

DESCRIPTION OF *NAOBRANCHIA DENTICIS* N. SP. (COPEPODA,
SIPHONOSTOMATOIDA, LERNAEOPODIDAE) PARASITIC ON *DENTEX*
HYPSELOSOMUS (TELEOSTEI, SPARIDAE) FROM JAPANESE WATERS,
WITH A KEY TO THE SPECIES OF *NAOBRANCHIA*

BY

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ABSTRACT

The adult female of *Naobranchia denticis* n. sp. is described based on material collected from the gill filaments of the yellowback seabream *Dentex hypselosomus* caught in the southern Sea of Japan off the northern coast of Kyushu. Characteristic features of the new species include a cephalothorax three times as long as the trunk, a trunk as wide as long, egg-sacs situated posterolateral to the trunk, without extending to the bases of the maxillae anteriorly, slightly inclined toward each other posteriorly, with three pairs of reinforcement ribbons; caudal rami longer than abdomen and digitiform; head with lateral adhesive lobes and 12 hyaline papillae. The male has not been found. Our finding represents the first report of *Naobranchia* species from Japanese sparid hosts and the fourth report of this genus from the coastal waters of Japan. A key to the 21 species of *Naobranchia* is also included herein. Three species (*N. bellones*, *N. pomolobi*, and an unspecified species of *Naobranchia* from Hawaii) are not considered members of this genus because they lack the ribbon-like maxillae.

RESUMEN

La hembra adulta de *Naobranchia denticis* n. sp. es descrita basado en el material obtenido de los filamentos branquiales de la dorada de espalda amarilla *Dentex hypselosomus* capturado en el sur del Mar de Japón frente a la costa norte de Kyushu. Los rasgos característicos de la nueva especie incluyen el cefalotórax tres veces más largo que el tronco, un tronco tan ancho como largo, los ovisacos situados posterolateralmente al tronco, sin extenderse a las bases de los maxilares anteriormente, ligeramente inclinados el uno al otro en la región posterior, con tres pares de cintas de refuerzo; ramas caudales más largas que el abdomen y digitiformes; cabeza con lóbulos adhesivos laterales y 12 papilas hialinas. El macho no ha sido encontrado. Nuestro hallazgo representa el primer informe de especies de *Naobranchia* en hospedadores espáridos japoneses y el cuarto informe de

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este género en las aguas costeras de Japón. Una clave de las 21 especies de *Naobranchia* también se ha incluido en este documento. Tres especies (*N. bellones*, *N. pomolobi*, y una especie no especificada de *Naobranchia* de Hawai) no se consideran miembros de este género porque carecen de los maxilares con forma de cinta.

INTRODUCTION

Naobranchia Hesse, 1863, a genus recently moved to the family Lernaeopodidae (Kabata, 1981; Boxshall & Montú, 1997), was placed for more than three decades in the family Naobranchiidae Yamaguti, 1939 (cf. Yamaguti, 1939; Kabata, 1979; Boxshall & Halsey, 2004). The adult females of the genus *Naobranchia* are parasitic on the gill filaments of marine fishes, and are unique in having a ribbon-like maxilla, forming a loop-like attaching device, without bulla; a well developed and elongate cephalothorax, dorsally located to the bases of the maxillae; and a trunk with processes that can be discrete, not connected by a membrane, or absent. The males are parasitic on the body surface of the females and are characterized by having the trunk extremely reduced, typically represented by a sac-like process and without thoracic legs (Boxshall & Montú, 1997). To date, 23 species comprise the genus *Naobranchia*, which includes *Naobranchia alta* Kabata, 1992; *N. amplexans* (Kurz, 1877); *N. aulopi* Yamaguti, 1939; *N. auriculata* Shiino, 1958; *N. bellones* (Oken, 1815) [syn. *Axine bellones* Oken, 1815]; *N. cygniformis* Hesse, 1863; *N. hemiconiati* Nuñez-Ruivo, 1963; *N. kabatana* Dippenaar & Jordan, 2008; *N. lizae* (Krøyer, 1863) [*N. stibara* Leigh-Sharpe, 1926 (cf. Boxshall & Montú, 1997)]; *N. maxima* Ho, 1975; *N. microsoma* Dojiri, 1981; *N. occidentalis* Wilson, 1915; *N. pagelli* Nuñez-Ruivo, 1963; *N. polynemi* Tripathi, 1962; *N. pomolobi* Fowler, 1912; *N. pritchardae* Kensley & Grindley, 1973; *N. sargi* Nuñez-Ruivo, 1963; *N. scorpaenae* Dojiri, 1981; *N. smaridis* Nuñez-Ruivo, 1963; *N. spinosa* Pearse, 1952; *N. variabilis* Brian, 1924; *N. vermiformis* Rangnekar, 1956; *N. wilsoni* Nigrelli, 1933; and *Naobranchia* sp. of Lewis (1967) (cf. Brian, 1924; Sordi, 1951; Pillai, 1962). Among these 23 members, only three species (*N. aulopi*, *N. auriculata*, and *N. occidentalis*) have been reported from the coastal waters of Japan (Yamaguti, 1939; Shiino, 1958; Ho & Kim, 1996).

