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A new species of *Caligus* Müller, 1785 (Copepoda: Siphonostomatoida: Caligidae) from coral reef plankton in the Mexican Caribbean

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Abstract

During a survey of the zooplankton community of a protected reef system on the southern coast of the Mexican Caribbean, many female and male specimens of an undescribed species of *Caligus* Müller, 1785 were collected. The new species closely resembles *C. wilsoni* Delamare Debouttéville & Nunez-Ruivo, 1958 and *C. belones* (Krøyer, 1863) and has affinities with *C. balistae* Steenstrup & Lütken, 1861 and *C. longipedis* Bassett-Smith, 1898, all known from the Caribbean Sea and adjacent waters of the north-western Atlantic Ocean. *Caligus ilhoikimi* **sp. nov.**, is described in full and illustrations of both sexes are also provided. The new species differs from *C. wilsoni* and *C. belones* in several features, including the shape of the sternal furca, the shape and proportions of the genital complex and abdomen, the lack of accessory processes on the distal elements of leg 1 exopod, and the presence of a lateral spine on the third exopodal segment of leg 2. This is the seventh species of *Caligus* known from waters of the Atlantic seaboard of Mexico and the 32nd species of the genus recorded in Mexican waters. The specimens were caught with a plankton light trap. The unusually high number of individuals captured and the fact that the sample was monospecific (*i.e.* only adults of this caligid species were collected) suggests that it is a chiefly planktonic form. This is a mode of life recently revealed as being more common among caligids than previously thought.

Key words: parasitic copepods, reef zooplankton, biodiversity

Introduction

Copepods of the genus *Caligus* Müller, 1785 are among the most diverse crustacean parasites of teleost fish (Boxshall & Halsey 2004; Ho & Lin 2004). They are commonly known as sea lice, and some species cause serious impacts on cultured fishes (Ho & Lin 2004). They are usually recorded as ectoparasitic forms attached to the hosts, but in many cases they can consistently be found as part of the plankton which instigated a recent re-evaluation of their modes of life (Venmathi Maran & Ohtsuka 2008; Suárez-Morales *et al.* 2012b; Venmathi Maran *et al.* 2012).

Previous surveys of the caligid fauna of Mexico have yielded a total of 31 species of *Caligus* (Suárez-Morales *et al*. 2010, 2012b; Morales-Serna *et al*. 2012, 2014). Most of these records are from the Pacific coast; currently, there are only two species of the genus recorded from the Mexican Caribbean coast: *C. haemulonis* Krøyer, 1863 and *C. trachynoti* Heller, 1865 (Sánchez-Ramírez & Vidal-Martínez 2002; Suárez-Morales *et al*. 2010; Morales-Serna *et al*. 2012). In the Caribbean and the Gulf of Mexico there are about 32 nominal species of *Caligus* recorded. Caribbean Sea parasitological research is lagging despite the high number of crustacean parasites harbored by fish in this region (Bunkley-Williams & Williams 1994; Luque & Poulin 2007).

A biological survey of the planktonic fauna of the protected reef system of Xcalak, on the southern Caribbean coast of Mexico, was carried out in March 2005. Light traps were selected as a gear to assess the local diversity of zooplankton and ichthyoplankton in this shallow reef area because they are efficient in sampling structurally complex environments in which active gears (standard plankton nets) are precluded (Hernández & Lindquist 1999; Lindquist *et al*. 2001). Numerous specimens of males and females of the copepod genus *Caligus* were recorded in these samples. The taxonomic examination of these individuals revealed that they represent a new species which is described here and compared with its closest congeners.

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Material and methods

Adult female and male individuals of a caligid copepod of the genus *Caligus* were recovered from samples of the water column obtained on 11 March 2005 from the reef area of Xcalak, which is part of the Mesoamerican Barrier Reef System and a National Marine Protected Park (location: 18°15.916' N; 87°49.660' W). The plankton fauna from this area was surveyed during March 2005 by using a zooplankton nightlight trap primarily designed to collect ichthyoplankton in shallow, coastal and reef-related environments (Rooker *et al.* 1996; Jones 2006) and has been recognized as an efficient method to study the reef planktonic fauna in the surveyed area (Vásquez-Yeomans *et al*. 2011). The plankton captured in this sampling gear was fixed shortly after collection in 70% ethanol. Specimens of *Caligus* were sorted from the sample and processed for identification by transferring them to glycerol and then pure glycerine. Light staining with methylene-blue was used for the observation of the body and appendages. Drawings were prepared using a camera lucida mounted on an E-200 Nikon compound microscope. Terminology of the body parts and appendages follows Ho & Lin (2004). Type specimens were deposited in the collection of Zooplankton held at El Colegio de la Frontera Sur, Unidad Chetumal (ECO-CHZ), Quintana Roo, Mexico and in the National Museum of Natural History, Smithsonian Institution, Washington, D.C. (USNM).

Systematics

Order Siphonostomatoida Burmeister, 1835

Family Caligidae Burmeister, 1835

Genus *Caligus* Müller, 1785

***Caligus ilhoikimi* sp. nov.**
(Figs. 1–4)

Material examined. Holotype female, plankton light trap, collected March 11, 2005 by L. Vásquez-Yeomans, Xcalak reef zone, Quintana Roo, Mexico. Specimen partially dissected, mounted in glycerine, semi-permanent slides sealed with Entellan (ECO-CHZ-09268). Allotype male, same date, collector, and site, partially dissected, semi-permanent slides (ECO-CHZ-09269). Paratypes 12 adult females from same locality, collector and date, specimens undissected, ethanol-preserved (ECO-CHZ-09270); 10 adult males, undissected, ethanol-preserved (ECO-CHZ-09271). Three adult females, 3 adult males mounted in semi-permanent slides, same collection data (USNM-1267302).

