Revision of *Mesacanthion* Filipjev, 1927 (Nematoda: Thoracostomopsidae) with description of a new species from Jeju Island, South Korea (#38441)

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Revision of *Mesacanthion* Filipjev, 1927 (Nematoda: Thoracostomopsidae) with description of a new species from Jeju Island, South Korea

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A new species of the genus *Mesacanthion* Filipjev, 1927 was discovered during a survey of natural beaches of Jeju Island in South Korea. The new species *Mesacanthion jejuensis* **sp. nov.,** shares general morphology of the genus such as the outer labial and cephalic setae being situated at the middle of cephalic capsule, well-developed mandibles with two columns united by a curved bar, and three equally sized and shaped teeth which shorter than the mandibles. The new species belongs to a group of *Mesacanthion* species which has two symmetrical, comparatively long spicules, divided into two portions by a seam and bearing gubernaculum with caudal apophysis. The new species is most closely related to *M. ditlevseni*, first discovered in Greenland, in terms of similar body ratio (a, b, c') and general morphology. It can be distinguished however by its longer cephalic setae (in cases almost double the length of *M. ditlevseni*), distribution of cervical setae in groups of two to three below the level of cephalic capsule (character missing in *M. ditlevseni*) and by its differing morphology of the spicule (specifically its proximal portion of spicule being longer instead of distal portion being longer). Along with the description of *Mesacanthion jejuensis* **sp. nov.,** a full review of the genus including comprehensive measurement table of all valid species, re-examination of existing species in terms of validity, as well as an updated diagnosis of the genus are provided.

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Abstract

A new species of the genus *Mesacanthion* Filipjev, 1927 was discovered during a survey of natural beaches of Jeju Island in South Korea. The new species *Mesacanthion jejuensis* **sp. nov.,** shares general morphology of the genus such as the outer labial and cephalic setae being situated at the middle of cephalic capsule, well-developed mandibles with two columns united by a curved bar, and three equally sized and shaped teeth which shorter than the mandibles. The new species belongs to a group of *Mesacanthion* species which has two symmetrical, comparatively long spicules, divided into two portions by a seam and bearing gubernaculum with caudal apophysis. The new species is most closely related to *M. ditlevseni*, first discovered in Greenland, in terms of similar body ratio (a, b, c') and general morphology. It can be distinguished however by its longer cephalic setae (in cases almost double the length of *M. ditlevseni*), distribution of cervical setae in groups of two to three below the level of cephalic capsule (character missing in *M. ditlevseni*) and by its differing morphology of the spicule (specifically its proximal portion of spicule being longer instead of distal portion being longer). Along with the description of *Mesacanthion jejuensis* **sp. nov.,** a full review of the genus including comprehensive measurement table of all valid species, re-examination of existing species in terms of validity, as well as an updated diagnosis of the genus are provided.

Introduction

Over 50 species of free-living marine nematodes have been reported in South Korea, including those reported on domestic journals (Rho et al. 2011; Barnes et al. 2012; Hong and Lee 2014; Kim et al. 2015; Hong et al. 2016; Jeong et al. 2019). Majority of the species found in South Korea belong to the family Draconematidae Filipjev, 1918 and other families reported so far includes Comesomatidae Filipjev, 1918, Desmoscolecidae Shipley, 1896, Enchelidiidae Filipjev, 1918 Cyatholaimidae Filipjev, 1918 and Ironidae de Man, 1876. This is the first record of the genus *Mesacanthion*, let alone the family Thoracostomopsidae Filipjev, 1927 to be recorded in South Korea.

Family Thoracostomopsidae was first erected by Filipjev (1927) and now total of 238 species belonging to 22 genera make up the family to date (Bezerra et al, 2019). The genus *Mesacanthion* Filipjev, 1927 was first erected as a subgenus of *Enoplolaimus* de Man, 1893 with type species *Mesacanthion lucifer* (Filipjev, 1927) Gerlach & Riemann, 1974 discovered from Barents Sea. Filipjev (1927) specified the characters of the genus *Mesacanthion* to be three equal onchs, outer labial and cephalic setae placed in the middle or anterior to the cephalic capsule with tapered tail with a short dactyli/claviform terminal part. The genus *Mesacanthion* is the second most diverse genus in the family next to *Enoplolaimus* de Man, 1893, with 40 valid species recorded to date.

Materials and Methods

A series of sampling took place in June 2018, during a survey of natural beaches of Jeju Island, South Korea (Fig. 1). 2 sub-samples of the sediments of the intertidal zone were obtained using a

10cm^2 acryl sampling tube. Sediments were fixed in 5% neutralized formalin solution and brought back to the laboratory. Meiofauna were extracted using the Ludox method (Burgess 2001), and post-fixed with 70% ethanol dyed with Rose bengal. Nematodes were counted and individual specimens of interest were picked to a Petri dish filled with 10% glycerin. The dish was placed in a drying oven set at 40°C for a day or two to be completely dehydrated as conferred in the glycerin-ethanol method (Seinhorst 1959). A single or as many as 5 specimens (depending on their size) were mounted in a single drop of anhydrous glycerin on a glass slide using the wax-ring method (Hooper 1986). Mounted specimens were identified under Olympus BX51, Leica DM5000B and DM2500 microscope. All morphometric measurements were done manually using IC measure application. For scanning electron microscopy, specimens were placed in a drop of glycerin and gradually mixed with drops of distilled water to be washed from any remnant of glycerin. Hydrated specimen were treated to ethanol series for dehydration (20%, 40%, 50%, 70%, 80%, 90%, 95%, 100%, for 10 min each) and then placed in hexamethyldisilazane (HMDS). Specimens bathed in hexamethyldisilazane (HMDS) were placed in a drying oven to be dried. Once dried, specimens were mounted on a stub to be splutter coated, and observed with COXEM EM-30 microscope.

The classification used follows the one proposed by Hodda (2007).

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Abbreviations

a: body length / maximum body diameter
b: body length / pharynx length
c: body length / tail length
calc: calculated from published measurements
calp: calculated from published figures
c': tail length / anal body diameter

Systematics

Order Enoplida Filipjev, 1929

Family Thoracostomopsidae Filipjev, 1927
Subfamily Enoplolaiminae de Coninck, 1965
Genus *Mesacanthion* Filipjev, 1927

Type species: *Mesacanthion lucifer* (Filipjev, 1927) Gerlach & Riemann, 1974. *Mesacanthion*, *Enoplolaimus* de Man, 1893, *Paramesacanthion* Wieser, 1953, and *Oxyonchus* Filipjev, 1927 bear mandibles which are arch-shaped, consisting of two rod-like columns while mandible of *Enoploides* are solid, two lateral bars fused to form a single rod. *Mesacanthion* species are differentiated from other genera which share the morphology of the mandible by their placement of outer labial and cephalic setae at the middle or anterior end of the cephalic capsule. Only *Paramesacanthion* species share this characteristic, making them the closest related genus within the family. The two genera can be differentiated from each other however by the following three characteristics: 1. Outer labial and cephalic setae are located at the anterior end of cephalic capsule for *Paramesacanthion* while outer labial and cephalic setae are located at the middle of cephalic capsule for *Mesacanthion*. *Paramesacanthion* species have extra ring(s) of subcephalic setae located at the middle of cephalic capsule where outer labial and cephalic setae would be located for *Mesacanthion* species. This means when compared to *Mesacanthion* species, *Paramesacanthion* species may appear to have extra ring(s) of setae at the anterior end of cephalic capsule, in between inner labial setae and cephalic setae/outer labial setae. This seemingly additional ring of setae are actually the cephalic setae, while ring of setae at the middle of cephalic capsule are actually the sub-cephalic setae for *Paramesacanthion* species; 2. Sexual dimorphism is apparent in the pilosity of the head for *Paramesacanthion* species, while it is not apparent in *Mesacanthion species*; 3. All *Paramesacanthion* species have spicules consisting of two portions, distal and proximal, articulating from one another. Some *Mesacanthion* species may also have bipartite spicules divided by a transversal seam, but without the obvious articulation or constriction.

Diagnosis: (after Wieser 1953; Platt and Warwick 1983; Smol et al. 2014, updated) Enoplolaiminae. Outer labial and cephalic setae situated at middle or anterior end of cephalic capsule. Mandible well-developed, provided with claws, arch-shaped, consisting of two rod-like columns anteriorly united by a curved bar. Teeth shorter than mandibles. Spicule mostly short, unipartite and symmetrical, sometimes long, bipartite (divided by a seam: *M. ditlevseni*) and asymmetrical (anisomorphic and anisometric: *M. diplechma*). If long, usually gubernaculum present with caudal apophysis. Marine and freshwater.

List of valid species

1. ***Mesacanthion africanthiforme* Warwick, 1970** (Warwick, 1970: 142–145, fig. 2A–E; three males and three females, Exe estuary, England).

2. ***Mesacanthion africanum* Gerlach, 1957** (Gerlach, 1957b: 4, fig. 3A–C; description based on one male, Atlantic at Congo mouth, plankton net from above muddy ground).
3. ***Mesacanthion agubernatus* Vitiello, 1971** (Vitiello, 1971: 860, fig. 1 A–E; description based on one male, Mediterranean, terrigenous coastal muds, 60 m deep).
4. ***Mesacanthion alexandrinus* Nicholas, 1993** (Nicholas, 1993: 163, 165, figs. 1A–E, 2A–D; four males and three females, sand at water edge of fresh-water Lake Alexandrina, South Australia).
5. ***Mesacanthion arabium* Warwick, 1973** (Warwick, 1973: 114–116, fig. 14A-G; three males and three females, Arabian Sea, fine sand, 49 m deep).
6. ***Mesacanthion arcuatile* Wieser, 1959** (Wieser, 1959: 16–17, Pl. 11 fig. 11A–B; description based on one female, Alki Beach, Washington, US, 6.5 feet, lapsus arcuatilis).
7. ***Mesacanthion armatum* Timm, 1961** (Timm, 1961: 32, fig. 5A–C; more than one male and one female, Bay of Bengal, on *Siphonocladus*, lapsus armatus).
8. ***Mesacanthion audax* (Ditlevsen, 1918) Filipjev, 1927** [Ditlevsen, 1918: 208–209, pl. 14 figs. 4, 7, pl. 15 fig. 5 (=*Enoplolaimus audax*); description based on one male, Øresund, off Aalsgaarde. Filipjev, 1927: 143; transfer *Enoplolaimus audax* to subgenus *Mesacanthion*. Gerlach, 1958b: 73; (as *Mesacanthion audax*), Kiel Bay, Sand and silt, 6 m deep. Riemann, 1966: 186; three males, North Sea, sand].
9. ***Mesacanthion banale* (Filipjev, 1927) Gerlach & Riemann, 1974** [Filipjev, 1927: 147, Pl. 7 fig. 40A, B; (=*Enoplolaimus* (*Mesacanthion*) *banalis*), description based on three females, Barents Sea. Gerlach & Riemann, 1947: 531; transfer *Enoplolaimus banale* to genus *Mesacanthion*].
10. ***Mesacanthion brachycolle* Allgén, 1959** [Allgén, 1959: 50, fig. 32A, B; two females and two juveniles, Falkland Island, sandy bottom with algae, 40 m deep, Graham Island, mud, 125 m deep. Allgén, 1960: 479, fig 3; (as *Enoplolaimus* (*Mesacanthion*) *brachycollis*), lapsus *brachycollis*].
11. ***Mesacanthion breviseta* (Filipjev, 1927) Gerlach & Riemann, 1974** [Filipjev, 1927: 150–151, pl. 7 fig 43A–C; (=*Enoplolaimus* (*Mesacanthion*) *breviseta*) description based on one male and a juvenile male, Barents Sea, sand with shells and stones, 83 m deep. Gerlach & Riemann, 1974: 531; transfer *Enoplolaimus* (*Mesacanthion*) *breviseta* to genus *Mesacanthion*].
12. ***Mesacanthion cavei* Inglis, 1964** [Inglis, 1964: 313–314, figs. 76–78; description based on two males (one in poor condition) and one damaged larva, South Africa, coarse sand and broken shells, 26–27 m deep].
13. ***Mesacanthion ceeum* Inglis, 1964** (Inglis, 1964: 313, figs. 74–75; description based on one male and one larva, South Africa, coarse sand and broken shells, 26 m deep, lapsus *ceeus*).
14. ***Mesacanthion conicum* (Filipjev, 1918) Filipjev, 1927** [Filipjev, 1918: 105–107, Table 3, fig. 16A–B; (=*Enoplolaimus conicus*), description based on one female, Black Sea. Filipjev, 1927: 143; transfer *Enoplolaimus conicus* to subgenus *Mesacanthion*].

