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FOUR NEW SPECIES OF *Neobrachiella* (COPEPODA : LERNAEOPODIDAE), PARASITIC ON *Sciaena* GENUS (TELEOSTEI : SCIAENIDAE) IN THE SOUTH PACIFIC

CUATRO ESPECIES NUEVAS DE *Neobrachiella* (COPEPODA : LERNAEOPODIDAE) PARASITANDO SOBRE EL GENERO *Sciaena* (TELEOSTEI : SCIAENIDAE) EN EL PACIFICO SUR

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ABSTRACT

Four new species (**Neobrachiella oralis** n. sp., **N. auriculata** n. sp., **N. fasciata** n. sp. and **N. dispar** n. sp.) all parasitic on fishes of the genus **Sciaena** from Antofagasta, South Pacific, coast of Chile, are described and illustrated. Three of these species share some morphological characteristics, indicating their close relationship. The fourth is distinctly dissimilar in the details of its appendages, as well as in its site preference.

This paper raises the number of species of **Neobrachiella** discovered in the South Pacific, particulary of those living on fishes of the family Sciaenidae. It points out the desirability of a more comprehensive study of this teleost family, a study that offers a possibility of establishing exact relationships among neobrachiellid copepods. This, in turn, could lead to a complete revision of **Neobrachiella**, by revealing characteristics other than the currently known gross morphology.

The paper discusses **Neobrachiella** parasitic on all know Sciaenidae. It includes also an identification key to all known females of **Neobrachiella**.

RESUMEN

Se describen e ilustran cuatro nuevas especies de **Neobrachiella** (**Neobrachiella oralis**; **N. auriculata**; **N. fasciata** y **N. dispar**) todas parasitando peces del Género **Sciaena**, en las costas de Antofagasta, Pacífico Sur, Chile. Tres de estas especies comparten algunas características morfológicas, que estarían indicando su estrecha relación. La cuarta se diferencia notoriamente por el detalle de sus apéndices.

El presente trabajo aumenta el número de **Neobrachiella** descubiertas en el Pacífico Sur, especialmente de aquellos que parasitan sobre peces de la familia Sciaenidae. Se indica además, la necesidad de efectuar estudios más amplios sobre esta familia de Teleosteos, que permitan establecer relaciones más precisas entre los copépodos neobrachielidos. Se discute también, los **Neobrachiella** parásitos sobre los Sciénidos conocidos. Se incluye, una clave para la identificación de las hembras de **Neobrachiella**.

KEY WORDS : Crustacea; parasitic copepods; taxonomy; fish parasites; new species; South Pacific.

INTRODUCCION

The parasitic copepods of the genus *Neobrachiella* Kabata, 1979 (Lernaeopodidae) appear to be scarce in the South Pacific along the coast of Chile. Only six species have been hitherto recorded from this region. Four of them had been described by earlier authors [(*N. appendiculata* (Kroyer, 1863); *N, chevreuxii* (van Beneden, 1891); *N. exilis* (Shiino, 1956) and *N. amphipacifica* (Ho, 1982)]; to these must be add *N. paralichthyos* Castro & Baeza, 1986 and *N. anisotremi* Castro & Baeza (in press). This apparent scarcity in the region of an otherwise abundant genus is more than likely due to the regrettable lack of adequate studies and observations. A genus abundant in species, all living on related host, can be used to study host-parasite relationships and parallel evolution of hosts and parasites (e.g. CRESSEY et al. 1983; KABATA and HO, 1981; HO, 1983). The authors have taken as their goal a study of such relationships between *Neobrachiella* and fishes of the family Sciaenidae. With this goal in mind, they set out to examine these fishes for the presence of *Neobrachiella* in the neighbourhood of Antofagasta, Chile.

This paper is a preliminary report, intended to describe and illustrate four new species of *Neobrachiella* found on *Sciaena gilberti* (Abbot, 1899) ; *S. deliciosa* (Tschudi, 1844) and *S. fasciata* (Tschudi, 1845). It also presents a general picture (gross morphology) of *Neobrachiella* living on Sciaenidae throughout the world and gives a key to identification of its species.

The methods used in this study were the same as those of CASTRO and BAEZA (1985). The key employs features of gross morphology of *Neobrachiella*, because in most instances the detailed structure of the appendages of its species has not been described. The work of BEN HASSINE and RAIBAUT (1978) was consulted for the details of *N. hostilis* (Heller, 1865)

In the key was not included *N. trichiuri* (Gnanamuthu, 1951) considered to be the same with *N. trichiuri* (Yamaguti, 1979). HO & DO, 1984 suggest treat them as geographic forms : a japanese *N. trichiuri trichiuri* and the indian *N. trichiuri indica.*

N. malabarica (Pillai, Prabha & Balaraman, 1982) was not included separately in the key by its close similarity with *N. lutiani* (Pillai, 1968), both species can be distinguished by the lack of a third posterior process on the trunk in *N. malabarica* (c.f. PILLAI, 1985).

Neobrachiella oralis sp. nov.
(Figs. 1 - 7)

Host : *Sciaena deliciosa* (Tschudi, 1844) (type) and *S. gilberti* (Abbot, 1899).

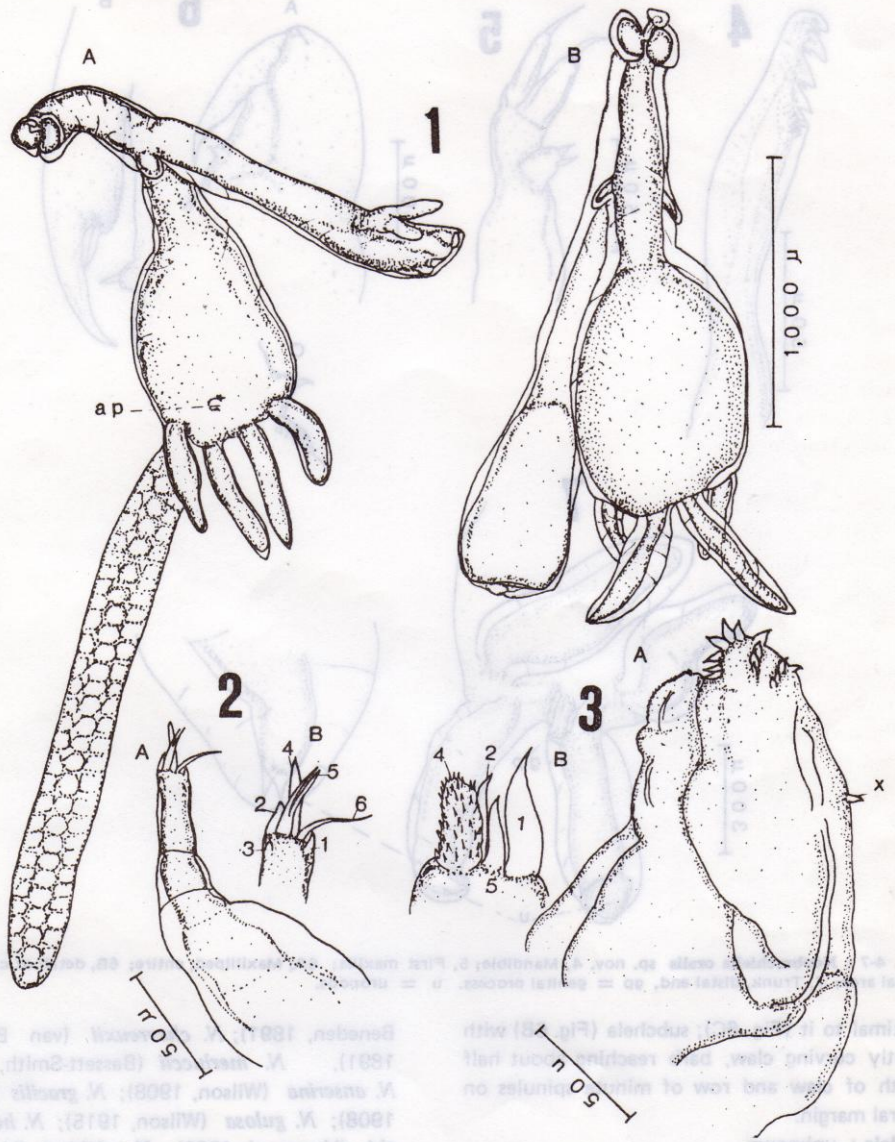
Habitat : Buccal and branchial cavity.

Locality : Antofagasta, Chile (23° 29′ S, 70° 25′ W).

Record of specimens : Eigth females were taken on Feb. 15, 1983; one on Jan. 8, 1980 (ovigerous). One female becames the holotype of the species and is deposited in Museo Nacional de Historia Natural, Santiago de Chile. Reg. Nº MNHN - CP 15079 (holotype); paratypes (2 females) Reg. Nº MNHN - CO 15080.

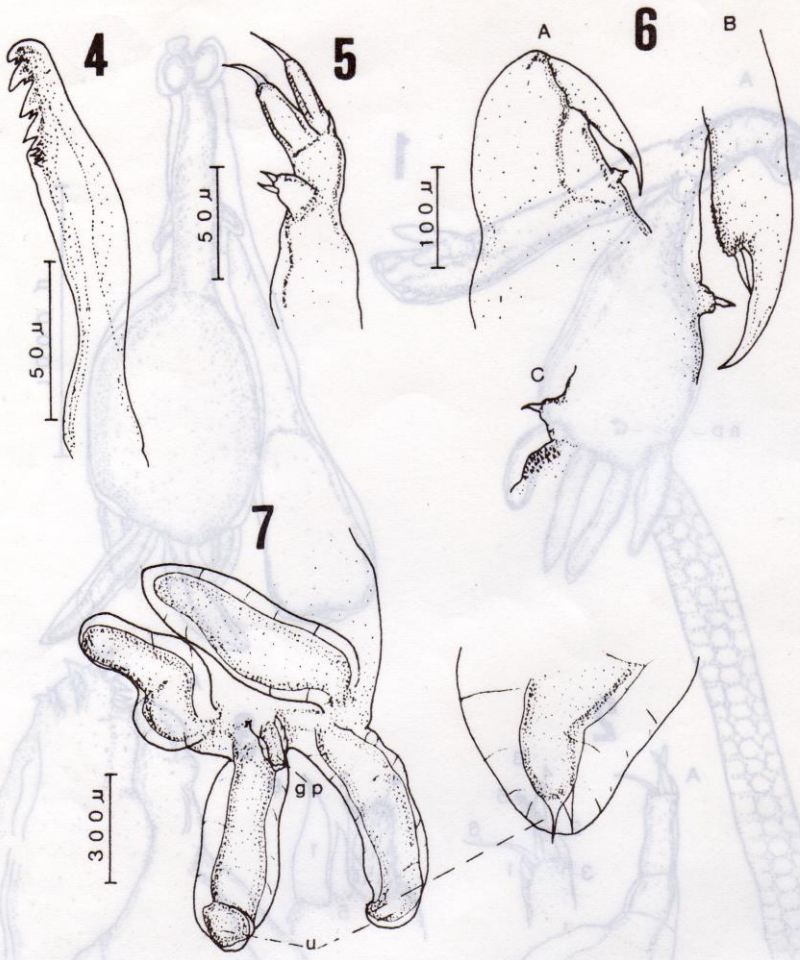
Description : Female (Figs. 1A, B). Cephalothorax long, subcylindrical, dorsal shield subtriangular. Trunk pyriform or suboval, shorter than cephalothorax, forming short, narrow neck at junction with cephalothorax; posterior margin with one pairs of ventral processes (uropods) (length about 46 % of trunk) and one of dorsal processes (length about 35 % of trunk, 78 % of uropods); perianal region displaced some distance to dorsal surface of trunk, slightly tumescent (ap. Fig. 1A); short genital process (gp, Fig. 7), difficult to observe, near posterior margin of trunk, between bases of uropods. Dimensions (based on eight specimens, in um) : Cephalothorax length 1,601 (1,272 – 1,939); width 391 (305 – 483). Trunk length 1,294 (1,046 – 1,636) Second maxilla length 791 (547 – 853); width 269 (103 – 363). Dorsal process length 465 (242 – 628); width 162 (128 – 177). Ventral process length 592 (402 – 788); width 152 (112 – 177); Egg sacs length 2,374 (1,212 – 3,636); diameter 292 (241 – 363).

