



Exacanthomysis marsailiae and *Nipponomysis neolingvura*, two new species of mysid (crustacea: mysida: mysidae) from the east coast of Korea

Hyung Seop Kim¹, Soo-Gun Jo^{2,*}

¹ Department of Marine Biological Resource and Aquaculture, Kunsan National University, Gunsan 54150, Korea

² Jeonbuk Sea Grant Center, Gunsan 54150, Korea

Abstract

Exacanthomysis marsailiae and *Nipponomysis neolingvura* are described as new species based on specimens collected with a light trap off the East Sea coast of Korea. *E. marsailiae* is closely related to *Exacanthomysis alaskensis* (Banner, 1954) and *Exacanthomysis borealis* (Banner, 1954). However, *E. marsailiae* can be distinguished from these species by having slightly grouped spines on lateral margins near the telson apex, and the exopod of male's fourth pleopod more than twice as long as the endopod. *N. neolingvura* can be distinguished from its closest relative, *Nipponomysis lingvura* (Murano, 1977), in that the lateral sides of the telson are all armed with spines without any empty space, and that the second segment of the fourth male pleopod is longer than the third one. The report of *E. marsailiae* from the East Sea of Korea extends the distribution range of the genus *Exacanthomysis* from the high-latitude North Pacific southward to the mid-latitude waters of the western Pacific. The morphological characteristics of the two current new species are also compared with those of their congeners.

Keywords: Mysida, New species, *Exacanthomysis*, *Nipponomysis*, Range extension

Introduction

To date, 56 species of mysids have been reported from Korean waters (MOF & MABIK, 2018). Considering that Korea, as a peninsula, has three different marine environments with different characteristics, and that mysids live in diverse environments, it is judged that this does not sufficiently reflect the diversity of mysids that inhabit the coasts of Korea.

However, fortunately, Korea's Ministry of Oceans and

Fisheries (MOF) and the National Marine Biodiversity Institute (MABIK) have recently conducted the 'Survey on Marine Bio-Resources' project to investigate marine biodiversity since 2016. As part of the project, light traps have been used as a collection tool for mysids in Korean waters, and many species and populations have been collected.

This study was conducted to compile the 'National List of Marine Species', which is implemented to secure the diversity and integrated management of Korea's marine species men-

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*Corresponding author: Soo-Gun Jo

Jeonbuk Sea Grant Center, Gunsan 54150, Korea

Tel: +82-63-469-4591, E-mail: sgjo@kunsan.ac.kr

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tioned above. The mysids samples used in this study were obtained from mysids collected using light traps on the east coast from Goseong, Gangwon-do to Pohang, including Ulleungdo, Korea, from February to May 2022. The purpose of this paper is to report in detail the external morphological characteristics of two new species belonging to the genera *Exacanthomysis* and *Nipponomysis* collected during the project to discover and report new and unrecorded species of mysids in Korean waters.

Materials and Methods

The light trap used as a mysid collection tool was installed in the bottom of the sea during the day and recovered during the morning of the next day. The collected mysids were fixed in 90% ethyl alcohol in the field, transported to the laboratory, and stored. The total length of mysids was measured from the end of rostrum to the end of telson. Each individual was identified using a dissecting microscope (SMZ-U, Nikon, Tokyo, Japan) and a biological microscope (Optiphot-2, Nikon, Tokyo, Japan). Illustrations were made with the aid of a camera lucida under the microscope.

Results and Discussion

Systematic account

Order Mysida Boas, 1883

Family Mysidae Haworth, 1825

Subfamily Mysinae Haworth, 1825

Tribe Neomysini Wittmann, Ariani & Lagardère, 2014

Genus *Exacanthomysis* Holmquist, 1981

Exacanthomysis marsailiae sp. nov. (Figs. 1–4)

New Korean name: 진주곤쟁이

Acanthomysis sp. Ii, 1964: 511–513, fig. 132.