15. ***Mesacanthion cricetoides* Wieser, 1959** (Wieser, 1959: 17–18, fig. 13A–B; description based on one female, Richmond Beach, Washington, 2.5 feet deep).
16. ***Mesacanthion diplechma* (Southern, 1914) Filipjev, 1927** [Southern, 1914: 55–56, fig. 25A–J; (=*Enoplus diplechma*), two males and two females, Clew Bay, sandy bottom, 25–31 m deep. Filipjev, 1927: 143; transfer *Enoplus diplechma* to subgenus *Mesacanthion*. Gerlach, 1958: 72; as *Mesacanthion diplechna*, Kiel Bay, silt, 8 m deep. Riemann, 1966: 186; North Sea, sand. Boucher, 1977: 741–743, fig. 4A–E; as *Mesacanthion diplechma* (Southern, 1914), one male, three females and six juveniles, Pierre Noue (Western Channel), infralittoral sands].
17. ***Mesacanthion ditlevseni* (Filipjev, 1927) Gerlach & Riemann, 1974** [Filipjev, 1927: 148, pl. 5 fig. 41A–D; (=*Enoplolaimus* (*Mesacanthion*) *ditlevseni*), three males and one female, Barents Sea, silt with stones, 36–280 m deep. Ditlevsen, 1928: 210–213, figs. 8–13; (=*Enoplolaimus angustignathus*), one male and one female, Greenland, mud, clay, 100–200 m deep, De Coninck and Stekhoven, 1933: 38. Allgén, 1954: 22; (as *Enoplolaimus* (*Mesacanthion*) *angustignathus*), five males and nineteen females, Jan Mayen, Greenland, black sand, 23 m deep. Gerlach & Riemann, 1974: 532; transfer *Enoplolaimus ditlevseni* to genus *Mesacanthion*].
18. ***Mesacanthion fricum* Inglis, 1966** (Inglis, 1966: 87, Figs. 10–12; description based on one male, South Africa, sand, lapsus *frica*).
19. ***Mesacanthion heterospiculum* Sergeeva, 1974** (Sergeeva, 1974: 123, fig. 4A–B; 14 males, Black Sea, various depths and sediments.
20. ***Mesacanthion hirsutum* Gerlach, 1953** (Gerlach, 1953: 536–537, fig. 9A–E; one male and one female, Mediterranean. Gerlach, 1967: 26, fig. 10A–E; two males, two juveniles and one male, Red Sea).
21. ***Mesacanthion infantile* (Ditlevsen, 1930) De Coninck & Schuurmans Stekhoven, 1933** [Ditlevsen, 1930: 205–208, figs. 8–10; (=*Enoplolaimus infantilis*), one male and one female, Stewart Island, Halfmoon Bay, sand, 5–7 fms. Allgén, 1951: 322–323, fig. 33A–B; (=*Enoplolaimus mortenseni*), description based on one female, Australia; see Mawson, 1956: 65–66 (re-examination of type specimen=*Mesacanthion infantilis*), op Wieser, 1953: 75. Allgén, 1951: 323–324, fig. 34A–B; (=*Enoplolaimus philippinensis*), description based on one juvenile, Australia, op Mawson, 1956: 65–66 (re-examination of type specimen=*Mesacanthion infantilis*). De Coninck & Schuurmans Stekhoven, 1933: 38; (as *Mesacanthion infantile*). Wieser, 1953: 76, fig. 39A–B; two females, Chile. Mawson, 1956: 65–66, fig. 29A–C; two juveniles, Antarctica].
22. ***Mesacanthion karense* (Filipjev, 1927) Gerlach & Riemann, 1974** [Filipjev, 1927: 152, pl. 7 fig. 45A–C; (=*Enoplolaimus* (*Mesacanthion*) *karensis*), one juvenile male and three females, Kara Sea, sand, 15 m deep. Gerlach & Riemann, 1974: 533; transfer *Enoplolaimus* (*Mesacanthion*) *karensis* to genus *Mesacanthion]*.
23. ***Mesacanthion kerguelense* Mawson, 1958** (Mawson, 1958: 338–339, fig. 22A–D; five males, two females and three juveniles, Kerguelen Island, Heard Island, Macquarie Island).

24. ***Mesacanthion longispiculum* Gerlach, 1954** (Gerlach, 1954: 228–229, fig. 1A–B; one male and one female, Mediterranean. Gerlach, 1957a: 421; Brazil. Gerlach, 1958a: 352–353, fig. 4A–C; (as cf. *longispiculum*), one male, Mananjary, Madagascar, muddy sand).
25. ***Mesacanthion longissimesetosum* Wieser, 1953** (Wieser, 1953: 78–79, fig. 42A–E; two males, one female and thirteen juveniles, Chile, littoral exposed and sheltered sand, sublittoral secondary substratum and soft bottom, lapsus *longissimesetosus*).
26. ***Mesacanthion lucifer* (Filipjev, 1927) Gerlach & Riemann, 1974** [Filipjev, 1927: 149–150, pl. 7 fig. 42A–C; (=*Enoplolaimus* (*Mesacanthion*) *lucifer*), one male and two females, Barents Sea, Kara Sea, sand and sandy silt, 18–83 m deep. Gerlach & Riemann, 1974: 533; transfer *Enoplolaimus* (*Mesacanthion*) *lucifer* to genus *Mesacanthion*.]
27. ***Mesacanthion majus* (Filipjev, 1927) Gerlach & Riemann, 1974** [Filipjev, 1927: 151–152, pl. 7 fig. 44A–C; (=*Enoplolaimus* (*Mesacanthion*) *major*), three females, Kara Sea, Barents Sea, sand and gravel, 15–36 m deep. Wieser, 1953: 78, fig. 41A–D; (as *Mesacanthion major* Filipjev 1925b), four males, two females and 15 juveniles, Arctic Sea, Chile, sublittoral, secondary substratum and coarse bottom, lapsus major. Gerlach & Riemann, 1974: 533; (as *Mesacanthion majus* (Filipjev 1927)).]
28. ***Mesacanthion marisalbi* Galtsova, 1976** (Galtsova, 1976: 261–263, fig. 7; two males, one female and one juvenile, White Sea, littoral zone in slightly silted sand).
29. ***Mesacanthion monhystera* Gerlach, 1967** (Gerlach, 1967: 27–28, fig. 11A–F; one male and one juvenile female, Red Sea, sandy beach and littoral subsoil water).
30. ***Mesacanthion obscurum* Gagarin & Klerman, 2006** (Gagarin & Klerman, 2006: 533–535, fig. 1A–E; twelve males and eight females, Mediterranean Sea off the Israeli coast near Hadera, sandy sediment, 30–35 m deep).
31. ***Mesacanthion pali* Wieser, 1959** (Wieser, 1959: 16, fig. 10A–B; description based on one male, Puget Sound, subterranean water, medium fine to coarse sand).
32. ***Mesacanthion pannosum* Wieser, 1959** (Wieser, 1959: 17, fig. 12A–D; one female and one female, Puget Sound, medium fine to coarse sand, 2.5 feet deep).
33. ***Mesacanthion propinquum* Gagarin & Klerman, 2006** (Gagarin & Klerman, 2006: 536–538, fig. 2A–E; twelve males and eleven females, Mediterranean Sea off the Israeli coast near Hadera, sandy sediment, 30–35 m deep).
34. ***Mesacanthion proximum* Gerlach, 1957** (Gerlach, 1957a: 427–429, fig. 5G–M; one male and one juvenile, Santos, Brazil, fine sand).
35. ***Mesacanthion rigens* Gerlach, 1957** (Gerlach, 1957a: 427, fig. 5C–F; one male and one female, Bertioga, Brazil. Gerlach, 1956: 204; Brazil, nomen nudum).
36. ***Mesacanthion southerni* Warwick, 1973** (Warwick, 1973: 111–114, figs. 12A–C, 13A–C; six males, three females and two juveniles, Arabian Sea, fine sand and fine muddy sand, 48–49 m deep).
37. ***Mesacanthion studiosum* Inglis, 1964** (Inglis, 1964: 315–316, figs. 79–90; two males, two females and two larvae, South Africa, coarse white sand, 27 m deep, lapsus *studiosa*).

38. ***Mesacanthion tenuicaudatum* (Ssaweljev, 1912) De Coninck & Schuurmans Stekhoven, 1933** [Ssaweljev, 1912: 111–112; (=*Enoplolaimus tenuicaudatus*), both sex but number of specimen not specified, White Sea, lapsus tenuicaudatus. De Coninck & Schuurmans Stekhoven, 1933: 39; transfer and correct name from *Enoplolaimus tenuicaudatus* to *Mesacanthion tenuicaudatum*].
39. ***Mesacanthion virile* (Ditlevsen, 1930) De Coninck & Schuurmans Stekhoven, 1933** [Ditlevsen, 1930: 208–211, fig. 11–14; (=*Enoplolaimus virilis*), description based on one male, Stewart Island; Halfmoon Bay, New Zealand, Sand, 5–7 fms. De Coninck & Schuurmans Stekhoven, 1933: 39; transfer and correct name *Enoplolaimus virilis* to *Mesacanthion virile*. Allgén, 1959: 48–50; 8 females and twelve juveniles, Falkland Islands, South Georgia, Graham Land].

