta appear to be somewhat larger.

The spermatophore (Fig. 26) is elongated and slender, 121  $\times$  32  $\mu$  (including the slender neck of 30  $\mu$ ), measured inside the body of a male.

The rostrum resembles that of the female.

The first antenna (Fig. 27) is strongly modified for prehension. It bears two aesthetes and many setae, but the identity of the segmentation is largely obscure beyond the third segment. Segments 5-9 seem to have been transformed into a claw-like apparatus. All the setae are naked



except for four small spiniform setae on the inner surface of the swollen segment, which are finely barbed along one side.

The second antenna, labrum, mandible, paragnath, first maxilla, second maxilla, and maxilliped are like those of the female.

Leg 1 resembles that of the female.

Leg 2 (Fig. 28) has an exopod as in the female, but the endopod shows strong sexual dimorphism. The formula for the endopod is 0:1, 0:1, 2,2 (lacking the spine seen in the female). Its first segment is unmodified, but the unarmed outer side of the second segment is prolonged into a long lanceolate process increasing the total length of the outer margin of this segment to  $150 \mu$ . The third segment is short (only  $33 \mu$  long), without the row of spinules on the outer margin, and bearing four setae, two on the inner edge and two terminally (the inner one of which is less than half as long as the other and barbed rather than feathered).

Leg 3 (Fig. 29) has an exopod with the same spine and setal formula as in the female, but the third segment is almost spherical,  $36 \times 36 \mu$ , with the three spines large and stout, the outermost of the five setae long and well-developed, and the other four setae weak and progressively smaller going toward the base of the segment. The segments of the endopod show spinules on their posterior surfaces which are apparently not present in the female.

Leg 4 (Fig. 30) resembles that of the female but the segments of the endopod show spinules on their posterior surfaces not present in the female.

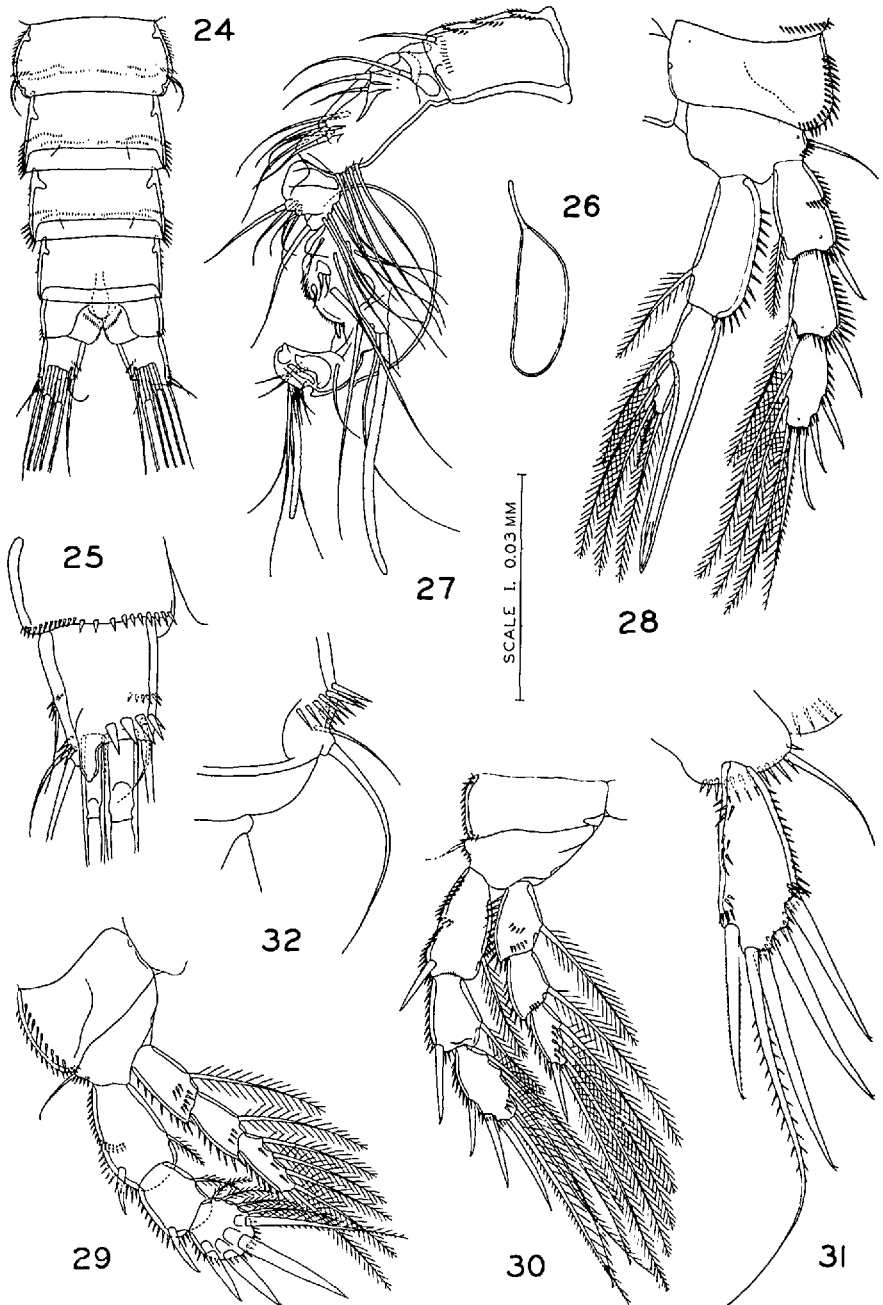
Leg 5 (Fig. 31) bears on its basal part an outer seta and a row of spinules. Its free segment is  $56 \times 24 \mu$  in greatest dimensions, being broad distally and somewhat tapered proximally; it bears five setae, all spiniform and showing a minute subterminal flagellum except the next to the innermost which is much longer and typically setiform. The lengths of the five setae from outermost to innermost are  $44$  (naked),  $57$  (naked),  $66$  (naked),  $108$  (bilaterally barbed along the midregion), and  $56 \mu$  (very finely barbed). Other small spinules are present as indicated in the figure.

