

Two new species of *Branchiomma* (Sabellidae) with redescriptions of closely related species and comments on *Pseudobranchiomma* and *Sabellastarte*

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ABSTRACT

Species of *Branchiomma* K lliker (= *Dasychone* Sars) are reviewed briefly in order to describe two new species, *B. moebii* from the Mediterranean and *B. spongiarum* from the Faroe Islands. Figures of *Branchiomma infarctum*, *B. bahusiense* and *B. arcticum* (= *Sabellastarte arctica*) are given for comparison. SEM helps to show (a) specific differences in uncini and (b) differences between the stylodes of *Branchiomma* and the "reduced stylodes" of *Pseudobranchiomma* Jones. *Pseudobranchiomma* should include some species formerly in the genera *Branchiomma* and *Sabellastarte* Kr yer.

R SUM 

Deux nouvelles esp ces de *Branchiomma* (Sabellidae) avec des redescriptions des esp ces voisines et des remarques sur *Pseudobranchiomma* et *Sabellastarte*

Les esp ces de *Branchiomma* K lliker (= *Dasychone* Sars) sont pass es en revue bri vement pour d crire deux esp ces nouvelles, *B. moebii* de M diterran e et *B. spongiarum* des  les F ro . Des figures des *Branchiomma infarctum*, *B. bahusiense* et *B. arcticum* (= *Sabellastarte arctica*) sont donn es pour comparaison. L'observation au SEM permet de voir a) les diff rences sp cifiques entre les uncini et b) les diff rences entre les stylodes de *Branchiomma* et les "stylodes r duits" de *Pseudobranchiomma* Jones. *Pseudobranchiomma* comprend quelques esp ces plac es autrefois dans les genres *Branchiomma* et *Sabellastarte* Kr yer.

INTRODUCTION AND METHODS

Collections from the Mediterranean (KNIGHT-JONES *et al.*, 1991) and the Faroes (KNIGHT-JONES, 1993) yielded several species of *Branchiomma* as diagnosed by JOHANSSON (1927) and FITZHUGH (1989). Most species were difficult to name, as descriptions are often inadequate and JOHANSSON's review was partial. It was therefore

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necessary to study types (or original material) of all known *Branchiomma* species. It soon became clear that many synonyms in the literature were incorrect. Two new species are compared here with those that are morphologically most similar and *B. bahusiense* is figured for the first time. Some species are close to *Pseudobranchiomma* Jones (1962), so *Pseudobranchiomma emersoni* Jones was also studied and compared with *Branchiomma* and *Sabellastarte*.

Material has not yet been found of species followed here by asterisks, but these were figured in the original descriptions. All other listed species have been examined and will be compared elsewhere. Original citations of most species listed here can be found in HARTMAN, 1959, under *Branchiomma*, *Dasychone*, or *Sabella*.

Optical microscopy was helped by a Wild drawing attachment. For scanning electron microscopy (KNIGHT-JONES & FORDY, 1979) alcohol preserved material was washed in distilled water, placed in a weak cleaning solution (Decon 75) in an ultrasonic bath for 20-30 sec, rinsed in distilled water, dehydrated in an acetone series, coated in a polaron MK2 sputter coater, and examined in a JEOL 35 C. Crown radioles were transferred before coating to a Polaron MK1 critical point drying unit using CO₂ as the intermediate liquid. Fascicles of chaetae were also studied by SEM but no specific differences in surface detail could be found.

OLD AND NEW SPECIES OF *BRANCHIOMMA*

Branchiomma bombyx (Dalyell), *B. lucullanum* (delle Chiaje), *B. violaceum* (Schmarda), *B. natalense* (Kinberg), *B. capense* (McIntosh) and *B. pseudoviolaceum* (Augener) have their dorsal collar margins fused to the edges of the narrow faecal groove, but the two new species described here are like most *Branchiomma* in having free dorsal margins separated by a wide gap. Their uncinal crests have many rows of teeth, as in *Branchiomma infarctum* (Krøyer = *Dasychone decora* Sars), *B. inconspicuum* (Sars), *B. bahusiense* Johansson (as *B. infarcta* var. *bahusiensis*) and *B. arcticum* (Ditlevsen = *Sabellastarte arctica* Ditlevsen) with which they are compared.

