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CARIBEOPSYLLUS CHAWAYI, NEW GENUS, NEW SPECIES (COPEPODA: CYCLOPOIDA: THAUMATOPSYLLIDAE), FROM A MEXICAN REEF AREA

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ABSTRACT

A member of the cyclopoid family Thaumatopsyllidae was found in plankton samples collected at night in a reef area of the southern portion of the Mexican Caribbean coast. This copepod shows a combination of characters peculiar enough to designate it as a new genus and species. The new genus *Caribeopsyllus* can be distinguished mainly by the presence of 4 urosomal somites, a fused first pediger, a 1-segmented fifth leg, 3 terminal furcal setae, and anal somite over 35% of total body length. The new genus differs from the other known genera in the family also in the proportions of the body and some appendages. Only 3 other monotypic genera of this group are known, each from Sweden and Norway, Nicobar Islands, and Australia. This is the first record of a thaumatopsyliid in the Western Hemisphere.

Copepods of the family Thaumatopsyllidae, recognized now as belonging to the Cyclopoida, have been previously included within the Monstrilloida, because of the absence of antennae and mouthparts, and a parasitic life cycle with a planktonic reproductive adult stage (Sars, 1913, 1921; Davis, 1949; Isaac, 1975). Authors such as Bresciani and Lützen (1962), Fosshagen (1970), and later Huys and Boxshall (1991) placed the family Thaumatopsyllidae in the Cyclopoida. A sequential and complete overview of the scarce literature on this odd group of Copepoda was presented by McKinnon (1994) and Grygier (1995).

Up to date, only three monotypic genera of the family Thaumatopsyllidae are known, each from widely differing localities including cold and tropical environments (*Thaumatopsyllus paradoxus* Sars, 1913, from Sweden and deep Norwegian fjords; *Orientopsyllus investigatoris* Sewell, 1949, from the Nicobar Islands, Indian Ocean; and more recently, *Australopsyllus fallax* McKinnon, 1994, from Victoria, southern Australia).

This paper describes a fourth genus of Thaumatopsyllidae collected during a plankton survey in a shallow reef area off the Mexican Caribbean Sea, in the westernmost portion of the Caribbean Basin. This is also the first record of a thaumatopsyllid copepod in the Western Hemisphere.

DESCRIPTION

Family Thaumatopsyllidae Sars, 1913

Caribeopsyllus, new genus, Suárez-Morales

Diagnosis.—The new genus is defined by the combination of the following characters: (a) first pedigerous somite fused to the cephalosome; (b) antennule six-segmented; (c) four urosomal somites; (d) fourth leg biramous; (e) fifth leg one-segmented, armed with one distal short spine and a long seta; (f) three terminal furcal setae; and (g) relative length of the anal somite to total length over 35%.

Etymology.—The new genus makes reference to the general geographic area (the Caribbean Basin) from which it was collected; the Greek word *psyllus* (flea) follows the names of previously described genera of this family.

Caribeopsyllus chawayi, new species, Suárez-Morales
Figs. 1A–F, 2A–E

Material examined.—Mahahual reef area, southern portion of the Caribbean coast of Mexico, 2 January 1991, surface plankton trawl. Holotype adult ♀, 1.57 mm, undissected, ethanol-preserved, in vial deposited in The Natural History Museum, London, United Kingdom (BMNH–1997.473).

Description.—Female, holotype: Body cyclopiform (Fig. 1A–C), body length (from anterior tip of prosome to posterior margin of anal somite) 1.57 mm, 1.78 mm when including furcal rami. Prosome 0.86 mm long, almost 54% of total body length, first pedigerous somite fused to cephalosome, with lateral protuberance on midsection of prosome, probably vestige of intersomital division (Fig. 1A, B). Cephalosome rounded anteriorly, produced anteroventrally into broad, unarmed, low rostrum. Oral opening located about 27% of way posteriorly along ventral surface of prosome, with scar of vestigial labrum (Fig. 1G). Ocelli present, pigment cups rounded, medially conjoined in dorsal

