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New species of sabellariids (Annelida: Sabellariidae) from the Caribbean Sea and the Gulf of Mexico

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Abstract. In the Caribbean Sea and the Gulf of Mexico, 15 species of sabellariids have been described. Since Kirtley's (1994) worldwide review, at least seven species have not been re-recorded for this region. Therefore, the aims of this contribution were: a) to review the sabellariids held in scientific collections, b) to generate standardized descriptions, and c) to provide taxonomic identification keys for the species of the region. The sabellariids of two Mexican and one US scientific collection were reviewed. Five new species are described: *Lygdamis pechi* sp. nov. from Veracruz, Gulf of Mexico, *Mariansabellaria caribbea* sp. nov. from Quintana Roo, Mexico, *Phalacrostemma danieli* sp. nov. from southwest of Grenada, *Tetreres israeli* sp. nov. from the Virgin Islands, and *T. oscari* sp. nov. from Florida. Another morphospecies, *Phalacrostemma* sp., is characterized by a single incomplete specimen from the Bahamas. Also, new records of *Phalacrostemma perkinsi* Kirtley, 1994, and *P. dorothyae* Kirtley, 1994 were made.

Keywords. *Lygdamis*, *Mariansabellaria*, *Phalacrostemma*, *Tetreres*, Western Atlantic.

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Introduction

The family Sabellariidae Johnston, 1865 has been recorded from all oceans (Capa *et al.* 2015). Most sabellariids live in intertidal or shallow habitats, but some genera and species are restricted to the continental shelf or deep sea (Kirtley 1994; Capa *et al*. 2015). The best-studied species are gregarious and intertidal (Capa & Hutchings 2019). In deep environments, sabellariids are usually found as isolated individuals or in groups of a few individuals (Kirtley 1994) on the sediment or associated with other invertebrates, such as mollusks or sea urchins (Chávez-López & Bastida-Zavala 2021).

To date, 12 genera and about 140 nominal species of sabellariids have been described (Read & Fauchald 2021). In the Gulf of Mexico and the Caribbean Sea, six genera and 15 species of sabellariids have been recorded (Chávez-López 2021), excluding questionable records. Species of *Idanthyrsus* Kinberg, 1867, *Phragmatopoma* Mörch, 1863, and *Sabellaria* Lamarck, 1818 live from the surf zone to depths less than 15 m, members of *Lygdamis* Kinberg, 1867 can be found from the intertidal zone to around 500 m, while species of *Phalacrostemma* Marenzeller, 1895, and *Tetreres* Caullery, 1913 are restricted to depths

of 200–4000 m. Since Kirtley's (1994) revision, *Lygdamis rayrobertsi* Kirtley, 1994, *Phalacrostemma dorothyae* Kirtley, 1994, *P. gloriaae* Kirtley, 1994, *P. gwendolynae* Kirtley, 1994, *P. perkinsi* Kirtley, 1994, *P. tenera* (Augener, 1906) and *Tetreres varians* (Treadwell, 1901) have not been recorded again. Therefore, this work aims were to review sabellariids present in the Gulf of Mexico and the Caribbean Sea, based on biological material stored in scientific collections, as well as to describe and illustrate the species and generate identification keys for the species of the region.

Material and methods

Specimens revised belong to two Mexican collections: the reference collection of the Laboratorio de Poliquetos, El Colegio de la Frontera Sur (ECOSUR) (Qnr.IN.021-0497), Chetumal, Quintana Roo, and the collection of the Laboratorio de Biodiversidad y Cambio Climático (BCC), ECOSUR, Campeche; and one US collection: Marine Invertebrates Museum, Rosenstiel School of Marine and Atmospheric Science, University of Miami, Florida, United States (UMML), collected by the oceanographic program "University of Miami Deep-Sea Expeditions". Type specimens were deposited in UMML, Florida, and ECOSUR, Chetumal.

The specimens were observed with a stereoscopic microscope Olympus SZ40. In some cases, specimens were temporally stained with Shirlastain-A to improve contrast and therefore visibility of some features. Body measurements included total length, from the apical end of the crown (including paleae) to the last abdominal segment, width in the parathoracic region, number of opercular paleae per lobe, number of abdominal chaetigers, and length of the caudal peduncle. The caudal peduncle was measured separately because it is an easily detachable elastic structure. Once the outer paleae were removed, their total length was measured from the apical to the basal end.

Semi-permanent preparation of paleae and chaetae, including uncini, were made. These microstructures were cleaned with a thin brush to remove organic material, mounted with a solution of 1:1 glycerol-ethanol, and then observed under an optical microscope Olympus CH30. Capa *et al*.'s (2015) terminology was followed for delimiting median ridge and median organ.

Photographs of specimens were taken in dorsal, lateral, and ventral views with a digital Canon camera Rebel T8i. Digital photographs were compressed with Helicon Focus (HeliconSoft Limited 2007) and plates were arranged with Adobe Photoshop CC program (Adobe 2018).

Scanning electron micrographs (SEM) were used to achieve a more detailed examination of some structures, mainly the opercular paleae. For this, some paratypes were dehydrated in a series of increasing concentrations from 80%, 90%, and 100% ethanol and from 25%, 50%, and 75% hexamethyldisilazane (HMDS), mounted on an aluminum stub and subsequently coated with gold. They were observed with a JEOL JSM-6010Plus-LA scanning electron microscope at the Scanning Electron Microscopy Laboratory (LMEB), ECOSUR, Chetumal.

Results

Phylum Annelida Lamarck, 1809
Family Sabellariidae Johnston, 1865

Genus ***Lygdamis*** Kinberg, 1867

Type species

Lygdamis indicus Kinberg, 1867; by monotypy.

Diagnosis

Operculum completely divided into two free lobes. Two rows of opercular paleae. Outer paleae arranged in semicircles, with straight or slightly curved, cylindrical blades and smooth or serrated margins. Inner paleae arranged in one row along inner margin of opercular lobes with straight and cylindrical blades. One pair of nuchal hooks without limbation. Multiple tentacular filaments (compound). Median ridge with lateral eyespots. Median organ cylindrical, tip truncate or tapered. Four parathoracic segments (Kirtley 1994; Capa & Hutchings 2019).

Key to species of *Lygdamis* Kinberg, 1867 from the Caribbean Sea

1. Outer paleae with smooth margins and conical slightly bent, sharp tips; inner paleae with smooth margins ..... ***L. rayrobertsi*** Kirtley, 1994. Palm Beach, Florida, 62–73 m depth
– Outer paleae with serrated margins and flattened sharp tips; inner paleae with faintly serrate margins, blunt tips .....***L. pechi*** sp. nov. Veracruz, 47 m depth

Lygdamis pechi sp. nov.
urn:lsid:zoobank.org:act:431F3C52-F1BF-4B86-81D2-A601CCA93204
Figs 1–2

Diagnosis

Seven outer paleae cylindrical at base, flattened sharp tips, and serrate margins. Four inner paleae cylindrical, blunt tips and faintly serrate margins. Median organ shorter than lobes, cylindrical, without lateral eyespots, with truncate and pigmented tip.

Etymology

This species name is after Dr Daniel Guadalupe Pech Pool, head of the BIOMARCCA collection, who kindly lent me the holotype specimen. The species name is a noun in the genitive case (ICZN 1999, Art. 31.1.2).

Material examined

Holotype

MEXICO • complete spec. (body length 5.5 mm); Veracruz, northeast of Tecolutla; 20°45′37.91″ N, 96°57′41.8″ W; depth 47 m; 18 Mar. 2018; ALH leg.; ECOSUR-302.

Description

Body. Holotype complete (ECOSUR-302), preserved material colorless, 5.5 mm long, 0.8 mm wide, 17 abdominal segments, caudal peduncle 0.5 mm long (Fig. 1).

Operculum. Opercular disc oblique, two rows of translucent, pale yellow paleae; outer row with 6–7 paleae per lobe, inner row with four paleae per lobe (Fig. 1A–C). Outer paleae cylindrical at base with flattened, sharp tip; blade straight with serrated margins (Fig. 2A–C). Inner paleae 1.6 times as long as outer paleae, cylindrical; blade straight, with faintly serrate margins and blunt tips (Fig. 2A, D). Opercular stalk twice longer than wide (Fig. 1A–B). Five to six opercular papillae decrease in size ventrally (Fig. 1C); first pair of papillae about four times as long as others, with dark tips (Fig. 1B). Nine rows of buccal tentacles. Palps slightly longer than median organ, as long as opercular stalk lobes (Fig. 1D). A pair of nuchal hooks, large, sharp (Fig. 1B–C). Median ridge with marginal eyespots. Median organ shorter than lobes, almost four times as long as wide, cylindrical, tip truncate and pigmented, without lateral eyespots (Fig. 1D).

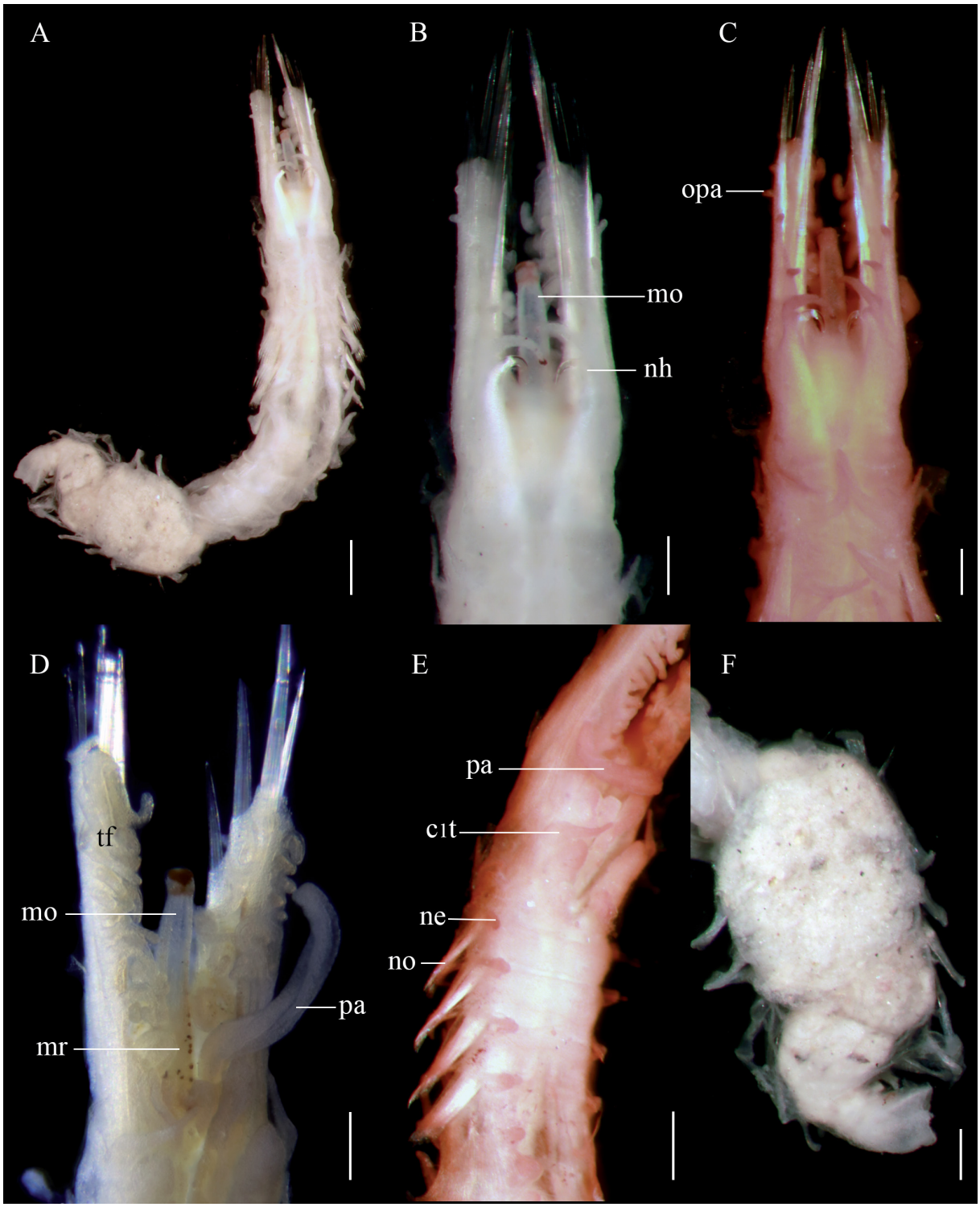

Fig. 1. *Lygdamis pechi* sp. nov., holotype (ECOSUR-302). **A**. Complete specimen, dorsal view. **B–C**. Anterior region, dorsal view. **D**. Median ridge and median organ, ventral view. **E**. Thorax and parathoracic region, ventral view. **F**. Posterior region, dorsal view. Abbreviations: c1t = cirrus 1st thoracic segment; mo = median organ; mr = median ridge; ne = parathoracic neuropodium; nh = nuchal hooks; no = parathoracic notopod; opa = opercular papillae; pa = palps; tf = tentacular filament. Scale bars: A = 0.5 mm; B–F = 200 µm.

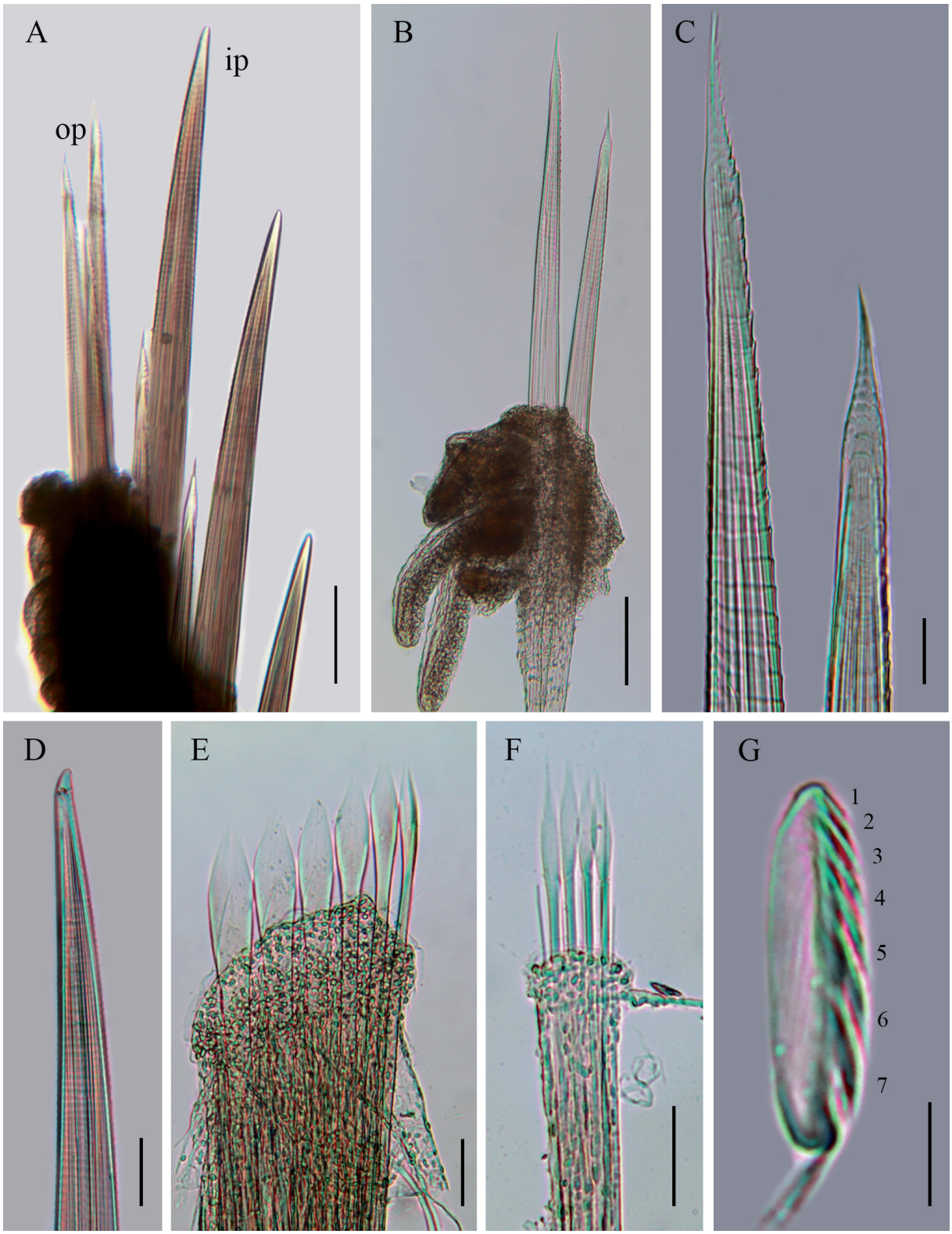

Fig. 2. *Lygdamis pechi* sp. nov., holotype (ECOSUR-302). **A**. Opercular paleae. **B**. Outer paleae. **C**. Detail of the outer paleae tips. **D**. Inner palea. **E**. Parathoracic notochaetae. **F**. Parathoracic neurochaetae. **G**. Abdominal uncini. Abbreviations: op = outer paleae; ip = inner paleae. Numbers indicate the rows of teeth. Scale bars: A–B = 100 µm; C = 20 µm; D–F = 50 µm; G = 10 µm.

Thorax. First thoracic segment with one lobe-shaped neuropodium and capillary chaetae (Fig. 1E). Second segment with capillary neurochaetae, two triangular-shaped lateral lobes, and paired branchiae.

Parathorax. With four segments, all with branchiae. Notopodia with six lanceolate and five capillary chaetae (Fig. 2E). Neurochaetae with four lanceolate and five capillaries, half the length of notochaetae (Fig. 2F).