The radioles of the new species lack the 'macrostylodes' (defined as being three or more times the length of neighbouring pairs, see KNIGHT-JONES *et al.*, 1991), which are seen in distal halves of dorsal and lateral radioles in *B. nigromaculatum* (Baird) (= *Sabella crispa* Krøyer; = *Dasychone ponce* Treadwell), *B. boholense* (Grube), *B. bairdi* (McIntosh), *B. japonicum* (McIntosh), *B. conspersum* (Ehlers) (= ? *Dasychonopsis arenosa* Treadwell), *B. maculatum* (Fischli)*, *B. gravelyi* (Aziz)*, *B. loandense* (Treadwell) and *B. pererai* de Silva (as *B. cingulata* var. *pererai*) [some of the latter four species may be synonyms of the others]. Some species which lack distal macrostylodes, e.g. *B. havaicum* (Kinberg), *B. cingulatum* (Grube), *B. luctuosum* (Grube), *B. curtum* (Ehlers), *B. corolliferum* (Ehlers) and *B. galei* (Augener), differ from the two new ones in having thoracic uncinal crests with just two or three rows of few teeth (e.g. Fig. 4g-h). At least the last five of these are distinct species and will be described elsewhere.

Branchiomma moebii sp. nov.— Holotype ZMHUB 2304a (Fig. 1a-d, f-k); paratype ZMHUB 2304b (Fig. 1e) Rovinj, N Adriatic.

Dasychone lucullana — SAINT-JOSEPH, 1906 : 241. Cannes (MNHNP A311). *Branchiomma* species A.— KNIGHT-JONES *et al.*, 1991 : 847. One specimen found in gully 3-13 m deep SW of Harem point, Bodrum, Turkey (personal collection).

Additional material: a single specimen from the Bay of Muggia, Trieste (ZMUC), labelled *D. lucullana* by MARENZELLER.

The following description is based on the holotype, data in parentheses refer to the paratype.

Body 19 by 3.5 (17 by 3) mm with 40 (50) segments of which 8 are thoracic; crown a further 19 (14) mm long, ventrally involuted at base; radioles 16 (18) on each side connected by a shallow web; each with about 25 (18) pairs of tongue shaped stylodes, larger pairs towards bases of dorsal and lateral radioles (Fig. 1c-d); radiolar eyes almost obscured by narrow dense pigment bands lying just anterior to bases of (usually) alternate pairs of stylodes (Fig. 1d), but eyes not apparent in paler, more distal bands or areas between bands (more eyes occur in Bodrum material -see below); apinnulate tips of radioles fine, 1 or (less commonly) 2 mm long; dorsal lips tapered, grooved (with midrib support), about a quarter of length of crown and with fairly narrow lamellae, the dorsal lamella attached to base of adjacent radiole, without pinnular support; collar with dorsal gap, small ventral lappets and no ventro-lateral notches; 1st segment (excluding collar margin) about same length as others in thorax

(measured at sides); thoracic fascicles (segments 2 to 8) with about 10 superior chaetae which are slender and scarcely geniculate, the 'knee' region scarcely wider than shaft (Fig. 1g), and about 20 inferior geniculate chaetae with knee up to twice width of shaft (Fig. 1h); thoracic uncini with an extensive crest of small compact teeth (Fig. 4a-b) not usually seen in light microscopy (Fig. 1f); thoracic tori long (segment 7 with about 30 uncini), all but the first two tori reaching ventral shields; most fascicles of abdominal chaetae forming compact tufts, outer chaetae geniculate (Fig. 1k) with thick emergent shafts arranged in a C-shape (see Fig. 1a, insert) around a cluster of capillary chaetae (Fig. 1j); pigment patterns dark brown, most thoracic ventral shields with two D-shaped patches, 1st shield with paired transversely elongate triangles, dorsal side of thoracic parapodia and interramal area (between fascicles and tori) with unusually large patches, and dorsal side of abdominal parapodia with dark triangles.