First antenna (Figs. 2A,B) apparently four–segmented, basal two segments fused, terminal shortest, apical armature (Fig. 2B) with tubercles (1) and (3), complex, bifid seta (5) digitiform seta (4) and slender seta (6). Second antenna (Figs. 3A, B) characteristic for *Neobrachiella*, with two–segmented endopod (Fig. 3B); apical armature comprising ventral, densely spinulated process (4), reduced hook (1) and spini-



Figs. 1-3 : **Neobrachiella oralis** sp. nov. 1A, Female N. oralis, dorsal view; 1B, ventral view; 2A, First antenna, entire; 2B, apical armature; 3A, second antenna, entire; 3B, endopod armature.

form processes (2) and (5); exopod (Fig. 3A) globose, with short spine (x) on its dorsomedial margin, distal surface with three rows of sturdy spines. Mandible (Fig. 4) with dental formula P1S1, P1S1, P1S1, B5. First maxilla with ventral exopod bearing two short setae; endopod with two apical, setiferous papillae and short seta at base of dorsal papilla; no spinulation observed. Second maxilla (Fig. 1) about half length of cephalothorax, completely fused. Maxilliped (Figs. 6A-C) corpus robust, myxal area with small, spiniferous prominence and spinulated pad



Figs. 4-7 : **Neobrachiella oralis** sp. nov. 4, Mandible; 5, First maxilla; 6A, Maxilliped, entire; 6B, detail of claw; 6C, myxal area; 7, Trunk, distal end. gp = genital process. u = uropods.

proximal to it (Fig. 6C); subchela (Fig. 6B) with slightly curving claw, barb reaching about half length of claw and row of minute spinules on ventral margin.

Male : unknown.

Etymology : The specific name, ***oralis*** (from Latin os = mouth) refers to one of the sites of preference of this species.

Remarks : To determine the identity of the specimens described above, they must be compared with all the species of ***Neobrachiella*** bearing two pairs of posterior processes. This group consists of 25 species : *N.* ***appendiculosa*** (Kroyer, 1863); *N.* ***appendiculata*** (Kroyer, 1863); *N.* ***insidiosa*** (Heller, 1865); *N.* ***chavesii*** (van Beneden, 1891); *N.* ***chevreuxii*** (van Beneden, 1891), *N.* ***merluccii*** (Bassett-Smith, 1896); *N.* ***anserina*** (Wilson, 1908); *N.* ***gracilis*** (Wilson, 1908); *N.* ***gulosa*** (Wilson, 1915); *N.* ***hoplognathi*** (Yamaguti, 1939); *N.* ***trichiuri*** (Yamaguti, 1939); *N.* ***rotunda*** (Pearse, 1952); *N.* ***suplicans*** (Barnard, 1955); *N.* ***indica*** (Tripathi, 1959); *N.* ***dentici*** (Nunes-Ruivo, 1962); *N.* ***otolithi*** (Pillai, 1962); *N.* ***albida*** (Rangnekar, 1965); *N.* ***lutiani*** (Pillai, 1968); *N.* ***regia*** (Lewis, 1967); *N.* ***lata*** (Song and Chen, 1976); *N.* ***yonxingensis*** (Song and Chen, 1976); *N* ***richiardii*** (Ben Hassine and Raibaut, 1978); *N.* ***brevicapita*** (Ho and Do, 1984); *N.* ***anisotremi*** (Castro and Baeza, in press) and *N.* ***paralichthyos*** (Castro and Baeza, 1986).

Nine species of this group cannot be conspecific with the newly proposed taxon because their second maxilla are much reduced (less than a half of cephalothorax length). This group comprises N. ***appendiculata; N. hostilis; N. chevreuxii; N. gulosa; N. trichiuri; N. otilithi; N. indica; N. anisotremi; N. paralichthyos*** and ***N. dentici.***

Another 11 species must be excluded because their second maxilla are about as long as, or longer than cephalothorax (***N. insidiosa; N. anserina; N. gracilis; N. hoplognathi; N. suplicans; N. albida; N. indica; N. regia; N. yonxingensis*** and ***N. brevicapita).***

Only five species share with ***N. oralis*** the length of the second maxilla (about a half of cephalothorax length) : ***N. appendiculosa; N. merluccii; N. rotunda; N. lata*** and ***N. chavesii.***

N. appendiculosa is easily differentiated from the new species by the shape of its trunk, by longer ventral processes (uropods) and by the absece of fusion of its second maxilla (fused in ***N. orallis***). ***N. merluccii*** differs from the new species by its subquadrangular trunk, by the length of the posterior processes (longer than trunk in ***N. merluccii***, only about half of trunk's length in ***N. oralis***). They can also be distinguished by the length of the genital process (well-developed in ***N. merluccii***, minute in ***N. oralis***).

N. rotunda differs from the new species principally in the shape of the trunk (subcircular in ***N. rotunda***, pyriform in ***N. oralis***).

N. lata can be differentiated from the new species by the length of its cephalothorax (longer than trunk in ***N. oralis***, shorter in ***N. lata***), as well by the exopod of the second antenna.

N. chavesii is distinguishable from the new species by the shape of its trunk, the length of the posterior processes (longer than trunk in ***N. chavessi***, only half of trunk's length in ***N. oralis***), as well as by the condition of the second maxilla (separate from each other in ***N. chavesii***, fused in ***N. oralis***).

A unique characteristic of the new species is the presence of a stout seta (x, Fig, 3A) on the exopod of the second antenna. No other species of *Neobrachiella* has been reported to have such seta. In view of the fact that the genital process of many species tends to vary in length, it is important to note that no length variations of this process were observed in nine specimens of ***N. oralis*** examined by the authors.

Neobrachiella auriculata sp. nov.
(Figs. 8 - 27)

Hots : ***Sciaena gilberti*** (Abbott, 1899) (type), vernacular name "corvina" and ***S. deliciosa*** (Tschudi, 1844), vernacular name "corvinilla".

Habitat : Gill filaments.

Locality : Antofagasta (23° 29′ S; 70° 25′ W).

Record of specimens : (from ***S. gilberti***) one juvenile female was taken on 27 Feb. 1984; nine juvenile and 69 ovigerous females on 16 Aug. 1984. From ***S. deliciosa***, seven females on 25 Jan. 1984. The specimens were deposited in the Museo Nacional de Historia Natural de Santiago de Chile. Holotype female, Reg. Nº MNHN-CP 15074; paratype female (5), Reg. Nº MNHN- CP 15075.

Description : Female (Figs, 8A-C) Cephalothorax elongate, shorter than trunk, head with conspicuous dorsal shield (Fig. 18). Trunk oblong, with shallow constriction near its junction with cephalothorax; posterior margin with one pair of dorsal processes (Fig. 16), 57 % trunk's length; modified uropods present, length of posterior processes in relation to that of uropods varying with age (in young female 73 - 95 % of uropod length) in mature females equal to, or greater than that of uropods (Fig. 17). Genital area (Fig. 16) with short genital process (gp. Fig. 16), length of process constant in all specimens examined; rounded tubercle with anal slit (ap, Figs. 8C and 16) on dorsal surface of trunk, proximal to genital process.

Dimensions, based on 50 adult females, in um: Cephalothorax length 2,277 (2,000 – 2,545); width 356 (242 – 485). Trunk length 3,207 (2,848 – 3,818); width 1,393 (970 – 1,454). Second maxilla length 906 (606 – 1,212); width 308 (242 – 364). Genital process length 385 (242 – 545); width 234 (182 – 364). Uropod length 1,503 (1,091 – 1,757); width 204 (182 – 242). Posterior process length 1,273 (1,030 – 1,576); width 205 (182 – 242). Eggs sacs length 3,265 (1,939 – 5,272); diameter 461 (303 – 727).

First antenna (Figs. 10A–C) apparently four–segmented, two basal segments fused, third shortest; apical armature (Figs. 10B-C) comprising stout digitiform process (4) complex (5) and slender seta (6), in addition to tubercles (1) and (2), tubercle (3) apparently replaced by slender

