

Two New Records of Scolecid Polychaetes (Annelida: Polychaeta: Scolecida) in Korean Fauna

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ABSTRACT

Two new records of scolecid polychaetes, *Praxillella pacifica* Berkeley, 1929 and *Naineris dendritica* (Kinberg, 1867), collected from Korean waters are reported here with descriptions and illustrations. *Praxillella pacifica* can be distinguished from its congeners by the number of asetigerous segments on the posterior region of the body and features of the anal cone and neuropodial spines on setigers 2 and 3. *Naineris dendritica* is distinguishable from its relatives by the morphology of thoracic neuropodial lobes and the thoracic uncini at the inferior position. In the present paper, keys to *Praxillella* and *Naineris* species from Korean waters were also provided.

Keywords: Orbiniidae, *Naineris*, Maldanidae, *Praxillella*, taxonomy

INTRODUCTION

The scolecid polychaetes are widely distributed from intertidal zone to deep sea. They are generally regarded as non-selective or selective deposit feeders (Fauchald and Jumars, 1979; Rouse and Pleijel, 2001). They have two apomorphies, the presence of parapodia with similar rami and the possession of two or more pairs of pygidial cirri (Rouse and Fauchald, 1997; Rouse and Pleijel, 2001). They are usually considered to be a polyphyletic assemblage, including families such as Arenicolidae Johnston, 1835, Capitellidae Grube, 1862, Cossuridae Day, 1963, Maldanidae Malmgren, 1867, Opheliidae Malmgren, 1867, Orbiniidae Hartman, 1942, and Paraonidae Cerruti, 1909 (Rouse and Fauchald, 1997; Rouse and Pleijel, 2001, 2007).

Among scolecid polychaetes, genus *Praxillella* Verrill, 1881, a member of the family Maldanidae including about 208 species of 30 genera, is characterized by the presence of distinct cephalic plates, the acicular spines on the first 3 or 4 setigers, and the pygidium encircled by anal cirri (Fauchald, 1977; Imajima and Shiraki, 1982). Sixteen valid *Praxillella* species are currently known worldwide (Fauchald, 1977; WoRMS, 2016). Four species, *P. affinis* (Sars, 1872), *P. gracilis* (Sars, 1861), *P. pacifica* Berkeley, 1929, and *P. praetermissa*

(Malmgren, 1865), have been taxonomically recorded in East Asia (Imajima and Hartman, 1964; Imajima and Shiraki, 1982; Liu, 2008). In Korean waters, this genus is only represented by *P. affinis* (Paik, 1982, 1989; Lee and Paik, 1986).

Meanwhile, genus *Naineris* Blainville, 1828 belongs to family Orbiniidae, which consists of about 150 species within 18 genera. It is easily distinguished from other orbiniid genera by a single asetigerous peristomial ring and the rounded or truncate prostomium (Fauchald, 1977; Blake, 1996; Bleidorn, 2005). This genus currently comprises 18 valid species described worldwide (Fauchald, 1977; WoRMS, 2016), and four species are recorded in East Asia, *N. dendritica* (Kinberg, 1867), *N. hainanensis* Wu, 1984, *N. japonica* Imajima, 2009, and *N. laevigata* (Grube, 1855) (Imajima and Hartman, 1964; Wu, 1984; Liu, 2008; Imajima, 2009). Of them, only one species, *N. laevigata* is recorded from Korean waters (Paik, 1982, 1989).

During a survey for marine polychaetes from Korean waters, two scolecid polychaetes, *Naineris dendritica* (Kinberg, 1866) (Orbiniidae) and *Praxillella pacifica* (Maldanidae), were newly reported from tidal and subtidal habitats. In the present study, detailed descriptions and illustrations of the two species are provided, together with keys to *Praxillella* and *Naineris* species from Korean waters.

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MATERIALS AND METHODS

Samples were collected from sandy mud of subtidal zone and rocky bottoms of intertidal zone (Fig. 1). Specimens were sorted using sieves with pore size of 0.5 mm, initially fixed with 5% formaldehyde-seawater solution, and transferred to 85% ethyl alcohol. The characteristics of the whole body were observed. Appendages were dissected in a petri dish using dissection forceps or surgical knives and needles under a stereomicroscope (SMZ1500; Olympus, Tokyo, Japan). Dissected specimens were mounted onto temporary slides using glycerol or permanent slides using polyvinyl lactophenol solution. Drawings were made under the stereomicroscope and a light microscope (LABOPHOT-2; Nikon, Tokyo, Japan) with aids of drawing tubes. The examined materials were deposited at the National Institute of Biological Resources (NIBR) and Chosun University in Korea.