List of invalid species

1. *Mesacanthion donsitarvae* (Allgén, 1935) Wieser, 1953 (species inquirenda) [Allgén, 1935: 47; (=*Enoplolaimus donsitarvae*) Norway, lapsus (*donsi*)-*tarvae*. Wieser, 1953: 76; transfer *Enoplolaimus donsitarvae* to genus *Mesacanthion* and opinionates the fact that Allgén provided no figures and description was based on erroneous data of Ditlevsen on wrong number of cephalic setae].
2. *Mesacanthion gracilisetosum* (Allgén, 1930) Wieser, 1953 (species inquirenda) [Allgén, 1930: 189–191, figs. 1–3; (=*Enoplolaimus gracilisetosus*), one male, two females and one juvenile, Macquarie Island. Wieser, 1953: 76; transfer *Enoplolaimus gracilisetosus* to genus *Mesacanthion*, lapsus *gracilisetosus*].
3. *Mesacanthion hawaiiense* (Allgén, 1951) Wieser, 1953 (species inquirenda) [Allgén, 1951: 274–275, fig. 5A–B; (=*Enoplolaimus hawaiiensis*), description based on one female, Honolulu, Hawaii. Wieser, 1953: 75; transfer *Enoplolaimus hawaiiensis* to genus *Mesacanthion* and opinionates description is insufficient, lapsus *hawaiiensis*].
4. *Mesacanthion microsetosus* Allgén, 1932 (nomen nudum – Bezerra et al., 2019) [Allgén, 1932: 110–111, fig. 7A–B; (=*Enoplolaimus microsetosus*) description based on one juvenile, Campbell Island 40 m deep. Allgén, 1959: 48; (transfer *Enoplolaimus microsetosus* to genus *Mesacanthion*) nine females and five juveniles, South Georgia, Antarctica, clay with sparse stones, 125 m deep, lapsus *microsetosus*, nomen nudum]. Only female or juvenile used for description and according to Wieser, 1953, Allgén stating 4 labial and 4 cephalic setae makes his description doubtful, Wieser, 1953: 82; moved to *Paramesacanthion*
5. *Mesacanthion pacificum* (Allgén, 1947) Wieser, 1953 (species inquirenda) [Allgén, 1947: 212, fig. 76A–B; (=*Enoplolaimus pacificus*), description based on one female and one juvenile, Bay of Panama, Perlas Island. Allgén, 1951: 275, 277, fig. 6A–D; one male, one female and three juveniles, Coast of Honolulu. Wieser, 1953: 66, 76; transfer *Enoplolaimus pacificus* to genus *Mesacanthion* and opinionates it resembles *Oxyonchus*

more. Allgén, 1959: 48; (as *Mesacanthion pacificus*), two juveniles, Falkland Island, sand and small stones with algae, 40 m deep, lapsus *pacificus*].

6. *Mesacanthion paradentatum* (Allgén, 1932) Wieser, 1953 (species inquirenda) [Allgén, 1932: 111–112, fig. 8A–B; (=*Enoplolaimus paradentatus*), description based on one juvenile, Campbell Island. Wieser, 1953: 76; transfer *Enoplolaimus paradentatus* to genus *Mesacanthion*, lapsus *paradentatus*].
7. *Mesacanthion primitivum* (Allgén, 1929) Wieser, 1953 (species inquirenda) [Allgén, 1929: 441, fig 6A–B; (=*Enoplolaimus primitivus*), Skagerrak. Wieser, 1953: 76; transfer *Enoplolaimus primitivus* to genus *Mesacanthion*, lapsus *primitivus*].
8. *Mesacanthion ungulatum* Wieser, 1953 (Wieser, 1953: 78, fig. 40A–B; description based on two juveniles, Seno Reloncavi proper, Chile, exposed littoral algae, lapsus *ungulatus*). **Nomen dubium**. Further discussed in the discussion.

Mesacanthion jejuensis **sp. nov.**

Figs. 2, 3, Table 1

urn:lsid:zoobank.org:act:EE4EB2FC-59DA-48D3-9C10-C9E5646AF0D9

Type locality: Intertidal zone at coast of Jeju Island, South Korea (33º26’05”N 126º55’15”E), in sandy beach

Type material: All specimen deposited in National Institute of Biological Resources (South Korea). Holotype 1♂ (NIBRIV00008488276) on one slide, Allotype 1♀ (NIBRIV00008488277) on one slide, Paratypes 2♂♂, 1♀ on two different slides (NIBRIV00008488278–NIBRIV00008488279), 1♂ and 1♀ dried, mounted on two separate stubs and coated with gold for SEM (NIBRIV00008488280– NIBRIV00008488281) from coast of Jeju Island, South Korea (33º26’05”N 126º55’15”E) collected 17 June 2018.

Measurements: See table 1 for detailed measurements and morphometric ratios.

Description: Male (Fig. 2). Cuticle smooth above cephalic capsule, finely striated posterior to cephalic capsule until tail tip. (Fig. 5B) Lips well developed; edges of lips narrowed and distally pointy. 6 inner labial setae, stout and conical 12 µm long. 6 longer outer labial setae and 4 shorter cephalic setae sharing one crown, situated at midlevel of cephalic capsule. Cephalic capsule vaguely set off at mid-level, anterior part narrow, and posterior part gradually thicker. Stoma funnel shaped, wide at anterior end, gradually narrowing to the base. Coffee-bean shaped epidermal glands distributed along dorsal plane from anterior end of body until posterior end. Stoma armed with three mandibles and three teeth. Mandible consisting of two rods distancing from one another anteriorly joined by anterior rod. ~5–6 short cervical setae in singles at level of posterior end of cephalic capsule. Amphideal flap, inverse triangular, just posterior to the lateral outer labial seta at level of posterior end of cephalic capsule (Fig. 5B). Cervical setae in 8 groups

of 2–3 around pharyngeal region, roughly two cephalic capsule lengths below level of cephalic capsule end (Fig. 5A). Somatic setae scarcely distributed along the body in singles until tail region. Pharynx fairly long and annulated with plasmatic lens-like interlayers and sinuous external contours, cardia triangular and going into the middle of intestine. Metanemes not visible. Testis paired opposed, right of intestine. Thick supplement, 18 μm long, 165 μm above from cloacal opening. Spicules paired, bipartite, symmetrical, curved slightly and thick. Each spicule with distinct transverse seam, dividing it distal and proximal portions. Distal portion shorter than proximal portion. Distal portion slightly curved towards anus, anterior end with one denticle just above and/away from its round pointy end. Proximal portion rather straight, posterior end with a knob/neck-like constriction. Gubernaculum embracing spicules, shaped like irregular triangle, lateral end which lies lateral to the spicule, almost perpendicular to axis of the anus, even extending beyond distal end of spicule, and the other end arching off at an angle towards the tail. Tail elongated and papilliform. 5 somatic setae in tail region. Caudal gland located anterior to the anus vestigial and spinneret well developed. 1 short caudal (terminal) setae (with porous) just above distal end of tail.

Female (Fig. 3). Female generally longer and larger in size. No subtle sexual dimorphism found in setae in the head region, other than shorter length outer labial and cephalic setae compared to male. Short knobs on each anterior end of mandible. Female lacking amphideal flap on cephalic capsule end. Groups of cervical setae found in esophageal region in males are in singles as opposed to doubles/trios (Fig. 5D). Vulva located at 55% of total body length with protruding lips. Reproductive system didelphic amphidelphic, both ends flexed inwards. Both ovaries positioned left of the intestine, antidromously reflexed. Tail conico-cylindrical, 3 somatic setae in tail region with no apparent caudal setae.

Diagnosis: *Mesacanthion*. Body length 2700–4630 μm. Cuticle finely striated along the body, smooth only in cephalic capsule region, head set off with cephalic capsule. Metanemes not visible. Inner labial setae 8–15 μm, outer labial setae 36–59 μm, cephalic setae 18–34 μm long. Stoma armed with mandible and three teeth. Mandible consisting of two rods distancing from one another anteriorly joined by anterior rod. Buccal cavity 37–61 μm long. 8–9 groups of cervical setae in groups of two to three at stoma region. Cervical setae in single groups in females. Males with testis paired and opposed. Spicule paired, symmetrical, slightly curved, divided into two portions by a seam. Distal portion shorter than proximal. Proximal portion with knob/neck-like end. Gubernaculum paired, shaped like an irregular triangle with caudal apophysis, distal end extending beyond spicules and ventrally towards cloacal opening. Precloacal supplementary organ present. Three to four somatic setae distributed along the tale. Tail conico-cylindrical, c’ 4–5.7, cylindrical portion of the tail constituting about 30% of the entire tail length.

Differential diagnosis: The new species is most similar to *M. ditlevseni* as they both share striking resemblance in overall morphology, including the stout and strongly based inner labial

setae, similarly shaped gubernaculum (which was thought to be peculiar at the time of description of *M. ditlevseni*), as well as their body ratio being within range from one another (a, b, and c'). The new species can be distinguished by its proportionally longer cephalic setae (in which is double the length of cephalic setae observed in *M. ditlevseni*), dense distribution of cervical setae in groups of doubles/trios below at stoma region in males and differing details to its spicules and gubernaculum. The new species bears cervical setae which are in eight groups of doubles and trios in males, in singles in females, while none were depicted or mentioned for *M. ditlevseni*. The spicule of the new species is different from *M. ditlevseni* in that distal portion of the spicule is shorter than proximal portion where vice versa is true for *M. ditlevseni*. This is peculiar characteristic unique to the new species, as all bipartite spicules found in *Mesacanthion* species have longer distal portion over proximal portion. The distal portion of spicules found in *M. ditlevseni* was described as being angled almost perpendicular from the proximal portion and is depicted elongating beyond extension of anterior extension of gubernaculum. If *M. ditlevseni*'s whole spicule resembles a boomerang, new species' spicule is more of a small case "j". The anterior extension of gubernaculum of the new species is seen elongating towards the opening of the anus. The de Man constant "c" is also slightly lower in value for the new species compared to *M. ditlevseni* (11.7–13.5 to 14–16) which implicates the new species has longer tail proportionate to the body length. Body length and other body parts are generally longer/larger in *M. ditlevseni* compared to the new species. Amphideal flap observed for the first time in the genus, at posterior end of cephalic capsule just below lateral outer labial setae (5B) may hold diagnostic value in differentiation, however it could have easily been missed during observation in other species of the genus.

Etymology: The species name *jejuensis* is given as the species was discovered from coast Jeju Island, South Korea.

Pictorial key to species with symmetrical bipartite spicules within the genus *Mesacanthion* and morphometric values for valid species of *Mesacanthion*

Fig. 6, Table 2

Key to species with symmetrical bipartite spicules within the genus *Mesacanthion* (Refer to Gagarin 2006 for species with asymmetrical bipartite spicules)

1. Supplementary organ present in males … 2
-Supplementary organ absent in males … *M. infantile*
2. Gubernaculum irregular triangular shape, posteriorly shortest, stretched anteriorly and inferiorly in prolongations … 3
-Gubernaculum irregular triangular shape, anteriorly shortest, elongated inferiorly … *M. audax*
3. Spicule's distal portion longer than proximal portion … *M. ditlevseni*
-Spicule's proximal portion longer than distal portion … *M. jejuensis*

Discussion

The genus *Mesacanthion* currently consist of 40 valid species. Of these valid species, *Mesacanthion ungulatum* Wieser, 1953 is most ambiguous in terms of validity. The species was erected from a description based on only two juvenile specimens, with reasoning that the species in question bears extremely long labial setae and high lips. While there is no problem with the validity according to the International Code of Zoological Nomenclature, since a new species can be described at any life stage, it is ambiguous nonetheless in its current state as its distinguishing characters for the species is no longer unique to the species. Labial setae in *M. ungulatum* is noted to be extremely long, measuring to be 15 µm might have been lengthy for the genus at the time of original description, but currently compared to other species within the genus, it is quite average in length. *Mesacanthion arabium* Warwick, 1973 bears labial setae measuring from 23–25 µm, albeit its overall longer body length. Even when comparing proportionally to body length, *Mesacanthion fricum* Inglis, 1966 (body length 1650 µm/length of inner labial setae 13 µm) and *Mesacanthion hirstum* Gerlach, 1953 (1155–1982 µm/8–14 µm) have longer proportioned inner labial setae than *M. ungulatum* (2250–2430 µm/15 µm). The only characteristic discerning this species from the rest is then by its high lips, but even that is questionable, considering later described species such as *Mesacanthion alexandrinus* Nicholas, 1993, while it does not mention in the description, depict just as high lips as shown in *M. ungulatum*. There is however 18s ribosomal RNA gene, partial sequence of *M. ungulatum* available on GenBank. It seems that the sample specimen was obtained from Chile, the type locality, so there is high probability that more information can be gathered regarding adult stage of this species. We are hopeful that somebody from the locality can review the species with a sound adult specimens to clear the species of nomen dubium/species inquirenda.