Type locality. Xcalak reef area, eastern coast of the Yucatan Peninsula, Mexican Caribbean, 18°20'00" N, 87°48'48" W.

Host. Unknown, plankton collection.

Description of female. Body shape as shown in Fig. 1A, with cephalic shield broadly ellipsoidal with curved lateral margins. Total length of holotype 3.75 mm, size range 3.37–4.21 mm (average = 3.77 mm, $n = 15$) measured from the anteriormost margin of the cephalothorax to the posterior margin of the abdomen. Greatest width 1.86–1.95 mm (measured at widest part of cephalothorax) (excluding narrow marginal hyaline membrane: 0.07 mm). Cephalothorax comprises more than half (62%) of total length. Genital complex about as long as wide, with rounded outer margins; posterolateral region weakly protruding posteriorly. Abdomen subrectangular, about 1.3 times as long as wide, genital complex approximately 1.4 times longer than abdomen (Fig. 2F). Caudal rami subrectangular about 1.2 times longer than wide, armed with 3 long terminal, one small outer, one small inner pinnate setae and short dorsal seta (Fig. 2F). Lunules widely separated, spaced by the length of about 4.6 times lunule diameter.

Antennule (Fig. 1B) with usual structure found in *Caligus*, 2-segmented, proximal segment distinctly longer than distal segment, armed with 23 plumose setae. Distal segment bearing 11 setal elements (1 of them subdistal, inserted medially on inner margin) plus two aesthetascs. Sternal furca (Fig. 1C) tines broad, with straight inner and outer margins and distally wide, truncate margins.

Antenna (Fig. 1D) claw recurved at right angle near tip with small, proximal accessory seta; posterior process

heavily sclerotized, pointed, moderately sharp. Postantennary process (Fig. 1E) broad, sickle-shaped, with rounded tip, with two basal papillae, each armed with single short seta, adjacent papilla located nearby on sternum smaller, also with single short seta.

Mouth cone as in genus, with slender mandibles bearing row of 15–20 teeth (Fig. 1H). Maxillule represented by pointed subtriangular process and basal papilla bearing two subequally long setae (Fig. 1F). Maxilla (Figs. 1G) 2-segmented, slender, brachiform; proximal segment (lacertus) unarmed; distal segment (brachium) slender, with subdistal flabellum on outer margin. Terminal elements, calamus and canna unequally long, the latter about 0.75 times as long as former. Maxilliped (Fig. 2A) robust, without protrusions on basal region; subchela about 0.5 times as long as basal segment. Shaft with short subdistal seta. Terminal claw heavily sclerotized, shorter than shaft, armed with short proximal seta on inner margin.

Leg 1 (Fig. 2B, C) coxa with proximal inner seta and short subdistal seta on outer margin. Mammiliform papilla on distal inner position of segment. First exopodal segment with inner margin bearing row of short hair-like elements and short outer subdistal spiniform seta. Last exopodal segment bearing 3 medial unequally long pinnate setae and 4 smooth terminal spines, without accessory processes, innermost element being longest, two outer elements equally long and fourth one, on medial position, being shortest (Fig. 2C).

Leg 2 (Fig. 2D, E) coxa subquadrate, armed with long plumose coxal seta on inner margin. Basipodite robust, with small seta on outer distal edge and setule-bearing papilla on middle inner margin. First exopodal segment bearing strong outer spine reaching across second segment to proximal margin of third segment; second segment with much shorter recurved outer spine reaching to middle of last exopodal segment. Distal segment with two elements on outer margin, one short naked spiniform element plus stout sclerotized spine. Terminal spine curved, with narrow membrane along outer margin, about 2.3 times as long as subdistal spine and 1.5 times as long as distal segment (Fig. 2E). All setae on medial margins of all segments pinnate.

Leg 3 (Fig. 3A, B) exopod first segment with stout, slightly recurved terminal spine with thin flange on outer lateral margin nearly reaching to third segment; three outer distal setae digitiform, subequally long (Fig. 3B). First endopodal segment with single inner pinnate seta, second segment with 6 pinnate setae.

Leg 4 (Fig. 3C) uniramous, brachiform; exopod 2-segmented. Protopod with short seta on distal outer margin. First exopodal segment with terminal spine not reaching base of setal elements of second segment. Second exopodal segment bearing 3 smooth, unequally long spines, outermost shortest, innermost longest; each of 4 exopodal spines with subtriangular pecten at base.

Armature of rami of legs 1–4 as follows (Roman numerals indicating spines and Arabic numerals setae):

	exopod	endopod
Leg 1	1-0; III, 4	vestigial
Leg 2	I-1; I-1; III, 5	0-1; 0-2; 6
Leg 3	I-0; I-1; III, 4	0-1; 6
Leg 4	I-0; I, III	absent

Leg 5 represented by two small papillae on posterolateral corner of genital complex, one armed with two short pinnate setae, the other with one seta (Fig. 2F).