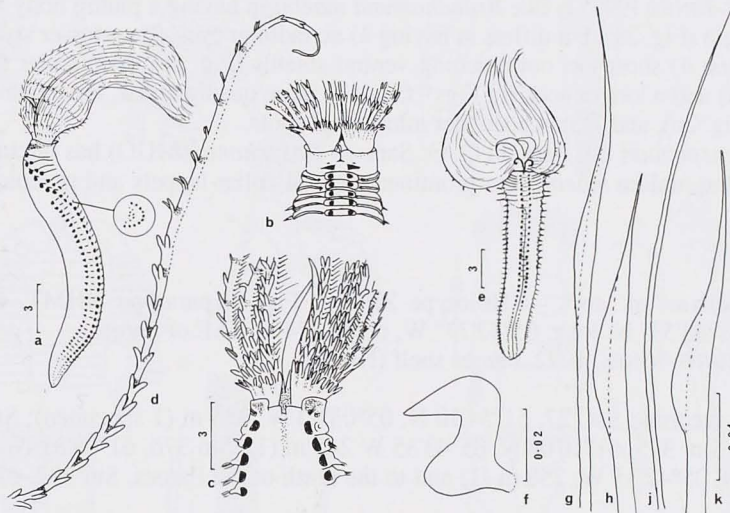


FIG. 1. — *Branchiomma moebii* sp. nov.: a, lateral view of holotype. — b, ventral thorax. — c, dorsal thorax. — d, whole radiole. — e, ventral view of paratype. — f, thoracic uncinus. — g, superior thoracic chaeta from 7th thoracic fascicle. — h, same, but inferior thoracic chaeta. — j, superior capillary chaeta from 6th abdominal fascicle. — k, same, but inferior chaeta. Scales in mm: b as c; g, h, j as k.

This species is named after Professor K. A. MÖBIUS (1825-1908) who collected the largest and best preserved specimens. He, CLAPARÈDE & MARENZELLER labelled their material *Dasychone lucullana*, but the dorsal lips of that species are short (lengths only two times breadth, KNIGHT-JONES *et al.*, 1991) and the dorsal collar margins are fused to the sides of the faecal groove.

On the Bodrum specimen some stylodes next to the web are unpaired, the more basal stylodes from dorsal and lateral radioles are less crowded (more like those of paratype) and eyes are present between most successive pairs of stylodes. Eyes not associated with colour bands, however, are smaller with fewer ocular units. Eyes are absent near the base of the crown (as in Rovinj material) and between a few other random pairs of stylodes. Frequency of radiolar eyes was not noted in the material from Cannes and Trieste.

The following four species are the only ones within *Branchiomma* which resemble *B. moebii* in having widely separated dorsal collar margins and uncinal crests with numerous small teeth:

- *Branchiomma infarctum* (Krøyer, holotype 'Greenland?', ZMUC, Fig. 2a-d, j-k) has stylodes like those of *B. moebii* (cf. Figs 1d; 2e), but larger specimens of *B. infarctum* (e.g. MALMGREN, 1866, NRS 1252, Fig. 2f-g) have broader, almost subcircular stylodes towards the bases of the dorsal and lateral radioles. Like *B. moebii*, *B. infarctum* is plump (body length 4 to 5 times breadth, thorax about as long as broad, with crown up to three quarters of body length), but *B. infarctum* differs in having 1) a more extensive collar (especially ventrally) with ventro-lateral notches, 2) very numerous chaetae (about 80 in both thoracic and abdominal fascicles), 3) posterior

inferior thoracic chaetae more slender ('knee' scarcely wider than shaft Fig. 2k), 4) thoracic uncini with a longer neck (cf. Figs 2h, j; 1f), 5) no radiolar eyes and 6) no pigment pattern other than bands on crown and indistinct inter-ramal spots. Many records of *infarctum* (e.g. LEVENSEN, 1886; DITLEVSEN, 1937; BERTELSEN, 1937; ZMUC) are in fact the more elongate species *Branchiomma arcticum*.

- *Branchiomma arcticum* (Ditlevsen = *Sabellastarte arctica* Ditlevsen, holotype, Baffin Bay "Godthaab Expd". Stn 86 ZMUC) has similar stylodes to *B. moebii* (these had been overlooked by Ditlevsen, as most of his description referred to specimens from station 166, that had suffered histolysis, ZMUC) but differs from *B. moebii* in having 1) an elongate shape (crown normally 0.25 to 0.4 of body length), 2) first segment about twice the length of the following one (measured at sides), 3) prominent ventral collar lappets (Fig. 2t & w, specimens preserved out of and in tubes respectively), 4) tori with gaps between their ventral ends and ventral shields, and 5) uncini with broader crests of more distinct teeth (Fig. 4e).

- *Branchiomma bahusiense* Johansson (syntypes from W Sweden, ZMUU 346 a-b; other material from SE Faroes, NHMT, KNIGHT-JONES 1992) is like *Branchiomma moebii* in having a plump body and a crown usually more than half body length (Fig. 2q), but differs in having 1) no radiolar eyes, 2) narrower stylodes; 3) collar with prominent ventral lappets; 4) short tori not reaching ventral shields (Fig. 2p); 5) broader thoracic uncini with fewer crest teeth (Fig. 4f) and a longer neck (cf Figs 1f; 2s); 6) more quadrangular, less distinct pigment blotches on the ventral shields (Fig. 2p), and 7) much smaller inter-ramal spots.