SYSTEMATIC ACCOUNTS

Family Maldanidae Malmgren, 1867
Genus *Praxillella* Verrill, 1881

¹**Praxillella pacifica* Berkeley, 1929 (Fig. 2)

Praxillella affinis var. *pacifica* Berkeley, 1929: 313; Berkeley and Berkeley, 1952: 49, figs. 97–100.

Praxillella pacifica: Imajima and Shiraki, 1982: 58, fig. 27.

Material examined. Korea: 5 specimens, Gyeongsangnam-do: Tongyeong-si, Sanyang-eup, Yeongun-ri, 34°47'33"N, 128°28'24"E, 28 Aug 2014; 6 specimens, Tongyeong-si, Hansan-myeon, Dueok-ri, 34°47'15"N, 128°29'39"E, 28 Aug 2014. All specimens collected from mud of subtidal zone using a grab sampler (about 10–15 m deep).

Description. Body slender, about 60.5–75.0 mm in length and about 1.0 mm in width, consist of 18 setigers, and with 4 asetigerous segments in posterior region. Anterior setigers relatively shorter than median and posterior setigers (Fig. 2A, B).

Cephalic plate oval shaped, surrounded by membraneous rim well developed; cephalic rim with mid-dorsal cleft in posterior rim and pair of deep incisions in lateral rim. Prostomium with rounded protrusion on frontal margin of cephalic plate. Nuchal organs usually indistinct (Fig. 2A, C).

Neuropodial spines thick and bent almost at right angle, present on first 3 setigers, and 1 or 2 per setiger in number; spines on setiger 1 more slender than those on setigers 2 and 3, with 2 or 3 small teeth between bent neck to shaft;

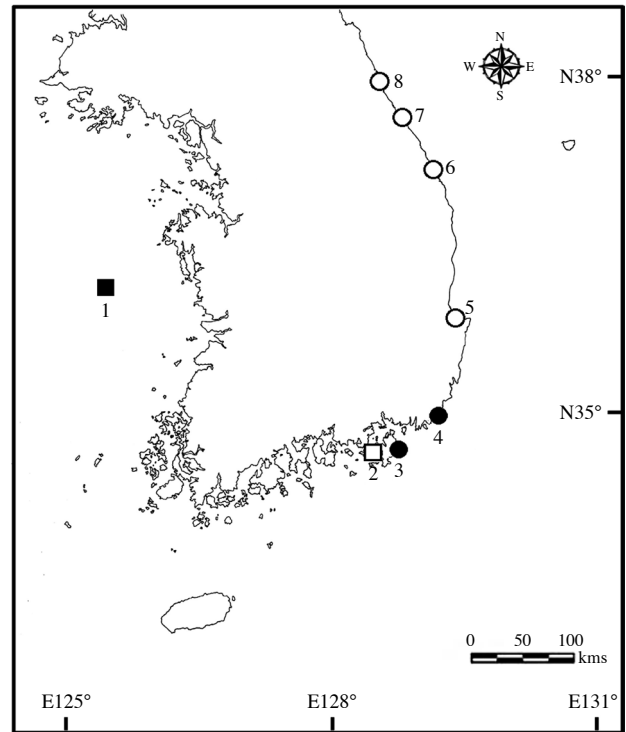


Fig. 1. A map showing the distributions for the species of the present study and closely related species previously reported in Korean waters: *Praxillella affinis* (■) (Lee and Paik, 1986), *P. pacifica* (□), *Naineris laevigata* (●) (Paik, 1989), and *N. dendritica* (○). 1, Yellow Sea, widely distributed in subtidal zone; 2, Tongyeong-si, Yeongun-ri and Dueok-ri; 3, Goeje-si, Jangseungpo; 4, Busan-si, Suyeong Bay; 5, Pohang-si, Ibam-ri; 6, Samcheok-si, Gungchon-ri; 7, Gangneung-si, Hyangho-ri; 8, Sokcho-si, Daepo-dong.

spines on setigers 2 and 3 thick, with 1 or 2 large teeth above main fang, without small teeth between bent neck to shaft. Neuropodial uncini rostrate, present on remaining setigers except first 3 setigers, and composed of 10–26 per torus in number; each uncinus with 5–6 teeth in row, several small accessory teeth on main fang, and long gular bristles. Notopodial setae consisted of slender and limbate capillary and laterally hirsute setae additionally (Fig. 2D–I).