Description of male. Body (Fig. 3D) smaller than female, length excluding caudal rami: 2.93–3.41 mm, average = 3.15 mm, *n* = 15. Cephalothoracic shield broadly ovoid in shape, 1.73 ± 0.13 mm long and 1.65 ± 0.12 mm wide (excluding narrow marginal hyaline membranes: 0.06 mm). Frontal plates well developed, carrying moderately large lunules separated by 2.1 times diameter of lunule; free margin of thoracic zone projecting well beyond tips of lateral zones; sinuses wide, moderately deep. Fourth pediger separated from genital complex by weak suture, somite roughly hexagonal in shape, about 2.5 times wider than it is long. Genital complex roughly oblong. Abdomen narrower and shorter than genital complex, subrectangular, represented by two somites; proximal somite wider than long, anal somite distinctly longer than wide. Caudal ramus subrectangular, 1.6 times longer than it is wide, bearing 6 setal elements including 3 terminal setae, one short inner setulated seta, one short outer naked seta plus short dorsal seta. Inner margin pilose (Fig. 4H).

Antennule as in female.

Antenna (Fig. 3E, F) 3-segmented, robust; proximal segment strong, with large corrugated pad on medial surface, second segment about as long as first one, armed with 3 corrugated pads, 2 on distal inner margin, 1

subdistal on outer surface; terminal segment smallest, armed with single basal seta and with three short, strong overlapping hooks (Fig. 3F).

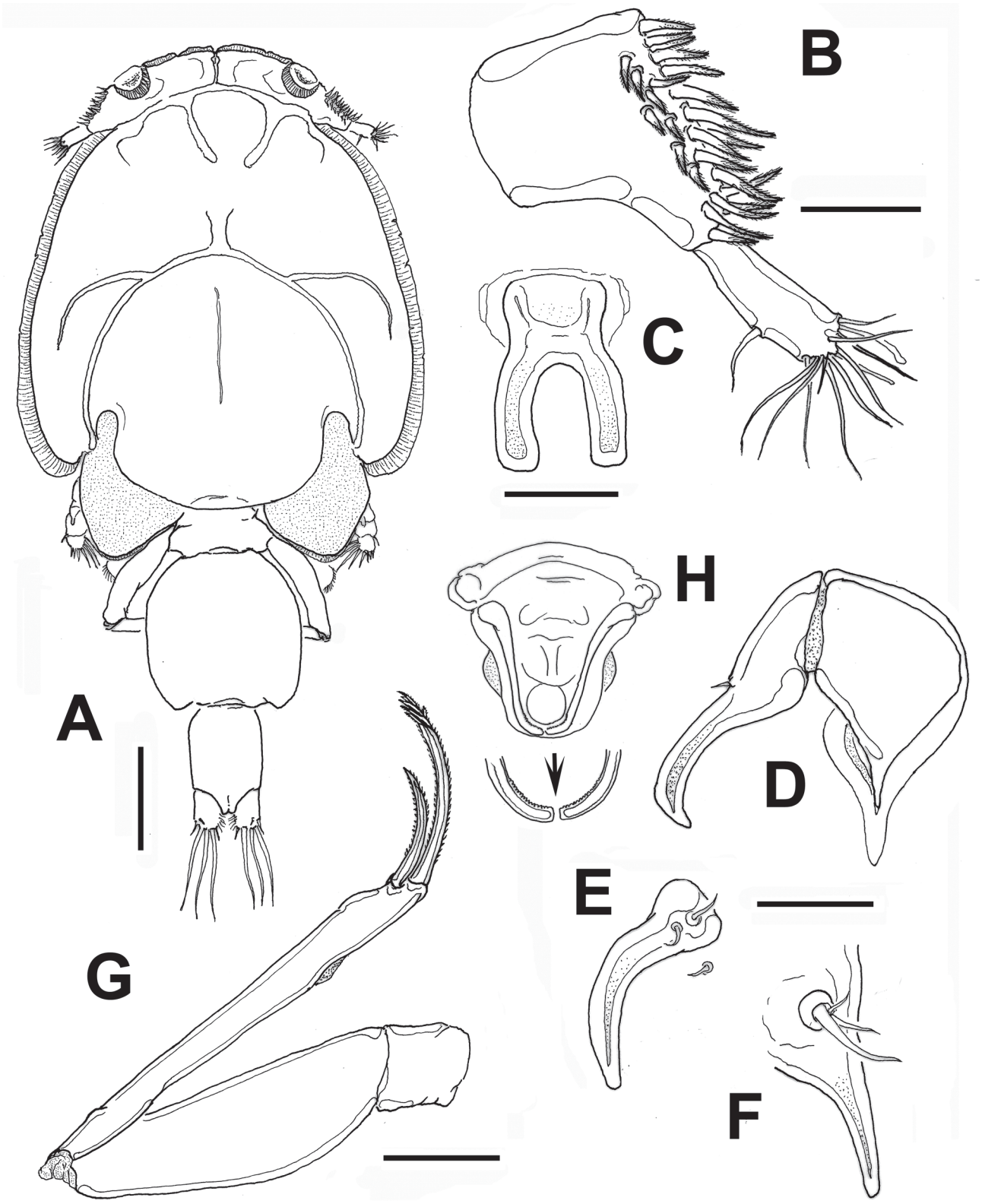

FIGURE 1. *Caligus ilhoikimi* **sp. nov.** (adult female holotype). A, habitus, dorsal view; B, antennule; C, sternal furca, ventral view; D, antenna; E, postantennary process; F, maxillule; G, maxilla; H. mouth cone and mandibles (detail). Scale bars: A = 0.5 mm; B = 0.2 mm; C–H = 0.1 mm.

