Redescription of a rare mysid *Nipponomysis surugensis* (Murano, 1977) (Crustacea, Mysida, Mysidae) based on specimens from the Seto Inland Sea, Japan

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**Abstract:** *Nipponomysis surugensis* (Murano, 1977) (Crustacea, Mysida, Mysidae) was first recorded on the basis of specimens collected from Suruga Bay, central Japan. No further collections have been made to date since the original record. Specimens recently found in the Seto Inland Sea, western Japan, were referred to *N. surugensis*. Our study revealed that *N. surugensis* is very remarkable among the members of *Nipponomysis* Takahashi & Murano, 1986 by having four-segmented carpo-propodi on the third to eighth thoracopodal endopods, as opposed to three segments in the remaining species. This rare species is redescribed based on newly-obtained specimens. An updated key to the species of *Nipponomysis* is provided.

**Key words:** Crustacea, Japan, Mysida, *Nipponomysis surugensis*, Seto Inland Sea

**Introduction**

The Asian shallow water mysid *Nipponomysis surugensis* (Murano, 1977) (Crustacea, Mysida, Mysidae) was first recorded as a species under the genus *Proneomysis* Tattersall, 1933 on the basis of four specimens collected from Suruga Bay, central Japan. Takahashi & Murano (1986), who subsequently made a world review of *Proneomysis*, found that species of the genus distributed in Asian waters could be distinguished in several morphological characteristics from the eastern Pacific species, and they established a new genus *Nipponomysis* Takahashi & Murano, 1986 for the Asian members.

*Nipponomysis surugensis* is regarded as a well-defined taxon among the species of the genus by having a combination of characteristic features, that is, the fourth pleopodal exopod of males has the second segment longer than the third and a moderately long linguiform telson with larger lateral setae that become longer distally. Specimens of this species, however, have not subsequently been reported since the original record, and some morphological details, such as those in the thoracopods, have not yet been sufficiently documented.

During a recent survey in the Seto Inland Sea, western Japan, several specimens of *Nipponomysis* were obtained from a benthopelagic collection. A taxonomic analysis revealed that they were as assignable to *N. surugensis* and also led us to recognize that *N. surugensis* is unique among the members of this genus with respect to the number of the carpo-propod segments on the thoracopodal endopods.

We redescribe this rare mysid herein based on the specimens from western Japan. A revised key to the currently-recognized 19 species of *Nipponomysis* is also provided by the addition of information gathered since Fukuoka (1997).

**Materials and Methods**

Benthopelagic animals were collected using a sledge net (mouth area, 1450×326 mm; mesh aperture, 0.33 mm)
during an on-board survey of the T.R.V. Toyoshio Maru, Hiroshima University. The sledge net was towed for five minutes at every station at a ship speed of 2 kt. All samples were fixed with 80–99% ethanol immediately after sampling. Selected animal groups, including mysids, were sorted from the samples and preserved in ethanol of a similar concentration until further examination. *Nipponomysis surugensis* was found from a single haul made at a southern locality in the Harima-nada offing in the eastern Seto Inland Sea, western Japan.

Watling’s (1989) setal/spine system was adopted in this paper. Body size (TL in mm) was measured from the anterior end of the rostrum to the posterior end of the telson, excluding terminal setae. The specimens reported in this paper were deposited in the National Museum of Nature and Science at Tsukuba, Japan (NSMT).

**Taxonomy**

Order Mysida Boas, 1883  
Family Mysidae Haworth, 1825  
Subfamily Mysinae Haworth, 1825  
Genus *Nipponomysis* Takahashi & Murano, 1986  
*Nipponomysis surugensis* (Murano, 1977)  
(Figs 1–4)

**Synonym**

Proneomysis surugensis Murano, 1977: 236, fig. 8.  
*Nipponomysis surugensis*: Takahashi & Murano, 1986: 136.

**Material examined**

NSMT-Cr 22999: 8 males (TL 6.5–8.0 mm), 7 females (TL 4.6–7.5 mm), 2 ovig. females (TL 7.5, 7.5 mm), 2 juvs (TL 3.6, 4.1 mm), at a station (34°17.92′N, 139°29.45′E) in the Harima-nada offing eastern Seto Inland Sea, Japan, depth 33 m, sledge, 4 October 2008, coll. S. Ohtsuka & R. Mantiri.

**Description**

**Male**

Body (Fig. 1a) slightly depressed dorsoventrally, moderate in size for genus.

Carapace (Fig. 1a, b) produced into subtriangular rostrum, falling slightly short of or barely reaching base of antennular peduncle; lateral edges of rostrum slightly bending dorsally, thus median surface weakly grooved; anterovelar part rounded; cervical sulcus well marked dorsally and laterally at about anterior 1/4; posterior dorsal margin excavate, exposing last 2 or 3 thoracic somites in dorsal aspect.