In this study, we collected an undescribed species of *Naobranchia* from Japanese waters when examining the gill filaments of *Dentex hypselosomus* (Bleeker, 1854) (Sparidae, Denticinae). Commonly known as the yellowback seabream, *D. hypselosomus* inhabits the waters of southern Japan (except the Ryukyu and Ogasawara Islands), southern Korea, China, and western Taiwan (Iwatsuki et al., 2007). This sparid species is commercially important and is caught mainly between 50 and 200 m in the East China Sea (Yamada, 1986). The taxonomic status of the species has been reviewed and established by Iwatsuki et al. (2007). To date, no

parasitological study has been done on the yellowback seabream, neither in Japan nor in any other surrounding countries. Hence, this study reports for the first time a lernaeopodid copepod parasitic on this sparid species, describes the adult female of an undescribed species of *Naobranchia*, and re-evaluates the validity of some of the current species in this genus. A key for the identification of the adult females of the species of *Naobranchia* is included herein.

MATERIAL AND METHODS

Yellowback seabream were caught by fishermen in the southern Sea of Japan off the northern coast of Kyushu, Japan. The standard length (SL) of the fish was measured. Copepods removed from the host's gill-filaments with a pair of forceps were fixed and preserved in 70% ethanol. Specimens were later soaked in 80% lactophenol for 2-3 hours, dissected, and observed using the wooden slide method of Humes & Gooding (1964). Drawings were made with the aid of a drawing tube fitted on an Olympus BX51 compound microscope. The morphological terminology follows Huys & Boxshall (1991). The scientific and common names of the fishes follow those adopted in Froese & Pauly (2010), except for *Dentex hypselosomus* (see Iwatsuki et al., 2007).

The body parts were measured using an ocular micrometer and are given in millimeters as the range, because of the low number of specimens ($n = 2$). Measurements of the habitus and main tagma of the species of *Naobranchia* are explained in a schematic diagram (fig. 1) in dorsal view: body length (= maximum length of body; A in fig. 1); cephalothorax length (= maximum length of cephalothorax; B in fig. 1); cephalothorax width (= maximum width of cephalothorax; C in fig. 1); trunk length (= maximum length of trunk, excluding caudal rami; D in fig. 1); trunk width (= maximum width of trunk; E in fig. 1); egg string length (= maximum length of egg string; F in fig. 1) and egg string width (= maximum width; G in fig. 1). The holotype (NSMT-Cr 21465) is deposited in the crustacean collection of the National Museum of Nature and Science, Tokyo. The further (paratype) material will be deposited in that same institution.

SYSTEMATICS

Family LERNAEPODIDAE H. Milne Edwards, 1840

Genus *Naobranchia* Hesse, 1863

***Naobranchia denticis* n. sp.**

(figs. 2-12)

Material examined. — Two females collected from the gill filaments of the host *Dentex hypselosomus* (Bleeker, 1854) (SL = 28 cm), in the southern Sea of Japan (33°35'N 130°24'E) off the northern coast of Kyushu, Japan, 21 October 2009. For deposition of types, see above.