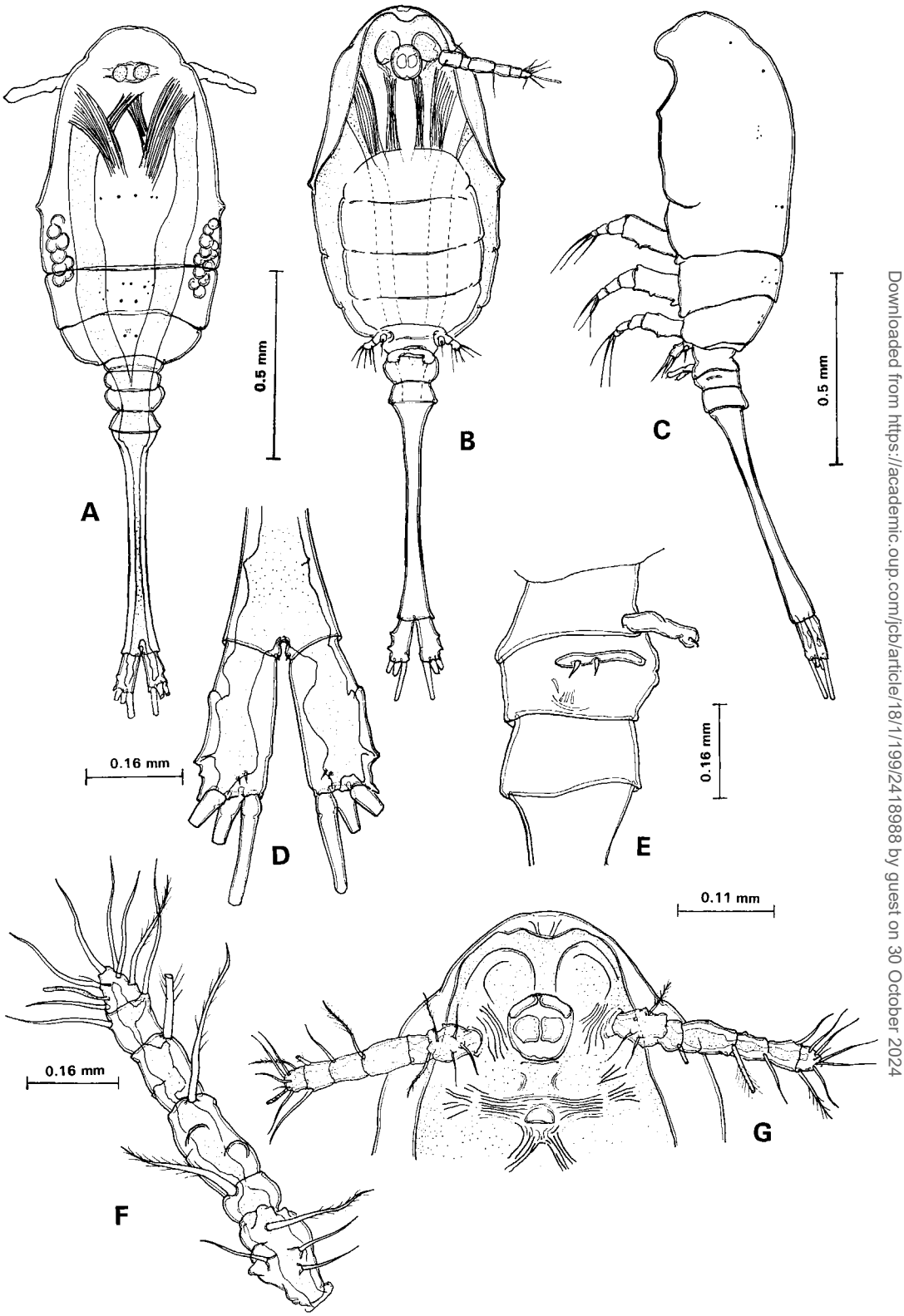

Fig. 1. *Caribeopsyllus chawayi*, new genus, new species, adult female, holotype. A, habitus, dorsal; B, habitus, ventral; C, habitus, lateral; D, furcal rami, ventral; E, first urosomites, lateral; F, right antennule, anterior view; head, ventral.