Type material

Holotype, adult male (14.0 mm in body length), MABIK CR00253006. Allotype, adult female (15.5 mm), MABIK CR00253007. Paratypes, 5 adult females (14.0–14.5 mm), 5 adult females (14.5–15.5 mm) MABIK CR00254248. Byeonggok-ri, Byeonggok-myeon, Yeongdeok-gun, Gyeongsangbuk-do (36°35'27.1"N, 129°27'29.6"E); all specimens collected by a light trap at 50 m depth, 12 April 2022.

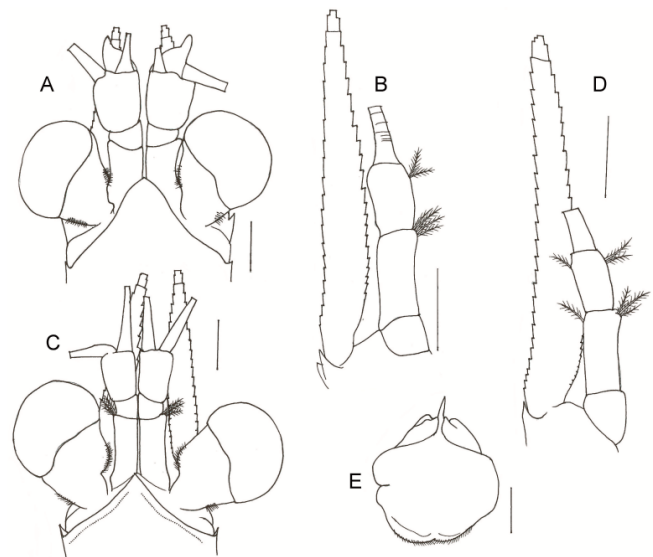


Fig. 1. *Exacanthomysis marsailiae* sp. nov. Holotype, male (BL 14.0 mm: A, B, E), allotype, female (BL 15.5 mm: C, D). A, C: anterior part of body; B, D: antenna; E: labrum, ventral. Scale bars: 0.5 mm for A–D; 0.25 mm for E.

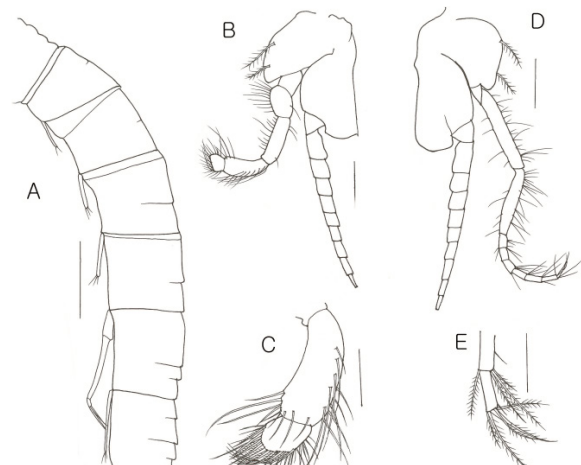


Fig. 2. *Exacanthomysis marsailiae* sp. nov. Holotype, male (BL 14.0 mm: A–E). A: lateral view of abdominal somites; B: second thoracopod; C: enlarged terminal part of second thoracopodal endopod; D: seventh thoracopod; E: enlarged terminal part of seventh thoracopodal endopod. Scale bars: 1.0 mm for A; 0.5 mm for B, D; 0.25 mm for C, E.

Description

Body robust (Figs. 1A, 1C, and 2A). Abdomen (Fig. 2A) 6-segmented with transverse dorsolateral folds: somites 1–3 usually with 1-fold, somite 4 with 1 or 2, somite 5 with 2 or 3, somite 6

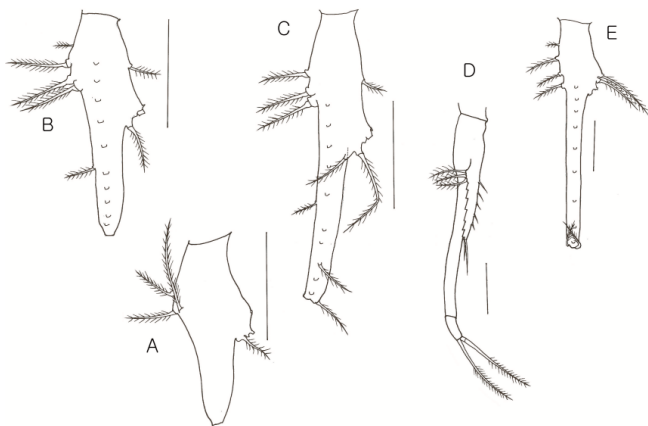


Fig. 3. *Exacanthomysis marsailiae* sp. nov. Holotype, male (BL 14.0 mm: A–E). A: first pleopod; B: second pleopod; C: third pleopod; D: fourth pleopod; E: fifth pleopod. Scale bars: 0.25 mm for A–E.