- *Branchiomma inconspicuum* (M. Sars, in G. O. Sars, as *Dasychone* ZMUO) has uncini which seem to be like those of *B. moebii* but, unlike *moebii*, has prominent ventral collar lappets and no colouration except tiny inter-ramal spots.

Branchiomma spongiarum sp. nov. — Holotype ZMUC, Fig. 3, paratype NHMT, both from Stn 377 (BIOFAR Survey) lat. 61°43'53" N, long. 05°42'77" W, depth 274 m. - SE of Faroes.
Branchiomma sp. — KNIGHT-JONES, 1992, Faroes shelf (NHMT).

Additional BIOFAR records : Stn. 27, 61°54'10 N, 05°03'80 W, 225 m (1 specimen); Stn 283, 61°07'30 N, 05°51'20 W, 284 m (2); Stn. 375, 61°10'04 N, 05°43'35 W 245 m (1); Stn 376, 61°09'51 N, 05°45'45 W, 250 m (1); Stn 378, 61°44'20 N, 05°42'35 W, 258 m (1) and to the north of the Faroes, Stn 352, 62°43'10 N, 07°22'40 W, 354 m (2).

Found in association with sponges, *Thenia levis* at Stn 377, and *T. valdiviae* at Stns 375, 376 and 378, hence the specific name. Sponge spicules were also with the specimen from Stn 27. The holotype is the largest complete specimen.

Very small species, body 7.5 by 0.8 mm with 34 segments of which 7 or 8 are thoracic; crown a further 5 mm, involuted ventrally at the base; 12 radioles on each side, each with small tapered tips, about six pairs of fine stylodes and no eyes; dorsal lips with tapered and grooved midribs, but no pinnular support, blunt tipped, and about one fifth length of crown; collar with wide gap dorsally and prominent paired ventral lappets; first segment similar in length to others in thorax; thoracic fascicles small, each with about 12 chaetae, these and those of abdomen like those of *B. moebii* (cf Figs 1g to k; 3g to j); thoracic uncinal crests more than half the length of the head, comprising about 20 fairly long and conspicuous teeth (Fig. 4 c, d); thoracic tori short (15 to 22 uncini in 5th and 6th tori) not reaching indistinct ventral shields (Fig. 3c); inter-ramal spots fairly large and very distinct, no other colouration.

As this species is found off Faroes, where the morphologically most similar *B. bahusiense* is also found, the possibility of it being a juvenile of the latter was considered. In *B. spongiarum*, however, the stylodes are relatively longer, compared with both breadth of stylode and width of radiole. *Branchiomma bahusiense* also differs in having 1) at least 5 times as many stylodes per radiole, 2) a crown base only 1/16 of crown length, compared with 1/6 in *B. spongiarum*, 3) thoracic uncini with a longer neck (cf. Figs 2s; 3f), and 4) uncinal crests smoother in profile (the small teeth lying closer to main fang) covering only half length of uncinal head (Fig. 4f). The blackish-red inter-ramal spots of *B. spongiarum* are very obvious against the pale body, whereas the minute inter-ramal spots of *B. bahusiense* are less noticeable against a background of pale pinkish-fawn. None of 19 Faroes specimens of *B. bahusiense* occurred at stations where *B. spongiarum* was found (although depths, 235-732 m, were similar) nor does *B. bahusiense* occur in association with sponges. It was commonly with *Sertella*.

Branchiomma infarctum, *B. arcticum* and *B. moebii* differ from *B. spongiarum* in having larger bodies, wider more numerous stylodes, larger uncinal crests of relatively smaller teeth, and longer tori either approaching or



FIG. 2. — *Branchiomma infarctum* (Krøyer, a to d, j, k, m = holotype; f, g, h = Malmgren's, 1866, material): — a, whole animal lateral view. — b, detail of a. — c, ventral thorax. — d, dorsal thorax. — e, whole radiole and enlarged stylode (Krøyer's MS). — f, dorsal collar and base of crown. — g, dorsal basal stylodes from f. — h and j, thoracic uncini. — k, inferior thoracic chaeta. — m, ventral view of type before damage (Krøyer's MS). *B. bahusiense* Johansson, Faroes material: — n, dorsal thorax. — p, ventral thorax. — q, whole animal, inserts showing most of a dorsal radiole. — r, inferior thoracic chaeta. — s, thoracic uncinus. *B. arcticum* (Ditlevsen), Greenland material: — t, ventral thorax. — u, dorsal thorax. — v, whole animal. — w, lateral thorax (another specimen). — x, dorsal radiole. — y, thoracic uncinus. — z, inferior thoracic chaeta. Scales in mm: c, d, as b; j, s and y as h; n as p; w and u as t; z as k.

touching the ventral shields. *Branchiomma moebii* further differs in having shorter ventral collar lappets, very large inter-ramal spots, and a distinctive colour pattern. *Branchiomma inconspicuum* differs in having more numerous teeth on the uncinal crests.