Abdomen. Abdominal segments with paired branchiae up to segment 4 (Fig. 1A, F). Neurochaetae capillary, ornamented with irregular thecal laminar extensions. Notopodia with series of uncini with 6–7 transverse rows of teeth (Fig. 2G). Caudal peduncle colorless, small, cylindrical (Fig. 1F).

Remarks

Uebelacker (1984) recorded *Lygdamis indicus* Kinberg, 1867 for the west coast of Florida, northeastern Gulf of Mexico. Her specimens had "14–31 pairs of outer paleae slender, faintly serrate, and distally pointed in juveniles, smooth with tips often bent in adults; …6–16 pairs of inner paleae stouter, blunt-tipped, smooth in adults, faintly serrate in juveniles; …a median tentacle (or median organ) stout with dark brown tip" (Uebelacker 1984: 49-5). The faintly serrated outer and inner paleae of specimens that Uebelacker (1984) described as juveniles resemble the opercular paleae of *L. pechi* sp. nov. However, *L. pechi* sp. nov. has outer paleae with flattened tips, and fewer opercular paleae (6–7 outer paleae per lobe, four inner paleae per lobe).

Kirtley (1994) included some of the Uebelacker's records in *L. rayrobertsi* Kirtley, 1994 from Florida. Kirtley also indicated that the record of *L. indicus* in the Gulf of Mexico was a misidentification. However, he failed to explain any morphological variations of the opercular paleae described by Uebelacker (1984), so it is not possible to determine whether the juvenile specimen described by Uebelacker also belongs to *L. rayrobertsi*.

In the brief description of *L. rayrobertsi*, Kirtley (1994) mentioned smooth outer paleae with sharp, slightly bent, conical tips; broad, flat inner paleae with smooth margins; and a median organ ending in discoidal, pigmented, truncate tip. *Lygdamis pechi* sp. nov. and *L. rayrobertsi* share a robust median organ; however, they differ in the morphology of their opercular paleae (see key above).

Kirtley (1994) did not describe the number of opercular paleae of *L. rayrobertsi.* Dos Santos *et al.* (2014) recorded *L. rayrobertsi* (8 mm long) for Brazil and describe it with 14 outer paleae, six inner paleae per lobe and opercular papillae of similar size (Dos Santos *et al.* 2014: fig. 2b), whereas *L. pechi* sp. nov. (5.5 mm long) has only seven outer paleae, four inner paleae per lobe and the first pair of papillae longer than other ones.

Distribution

Gulf of Mexico, northeast of Tecolutla, Veracruz, at 47 m depth (Fig. 22).

Genus ***Mariansabellaria*** Kirtley, 1994

Type species

Phalacrostemma norvegicum Strømgren, 1971; by original designation.

Diagnosis

Operculum completely divided into two free lobes. Two rows of opercular paleae. Outer paleae arranged in semicircles; straight, cylindrical, or slightly compressed blade with transverse irregular thecae bands. Few inner paleae arranged in one short row near to dorsal junction of inner marginal

lobes, with straight and cylindrical blades. One or more pairs of nuchal spines. Tentacular filaments arranged in single rows (simple). Palps grooved, longer than operculum. Median ridge short with some lateral eyespots. Median organ absent. Four parathoracic segments (Kirtley 1994; Capa & Hutchings 2019).

Remarks

Mariansabellaria Kirtley, 1994 included, until now, only four species: *M. norvegica* (Strømgren, 1971) from the Norwegian Sea, *M. chilena* Kirtley, 1994 from southern Chile, *M. harrisae* Kirtley, 1994 from Santa Monica Bay, California, and *M. tenhovei* Kirtley, 1994 from Yaquina Bay, Oregon. It is necessary to re-describe the species of *Mariansabellaria* because Kirtley did not include the same characters in all species descriptions. Standardization in the descriptions will facilitate the identification and comparison of the species, and will also allow the development of identification keys with clearer and easier to observe characters.

Key to species of *Mariansabellaria* Kirtley, 1994

1. Inner paleae with smooth margins .....
.....***M. harrisae*** Kirtley, 1994. Santa Monica Bay, Los Angeles, California, 183 m depth
– Inner paleae with transverse constrictions partially surrounding the blade 2

2. Middle region of outer paleae with thecae completely surrounding the blade 3
– Middle region of outer paleae with thecae partially surrounding the blade 4

3. Thecae of the middle region 5–6 times as wide as long .....
.....***M. norvegica*** (Strømgren, 1971). Bindalsfjorden, Norway, 70–400 m depth
– Thecae of the middle region almost as long as wide .....
.....***M. tenhovei*** Kirtley, 1994. Yaquina Bay, Oregon, 2000 m depth

4. Six pairs of simple feeding tentacles .....
.....***M. chilena*** Kirtley, 1994. Reina Adelaida Archipelago, Chile, 470–562 m depth
– Three pairs of simple feeding tentacles .....
..... ***M. caribbea*** sp. nov. Banco Chinchorro, Quintana Roo, Mexico, 274 m depth

Mariansabellaria caribbea sp. nov.
urn:lsid:zoobank.org:act:85B7E010-D51F-48C4-8EF4-0BA9A76B3FAF
Figs 3–4

Diagnosis

More than 50 pairs of outer paleae per lobe. Outer paleae with irregularly expanded margins resembling small denticles. Four to five inner paleae per lobe. Inner paleae with conspicuous transverse thecae and slightly curved tip. Three pairs of buccal tentacles.

Etymology

The species name is referred to the Caribbean Sea, where the species was found.

Material examined

Holotype

MEXICO • complete spec. (body length 10 mm); Quintana Roo, East of the Center Cay, Banco Chinchorro; RV *Edwin Link*, stn. 2782; 18°34.41′ N, 87°26.80′ W; depth 274 m; 23 Aug. 1990; ECOSUR-303.

Description

Body. Holotype complete (ECOSUR-303), integument slightly eroded. Body light brown, 10 mm long, 2.5 mm wide, fourth parathoracic segments, 12 abdominal segments, caudal peduncle 5 mm long (Fig. 3).

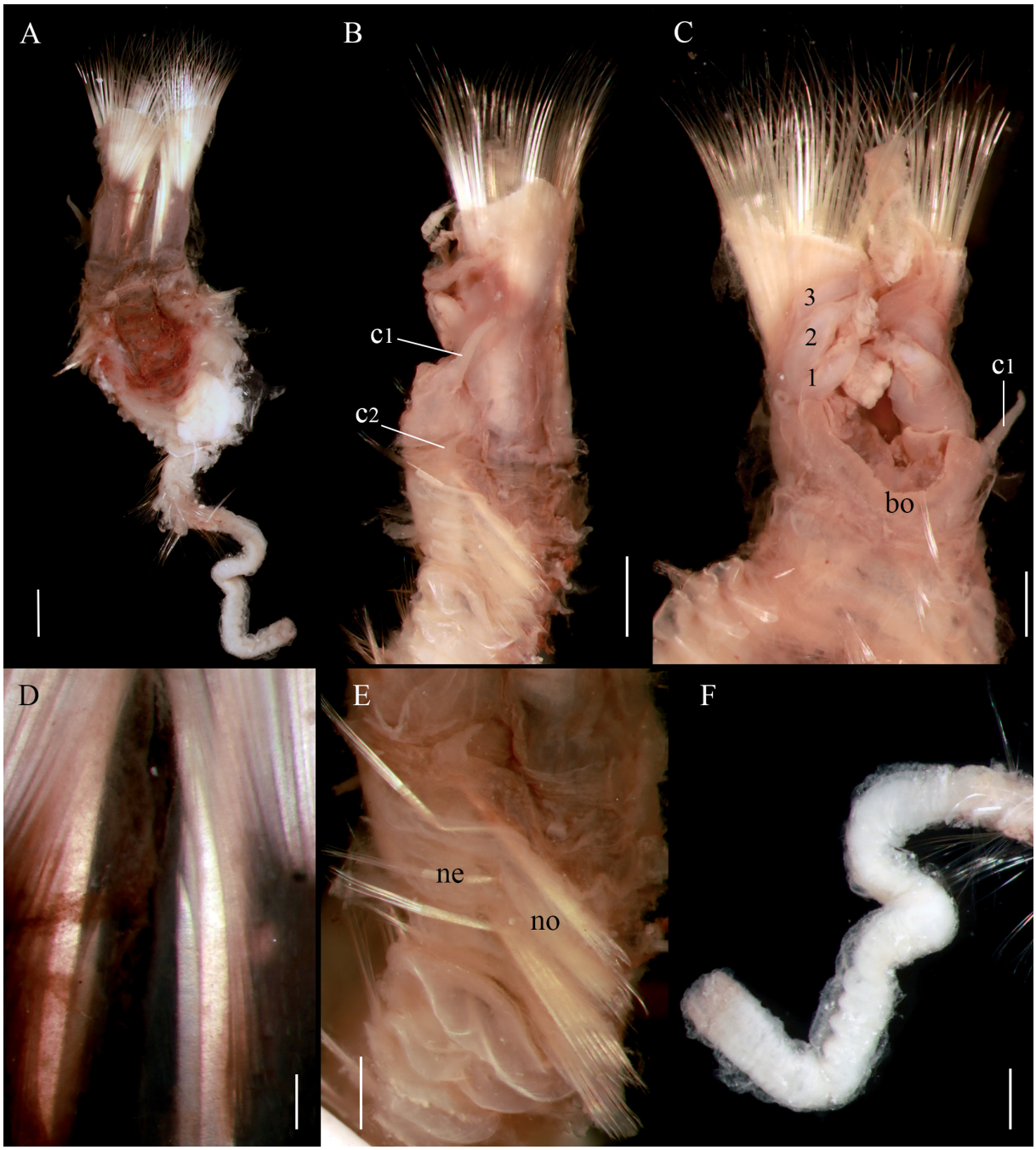

Fig. 3. *Mariansabellaria caribbea* sp. nov., holotype (ECOSUR-303). **A**. Complete specimen, dorsal view. **B**. Anterior region left lateral view. **C**. Anterior region ventral view. **D**. Nuchal spines. **E**. Parathorax left lateral view. **F**. Caudal peduncle. Abbreviations: bo = building organ; c1 = cirrus 1st thoracic; c2 = cirri 2nd thoracic segment; ne = parathoracic neuropodium; no = parathoracic notopodium. Numbers indicate the tentacular filaments. Scale bars: A–B, E: 1 mm; C, F: 0.5 mm; D: 200 µm.

Operculum. Opercular disc truncates, two rows of translucent, amber paleae: outer row with 54–56 paleae on each lobe, inner row with 4–5 paleae on each lobe (Fig. 3A, C). Outer paleae cylindrical, 2 mm long (Fig. 4A). Proximal region with compact thecae partially surrounding the blade, margins slightly expanded, denticulate (Fig. 4B, E). Middle region with thecae partially surrounding the blade, margins

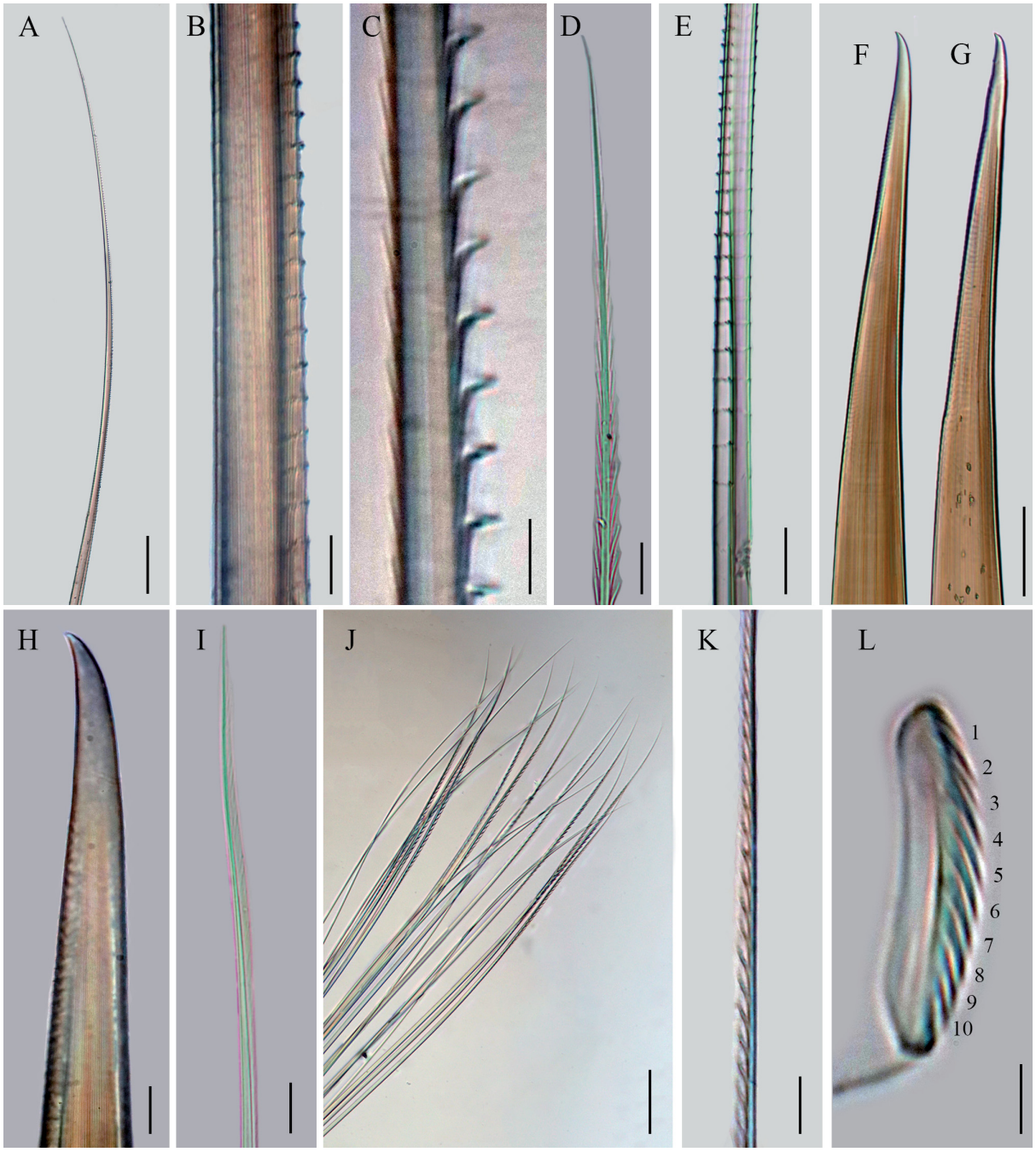

Fig. 4. *Mariansabellaria caribbea* sp. nov., holotype (ECOSUR-303). **A**. Outer palea dorsal. **B**. Basal region of dorsal outer palea. **C**. Middle region of dorsal outer palea. **D**. Details of the outer palea tip. **E**. Basal region of ventral outer palea. **F**. Dorsal inner palea. **G**. Ventral inner palea. **H**. Details of the inner palea tip. **I**. Parathoracic chaeta. **J–K**. Abdominal chaetae. **L**. Abdominal uncini. Numbers indicate the rows of teeth. Scale bars: A = 200 µm; B, D, H–I, K = 20 µm; C, L = 10 µm; E = 50 µm; F–G, J = 100 µm.

expanded, pectinate (Fig. 4C). Tip pinnate (Fig. 4D). Inner paleae cylindrical, finely tapering, with conspicuous thecae partially surrounding subdistal margins and slightly curved, smooth tip (Fig. 4F–H). Opercular stalk light brown, twice as long as wide (Fig. 3A). Seven opercular papillae on right lobe, three papillae on left; fragile, easily detachable tissue. Three pairs of tentacles, simple, grooved (Fig. 3C). Nuchal spines cylindrical, embedded in opercular tissue; two on left lobe and three in right one (Fig. 3D). Median ridge short, with some marginal eyespots. Median organ absent.

Thorax. First thoracic segment with long, triangular-shaped lateral lobe and capillary neurochaetae. Second chaetiger with short, triangular-shaped lateral lobe, without chaetae (Fig. 3E).

Parathorax. With four segments, body wall eroded, branchiae translucent, fragile (Fig. 3E). Pigmented tissue, in dorsal view, with seven reddish transverse lines (Fig. 3A). Notopodia with lanceolate and capillary chaetae (Fig. 4I). Neuropodia with only capillary chaetae.

Abdomen. Abdominal region bent, body wall damaged, branchiae translucent, fragile, present only in first four segments. Abdominal segments colorless. Neurochaetae capillary, ornamented with irregular thecal laminar extensions (Fig. 4J–K). Notopodia with series of uncini with 9–10 transverse rows of teeth (Fig. 4L). Caudal peduncle whitish, slightly annulate (Fig. 3F).

Remarks

Mariansabellaria caribbea sp. nov. shares the presence of transverse margins on the inner paleae with *M. chilena*, *M. tenhovei*, and *M. norvegica*, and the outer paleae with thecae that do not surround the blade, also called 'hemithecae' by Kirtley (1994) for *M. chilena*. However, *M. tenhovei*, *M. chilena* and *M. caribbea* sp. nov. differ in the number of buccal tentacles. Kirtley (1994) described *M. tenhovei* with five pairs of buccal tentacles and *M. chilena* with six pairs, while *M. caribbea* sp. nov. only has three pairs.

Mariansabellaria caribbea sp. nov. is characterized by having more than 50 pairs of outer paleae with irregularly expanded margins resembling small denticles, 4–5 inner paleae, and only three pairs of buccal tentacles. Although the outer paleae of *M. norvegica* also have irregular margins resembling denticles, Strömgren (1971) did not describe the number of opercular paleae. However, the two species differ in the morphology of the thecae of the outer paleae, and in the number of teeth on the abdominal uncini, seven pairs in *M. norvegica* and 9–10 pairs in *M. caribbea* sp. nov.