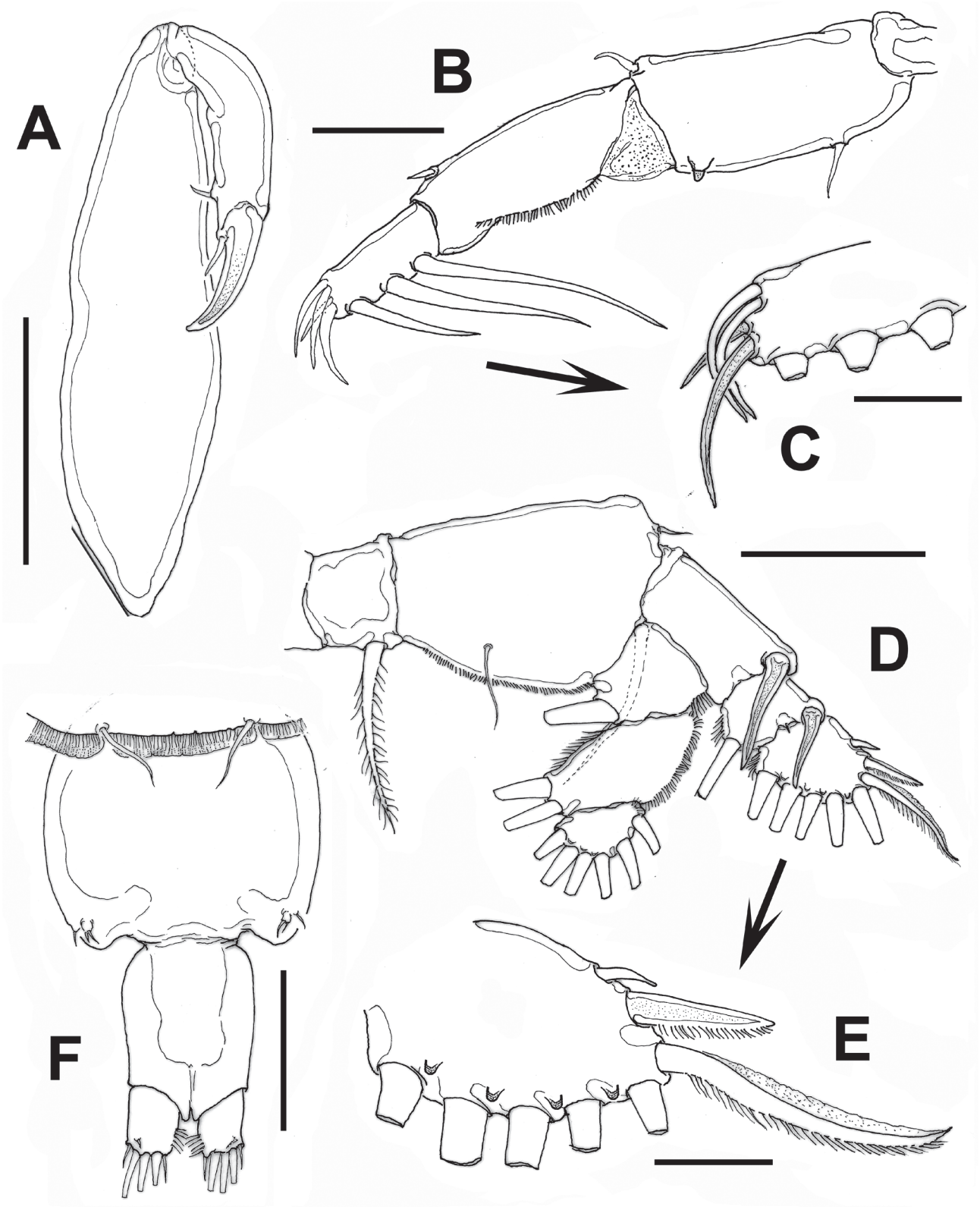

FIGURE 2. *Caligus ilhoikimi* **sp. nov.** (adult female holotype). A, maxilliped; B, first leg; C, detail of distal elements of first leg; D, second leg; E, detail of third exopodal segment of second leg; F, genital complex showing fifth legs and abdomen, ventral view. Scale bars: A, D = 0.2 mm; B = 0.1 mm; E, C = 0.05 mm; F=0.5 mm.