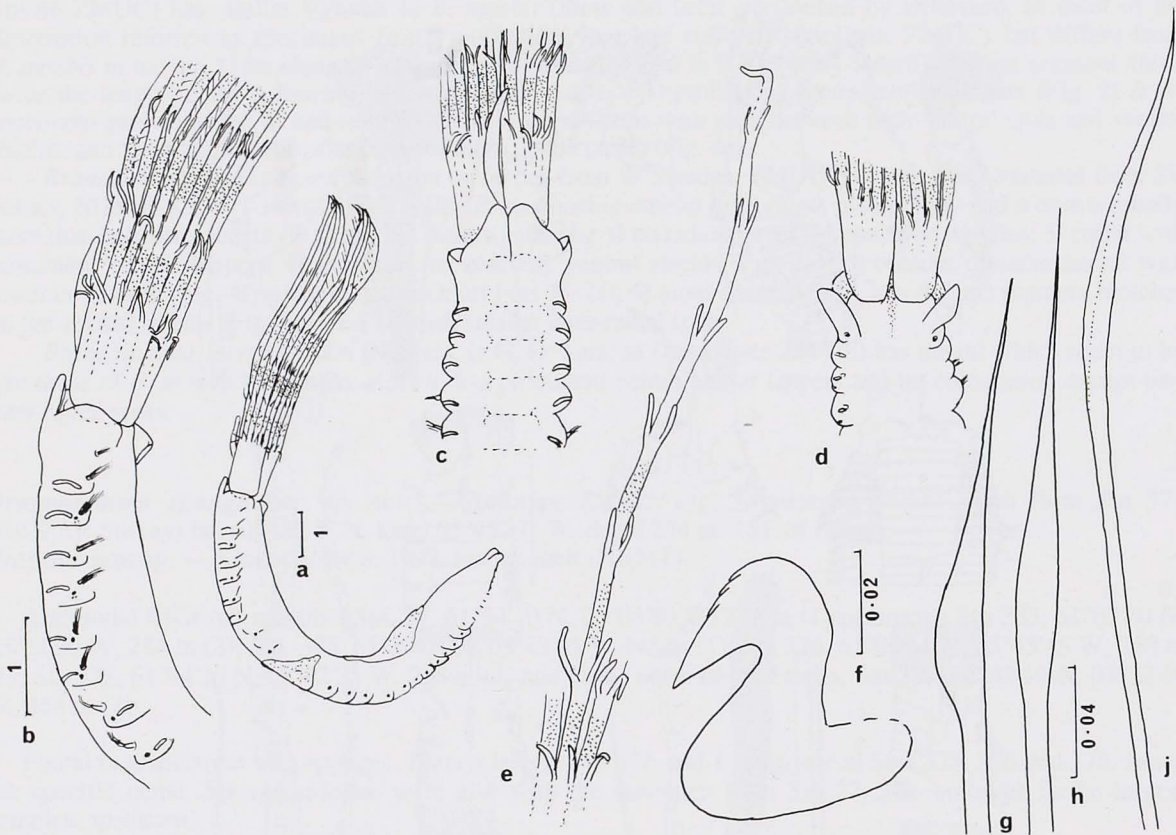


FIG. 3. — *Branchiomma spongiarum* sp. nov.: — a, Lateral view of holotype. — b, detail of a. — c, ventral thorax. — d, dorsal thorax. — e, dorsal radiole. — f, thoracic uncinus. — g and h, inferior thoracic chaetae, side and face view respectively. — j, superior thoracic chaeta. Scales in mm: c and d as b; g and j as h.