Diagnosis of the genus *Mesacanthion* provided by Smol et al. 2014, which provides sufficient description as is, was given a slight update based on our review and findings. The original diagnosis specifically states that spicules are generally short, but if long, gubernaculum with caudal apophysis is to be present. This is true in most cases, but exceptions are shown in species such as *M. brevista*, which has one of the longest spicules in the genus (165 µm) with no gubernaculum at all, and *M. arabium,* which has a pair of short spicules (24 µm) bearing a triangular gubernaculum which resembles a caudal apophysis. In addition, accounts for different types of spicules were added (symmetric/asymmetric, bipartite, etc), so that later encounters of new species with bipartite spicules is not simple mindedly mistaken as *Paramesacanthion* as opposed to *Mesacanthion*, as was the case with us.

The morphology of the spicule is especially diverse in the genus *Mesacanthion*. Spicules which come in a pair can be either short or long/symmetrical or asymmetrical/straight, L-shaped or arcuate in shape. Spicules, if long can be anisomorphic and/or anisometric and can be bipartite or in whole. The part of it being bipartite can be perplexing when it comes to species identification, as it can lead to wrongful placement of the species to the related genus *Paramesacanthion*. Diagnosis of *Paramesacanthion* provided by Smol et al. 2014 specifically

mentions its distinguishing characteristic is “spicules consisting of two portions, distal and proximal, articulating with each other”, while diverse nature of spicules in *Mesacanthion* is missing in its diagnosis. Even while knowing some spicules in *Mesacanthion* can be bipartite, it is imperative to put emphasis into the word “articulating” in diagnosis of Paramesacanthion species’ two portioned spicules. Most spicules of the genus *Paramesacanthion* clearly depict the two portions and its articulation from one another (i.e. Knee joint). While some species like *P. marei*, does not clearly show the articulation much like bipartite spicules found in *Mesacanthion*, they too can be distinguished as a *Paramesacanthion* species by its: 1. Outer labial and cephalic setae in front of anterior end of cephalic capsule and 2. Subcephalic setae at middle of cephalic capsule. *Paramesacanthion* species bear an extra ring of subcephalic setaes which can be confused with the true cephalic setae of *Mesacanthion* species. Wieser (1953) specifically mentioned this when erecting the genus, not to confuse “the subcephalic setae of the male with the true cephalic setae since the former occupy that level of the head on which in *Mesacanthion* the insertion of the cephalic setae takes place” (p.80). As such, the new species has a paired spicule which are symmetric from one another. They are bipartite with distal portion slightly shorter than proximal part. Distal and proximal is divided by a seam which seems to thicken or “arm” around the distal portion of the spicule. Proximal end arcuate and distal end set with pointing spine or a “barb”.

Metanemes are one character which was surprisingly not observed within the new species. While no species belonging to *Mesacanthion* have yet been described to date with description or depiction of metanemes, orthometaneme of dorsolateral kind was expected to be present within the new species prior to inspection. Diagnosis of the family Thoracostomopsidae Filipjev, 1927 (according to Smol et al. 2014) specifically states “only dorsolateral orthometanemes with a robus scapulus but no caudal filament”. Species belonging to *Mesacanthion*’s most closely related genus, *Paramesacanthion abyssorum* Bussau 1995, was also recorded with presence of dorsolateral orthometanemes. Not only that, “coffee bean shaped epidermal glands” which were sighted alongside dorsolateral orthometanemes in *P. abyssorum* are very much present within the new species as well (Figs. 2A, 3A). Given that orthometanemes are subtler in their appearance compared to loxometanemes, it is quite possible that even other species of *Mesacanthion* already described, could have had them present. Despite it being more difficult to spot in older types due to their conditions, it’ll be important for future descriptions of any species belong to the family Ironidae to identify their metanemes.

After discovering the new species, the type locality was visited twice more in August and November of 2018, to obtain alcohol samples of the specimen for molecular analysis. While the efforts were unfortunately fruitless until now, we are hopeful that we will get the required specimen for additional molecular analysis in the future. It’ll be interesting to compare the relationship between close related species such as *M. ditlevseni* by the means of molecular phylogenetic data.

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References

Allgén, C.A. (1929) Neue freilebende marine Nematoden von der Westküste Schwedens. *Zoologische Jahrbucher (Systematik)*, 57 (5), 431–496.

Allgén, C.A. (1930) Über eine neue Art des Genus *Enoplolaimus* de Man, *Enoplolaimus gracilisetosus* von der Macquarieinsel. *Zoologischer Anzeiger*, 92, 189–191.

Allgén, C.A. (1932) Weitere Beiträge zur Kenntnis der marinen Nematodenfauna der Campbellinsel. *Nyt Magasin for Naturvidenskaberne*, 70, 97–198.

Allgén, C.A. (1935) Zur Kenntnis norwegischer Nematoden. V. Weitere neue oder wenig bekannte freilebende marine Nematoden aus der Strandzone bei Tarva. *Det Konglige Norske Videnskabers Selskab Forhandlinger*, 8 (15), 47–50.

Allgén, C.A. (1947) West American Marine Nematodes. (Papers from Dr. Th. Mortensen's Pacific Expedition 1914-16. 75). *Videnskabelige Meddelelser Dansk Naturhistorisk Forening i Kjöbenhavn*, 110, 65–219.

Allgén, C.A. (1951) Pacific Freeliving Marine Nematodes. (Papers from Dr. Th. Mortensen's Pacific Expedition 1914-16. LXXVI). *Videnskabelige Meddelelser Dansk Naturhistorisk Forening i Kjöbenhavn*, 113: 263–411.

Allgén, C.A. (1954) Freeliving marine nematodes from East Greenland and Jan Mayen (The Swedish Greenland Expedition 1899). *Meddelelser om Grønland*, 107 (6), 1–44.

Allgén, C.A. (1959) Freeliving marine nematodes. *Further zoological results of the Swedish Antarctic expedition 1901–1903*, 5 (2), 1–293.

Allgén, C.A. (1960) Antarktische meistens neue freilebende marine Nematoden aus dem Graham-Land. *Zoologischer Anzeiger*, 164, 474–499.

Barnes, N., Kim, H. & Lee, W. (2012) New species of free-living marine Sabatieriinae (Nematoda: Monhysterida: Comesomatidae) from around South Korea. Zootaxa, 3368, 263-290. https://doi.org/10.11646/zootaxa.3368.1.14

Bezerra, T.N., Decraemer, W., Eisendle-Flöckner, U., Hodda, M., Holovachov, O., Leduc, D., Miljutin, D., Mokievsky, V., Peña Santiago, R., Sharma, J., Smol, N., Tchesunov, A., Venekey, V., Zhao, Z. & Vanreusel, A. (2019) Nemys: World Database of Nematodes. Accessed from: http://nemys.ugent.be (accessed 26 May 2019) https://doi.org/10.14284/366

Boucher, G. (1977) Nématodes des sables fins infralittoraux de la Pierre Noue (Manche occidentale). IV. Enoplida. *Bulletin du Muséum National d'histoire naturelle, Zoologie*, 325, 733–752.

Burgess, R. (2001) An improved protocol for separating meiofauna from sediments using colloidal silica sols. *Marine Ecology Progress Series*, 214, 161–165. https://doi.org/10.3354/meps214161

De Coninck, L.A. & Schuurmans Stekhoven, J.H. (1933) The freeliving marine nemas of the Belgian Coast. II With general remarks on the structure and the system of nemas. *Mémoires du Musée royal d'histoire naturelle de Belgique*, 58, 3–163.

de Man, J.G. (1876) Onderzoekingen over vrij in de aarde levende Nematoden. *Tijdschrift Nederlandsche Dierkundig Vereeiging*, 2, 78–196.

de Man, J.G. (1893). Cinquième Note sur les Nématodes libres de la mer du Nord et de la Manche. *Mémoires de la Société zoologique de France,* 6, 81–125.

Ditlevsen, H. (1918) Marine freeliving nematodes from Danish waters. *Videnskabelige Meddelelser fra Dansk Naturhistorisk Forening i Kjøbenhavn*, 70, 147–214.

Ditlevsen, H. (1928) Free-living marine Nematodes from Greenland Waters. *Meddelelser om Grønland Supplement*, 27, 199–250.

Ditlevsen, H. (1930) Marine free-living nematodes from New Zealand. *Videnskabelige Meddelelser fra Dansk Naturhistorisk Forening i Kjøbenhavn*, 87, 201–242.

Filipjev, I.N. (1918) Free-Living Marine Nematodes of the Sevastopol Area. *Transactions of the Zoological Laboratory and the Sevastopol Biological Station of the Russian Academy of Sciences. Series II*, N4, (Issue I & II). (Translated from Russian).

Filipjev, I.N. (1927) Les Nematodes libres des mers septentrionales appurtenant a la famille des Enoplidae. *Archiv für Naturgeschichte*, 91A (6), 1–216.

Gagarin, V.G. & Klerman, A.K. (2006) Two new species of *Mesacanthion* Filipjev, 1927 (Nematoda: Enoplida) from the Mediterranean Sea. *Nematology*, 8 (4), 533–538. https://doi.org/10.1163/156854106778614001

Galtsova, V.V. (1976) Free-living marine nematodes as a component of the meiobenthos of Chupa Inlet of the White Sea. *Issledovanija fauni morjei (Nematody i ikh Rol' v Meiobentose)*, 17 (25), 165–272 (in Russian).

Gerlach, S.A. (1953) Die Nematodenbesiedlung des Sandstrandes und des Küstengrundwassers an der italienischen Küste I. Systematischer Teil. *Archivio Zoologico Italiano*, 37, 517–640.

Gerlach, S.A. (1954) Nématodes marins libres des eaux souterraines littorals de Tunisie et d'Algérie. *Vie Milieu*, 4 (2), 221–237.

Gerlach, S.A. (1956) Die Nematodenbesiedlung des tropischen Brandungsstrandes von Pernambuco. Brasilianische Meeres-Nematoden II. *Kieler Meeresforsch*, 12, 202–218.

Gerlach, S.A. (1957a) Die Nematodenfauna des Sandstrandes an der Küste von Mittelbrasilien (Brasilianische Meerse-Nematoden IV). *Mitteilungen aus dem Zoologischen Museum in Berlin*, 33 (2), 411–459.

Gerlach, S.A. (1957b) Marine Nematoden von der Kongo-Mündung. *Bullitin del'Institut Royal des Sciences Naturelles de Belgique*, 33 (28), 1–16.

Gerlach, S.A. (1958a) Deuxième contribution à la faune des Nématodes des eaux interstitielles littorales de Madagascar. *Mém. Inst. scient. Madagascar*, (F) 2, 343–365.

Gerlach, S.A. (1958b) Die Nematodenfauna der sublitoralen Region in der Kieler Bucht. *Kieler Meeresforsch*, 14, 64–90.