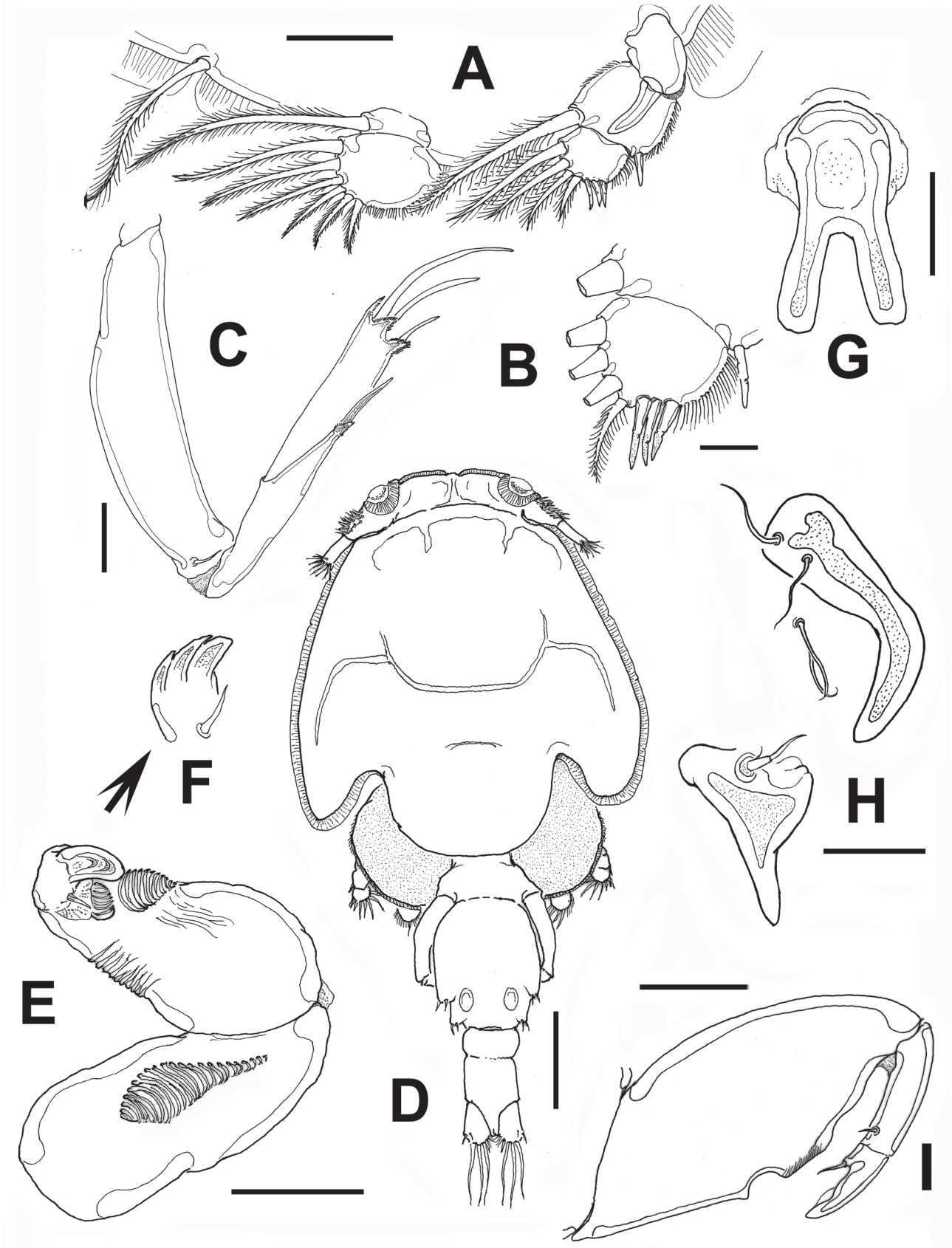

FIGURE 3. *Caligus ilhoikimi* **sp. nov.** (adult female holotype). A, third leg; B, detail of setal elements on third exopodal segment of third leg; C, fourth leg; adult male; D, habitus, dorsal view; E, antenna; F, detail of terminal antennary process; G, sternal furca, ventral view; H, post antennal process and maxillule; I, maxilliped. Scale bars: A, C, E, G–I = 0.1 mm; B = 0.05 mm; D = 0.5 mm.