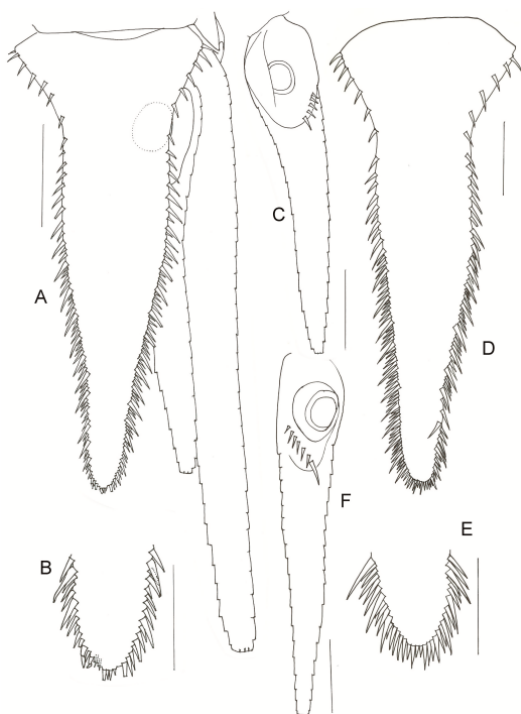


Fig. 4. *Exacanthomysis marsailiae* sp. nov. Holotype, male (BL 14.0 mm: A–C), allotype, female (BL 15.5 mm: D–F). A, D: dorsal view of telson and uropod; B, E: enlarged distal part of telson; C, F: uropod. Scale bars: 0.5 mm for A, C, D, F; 0.25 mm for B, E.

always with 3. Carapace (Fig. 1A and 1C) with anterior margin produced into wide triangular rostral plate with edges slightly raised upward, completely exposing eyestalk dorsally; anterolat-

eral corners of carapace acutely pointed; rostrum with pointed apex. Eyes (Fig. 1A and 1C) extending to middle of segment 3 of antennular peduncle; cornea much wider than eyestalk; eyestalk decreasing sharply in width from distally to proximally, with fine hairs on basal half. Antennular peduncle (Fig. 1A and 1C) slender, slenderer in females; segment 1 almost the same length as segment 3 in males, slightly shorter than segment 3 in females. Antennal peduncle (Fig. 1B and 1D) extending slightly beyond middle of antennal scale in males, slightly below middle of antennal scale in females; three-segmented, segment 2 the longest, 1.3 times segment 3. Antennal scale (Fig. 1B and 1D) slender and setose along entire margins, 7.5 times maximum width in females, 8.5 times in males; transverse suture distinct, extending slightly beyond appendix masculine. Labrum (Fig. 1E) armed with no spines on each side of anterior spinous process. Thoracopods all biramous; endopod and exopod slender and well developed; thoracopods 1 and 2 (Fig. 2B and 2C) similar in general form, with basal plate of exopod bearing denticle at outer distal corner; The remaining thoracopods similar in structure to each other as thoracopod 7 (Fig. 2D and 2E): thoracic endopods 3 to 8 with carpopropodus divided into five sub-segments armed with only setae; dactylus with long and slender claw. Thoracic exopods 3 to 8 with basal plate smooth without denticles at outer distal corner; its flagellum segmented into 10. All male pleopods (Fig. 3A–3E) unsegmented and reduced to uniramous except for pleopod 4; pleopod 5 more slender and longer than the other pleopods (pleopods 1 to 3), extending posteriorly by three-quarters of abdominal segment 6. Pleopod 4 biramous, extending posteriorly to middle of abdominal segment 6; endopod rudimentary and unsegmented, half length of proximal segment of exopod; exopod two-segmented, with proximal segment about 7 times longer than distal segment; distal segment having two long subequal terminal setae, which are more than 3 times longer than distal segment. Telson (Fig. 4A, 4B, 4D, and 4E) narrow and elongated in overall appearance, about 2.5 times longer than width at its base; telson width decreasing rapidly in the proximal quarter, becoming parallel in next quarter, gradually decreasing in distal half. Lateral margins armed with spines throughout, with proximal half being relatively sparsely armed with about 16 spines; distal half more densely armed with spines arranged in 11 to 13 groups with two to five smaller spines of increasing size between two larger ones, large spines becoming slightly smaller toward apex; apex narrow and round, armed with two pairs of spines, inner pair much smaller than outer one. Uropods (Fig. 4C and 4F) fringed with