Kirtley (1994) only provided the number of opercular paleae for *M. harrisae*, with 24 pairs of outer and 10 pairs of inner paleae. In addition to the difference in the number of opercular paleae, *M. harrisae* has smooth inner paleae and five buccal tentacles per lobe, while *M. caribbea* sp. nov. has inner paleae with conspicuous thecae and three tentacles.

Distribution

Banco Chinchorro, Quintana Roo, at 274 m depth. This is the first record of the genus *Mariansabellaria* in the western Atlantic (Fig. 22).

Genus ***Phalacrostemma*** Marenzeller, 1895

Type species

Phalacrostemma cidariophilum Marenzeller, 1895, by monotypy.

Diagnosis

Operculum completely divided into two free lobes. Two rows of opercular paleae. Outer paleae arranged in spiral, with straight, cylindrical blades and ornamented thecae. Few (2–8) inner paleae arranged

in one short row near to dorsal junction of inner marginal lobes, with straight, cylindrical, or slightly flattened blades. Two to six pairs of nuchal hooks with limbation. Few tentacular filaments arranged in a single row (simple), absent in some species. Median organ small, conical. Four parathoracic segments (Kirtley 1994; Capa & Hutchings 2019).

Key to species of *Phalacrostemma* Marenzeller, 1895 from the Western Atlantic*

1. Outer paleae with distal thecae partially surrounding the blade (Figs 11D, 12A, E) .... ***P. dorothyae*** Kirtley, 1994. Florida Keys, 349.3 m depth
– Outer paleae with distal thecae completely surrounding the blade (Fig. 7E) 2

2. Outer palea with mid-distal thecae with pectinate margins, extensions of similar size that form a horizontal stroke, like fringe (Fig. 8D, I) 3
– Outer palea with mid-distal thecae with lacerate margins, elongated extensions of different sizes that form an asymmetrical and irregular stroke (Fig. 15G) 6

3. Outer palea with middle thecae with short extension, irregularly distributed, of different sizes and shapes (Fig. 8L) ..... ***P. gwendolynae*** Kirtley, 1994. Aruba, 228.7 m depth
– Outer palea with middle thecae with long extensions, of similar size and shape (Fig. 8C–D, I) 4

4. Middle thecae of outer palea with inclined extensions, 10–16 times as long as wide (Fig. 8D) .... ***P. paulinae*** Kirtley, 1994. Delaware Bay, New Jersey, 2160 m depth
– Middle thecae of outer palea with straight extensions, 6–9 times as long as wide (Fig. 8I) 5

5. Inner paleae with horizontal conspicuous thecae, margin of blade serrate (Fig. 6G); all opercular papillae of similar size (Fig. 5C, F) .....***P. danieli*** sp. nov. Grenada Island, 597 m depth
– Inner paleae with horizontal thecae inconspicuous, margin of blade smooth (Fig. 17E–F); first pair of opercular papillae twice as large as the others (Fig. 16B) .... ***Phalacrostemma*** sp. The Bahamas, 3000 m depth

6. Middle thecae of outer paleae almost longer than wide, margin forms a horizontal stroke with distal short extensions like denticles (Fig. 8M–N) ....***P. gloriaae*** Kirtley, 1994. Sanibel Island, Florida, Gulf of Mexico, 228.3–235.9 m depth
– Middle thecae of outer paleae three times as wide as long, margin forms a 'V' stroke (Fig. 15F) .... ***P. perkinsi*** Kirtley, 1994. Andros Island, Bahamas, 1362–1364 m depth

**Phalacrostemma tenera* (Augener, 1906), described from Barbados, was not included in the key. The redescription of the species based on type or topotype material is necessary to define its diagnostic characters.

Phalacrostemma danieli sp. nov.
urn:lsid:zoobank.org:act:8255C32E-0216-4353-A681-3A5E42915E88
Figs 5–7, 8E, G–J

Diagnosis

Outer paleae with pectinate margins on distal thecae, hirsute tips. Inner paleae cylindrical with conspicuous thecae, slightly expanded margins, and blunt tip. Tentacular filaments absent.

Etymology

This species name is after my brother Daniel Chávez-López. It is a noun in the genitive case (ICZN 1999, Art. 31.1.2).

Material examined

Holotype

LESSER ANTILLES • incomplete spec. (body length 10 mm); southwest of Grenada; RV *Pillsbury*, stn 478; 11°33′ N, 62°09′ W; depth 597 m; 2 Aug. 1966; UMML-22.1179.

Paratypes

LESSER ANTILLES • 9 specs; same collection data as for holotype; UMML-22.1180 • 1 spec. (using mid-operculum for SEM); same collection data as for holotype; UMML-22.1181 • 1 spec.; same collection data as for holotype; ECOSUR-304.

Additional material

BAHAMAS – **Southeastern Bahamas** • 4 specs; RV *Columbus Iselin*, stn 163; 23°37′ N, 77°13′ W; depth 1342 m; 6 Feb. 1974; UMML-22.1182 • 1 spec.; same collection data as for preceding; ECOSUR-P3236.

Description

Body. Holotype incomplete (UMML-22.1179), 10 mm long, 2.5 mm wide, six abdominal segments, caudal peduncle 3.5 mm long (Fig. 5).

Operculum. Opercular disc truncate. Outer paleae arranged spirally, 29–30 paleae on each lobe. Inner paleae arranged diagonally, two paleae on right lobe, one palea on left. Outer paleae amber, cylindrical, 2.5 mm long (Figs 6A–E, 7C–F). Proximal region with compact thecae, margins slightly expanded, denticulate (Figs 6B, 7C–D). Thecae of middle region with margins expanded, denticulate (Figs 6C, 7E). Thecae of mid-distal region with margins expanded, pectinate (Figs 6D, 7F); tips hirsute (Figs 6F, 7E). Inner paleae amber, cylindrical, with conspicuous thecae, slightly expanded margins; tips blunt, smooth (Figs 6F–G, 7G). Opercular stalk brown, slightly wider than long (Fig. 5A–D). Opercular papillae in one row peripheral to outer paleae; nine papillae on each lobe. Papillae conical and tapered, 5–6 times as long as wide (Fig. 5C). First papilla appears in dorsal region of opercular peduncle, at level of nuchal hooks (Fig. 5F). Four pairs of amber nuchal hooks, compressed, tip slightly curved, with long limbation. Limbation exceeds curvature of hook tip, 2.5 times as long as tip (Figs 6H, 7B). Palps robust, tapered, twice as long as wide (Figs 5C–D, 7A). Pair of broad buccal flaps (Fig. 5D). Tentacular filaments absent. Median organ conical, tapered without eyespots.

Thorax. First thoracic segment with two long, triangular-shaped lateral lobes and capillary neurochaetae (Fig. 5C–D). Second segment with 2–3 triangular-shaped lateral lobes and paired branchiae, without chaetae (Fig. 5C).

Parathorax. With four segments, all with paired branchiae. Notopodia with six lanceolate chaetae and six capillary chaetae (Fig. 6I). Neurochaetae capillary.

Abdomen. Abdominal segments brownish with paired branchiae up to segment 4. Neurochaetae capillary, ornamented with irregular thecal laminar extensions (Fig. 6J). Notopodia with series of uncini with 10 rows of teeth (Fig. 6K). Caudal peduncle cylindrical, brownish, broken, only posterior region attached to abdomen (Fig. 5B, E).

Variation

Body incomplete 4–10 mm long, 0.5–2 mm wide, 3–6 abdominal segments. Operculum with 16–30 outer paleae per lobe, 1–3 inner paleae per lobe, generally two pairs, and 3–5 pairs of nuchal hooks. Outer paleae 1–2.5 mm long.

Fig. 5. *Phalacrostemma danieli* sp. nov., holotype (UMML-22.1179). **A**. Complete body, dorsal view. **B**. Complete body, ventral view. **C**. Anterior region, lateral view. **D**. Anterior region, ventral view. **E**. Caudal peduncle. **F**. Nuchal hooks. Abbreviations: bf = buccal flaps; bo = building organ; ca = caudal peduncle; c1 = cirri 1st thoracic segment; c2 = cirri 2nd thoracic segment; mo = mouth; nh = nuchal hooks; ne = neuropodium; op = outer paleae; opa = opercular papillae; pa = palps. Numbers indicate the cirri. Scale bars: A–B = 1 mm, C–E = 0.5 mm; F = 200 µm.

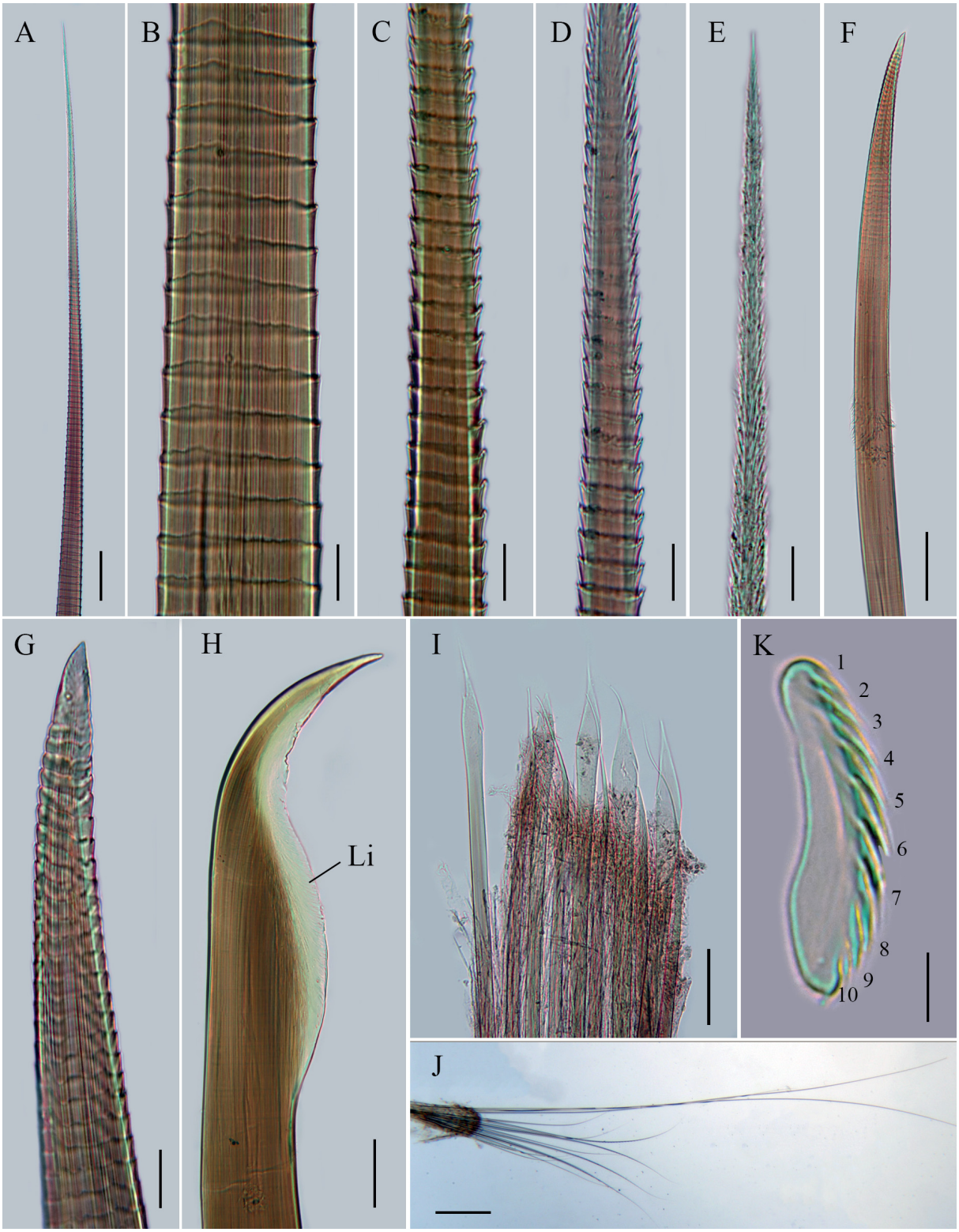

Fig. 6. *Phalacrostemma danieli* sp. nov., holotype (UMML-22.1179). **A**. Outer palea. **B**. Proximal region outer palea. **C**. Middle region of outer palea. **D**. Middle-distal region of outer palea. **E**. Tip of outer palea. **F**. Inner palea. **G**. Tip of inner palea. **H**. Nuchal hook. **I**. Parathoracic notochaetae. **J**. Abdominal parapodium. **K**. Uncini. Abbreviation: Li = limbation. Numbers indicate the rows of teeth. Scale bars: A, F, H–I = 100 µm; B–E, G = 20 µm; J = 200 µm; K = 10 µm.

Fig. 7. *Phalacrostemma danieli* sp. nov., paratype (UMML-22.1181). **A**. Right opercular lobe. **B**. Nuchal hooks. **C–D**. Basal region of outer palea. **E**. Middle region and tip of outer paleae. **F**. Middle-distal region of outer palea. **G**. Inner paleae. Abbreviations: nh = nuchal hooks; op = outer paleae; pa = palps; tip = outer palea tip. Arrows indicate inner paleae. Scale bars: A = 200 μm; B–C = 100 μm; D = 20 μm; E, G = 50 μm; F = 10 μm.

Remarks

Phalacrostemma danieli sp. nov. shares the morphology of the outer paleae with *P. paulinae* Kirtley, 1994, and the morphology of the abdominal uncini with *P. tenera* (Augener, 1906).

Phalacrostemma paulinae Kirtley, 1994 was described from the Northwestern Atlantic Ocean (Kirtley 1994: 38°41′ N, 70°38′ W), from a single specimen collected by RV *Atlantis II*, stn 95 at 2160 m depth. Its original description is brief and only included a partial description of the outer palea, so it is necessary to redescribe *P. paulinae* to know the rest of the characters.

According to Kirtley (1994: 162), the type material of *P. paulinae* was in the Natural History Museum, Los Angeles (NHM) without a specific catalog number. During his stay at NHM (Feb.–Mar. 2022) Dr Sergio Salazar-Vallejo, along with the polychaete collection manager Leslie H. Harris, searched for the type material of *P. paulinae* and found the holotype vial with catalog number LACM-AHF POLY 1691 (Fig. 8A). Unfortunately, the vial was empty, which means the holotype is missing, and there are no other specimens from nearby localities or the same oceanographic expedition in the museum.

In *P. paulinae* the outer paleae have the proximal thecae with denticulate and slightly expanded margins (Fig. 8B); thecae of the middle region with expanded pectinate margins (Fig. 8C), and the mid-distal thecae with expanded elongate and pectinate margins (Fig. 8D). The morphology of the outer paleae of *P. danieli* (Fig. 8G–I) resembles that of *P. paulinae*; although there are some differences in the denticles of the mid-distal thecae. *Phalacrostemma danieli* sp. nov. has straight denticles, 5–9 times as long as wide (Fig. 8I), whereas *P. paulinae* has slightly inclined denticles, 10–16 times as long as wide (Fig. 8D).

Another difference is the locality and bathymetric range where the species were found. According to Kirtley (1994: 162), *P. paulinae* was collected in the North Atlantic (38°41′ N, 70°38′ W) at 2160 m depth; however, the vial label contains different coordinates (38°33′ N, 68°32′ W) and depth (3753 m) (Fig. 8A), even though both refer to the same station and oceanographic cruise: RV *Atlantis*, stn Atl. 95. Based on the above, *P. paulinae* could be distributed from 38°41′ N, 70°38′ W to 38°33′ N, 68°32′ W at 2160 m or 3753 m depth, while *P. danieli* sp. nov. was collected in the Lesser Antilles (11°33′ N, 62°09′ W) at 597 m depth and the Bahamas (23°37′ N, 77°13′ W) at 1342 m.

Phalacrostemma tenera (Augener, 1906) was described from Barbados at 365.8 m depth. *Phalacrostemma danieli* sp. nov. shares the abdominal uncini with a curved dorsal region and 10 rows of teeth (Fig. 8J) with *P. tenera* (Fig. 8K). Although these species are distributed at similar depths at relatively close localities, they differ mainly in the shape of the nuchal hooks. *Phalacrostemma tenera* has a short, slightly falcate tip, at a 57° angle, and a slightly wider limbation than the tip (Fig. 8F), whereas *P. danieli* sp. nov. has a curved tip, at a 45° angle, and a wider tip than the limbation (Fig. 8E).

The lack of detail mainly in the morphology of the opercular paleae of *P. tenera* and *P. paulinae* prevents the determination of their diagnostic characters and therefore hinders their comparison with the other species of the genus. In addition, the type material of *P. tenera* (Kirtley 1994: 165) and *P. paulinae* (Salazar-Vallejo 2022 pers. com.) is missing. Therefore, topotype material is necessary.

Based on the morphological differences found and considering the area of distribution and bathymetric ranges, I assigned the analyzed specimens to *P. danieli* sp. nov.

Distribution

Southwest of Grenada Island at 597 m depth (Fig. 22).