Abdomen (Fig. 1a) slightly depressed dorsoventrally, dorsal surface smooth, without distinct folds or grooves; first 5 abdominal somites subequal in length, sixth somite 1.2–1.3 times as long as preceding somite.

Eye (Fig. 1a, b) somewhat depressed dorsoventrally, cornea well developed, wider than stalk.

Antennule (Fig. 1d) with first segment 1.3–1.4 times as long as broad, distolateral corner slightly protruded, bearing several setae; second segment shortest, slightly more than half as long as broad; third segment rather massive, slightly shorter than combined length of first and second segments, well-developed male lobe bearing long hair-like setae along margins.

Antenna (Fig. 1f) with scale lanceolate, approximately 4 times as long as wide, setose all around margins; apex rounded, extending beyond antennal peduncle by about 1/5 length, falling just short of anterior end of male lobe; distal suture marked, demarcating short distal lobe; distal lobe as long as width across proximal part; sympod with sharp and moderately long anterolateral process; peduncle falling short of anterior end of scale, first segment shortest, as long as broad, second segment slightly longer than third.

Labrum (Fig. 1g) almost symmetrical, with sharp anteromedial process.

Mandibular palp (Fig. 2a) without lamellar plate on mesial margin of second segment. Maxillule and maxilla (Fig. 2b, c) as illustrated and typical for genus. Endopods of first and second thoracopods (Fig. 2d, e) without characteristic setules on flagellar part.

Third to eighth thoracic limbs (Figs 2f, 3a, b) similar in basic structure and size, although eighth one slightly shorter than remaining ones; endopods with merus subequal or slightly shorter than carpo-propodus, latter composed of 4 segments; exopod with basal plate bearing 2 or 3 denticles on distolateral corner and 9- or 10-segmented flagelliform part.

Penis (Fig. 3c) slightly curved anteriorly, outer side gently rounded but inner side almost flat, with obtusely protruding lobe on posterdistal part, armed with several setae along posterior margin and a few setae on anterodistal part.

Pleopod endopods on first, second, third, and fifth abdominal somites (Fig. 3d–f, h) unsegmented, rod-shaped, increasing in length posteriorly; fifth one elongated, reaching posterior 1/5 of sixth somite, with long seta distally. Fourth pleopod (Fig. 3g) biramous; exopod long, reaching posterior 1/4 of sixth somite, 3-segmented, second segment distinctly longer than third, with 1 short distolateral and 1 long distomesial seta, third segment with pair of long terminal setae of subequal length, slightly more than 1.5 times as long as distal 2 segments combined, and 1 moderately long, 2 short, and 1 tiny seta distally; endopod extending well beyond midlength of first segment of exopod.

Telson (Fig. 4a) linguiform, slightly grooved along median line, 1.2–1.3 times as long as sixth abdominal somite, 1.7–1.8 times as long as proximal width, abruptly narrowing near proximal part and then gradually decreasing its width distally; distal margin obtusely rounded or somewhat truncate, with long outer and short inner pairs of setae; lateral margin with 20–26 spine-like setae of varying length along entire margin, larger setal series showing
Redescription of *Nipponomysis surugensis*

Fig. 1. *Nipponomysis surugensis* from the Seto Inland Sea, male (TL 8.0 mm) (a, b, d, f, g) and female (TL 7.5 mm) (c, e): a, entire body, lateral view; b, carapace and cephalic appendages, male, dorsal view; c, same, female; d, right male antennule, dorsal view; e, left female antennule, dorsal view; f, right antenna, dorsal view; g, labrum, ventral view.
Fig. 2. *Nipponomysis surugensis* from the Seto Inland Sea, male (TL 8.0 mm): a, right mandible, ventral view; b, right maxillule, ventral view; c, right maxilla, ventral view; d, right first thoracopodal endopod, anterior view; e, right second thoracopod, anterior view; f, left third thoracopod, posterior view.
Redescription of *Nipponomysis surugensis*

Fig. 3. *Nipponomysis surugensis* from the Seto Inland Sea, male (TL 8.0 mm): a, left fifth thoracopod, anterior view; b, right eighth thoracopodal endopod, anterior view; c, left penis, outer view; d–h, first to fifth pleopods.
tendency to increase in length distally, subterminal stout setae arising at distal 1/9–1/8, extending as far as distal end of inner pairs of terminal setae, 4–6 much shorter setae situated distally to large outer terminal setae.

Uropod (Fig. 4b) with exopod extending beyond telson (excluding terminal telson setae) and about 1.2 times longer than endopod, latter bearing 9 or 10 spine-like setae on ventral surface in statocyst region, gradually increasing its length distally, and several short slender setae located sparsely along outer margin.

Female

Sexual dimorphism as common for genus.