Pygidial funnel with fringed margin bearing 23–24 marginal cirri and long cirrus on mid-dorsal side; anal cone strongly constricted immediately in front of funnel (Fig. 2B).

Remarks. The present species, *Praxillella pacifica* Berkeley, 1929, was originally described from Nanaimo in Canada as a subspecies of *P. affinis* (Sars, 1872) (Berkeley, 1929; Berkeley and Berkeley, 1952). However, Imajima and Shiraki (1982) have transferred this subspecies to specific rank because it is distinguishable from *P. affinis* by the following

Korean name: ¹*민꼬리대나무갯지렁이(신칭)

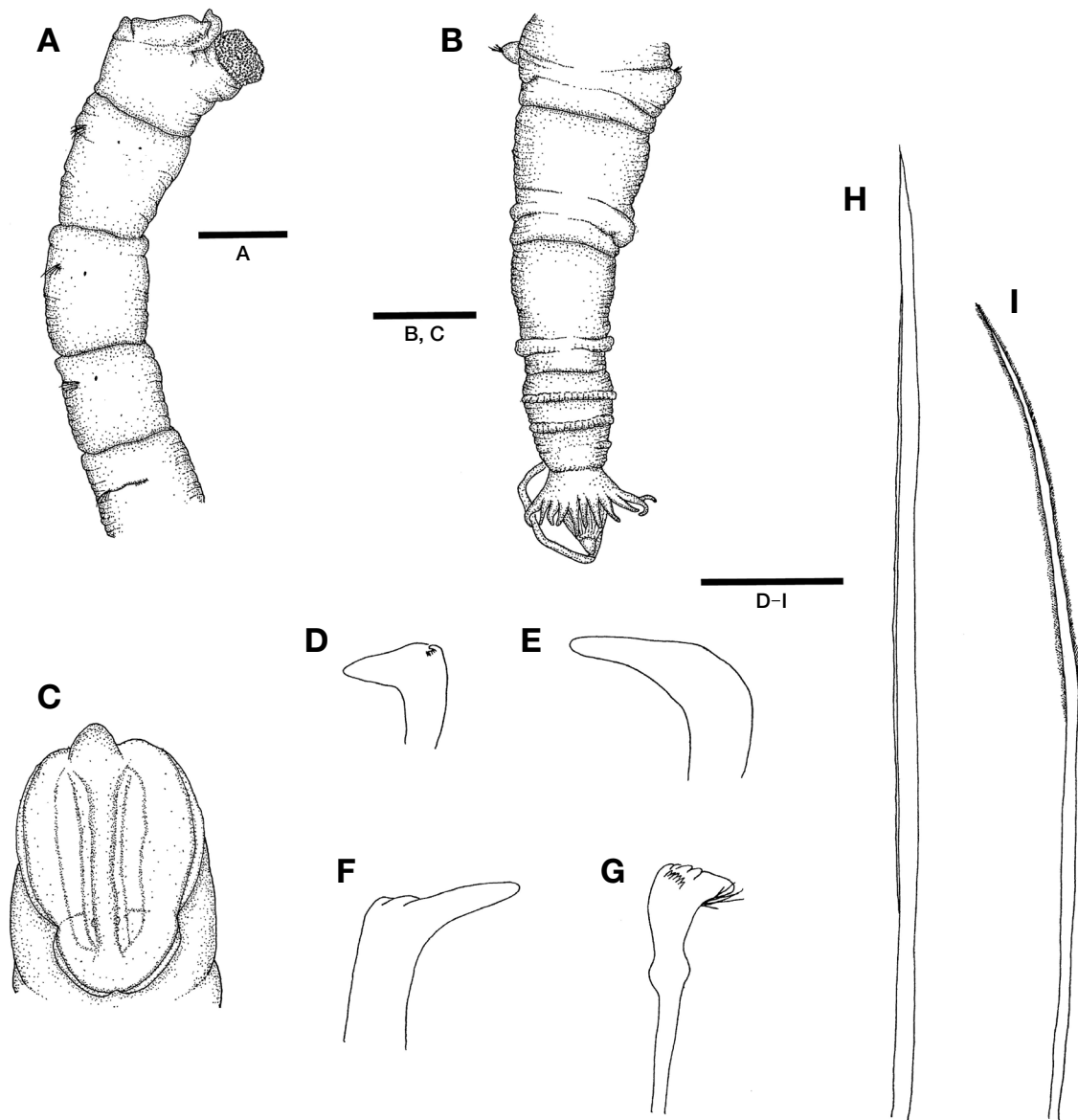


Fig. 2. *Praxillella pacifica* Berkeley, 1929. A, Lateral view of anterior end; B, Lateral view of posterior end; C, Cephalic plate; D, Spine on first setiger; E, Spine without large tooth on setiger 2; F, Spine with 2 large teeth on setiger 3; G, Rostrate uncini; H, Noto-podial capillary seta; I, Hirsute seta. Scale bars: A=1.0 mm, B, C=0.5 mm, D-I=0.05 mm.

characteristics: *P. pacifica* has four asetigerous segments in the posterior region, while *P. affinis* has three ones; the pygidium of *P. pacifica* has a constricted anal cone in front of the funnel, but that of *P. affinis* has a smooth one; the neuropodial spines of setigers 2 and 3 in *P. pacifica* are thick with distinct fangs almost bent at right angle without small teeth, but those in *P. affinis* are slightly reduced, rostrate form in comparison to those of *P. pacifica* with 2–5 small teeth above the main fang (Berkeley, 1929; Imajima and Shiraki, 1982). In this respect, the Korean materials of the

present study generally agrees well with the Japanese materials of Imajima and Shiraki (1982) identified as *P. pacifica*. However, the Korean materials of *P. pacifica* have a minor difference from the Japanese materials in the morphology of the spines on setigers 2 and 3 as follows: the spines on setigers 2 and 3 have 0–2 large teeth above the main fang in the Korean materials, while those in the Japanese materials do not have large tooth (Imajima and Shiraki, 1982).