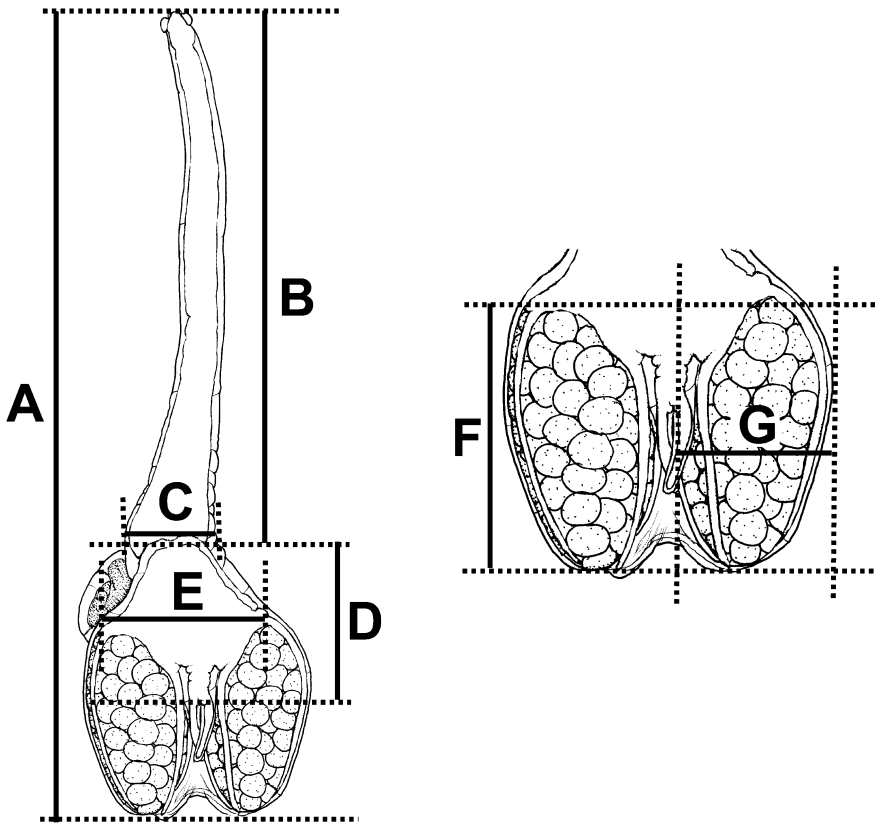
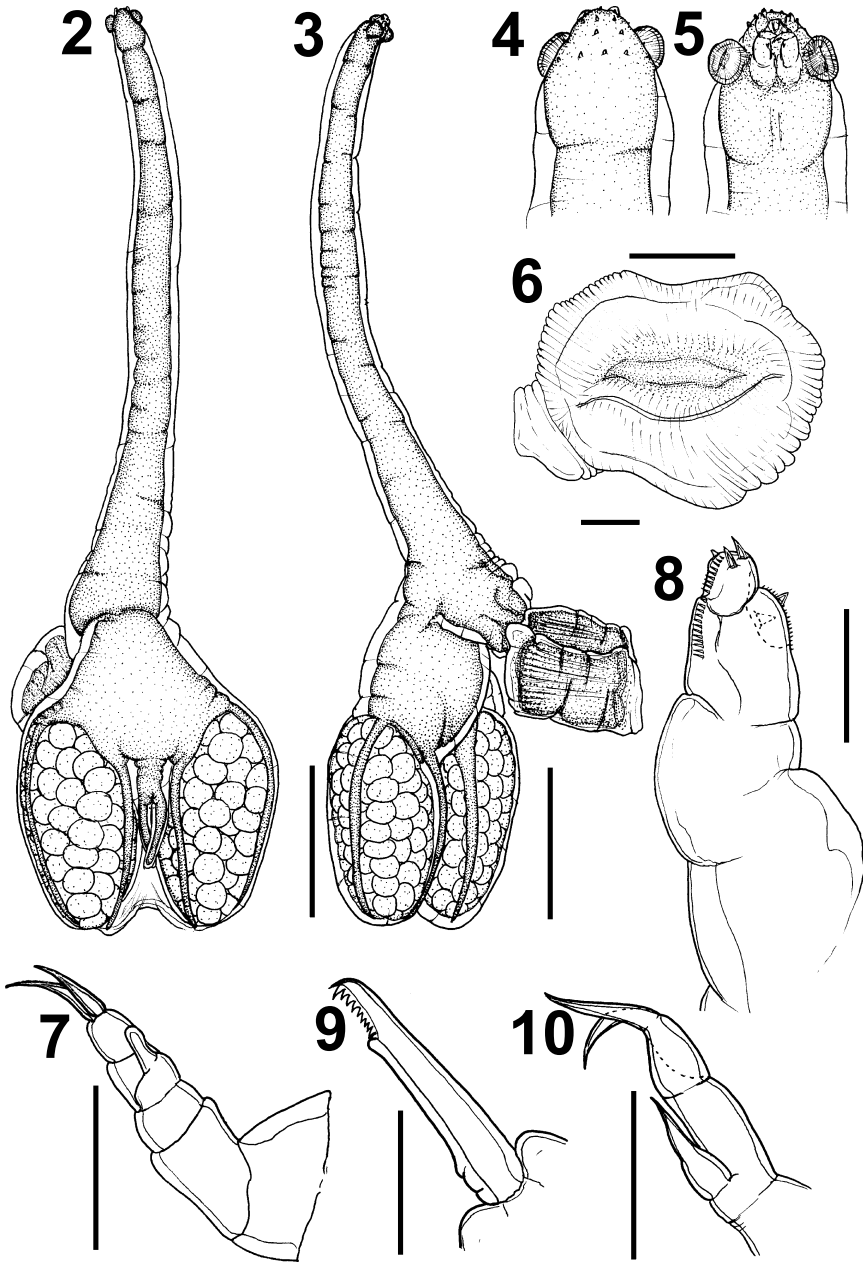