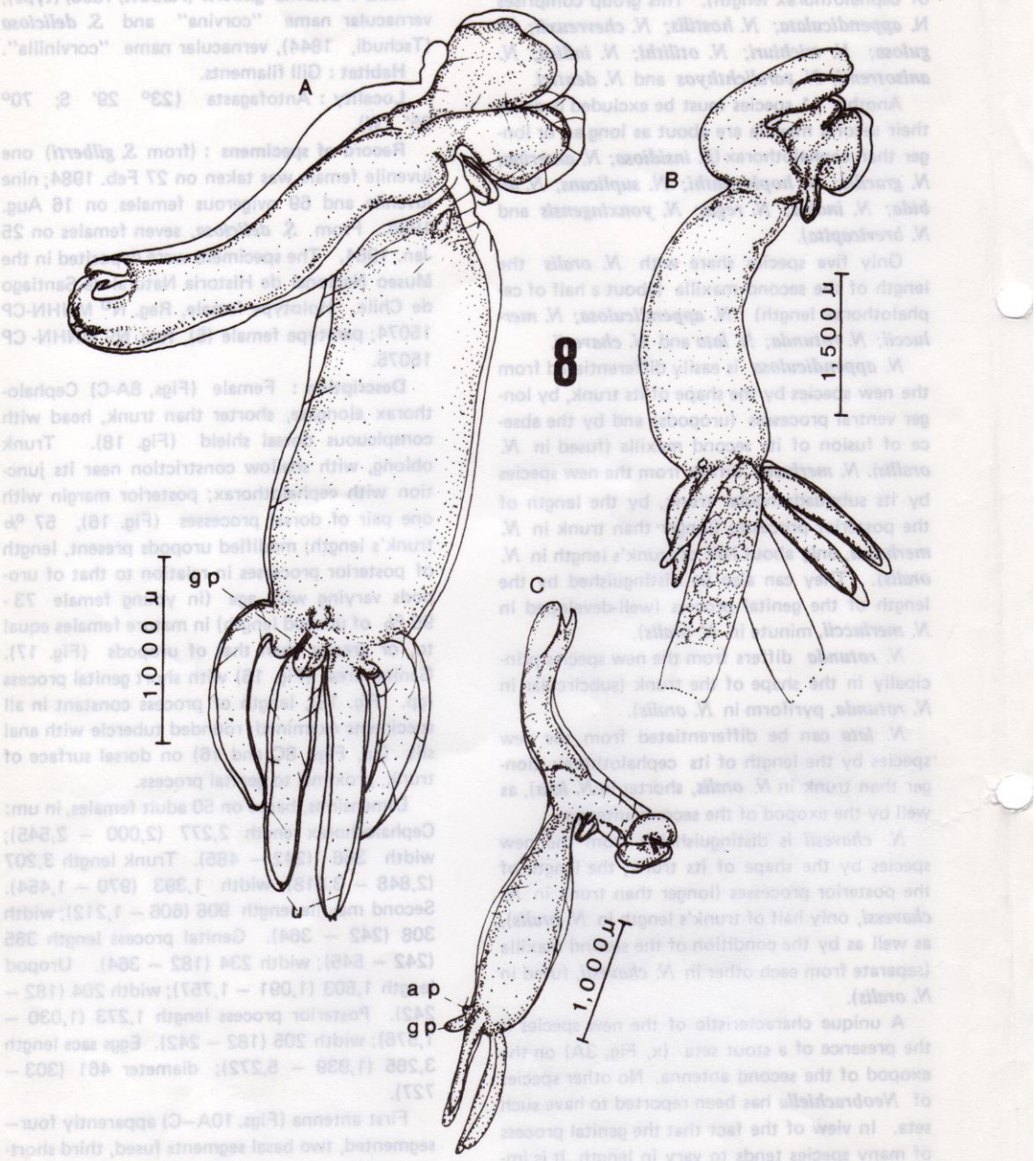
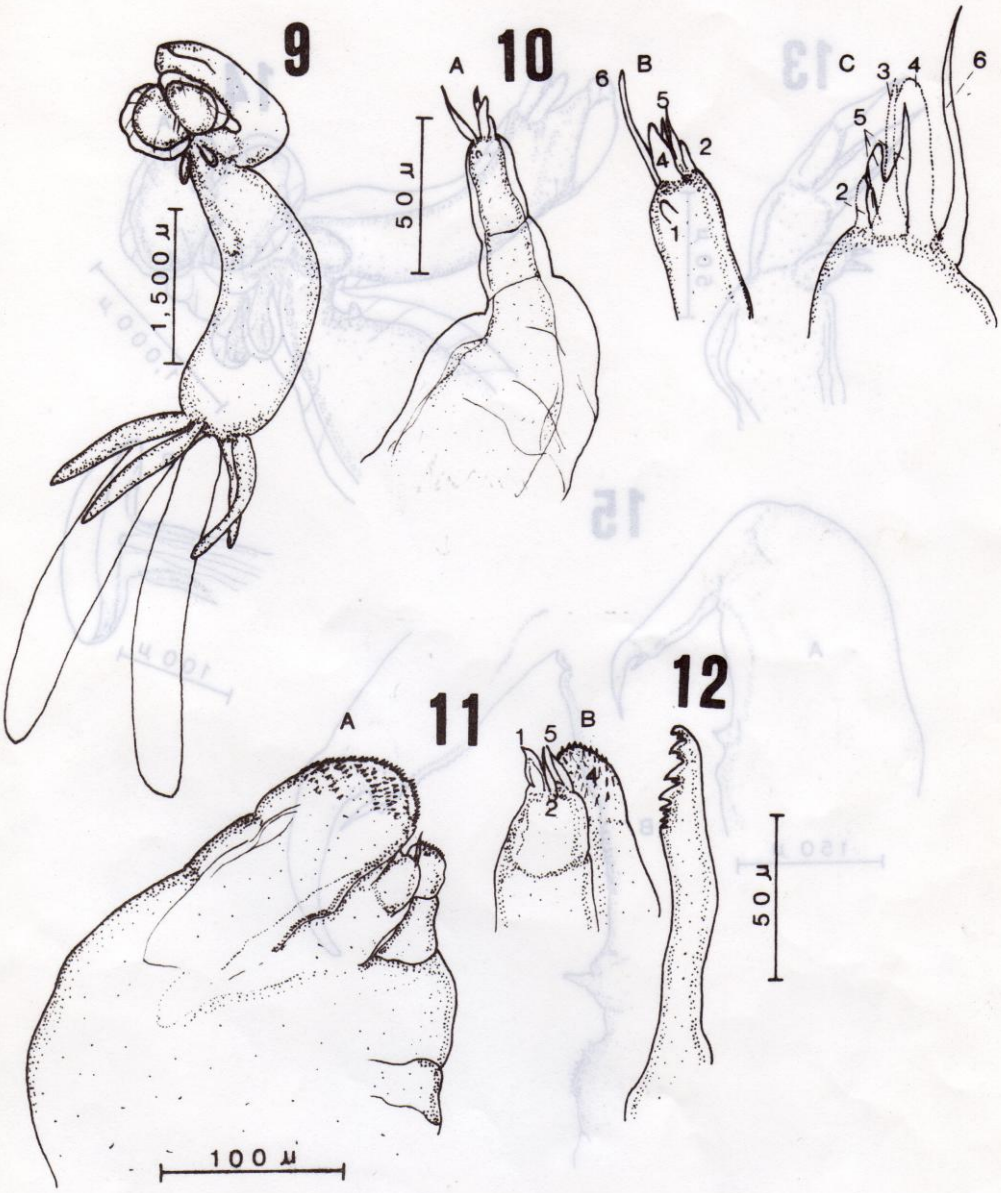
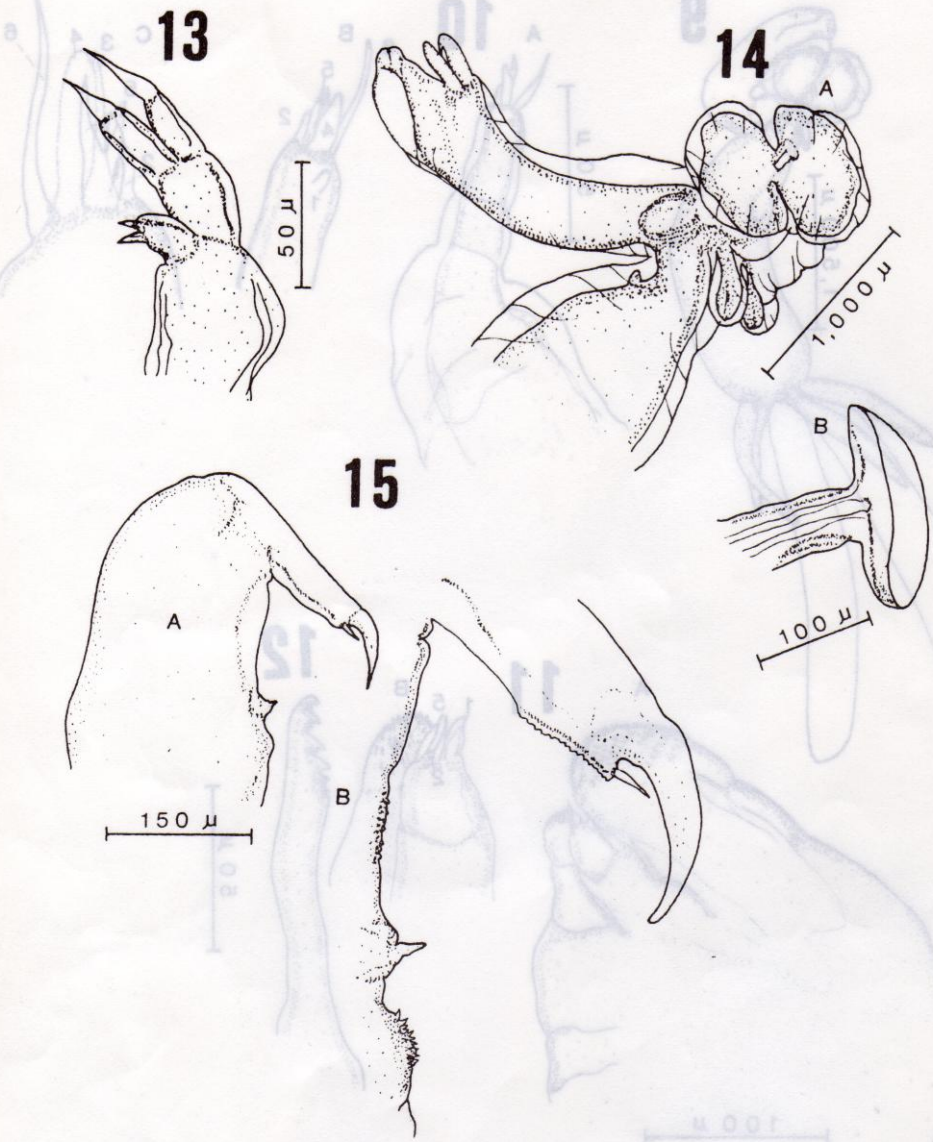


Fig. 8 : Female of **Neobrachiella auriculata** sp. nov.; 8A, Female **N. auriculata**, dorsal; 8B, lateral view; 8C, lateral view juvenil. gp = genital process. u = uropods.



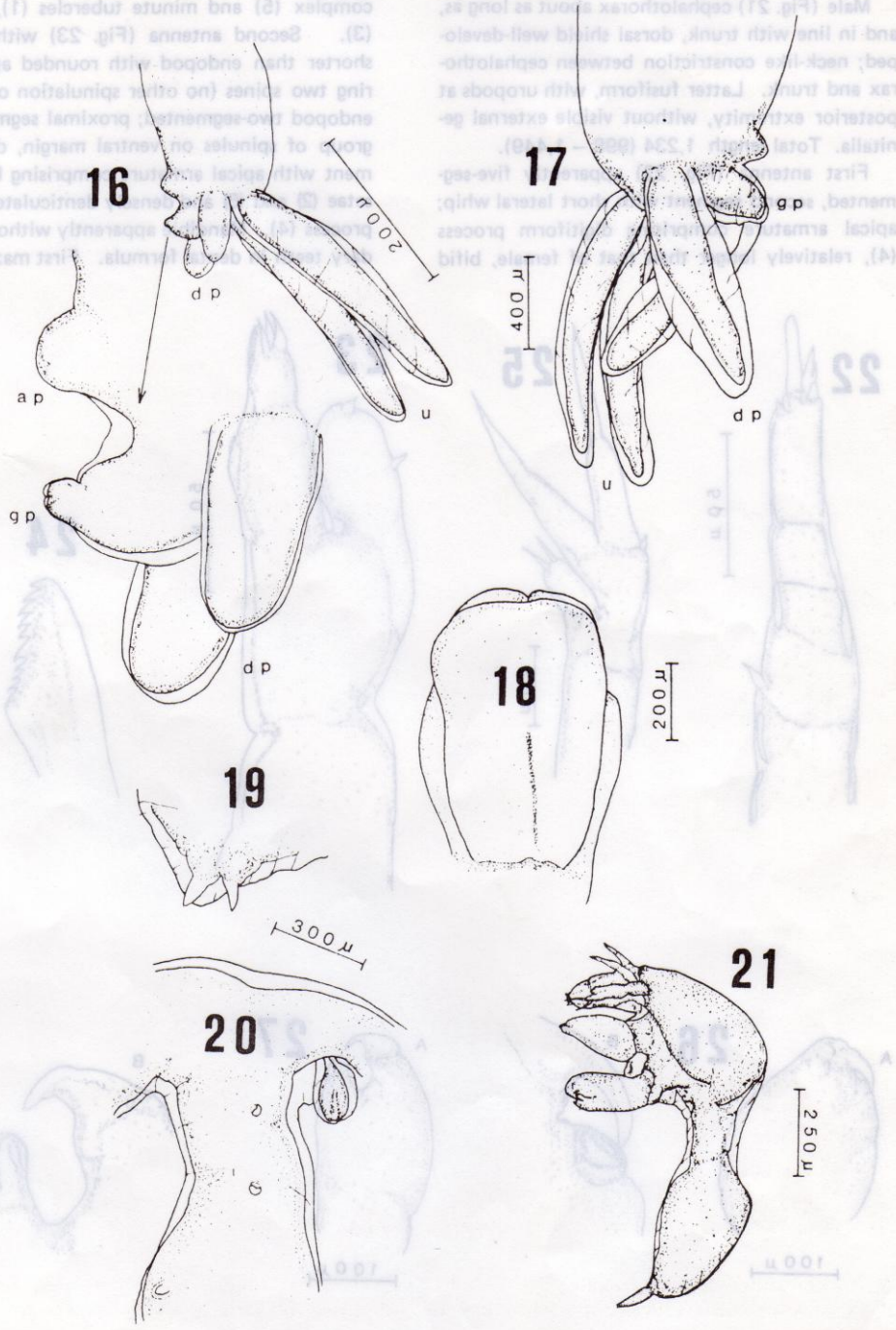
Figs. 9-12 : Female of **Neobrachiella auriculata** sp. nov.; 9, Female adult, ventral; 10A, First antenna, entire; 10B, apical armature; 10C, different view; 11A, Second antenna, entire; 11B, endopod, apical armature; 12, Mandible.

seta. Second antenna with sympod-exopod long axis; endopod two-segmented (Fig. 11B), armed with inflated, spinulated ventral process (4), spines (5) and (2), as well as with reduced hook (1); exopod (Fig. 11A) with distal surface densely spinulated, spinules arranged in characteristic rows Mandible (Fig. 12) with dental formula P1S1, P1S1, P1S1, B5. First maxilla (Fig. 13) with ventrolateral exopod tipped with two short setae; endopod with two terminal setiferous papillae; no



Figs. 13-15 : Female of **Neobrachiella auriculata** sp. nov.; 13, First maxilla; 14A, Cephalothorax , second maxilla; 14B, bulla; 15A, Maxilliped, entire; 15B, detail of myxal area and claw.