plumose setae along margins; endopod slightly shorter than telson, armed with 5 to 7 spines near statocyst; spines increasing in size distally; exopod elongated, about 1.3 times longer than telson, about 1.4 times longer than endopod.

Etymology

The species name comes from the Gaelic equivalent of pearl and was named to celebrate the birth of Jo's granddaughter.

Remarks

Holmquist (1981) established the genus *Exacanthomysis* to accommodate *Acanthomysis davisii* Banner, 1954 and *Acanthomysis alaskensis* Banner, 1954, and at the same time included the new species *Exacanthomysis arctopacifica*. Afterwards, Petryashov (1992) organized *E. arctopacifica* Holmquist, 1981 as the junior synonym of *Acanthomysis stelleri* (Derzhavin, 1913), and Sedova et al. (2016) changed *Acanthomysis borealis* Banner, 1954 into species of the genus *Exacanthomysis*. According to Mees & Meland (2023), the number of species in the genus *Exacanthomysis* is currently known to be three, namely *Exacanthomysis davisii* (Banner, 1948), *Exacanthomysis alaskensis* (Banner, 1954) and *Exacanthomysis borealis* (Banner, 1954). With the report of this new species, the genus *Exacanthomysis* consists of a total of four species.

E. marsailiae sp. nov. was first reported as *Acanthomysis* sp. by Ii (1964) based only on female specimens collected near Ulsan on the east coast of Korea. He believed that this species was probably a new species, although it was similar to *E. alaskensis* (Banner, 1954), *E. borealis* (Banner, 1954), as well as *Paracanthomysis kurilensis* Ii, 1936. However, since his specimens at that time did not contain any specimens of males, which are more taxonomically important than females, the species was left unnamed as a new species.

The specimens in this study were collected from the coast approximately 100 km north of the specimen collection site of Ii (1964). The male specimen collected in this study is similar to *P. kurilensis* in the rostrum, telson spine arrangement, and folds on the abdominal somites, but can be easily distinguished by the male's fourth pleopod. That is, in *P. kurilensis*, the exopod of the fourth pleopod is unsegmented, whereas in this species, it is 2-segmented. As previously mentioned, *E. marsailiae* sp. nov. resembles the remaining species of the genus *Exacanthomysis* in some morphological characteristics, namely the rostrum, the fourth male pleopod, the form of the telson, the arrangement of the spines of the telson, the several-segmented carpopropodus of the endopod of the third to eighth thoracopods, etc. However,

they can be distinguished by a combination of characters such as antennae, exopods of the first and second thoracopods, and the fourth male pleopod. Table 1 provides a comparison of external morphological characteristics that can be helpful in distinguishing between species belonging to the genus *Exacanthomysis*.

Until now, all species of the genus *Exacanthomysis* have been reported only from the high-latitude northeast Pacific or northwest Pacific (Table 1). In this study, *E. marsailiae* was added as a new member of the genus *Exacanthomysis* from the East Sea of Korea, expanding the distribution range of this genus further south to the mid-latitude waters of the Pacific Ocean.