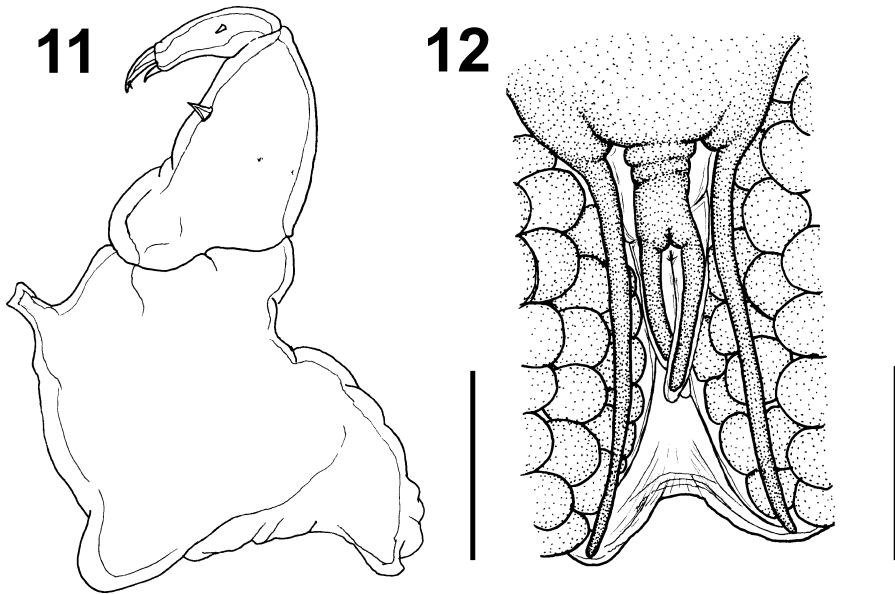
Fig. 1. Schematic diagram of various parts of the habitus of *Naobranchia denticis* sp. n., female showing measurements taken: A, body length; B, cephalothorax length; C, cephalothorax width; D, trunk length; E, trunk width; F, egg sac length; G, egg sac width.

Description of female. — Body (figs. 2, 3) 5.82-6.01 mm long, excluding caudal rami. Cephalothorax (figs. 2, 3) filiform ($3.43-3.63 \times 0.72-0.78$), increasing in diameter posteriorly; three times as long as trunk. Trunk subtriangular, as long as wide ($1.14-1.21 \times 1.20-1.33$). Egg sacs (figs. 2, 3, 12) longer than wide ($1.44-1.48 \times 0.78-0.83$), multiseriata, posterolateral to trunk, without extending to base of maxilla anteriorly, overreaching tips of caudal rami posteriorly, slightly inclined toward each other; reinforced with 3 pairs of long ribbons. Abdomen (figs. 2, 12) rectangular, longer than wide ($0.35-0.42 \times 0.21-0.23$) with long digitiform caudal rami. Caudal rami (fig. 12) longer than abdomen ($0.5-0.6 \times 0.12-0.15$), slightly inclined toward each other.

Head conical (figs. 4, 5); anterior margin bearing 12 spherical, hyaline papillae symmetrically arranged on both sides (figs. 4, 5); adhesive lobes (fig. 6) lateral to the maxillipeds, protrude beyond margins of cephalothorax (fig. 5). Antennule (fig. 7) lateral to mouth tube (fig. 5), 4-segmented; first two segments



Figs. 2-10. *Naobranchia denticis* n. sp., adult female: 2, habitus, dorsal; 3, habitus, latero-ventral; 4, tip of cephalothorax (head), dorsal; 5, tip of cephalothorax (head), ventral; 6, adhesion lobe, ventral; 7, antennule, ventro-lateral; 8, antenna, ventral; 9, mandible, lateral; 10, maxillule, ventral. Scale bars: 2, 3 equal 1 mm; 4, 5 equal 0.15 mm; 6-10 equal 0.01 mm.



Figs. 11-12. *Naobranchia denticis* n. sp., adult female: 11, maxilliped, ventral; 12, posterior part of trunk and abdomen, dorsal. Scale bars: 11 equals 0.04 mm; 12 equals 0.5 mm.

stout, unarmed; third segment with medial digitiform process extending beyond distal margin of terminal segment; the latter with 2 apical digitiform processes. Antenna (fig. 8) lateral to antennule, biramous, indistinctly 3-segmented; exopod 1-segmented, smaller than endopod, distally with 2 spines and 1 row of small setules marginally; endopod indistinctly 2-segmented; basal segment armed with a row of setules marginally; distal segment equipped with two spines, 2 rounded setae, and 1 row of setules. Mandible (fig. 9) with 10 teeth, uniform in size except for large tooth situated next to distalmost one; dental formula S1, P1, S1, S1, B6. Maxillule (fig. 10) posterolateral to mouth tube, biramous; exopod small with terminal dentiform seta; endopod with 2 long truncate setae on elongate papillae. Maxillae (fig. 3) with distal ends attached to base of cephalothorax; ribbon-like, slightly wrinkled transversely, equal-sized, with undetermined number of muscle bands. Musculature of maxillae scattered irregularly in a branching system. Maxilliped (fig. 11) basal portion stout, with flat-tipped process on inner margin; corpus robust, 1-segmented, with 1 stout spine; shaft carrying small conical element at midlength and 1 spine distally; terminal claw with 2 small accessory papillae on apex.

Etymology. — The species epithet, *denticis*, is taken from the host's genus *Dentex*. It hence is a noun in the genitive singular.