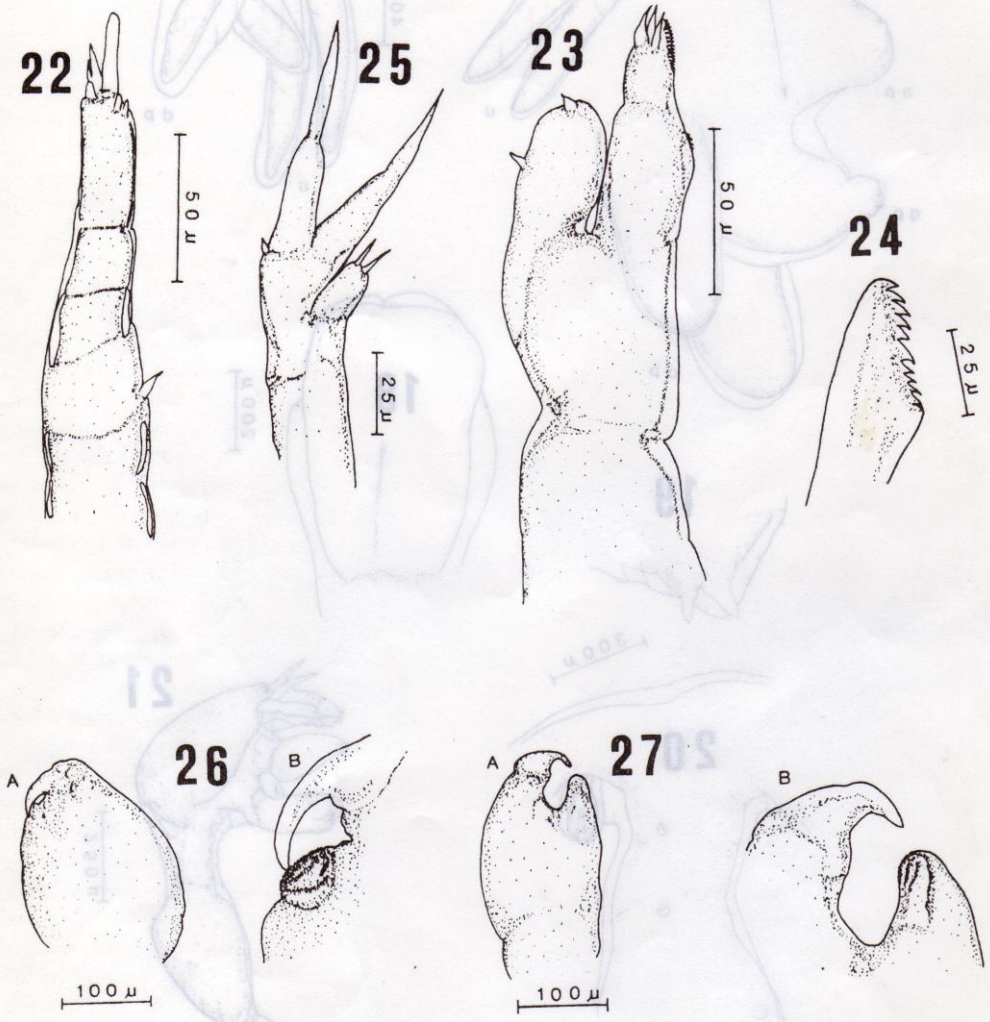
spinulation visible. Second maxilla (Figs. 14A, B) short, with large collars (**in situ** applied to surface of gill filaments); nipple-like orifices of excretory ducts prominent, clearly sean in lateral and ventral aspect (Figs. 14, 20). Bulla (Figs. 14B) with short manubrium and mashroom-shaped anchor. Maxilliped (Figs. 15 A, B) with corpus strong, myxal area with two patches of spinules and small setiferous swelling between them (Fig. 15B); subchela with slightly curving claw, barb at base of claw and serrated fringe proximal to it on inner margin of subchela (Fig. 15B).



Figs. 16-21. Female and male of **Neobrachiella auriculata** sp. nov.; 16, Juvenil female. ap = anal process. dp = dorsal process. u = uropods; 17, Adult female, showing portion of genital area and anal process. gp = genital process. dp = dorsal process. u = uropods.; 18, Dorsal shield; 19, Uropods armature; 20, Trunk, detail lateral view; 21, Male, lateral view.

Male (Fig. 21) cephalothorax about as long as, and in line with trunk, dorsal shield well-developed; neck-like constriction between cephalothorax and trunk. Latter fusiform, with uropods at posterior extremity, without visible external genitalia. Total length 1,234 (998 – 1,449).

First antenna (Fig. 22) apparently five-segmented, second segment with short lateral whip; apical armature comprising digitiform process (4), relatively longer than that of female, bifid complex (5) and minute tubercles (1), (2) and (3). Second antenna (Fig. 23) with exopod shorter than endopod with rounded apex, bearing two spines (no other spinulation observed); endopod two-segmented; proximal segment with group of spinules on ventral margin, distal segment with apical armature comprising hook (1), setae (2) and (5) and densely denticulated ventral process (4). Mandible apparently without secondary teeth in dental formula. First maxilla (Fig.



Figs. 22-27 : Male of **Neobrachiella auriculata** sp. nov.; 22, First antenna; 23, Second antenna; 24, Mandible; 25, First maxilla; 26A, Second maxilla, entire; 26B, detail of adhesion surface; 27A, Maxilliped, entire; 27B, Datail of adhesion surface.

25) ventral exopod, similar to female appendage. Second maxilla (Figs.26 A,B) with robust corpus with spinulated adhesive surface on distal inner margin (Fig. 26B), subchela short, unarmed. Maxilliped (Figs. 27 A, B) with prominent myxal area equipped with spinulated ridges; subchela short, hooked, unarmed.

Etymology : The specific name ***auriculata*** (from Latin ***auris*** = ear) refers to great size of maxillary collars, giving maxilla earlike appearance.

Remarks : To determine the intrageneric position of this species, one must compare it with 11 species of *Neobrachiella* characterized by possession of two pairs of posterior processes and second maxilla less than half legth of the cephalothorax. The group consist of *N. appendiculata; N. hostilis; N. chevreuxii; N. gulosa; N. trichiuri; N. dentici; N. otolithi; N. lutiani; N. richiardii; N. anisotremi* and *N. paralichthyos.*

N. appendiculata can be distinguished from *N. auriculata*, with wich it shares the shape of the trunk, by it relatively shorter uropods and the structure of the second maxilla. The claw of the maxilliped of *N. appendiculata* is equipped with a secondary denticle, while no such denticle is present in *N. auriculata.*

N. auriculata differs from *N. hostilis* (fide BEN HASSINE AND RAIBAUT, 1978) in the shape of the trunk and the second maxilla and by the position of the posterior processes (pointing dorsal in *N. auriculata* but not in *N. hostilis*). Other differences can be found in the armature of the second antenna and the first maxilla.

N. chevreuxii can be easily distinguished from the new species by the shape of the trunk, relative length of the genital process and the posterior processes (longer than trunk in *N. chevreuxii*, shorter in *N. auriculata*).

N. gulosa differs from the present species by the length of its cephalothorax (longer than trunk in *N. gulosa*, shorter in the new species) by the structure of its second maxilla and the relative length of the posterior processes (about equal to that of trunk in *N. gulosa* and only a half of its length in *N. auriculata*).

N. trichiuri can be distinguished from the new species by the shape of its trunk, the relative length of its posterior processes (2/3 length of, to longer than, trunk in *N. trichiuri*, only a half of trunk's length in *N. auriculata*) by the structure of the second maxilla, dental formula of mandible and the myxal area of the maxilliped.

N. dentici is differentiated from the new species by the shape of the trunk (transversely oval in *N. dentici*, oblong in the new species), as well as by the relative length of its posterior processes (equal to trunk's in *N. dentici*, shorter than that of trunk in *N. auriculata*).

N. otolithi differs from *N. auriculata* by the shape of the trunk, the structure of the tips of second maxilla and by the relative length of the cephalothorax (longer than trunk in *N. otolithi*, equal to trunk's length in *N. auriculata).*

N. lutiani cannot be conspecific with the new species, because of its bifid genital process (simple in *N. auriculata*) the relative length of the posterior processes (longer than trunk in *N. lutiani* only a half of trunk's length in *N. auriculata*), as well as by the structure of the second maxilla.

N. richiardii differs from the present species in the length of its genital process (about twice that of the ventral processes in *N. richiardii*, reduced in the new species) and in the endopod of the first maxilla.