Genus *Nipponomysis* Takahashi & Murano, 1986

Nipponomysis neolingvura sp. nov. (Figs. 5 and 6)

New Korean name: 가시곤쟁이

Type material

Holotype, adult male (9.0 mm body length), MABIK CR00253008. Galnam Port, Galnam-ri, Wondeok-eup, Samcheok-si, Gangwon-do (37°16'52.04"N, 129°19'26.63"E); light trap, 18 May 2022.

Description

Abdominal segments smooth without grooves or folds; segment 6 longest, 1.4 times as long as segment 5. Carapace (Fig. 5A) with anterior margin produced into triangular rostral plate, dorsally leaving eyestalk exposed; rostrum with obtusely angled apex, reaching middle of segment 1 of antennular peduncle. Eyes (Fig. 5A) extending beyond segment 2 of antennular peduncle; eyestalk broader than length; cornea wider than eyestalk. Antennular peduncle (Fig. 5A) robust, three-segmented, segment 3 as long as basal and second segments combined, 2.6 times longer than segment 2 at inner margin; appendix masculine densely covered with long sensory hairs. Antennular peduncle (Fig. 5B) three-segmented, segment 2 longest, 1.3 times segment 3. Antennal scale (Fig. 5B) with distinct transverse suture, lanceolate, setose along entire margins, 3.5 times as long as broad, 1.2 times longer than antennal peduncle, not extending beyond distal margin of appendix masculine. Labrum (Fig. 5C) armed with no spines on each side of strong median frontal process. Thoracopods all biramous with well-developed endopod and exopod; thoracopods 3 to 8 similar to each other as thoracicopod 7 (Fig. 5D and 5E); edopods with carpopropodus divided into 3 subsegments armed with only setae, of which

Table 1. Comparison of characters and geographical distribution among species of the genus *Exacanthomysis*

Characteristic	<i>Exacanthomysis davisii</i> (Banner, 1948) ¹⁾	<i>Exacanthomysis alaskensis</i> (Banner, 1954) ²⁾	<i>Exacanthomysis borealis</i> (Banner, 1954) ³⁾	<i>Exacanthomysis marsailiae</i> sp. nov. ⁴⁾
Rostrum	Widely triangular	Narrowly triangular	Narrowly triangular	Widely triangular
Anterolateral corner of carapace	Rounded	Pointed	Pointed	Pointed
Distal segment of male antennal peduncle extends beyond half of antennal scale	Yes	No	No	Yes
Carpopropodus of 3rd to 8th thoracopodal endopods	4 or 5-segmented	6 to 8-segmented	5-segmented	5 or 6-segmented
Basal plate of 1st and 2nd thoracopodal exopods bears a denticle at outer corner	No	No	No	Yes
Relative length of proximal to distal segments of 4th male pleopodal exopod (ps/ds)	Less than 5 times (4.5)	More than 7 times (7.3)	Almost equal	More than 6 times (6.6)
Relative length of exopod to endopod of 4th male pleopod (ex/en) (setae not included)	Less than twice (1.7)	Less than twice (1.3)	Less than twice (1.5)	More than twice (2.3)
Two terminal setae of 4th male pleopodal exopod	Subequal	Subequal	Distinctly unequal	Subequal
Telson length to its basal width	2.5	3.1	3.5	2.5
Number of spines near statocyst of uropod	3–5	4 or 5	3–6	5–7
Lateral margins near apex	With uniform series of spines, lacking large spines	With distinctly grouped spines	With uniform series of spines, lacking large spines	With slightly grouped spines
Geographical distribution	Northeast Pacific (Alaska to California)	Northeast Pacific (Alaska to California)	North Pacific (Kamchatka Peninsula)	Northwest Pacific (East Sea, Korea)

¹⁻⁴⁾ All comparisons were based on figures or descriptions from previous literatures.

¹⁾ Banner (1948), Holmquist (1981), Kathman et al. (1986).

²⁾ Banner (1954), Holmquist (1981), Kathman et al. (1986).

³⁾ Banner (1954), Petryashov (1992), Sedova et al. (2016).

⁴⁾ Ji (1964), the present study.