Remarks. — The present species resembles *Naobranchia alta*, *N. auriculata*, *N. cygniformis*, *N. hemiconiati*, *N. maxima*, *N. microsoma*, *N. pagelli*, *N. pritchardae*,

N. sargi, *N. smaridis*, *N. scorpanea*, and *N. vermiformis* in having the cephalothorax longer than the trunk. However, *N. denticis* n. sp. differs from all these in having the cephalothorax three times as long as the trunk. The only other species sharing this body proportion is *N. pagelli* described by Nuñez-Ruivo (1963) found on the gill filaments of *Pagellus acarne* (Risso, 1827) (table I) from the coastal waters of Senegal, Africa. These species resemble each other in the position of the egg sacs being posterolateral to the trunk, without extending to the bases of the maxillae anteriorly, and in being slightly inclined toward each other posteriorly. In addition, the egg sacs are reinforced by three pairs of elongate ribbons. However, *N. pagelli* differs from *N. denticis* n. sp. in having a body length of 8.00 mm (table II), the head lacking adhesive lobes and hyaline papillae, and the abdomen as long as the caudal rami, which are parallel to each other. In contrast, the Japanese species has a maximum body length of 6.01 mm, the head with a pair of adhesive lobes ventrally as well as 12 hyaline papillae dorsally, and the abdomen shorter than the caudal rami, which are inclined toward each other.

DISCUSSION

To date, only four species of *Naobranchia* (i.e., *N. cygniformis* [syn. *Cestopoda cygniformis*, *C. amplexens*, *N. amplexens*], *N. lizae* [syn. *N. stibara*], *N. pagelli*, and *N. sargi*) have been reported from the gill filaments of sparid fishes, mainly from the Mediterranean Sea (table I). However, there is no report of this copepod genus from sparid hosts in Japanese waters. Species of *Naobranchia* described so far from Japanese waters include: *N. aulopi* parasitic on the gill filaments of *Hime japonica* (Günther, 1877) [as *Aulopus japonicus*] (Aulopidae) from Wakayama, Japan (Yamaguti, 1939; Shiino, 1958), *N. auriculata* parasitic on the gill filaments of *Beryx splendens* Lowe, 1834 (Berycidae) from Mie, Japan (Shiino, 1958), and *N. occidentalis* parasitic on the gill filaments of *Icelus canaliculatus* Gilbert, 1896 (Cottidae) from Hokkaido, Japan (Ho & Kim, 1996). Therefore, our finding of *N. denticis* n. sp. parasitic on the gill filaments of *D. hypselosomus* from the Sea of Japan represents the first report of *Naobranchia* from Japanese sparid hosts and the fourth report of this genus from the coastal waters of Japan.

The total number of species comprising the genus *Naobranchia* was considered to be 23, if we exclude *N. denticis* n. sp. However, a closer look at the description of some of these learnaeopodid species has made us reconsider the validity of some of them as members of this genus. It has been noticed that three of those species do not share the basic characters of the genus *Naobranchia* as defined by Boxshall & Montú (1997). Among these species, *N. bellones* (syn. *Axine bellones*) cannot be placed in the genus because it lacks maxillae and the habitus, as illustrated

TABLE II
 Body proportions of 21 species of *Naobranchia*. Abbreviations: TL, total length; CL, cephalothorax length; CW, cephalothorax width; TL, trunk length; TW, trunk width; all measurements are in mm

Species	TL	CL	CW	TL	TW	References
<i>N. alta</i> Kabata, 1992	2.70-3.50	1.50-1.90	0.28-30	1.20-1.60	0.88-1.00	Kabata, 1992
<i>N. aulopi</i> Yamaguti, 1939	5.07	2.50	-	2.57	1.32	Yamaguti, 1939; Shiino, 1958
<i>N. auriculata</i> Shiino, 1958	6.20	3.14	-	2.96	1.50	Shiino, 1958
<i>N. cygniformis</i> Hesse, 1863	6.00	3.60	-	1.80	-	Hesse, 1863
[syn. <i>N. amplexens</i> (Kurz, 1877)]						
<i>N. denticis</i> n. sp.	5.82-6.01	3.43-3.63	0.72-0.78	1.14-1.21	1.20-1.33	Present study
<i>N. hemiconiati</i> Nuñez-Ruivo, 1963	4.5	3.00	-	1.5	-	Nuñez-Ruivo, 1963
<i>N. kabatana</i> Dippenaar & Jordaan, 2008	9.1	4.6	1.06	4.5	3.18	Dippenaar & Jordaan, 2008
<i>N. lizae</i> (Krøyer, 1863) [syn. <i>N. stibara</i> Leigh-Sharpe, 1926]	8.4	3.4	0.5	3	1.85	Wilson, 1915
<i>N. maxima</i> Ho, 1975	11.08-16.17	7.60-9.34	0.91-1.09	3.48-6.83	1.60-2.41	Ho, 1975
<i>N. microsoma</i> Dojiri, 1981	2.03-3.07	1.29-2.01	0.25-0.46	0.74-1.06	0.53-0.79	Dojiri, 1981
<i>N. occidentalis</i> Wilson, 1915	8.00	4.00	1.65	4.00	2.80	Wilson, 1915
<i>N. pagelli</i> Nuñez-Ruivo, 1963	8.00	5.00	-	1.00	-	Nuñez-Ruivo, 1963
<i>N. polynemi</i> Tripathi, 1962	4.45	2.08	0.27	2.18	0.79	Tripathi, 1962
<i>N. pritchardae</i> Kensley & Grindley, 1973	4.00	2.00	-	1.33	-	Keysley & Grindley, 1973
<i>N. sargi</i> Nuñez-Ruivo, 1963	4.30	3.00	-	1.5	-	Nuñez-Ruivo, 1963
<i>N. scorpaenae</i> Dojiri, 1981	2.93-4.99	1.82-3.26	0.53-0.69	1.11-1.73	1.41-1.92	Dojiri, 1981
<i>N. smaridis</i> Nuñez-Ruivo, 1963	6.00	4.00	-	1.00	-	Nuñez-Ruivo, 1963
<i>N. spinosa</i> Pearse, 1952	2.80	1.40	-	1.40	-	Pearse, 1952
<i>N. variabilis</i> Brian, 1924	3.30-3.65	1.50	0.50	1.80-2.15	2.46-2.94	Kabata, 1968
<i>N. vermiformis</i> Rangnekar, 1956	6.40	3.80	0.90	2.60	-	Rangnekar, 1956
<i>N. wilsoni</i> Nigrelli, 1933	5.28	2.9	1.25	2.30	2.30	Nigrelli, 1933