Praxillella pacifica also resembles *P. gracilis* from East Asia in having four asetigerous segments in the posterior

region and neuropodial spines, which are thick and bent at right angle on setigers 2 and 3 (Imajima and Shiraki, 1982). However, they are easily distinguished from each other because the prostomium is bluntly rounded in *P. pacifica*, while that of *P. gracilis* is prolonged forward as a finger-like projection (Imajima and Shiraki, 1982).

Habitat. According to Imajima and Shiraki (1982), this species was usually found from the depth of more than 10 m in Japanese waters. The Korean materials of *P. pacifica* were also collected from the mud of subtidal zone in the depth of 10–15 m using grab sampler.

Distribution. Korea, Japan, Pacific Ocean (from Southern California north to western Canada).

Key to the species of the genus *Praxillella* from Korea

1. Posterior region with 4 asetigerous segments
..... *P. pacifica* Berkeley, 1929
- Posterior region with 3 asetigerous segments
..... *P. affinis* (Sars, 1872)

Family Orbiniidae Hartman, 1942

Genus *Naineris* Blainville, 1828

^{2*}*Naineris dendritica* (Kinberg, 1867) (Fig. 3)

Naineris nannobranhia Chamberlin, 1919: 260, Pl. 2, fig. 10, Pl. 3, fig. 1.

Naineris laevigata: Berkeley and Berkeley, 1941: 41.

Naineris dendritica: Hartman, 1957: 299, Pl. 36, figs. 1–3, Pl. 37, figs. 1–7; Blake, 1996: 19, fig. 1.7.

Material examined. Korea: 14 specimens, Gyeongsangbuk-do: Pohang-si, Nam-gu, Donghae-myeon, Ibam-ri, 35°57'21" N, 129°35'23"E, 19 May 2015; 4 specimens, Gangwon-do: Samcheok-si, Geundeok-myeon, Gungchon-ri, 37°16'17"N, 129°26'28"E, 16 Sep 2014; 11 specimens, Gangneung-si, Jumunjin-eup, Hyangho-ri, 33°12'19"N, 126°21'58"E, 15 Sep 2014; 6 specimens, Sokcho-si, Daepo-dong, 38°10'27" N, 128°38'18"E, 15 Sep 2014. All specimens collected from seagrass beds of intertidal rocky bottoms.