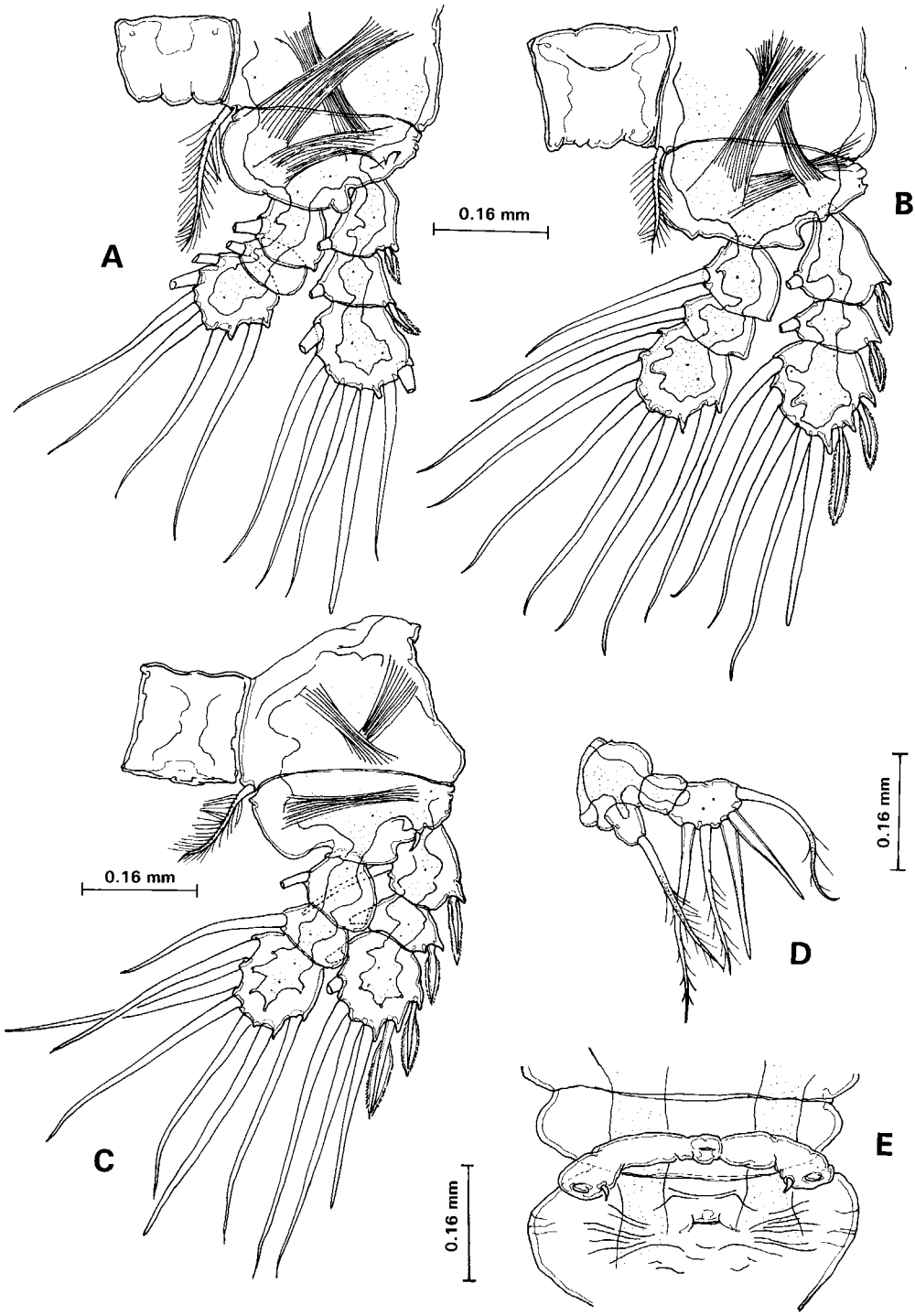

Fig. 2. *Caribeopsyllus chawayi*, new genus, new species, adult female, holotype. A, leg 1, anterior; B, leg 2, anterior; C, leg 3, anterior; D, leg 4, anterior; E, leg 5 and genital double-somite, ventral.

view. Cephalosome with several ventral cuticular processes around mouth area, forming transverse ridges extending to bases of antennules (Fig. 1G). Other cuticular structures including several groups of small pores on dorsal surface: 1 group of 5 pores aligned in single row about midlength of prosome, 2 pairs on second pedigerous somite, and 1 pair on succeeding third somite (Fig. 1A).

Antennule length 0.25 mm, almost 16% of total body length, and 29% of prosome length. Six-segmented, armed with 4, 1, 1, 1, 2, and 7+1 aesthetascs (Fig. 1F). First antennular segment relatively complex, with several protuberances on anterior surface probably result of fusion of several segments; third segment with 2 rounded cuticular processes on anterior face. Terminal segment with large aesthetasc (0.065 mm) on outer margin. Length ratio of antennular segments as: 28.6:9.4:22:18:13:9 = 100 (Fig. 1F).