578 Gerlach, S.A. (1967) Freilebende Meeres-Nematoden von dan Sarso-Inseln (Rotes Meer) 3.
579 Beitrag der Arbeitsgruppe Litoralforschung. *"Meteor" Forschungsergebnisse*, Series D
580 (2), 19–43.
581 Gerlach, S.A. & Riemann, F. (1974) The Bremerhaven checklist of aquatic nematodes. A
582 catalogue of Nematoda Adenophorea excluding the Dorylaimida. Part
583 2. *Veröffentlichungen des Instituts für Meeresforschung in Bremerhaven*, Supplement 4,
584 405–736
585 Hodda, M. (2007) Phylum Nematoda. *Zootaxa*, 1668, 265–293.
586 https://doi.org/10.11646/zootaxa.1668.1.14
587 Hong, J.H. & Lee, W. (2014) Two new species of free-living marine nematodes (Nematoda:
588 Oncholaimida: Enchelidiidae) from Maemul Island, Korea. *Zootaxa*, 3785 (3), 419–437.
589 https://doi.org/10.11646/zootaxa.3785.3.5
590 Hong, J.H., Tchesunov, A.V. & Lee, W. (2016) Revision of *Cervonema* Wieser, 1954 and
591 Laimella Cobb, 1920 (Nematoda: Comesomatidae) with descriptions of two species from
592 East Sea, Korea. *Zootaxa*, 4098 (2), 333–357. https://doi.org/10.11646/zootaxa.4098.2.7
593 Hooper, D. (1986) Drawing and measuring nematodes. *In: Laboratory Methods for Work with*
594 *Plant and Soil Nematodes.* Ministry of Agriculture, Fisheries and Food, Her Majesty's
595 Stationery Office, London, pp. 87–94.
596 Inglis, W.G. (1964) The marine Enoplida (Nematoda): a comparative study of the head. *Bulletin*
597 *of the British Museum (Natural History) Zoology*, 11, 265–376.
598 Inglis, W.G. (1966) Marine nematodes from Durban, South Africa. *Bulletin of the British*
599 *Museum (Natural History) Zoology*, 14, 81–106.
600 Jeong, R., Tchesunov, A.V. & Lee, W. (2019) A new species of the genus *Thalassironus*
601 (Nematoda: Enoplida: Ironidae) from the coasts of South Korea. *Zootaxa*, 4563 (3), 516–
602 530. https://doi.org/10.11646/zootaxa.4563.3.6
603 Kim, H., Tchesunov, A.V. & Lee, W. (2015) A new species of the genus *Marylynnia*
604 (Nematoda: Chromadorida: Cyatholaimidae) from Gwangyang Bay, Korea. *Proceedings*
605 *of the Biologcal Society of Washington*, 128 (4), 227–238. https://doi.org/10.2988/0006-
606 324X-128.4.227
607 Mawson, P.M. (1956) Free-living nematodes. Section I: Enoploidea from Antarctic stations.
608 *B.A.N.Z. Antarctic Research Expedition Reports*, Series B, 6 (3), 37–74.
609 Mawson, P.M. (1958) Free-living nematodes. Section 3: Enoploidea from subantarctic stations.
610 *B.A.N.Z. Antarctic Research Expedition Reports,* Series B, 6 (14), 307–358.
611 Nicholas, W.L. (1993) Two new species of nematode (Nematoda: Enoplida:
612 Thoracostomopsidae) from Lake Alexandrina, South Australia. *Transactions of the Royal*
613 *Society of South Australia*, 117 (4), 163–170.
614 Platonova, T.A. & Galtsova, V.V. (1976) Nematodes and their role in the meiobenthos. *Akad.*
615 *Nauk (Zool. Inst.)*, Moscow, pp. 1–366., available online at
616 https://archive.org/details/nematodestheirro00plat

617 Platt, H. & Warwick, R.M. (1983) Free-living Marine Nematodes. Part I. British Enoplids. *In:*
618 Kermack, D.M. & Barnes, R.S.K. (Eds.), *Synopses of British Fauna (New Series) n. 28*,
619 Cambridge University Press, Cambridge, pp. 307.
620 Riemann, F. (1966) Die interstitielle Fauna im Elbe-Aestuar. Verbreitung und Systematik,
621 *Archiv für Hydrobiologie*, 31 (Supplement), 1–279.
622 Rho, H. & Min, W. (2011) Nematoda: Chromadorea: Desmodorida: Draconematidae. Marine
623 dragon nematodes. *Invertebrate Fauna of Korea*, 13, 1–100.
624 Ssaweljev, S. (1912) Zur Kenntnis der freilebenden Nematoden des Kolafjords und des
625 Relictensee Mogilnoje. *Travaux de la Société (Impériales) des Naturalistes de Saint-*
626 *Petersbourg*, 43, 108–126.
627 Seinhorst, J. (1959) A rapid method for the transfer of nematodes from fixative to anhydrous
628 glycerin. *Nematologica*, 4, 67–69. https://doi.org/10.1163/187529259X00381
629 Sergeeva, N.G. (1974) New Free-living Nematodes (Enoplida) from the Black Sea, Report 2
630 (Novye Vidy Svobodnozhivushchikh Nematod Otriada (Enoplida) iz Chernogo Moria,
631 Soobshchenie 2). *Zoologicheskii Zhurnal*, 53 (1), 120–125.
632 Shipley, A.E. (1896) Nemathelminthes. *In:* Harmer, S.F. & Shipley, A.E. (Eds) *The Cambridge*
633 *Natural History*. Weldon & Wesley, Cambridge, pp. 123–185.
634 Smol, N., Muthumbi, A. & Sharma, J. (2014) 7.3 Order Enoplida. *In*: Schmidt-Rhaesa, A. (Ed.),
635 *Handbook of zoology. Gastrotricha, Cycloneuralia, Gnathifera. Vol. 2. Nematoda*. De
636 Gruyter, Berlin, pp. 193–249.
637 Southern, R. (1914) Nemathelmia, Kinorhyncha and Cheatognatha (Clare Island survey, part 54).
638 *Proceedings of the Royal Irish Academy*, 31, 1–80.
639 Timm, R.W. (1961) The marine nematodes of the Bay of Bengal. *Proceedings of the Pakistan*
640 *Academy of Sciences*, 1 (1), 25–88.
641 Vitiello, P. (1971) Nématodes nouveaux des vases terrigènes cotières des côtes provençales.
642 *Téthys*, 2, 859–876.
643 Warwick, R.M. (1970) Fourteen new species of marine nematodes from the Exe estuary. *Bulletin*
644 *of the British Museum (Natural History) Zoology*, 19, 137–177.
645 Warwick, R.M. (1973) Freeliving marine nematodes from the Indian Ocean. *Bulletin of the*
646 *British Museum (Natural History) Zoology*, 25 (3), 85–117.
647 Wieser, W. (1953) Reports of the Lund University Chile expedition 1948–49: 10. Free-living
648 marine nematodes I. Enoploidea. *Lunds Universitets Årsskrift* 49 (6), 155 pp.
649 Wieser, W. (1959) Free-living nematodes and other small invertebrates of Puget Sound beaches.
650 *In: University of Washington Publications in Biology. Vol. 19.* University of Washington
651 Press, Seattle, pp. 1–179.
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Tables

Table 1. Measurement of major morphological characters of *Mesacanthion jejuensis* **sp. nov.** Measurements are in μm where applicable, and morphometric values rounded.

Table 2. Comparison of major morphological characters of all *Mesacanthion* species. Males and females joined, morphometric values rounded.

Figures

Figure 1. Map of sampling locality. This map is made with QGIS software v.2.18.14, a free and open source geographic information system.

Figure 2. *Mesacanthion jejuensis* **sp. nov.** male. A. head, lateral view; B. tail, with spicule and gubernaculum; C. habitus. Scale bars: 20 μm (A and B) and 200 μm (C).

Figure 3. *Mesacanthion jejuensis* **sp. nov.** female. A. head, lateral view; B. reproductive system with vulva protruding; C. habitus; D. tail region with caudal glands. Scale bars: 20 μm (A and D) and 100 μm (B and C).

Figure 4. *Mesacanthion jejuensis* **sp. nov.** (A and B, paratype). A. lateral view of male cloacal region, showing a seam separating spicules in distal and proximal portions; B. lateral view of male cloacal region, showing distal end of spicule and triangular gubernaculum embracing the spicule. Scale bars: 30 μm (A and B).

Figure 5. Scanning electron micrograph of *Mesacanthion jejuensis* **sp. nov.** A. male, head region, lateral view, groups of cervical setae in doubles/trios; B. male, head region showing triangular amphideal flap just posterior to lateral outer labial seta; C. male, cloacal opening with distal end of gubernaculum peeking out; D. female, head region, lateral view, single cervical seta.

Figure 6. Pictorial key to species with symmetrical bipartite spicules within the genus *Mesacanthion*. Figure source: A. Ditlevsen, 1930; B. Ditlevsen, 1918; C. Filipjev, 1927.

Figure 1

Map of sampling locality.

This map is made with QGIS software v.2.18.14, a free and open source geographic information system.

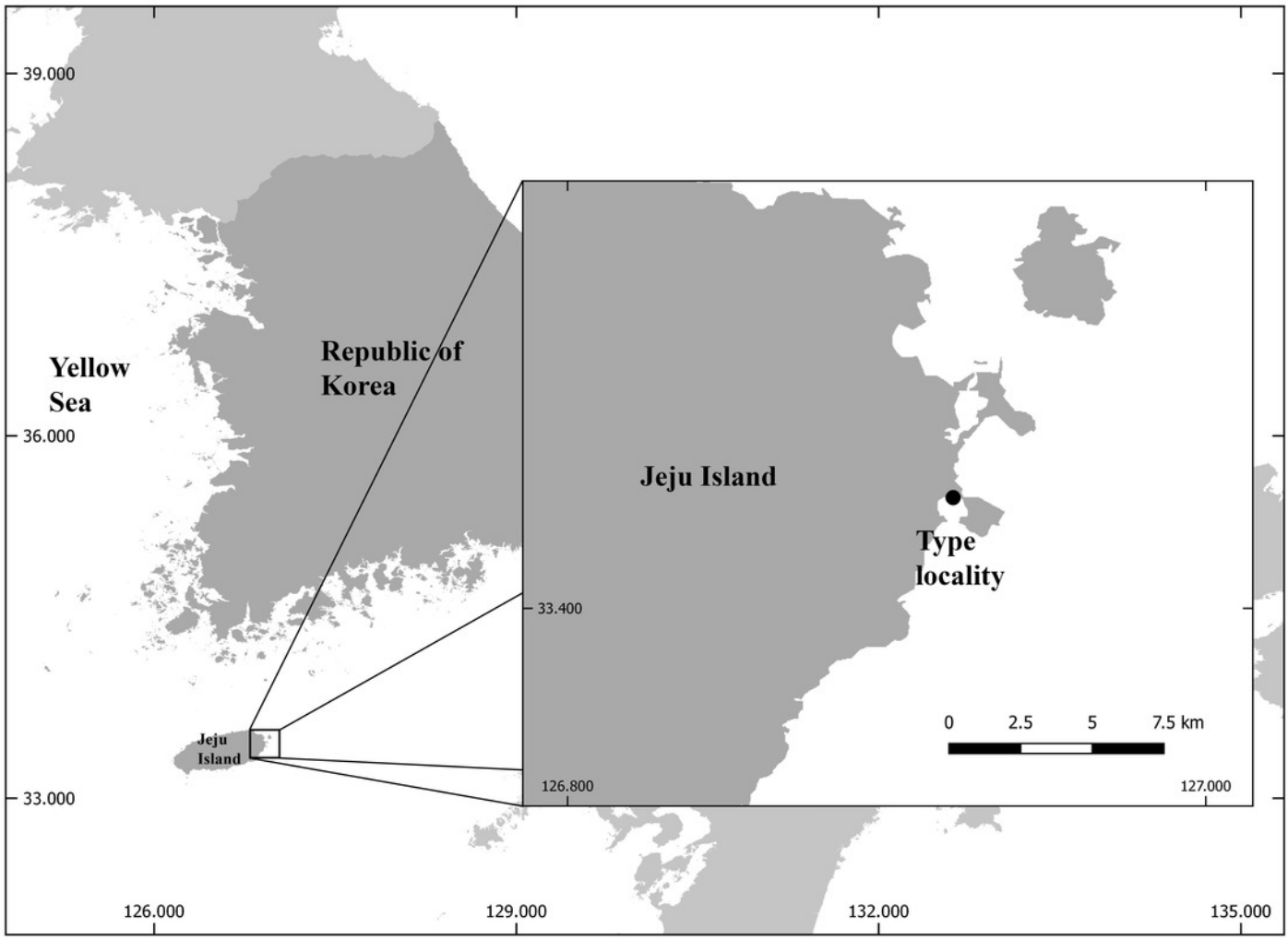

Figure 2

Mesacanthion jejuensis sp. nov. male.