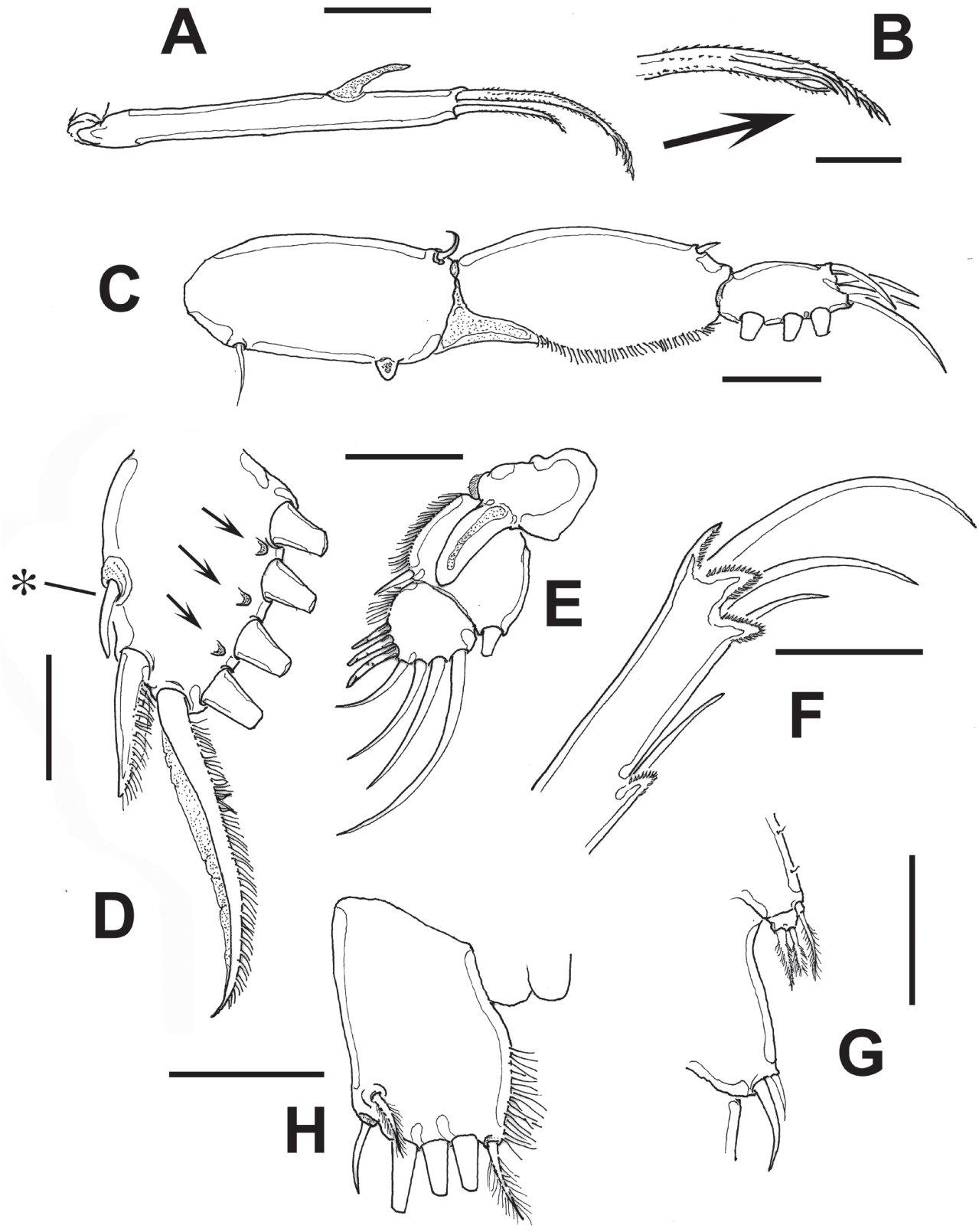

FIGURE 4. *Caligus ilhoikimi* **sp. nov.** (adult male allotype). A, terminal segment of maxilla; B, detail of terminal part of calamus; C, first leg; D, detail of setal elements on third exopodal segment of second leg showing papillae near base of inner setae (arrowed) and outer medial spine (*); E, exopod of third leg; F, terminal part of fourth leg; G, fifth and sixth legs on posterior part of genital complex; H, caudal ramus, dorsal view. Scale bars: A, C, E, G, H = 0.1 mm; B = 0.025; D, F = 0.05 mm.

Sternal furca as in female, tines slightly more separated basally and more divergent (Fig. 3G). Postantennary process as in female except for being more strongly curved, with longer setae on basal papillae and adjacent papilla armed with two long setae (Fig. 3H).

Maxillule (Fig. 3H) shorter and stronger than in female, comprising distally blunt dentiform process bearing basal papilla armed with two unequally long setae, one of them articulate.

Maxilla (Fig. 4A, B) as in female except for brachium bearing subterminal hyaline spiniform element; canna about half as long as calamus, the latter terminally branched forming a spiral-like ornamentation (Fig. 4B).

Maxilliped (Fig. 3I) robust, subchela about 0.5 times as long as basal segment. Basal segment with medial sinus. Shaft with short subdistal seta. Terminal claw heavily sclerotized, shorter than shaft, armed with short proximal seta on inner margin.

Leg 1 (Fig. 4C) as in female except for having three outer setal elements equally long, instead of medial one being shorter.

Leg 2 (Fig. 4D) as in female including short lateral spine (asterisk in Fig. 4D) and papilla-like elements near insertion of inner setae (arrowed in Fig. 4D).

Legs 3 and 4 as in female (Fig. 4E, F).

Leg 5 (Fig. 4G) located on middle of lateral margin of genital complex, represented by two short segments, one (proximalmost) armed with short pinnate seta and the other, larger segment with two short, pinnate setae. Leg 6 (Fig. 4G) represented by lateral protuberance armed with two setae, inner seta twice as long as outer seta.

Etymology. The new species is named after Prof. Il-Hoi Kim, Gangneung-Wonju National University, Korea, for his abundant and high-quality contributions to the knowledge of symbiotic copepods worldwide.

Discussion

The new species closely resembles *C. wilsoni* Delamare Deboutteville & Nunez-Ruivo, 1958, described from specimens collected in the Woods Hole region and previously identified by Wilson (1905, 1932) as *C. belones* (Krøyer, 1863). Without providing comparative data, Williams & Bunkley-Williams (1996) proposed that the former species should be treated as a synonym of *C. belones* although Cressey (1991) reported *C. wilsoni* from the western Caribbean. Our comparative analysis of these two species suggests that Cressey's (1991) record of *C. wilsoni* is in fact assignable to this species and the name is deemed valid. Comparisons are performed among these three species but differences between *C. belones* and *C. wilsoni* are presented first. The three species share a longer than wide genital complex, a relatively short abdomen, a similar structure and armature of legs 1 with three inner setae on the last segment and four distal elements. They have also a 2-segmented fourth leg exopod; the three terminal spiniform elements are of different lengths, the innermost being longest.

Based on previous descriptions (Wilson 1905, 1932; Delamare Deboutteville & Nunes-Ruivo 1958; Cressey 1991), important differences between *C. belones* and *C. wilsoni* can be noted in their body proportions, as previously highlighted by Delamare Deboutteville & Nunes-Ruivo (1958). In *C. wilsoni* the abdomen/genital complex length ratio is between 0.68 and 0.77: 0.77 (Wilson 1905), 0.73 (Wilson 1932), 0.68 (Cressey 1991). The abdomen represents 42 % of the urosome (Wilson 1905; Cressey 1991) whereas in *C. belones* the ratio is 0.53, the abdomen is 36% of the urosome. In the new species the proportions are 0.7 and 41%, respectively. The genital complex/cephalosome length ratio is 0.47–0.50 in *C. wilsoni* (Wilson 1905: fig. 135; Wilson 1932: fig. 252; Cressey 1991: fig. 38), vs. 0.66 in *C. belones* (Delamare Deboutteville & Nunes-Ruivo 1958: fig. 3a), and 0.33 in the new species. The posterolateral corners of the genital complex are strongest in *C. belones* and clearly weaker in *C. wilsoni* (Wilson 1905, 1932; Cressey 1991) and in the new species. In *C. belones* the abdomen is laterally produced, with rounded margins at its proximal half only (Delamare Deboutteville & Nunes-Ruivo 1958: fig. 3a; Cressey & Collette 1970: fig. 117), whereas the abdomen is uniformly rounded in *C. wilsoni* (Wilson 1905; Cressey 1991) and margins are straight in the new species (Fig. 1A).