First pedigerous somite fully incorporated into prosome. This and each of 2 succeeding pedigers bearing well-developed swimming legs, all with triarticulate endopods and exopods (Fig. 2A–C). Armament formula of swimming legs as:

	Coxa	Basis	Exopodite	Endopodite
Leg 1	0–1	0–1	I–1; I–1; I, 2, 3, 2	0–1; 0–1; 1, 3, 2
Leg 2	0–1	0–0	I–1; I–1; II, I, 2, 2	0–1; 0–1; 1, 2, 3
Leg 3	0–1	I–0	I–1; I–1; II, I, 2, 2	0–1; 0–1; 1, 2, 3

Anterior margins of intercoxal plates of legs 1–3 with variable size and shape. Anterior margin of basis of legs 1–3 with rounded protuberance between insertion of rami, and with cuticular spiniform process near base of exopod. Seta on inner first basipodite of leg 1 longer than in other 2 legs.

Fourth leg biramous (Fig. 2D), basipodite wide; endopod 1-segmented, with 1 long distal spiniform seta. Exopod 2-segmented, proximal segment unarmed, terminal segment armed with 5 elements: 2 spiniform and 3 normal setae. Two normal setae on inner margin, 2 subterminal spiniform setae, and 1 terminal seta. Fifth leg uniramous (Fig. 2E), unsegmented, consisting of elongated single lobe distally rounded, armed with 1 short subterminal spine. Socket on tip of each ramus of fifth leg, possibly indicating position of long seta, as in other 3 genera. Sixth leg represented by anterolateral process with 2 curved, subequal spines (Fig. 1E).

Urosome length 0.7 mm, consisting of 4 somites: fifth pedigerous, genital double-somite, 1 free somite, and elongated anal somite (0.55 mm). Ratio of length of urosomites: 7.7:6.8:6.6:78.5 =100. Genital double-somite with ventral copulatory pore (Fig. 2E). Elongated anal somite representing about 35.5% of total body length. Width of anal somite at its middle portion about 50% as wide as posterior margin, and about 35% of anterior margin. Posterior margin of anal somite with pair of small spines medially on ventral surface, near base of each furcal ramus.

Furcal rami elongated, 0.21 mm long, slightly divergent, almost 2.3 times longer than wide, bearing only 3 well-developed terminal setae with almost same length and breadth. Outer margin with 2 protuberances, 1 on proximal one-third, probably at insertion of lateral seta, and other subterminal; 2 small spinules on ventral surface, near base of outermost furcal seta (Fig. 1D).

Male: unknown.

Type Locality.—Reef lagoon off Mahahual, southern portion of eastern coast of the Yucatan Peninsula (18°42.35′N, 87°41.10′W). Plankton sample, water column. Depth 1.5 m.

Habitat.—Mahahual is a small fishing town with some tourist impact, located in the southern portion of the Mexican Caribbean Sea. The reef lagoon is shallow (mean depth 1.5 m), and is influenced by surface Caribbean waters. The specimen of *C. chawayi* was collected 2 January 1991 (1015 h), at a salinity of 36.0 ‰, and a temperature of 26°C.

Host.—Unknown. Members of this group are parasites of brittle stars during their naupliar stages. *Thaumatopsyllus* is free-living during copepodid stages (Bresciani and Lützen, 1962; Fosshagen, 1970). The host is known only for *T. paradoxus*, which parasitizes at least three different species of brittle stars in Norway (Fosshagen, 1970). More than 50 species of brittle stars are reported from the western Caribbean (Hendler *et al.*, 1995), and any one of them is a potential host of this copepod.

Etymology.—The name of the new species is derived from the Mayan term for reef (chaway), and makes reference to the type of marine environment where it was collected.

Table 1. Comparison of features of females of the four known genera of Thaumatopsyllidae. Proportions of body and appendages are presented as relative length (%) and as ratio; measurements based on illustrations and descriptions of Sars (1913), Sewell (1949), Fosshagen (1970), Huys and Boxshall (1991), and McKinnon (1994).