A. head, lateral view; B. tail, with spicule and gubernaculum; C. habitus. Scale bars: 20 µm (A and B) and 200 µm (C).

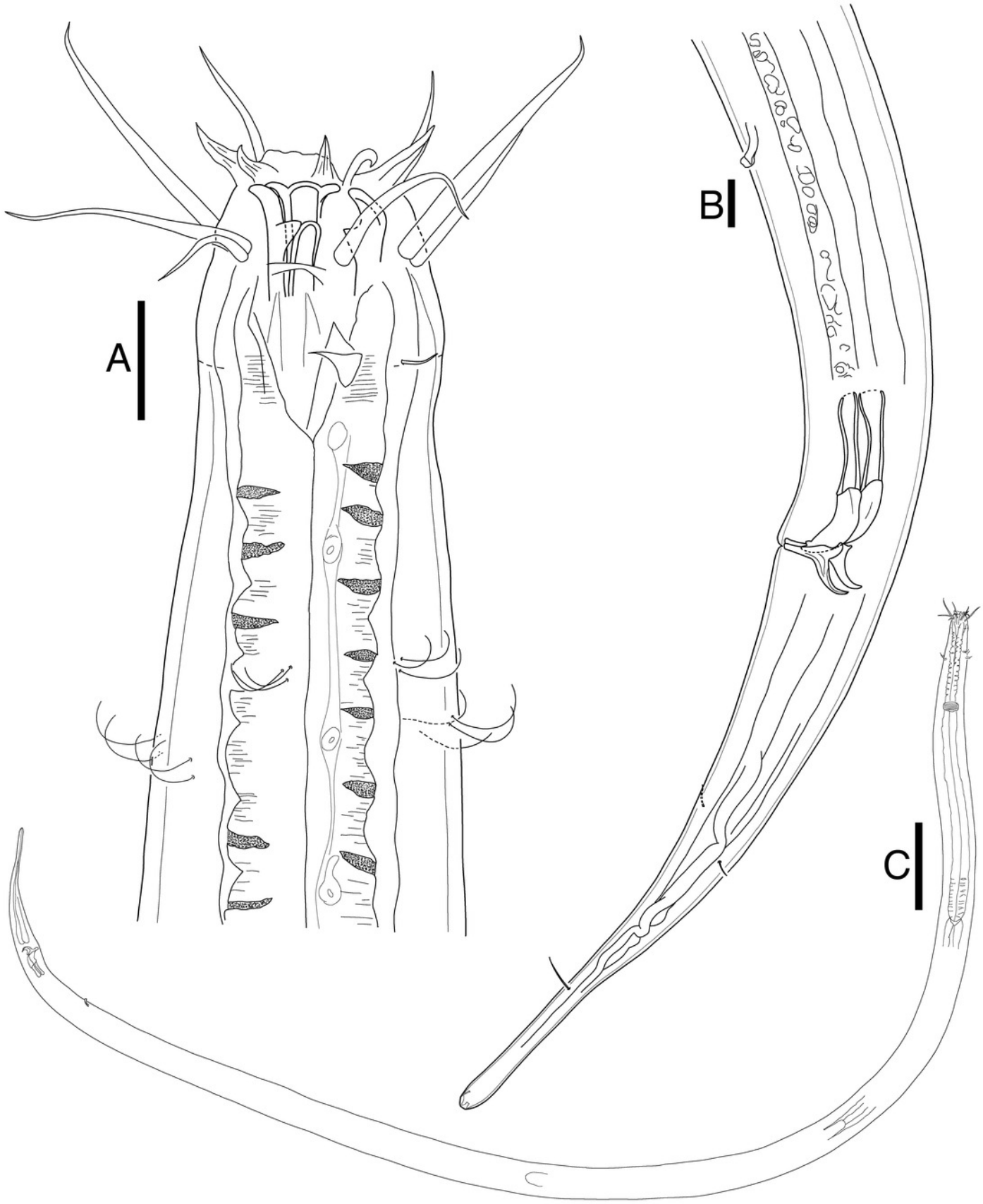
A
B
C

Figure 3

Mesacanthion jejuensis sp. nov. female.

female. A. head, lateral view; B. reproductive system with vulva protruding; C. habitus; D. tail region with caudal glands. Scale bars: 20 µm (A and D) and 100 µm (B and C).

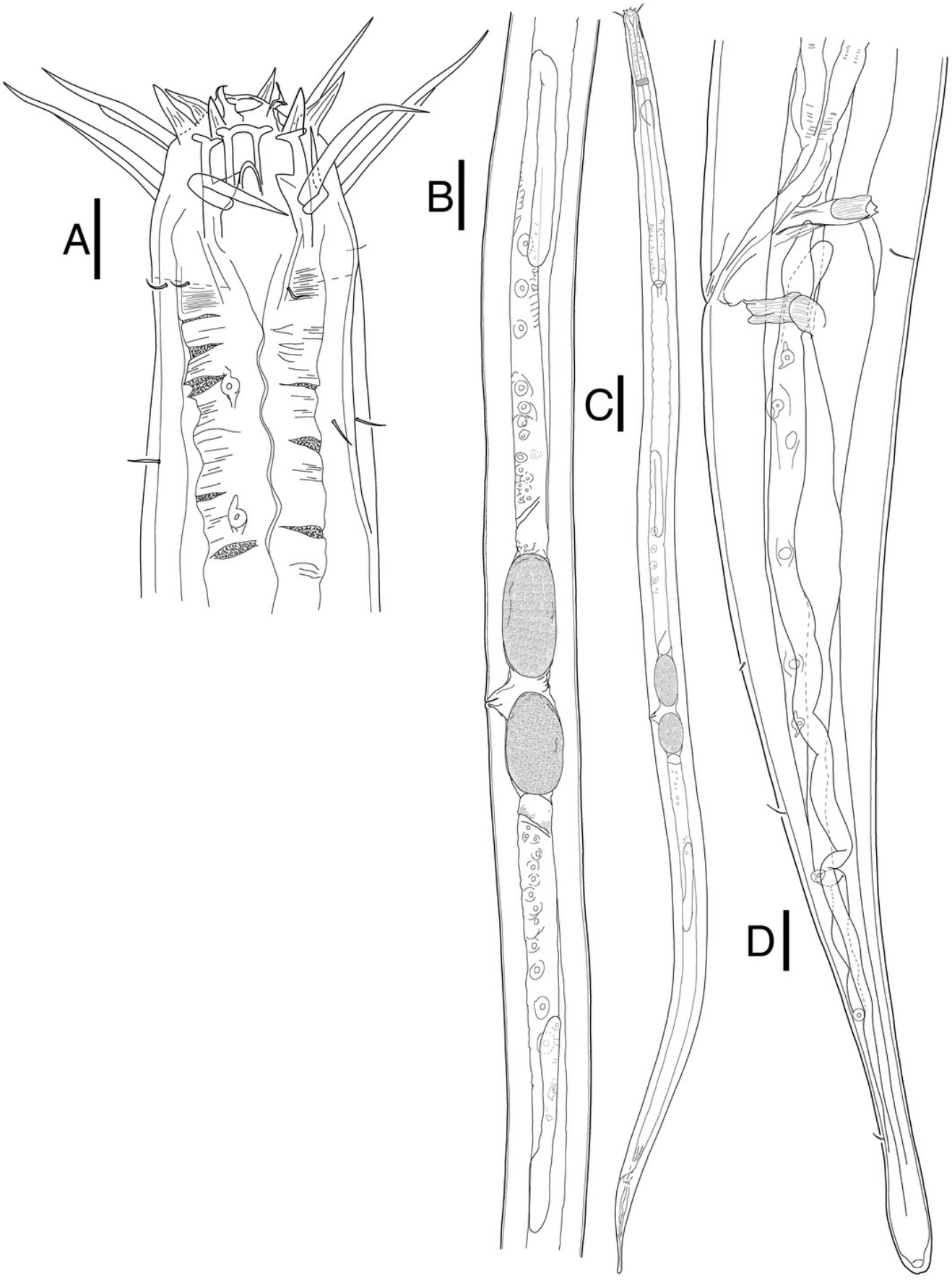
A
B
C
D

Figure 4

Mesacanthion jejuensis sp. nov. (A and B, paratype).

A. lateral view of male cloacal region, showing a seam separating spicules in distal and proximal portions; B. lateral view of male cloacal region, showing distal end of spicule and triangular gubernaculum embracing the spicule. Scale bars: 30 μm (A and B).