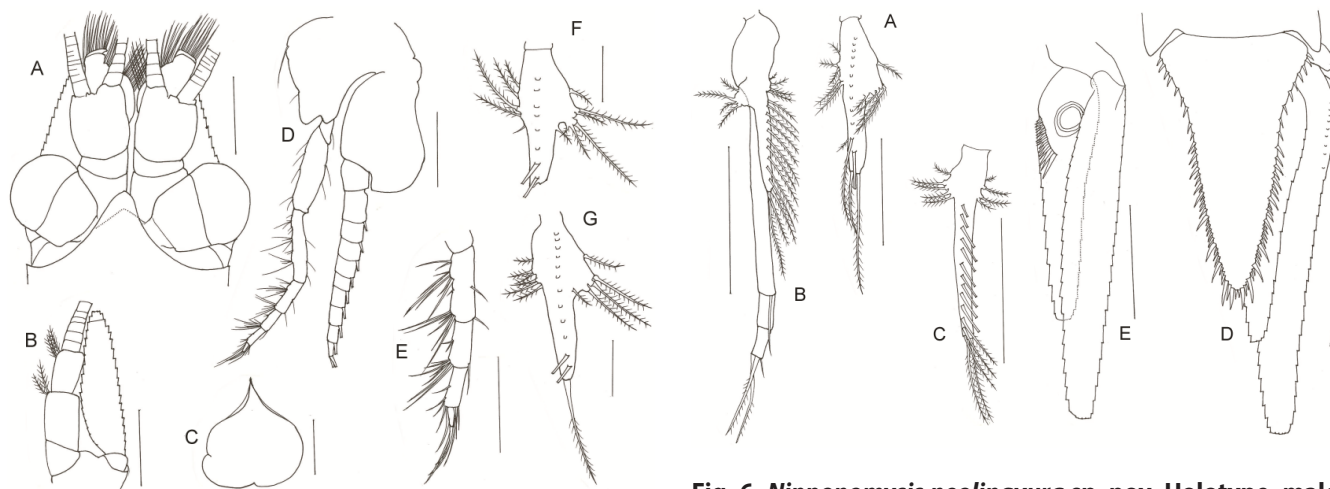


Fig. 5. *Nipponomysis neolingvura* sp. nov. Holotype, male (BL 9.0 mm: A–G). A: anterior part of body; B: antenna; C: labrum, ventral; D: seventh thoracopod; E: enlarged distal part of seventh thoracopodal endopod; F: first pleopod; G: second pleopod. Scale bars: 0.5 mm for A, B, D; 0.25 mm for C, E–G.

Fig. 6. *Nipponomysis neolingvura* sp. nov. Holotype, male (BL 9.0 mm: A–E). A: third pleopod; B: fourth pleopod; C: fifth pleopod; D: dorsal view of telson and uropod; E: uropod. Scale bars: 0.5 mm for B–E; 0.25 mm for A.

most proximal subsegment longest, second longer than third; exopods with basal plate smooth without denticle at outer distal margin, flagellum 10-segmented. Pleopods (Figs. 5F and 5G, 6A-6C) uniramous except for pleopod 4; pleopod 4 biramous, reaching middle of abdominal segment 6, not extending beyond end of pleopod 5, with exopod three-segmented; segment 1 of exopod armed with one long seta extending beyond segment 2, slightly less than twice as long as endopod, 3.6 times longer than remaining two segments combined; segment 2 slightly longer than segment 3, segment 3 terminating into two strong setae of slightly different lengths. Telson (Fig. 6D) tongue-shaped, 1.6 times as long as maximum width near base; lateral margin slightly concave in proximal half, armed with spines without any spineless parts; proximal one-third of lateral margin armed with spines of approximately equal size, distal two-thirds more densely armed with spines arranged in eight or nine groups with one to five small spines of different sizes between two

larger spines; larger spines near apex gradually increase in size; apex armed with two pairs of spines, with outer spines much larger than inner ones. Uropods (Fig. 6D and 6E) fringed with plumose setae along lateral margins; endopod armed with 17 graded spines on inner ventral margin near statocyst, extending beyond telson by about one-fifth of length of telson; exopod extending by about half length of telson.

Etymology

The species name comes from *Nipponomysis lingvura*, which has a remarkably similar external morphology.