Character/genus		*Thaumatopsyllus*	*Orientopsyllus*	*Australopsyllus*	*Caribeopsyllus*
Pediger 1		fused to CT	not fused	fused to CT	fused to CT
Somites of urosome		5	3	3	4
Antennule		15-segmented	6-segmented	8-segmented	6-segmented
Terminal furcal setae		4	4	4	3?
Leg 4		biramous	uniramous	uniramous	biramous
Elements of terminal segment of leg 4		2	4	5	5
Leg 5		3-segmented	1-segmented	2-segmented	1-segmented
Anal somite/total length	%	28	33	31.7	35.5
	(ratio)	(3.5)	(3.0)	(2.57)	(2.83)
Anal somite/urosome	%	66	78.5	64.2	78
	(ratio)	(1.51)	(1.57)	(1.53)	(1.33)
Antennule/proseme	%	57.6	22.6	25.5	12.3
	(ratio)	(1.73)	(4.41)	(4.25)	(7.39)
Anal somite/furcal rami	ratio	3.6	5.3	2.8	5.04
Terminal A_1 segment/A_1 length	ratio	15.5	13.8	10.5	4.77
Anterior/posterior margin of anal somite	ratio	1.62	0.7	1.07	1.4

Discussion

The genus *Caribeopsyllus* can be distinguished from the three other thaumatopsyllid genera by the combination of the following characters: (a) first pedigerous somite fused to the head, present only in *Thaumatopsyllus* and *Australopsyllus*; (b) antennules reduced, six-segmented, differing from *Thaumatopsyllus* (15 segments) and from *Australopsyllus* (8 segments). The nine antennular segments mentioned by Sars (1913) and McKinnon (1994) for female *Thaumatopsyllus* seem to be an underestimation, since there are several partially fused proximal segments, bringing the number up to 14 or 15 segments (Fosshagen, 1970; Huys and Boxshall, 1991); (c) four urosomal somites, differing from *Thaumatopsyllus* (5 somites), *Orientopsyllus* (3 somites), and *Australopsyllus* (3 somites); (d) fifth leg 1-segmented, versus 2- and 3-segmented in the other genera; (e) three terminal furcal setae, but 4 in the other genera. This feature seems to be not as reliable as the others mentioned, since one or more furcal setae may be missing in the specimen of *Caribeopsyllus*; however, it is noted here that there is little space left along the distal margin of the furcal rami to allow an additional terminal seta of at least the same size as the other three; (f) relative length of the anal somite: total length over 35%, which is relatively smaller in the others. These differences provide sufficient evidence for the erection of a new genus of the Thaumatopsyllidae.

The length of *C. chawayi* is 1.57 mm, which is similar to two of the other known thaumatopsyllids: *Australopsyllus* (1.56 mm), *Thaumatopsyllus* (1.5–1.6 mm), and smaller than *Orientopsyllus* (1.82 mm). Length ratios of prosome : anal somite, urosome : anal somite, antennule : prosome, furcal rami: anal somite, and antennule : antennular terminal segment are also useful to separate *Caribeopsyllus* from the other three genera of the Thaumatopsyllidae (see Table 1). Measurements show additional morphometric differences not previously described among these three genera. *Caribeopsyllus* has the relatively longest anal somite with respect to total body length and the second, after *Orientopsyllus,* with respect to the urosome. It has also the shortest antennules, and the longest terminal antennular segment in the family. In *Caribeopsyllus*, the anterior (proximal) margin of the anal somite is wider than the posterior margin, with a length ratio of 1:1.4; values differ in the other genera (*Thaumatopsyllus* 1:0.6; *Orientopsyllus* 1:0.7, and *Australopsyllus* 1:1.07). The position of the oral opening, the cuticular ornamentation around the oral region, and the arrangement of the pores, characters not fully considered in previous descriptions, may be valuable in the taxonomy of this group.

The three other genera of the Thaumatopsyllidae have also been described from very few specimens (Sewell, 1949; Fosshagen, 1970; McKinnon, 1994), and our description is based on a single specimen. Scarcity of ma-

terial is a feature shared also with the Monstrilloida, and may be the result of having only one free-living stage which is collected occasionally in plankton samples, and, probably, of having sharp seasonal cycles (Fosshagen, 1970). The male is known only in *Thaumatopsyllus paradoxus* (see Fosshagen, 1970); males of other species remain unknown.

It is relevant to mention the known geographical ranges of these three species: from Sweden and Norway (Oslofjorden and Trondheimsfjorden), the Nicobar Islands, Indian Ocean, and Victoria, Australia. Considered alone, these records would lead us to think that the geographic isolation of the two Atlantic genera (*Thaumatopsyllus* and *Caribeopsyllus*) with respect to the Indo-Pacific ones (*Orientopsyllus* and *Australopsyllus*) would favor the conception of at least two groups with a different origin. Something similar could be stated considering the three eastern and the new western genus. However, the combination of characters is unique in each genus, and biogeographic relations cannot be detected from the known distributional data.

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