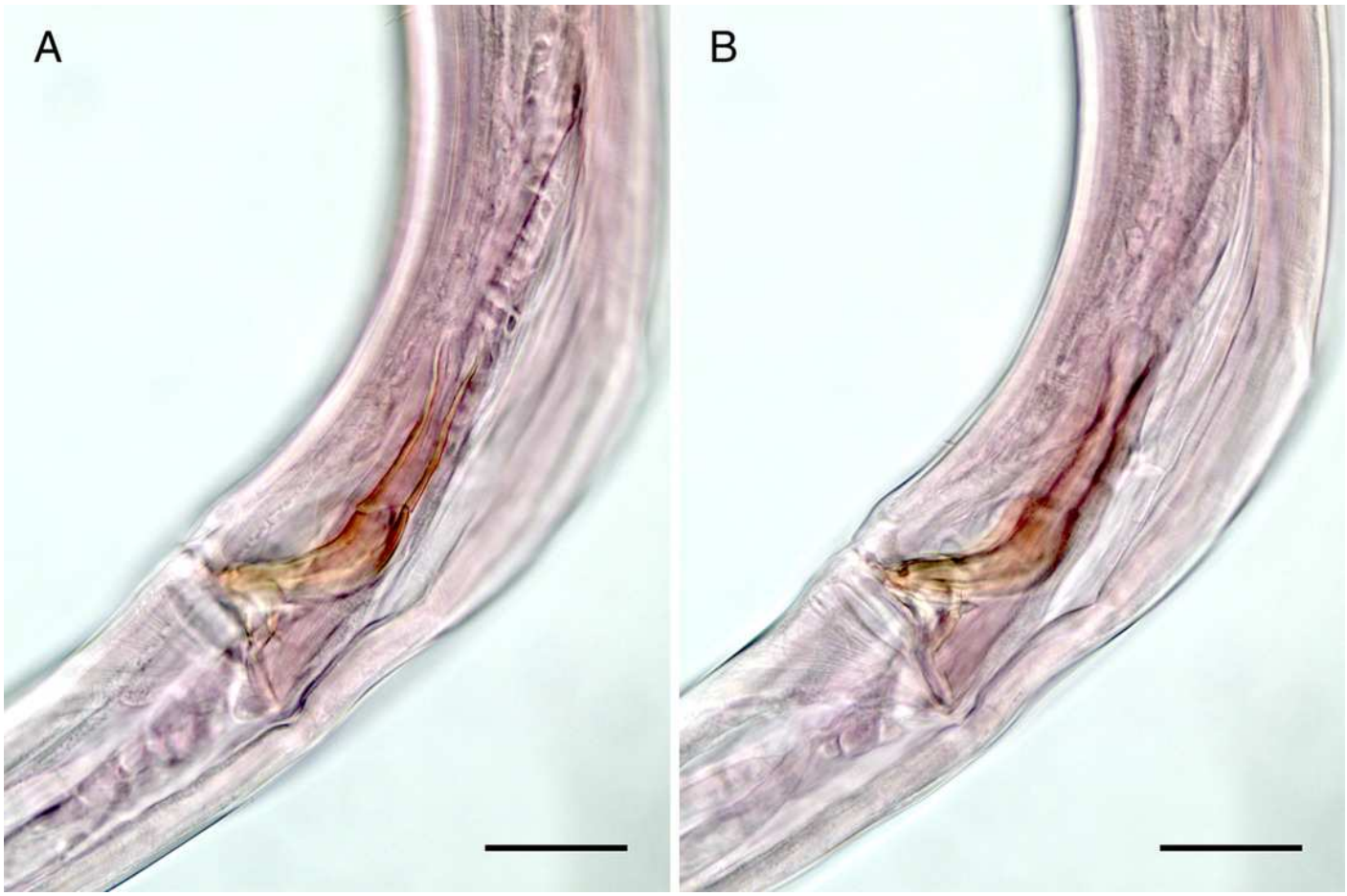

Figure 5

Scanning electron micrograph of *Mesacanthion jejuensis* sp. nov.

A. male, head region, lateral view, groups of cervical setae in doubles/trios; B. male, head region showing triangular amphideal flap just posterior to lateral outer labial seta; C. male, cloacal opening with distal end of gubernaculum peeking out; D. female, head region, lateral view, single cervical seta.

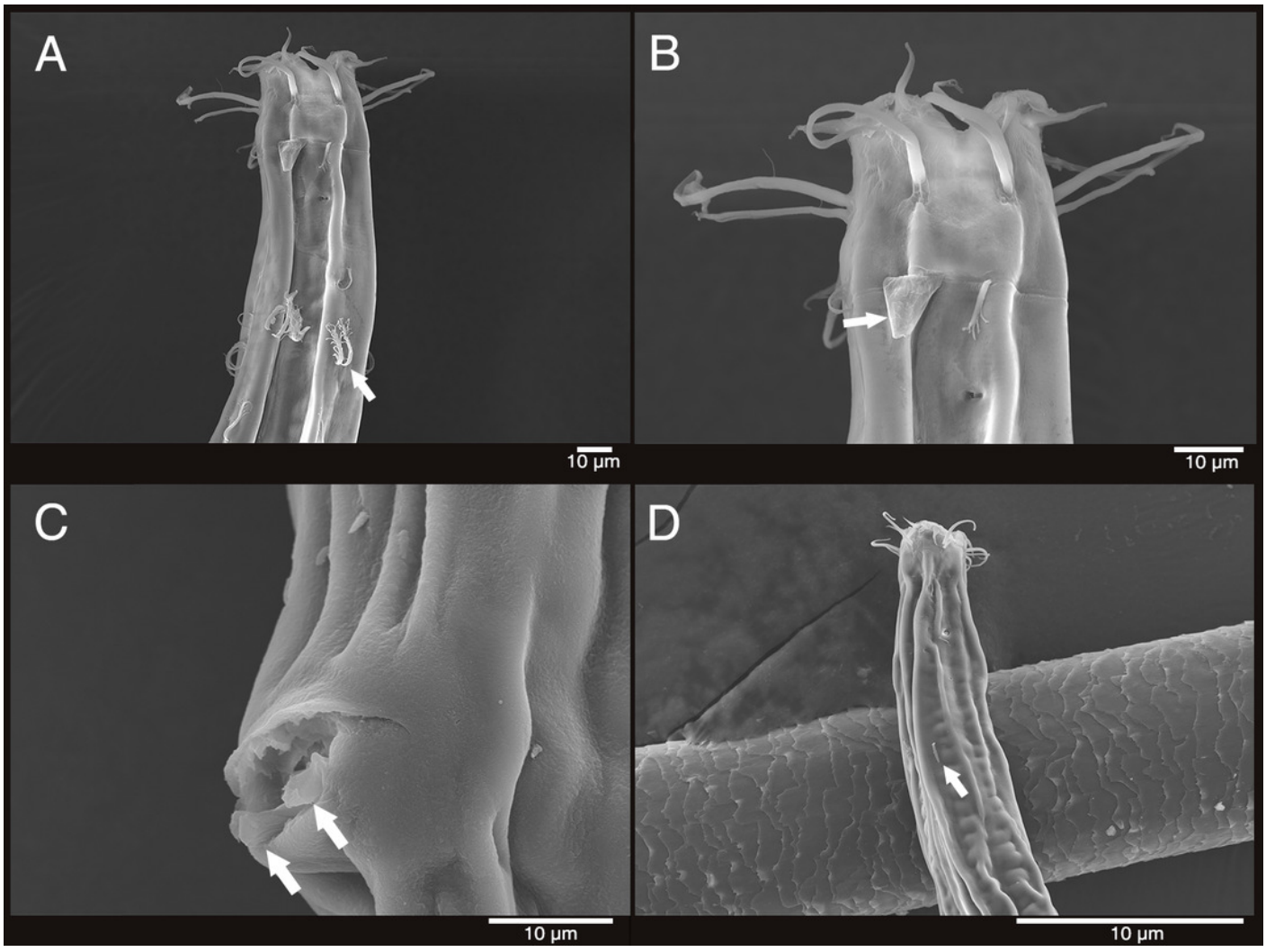

Figure 6

Pictorial key to species with symmetrical bipartite spicules within the genus *Mesacanthion*.

Figure source: A. Ditlevsen, 1930; B. Ditlevsen, 1918; C. Filipjev, 1927.

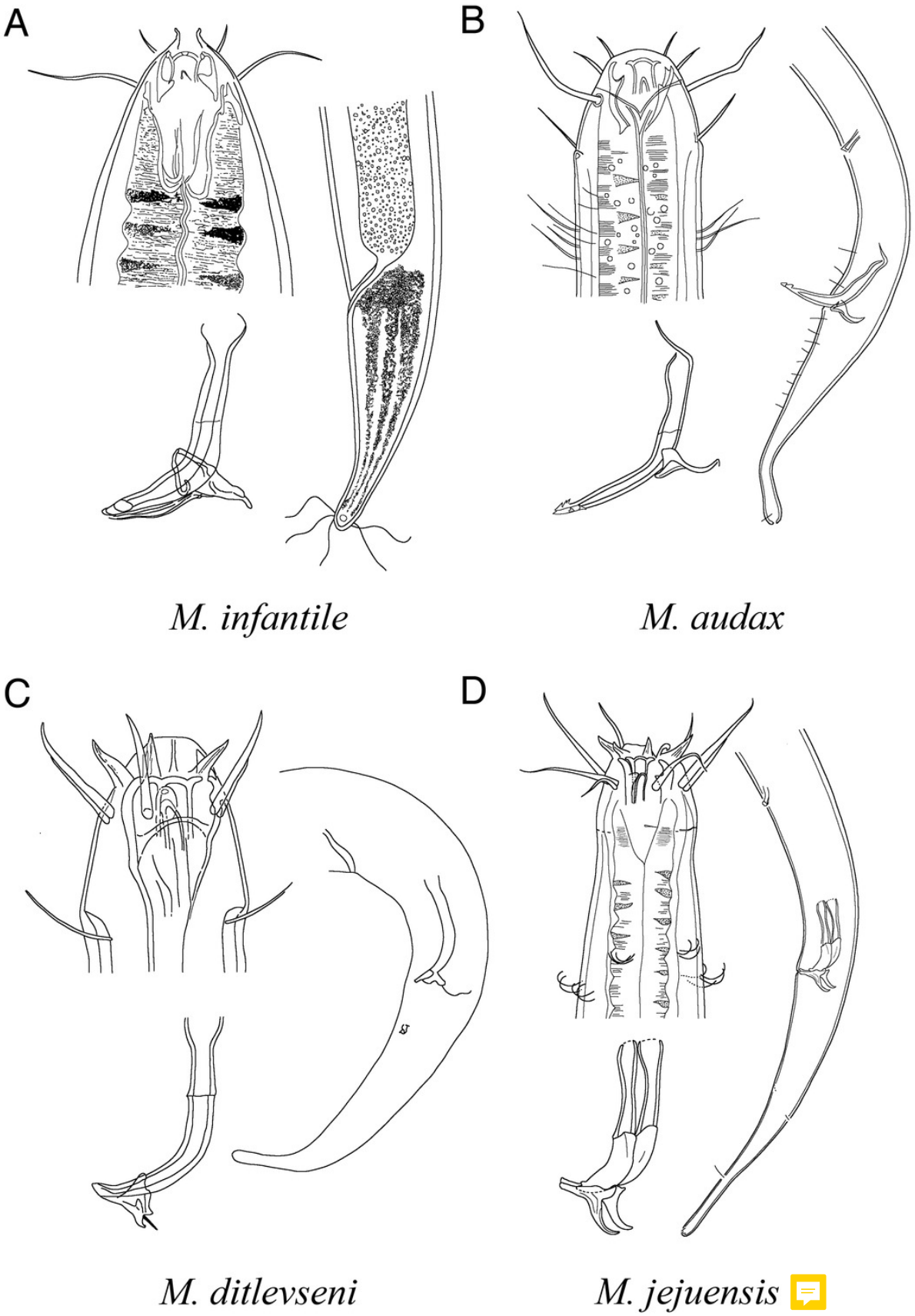
A
B
M. infantile
M. audax
C
D
M. ditlevseni
M. jejuensis

Table 1(on next page)

Measurement of major morphological characters of *Mesacanthion jejuensis* sp. nov.

Measurements are in µm where applicable, and morphometric values rounded.