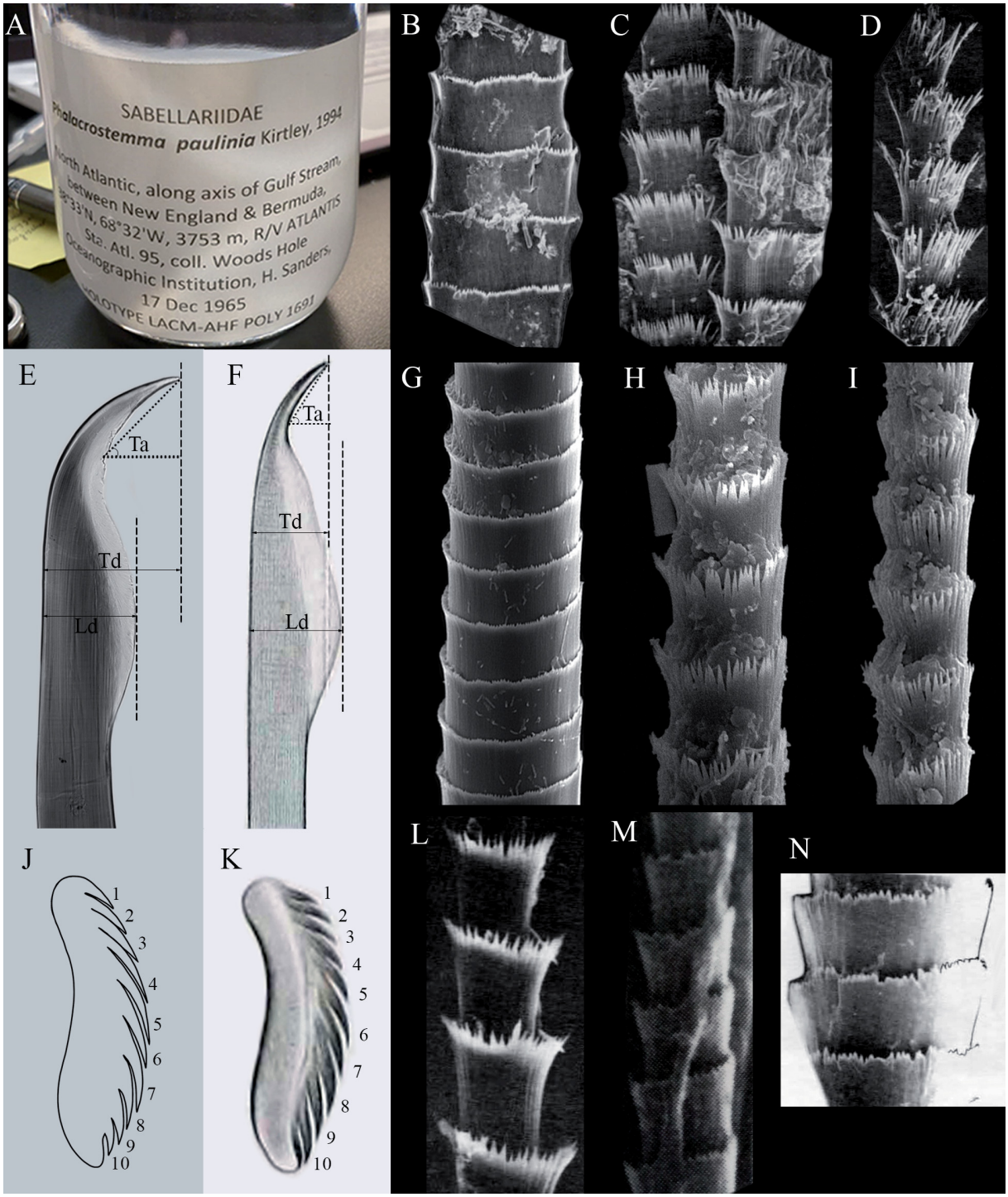

Fig. 8. Comparation between some species of *Phalacrostemma* Marenzeller, 1895. **A**. Holotype vial of *P. paulinae* Kirtley, 1994. **B–D**. Outer palea of *P. paulinae*. **B**. Proximal region. **C**. Middle region. **D**. Mid-distal region. **E**. Nuchal hook of *P. danieli* sp. nov. **F**. Nuchal hook of *P. tenera* (Augener, 1918). **G–I**. Outer palea of *P. danieli* sp. nov. **G**. Proximal region. **H**. Middle region. **I**. Mid-distal region. **J**. Abdominal uncini of *P. danieli* sp. nov. **K**. Abdominal uncini of *P. tenera*. **L**. Middle region of outer palea of *P. gwendolynae* Kirtley, 1994. **M–N**. Middle region of outer palea of *P. gloriaae* Kirtley, 1994. Abbreviations: Ld = limbo distance; Ta = tip angle; Td = tip distance. Numbers indicate the rows of teeth. A, Photo taken by Sergio Salazar-Vallejo; B–D, L–N, modified from Kirtley (1994); F, K, from Augener (1918).

Phalacrostemma dorothyae Kirtley, 1994
Figs 9–11, 12E–H

Phalacrostemma dorothyae Kirtley, 1994: 153, figs 9.3.1a–c, 9.3.2a–e. Type locality: Pourtales, Florida Keys, 349.3 m depth.

Material examined

NORTH ATLANTIC – **Bahamas** • 2 specs; northwest of North Cat Cay; RV *Gerda*, stn 242; 25°37′ N, 79°22′ W; depth 494 m; on sea urchin spine; 30 Jan. 1964; UMML-22.1183 • 1 spec. (using mid operculum for SEM); same collection data as for preceding; UMML-22.1184 • 1 spec.; same collection data as for preceding; ECOSUR-P3237. – **Florida Strait** • 6 specs; southeast of Long Key; RV *Gerda*, stn 456; 24°39′ N, 80°47′ W; depth 132 m; on sea urchin spine; 23 Jan. 1965; UMML-22.1185 • 1 spec.; same collection data as for preceding; ECOSUR-P3238 • 1 spec.; southeast of Long Key; RV *Gerda*, stn 457; 24°37′ N, 80°46′ W; depth 178 m; on sea urchin spine; 23 Jan. 1965; UMML-22.1186 • 1 spec.; south of Duck Key; RV *Gerda*, stn 480; 24°31′ N, 80°55′ W; depth 192 m; 26 Jan. 1965; UMML-22.1187 • 2 specs; south of Saddlebunch Key; RV *Gerda*, stn 861; 24°00′ N, 81°36′ W; depth 536; on a gastropod shell; 29 Aug. 1967; UMML-22.1200. – **East Florida** • 7 specs; east of Boynton Beach; RV *Gerda*, stn 158; 26°31′ N, 79°23′ W; depth 535 m; 25 Jun 1963; UMML-22.1188 • 4 specs; east of Fort Lauderdale; RV *Gerda*, stn 718; 26°08′ N, 79°19′ W; depth 448 m; 3 Aug. 1965; UMML-22.1189. – **South Grand Bahamas** • 1 spec.; south of Xanadu Beach; RV *Gerda*, stn 694; 26°27′ N, 78°42′ W; depth 658 m; on sea urchin spine; 21 Jul 1965; UMML-22.1190.

Description

Body. Complete specimen (UMML-22.1183), broken in middle part of abdomen, 13 mm long, 1 mm wide, 12 abdominal segments, caudal peduncle 8 mm long (Fig. 9A).

Operculum. Opercular disc truncate (Fig. 9B, E). Opercular crown with some broken or missing paleae (Fig. 9E). Outer paleae arranged spirally, 19 paleae on right lobe, 31 paleae in on. Inner paleae arranged diagonally, three paleae on each lobe (Figs 9E–F, 10A). Outer paleae amber, cylindrical, 1.5 mm long (Fig. 10A). Proximal region with compacts thecae, margins non-expanded (Fig. 10B). Thecae of middle region with margins slightly expanded, denticulate (Figs 10C, 11C). Tip with thecae partially surrounding blade, margins expanded, pectinate (Fig. 11D). Inner paleae amber, cylindrical, with conspicuous, compact thecae, margins non-expanded; tips blunt, smooth (Figs 10D, 11F). Opercular stalk pale brown, 1.5 times as long as wide. Opercular papillae in one row peripheral to outer paleae; 10 papillae on each lobe. Papillae conical, robust, tapered, 2.5–4 times as long as wide (Fig. 9B–C). First papilla appears on inner region of opercular peduncle, at level of nuchal hooks (Fig. 11A–B). Five pairs of amber nuchal hooks, compressed, tip slightly falcate, with short limbation. Limbation not reaching tip curvature, almost three times as long as tip (Figs 10E, 11E). Palps robust, tapered, four times as long as wide (Fig. 10A–E). Pair of broad buccal flaps (Fig. 11D). Tentacular filaments absent. Median organ conical, colorless, without eyespots.

Thorax. First thoracic segment with long, triangular-shaped lateral lobe and capillary neurochaetae. Second segment with two triangular-shaped lateral lobes and paired branchiae, without chaetae (Fig. 9C).

Parathorax. Four segments, all with paired branchiae. Notopodia with five lanceolate chaetae and five capillary chaetae (Fig. 10F). Neurochaetae capillary.

Abdomen. Abdominal segments brown, with paired branchiae up to segment 2. Neurochaetae capillary, ornamented with irregular thecal laminal extension. Notopodia with series of uncini with 8–9 rows of teeth (Fig. 10G). Caudal peduncle cylindrical, brownish (Fig. 9A).

Variation

Body 6–14 mm long, 1–2 mm wide. Incomplete specimens with 5–18 abdominal segments; complete specimens with 11–12 abdominal segments and caudal peduncle 5–8 mm. Operculum with 15–35 outer paleae per lobe, 1–4 inner paleae per lobe, and 3–6 pairs of nuchal hooks. Outer paleae 1–1.5 mm long. Opercular papillae with 7–13 per lobe.

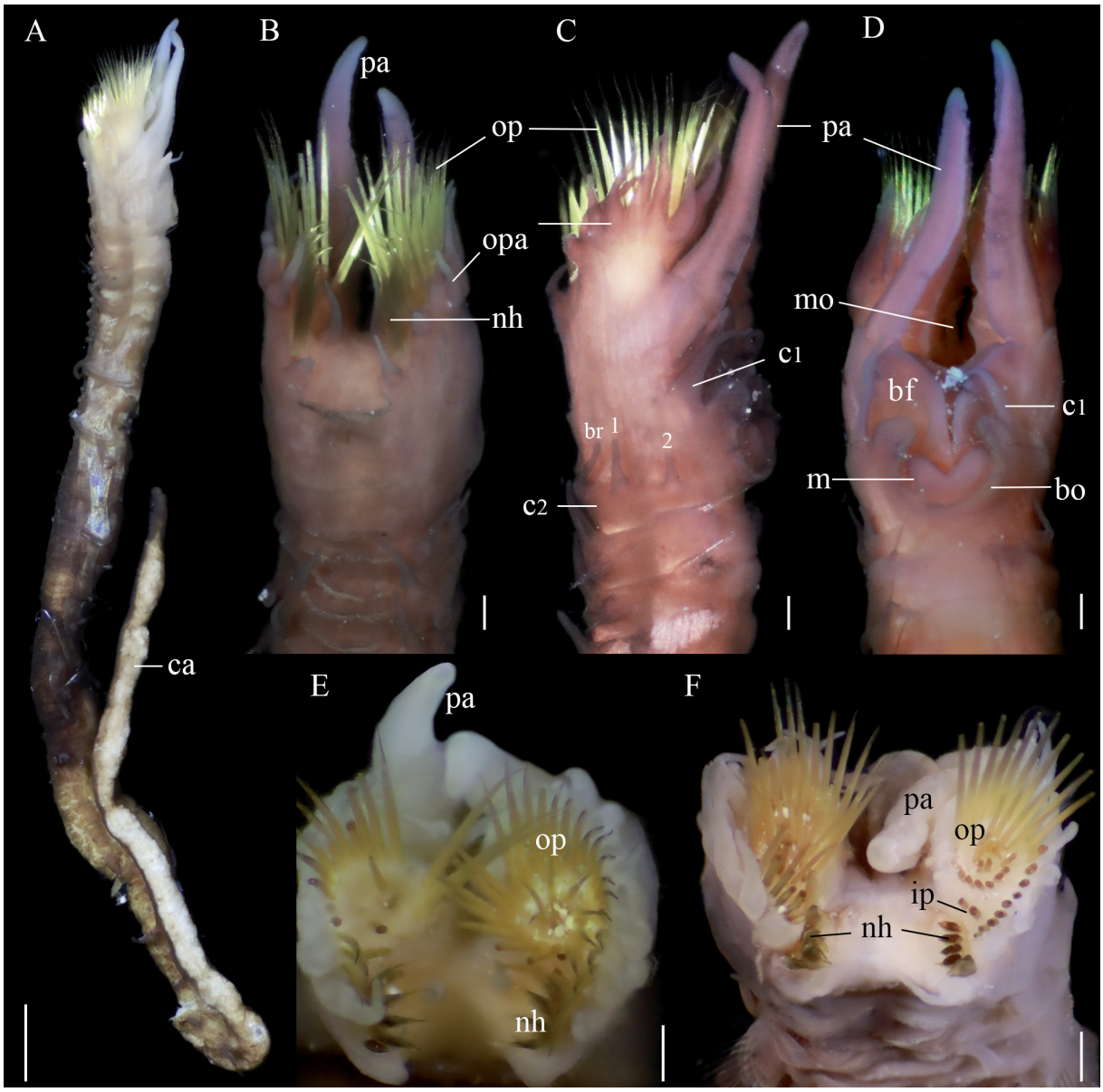

Fig. 9. *Phalacrostemma dorothyae* Kirtley, 1994 (UMML-22.1183). **A**. Complete specimen, lateral view. **B**. Anterior region, dorsal view. **C**. Anterior region, lateral view. **D**. Anterior region, ventral view. **E**. Opercular crown, upper view. **F**. Opercular crown of another specimen (UMML-22.1183), upper view. Abbreviations: bf = buccal flaps; bo = building organ; br = branchiae; ca = caudal peduncle; c1 = cirri 1st thoracic segment; c2 = cirri 2nd thoracic segment; ip = inner paleae; m = mount; mo = median organ; nh = nuchal hooks; op = outer paleae; opa = opercular papillae; pa = palps. Scale bars: A = 1 mm; B–F = 0.2 mm.

Remarks

Phalacrostemma dorothyae was described by Kirtley (1994) from Florida Keys. Its original description is brief and only included the partial description of opercular paleae and nuchal hooks. The revised specimens share the morphology of the outer paleae with *P. dorothyae*. Both species have elongated,

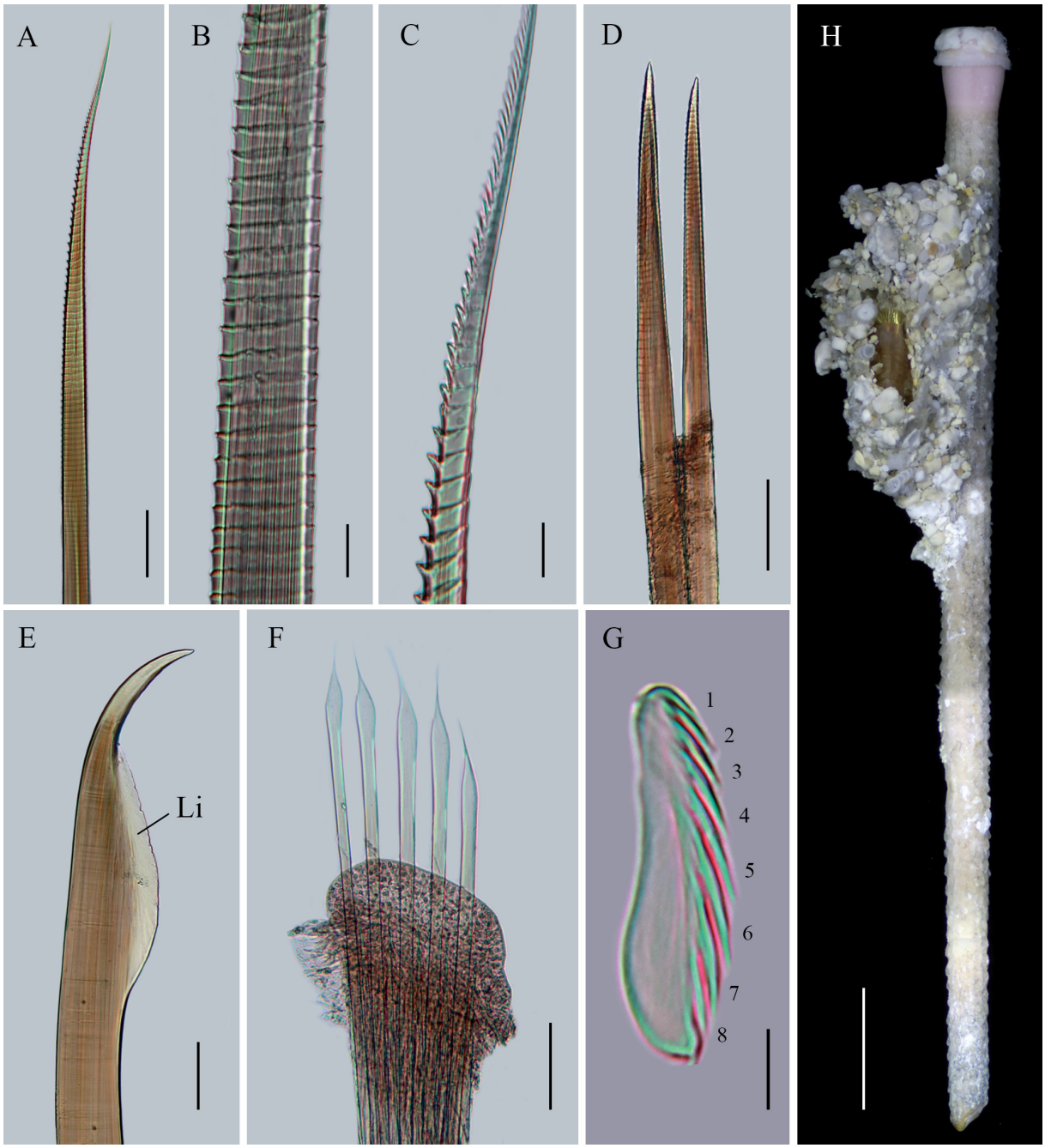

Fig. 10. *Phalacrostemma dorothyae* Kirtley, 1994 (UMML-22.1183). **A**. Outer palea. **B**. Proximal region of outer palea. **C**. Middle region of outer palea. **D**. Inner paleae. **E**. Nuchal hook. **F**. Parathoracic notochaetae. **G**. Uncini. **H**. Specimen (UMML-22.1186) in its tube attached to a spine of sea urchin. Abbreviation: Li = limbation. Numbers indicate the rows of teeth. Scale bars: A, D–F = 100 µm; B–C = 20 µm; G = 10 µm; H = 0.5 mm.

irregular thecae at the tip of the outer paleae that partially cover the blade, only the inner side (Fig. 12A, E); thecae with finely denticulate expanded margins in the middle region (Fig. 12B, F); and proximal compact thecae with irregular margins (Fig. 12C, G). However, my specimens differ from *P. dorothyae* in the inner paleae; *P. dorothyae* has inner paleae with "irregular, slightly swollen thecae with distal margins with smoothly rounded distal denticles" (Kirtley 1994: 153) (Fig. 12D), while my specimens have compact thecae with irregular margins in the inner paleae (Fig. 12H).