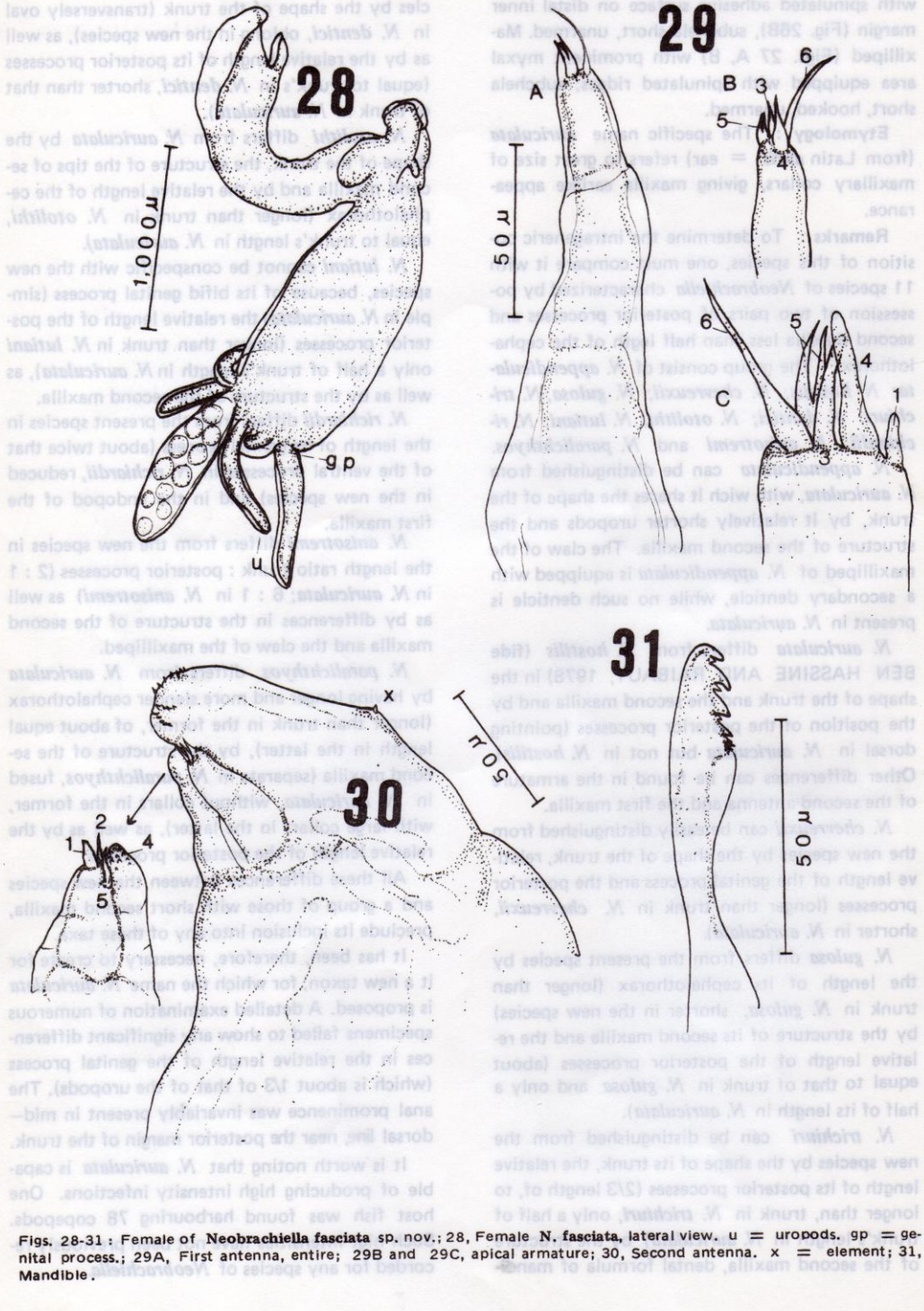
N. anisotremi differs from the new species in the length ratio trunk : posterior processes (2 : 1 in *N. auriculata*; 6 : 1 in *N. anisotremi*) as well as by differences in the structure of the second maxilla and the claw of the maxilliped.

N. paralichthyos differs from *N. auriculata* by having longer and more slender cephalothorax (longer than trunk in the former, of about equal length in the latter), by the structure of the second maxilla (separate in *N. paralichthyos*, fused in *N. auriculata*, without collars in the former, with large collars in the latter), as well as by the relative length of the posterior processes.

All these differences between the new species and a group of those with short second maxilla, preclude its inclusion into any of these taxa.

It has been, therefore, necessary to create for it a new taxon, for which the name *N. auriculata* is proposed. A detailed examination of numerous specimens failed to show any significant differences in the relative length of the genital process (which is about 1/3 of that of the uropods). The anal prominence was invariably present in mid–dorsal line, near the posterior margin of the trunk.

It is worth noting that *N. auriculata* is capable of producing high intensity infections. One host fish was found harbouring 78 copepods. Such higt intensities have not been previously recorded for any species of *Neobrachiella.*



Figs. 28-31 : Female of **Neobrachiella fasciata** sp. nov.; 28, Female **N. fasciata**, lateral view. u = uropods. gp = genital process.; 29A, First antenna, entire; 29B and 29C, apical armature; 30, Second antenna. x = element; 31, Mandible.

Neobrachiella fasciata sp. nov.
((Fig.s 28 – 43)

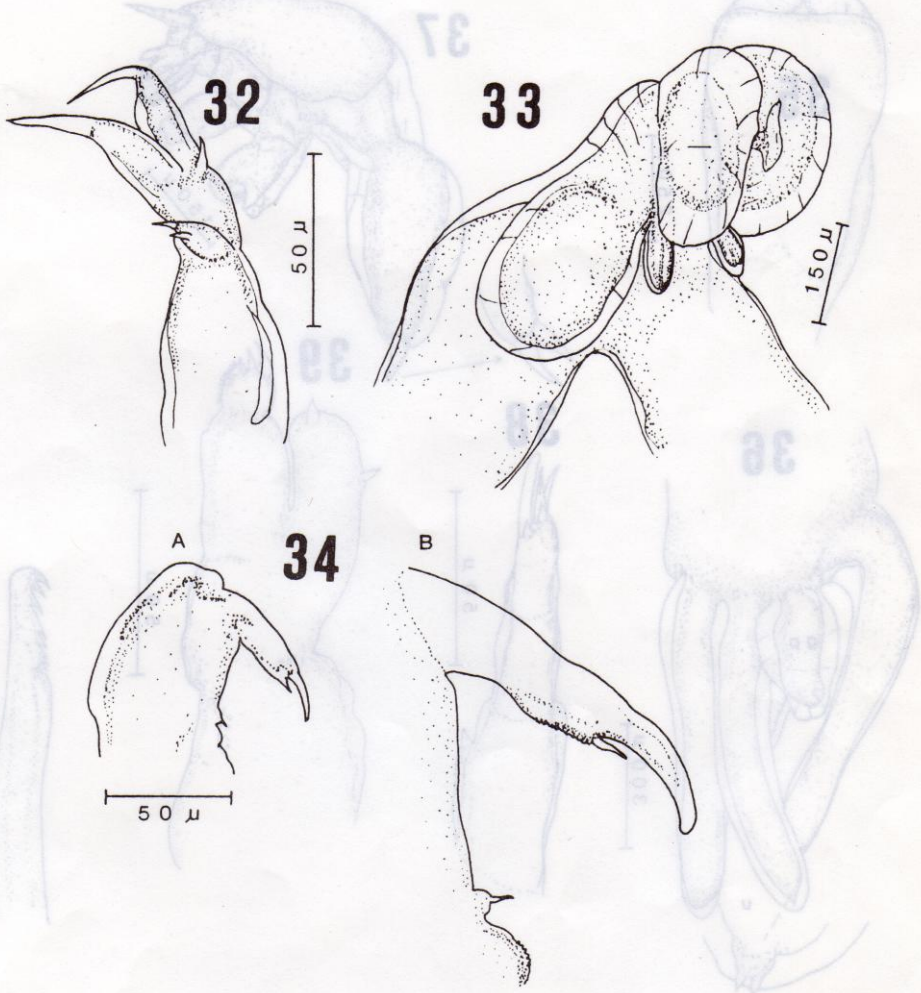
Host : ***Sciaena fasciata*** (Tschudi, 1845), vernacular name "roncacho".

Habitat : Gill arches and filaments.

Locality : Antofagasta (23° 29′ S; 70° 25′ W)

Record of specimens : Seven adult females were taken on 17 Jan. 1984. The specimens were deposited in the Museo Nacional de Historia Natural de Santiago de Chile. Holotype female, Reg. Nº MNHN-CP 15076; paratype female, Reg. Nº MNHN-CP 15077.

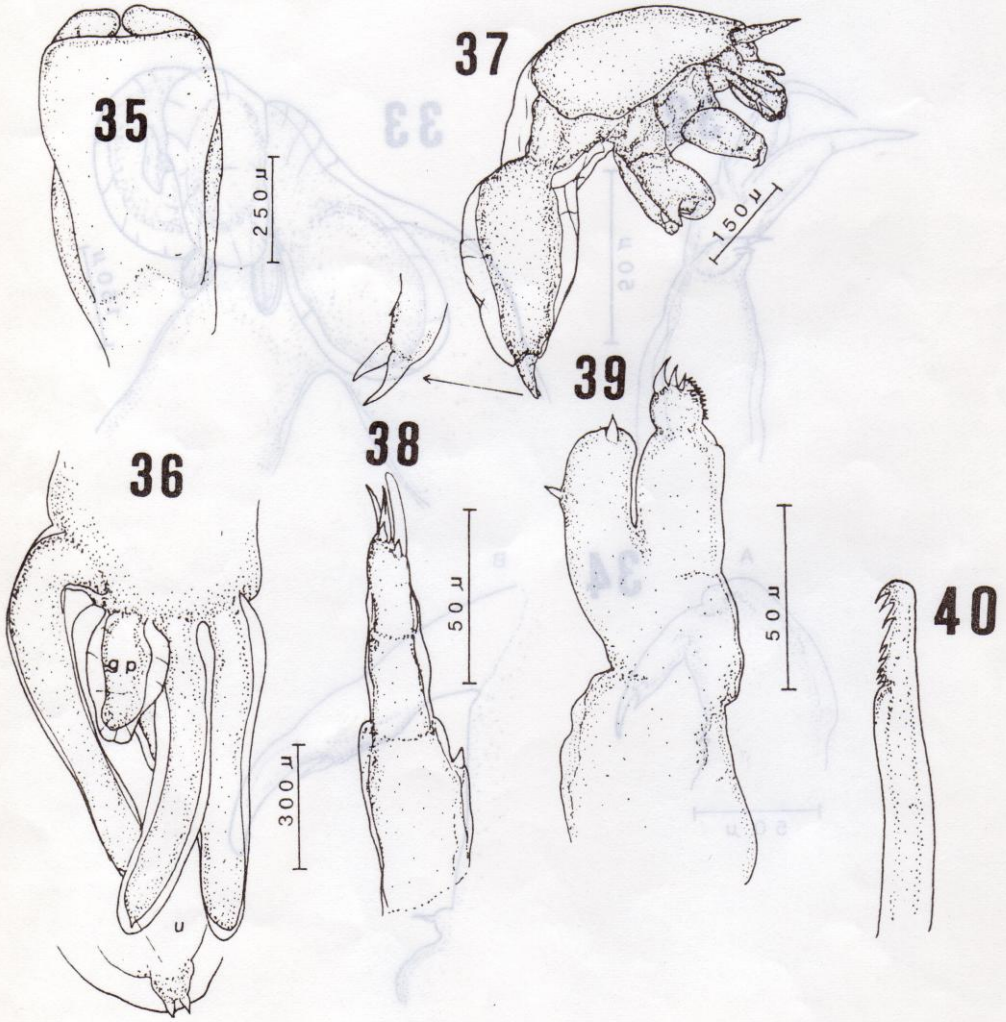
Description : Female (Fig. 28). Cephalothorax about as long as trunk, with conspicuous dorsal shield (Fig. 35), wider anteriorly. Trunk oblong, longer than wide, distally bearing modified uropods and with genital process between them, of variable length but generally shorter than uropod (Fig. 36); also present one pair of dorsal processes, shorter than uropods (length of dorsal processes 68 % of that of trunk, length of uropod 52 % of that of trunk, about 77 % of that of dorsal processes). Egg sacs short, containing 11 – 14 eggs each.