STUDIES ON *PSEUDOBANCHIOMMA* JONES AND *SABELLASTARTE* KRØYER

JONES (1962) suggested the genus *Pseudobranchiomma* for *P. emersoni*, a species like *Branchiomma* but with four thoracic segments and radioles with reduced stylodes and without eyes. FITZHUGH (1989) suggested three more characters separating *Pseudobranchiomma* from *Branchiomma*: radioles bearing flanges; dorsal lips without pinnular support; and abdominal fascicles with longer chaetae in the middle of the group. However, the latter character is also found in *Branchiomma*; presence or absence of pinnular support for a dorsal lip is rarely important (the holotype of *P. emersoni*, AMNH, has one of its lips free and the other attached to a pinnule); whilst possession of few thoracic segments is no more than a specific character, examples occurring in *Branchiomma* (e.g. *B. curta*) and other genera (e.g. *Perkinsiana* Knight-Jones, 1983). *Pseudobranchiomma* may thus seem closer to *Branchiomma* than envisaged by JONES (1962) and FITZHUGH (1989).

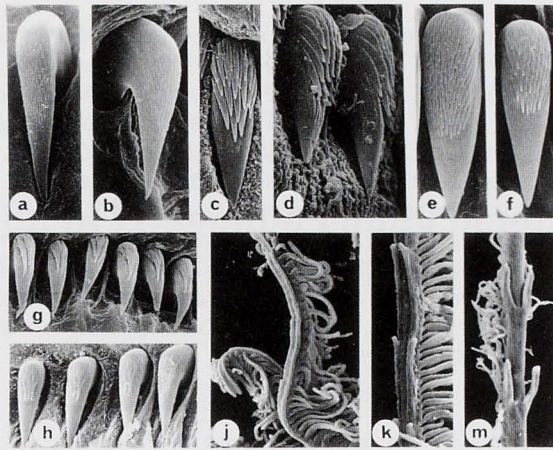


FIG. 4. — SEM of thoracic uncini (a to h) and radioles (j to m). — a and b, *Branchiomma moebii* sp. nov. — c and d, *B. spongiarum* sp. nov. — e, *B. arcticum* Ditlevsen. — f, *B. bahusiense* Johansson. — g, *B. cingulatum* (Grube). — h, *B. curtum* (Ehlers). — j, *Pseudobranchiomma emersoni* Jones from Cape Verde Islands (NHML). — k, *P. orientalis* (McIntosh) from Hong Kong (NMWC). — m, *Branchiomma moebii* sp. nov.

The so-called reduced stylodes of *Pseudobranchiomma*, however, are very different from *Branchiomma* stylodes, which are epithelial flaps arising more or less transversely to the axis of the radiole (Fig. 4m). *Pseudobranchiomma* 'stylodes' are mere discontinuities in paired flanges along the radioles (Fig. 4j,k). Similar notched flanges are seen in *Sabella* (*Dasychone*) *serratibranchis* Grube, *Sabella tricolor* Grube, *Dasychone picta*, *D. orientalis* McIntosh, *D. kumari** Aziz, *D. odhneri* Fauvel and *Sabella zebuensis* McIntosh. These species should be included in *Pseudobranchiomma*, although some seem to be synonyms of others (study in progress). The notches in *odhneri* and *zebuensis*, however, are sparse and vestigial. Both species have been placed in *Sabellastarte* by DAY (1951) and HARTMAN (1959). DAY (1951) synonymised *odhneri* with *Sabellastarte longa* (Kinberg), but present studies show the two species to be distinct, yet similar enough to place *S. longa* in *Pseudobranchiomma* too, amending the only significant generic character to:— radioles with paired, longitudinal flanges, usually notched, but notches sometimes vestigial or absent. *Pseudobranchiomma odhneri* and *P. longa* both have eyes on the radioles so that character too should be amended to:— radioles with or without eyes. They, like the other species here placed in *Pseudobranchiomma*, have their dorsal collar margins free, not fused to the sides of the faecal groove.

There seems to be no type material of *Sabellastarte indica* (Savigny) (type species designated by HARTMAN, 1959), but species agreeing with SAVIGNY's definition (under "Tribu Sabellae Astarte") have a double row of [interdigitating] radioles, as in *Sabellastarte magnifica* (Shaw) and other species under study. These lack radiolar flanges (and eyes) and have dorsal collar margins fused to the midline groove. The latter character is not necessarily generic, for it varies within *Branchiomma* and both states (fused and free) can occur in a single species (*Megalomma heterops* PERKINS, 1984). Studies on *Pseudobranchiomma* and *Sabellastarte* are continuing so characters other than radiolar flanges may be found to separate these genera more conclusively. Like *Sabellastarte*, *Branchiomma* lacks such flanges.

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