The nuchal hooks of my specimens are slightly different from those of *P. dorothyae*. Kirtley's (1994: fig 9.3.2d) *P. dorothyae* has nuchal hooks with shorter tips, about three times as long as wide, while in what is herein regarded as *P. dorothyae* they are six times as long as wide.

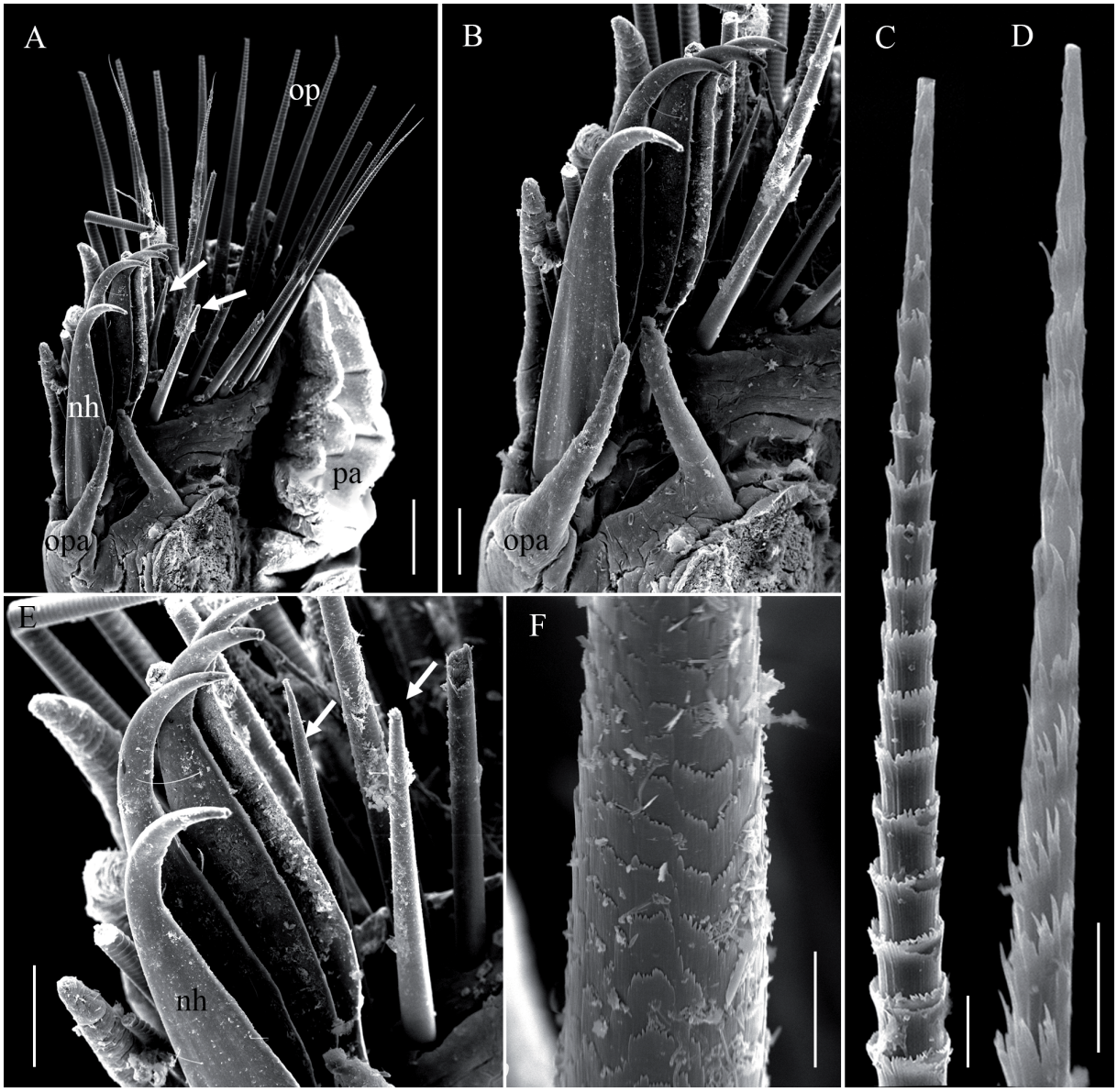

Fig. 11. *Phalacrostemma dorothyae* Kirtley, 1994 (UMML-22.1184). **A**. Left opercular lobe. **B**. Nuchal hooks. **C**. Outer palea. **D**. Tip of outer palea. **E**. Inner paleae. **F**. Thecae of inner palea. Abbreviations: nh = nuchal hooks; opa = opercular papillae; op = outer paleae; pa = palps. Arrows indicate inner paleae. Scale bars: A = 200 μm; B, E = 100 μm; C–D, F = 10 μm.

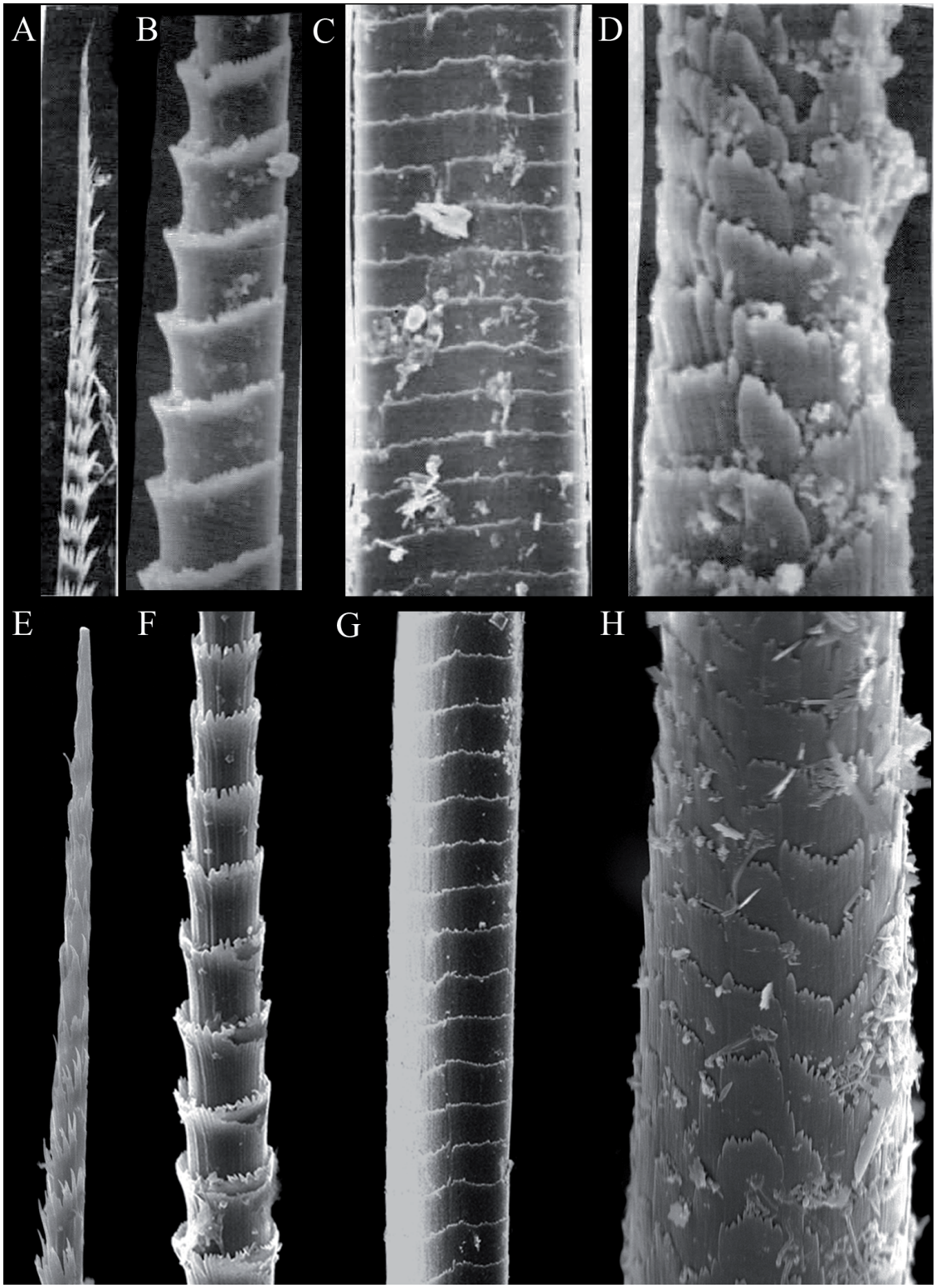

Fig. 12. Comparation between opercular paleae of *Phalacrostemma dorothyae* Kirtley, 1994. **A–D**. Holotype of *P. dorothyae*. **A**. Tip of outer palea. **B**. Middle region of outer palea. **C**. Proximal region of outer palea. **D**. Thecae of inner palea. **E–H**. *P. dorothyae*, this work (UMML-22.1184). **E**. Tip of outer palea. **F**. Middle region of outer palea. **G**. Proximal region of outer paleae. **H**. Thecae of inner palea. A–D, modified from Kirtley (1994).

Another possible difference between the revised specimen here and *P. dorothyae* is in the buccal tentacles. According to the key in Kirtley (1994: 149), *P. dorothyae* is grouped with species having 3–5 simple buccal tentacles, whereas my specimens lack them. Unfortunately, in the description of *P. dorothyae*, Kirtley (1994) did not mention anything about the number of buccal tentacles.

Phalacrostemma dorothyae and my specimens have similar outer paleae and may even be found in the same geographic area at similar depths (*P. dorothyae* from the Florida Keys at 200–350 m, holotype; *P. dorothyae* from Southeast Florida at 130–530 m, this study), and on same substrates (urchin spines). Despite some minor morphological differences above, I have assigned them to the same species.

Distribution

Southeast of Florida and Grand Bahamas, at 132–536 m depth, on sea urchin spine and gastropod mollusk shells (Fig. 22).

Phalacrostemma perkinsi Kirtley, 1994
Figs 13–15

Phalacrostemma perkinsi Kirtley, 1994: 163, fig. 9.8a–c. Type locality: The Bahamas, 1362–1364 m depth.

Material examined

NORTH ATLANTIC – **Southeastern Bahamas** • 1 spec.; RV *Columbus Iselin*, stn 47: 23°43′ N, 77°09′ W; depth 3000 m; 24 Feb. 1973; UMML-22.1191 • 1 spec. (using mid operculum for SEM); same collection data as for preceding; UMML-22.1192 • 1 spec.; RV *Columbus Iselin*, stn 250; 23°52′ N, 76°56′ W; depth 1305 m; 31 Oct. 1974; UMML-22.1193 • 1 spec.; same collection data as for preceding; ECOSUR-P3239.

Description

Body. Incomplete specimen (UMML-22.1191), 13 mm long, 3 mm wide, six abdominal segments (Fig. 13A–F).

Operculum. Opercular disc truncate (Fig. 13A–B). Opercular crown with some broken or missing paleae. Outer paleae arranged spirally, 22 paleae on right lobe, 14 paleae on left. Inner paleae arranged diagonally, two paleae on each lobe. Outer paleae amber, cylindrical, 3–4 mm long (Figs 14A–E, 15A–D). Proximal region with compacts thecae, margins non-expanded (Fig. 14B, D). Thecae of middle region with margins non-expanded (Fig. 15E) to slightly irregularly expanded (Figs 14C, 15F). Thecae of mid-distal region elongate with margins irregularly expanded (Fig. 15G); tips hirsute (Figs 14D, 15H). Inner paleae amber, cylindrical, with thecae inconspicuous; tips lanceolate (Figs 14E, 15I). Opercular stalk brown. Opercular papillae in two rows, each row with 11–13 opercular papillae on each lobe (Fig. 13B). Papillae conical, tapered, 2–4 times as long as wide (Figs 13B, 15B). First papilla appears in dorsal region of opercular peduncle, at level of nuchal hooks. Six pairs of amber nuchal hooks, compressed, tips sharp falcate, with limbation. Limbation not reaching tip curvature, 1.5 times as long as tip (Figs 14G, 15C). Palps robust, tapered, three times as long as wide (Fig. 13D). Pair of broad buccal flaps (Fig. 13D). Tentacular filaments absent. Median organ conical, brownish, without eyespots. Building organ U-shaped, brown.

Thorax. First thoracic segment with three long, triangular-shaped lateral lobes and neurochaetae capillary (Fig. 13E). Second segment with two long triangular-shaped lateral lobes and paired branchiae, without chaetae.

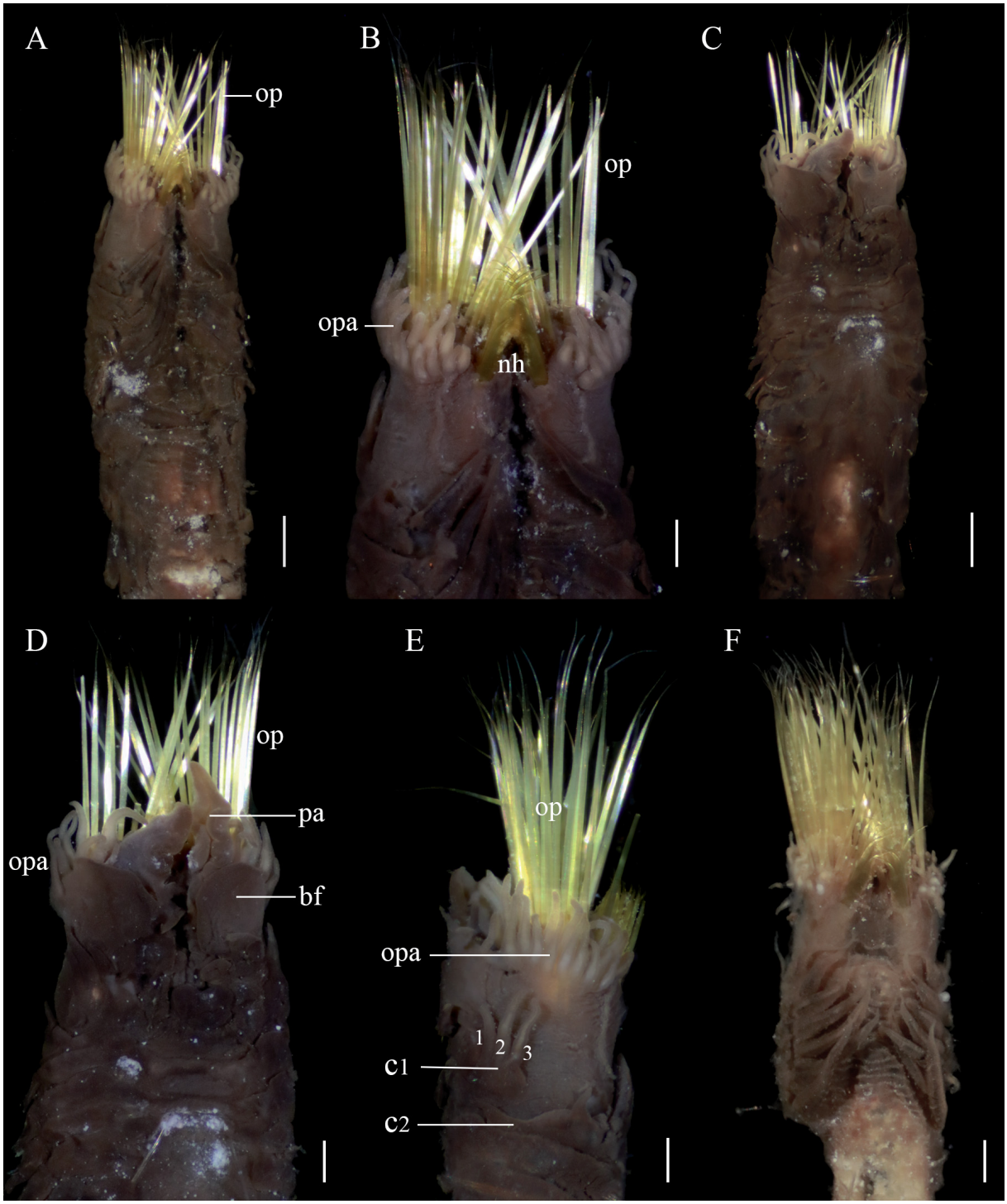

Fig. 13. *Phalacrostemma perkinsi* Kirtley, 1994 (UMML-22.1191). **A**. Anterior region, dorsal view. **B**. Operculum, dorsal view. **C**. Anterior region, ventral view. **D**. Operculum, ventral view. **E**. Anterior region, lateral view. **F**. Another specimen (UMML-22.1192). Abbreviations: bf = buccal flaps; c1 = cirri 1st thoracic segment; c2 = cirri 2nd thoracic segment; nh = nuchal hooks; op = outer paleae; opa = opercular papillae; pa = palps. Numbers indicate the cirri. Scale bars: A, C = 1 mm; B, D–F = 0.5 mm.