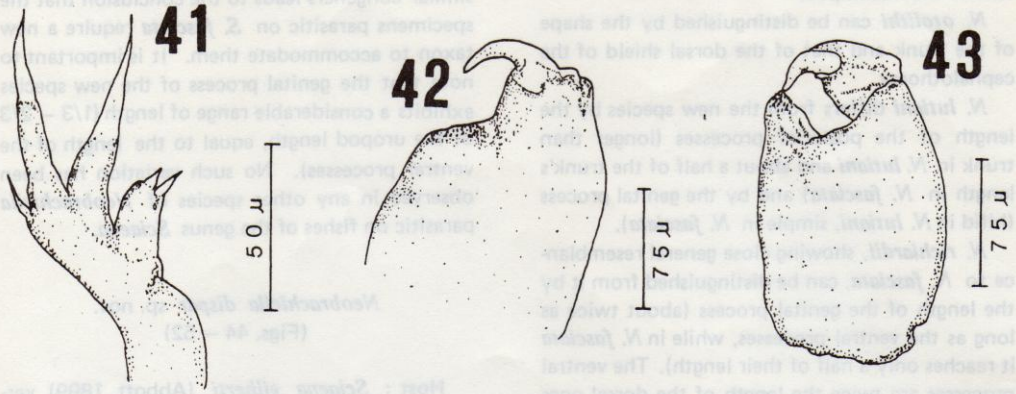
Figs. 32-34 : Female of **Neobrachiella fasciata** sp. nov.; 32, First maxilla; 33, Second maxilla; 34A, Maxilliped, entire; 34B, myxal area.

Dimensions based on seven specimens, in um : Cephalothorax length 1,454 (1,272 – 1,636); width 242. Trunk length 1,379 (1,212 – 1,515); width 636 (606 – 666). Second maxilla length 483 (370 – 531); width 205 (193 – 209). Uropod length 728 (644 – 805); width 137 (129 – 145). Dorsal processes length 942 (692 – 1,159); width 129 (113 – 145). Genital process length 471 (306 – 708). Egg sacs length 1,078 – 1,969; diameter 322 – 242.

First antenna (Figs. 22A-C) apparently four–segmented; apical armature (Fig. 29B) consisting of digitiform seta (4), slender seta (6), bifid seta complex (5), as well as small tubercle (1) and seta in place of tubercle (3); tubercle (2) and gibber absent. Second antenna (Fig. 30); exopod with spinules arranged in rows on apical surface and dorsomedial spinule (x, Fig. 30); endopod distally armed with spinulated ventral process (4), reduced hook (1) and spines (2) and (5). Mandible (Fig. 31) with dental formula P1S1, P1S1, P1S1, B4. First maxilla (Fig. 32), endopod with two papillae bearing one terminal seta each, small seta at base of dorsal papilla; exopod ventrolateral,



Figs. 35-40 : Female and male of **Neobrachiella fasciata** sp. nov.; 35, Female dorsal shield; 36, Female trunk, distal end; ventral view. Posterior process. u = uropods. gp = genital process; 37, Male, lateral view and detail uropod armature; 38, First antenna; 39, Second antenna; 40, Mandible.



Figs. 41-43 : Male of **Neobrachiella fasciata** sp. nov.; 41, First maxilla; 42, Second maxilla; 43, Maxilliped.

short, tubercular, bearing at its apex two minute setae. Second maxilla (Figs. 28, 33) fused, short, with moderately developed collars and prominent nipples at orifices of maxillary ducts. Maxilliped (Fig. 34A, B), corpus strong, with myxal area bearing short, spine-tipped prominence and spinulated swelling proximal to it; subchella with slightly curved claw, short barb at its base and ventral margin of shaft bearing distally three rows of spinules.

Male (Fig. 37), cephalothorax about as long as trunk, with conspicuous dorsal shield, waist-like constriction between cephalothorax and trunk. Latter oblong, bearing distally uropods; external genitalia absent.

First antenna (Fig. 38) apparently three–segmented, basal segment with spiniform whip; distal segment with digitiform seta (4), simple seta (3) and spiniform tubercles (1) and (3). Second antenna (Fig. 39) biramous; exopod shorter than endopod, with two spiniform processes; endopod two–segmented, distal segment with three spiniform processes and ventral margin armed with single row of spinules. Mandible (Fig. 40) with dental formula not clearly determined (three distal primary teeth and five smaller basal teeth observed). First maxilla (Fig. 41) as in female. Second maxilla (Fig. 42) subchelate, basal segment bearing sparse spinulation on distal inner surface. Maxilliped (Fig. 43) corpus subrectangular, inner margin forming distally subtriangular, spinulated myxa.

Male : Unknown.

Etymology : The specific name ***fasciata***, refers to the specific name of the host.

Remarks : ***N. fasciata***, parasitic on ***Sciaena fasciata***, is a member of the same group as ***N. auriculata***, described above. To determine its distinctness one must, therefore, compare it with the same 11 species (with reduced second maxilla) to which ***N. auriculata*** must be added.

From ***N. appendiculata***, even though it resembles it closely in gross morphology, ***N. fasciata*** can be distinguished by its genital process (minute in ***N. appendiculata*** and well-developed in ***N. fasciata***). The two species differ from each other also in the structure of the maxilliped (the claw and myxal area).

N. chevreuxii differs from the new species by the shape of its trunk and by the posterior processes : trunk length ratio.

N. gulosa differs from ***N. fasciata*** by having cephalothorax longer than trunk (of about equal length in ***N. fasciata***). There are also differences in the length ratio posterior processes : trunk (processes slightly longer than trunk in ***N. gulosa*** and only a half of the trunk's length in ***N. fasciata***).

N. trichiuri can be separated from the new species by the length ratio second maxilla : cephalothorax, the tips of the second maxilla; length ratio posterior processes : trunk. Exopod of the second antenna; mandibular formula and the myxal area of the maxilliped.

N. dentici substantially differs from the new

species in the shape of its trunk and in the structure of the maxilliped.

N. otolithi can be distinguished by the shape of the trunk and that of the dorsal shield of the cephalothorax.

N. lutiani differs from the new species by the length of the posterior processes (longer than trunk in *N. lutiani* and about a half of the trunk's length in *N. fasciata*) and by the genital process (bifid in *N. lutiani*, simple in *N. fasciata*).

N. richiardii, showing close general resemblance to *N. fasciata*, can be distinguished from it by the length of the genital process (about twice as long as the ventral processes, while in *N. fasciata* it reaches only a half of their length). The ventral processes are twice the length of the dorsal ones in *N. richiardii*, whereas in *N. fasciata* both pairs are of about the same length. Differences are also present in the myxal area of the maxilliped.

N. anisotremi is distinguishable from the new species by the length of the trunk and by the length ratio posterior process : trunk . There are also diferrences in the structure of the second antenna and the claw of the maxilliped.

N. paralichthyos differs from *N. fasciata* by the slender cephalothorax, longer than trunk (the two tagmata are of about equal length in *N. fasciata*) and by the second maxilla (separated in *N. paralichthyos*, fused in the new species). Differences also exist in the armature of the first and second antennae and the myxal area of the maxilliped.

From *N. auriculata* the new species can be differentiated by the shape of the second maxilla (with large collars in the former, without them in the latter), by differences in the armature of the first and second antennae and by dorsal position of anal swelling (terminal in *N. fasciata*).

Finally, *N. hostilis* bears a close similarity to the new species (**fide** BEN HASSINE and RAIBAUT, 1978). The two species have reduced second maxilla and share the shape of the cephalothorax. Both have genital process of apparently variable length. They can be distinguished from each other by the shape of the trunk (subcircular in *N. hostilis* and more oblong in the present species). The morphology of the male uropods is also a good discriminant (= caudal rami of BEN HASSINE and RAIBAUT, 1978; Pl.I. Fig. F). In *N. hostilis* the inner spine at the base of the uropod is bifid, in *N. fasciata* it is simple (cf. Fig. 37).

The comparison of our material with closely similar congeners leads to the conclusion that the specimens parasitic on *S. fasciata* require a new taxon to accommodate them. It is important to note that the genital process of the new species exhibits a considerable range of length (1/3 – 2/3 of the uropod length, equal to the length of the ventral processes). No such variation has been observed in any other species of *Neobrachiella* parasitic on fishes of the genus *Sciaena*.

Neobrachiella dispar sp. nov.
(Figs. 44 – 52)

Host : *Sciaena gilberti* (Abbott, 1899), vernacular name "corvina".

Habitat : Dorsal fin.

Locality : Antofagasta (23° 29' S; 70° 25' W).

Record of specimens : One damage, adult females and one whole, ovigerous female. The specimens were deposited in Museo Nacional de Historia Natural de Santiago de Chile. Holotype Reg. Nº MNHN-CP 15078.

Description : Female (Figs. 44, 45). Cephalothorax cylindrical, measuring about 78 % of trunk's length; dorsal shield (Fig. 46) conspicuous.

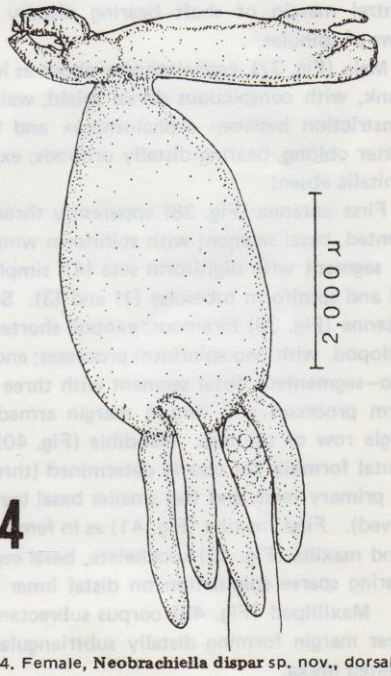
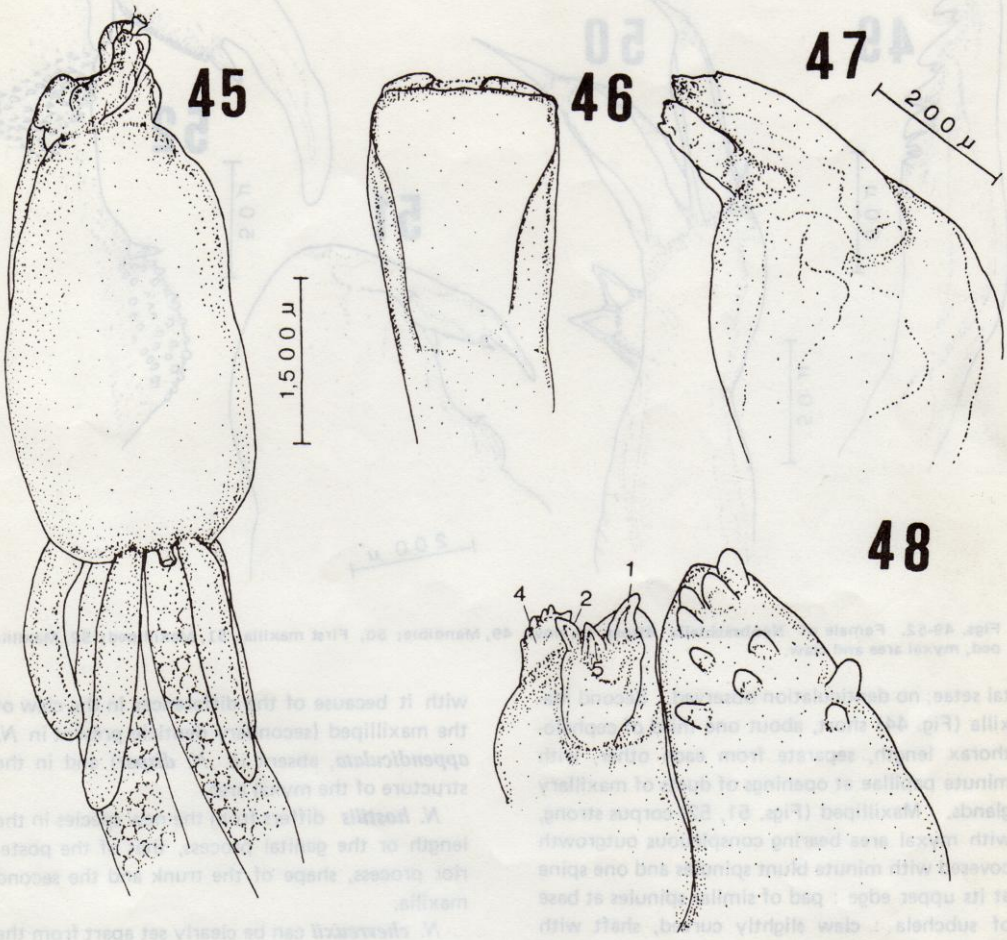


Fig. 44. Female, **Neobrachiella dispar** sp. nov., dorsal view.