by Oken (1815), resembling a monogenean rather than a copepod. *Naobranchia pomolobi* should be transferred to the genus *Clavellisa* Wilson, 1915 because it lacks the ribbon-like maxillae. This species was reported by Fowler (1912) from the opercular plate, gill raker, and gill filaments of its host, while all *Naobranchia* species have been reported exclusively from the gill filaments. *Naobranchia* sp. as described by Lewis (1967) should be removed from this genus because the description states that the fused maxillae form an obcordate (i.e., heart-shaped) ventral projection, with the fusion appearing to be at the distal end, not with the body. Therefore, the shape of these maxillae does not resemble the ribbon-like maxillae characteristic of the genus *Naobranchia* but rather those of the genus *Clavella* Oken, 1815 or *Clavellisa*.

Additionally, a couple of inconsistencies have been found in the descriptions of *N. lizae* [syn. *N. stibara*] and *N. occidentalis*. *Naobranchia lizae* was originally described by Krøyer (1863). In Wilson's (1915) subsequent description of *N. lizae* (table II) the ovigerous female has a body length of 8.40 mm, almost twice the length of *N. lizae* reported by Boxshall & Montú (1997) (4.80), who considered *N. stibara* (4.60-5.00) to be a junior synonym of *N. lizae*. While *N. lizae* has the cephalothorax almost as long as the trunk, which is rectangular (Boxshall & Montú, 1997), *N. stibara* possesses a cephalothorax shorter than the trunk, about 0.5 its total length, and an elliptical trunk (Leigh-Shape, 1926). *Naobranchia occidentalis* was originally described by Wilson (1915) as parasitic on *Gadus macrocephalus* Tilesius, 1810 from Alaskan waters. Later on, Ho & Kim (1996) collected a species of *Naobranchia*, thought to be *N. occidentalis*, from the gill filaments of *Icelus canaliculatus* and *I. euryops* Bean, 1890 from Hokkaido and the Bering Sea. However, there are four major differences between Wilson's (1915) and Ho & Kim's (1996) descriptions of *N. occidentalis*, mainly in the body proportions, the shape of the posterior part of the trunk, the shape and length of the abdomen, and the length of the caudal rami. *Naobranchia occidentalis* described by Wilson (1915) has a body length of 8.00 mm (table II), while the one described by Ho & Kim (1996) is 5.10 mm long. In addition, in Wilson's (1915) specimens the anterior part of the egg sacs forms a shoulder at the posterior end of the trunk, a shoulder formation absent in the specimens collected from Hokkaido and the Bering Sea. The abdomen is wider than long in Wilson's (1915) specimens, but it is longer than wide in Ho & Kim's (1996) description. Finally, the caudal rami of *N. occidentalis* collected from Alaskan waters are short, while the caudal rami of Ho & Kim's specimens are longer, almost as long as the abdomen.