Cressey (1991) stated that the lack of a lateral spiniform seta on the second exopodal segment of leg 4 in *C. wilsoni* (Wilson, 1905, 1932: fig. 252b) was the main feature used by Delamare Deboutteville & Nunes-Ruivo (1958) to distinguish *C. wilsoni* as a distinct species. This element is present in *C. belones* (Delamare Deboutteville & Nunes-Ruivo 1958: fig. 3d), thus diverging from the pattern observed in the other two species, both with only three elements on this segment. Also, the inner spiniform seta of the first exopodal segment is short in *C. belones*, barely reaching halflength of second exopodal segment (Delamare Deboutteville & Nunes-Ruivo 1958: fig. 3d);

this element is clearly longer in *C. wilsoni* (Wilson 1905, 1932; Cressey 1991: fig. 45) and in the new species, almost reaching the insertion of the distal setae of the second exopodal segment. The small distal seta on the leg 4 protopod is present in *C. wilsoni* (Cressey 1991: fig. 45) but was not depicted by Wilson (1905, 1932) or by Delamare Deboutteville & Nunes-Ruivo (1958) for *C. belones*; it is present in the new species, *C. ilhoikimi* (Fig. 3C).

The new species differs from *C. wilsoni* and *C. belones* in other taxonomically relevant characters, as follows: (a) the sternal furca has a different shape in these species, tines are clearly divergent and distally rounded in both *C. wilsoni* (Wilson 1905: fig. 137; Cressey 1991: fig. 41) and in *C. belones* (Delamare Deboutteville & Nunes-Ruivo 1958: fig. 3b), thus contrasting with the straight, distally truncate tines of the new species (Fig. 1C); (b) the postantennary spine is robust in *C. wilsoni*, with long basal setae (Cressey 1991: fig. 40b) *vs.* a slender process with short basal setae in *C. ilhoikimi* (Fig. 1E), this structure was not described for *C. belones*; (c) the maxillulary spiniform process is short, strong and armed with three basal setae in *C. wilsoni* (Cressey 1991: fig. 40c) *vs.* a long, slender process armed with two basal setae in the new species (Fig. 1F); (d) the terminal setae of the last exopodal segment of leg 1 have accessory processes in both *C. wilsoni* (Cressey 1991: fig. 42) and *C. belones* (Delamare Deboutteville & Nunes-Ruivo 1958: fig. 3c), whereas these elements are simple in the new species (Fig. 2B, C); (e) in *C. wilsoni* the third exopodal segment of leg 2 lacks a lateral outer spine (Cressey 1991: fig. 43) but this element is present in *C. ilhoikimi* (Fig. 2D, E); and (f) the new species has rounded papillae at the insertion of the inner setae of the third exopodal segment (Fig. 2E); although this feature could not be checked in specimens, these papillae have not been described or depicted for *C. wilsoni* or *C. belones* (Delamare Deboutteville & Nunes-Ruivo 1958; Cressey 1991).

Following Cressey's (1991) criteria, these three species can be separated from the other known *Caligus* species of the Gulf of Mexico and Caribbean Sea by their possession of a fourth leg with a 2-segmented exopod armed with 4 spines. The first exopodal segment lacking a medial seta is shared by two other species of the genus in this region, *C. balistae* Steenstrup & Lütken, 1861 and *C. longipedis* Bassett-Smith, 1898 (Cressey 1991). The new species differs from *C. balistae* in the shape of the genital complex, which is massively developed with strong posterolateral processes in *C. balistae* and much smaller and weakly produced in the new species. The tines are divergent and distally subacute in *C. balistae* and parallel, distally truncate in *C. ilhoikimi*. Both species share the lack of accessory processes on the setae of the third exopodal segment of leg 1 and of a lateral spine on the third exopodal segment of leg 2; however *C. balistae* lacks the basal papillae on the latter segment.

The new species also resembles the Brazilian *C. itacurussensis* Luque & Cezar, 2000. Both species differ in the shape of the genital complex, with well developed posterolateral corners in *C. itacurussensis* (Luque & Cezar 2000: fig. 17) and weakly produced in *C. ilhoikimi*. The abdomen is relatively narrower in *C. itacurussensis* (Luque & Cezar 2000: fig. 17). The tines are straight and distally truncate in the new species whereas they are slightly divergent and distally rounded in the Brazilian species (Luque & Cezar 2000: fig. 25). The antennary claw is stronger in *C. itacurussensis* (Luque & Cezar 2000: fig. 20) than in the new species and the maxillule is more slender in the new species. In the Brazilian species two of the terminal setae of the first leg have acute accessory processes (Luque & Cezar 2000: fig. 26) whereas these are absent in *C. ilhoikimi*. In the new species the terminal spine of the first exopodal segment of the fourth leg does not reach the base of the setal elements on the second segment, thus differing from *C. itacurussensis* in which this element is longer, reaching the distal margin of the second exopodal segment (Luque & Cezar 2000: fig. 31). The male of *C. itacurussensis* has a wider marginal hyaline membrane (Luque & Cezar 2000: fig. 33) which is narrower in the new species and the genital complex/abdomen are narrower in *C. itacurussensis* (Luque & Cezar 2000: fig. 33) than in the new species. The male antennae show additional differences; in *C. itacurussensis* the corrugated pad on the first segment is almost as long as the segment (Luque & Cezar 2000: fig. 34) whereas it is clearly shorter in the new species; also the second segment has 3 corrugated pads vs. 2 differently shaped ones in *C. itacurussensis*; the new species has three short, strong distal hooks vs. only two in the Brazilian species.