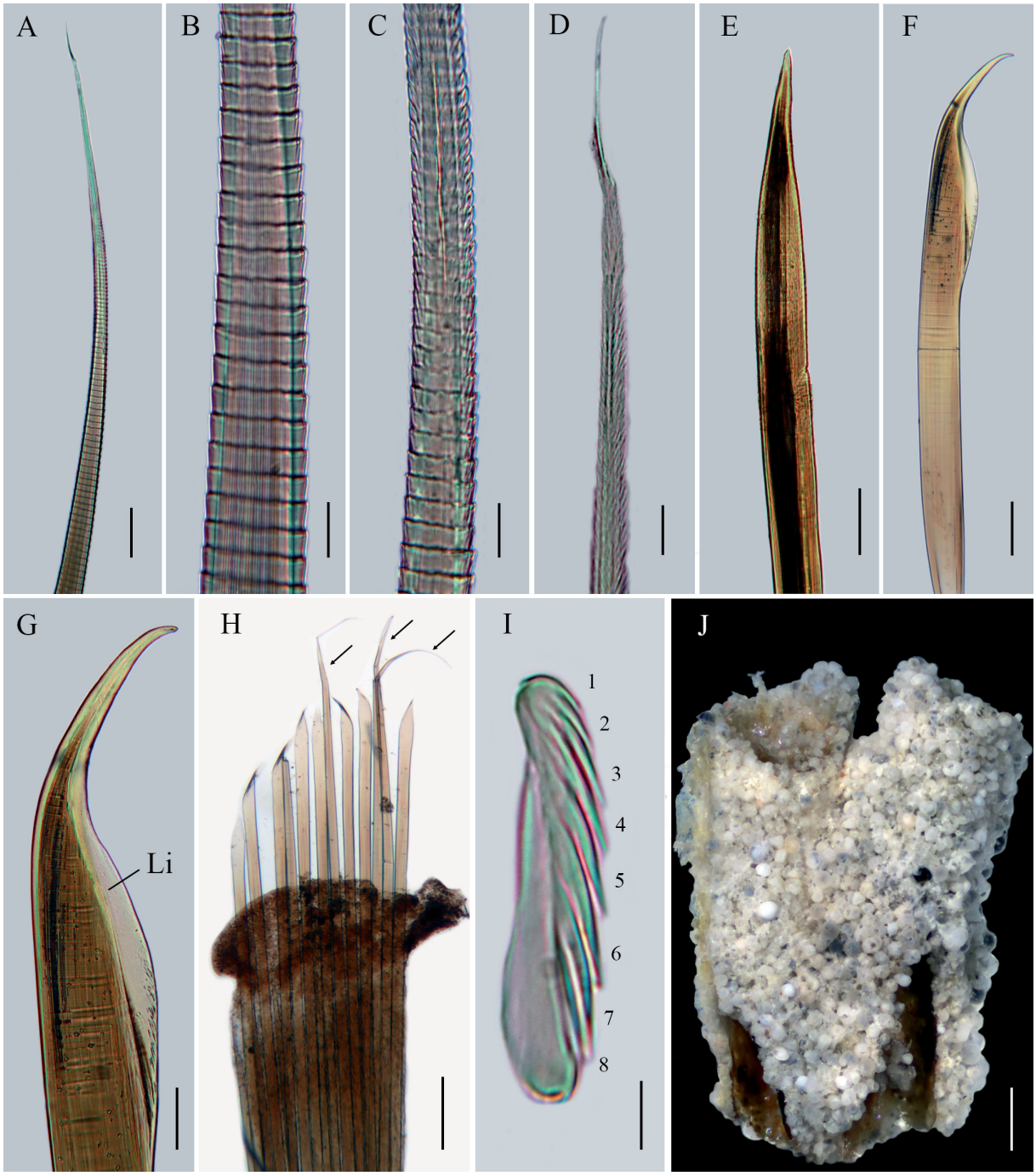

Fig. 14. *Phalacrostemma perkinsi* Kirtley, 1994 (UMML-22.1191). **A**. Outer palea. **B**. Distal region of outer palea. **C**. Middle region of outer palea. **D**. Tip of outer palea. **E**. Inner palea. **F**. Nuchal hook. **G**. Detail of nuchal hook. **H**. Parathoracic notochaetae. **I**. Uncini. **J**. Tubes. Abbreviation: Li = limbation. The arrows indicate capillary chaetae. Numbers indicate the rows of teeth. Scale bars: A, E–F, H = 200 µm; B–D = 20 µm; G = 100 µm; I = 10 µm; J = 2 mm.

Parathorax. With four segments, all with paired branchiae. Notopodia with seven lanceolate chaetae and three capillary chaetae (Fig. 14H). Neurochaetae capillary.

Abdomen. Abdominal segments brown, all with paired branchiae. Neurochaetae capillary, ornamented with irregular thecal laminar extensions. Notopodia with series of uncini with 7–8 rows of teeth (Fig. 14I).

Tubes

With foraminiferans (Fig. 14J).

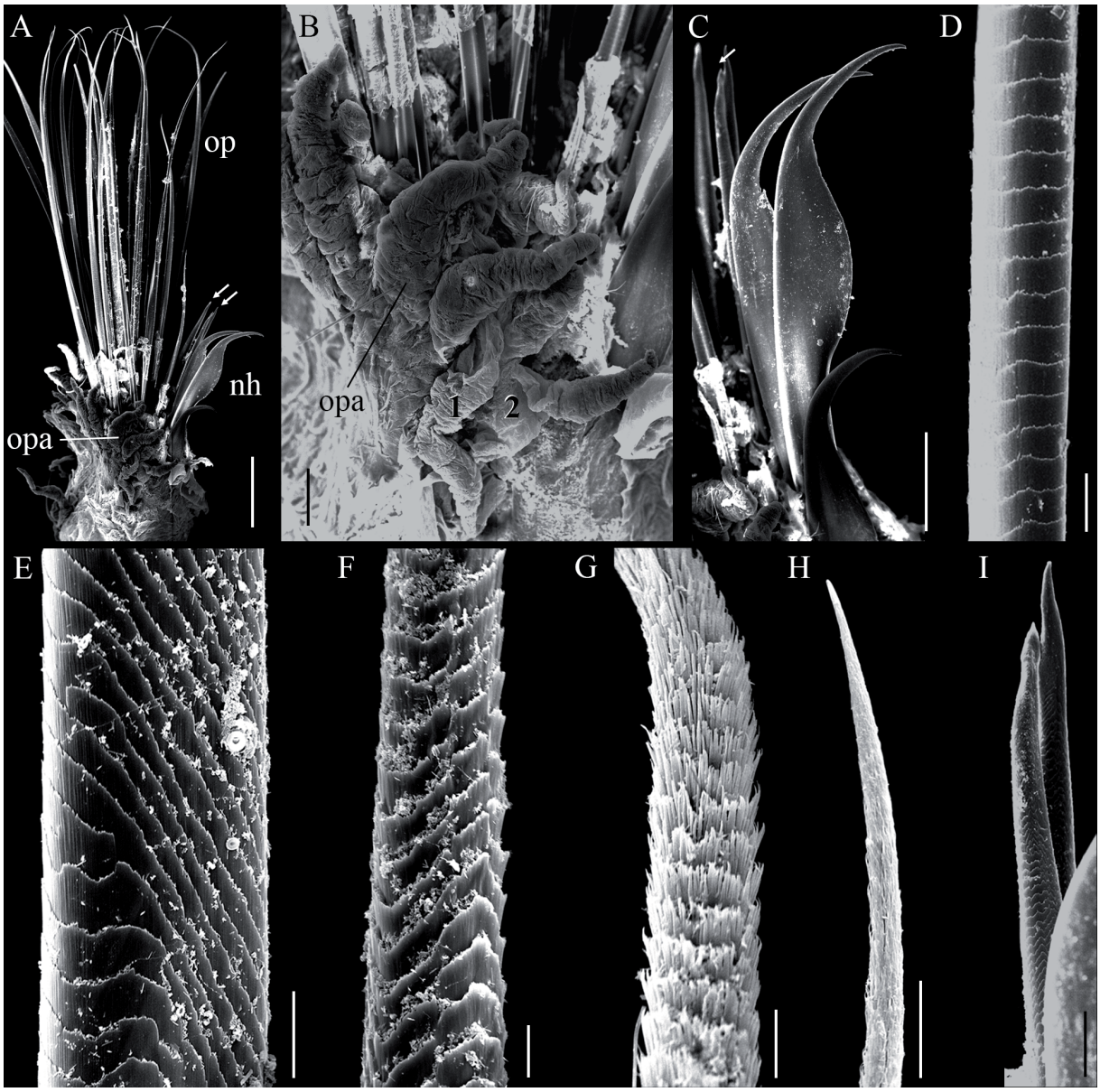

Fig. 15. *Phalacrostemma perkinsi* Kirtley, 1994 (UMML-22.1192). **A**. Left opercular lobe. **B**. Detail of two rows of opercular papillae. **C**. Nuchal hooks. **D–H**. Outer palea. **D**. Proximal region. **E**. Proximal-middle region. **F**. Middle region. **G**. Middle-distal region. **H**. Tip. **I**. Inner paleae. Abbreviations: nh = nuchal hooks; op = outer paleae; opa = opercular papillae. Arrows indicate inner paleae. Numbers indicate the rows of opercular papillae. Scale bars: A = 0.5 mm; B = 100 μm; C = 200 μm; D–E, H = 20 μm; F–G = 10 μm; I = 50 μm.

Variation

Body incomplete 8–13 mm long, 1.5–3 mm wide, 3–7 abdominal segments. Operculum with 21–30 outer paleae per lobe, 2–4 inner paleae per lobe, and 5–6 pairs of nuchal hooks, commonly five. Outer paleae 2–4 mm long. Opercular papillae with 9–13 per lobe. First thoracic segment with 2–4 triangular-shaped lateral lobes.

Remarks

Phalacrostemma perkinsi Kirtley, 1994 (1362–1364 m) was described based on specimens collected by RV *Columbus Iselin* at station 322 (Fig. 22). In this work, I reviewed specimens from the same expedition and cruise from two stations near the type locality of *P. perkinsi* (The Bahamas, 1342–3000 m depth, Fig. 22).

As the description of *P. perkinsi* is brief, only the morphology of the outer opercular paleae can be compared. *Phalacrostemma perkinsi* is characterized by outer paleae with numerous short, distal slightly expanded margins, thecae with weakly expanded margins in the middle region, and proximal transversal thecae with unexpanded margins. All these characteristics are shared with my Bahamian specimens; however, the latter have irregularly expanded thecae on the mid-distal region of the outer paleae that are not described or illustrated in *P. perkinsi*.

Kirtley's (1994) identification key for *Phalacrostemma* species groups *P. perkinsi* with those species having 3–5 tentacular filaments. The specimens reviewed here do not have buccal tentacles, so this feature could be a difference between the specimens identified by Kirtley. Redescription of *P. perkinsi* based on type material is necessary to confirm the presence of two rows of opercular papillae and the presence of buccal tentacles. Because *P. perkinsi* was described based on specimens from the same cruise as those reviewed in this work, and they have similar opercular paleae, I have assigned them to the same species.

Distribution

The Bahamas, at 1342 and 3000 m depth (Fig. 22).

Phalacrostemma sp.
Figs 16–17

Material examined

NORTH ATLANTIC – **Southeastern Bahamas** • 1 incomplete spec.; RV *Columbus Iselin*, stn 47; 23°43′ N, 77°09′ W; depth 3000 m; 24 Feb. 1973; UMML-22.1194.

Description

Body. Incomplete specimen (UMML-22.1194), 10 mm long, 2.5 mm wide, five abdominal segments (Fig. 16).

Operculum. Opercular disc truncate. Outer paleae arranged spirally, 37 paleae on each lobe. Inner paleae arranged diagonally, two paleae on right lobe, one palea on left. Outer paleae amber, cylindrical, 3 mm long (Fig. 17A). Proximal region with compact thecae, margins non-expanded (Fig. 17B). Thecae of middle region compact with non-expanded margins to thecae with margins irregular slightly expanded (Fig. 17C); tips hirsute (Fig. 17D). Inner paleae amber, cylindrical, with thecae inconspicuous; tip blunt, slightly inclined (Fig. 17E–F). Opercular stalk brown, 1.6 times as wide as long (Fig. 16). Opercular papillae in one row peripheral to outer paleae; 10–11 papillae on each lobe. Papillae conical, small, and tapered, 2–3 times as long as wide (Fig. 16E–F). First papilla twice as

Fig. 16. *Phalacrostemma* sp. (UMML-22.1194). **A**. Complete specimen, dorsal view. **B**. Anterior region, dorsal view. **C**. Complete specimen, ventral view. **D**. Anterior region, ventral view. **E**. Complete specimen, lateral right view. **F**. Anterior region, lateral view. Abbreviations: bo = building organ; br = branchia; c1 = cirri 1st thoracic segment; c2 = cirri 2nd thoracic segment; m = mount; mo = median organ; nh = nuchal hooks; op = outer paleae; opa = opercular papillae. Numbers indicate the cirri. Scale bars: A, C, E = 1 mm; B, D, F = 0.5 mm.

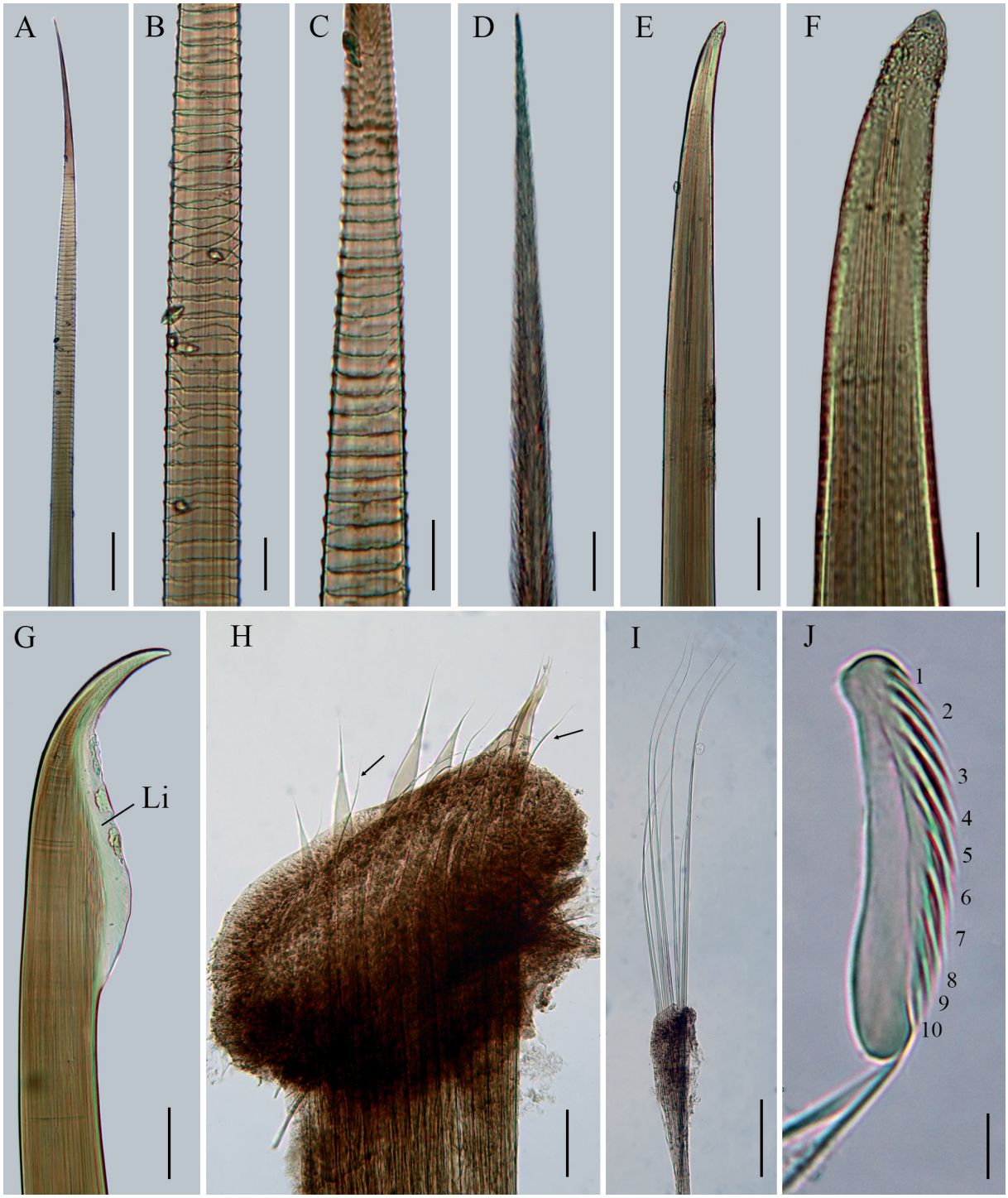

Fig. 17. *Phalacrostemma* sp. (UMML-22.1194). **A**. Complete outer palea. **B**. Distal region of outer palea. **C**. Middle region of outer palea. **D**. Tip of outer palea. **E**. Inner palea. **F**. Tip of inner palea. **G**. Nuchal hook. **H**. Parathoracic notochaetae. **I**. Abdominal chaetae. **J**. Uncini. Abbreviation: Li = limbation. The arrows indicate capillary chaetae. Numbers indicate the rows of teeth. Scale bars: A, I = 200 µm; B = 50 µm; C, E = 100 µm; D, F–H = 20 µm; J = 10 µm.

large as others, appears on dorsal region of opercular peduncle, at level of nuchal hooks (Fig. 16A–B). Four pairs of amber nuchal hooks, compressed, tip falcate, with short limbation. Limbation not reaching tip curvature, three times as long as tip (Fig. 17G). Palps robust, tapered, twice as long as wide (Fig. 16D). Pair of broad buccal flaps (Fig. 16C–D). Tentacular filaments absent. Median organ conical, brown, without eyespots.