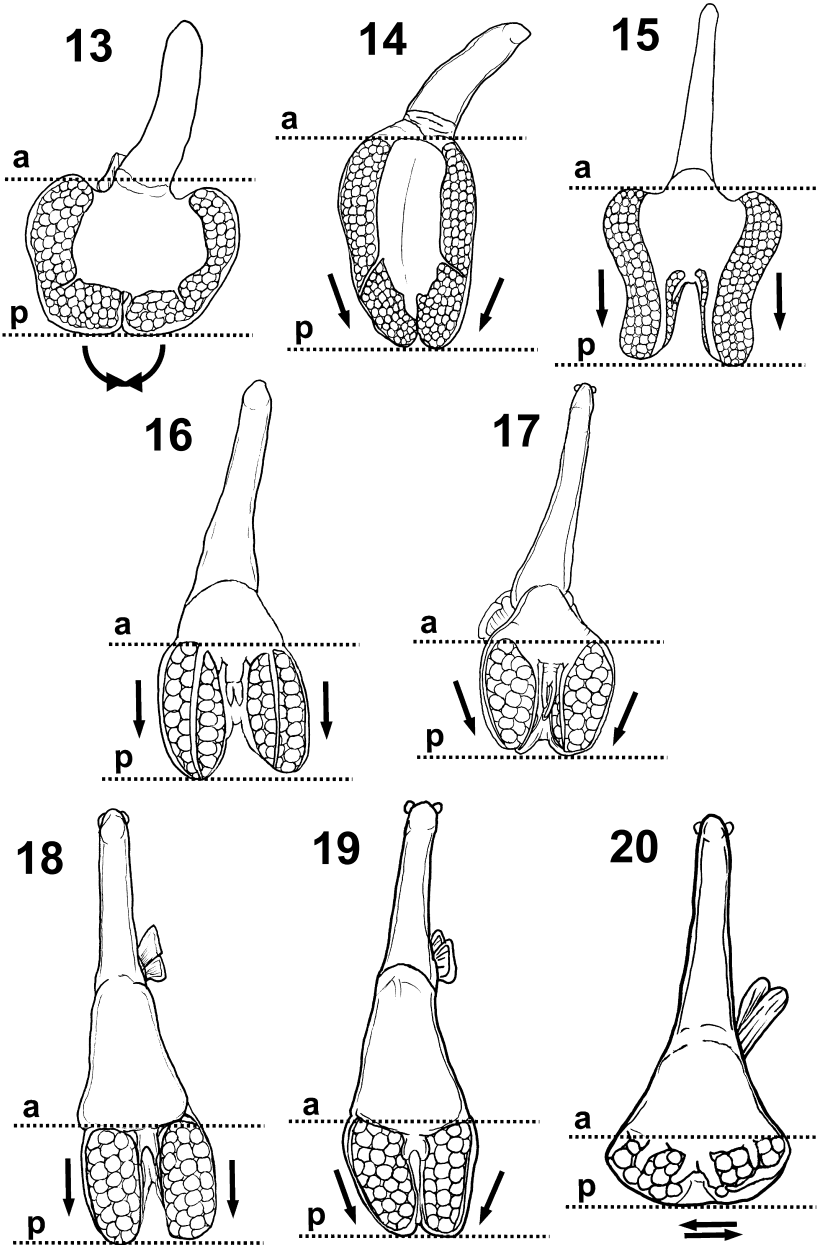
In conclusion, our finding of *N. denticis* n. sp. parasitic on the gill filaments of *D. hypselosomus* from the Sea of Japan represents the first report of *Naobranchia* from Japanese sparid hosts and the fourth record of this genus from the coastal waters of Japan. The female *N. denticis* n. sp. is featured by having the cephalothorax

three times as long as the trunk, the trunk as wide as long, the egg-sacs situated posterolateral to the trunk, slightly inclined toward each other, with three long reinforcement ribbons, the caudal rami digitiform, and the head with lateral adhesive lobes and 12 hyaline papillae. A total of 21 valid species, including *N. denticis* n. sp., now constitutes the genus *Naobranchia*. Species such as *N. bellones*, *N. pomolobi*, and *Naobranchia* sp. are not considered members of the genus because these species lack the ribbon-like maxillae. Future studies should re-examine the specimens of *N. lizae* and *N. stibara* to determine their validity, and compare Wilson's (1915) specimens of *N. occidentalis* with those of Ho & Kim (1996) to confirm the identification by the latter authors as *N. occidentalis*, or reveal it as an undescribed species.

A key to the 21 *Naobranchia* species known from around the world is provided below. This key has been developed based on morphological characters of the habitus such as the body proportions (table II), the shape of the trunk, and the position and orientation of the egg sacs (figs. 13-20). To date, the adult females of the species of *Naobranchia* have been divided into two groups according to the position of the egg-sacs, i.e., lateral along most or all of the trunk, or posterolateral without extending all the way up to the anterior end of the trunk (Kabata, 1992). However, this division excludes a third group of species of the genus, which has the egg sacs situated posterior to the trunk (i.e., *N. auriculata*, *N. hemiconiati*, and *N. maxima*). Due to this inconsistency, we here propose a different approach to classify the adult females of the genus *Naobranchia*, based not on the position of the egg sacs, but on the body proportions. These body proportions refer to the length of the cephalothorax with respect to the trunk: shorter (i.e., *N. lizae* [syn. *N. stibara*], *N. variabilis*, *N. aulopi*, and *N. polynemi*), as long as (i.e., *N. occidentalis*, *N. wilsoni*, *N. spinosa*, and *N. kabatana*), or longer than the trunk (*N. smaridis*, *N. hemiconiati*, *N. maxima*, *N. pagelli*, *N. denticis* n. sp., *N. auriculata*, *N. microsoma*, *N. alta*, *N. vermiformis*, *N. scorpanea*, *N. pritchardae*, *N. cygniformis*, and *N. sargi*) (see the key given below). Features of the oral appendages are excluded from the key because the descriptions of these appendages in many species of *Naobranchia* are vague or absent. Since both sexes are known for only a few species, the following key is essentially for the identification of ovigerous females.