Description. Body thick and robust, about 55.0–75.0 mm in length and about 5.0 mm in width, and consist of about 250–300 segments; thoracic region expanded and dorsoventrally flattened; abdominal region more slender and crowded than thoracic region; pygidium with about 2–4 lobes (Fig. 3A).

Prostomium broadly rounded anteriorly, without eyespots. Nuchal organs invisible. Proboscis everted, with numerous branches (Fig. 3A).

Peristomium narrow and unannulate, but biannulate ventrally in some small specimens (Fig. 3A).

Thorax with about 21–26 segments; transition between thorax and abdomen distinct (Fig. 3A).

Branchiae paired, beginning from setigers 8–12; initial branchiae reduced, sub-globular shaped; full sized branchiae narrowly long, pointed apically, and present from about setiger 25 (Fig. 3A–C).

Parapodia biramous, elevated, and forming distinct trough on mid-dorsal region; thoracic notopodia with long and subtriangular postsetal lobes; thoracic neuropodia simple ridges with slightly enlarged superior edge as small papilla; abdominal notopodia with more slender lobes than thoracic notopodia; abdominal neuropodia with subtriangular-shaped presetal lobes and more thicker and longer postsetal lobes than thoracic neuropodia (Fig. 3B, C).

Thoracic notosetae camerated capillaries. Abdominal notosetae slender capillaries and few furcate setae. Thoracic neurosetae consist of pointed setae, subuluncini, and uncini; pointed setae distally sharp, conspicuously denticulated along cutting edge, and arranged on anterior rows in fascicle; subuluncini occurred in uppermost part of fascicle, with prolonged and spinous distal end; uncini generally smooth, transversely ridged in inferior position, and located on posterior rows in fascicle. Abdominal neurosetae capillaries and few protruding acicular spines with smooth edge (Fig. 3D–J).

Remarks. The peristomium of *Naineris* species has been described as having a single ring (Day, 1967; Fauchald, 1977). However, Blake (1996) suggested that the small sized materials of *Naineris* species had two peristomial rings instead of one. Specimens with two peristomial rings were also observed from the part of Korean materials. Fauchald (1977) regarded the peristomium with two rings as one of the diagnostic feature of other taxa. However, Blake (1996) concluded that materials bearing two peristomial rings might actually be juveniles of the species belonging to *Naineris*. Considering the opinions above, the Korean materials with two peristomial rings might also be treated as juveniles of Korean species.

Naineris dendritica is closely related to *N. laevigata*, which is known as a cosmopolitan species. However, these two species differ from each other by the details of the thoracic neuropodia and setae as follows: the thoracic neuropodial lobes of *N. dendritica* possess superior edge which is slightly enlarged, resembling a small papilla, while those of *N. laevigata* have foliaceous and remarkably projected lobes; the thoracic uncini on the inferior position of *N. dendritica* have ridges, but those of *N. laevigata* are smooth (Hartman, 1957; Blake, 1996). In this respect, the Korean materials of the present study agree well with previous descriptions of *N.*

Korean name: ^{2*}둥근다리모자갯지렁이(신칭)