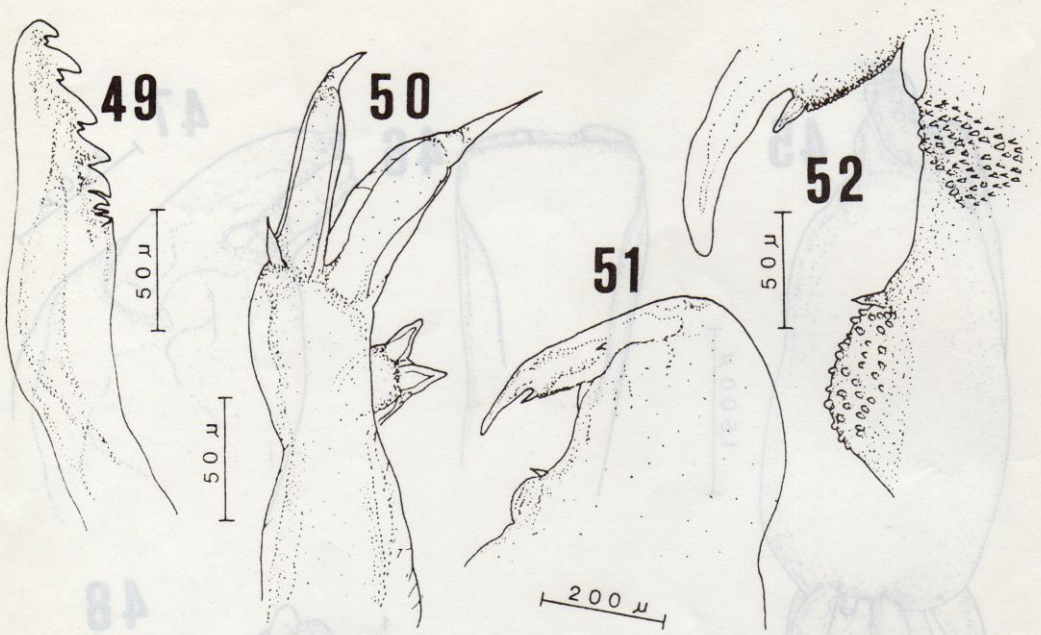


Figs. 45-48. Female of **Neobrachiella dispar** sp. nov.; 45, Female, ventral view; 46, Dorsal shield; 47, Second antenna, entire; 48, Second antenna, apical armature.

Trunk oblong with shallow constriction at junction with cephalothorax, two pairs of posterior processes, modified uropods slightly longer than dorsal processes, length of uropods reaching 63 % of that of trunk : genital process minute subcylindrical outgrowth (Fig. 45).

Dimensions based on single specimens,in um: Cephalothorax length 3.28 ; width 1.03. Trunk length 4.18; width 2.48. Uropod length 2.66; width 0.36. Dorsal process length 2.48; width 0.35. Genital process length 0.24; width 0.24. Second maxilla length 1.27; width 0.48.

First antenna damaged. Second antenna (Figs. 47, 48) sympod somewhat inflated; exopod in line with, slightly wider than, endopod, distal surface covered with minute papillae; endopod two–segmented (Fig. 48), its apical armature comprising reduced hook (1), seta (2) and (5) and short, lobular ventral outgrowth (4). Mandible (Fig. 49) with dental formula P1S1, P1S1, P1S1, B5; with first two basal teeth larger than other three. First maxilla (Fig. 50) endopod with two setiferous papillae and small seta at base of dorsal papilla; exopod ventral, with two dis-



Figs. 49-52. Female of **Neobrachiella dispar** sp. nov.; 49, Mandible; 50, First maxilla; 51, Maxilliped; 52, Maxilliped, myxal area and claw.

tal setae; no denticulation observed. Second maxilla (Fig. 44) short, about one third of cephalothorax length, separate from each other, with minute papillae at openings of ducts of maxillary glands. Maxilliped (Figs. 51, 52) corpus strong, with myxal area bearing conspicuous outgrowth covered with minute blunt spinules and one spine at its upper edge : pad of similar spinules at base of subchela : claw slightly curved, shaft with barb and several rows of minute spinules at distal inner margin (Fig. 52).

Etymology: The specific name (Latin *dispar* = distinct) refers to morphological differences between this species and other *Neobrachiella* parasitic on the members of the genus *Sciaena*.

Remarks : *Neobrachiella dispar*, in common with the two preceding species, must be included in a group of species of *Neobrachiella* with two pairs of posterior processes and with reduced second maxilla (*N. appendiculata; N. hostilis; N. chevreuxii; N. gulosa; N. trichiuri; N. dentici; N. otolithi; N. lutiani; N. richiardii; N. anisotremi; N. paralichthyos; N. auriculata* and *N. fasciata*).

N. appendiculata, morphologically closest to the present species, is not considered conspecific with it because of the differences in the claw of the maxilliped (secondary denticle present in *N. appendiculata*, absent in *N. dispar*) and in the structure of the myxal area.

N. hostilis differs from the new species in the length or the genital process, that of the posterior process, shape of the trunk and the second maxilla.

N. chevreuxii can be clearly set apart from the present species by the shape of its trunk, the large size of its posterior processes (longer than the trunk in *N. chevreuxii*, only a half of that length in *N. dispar*), by the length of the genital process (well developed in *N. chevreuxii*, reduced in the new species) as well as by the cephalothorax : trunk legth ratio and the second maxilla (fused in *N. chevreuxii*, separate in *N. dispar*).

N. gulosa cannot be considered conspecific with the present species, because of its cephalothorax : trunk length ratio; trunk : posterior processes length ratio and the structure of the second maxilla (fused in *N. gulosa*, clearly separated in *N. dispar*).

N. trichiuri is distinguishable from *N. dispar* by its second maxilla (fused in *N. trichiuri*, separated in *N. dispar*) length of its posterior proces-

ses (longer than trunk in *N. trichiuri*, not more than half of trunk's length in *N. dispar*), the length of the cephalothorax (longer than trunk in *N. trichiuri*, about 2/3 of trunk's length in *N. dispar*), the exopod of the second antenna, the mandibular formula and the myxal area of the maxilliped.

N. dentici differs clearly from the new species by the shape of its trunk and by its second maxilla (fused in *N. dentici* separated in *N. dispar*). Incomplete original description does not permit comparison of other morphological details.

N. otolithi differs from *N. dispar* by its cephalothorax : trunk length ratio; the shape of the trunk; the genital process (well developed in *N. otolithi*, reduced in *N. dispar*) and by its second maxilla (fused in *N. otolithi*, separated in *N. dispar*).

N. lutiani differs from the new species by the length of its posterior process (longer than trunk in *N. lutiani*, about a half trunk's length in *N. dispar*) and by the structure of its genital process (bifid in *N. lutiani*, simple in *N. dispar)*.

From *N. richiardii* the new species can be distinguished by definite differences in the length of its genital process (minute in *N. dispar*, half of trunk's length in *N. richiardii*, the relative length of its posterior processes (ventral only slightly longer than dorsal in *N. dispar*, twice the length of dorsal in *N. richiardii*) as well as differences in the exopod of the second antenna.

N. anisotremi (in press) is distinguishable from *N. dispar* by its trunk : posterior processes length ratio (6:1 in *N. anisotremi*, about 2 :1 in *N. dispar*). The two species can also be distinguished by their second maxilla (fused in *N. anisotremi*, separated in *N. dispar*).

N. paralichithyos shares with the present species only the lack of fusion of the second maxilla. The two species are distinguishable from each other by the length and thickness of the cephalothorax (longer than trunk in *N. paralichthyos*, about 2/3 of the trunk's length in *N. dispar*), by the length of their posterior processes (1/3 of trunk's length in *N. paralichthyos*, only a half of trunk's length in *N. dispar*), by the armature of the rami of the second antenna; by the first maxilla and the myxa of the maxilliped.

N. dispar is clearly distinguishable from *N. auriculata* by the structure of its second maxilla; the shape of the trunk; the length of the genital process (minute in *N. dispar*, well developed in *N. auriculata*), by the armature of the exopod of the second antenna; the first maxilla and the myxa of the maxilliped.

The new species cannot be considered conspecific with *N. fasciata* because of its second maxilla (fused in *N. fasciata*, separated in *N. dispar*), the length of the genital process (minute in *N. dispar*, well developed in *N. fasciata*) and the exopod of the second antenna.

All the differences between the specimens described above and their congeners led to the author's proposal for a new taxon for them, to be named *N. dispar*. the new species, unlike all previously described *Neobrachiella* from *Sciaena*, choses the fins of the host for its habitat.

DISCUSSION

The first three species described above (*N. oralis; N. auriculata* and *N. fasciata*) can be considered closely related to one another, in that they share some morphological characteristics. For example, *N. oralis* shares with *N. fasciata* the presence of a short seta on the exopod of the secon antenna (absent from *N. auriculata*). *N. oralis* shares with *N. auriculata* dorsal position of the anal swelling (terminal in *N. fasciata*). The distinctive dorsal displacement of the anus in two of these three species corroborates KABATA'S (1979) statement that Lernaeopodidae show a tendency towards such displacement, as exemplified by *N. triglae* (Claus, 1860).

In contrast, the fourth species, *N. dispar*, differs from the three other species by the absence of these characteristics, as well as by having separate second maxilla, rather than fused, as in these species. Moreover, its habitat on the host is quite different. *N. dispar* lives on the fins, other species on the gills or in the mouth of their hosts.

Comparing the four new species with all the other *Neobrachiella* parasitic on *Sciaena*, one finds affinity between *N. fasciata* and *N. hostilis* (as described by BEN HASSINE and RAIBAUT, 1978), suggested by the close morphological similarity of their appendages. This is evident, in particular, in the armature of the exopod of the second antenna (arrangement of spinules). On the other hand, these species differ in their site on the host, *N. hostilis* inhabiting the gill arches and rakers, while *N. fasciata* lives on gill filaments.

By describing four new species of *Neobra-*

TABLE I. **Neobrachiella** Species group, parasitic on Sciaenids fishes, as indicated by it gross morphology with host, habitat and distribution.