Leg 6 (Fig. 32) is represented on the posterolateral areas of the genital segment (see Figs. 23 and 24) by two unequal naked setae,  $14$  and  $34 \mu$  in length respectively.

The color in life is unknown.

*Etymology*.—The specific name *pulex*, from Latin = a flea, alludes to the presence of these copepods on the skin of the mammals.

*Remarks*.—A detailed comparison of *Harpacticus pulex* with the many described species of *Harpacticus* shows certain clear differences from all of them. Nineteen certain species were listed by Lang (1948, vol. 1, pp. 319-334). The eleven *species incertae et incertae sedis* in Lang's mono-



FIGURES 24-32. *Harpacticus pulex* n. sp., male: 24, genital and postgenital segments, dorsal (B); 25, caudal ramus, ventral (C); 26, spermatophore, from body of male (F); 27, first antenna, medial inner surface (E); 28, leg 2, anterior (F); 29, leg 3, posterior (F); 30, leg 4, posterior (F); 31, leg 5, inner surface (C); 32, leg 6, ventral (I). Letters in parentheses indicate the scale at which the figures were drawn.

graph, pp. 334-338, have not been included, since their descriptions are too fragmentary to make possible comparison. Not included in Lang's work are two species described by Klie (1939 and 1941), namely *H. islandicus* and *H. septentrionalis*.

Five characters in which these twenty-one species differ from *H. pulex* have been chosen for comparison here:

(1) the number of setae on the inner basal expansion of leg 5 of the female is other than four,

(2) a concavity, projection, or interruption on the inner margin of the third segment of the maxilliped is absent,

(3) the length of the body of the female is much smaller (0.46-0.56 mm) or much larger (1.1-1.55 mm) than in *H. pulex*,

(4) the caudal ramus is  $2 \times - 4 \times$  wider than long or is  $2 \times$  longer than wide, and

(5) the terminations of the exopod or endopod of leg 1 have an armature other than exopod = 4 claws and 1 seta and endopod = 2 claws and 1 seta.