Overall, the main features distinguishing the new species, *C. ilhoikimi*, are the lack of accessory processes on the distal setae of leg 1 exopod, the presence of only 4 setal elements on the two-segmented leg 4 exopod, weakly developed posterolateral corners of the genital complex, a lateral spiniform setal element on the third exopodal segment of leg 2 and the presence of basal papillae at the insertion sites of the inner setae of the same segment. *Caligus longipedis* differs from *C. ilhoikimi* by the different shape of the female genital complex (wide, strongly globose in *C. longipedis*, subquadrate in the new species), the presence of accessory processes on leg 1 exopod

(absent in *C. ilhoikimi*), leaf-like tines, and the absence of a lateral spine on the third exopodal segment of leg 2 (Cressey 1991).

These three species of *Caligus* (*C. wilsoni*, *C. belones*, *C. ilhoikimi*) have different distributions. *C. wilsoni* is probably restricted to the North American east coast (Wilson 1905, 1932), the Florida Straits and the Caribbean Sea (Cressey 1991; Williams & Bunkley-Williams 1996). *Caligus belones* is known from the North Atlantic including Norway, Sweden, Denmark (Krøyer 1846) and the Mediterranean off Italy (Cressey & Collette 1970) and France (Delamare Deboutteville & Nunes-Ruivo 1958).

Based on the available data, there are 34 nominal species of *Caligus* recorded in the Gulf of Mexico and the Caribbean (Table 1). A few of these are known from plankton samples only, *i.e.*, *C. chelifer* Wilson, 1905; *C. rufimaculatus* Wilson, 1905; and, *C. undulatus* Shen & Li, 1959 from the Gulf of Mexico (Suárez-Morales *et al*. 1998, 2012b; Ocaña-Luna & Álvarez-Silva 2001) and now *C. ilhoikimi* from the Caribbean coast of Mexico.

TABLE 1. List of the 34 nominal species of *Caligus* recorded from the Gulf of Mexico and the Caribbean Sea (in alphabetical order). Data from: Wilson (1913), Legarde (1989), Cressey (1991), Bunkley-Williams & Williams (1996), Suárez-Morales *et al*. (1998, 2003, 2008, 2012a, b), Ho & Lin (2003), Zambrano *et al*. (2003), Álvarez-León (2009) and Boxshall & El-Rashidy (2009).

Caligus afurcatus Wilson, 1913
C. asperimanus Pearse, 1951
C. atromaculatus Wilson, 1913
C. balistae Steenstrup & Lütken, 1861
C. bennetti Causey, 1953
C. berychis Wilson, 1936
C. biaculeatus Brian, 1914
C. bonito Wilson, 1905
C. chelifer Wilson, 1905
C. chorinemi Krøyer, 1863
C. constrictus Heller, 1865
C. coryphaenae Steenstrup & Lütken, 1861
C. enormis Wilson, 1913
C. evelynae Suárez-Morales, Camisotti & Martín, 2012
C. haemulonis Krøyer, 1863
C. ilhoikimi **sp. nov.**
C. irritans Heller, 1865
C. isonyx Steenstrup & Lütken, 1861
C. kabatae Cressey, 1991
C. longipedis Bassett-Smith, 1898
C. mutabilis Wilson, 1905
C. ocyurus Cressey, 1991
C. pelamydis Krøyer, 1863
C. pomacentrus Cressey, 1991
C. praetextus Bere, 1936
C. productus Dana, 1849
C. robustus Bassett-Smith, 1898
C. rufimaculatus Wilson, 1905
C. sciaenops Pearse, 1952
C. suffuscus Wilson, 1913
C. tenuifurcatus Wilson, 1937
C. undulatus Shen & Li, 1959
C. wilsoni Delamare Deboutteville & Nunes-Ruivo, 1958
C. xystercus Cressey, 1991

Ecological remarks. During this survey a total of 734 specimens of *C. ilhoikimi* were collected, of which 429 (59%) are females and 305 (41%) are males. According to Venmathi Maran & Ohtsuka (2008) males are usually more frequent in plankton samples than females at a rate of 80% vs. 20% because males are more easily detached from a host, but also recognize that in some species the absence of a host suggests different life cycle possibilities and represents an intriguing behavior as well. Both the number and the sex ratio in our samples might be biased by

the light trap; there is evidence showing that both larval (MacKinnon 1993) and adult (Flamarique *et al*. 2009) caligids are attracted to light but it is also possible that females are more strongly lured by the light than males. It is unlikely that all these specimens of *Caligus* detached from their fish hosts to reach the light trap; if this was the case, we would have different species in our sample but the entire sample was monospecific for caligids. This suggests that the new species dwells in the water column of this reef system as part of the plankton but how these planktonic adults complete their life cycle and their relation to potential hosts remains unknown. Local reef formations are represented by high spurs with an emerged crest; the reef structures in this zone are complex and largely continuous (Núñez-Lara *et al*. 2005). Based on these reef features, it is likely that the well developed reef crest of Xcalak might represent a barrier preventing a full exchange of zooplankters between the reef lagoon and the outer neritic waters (Tovar *et al*. 2009). The new species has probably a restricted distributional pattern in the western Caribbean. More taxonomical and ecological surveys are yet to be undertaken in order to reveal more of the potentially highly diverse caligid fauna in the region but also to explore the intriguing life cycle of these parasitic copepods dwelling in the water column.

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