GROUP	SPECIES	HOST	HABITAT	DISTRIBUTION			
				ATLANTIC	PACIFIC.	INDIC.	ANTARTIC.
I.	Neobrachiella chevreuxii (van Beneden, 1891)	Sciaena antarctica	G.P.	–	–	–	–
		Sciaenids Lutianids					
	N. appendiculosa (Kröyer, 1863)	Corvina, Pagellus	G.P.	–			
	N. hostilis (Heller, 1868) (Fide. Ben Hassin & Raibaut)	Umbrina cirrosa = Sciaena umbra. Corvina nigra Umbrina ronchus.	B.A.			–	
		Umbrina robinsoni				–	
II	N. otolithi (Pillai, 1962)	Otolithus argenteus	B.A.			–	
	N. oralis sp. nov.	Sciaena deliciosa	B, G.C.		–		
III	N. gulosa (Wilson, 1915)	Sciaenops ocellatus	O.I.S.	–			
		Micropogon undulatus	O.I.S.				
	N. gracilis (Wilson, 1908)	Cynoscion nobilis	B	–			
	N. indica (Tripathi, 1959)	Sciaena glauca	G.P.			–	
	N. albida (Rangnekar, 1956)	Otolithus ruber (Schn.)	G.P.			–	
		Otolithus argenteus Cuv.	G.P.			–	
	N. richiardi (Ben Hassin et Raibaut, 1978)	Umbrina cirrosa	G.P.	–		–	
		Umbrina canariensis	G.P.				
	N. brevicapita Ho & Do, 1984	Nibea albiflora (Richardson)	G.P.		–		
	N. auriculata sp. nov.	Sciaena gilberti	G.P.		–		
		Sciaena deliciosa	G.P.		–		
	N. fasciata sp. nov.	Sciaena fasciata	G.P.		–		
	N. dispar sp. nov.	Sciaena gilberti	F.		–		
IV.	N. intermedia (Bere, 1936)	Sciaenops ocellatus	G.	–			

B = Bucal cavity. B.A. = Branchial arch. G.C. = Gill chamber. G.P. = Gill plates. F = Fins. O.I.S. = Operculum inner surface.

chiella, parasitic of the members of the teleost genus ***Sciaena***, this paper raises their number to seven. All species of ***Neobrachiella*** currently known to parasitize sciaenid fishes can be split into four groups (see Table I). The first group, characterized by the shape of the trunk, is exemplified by *N. **chevreuxii*** (more or less quadrangular or subcircular). The second group has pyriform trunks, like that of *N. **otolithi***. The third resembles *N. **gulosa*** in the oblong shape of the trunk. This group comprises the majority of the species involved. The members of all three groups bear two pairs of posterior processes. In contrast, the sole member of the fourth group, *N. **intermedia***, has only one pair of these processes.

With the discovery of the four species, all parasitic on the fishes of the genus ***Sciaena*** in Antofagasta, seven species of ***Neobrachiella*** are now known to live on members of this genus in the Chilean waters, where no search for these parasites had hitherto been made. The fishes of this family resident in the South Pacific waters comprise 14 genera, jointly containing 46 species (CHIRICHIGNO, 1974; BAHAMONDE and PEQUEÑO, 1975). It is, therefore, quite possible that more copepod species still remain to be discovered on them. More survey work is required, combined with careful description of some old species. The results of such work could provide a basis for comparative assesment of possible interrelationships of these species and their congeners from other hosts. New light on the host : parasite relationships of Lernaeopodidae can be brought forth by these comparisons.

KEY TO *Neobrachiella* (FEMALES)

Trunk with two pairs of posterior processes, ventral (= uropods) and dorsal; with or without genital process . . . . . GROUP I
Trunk with single pair of posterior processes (= uropods); with or without genital processes . . . . . GROUP II
Trunk with more than two pairs of posterior processes; with or without genital process. . . . . GROUP III

GROUP I

1. Second maxilla about as long as cephalothorax 2
   Second maxilla only 1/2 of cephalothorax length 6
   Second maxilla less than 1/2 of cephalothorax length 10
   Second maxilla longer than cephalothorax 20
2. Uropods shorter than dorsal posterior processes 3
   Uropods about as long as dorsal posterior processes; latter bifid . . . . . *N. **suplicans*** (Barnard, 1955)
   Uropods simple, longer than dorsal posterior processes 5
3. Uropods short, about 1/2 length of dorsal posterior processes . . . *N. **insidiosa*** (Heller, 1865)
   Uropods short, their length only 1/3 or less than 1/3 of that of dorsal posterior processes. . . . 4
4. Dorsal posterior processes, subcylindrical, acuminate . . . . . *N. **albida*** (Rangnekar, 1956)
   Dorsal posterior processes subspherical, blunt . . . . . *N. **indica*** (Tripathi, 1959)
5. Uropods twice as long as dorsal posterior processes . . . . . .*N. **anserina*** (Wilson, 1908)
   Uropods three times as long as dorsal posterior processes; cephalothorax about as long as trunk; latter subrectangular . . . . . *N. **hoplognathi*** (Yamaguti, 1939)
6. Uropods as long as, or shorter than, dorsal posterior processes. 7
   Uropods somewhat longer than dorsal posterior processes 9
7. Trunk pyriform or oblong 8
   Trunk subquadrangular. . . . . *N. **merluccii*** (Bassett-Smith, 1986)
   Trunk subcircular . . . *N. **rotunda*** (Pearse, 1952).
   Trunk subtriangular . . . . . *N. **chavesii*** (van Beneden, 1981)
8. Genital process absent . . . . . *N. **lata*** (Song and Chen, 1976)
   Genital process present. . . . . *N. **paralichthyos*** (Castro and Baeza, 1986)
9. Trunk suborbicular; uropods longer than trunk . . . . .*N. **appendiculosa*** (Kroyer, 1863)
   Trunk pyriform; uropods half length of trunk . . . . . *N. **oralis*** sp. nov.
10. Trunk pyriform. 12
    Trunk oblong 14
    Trunk subcircular or subquadrangular 11
    Trunk transversely oval, apparently bilobed, length half of width; posterior processes lon-

ger than trunk. . . . . .
. . . . . *N. dentici* (Nunes-Ruivo, 1962)

11. Trunk subquadrangular; posterior processes longer than trunk; genital process well developed. . . . . *N. chevreuxii* (van Beneden, 1861)
Trunk subcircular; posterior processes slightly shorter than trunk; size of genital process variable, reaching half that of posterior processes. . . . . *N. hostilis* (Heller, 1865)

12. Genital process protruding from margin of trunk 13
Genital process not protruding from margin of trunk . . . . . *N. trichiuri* (Yamaguti, 1939)

13. Genital process simple . . . . . .
. . . . . *N. otolithi* (Pillai, 1962)
Genital process bifid, . . *N. lutiani* (Pillai, 1968)

14. Posterior processes as long as trunk. . . . . .
. . . . . *N. gulosa* (Wilson, 1915)
Posterior processes shorter than trunk 15

15. Posterior processes about half length of trunk 16
Posterior processes less than third of trunk length . . . . . .
. . . *N. anisotremi* (Castro and Baeza, in Press)

16. Genital process diminutive 17
Genital process well developed. 18

17. Second maxilla fused . . . . . .
. . . . . *N. appendiculata* (Kroyer, 1963)
Second maxilla separate . . . *N. dispar* sp. nov.

18. Genital process longer than uropod. . . . . .
. . . . *N. richiardi* (Ben Hassin & Raibaut, 1978)
Genital process shorter than uropod 19

19. Genital process reach about a half (or only a few shorter than dorsal process) . . . . . .
. . . . . *N. fasciata* sp.nov.
Genital process reach only a third the dorsal process length . . . . . *N. auriculata* sp. nov.

20. Posterior process well developed. 21
Posterior process as short lobules . . . . . .
. . . . . *N. regia* (Lewis, 1967)

21. Uropods and dorsal process about the same length . . . . . .
. . . . *N. yongxingensis* (Song & Chen, 1976)
Uropods longer than dorsal process. 22

22. Cephalothorax about the same length than trunk. Second maxilla fused . . . . . .
. . . . . *N. gracilis* (Wilson, 1908)
Cephalothorax a half trunk length. Second maxilla separated. . . . . .
. . . . . *N. brevicapita* (Ho & Do, 1984)

GROUP II

1. Trunk subquadrangular. 2
Trunk suborbicular . . . . . .
. . . . . *N. bispinosa* (Nordmann, 1832)
Trunk not as above (sublong or oval). 6

2. Uropods twice as long as trunk. . . . . .
. . . . . *N. superba* (Leigh-Sharpe, 1934)
Uropods half length of trunk 3
Uropods and trunk of equal length . . . . . .
. . . . . *N. cirrocauda* (Heegaard, 1962)
Uropods less than half length of trunk. 4

3. Second maxilla as long as cephalothorax, shorter than trunk; genital process absent . . . . . .
. . . . . *N. amphipacifica* (Ho, 1982)
Second maxilla about 1/3 of cephalothorax length; small, subtriangular, genital process present . . . . . *N. cirrata* (Heegaard, 1962)

4. Genital process well developed. 5
Genital process poorly developed or absent . .
. . . . . *N. annulata* (Markevich, 1940)

5. Uropods and genital process of equal length; second maxilla and trunk of equal length; weal – like swelling near base on dorsal surface of cephalothorax. . . . . .
. . . . . *N. tetrici* (Kabata, 1968)
Uropods longer than genital process; second maxilla half length of cephalothorax; latter of equal length with trunk; no weal – like swelling on dorsal surface of cephalothorax. . . . .
. . . . . *N. spinicephala* (Ringhelet, 1945)

6. Uropods of about equal length with trunk; genital process very short. . . . . .
. . . . . *N. intermedia* (Bere, 1936)
Uropods half length of trunk 7
Uropods less than 1/3 length of trunk 8
Uropods 1/3 length of trunk . . . . . .
. . . . . *N. nitida* (Wilson, 1915)

7. Second maxilla less than half length of cephalothorax, separate; trunk and cephalothorax of equal length . . . . . .
. . . . . *N. stellifera* (Heegaard, 1962)
Second maxilla about 1/2 length of cephalothorax, fused . . . . *N. pinguis* (Wilson, 1915)

8. Second maxilla equal or subequal to cephalothorax in length; uropods absent; posterior processes dorsolateral . . . . . *N. sihama* (Song and Chen, 1976)
   Second maxilla shorter than cephalothorax 9
9. Uropods short. 10
   Uropods poorly developed, reduced 11
10. Cephalothorax length 1/3 that of trunk (or of variable length); genital process developed . . . . . *N. mitrata* (Wilson, 1915)
    Cephalothorax more than half length of trunk, or about the same length as trunk; genital process greatly reduced . . . . . *N. rostrata* (Kroyer, 1837)
    Cephalothorax longer than trunk; genital process greatly reduced . . . . . *N. incurva* (Shiino, 1956)
11. Second maxilla 1/4 lenth of cephalothorax; uropods acuminate; genital process present. . . *N. lithognathae* (Kensley and Grindley, 1973)
    Second maxilla half length of cephalothorax; uropods blunttipped; genital process absent . . . . . *N. exigua* (Brian, 1906)

NOTE : Details of *N. mitrata* were taken from Wilson's description. Ho (1977) shows this species as having long cephalothorax, its length about a half of that of trunk, or about as long as trunk.

GROUP III

1. Uropods well developed 2
   Uropods not well developed, or very short 5
2. Trunk subquadrangular. 3
   Trunk not subquadrangular 4
3. Trunk subquadrangular, with two pairs of posterolateral process and one pair of short, posteroventral processes; cephalothorax enlarged, second maxilla with lateral outgrowths . . . . . *N. impudica* (von Nordmann, 1832)
   Trunk subquadrangular, with two pairs of posterolateral processes; cephalothorax subcylindrical, long; genital process of variable length . . . . . *N. robusta* (Wilson, 1912)
   Trunk more or less subquadrangular, with two pairs of posterolateral processes; genital process short. . . . . *N. septicauda* (Shiino, 1956)
4. Trunk suborbicular, with small lobes on anterolateral margin. . . . . *N. triglae* (Claus, 1860)
   Trunk pyriform, with five pairs of posterolateral processes, two pairs about as long as trunk . . . . . *N. genypteri* (Capart, 1959)
5. Three pairs of short, fine posterior processes; second maxilla short . . . . . *N. bera* (Yamaguti, 1939)
   Four pairs of short, subspherical posterior processes . . . . . *N. papillosa* (Pearse, 1952)
   Two pairs of posterolateral processes, second maxilla short . . . . . *N. exilis* (Shiino, 1956)

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