Antennule (Fig. 1e) slenderer than that of male; first segment about 1.7 times as long as broad, with weakly protruded distolateral corner bearing a few setae, second segment as long as broad, third segment slightly shorter than combined length of first and second segments when measured along lateral margin.

Pleopods (Fig. 4c–e) all unsegmented, rod-shaped, increasing in length posteriorly.

**Colour**

Melanophores on posteromedian part of abdominal sternites and ventral surface of antennal peduncle, and also narrow vertical band along posterior end of sixth abdominal somite, as well as small spots on basal parts of thoracopods and proximal median part of telson in specimens preserved at least for five years in ethanol.

**Remarks**

Our specimens of *Nipponomysis surugensis* from the Seto Inland Sea are remarkable among the species of the genus by having four-segmented carpo-propodi on the third to eighth thoracopodal limbs. Murano (1977) gave no accounts on the morphological features of the thoracic appendages in his original description of this species.

In their comprehensive taxonomic review of *Proneomysis*, Takahashi & Murano (1986) moved the Asian members to the new genus *Nipponomysis*. These species have three-segmented carpo-propodi in contrast to five or six segments in the typical species of *Proneomysis*. A three-segmented carpo-propod in *Nipponomysis* has been regarded as a stable character within the genus (e.g., Li 1964, Taka-
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hashi & Murano 1986, Fukuoka & Murano 1997, 2001, Liu & Wang 2000, Fukuoka & Pinkaew 2003). Therefore, we hesitated to identify our specimens as *N. surugensis*, because four-segmented carpo-propodi were not described in the original description by Murano (1977) or in the redescription of the allotype male (NSMT-Cr 5524) by Takahashi & Murano (1986). We reexamined the type specimens again, and observed that the holotype female (NSMT-Cr 5523) has a four-segmented carpo-propodus on the intact left fourth thoracopod.

In terms of the number of carpo-propod segments, this species bridges the known species of *Nipponomysis* (three-segmented carpo-propodus) and *Proneomysis* (five or six-segmented ones), although other morphological features show a closer affinity to *Nipponomysis* rather than *Proneomysis*. A slight amendment in the generic definition of *Nipponomysis* is needed to incorporate the present new finding, i.e., “the third to eight thoracopodal endopods are composed of three or four segments” (see also Takahashi & Murano 1986).

Specimens from the Seto Inland Sea (TL 7.0–8.0 mm) had a tendency to carry slightly fewer setae than those in Suruga Bay (TL 5.5 and 6.7 mm) such as in the telson (20–26 vs 26–27) and uropod (9–10 vs 11–14).

**Distribution**

*Nipponomysis surugensis* is known only from Suruga Bay and the eastern Seto Inland Sea, Japan, at depths of 20 and 33 m, respectively.

**Key to the species of Nipponomysis**

revised and updated after Takahashi & Murano (1986) and Fukuoka (1997).

1 Second segment of mandibular palp with mesial lamellar plate protruding distally with several small denticles around distal part ................. *N. patula* Fukuoka & Pinkaew, 2003

   (Gulf of Thailand)

   Second segment of mandibular palp normal, without mesial lamellar plate........................................ 2

2 Anterior 5 abdominal somites with single fold on dorsal surface .............. *N. misakiensis* (Ii, 1936)

   (temperate coast of Japan)

   Anterior 5 abdominal somites without folds but smooth on dorsal surface........................................ 3

3 Larger setae of lateral telson series subequal in length through margins............................................. 4

4 Larger setae of lateral telson series showing general tendency to increase its length distally .............. 12

4 Telson linguiform, lateral margin with distinct unarmed part just anterior to midlength.............................................. *N. lingvura* (Murano, 1977)

   (temperate coast of Japan; east coast of Korea)

   Telson long linguiform or subtriangular, lateral margin armed with setae throughout length ................ 5

5 Telson 3 times longer than broad; exopod of male fourth pleopod with first and second segments with pair of long setae extending beyond distal end of third segment ................................. *N. tenuiculus* (Ii, 1940)

   (temperate coast of Japan)

   Telson less than 2.5 times longer than broad; exopod of male fourth pleopod with first and second segments with pair of setae not extending beyond distal end of third segment................................................... 6

6 Lateral margin of telson with 15 sets of grouped setae ........................................................... *N. perminuta* (Ii, 1936)

   (temperate coast of Japan)

   Lateral margin of telson with less than 13 sets of grouped setae...................................................... 7

7 Larger terminal setae of telson much shorter than larger setae on lateral margin.................................

   .............................. *N. takitai* (Murano, 1977)

   (temperate coast of Japan)

   Larger terminal setae of telson subequal in length to larger setae on lateral margin......................... 8

8 Exopod of male fourth pleopod with first segment subequal to or shorter than combined length of distal 2 segments................................................................. 9

9 Exopod of male fourth pleopod with first segment much longer than combined length of distal 2 segments.................................................. 10

9 Lateral margin of telson with 8–13 sets of grouped setae; endopod of uropod with 15–21 ventromesial setae in statocyst region ..................................................... *N. longipes* Murano, 1977

   (temperate coast of Japan; east coast of Korea)

   Lateral margin of telson with 5 or 6 sets of grouped setae; endopod of uropod with 5–8 ventromesial setae in statocyst region.....................................................