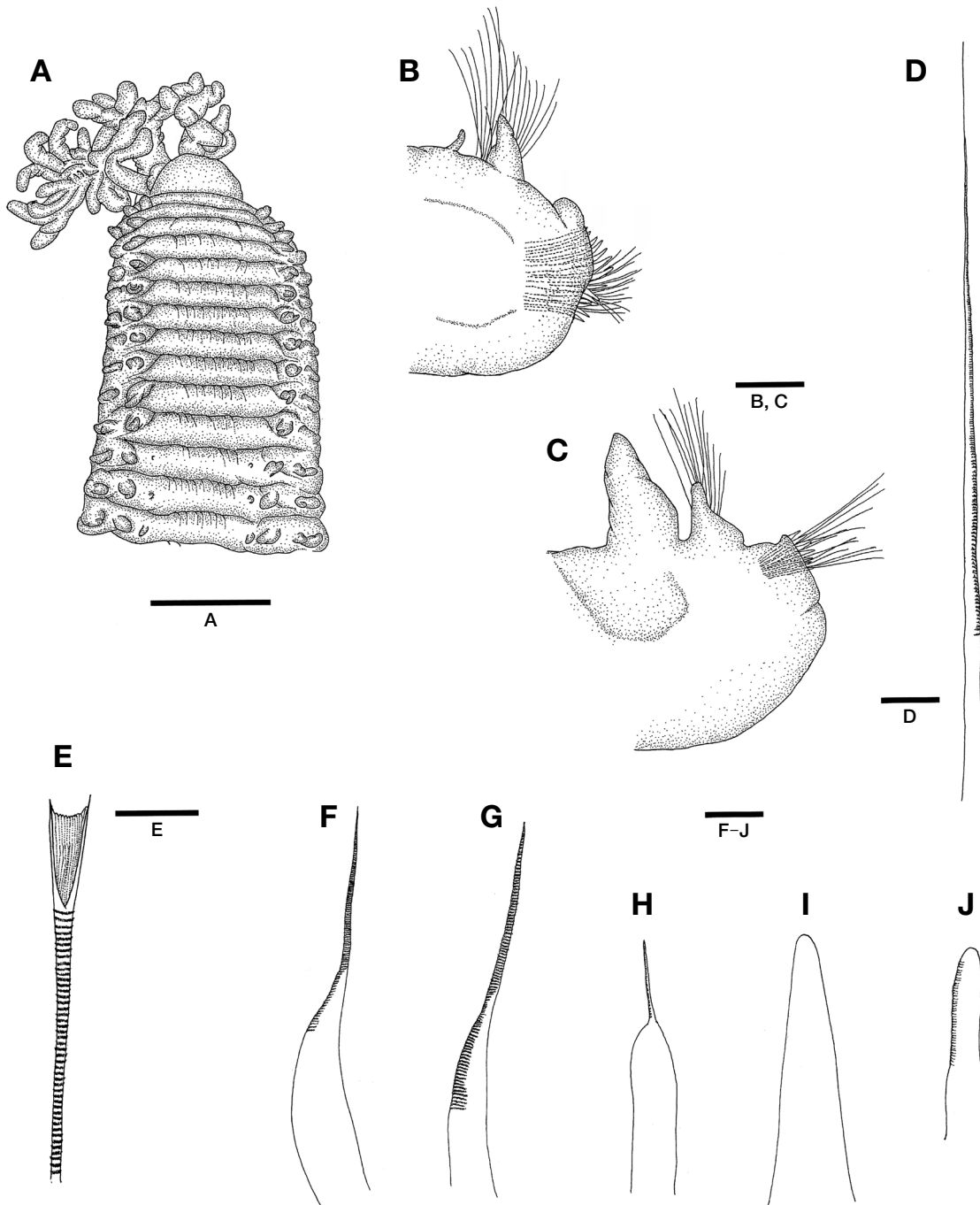


Fig. 3. *Naineris dendritica* (Kinberg, 1867). A, Anterior dorsal view (omitted setae); B, Anterior view of thoracic parapodium; C, Anterior view of abdominal parapodium; D, Camerated capillaries of thoracic notopodia; E, Furcate seta of abdominal notopodia; F, G, Pointed setae of thoracic neuropodia; H, Subbuluncini of thoracic neuropodia; I, Smooth uncini of thoracic neuropodia; J, Ridged uncini of thoracic neuropodia. Scale bars: A=1.0 mm, B, C=0.2 mm, D-J=0.02 mm.

dendritica (Hartman, 1957; Blake, 1996). However, the Korean materials have a minor difference as follows: the branchiae begin from about setiger 11-12 in the Korean materi-

als, while those of the previous descriptions of *N. dendritica* begin from setigers 8-12 or rarely from setiger 7 (Hartman, 1957; Blake, 1996).

Habitat. Blake (1996) mentioned that this species was commonly collected from seagrass beds in the intertidal rocky bottoms. In the present study, this species also was found in the similar habitat described by Blake (1996).

Distribution. Korea, Pacific Ocean (from Alaska to southern California), Gulf of Mexico.

Key to the species of the genus *Naineris* from Korea

1. Thoracic neuropodial lobes with slightly enlarged superior edge as small papilla *N. dendritica* (Kinberg, 1867)
- Thoracic neuropodial lobes with foliaceous and remarkably projected lobes *N. laevigata* (Grube, 1855)

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