Characters	♂ holotype	♂ (n=4) mean ± sd (range)	♀ (n=3) mean ± sd (range)
body length	3682	3401±476 (2703–3723)	3719±808 (3080–4627)
maximum body diameter	79	79±2 (76–82)	108±31 (80–141)
diameter at the level of cephalic setae	39	36±2.9 (32–39)	32.7±3.2 (29–35)
length of inner labial setae	12	12.5±1.7 (11–15)	10±1.7 (8–11)
length of outer labial setae	43	50.5±7.3 (43–59)	37.3±1.2 (36–38)
length of cephalic setae	28	27.8±6.9 (18–34)	24±2.6 (21–26)
distance from anterior to cephalic setae	19	15±3 (11–19)	13±1 (12–14)
width at cephalic capsule end	42	42±2 (41–45)	38±5 (32–41)
length of cephalic capsule	32	31±2 (29–33)	26±1 (25–27)
buccal cavity length	50	44±5 (37–50)	46±13 (38–61)
distance from nerve ring from anterior end	212	202±27 (161–220)	222±36 (194–262)
pharynx (oesophagus) length	731	706±74 (598–764)	800±172 (687–998)
corresponding body diameter at pharynx	76	76±2 (74–78)	97±23 (76–122)
cardia length	21	23±2 (21–25)	23±4 (18–26)
tail length	287	274±44 (209–304)	286±48 (257–342)
anal body diameter	50	54±4 (50–60)	58±12 (48–71)
c'	5.7	5.1±0.8 (4–5.7)	4.9±0.4 (4.6–5.4)
length of conical tail	223	209±35 (157–229)	227±40 (203–273)
length of cylindrical tail	64	66±11 (52–78)	59±9 (52–69)
cylindrical tail length portion as percentage of tail length	0.3	0.3±0 (0.3–0.3)	0.3±0 (0.3–0.3)
spicule length as arc	76	79±6 (72–85)	n/a
spicule length as arc / anal body diameter	1.5	1.5±0.1 (1.4–1.6)	n/a
length of gubernaculum	50	45±5 (39–50)	n/a
supplementary organ length	18	15±3 (10–18)	n/a
distance from cloacal opening to supplementary organ	165	160±16 (136–171)	n/a
distance from anterior end to vulva	n/a	n/a	2027±460 (1685–2549)
corresponding body diameter at vulva	n/a	n/a	108±31 (80–141)
distance from anterior end to vulva as percentage of total body length	n/a	n/a	54.4±0.8 (53.6–55.1)
a	46.6	43.1±5.1 (35.6–46.6)	34.9±3.1 (32.8–38.5)
b	5	4.8±0.2 (4.5–5)	4.6±0.2 (4.5–4.8)
c	12.8	12.4±0.6 (11.7–12.9)	12.9±0.8 (12–13.5)

Table 1. Measurement of major morphological characters of *Mesacanthion jejuensis* **sp. nov.** Measurements are in μm where applicable, and morphometric values rounded.

Table 2(on next page)

Comparison of major morphological characters of all *Mesacanthion* species.

Males and females joined, morphometric values rounded.

Species	Body length [µm]	Length of Setae: a	Inner labial Setae	Outer labial setae/cephalic setae	b	Spicule length [µm, (s)] left/right if applicable	Spicule type	Gubernaculum (length [µm])	Supplementary organ/papilla (distance from cloacal opening [µm])	c	c'
***Mesacanthion africanthiforme* Warwick, 1970**	2370–4490	56–82	6–8	23–41/10–20	4.1–5.4	20–33 (0.6–0.7 [calc])	symmetrical/unipartite	present (10–13)	absent	15.1–21.17	3.9–5.4 (calc)
***Mesacanthion africanum* Gerlach, 1957**	3345	33	6.5	15	6.1	85/180 (1.2/2.5 [calc])	asymmetrical/ bipartite /striated	present (53/44)	present (88)	12.6	3.7
Mesacanthion agubernatus Vitiello, 1971	3120	35	8	14–19	3.7	41 (0.9)	symmetrical/unipartite	absent	present (155)	21.5	3.2
***Mesacanthion alexandrinus* Nicholas, 1993**	1450–2570	26–43	9–13	27–29/11–19	3.1–3.8	79–86 (2.5–3.6)	asymmetrical/ unipartite	present (not measured)	present (64–70)	14–22	3.4–4.5
***Mesacanthion arabium* Warwick, 1973**	5780–6250	30–39	23–25	52–65/23–32	4.8–5.2	570–610 (6.2–6.8 [calc])	unclear/unipartite (striated)	present (120–127)	present (220–230)	16.1–18.4	3.7–4.8
***Mesacanthion arcuatile* Wieser, 1959**	3880	48	18	75/25	4.6	n/a	n/a	n/a	n/a	21.6	3
***Mesacanthion armatum* Timm, 1961**	1630–3370	23–51	5	14/9	4.5–5.7	41	symmetrical/unipartite	present (not measured)	absent	43.2–51 (female: 15.6)	1.5–2 (female: 3.4)
***Mesacanthion audax* (Ditlevsen, 1918) Filipjev, 1927**	3700	57	not measured	not measured	4.8	not measured (1.8)	symmetrical/bipartite	present (not measured)	present (178)	14.5	3.2
***Mesacanthion banale* (Filipjev, 1927) Gerlach & Riemann, 1974**	3920–4550	26–37	not measured	26/14	4.4–4.8	n/a	n/a	n/a	n/a	13–16	4.2–6.7 (calc)
***Mesacanthion brachycolle* Allgén, 1959**	3250	22	not measured	not measured	7.75	n/a	n/a	n/a	n/a	17.5	not measured
***Mesacanthion breviseta* (Filipjev, 1927) Gerlach & Riemann, 1974**	3960	23	10	20/15	4	165	symmetrical/unipartite	present (60)	absent	12	3 (calc)

***Mesacanthion cavei* Inglis, 1964**	4200	38	13	59/35	4.2	510	symmetrical/unipartite	present (38)	present (161)	17.5	3.75 (calc)
***Mesacanthion ceeum* Inglis, 1964**	3500	42	not mentioned/measured	59	4.9	430	symmetrical/unipartite	present (31)	present (121)	13.5	5.8 (calc)
***Mesacanthion conicum* (Filipjev, 1918) Filipjev, 1927**	3780	28	not measured	12	5	n/a	n/a	n/a	n/a	14	4.5 (calc)
***Mesacanthion cricetoides* Wieser, 1959**	4080	31	10	36/25	5.8	n/a	n/a	n/a	n/a	17.7	3.4
***Mesacanthion diplechma* (Southern, 1914) Filipjev, 1927**	3330–4241	27–44	11–12	24–45/35–43	4.6–5.9	500–598/95	asymmetrical/bipartite/striated	present (not measured)	present (not measured)	12.6–14.8	4–5.22 (calc)
***Mesacanthion ditlevseni* (Filipjev, 1927) Gerlach & Riemann, 1974**	3520–7000	24–41	12–16	21–26/not measured	4.3–5.8	87–100 (1.4–1.8)	symmetrical/bipartite	present (43–47)	present (155–172 [calc])	14–17.9	3.4–5.7 (calc)
***Mesacanthion fricum* Inglis, 1966**	1650	42	13	96/51	3.75	40 (1.1 [calc])	symmetrical/unipartite	"uncertain"	present (78)	9.07 (calc)	5.05
***Mesacanthion heterospiculum* Sergeeva, 1974**	2394–2398	23	6.2	not measured	4.4–4.6	109/54 (2/1)	asymmetrical/striated	present (19)	present (35)	13.6–14.2	not measured
***Mesacanthion hirsutum* Gerlach, 1953**	1155–1982	40–49	8–14	22–24/14	3.4–3.9	21–33 (1.3)	symmetrical/unipartite	absent	present (45–100)	8.7–12	4.52–6.7
***Mesacanthion infantile* (Ditlevsen, 1930) De Coninck & Schuurmans Stekhoven, 1933**	4210–7200	17–20	10–15	36–54 (calp)/~20–35	4.5–5.14	112 (calp)	symmetrical/bipartite	present (not measured)	absent	14.1–20.2	2.63 (calp)–3.25
***Mesacanthion karense* (Filipjev, 1927) Gerlach & Riemann, 1974**	1750–2050	35–39	10	33–36/24–26	4.5–4.9	24 (1)	symmetrical/unipartite	present (14)	not described, not depicted	12–16	4.1–6
***Mesacanthion kerguelense* Mawson, 1958**	3500–9000	20–31	8	40–50/25-30	3.5–5.7	150–200	symmetrical/unipartite (with tapering point)	present (not measured)	present (proximal end of spicule)	25–35.5	1.3–2.1

***Mesacanthion longispiculum* Gerlach, 1954**	2228–2647	47–55	11–17	33–38/13–16	3–3.3	75–143	symmetrical/unipartite	not described, not depicted	present (87–90)	18–25.8	3.8 (calc)
***Mesacanthion longissimesetosum* Wieser, 1953**	3260–4830	26–32	12	54-70/36-40	4.7–5.4	83 (1.1)	symmetrical/unipartite	present (39)	present (166)	11.1–13.7	4.2–4.5
***Mesacanthion lucifer* (Filipjev, 1927) Gerlach & Riemann, 1974**	4390–5590	26–30	10	22–23	4.3–4.6	155 (1.5)	symmetrical/unipartite	present (55)	present (~300)	10.7–18	4.1–5.3 (calc)
***Mesacanthion majus* (Filipjev, 1927) Gerlach & Riemann, 1974**	2840–5300	24–36	11.5–12	38–40/18–26	4.2–5.3	80 (1.35)	symmetrical/unipartite	present (27)	present (134)	11.7–18	3.8–4.0
***Mesacanthion marisalbi* Platonova, 1976**	2992–4037	45–52	6–8	61.2–64.0/not measured	4.3–5.5	56.7 (1.4 [calc])	symmetrical/unipartite	present (21.6)	present (126.9)	16–20.1	4.4–4.6
***Mesacanthion monhystera* Gerlach, 1967**	1833–2171	48–49	12–13	23–25/9–10	3–3.3	25 (0.8 [calc])	symmetrical/unipartite	absent	present (85)	9.6–11	5.4–6.3 (calc)
***Mesacanthion obscurum* Gagarin & Klerman, 2006**	2163–3791	19–32	7–10	37–44/22–27	3.5–5.4	269–310/70–81	asymmetrical/bipartite/striated	present (28–35)	present (36–59)	12.4–18.1	3.0–4.4
***Mesacanthion pali* Wieser, 1959**	2160	54	24	84/8	3.3	62	symmetrical/unipartite	present (26)	present (78)	15.4	2.8
***Mesacanthion pannosum* Wieser, 1959**	4100–4220	32–41	11–12	24–25/22	6.0–6.3	135	symmetrical/unipartite	present (66)	present (180)	13.7–15	3–4
***Mesacanthion propinquum* Gagarin & Klerman, 2006**	2076–3759	19–30	4.0–5.0	10–15	4.0–5.7	70–77/239–308	asymmetrical/bipartite	present (26–30)	present (28–31)	10.8–19.1	2.6–4.5
***Mesacanthion proximum* Gerlach, 1957**	1340–1417	51–54	11	18–20/6–10	3.1	20 (1.1)	symmetrical/unipartite	absent	present (46)	9.6–10.3	7–8
***Mesacanthion rigens* Gerlach, 1957**	1510–1565	42–52	8	20–25/8	3.2–3.3	25 (0.9)	symmetrical/unipartite	absent	present (70)	13.1–14.6	4
***Mesacanthion southerni* Warwick, 1973**	3280–5070	26–34	12–13	48–57/38–48	5.4–5.8	67–80/290–320	asymmetrical/bipartite/striated	present (40–51)	present (82–100)	12.6–14.9	4.2–5.6

***Mesacanthion studiosum* Inglis, 1964**	5500–6800	48–54	19–22	43–50/18–20	4.1–4.7	68–81	symmetrical/unipartite	absent	present (129–159)	16.0–20.6	3.7–4.8
***Mesacanthion tenuicaudatum* (Ssaweljev, 1912) De Coninck & Schuurmans Stekhoven, 1933**	6000–7500	45–50	not measured	not measured	5	45	no depiction ("chitinized")	"unclear"	present (~22.5)	22–26	not measured
***Mesacanthion virile* (Ditlevsen, 1930) De Coninck & Schuurmans Stekhoven, 1933**	4400	25	16 (calp)	50–61 (calp)	5	163 (calp)	symmetrical/unipartite	present (not measured)	present (232 calp)	17	not measured
***Mesacanthion jejuensis* sp. nov.**	2703–4627	33–47	8–15	36–59/18–34	4.5–5	72–85	symmetrical/bipartite	present (39–50)	present (136–171)	11.7–13.5	4.0–5.7

Table 2. Comparison of major morphological characters of all *Mesacanthion* species. Males and females joined, morphometric values rounded.