Thorax. First thoracic segment with 3–4 long, triangular-shaped lateral lobes (Fig. 16D–F), and capillary neurochaetae. Second segment with two triangular-shaped lateral lobes and paired branchiae, without chaetae (Fig. 16B, F).

Parathorax. With four segments, all with paired branchiae (Fig. 16E). Notopodia with seven lanceolate chaetae and seven capillary chaetae (Fig. 17H). Neuropodia with capillary chaetae.

Abdomen. Abdominal segments brownish. Neurochaetae capillary, ornamented with irregular thecal laminar extensions (Fig. 17I). Notopodia with series of uncini with 10 rows of teeth (Fig. 17J).

Remarks

Phalacrostemma sp. has outer paleae that resemble those of *P. danieli* sp. nov., with compact proximal thecae, median thecae with denticulate margins, and hirsute tip. However, these species differ in the morphology of the inner paleae and opercular papillae.

Phalacrostemma danieli sp. nov. has inner paleae with conspicuous thecae (Fig. 6G) and crenulate margins (Figs 6F, 7G), whereas *Phalacrostemma* sp. has inconspicuous thecae and smooth margins (Fig. 17E–F). The opercular papillae are as long as the nuchal hooks in *P. danieli* sp. nov. (Fig. 5C), while *Phalacrostemma* sp. has short papillae, ½ as long as the nuchal hooks (Fig. 16B, E–F). Also, the first papilla is different, *P. danieli* sp. nov. has a thin, conical papilla (Fig. 5F), while *Phalacrostemma* sp. has a wide, triangular papilla (Fig. 16B).

In addition to morphological differences, the species have been found in different habitats. *Phalacrostemma* sp. has been found in the Bahamas at 3000 m depth, while *P. danieli* sp. nov. was collected in the Lesser Antilles at 547 m depth.

Distribution

Only in The Bahamas, at 3000 m depth (Fig. 22).

Genus ***Tetreres*** Caullery, 1913

Type species

Hermella varians Treadwell, 1901; by original designation.

Diagnosis

Operculum with lobes partially fused. Two rows of opercular paleae. Outer paleae arranged in semicircles, blades straight, flat. Few (4–5) cylindrical inner paleae in single short row on ventral side of operculum, with blades straight, flat. One pair of large nuchal hooks with tips pointing inwards towards the prostomium. Tentacular filaments arranged in single rows (simple). Median organ small, conical at dorsal junction of opercular lobes. Palps grooved, longer than operculum. Four parathoracic segments (Kirtley 1994; Capa *et al.* 2012).

Key to species of *Tetreres* Caullery, 1913 from the Caribbean Sea

1. Outer paleae lanceolate, six times as long as wide, with long slender tip (Fig. 18A–B) .... ***T. israeli*** sp. nov. Northeast United States Virgin Islands, 4180 m depth
– Outer paleae oblong, three times as long as wide (Fig. 21A–B) 2

2. With about ten thin tentacular filaments on each opercular lobe ....***T. varians*** (Treadwell, 1901). Mayagüez, Harbor, Puerto Rico, 177.4–219. 5 m depth
– With five broad tentacular filaments on each opercular lobe (Fig. 20D) .... ***T. oscari*** sp. nov. Southeastern Key West, Florida, 288–378 m depth

Tetreres israeli sp. nov.
urn:lsid:zoobank.org:act:C1846882-4FD6-4BBF-AAD3-52C523251A89
Figs 18–19

Diagnosis

Outer paleae lanceolate, compressed with sharp tips, elongated and slender. Inner paleae cylindrical, smooth, with blunt tip. Two to four tentacular filaments per lobe.

Etymology

This species is named in memory of my grandfather Israel López, an exemplary man. The species name is a noun in the genitive case (ICZN 1999, Art. 31.1.2).

Material examined

Holotype
CARIBBEAN SEA • complete spec. (very damaged); Virgin Islands; RV *Pillsbury*, stn 1401; 18°51′ N, 65°04′ W; depth 4180 m; 12 Jul. 1972; UMML-22.1195.

Paratype
CARIBBEAN SEA • 1 spec.; same collection data as for holotype; UMML-22.1196.

Description

Body. Holotype complete (UMML-22.1195), very damaged, 40 mm long, 0.5 mm wide, four parathoracic segments, five abdominal segments (Fig. 18A–D).

Operculum. Opercular disc oblique. Opercular crown with almost all opercular paleae broken (Fig. 18B–C). Outer paleae arranged in semicircles, seven paleae on left lobe, 18 on right (Fig. 18B–F). Inner paleae in short ventral line on each inner margin of opercular lobes, three paleae on left lobe, four on right (Fig. 18B, F). Outer paleae amber, lanceolate, compressed, 3 mm long. Blade six times as long as wide (Fig. 19A–B). Tip sharp, elongate, slender (Fig. 19B). Inner paleae amber, cylindrical, smooth, tip blunt (Fig. 19C–D). Opercular stalk orange to pale yellow, almost three times as long as wide (Fig. 18B). Opercular papillae not observed. One pair of nuchal hooks amber, long, robust, with short limbation, tip strongly curved (Figs 18B, 19E). In lateral view, nuchal hooks distally curved at angle of ~115° (Fig. 19F). Palps and median organ not observed. Tentacular filaments damaged, simple, slender; two tentacles on left lobe, four on right (Fig. 18C).

Thorax. First thoracic segment without cirrus or chaetae. Second segment with two triangular-shaped lateral lobes and paired branchiae.

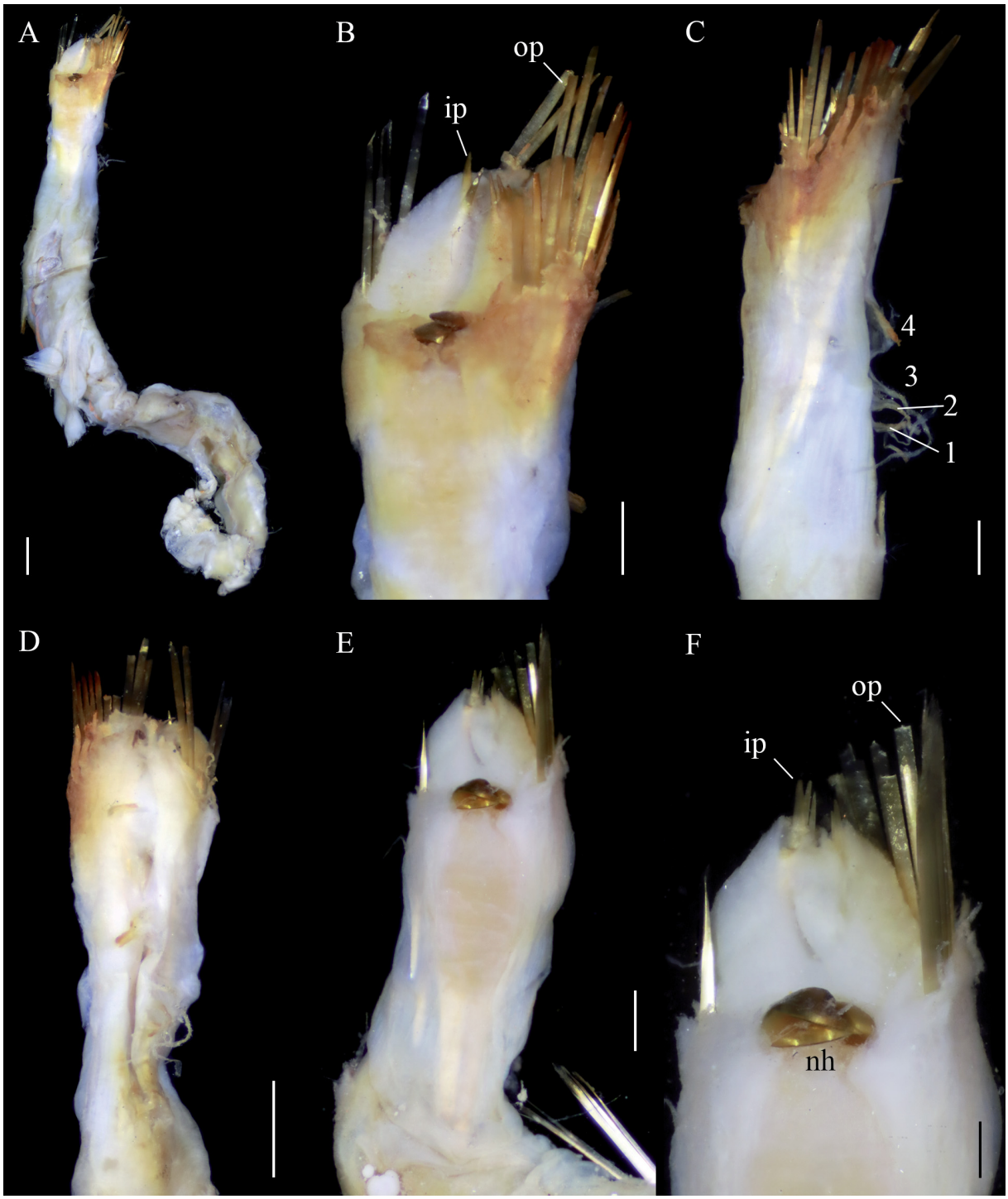

Fig. 18. *Tetreres israeli* sp. nov., holotype (UMML-22.1195). **A**. Complete specimen, dorsal view. **B**. Anterior region, dorsal view. **C**. Anterior region, lateral right view. **D**. Anterior region, ventral view. **E**. Paratype (UMML-22.1196). **F**. Operculum of the paratype. Abbreviations: ip = inner paleae; nh = nuchal hooks; op = outer paleae. Numbers indicate the tentacular filaments. Scale bars: A, C–E = 2 mm; B = 1 mm; F = 0.5 mm.

Parathorax. With four segments, branchiae not seen. Notopodia with lanceolate and capillary chaetae. Neurochaetae capillary.

Abdomen. Abdominal segments yellowish, not very well defined. Neuropodia small, with capillary chaetae, ornamented with irregular thecal laminar extensions (Fig. 19G–H). Notopodia robust, uncini not seen.

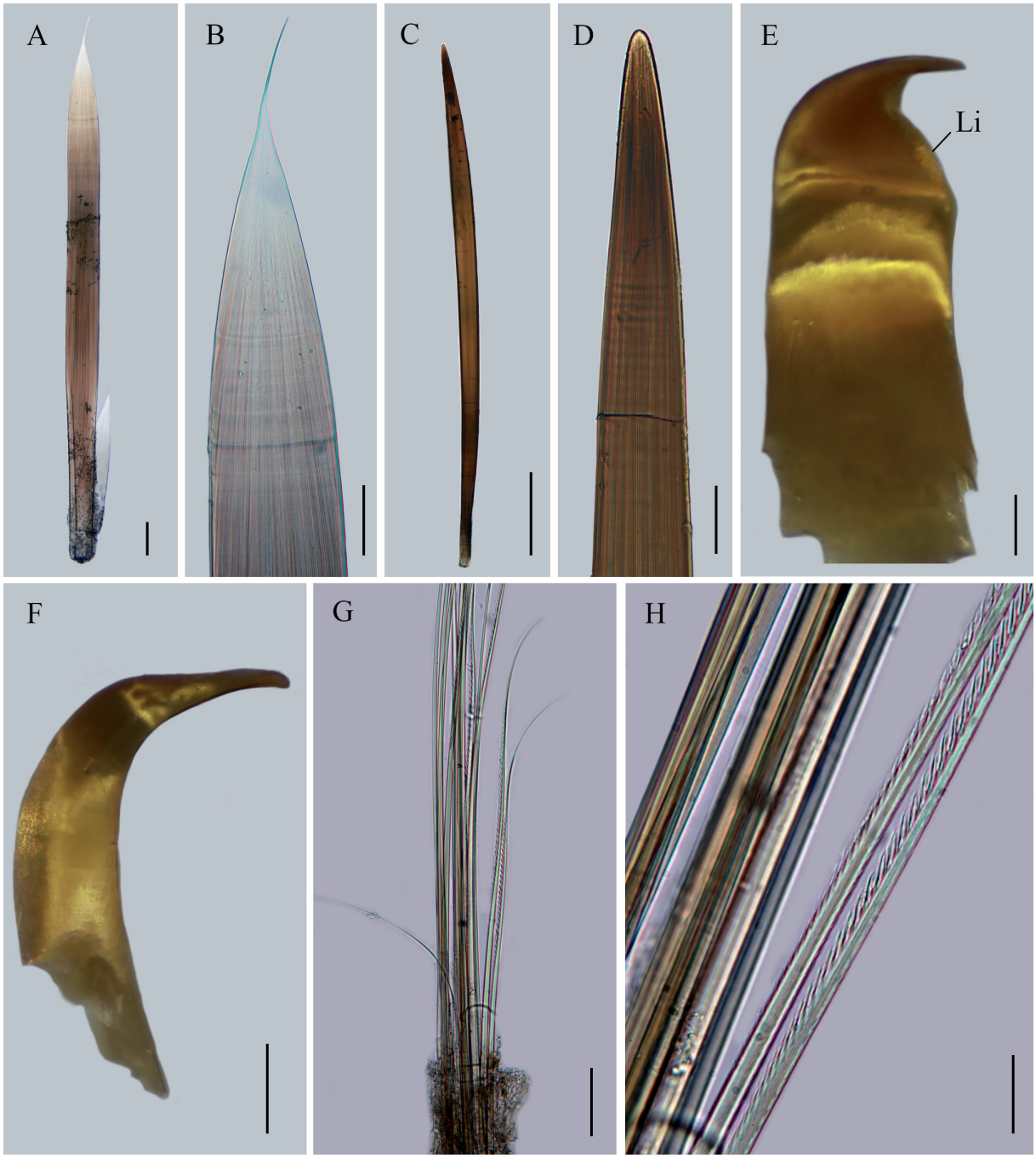

Fig. 19. *Tetreres israeli* sp. nov., holotype (UMML-22.1195). **A**. Outer palea. **B**. Tip of outer palea. **C**. Inner palea. **D**. Tip of inner palea. **E**. Nuchal hook, ventral view. **F**. Nuchal hook, lateral view. **G**. Abdominal parapodium. **H**. Abdominal chaetae. Abbreviation = Li, limbation. Scale bars: A, E = 200 µm; B, D, G = 100 µm; C = 1 mm; F = 0.5 mm; H = 30 µm.

Variation

Specimen incomplete 28 mm long, 4 mm wide, 3 abdominal segments (Fig. 18E–F).

Remarks

In the Caribbean Sea and the Gulf of Mexico, *Tetreres varians* (Treadwell, 1901) was the only species of the genus recorded. *Tetreres israeli* sp. nov. and *T. varians* differ mainly in the morphology of the outer blades, being lanceolate in *T. israeli* sp. nov. (Fig. 19A–B) and oblong in *T. varians* (Augener 1906: pl. 7, fig. 131; Kirtley 1994: fig. 12.10.3a, d–f).

The morphology of the paleae of *T. israeli* sp. nov. resembles those of *T. perryi* Kirtley, 1994 (Northwest Atlantic). Both species have lanceolate outer paleae with elongate tips; however, *T. perryi* has outer paleae with transverse irregular thecae, whereas *T. israeli* sp. nov. has no transverse thecae.

Distribution

Only known from the type locality, Virgin Islands, at 4180 m depth (Fig. 22).

Tetreres oscari sp. nov.

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Figs 20–21

Diagnosis

Outer paleae oblong, compressed with acute tips. Inner paleae slightly oblong, smooth, with blunt tips. Five tentacular filaments. First thoracic segment with a pair of long tapered cirri.

Etymology

This species name is after my brother Oscar Chávez-López. It is a noun in the genitive case (ICZN 1999, Art. 31.1.2).

Material examined

Holotype

FLORIDA STRAIT • complete spec.; southwest of Marquesas Keys; RV *Gerda*, stn 968; 24°17′ N, 82°34′ W; depth 378 m; 2 Feb. 1968; UMML-22.1197.

Paratypes

FLORIDA • 1 spec.; southeastern Miami; RV *Gerda*, stn 265; 25°40′ N, 80°00′ W; depth 332 m; 28 Mar. 1964; UMML-22.1198 • 1 spec. (body fragmented in two parts after the operculum); same collection data as for preceding; ECOSUR-305.

Additional material

NORTH ATLANTIC – **Florida Strait** • 1 dry spec.; southeastern Key West; RV *Gerda*, stn 15; 25°05′ N, 80°00′ W; depth 288 m; 30 May 1962; UMML-22.1199.

Description

Body. Holotype complete (UMML-22.1197) 12 mm long, 0.5 mm wide, four parathoracic segments, 22 abdominal segments, 4 mm caudal peduncle (Fig. 20).