Referring to these five characters, the known species may be differentiated from *H. pulex* as follows:

<i>H. chelifera</i> (O. F. Müller, 1776)	1,5
<i>H. comptonix</i> Monard, 1926	3,5
<i>H. falklandi</i> T. Scott, 1914	4,5
<i>H. flexus</i> Brady and Robertson, 1873	2
<i>H. furcatus</i> Lang, 1936	3,5
<i>H. furcifer</i> Giesbrecht, 1902	2,3,4,5
<i>H. glaber</i> Brady, 1899	1,5
<i>H. gracilis</i> Claus, 1863	4,5
<i>H. gurneyi</i> Jakubisiak, 1933	1,5
<i>H. islandicus</i> Klie, 1939	3,5
<i>H. littoralis</i> Sars, 1910	5
<i>H. meridionalis</i> Sars, 1927	1,4,5,
<i>H. nicaeensis</i> Claus, 1866	4,5
<i>H. obscurus</i> T. Scott, 1895	5
<i>H. poppei</i> Richard, 1897	5
<i>H. pulvinatus</i> Brady, 1910	5
<i>H. septentrionalis</i> Klie, 1939	3,5
<i>H. superflexus</i> Willey, 1920	2,3,5
<i>H. tenellus</i> Sars, 1920	5
<i>H. trisetosus</i> Lang, 1948	3,4,5
<i>H. uniremis</i> Kröyer, 1842	3,5

Other differences between *H. pulex* and these species may be found, but these five seem to be among the clearest and most reliable. Several of

the known species, for example, have caudal rami described as wider than long or quadrate, which would further differentiate them from *H. pulex*. Precise measurements of caudal rami, however, are sometimes difficult because of the shape of these structures. Therefore, only extreme variations in caudal rami have been included in the above comparison. The number of segments in the rami of leg 1 differs in the descriptions of certain species from the 2-segmented condition in *H. pulex*, but has not been included in the comparison.

The exact relationship of these copepods to the marine mammals from which they were collected can only be surmised. The confined condition in the Seaquarium may well have contributed to an infestation which perhaps does not normally occur when the mammals are free. In the cases of both the porpoise and the manatee there were infections of the skin which may have attracted the copepods. It is equally possible that the copepods live in small numbers on these mammals under natural conditions, and that their numbers increased under the rather artificial conditions in the aquarium. Recovery of the copepods from an unconfined porpoise or manatee would be necessary in order to establish whether these harpacticoids are indeed associated with the mammals in their wild state. The other known species of *Harpacticus* are free-living. Another harpacticoid from marine mammals, *Balaenophilus unisetus* Aurivillius on the baleen plates of whales belonging to the genus *Balaenoptera*, is known to be a true commensal (see Vervoort & Tranter, 1961).

#### SUMARIO

##### *Harpacticus pulex*, UNA NUEVA ESPECIE DE COPÉPODO DE LA PIEL DE UNA TONINA Y DE UN MANATÍ EN LA FLORIDA

Se describe un copépodo harpacticóideo, *Harpacticus pulex*, n. sp., procedente del tejido mudado de la piel de una tonina, *Tursiops truncatus*, y de un manatí, *Trichechus manatus latirostris*, ambos en cautiverio en el Seaquarium de Miami, Florida. Si estos copépodos están asociados o no con los mamíferos cuando éstos están libres, no en cautividad, es sólo una conjetura.

#### REFERENCES

KLIE, W.

1939. Diagnosen neuer Harpacticoiden aus dem Gewässern um Island. Zool. Anz., 126 (9/10): 223-226.

1941. Marine Harpacticoiden von Island. Kieler Meeresforsch., 5: 1-44.

LANG, K.

1948. Monographie der Harpacticiden. Nordiska Bokhandeln, Stockholm, vols. 1 and 2, pp. 1-1682.

VERVOORT, W. AND D. TRANTER

1961. *Balaenophilus unisetus* P.O.C. Aurivillius (Copepoda Harpacticoida) from the southern hemisphere. Crustaceana, 3 (1): 70-84.