Remarks

In this survey, female individuals of *N. neolingvura* sp. nov. was not collected, so only male characteristics are described. *N. neolingvura* is remarkably similar characteristics to *N. lingvura* (Murano, 1977) except for a few characters. However, the

Table 2. Comparison of geographical distribution and characters distinguishing *Nipponomysis neolingvura* sp. nov. and similar species of the genus *Nipponomysis*

Characteristic	<i>Nipponomysis fusca</i> (Ii, 1936) ¹⁾	<i>Nipponomysis sandoi</i> (Ii, 1964) ²⁾	<i>Nipponomysis lingvura</i> (Murano, 1977) ³⁾	<i>Nipponomysis calcarata</i> (Takahashi & Murano, 1986) ⁴⁾	<i>Nipponomysis neolingvura</i> sp. nov. ⁵⁾
Rostral plate	Sharply pointed	Widely triangular	Widely triangular	Widely triangular	Widely triangular
4th male pleopod: relative length of 2nd and 3rd segments	Equal	2nd slightly longer than 3rd	Equal	2nd slightly shorter than 3rd	2nd slightly longer than 3rd
4th male pleopod: ratio of 1st segment of exopod to endopod	1.7 : 1	3.2 : 1	1.5 : 1	2.7 : 1	1.9 : 1
Seta at distal end of 1st segment of 4th male pleopodal exopod	Extends beyond distal end of 2nd segment	Very short, not reaching distal end of 2nd segment	Very short, not reaching distal end of 2nd segment	Very short, not reaching distal end of 2nd segment	Extends beyond distal end of 2nd segment
Spines arrangement of telson	With spines along all lateral margins; large spines near apex suddenly increase in size	With spines along all lateral margins; large spines near apex suddenly increase in size	No spines near middle of lateral margins; large spines near apex gradually increase in size	With spines along all lateral margins; large spines near apex suddenly increase in size	With spines along all lateral margins; large spines near apex gradually increase in size
Number of spines near statocyst of uropod	8 or 9	9	16–22	7–9	17
Telson length to its basal width (spines not included)	1.6 : 1	1.6 : 1	1.8 : 1	1.6 : 1	1.6 : 1
Geographical distribution	Japan, Korea	Japan	Japan	Japan	Korea

¹⁻⁵⁾ All comparisons were based on figures or descriptions from previous literatures.

¹⁾ Ii (1936, 1964), Takahashi & Murano (1986).

²⁾ Takahashi & Murano (1986).

³⁾ Murano (1977).

⁴⁾ Takahashi & Murano (1986).

⁵⁾ the present study.

present species is justified as a new species on the basis that the telson is armed with spines on all margins, that the rostral apex of carapace extends slightly beyond the distal half of the antennular peduncle, and that the fourth male pleopod has a single elongated seta, which extends beyond the second segment, at the end of the first segment of the exopod.

On the other hand, in *N. lingvura*, there is about 1/6 of the spineless part on both sides of the telson, which is an important characteristic that distinguishes this species from other species in the genus *Nipponomysis*. In addition, the rostral apex of carapace in *N. lingvura* reaches near the distal end of the first segment of antennular peduncle and the fourth male pleopod has two short setae, which do not extend beyond the second segment, at the end of the first segment of the exopod.

N. neolingvura sp. nov. also resembles *Nipponomysis calcarata* Takahashi and Murano, 1986, *Nipponomysis fusca* (Ii, 1936), and *Nipponomysis sandoi* (Ii, 1964), but can be distinguished by combinations such as the rostral plate, the fourth male pleopod, the arrangement of spines on the telson, and the number of spines near the statocyst of the endopod of uropod. A detailed comparison between these species is shown in Table 2.

Competing interests

No potential conflict of interest relevant to this article was reported.

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Availability of data and materials

Upon reasonable request, the datasets of this study can be available from the corresponding author.

Ethics approval and consent to participate

This study conformed to the guidance of animal ethical treatment for the care and use of experimental animals.

ORCID

Hyung Seop Kim <https://orcid.org/0000-0002-1365-587X>

Soo-Gun Jo <https://orcid.org/0000-0001-7397-842X>

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