Operculum. Opercular disc oblique (Fig. 20A–B, F). Outer paleae arranged in semicircles, 22 paleae on each lobe (Fig. 20F). Inner paleae in short ventral line on each inner margin of opercular lobes, three paleae on each lobe (Fig. 20F). Outer paleae pale yellow, oblong, compressed, 1 mm long. Blade

three times as long as wide, with thecae transverse, compact; tips acute (Fig. 21A–B). Inner paleae pale yellow, slightly oblong, smooth, tips blunt (Fig. 21C–D). Opercular stalk pale yellow, three times as long as wide (Fig. 20B–D). Opercular papillae in one row peripheral to outer paleae, 11 papillae on each lobe. Papillae conical and tapered, 3–4 times as long as wide (Fig. 20F). One pair of yellow nuchal hooks, long, robust, with short limbation, tips falcate (Figs 20B, 21E–G). In lateral view, nuchal hook distally curved at angle of ~135° (Fig. 21E). Palps pale yellow, broken. Tentacular filaments simple, pale yellow, grooved; three tentacles on left lobe, five tentacles on right (Fig. 20D). Median organ small, conical (Fig. 20B).

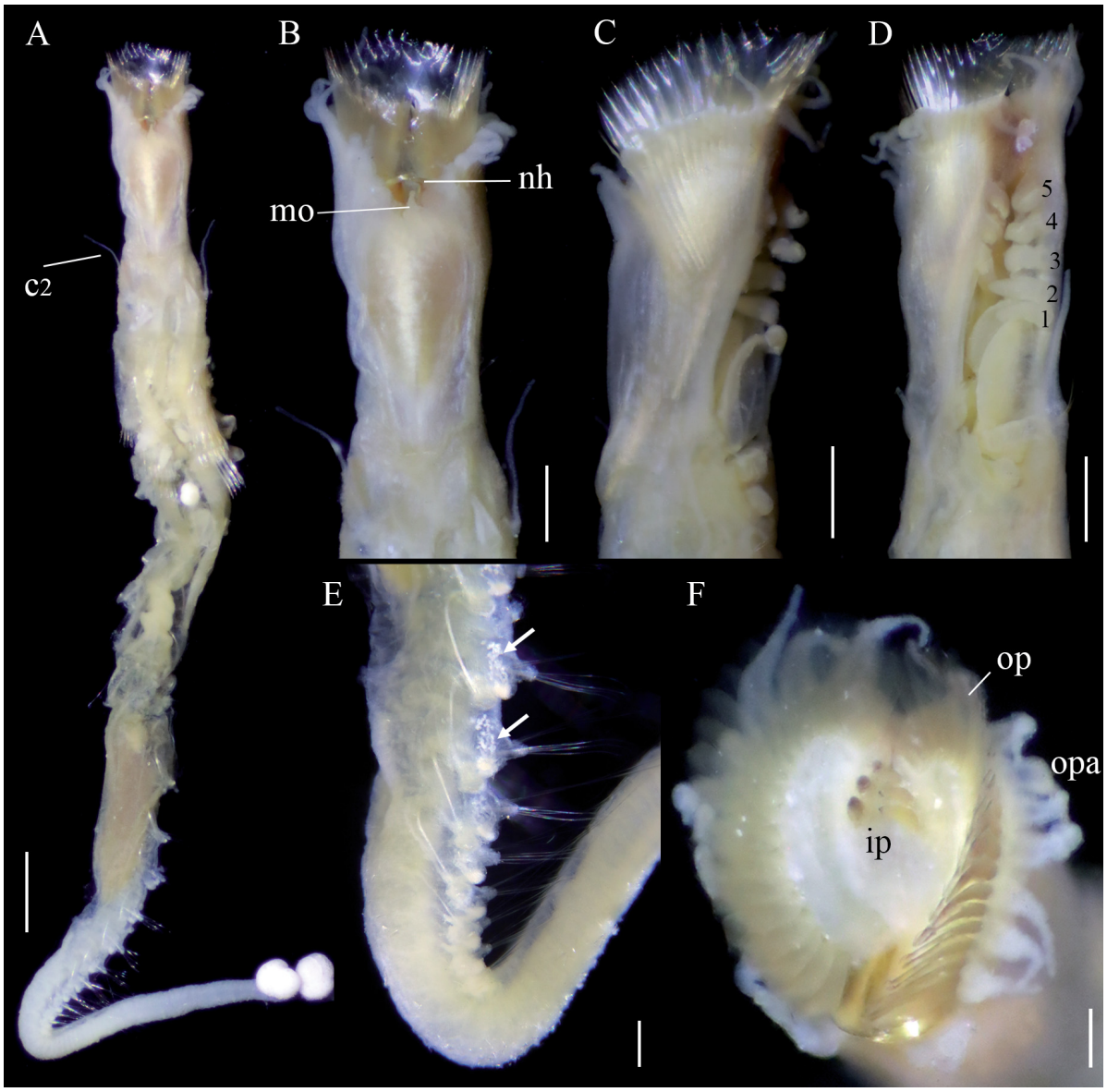

Fig. 20. *Tetreres oscari* sp. nov., holotype (UMML-22.1197). **A**. Complete specimen, dorsal view. **B**. Anterior region, dorsal view. **C**. Anterior region, lateral right view. **D**. Anterior region, ventral view. **E**. Last abdominal segments. **F**. Opercular crown, upper view. Abbreviations: c2 = cirri 2nd thoracic segment; ip = inner paleae; mo = median organ; nh = nuchal hooks; opa = opercular papillae; op = outer paleae. Numbers indicate the tentacular filaments. Arrows indicate gametes. Scale bars: A = 1 mm; B–D = 0.5 mm; E–F = 0.2 mm.

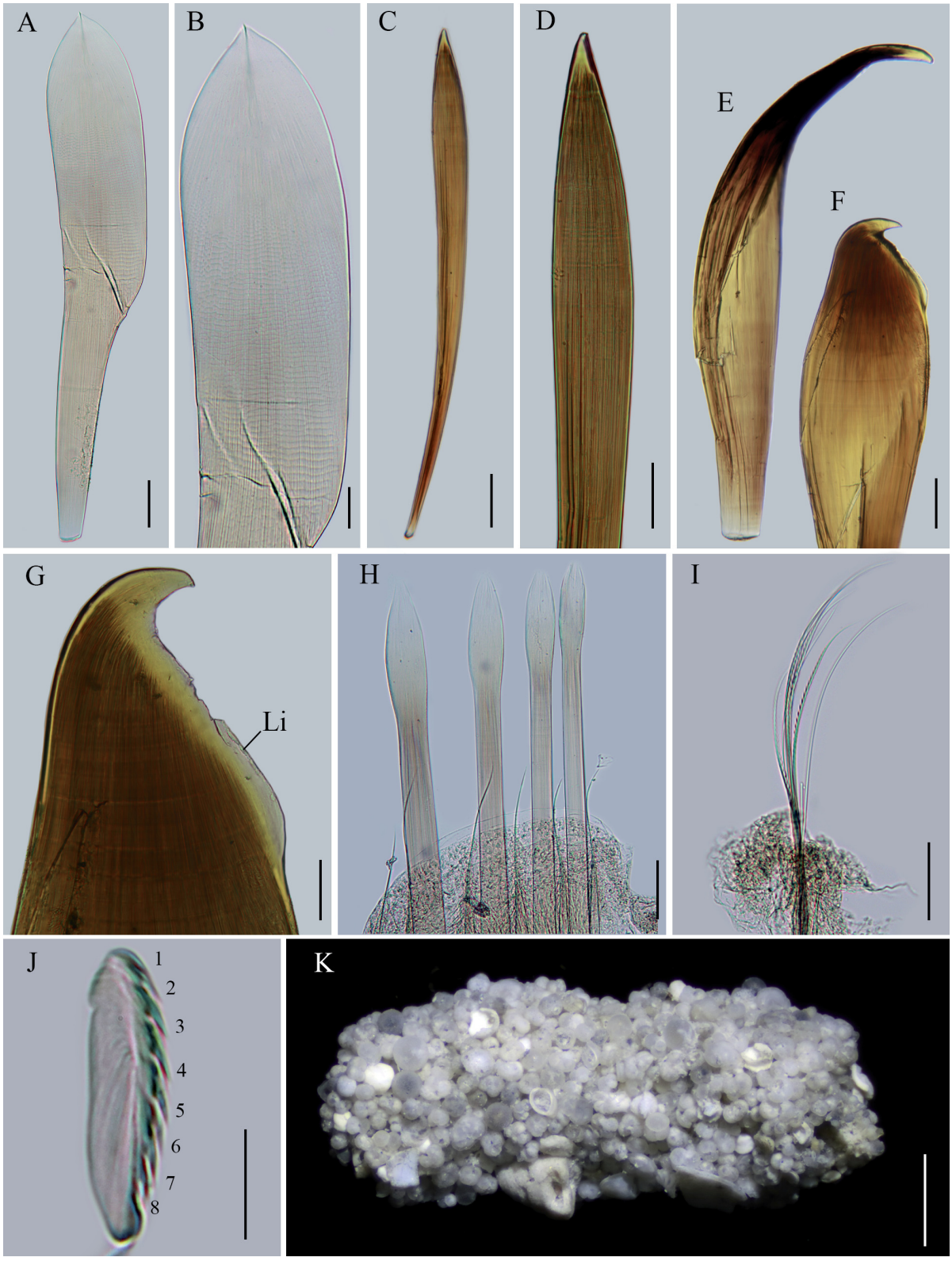

Fig. 21. *Tetreres oscari* sp. nov., holotype (UMML-22.1197). **A–B**. Outer palea. **C-D**. Inner palea. **E**. Nuchal hook, lateral view. **F**. Nuchal hook, ventral view. **G**. Tip of nuchal hook. **H**. Parathoracic notochaetae. **I**. Abdominal parapodium. **J**. Uncini. **K**. Tube. Abbreviation: Li = limbation. Numbers indicate the rows of teeth. Scale bars: A, D, G–I = 100 µm; B = 50 µm; C, E–F = 200 µm; J = 20 µm; K = 2 mm.

Thorax. First thoracic segment with long, triangular-shaped lateral lobe, and capillary chaetae. Second segment with three lateral lobes, and paired branchiae; first lobe after branchiae three times as long as other ones (Fig. 20A–B).

Parathorax. With four segments, all with paired branchiae. Notopodia with four lanceolate chaetae and six capillary chaetae (Fig. 21H). Neurochaetae capillary.

Abdomen. Abdominal segments yellowish. Last ten abdominal segments colorless, translucent. Neurochaetae capillary, ornamented with irregular thecal laminar extension (Fig. 21I). Notopodia with series of uncini with eight rows of teeth (Fig. 21J). Caudal peduncle colorless, translucent. Anus with two rigid white balls of sediment (Fig. 20A).

Variation

Specimens incomplete 7–10 mm long, 0.4–0.5 mm wide, seven abdominal segments. Only holotype complete. Operculum with 19–22 outer paleae per lobe, 3–5 inner paleae per lobe. Opercular papillae 8–12 per lobe. Only holotype with three tentacular filaments on left lobe; rest of specimens with five per lobe. Lateral cirrus of second thoracic segment 2–3 times as long as other cirri.

Tubes

With foraminiferans (UMML-22.1198, UMML-22.1199, Fig. 21K).

Remarks

Tetreres oscari sp. nov. is very similar to *T. varians*; however, both species can be distinguished by the morphology of the outer paleae, the length of the thoracic cirri, and mainly by the number of tentacular filaments.

The outer paleae of *T. oscari* sp. nov. have acute tips, whereas the paleae of *T. varians* are illustrated with mucronate tips (Augener 1906: pl. 7 fig. 131; Kirtley 1994: fig. 12.10.3a, d–f). The number of outer paleae also differs among these species. According to Hartman (1944: 333), the type specimen of *T. varians* has 25–30 outer paleae per lobe, whereas *T. oscari* sp. nov. has 19–22 per lobe. Further, *T. oscari* sp. nov. is characterized by two lateral lobes on the second thoracic segment, and one of them is three times as long as the other, whereas *T. varians* has three lateral lobes of similar size (Kirtley 1994: fig. 12.10.1a–b).

The number of tentacular filaments is the most obvious character. Although the number of tentacular filaments of *T. varians* has not been described, according to the drawings of Augener (1906: pl. 7 fig. 130) and Kirtley (1994: fig. 12.10.1a–b), *T. varians* has about 10 thin tentacular filaments on each lobe, whereas *T. oscari* sp. nov. has only five broad ones.

Distribution

Southeast Florida, 288–378 m depth (Fig. 22).

Discussion

Since Kirtley's (1994) world review, only 15 species of sabellariids were reported in the Caribbean Sea and the Gulf of Mexico. The present study increases the sabellariid record to 20 species with the description of *Lygdamis pechi* sp. nov., *Mariansabellaria caribbea* sp. nov., *Phalacrostemma danieli* sp. nov., *Tetreres israeli* sp. nov., and *T. oscari* sp. nov. This work also includes new records of *P. dorothyae* and *P. perkinsi*, the descriptions of one morphospecies, *Phalacrostemma* sp., and the first record of *Mariansabellaria* in the Tropical Western Atlantic.

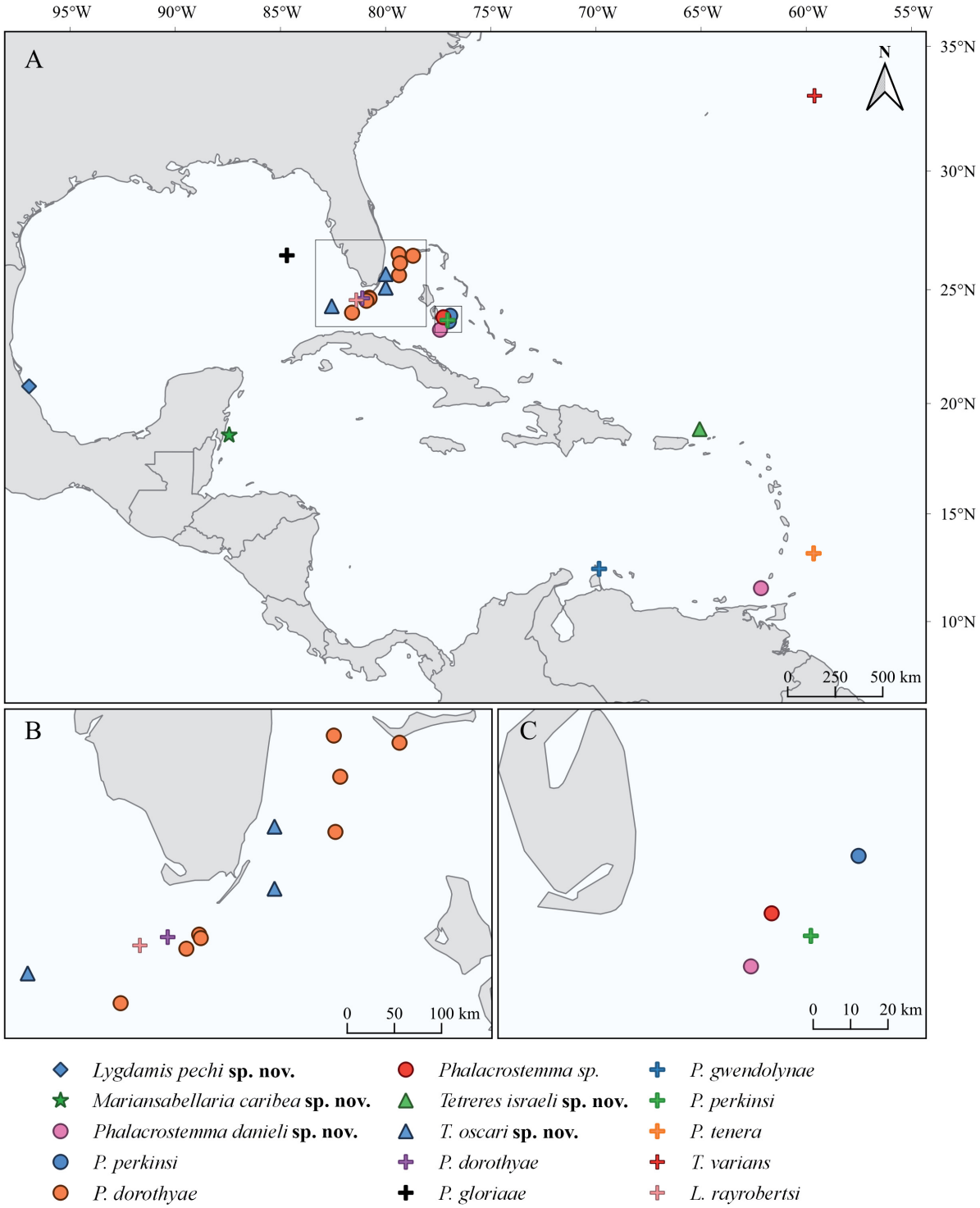

Fig. 22. Localities for studied specimens. **A**. Caribbean Sea and the Gulf of Mexico. **B**. South Florida. **C**. Southeastern Bahamas. The crosses indicate type localities of species previously recorded in the tropical Western Atlantic.

Of the species of sabellariids previously recorded for the Caribbean Sea and the Gulf of Mexico, at least the species of *Phalacrostemma* need to be redescribed based on type material since their descriptions are limited to the partial description of the operculum and opercular paleae. In addition, for some species with missing or absent type material, such as *P. paulinae* and *P. tenera*, it is necessary to search topotype material to re-establish a neotype. Heterogeneity in the descriptions makes taxonomic identification of sabellariids difficult and prevents simple identification keys that are easy to understand for non-specialists. Therefore, this paper provides standardized descriptions of sabellariids species, including detailed body and paleal morphology, and taxonomic keys to facilitate species identification.

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