   .............................. *N. minuta* Fukuoka & Murano, 1997

   (Iriomote Island, Japan)

   Two long terminal setae of male fourth pleopodal exopod distinctly unequal in length; lateral margin of telson with 5 or 6 sets of grouped setae..................

   .............................. *N. brevicauda* Fukuoka & Murano, 2001

   (Ogasawara Islands, Japan)

   Two long terminal setae of male fourth pleopodal exopod subequal in length; lateral margin of telson with more than 7 sets of grouped setae .... 11

11 Telson 2 times longer than broad, lateral margin abruptly narrowing in proximal part and then gradually decreasing width distally, with 7 or 8 sets of grouped setae ..........................

   .............................. *N. perminuta* (Ii, 1936)

   (temperate coast of Japan)

   Telson 2.5 times longer than broad, lateral margin narrowing in proximal third, followed by slightly widened part near midlength and then gradually decreasing its width distally, with 8–10 sets of grouped setae ........................................ *N. longipes* ( Murano, 1977)
longer than third one; third to eighth thoracopodal endopods with 4-segmented carpo-propodus

\[ \textit{N. surugensis} \] (Murano, 1977)

(temperate coast of Japan)

Exopod of male fourth pleopods with second and third segments subequal in length; third to eighth thoracopodal endopods with 3-segmented carpo-propodus

\[ \textit{N. sandoi} \] (Ii, 1964)

(temperate coast of Japan)

Telson linguiform, about twice as long as broad, lateral setae subequal in length except distinctly stout terminal setae

\[ \textit{N. ornata} \] (Ii, 1964)

(temperate coast of Japan; east coast of Korea)

Larger terminal setae of telson about 3 times as long as shorter pairs; male fourth pleopod barely reaching sixth abdominal somite, with first segment of exopod very slightly longer than endopod

\[ \textit{N. eriopedes} \] (Ii, 1936)

(temperate coast of Japan)

\[ \textit{N. calcarata} \] (Kalimantan Strait, Indonesia; northern South China Sea)

Endopod of uropod with 3–5 ventromesial setae in statocyst region; exopod of male fourth pleopod with first segment subequal to combined length of second and third segments

\[ \textit{N. quadrispinosa} \] (Ii, 1964)

(temperate coast of Japan)

Endopod of uropod with 6–13 ventromesial setae in statocyst region; exopod of male fourth pleopod with first segment more than twice combined length of second and third segments

\[ \textit{N. sinensis} \] (Wang, 1981)

(northern South China Sea)

Rostral plate reaching distal end of first segment of antennular peduncle

\[ \textit{N. fusca} \] (Ii, 1936)

(temperate coast of Japan; Jeju Island, Korea)

Rostral plate falling short of first segment of antennular peduncle

\[ \textit{N. calcara} \] Takahashi & Murano, 1986

(temperate coast of Japan)

First segment of carpo-propodus on third to eighth thoracopodal endopods with 4 or 5 moderately stout spine-like setae in addition to many slender setae

\[ \textit{N. neomysis} \] (in Chinese)

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\section*{References}

Fukuoka K (1997) Taxonomic studies of mysids of the Tribe Myxini (Eumalacostraca, Mysidacea, Mysidae, Mysinae) with special reference to species of the western Pacific. Ph D thesis, Tokyo Univ Fish, Tokyo, 389 pp.

Fukuoka K, Murano M (1997) Mysidacea from coastal waters of Iriomote Island, Ryukyu Islands, southwestern Japan, with descriptions of three new species. J Crust Biol 17: 520–537.

Fukuoka K, Murano M (2001) Two new species of Mysidacea (Crustacea) from adjacent waters of the Ogasawara Islands, southern Japan. Bull Natl Sci Mus Tokyo, Ser A (Zool) 27: 259–269.

Fukuoka K, Pinkaew K (2003) \textit{Nipponomysis patula} sp. nov. (Crustacea: Mysidacea: Mysidae) from the Gulf of Thailand. Spec Diver 8: 219–225.

Ii N (1964) Fauna Japonica. Mysidae (Crustacea). Biogeogr Soc Jpn, Tokyo, 610 pp.

Liu R, Wang S (2000) Order Mysidacea. Fauna Sinica: Crustacean Issues 6 (eds Felgenhauer BE et al.). A.A. Balkema, Rotterdam, pp. 15–26.