KEY TO FEMALES OF THE SPECIES OF *NAOBRANCHIA* HESSE, 1863 (21 SPECIES)

- | | |
|---|----------------------------------|
| 1 – Cephalothorax shorter than trunk | 2 |
| – Cephalothorax as long as trunk | 3 |
| – Cephalothorax longer than trunk | 4 |
| 2 – Trunk longer than wide, rectangular | 5 |
| – Trunk wider than long, elliptical | <i>N. variabilis</i> Brian, 1924 |



Figs. 13-20. Position of the egg sacs relative to the trunk of ovigerous females of species of *Naobranchia*: 13-15, lateral; 16-17, posterolateral; 18-20, posterior. Black arrows showing orientation of egg sacs: elliptical, inclined, parallel, or horizontal. Abbreviations: a, anterior end of egg sacs; p, posterior end of egg sacs.

- Trunk as long as wide, quadrangular
..... *N. lizae* (Krøyer, 1863) [syn. *N. stibara* Leigh-Sharpe, 1926]
- 3 – Trunk longer than wide 6
 - Trunk wider than long, maxillae broad, with four muscle strands
..... *N. spinosa* Pearse, 1952
 - Trunk as long as wide, maxillae slender, with one muscle strand
..... *N. wilsoni* Nigrelli, 1933
- 4 – Cephalothorax 1.5 times as long as trunk 7
 - Cephalothorax 2 times as long as trunk 8
 - Cephalothorax 3 times as long as trunk 9
 - Cephalothorax almost 4 times as long as trunk *N. smaridis* Nuñez-Ruivo, 1963
- 5 – Egg sacs lateral, reaching anteriorly the bases of the maxillae; extending posteriorly nearly to the tips of the abdomen and inclined toward each other *N. polynemi* Tripathi, 1962
 - Egg sacs postero-lateral without reaching anteriorly the bases of the maxillae; egg sacs shorter than abdomen and slightly inclined toward each other posteriorly
..... *N. aulopi* Yamaguti, 1939
- 6 – Egg sacs lateral, reaching anteriorly the bases of the maxillae; overreaching the tips of the caudal rami *N. kabatana* Dippenaar & Jordaan, 2008
 - Egg sacs posterolateral to trunk; protruding as shoulders anteriorly, without reaching the bases of the maxillae anteriorly, overreaching tips of caudal rami and inclined toward each other *N. occidentalis* Wilson, 1915
- 7 – Trunk longer than wide 10
 - Trunk wider than long 11
- 8 – Egg sacs posterior, horizontally arranged, inclined toward each other, with 3 robust reinforcement ribbons per sac *N. hemiconiati* Nuñez-Ruivo, 1963
 - Egg sacs posterior, vertically arranged, as long as the trunk, slightly inclined toward each other, and with 3 long reinforcement ribbons per sac *N. maxima* Ho, 1975
 - Egg sacs posterolateral to trunk, without reaching the bases of the maxillae anteriorly, overreaching the tips of the caudal rami posteriorly, inclined toward each other, with 3 reinforcement ribbons per sac 12
- 9 – Head without adhesive lobes or hyaline papillae, abdomen as long as caudal rami, caudal rami parallel to each other *N. pagelli* Nuñez-Ruivo, 1963
 - Head with a pair of adhesive lobes and hyaline papillae, abdomen shorter than caudal rami, caudal rami inclined toward each other *N. denticis* n. sp.
- 10 – Egg sacs posterior to trunk, overreaching tips of caudal rami posteriorly, inclined toward each other and reinforced with 3 ribbons per sac *N. auriculata* Shiino, 1958
 - Egg sacs posterolateral, without reaching the bases of the maxillae anteriorly, overreaching tips of caudal rami, parallel to each other, and with 3 reinforcement ribbons per sac
..... *N. microsoma* Dojiri, 1981
 - Egg sacs posterolateral, without reaching the bases of the maxillae anteriorly, overreaching tips of caudal rami, inclined toward each other, and lacking reinforcement ribbons
..... *N. alta* Kabata, 1992
 - Egg sacs lateral to trunk, almost reaching the bases of the maxillae anteriorly, just reaching tips of caudal rami posteriorly, parallel to each other, and lacking reinforcement ribbons ..
..... *N. vermiformis* Rangnekar, 1956
- 11 – Egg sacs posterolateral, without reaching the bases of the maxillae anteriorly, overreaching the tips of the caudal rami, inclined toward each other, and with 3 reinforcement ribbons per sac *N. scorpaenea* Dojiri, 1981

- Egg sacs lateral to trunk, reaching the bases of the maxillae anteriorly, overreaching the tips of the caudal rami posteriorly, slightly inclined toward each other, and with 3 reinforcement ribbons per sac *N. pritchardae* Kensley & Grindley, 1973
- 12 – Maxillae short, not totally fused to bases near the tips, with three muscle bands
 *N. cygniformis* Hesse, 1863 [syn. *N. amplexens* (Kurz, 1877)]
- Maxillae as long as trunk, totally fused to bases, with undistinguished number of bands . . .
 *N. sargi* Nuñez-Ruivo, 1963

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