Redescription of *Gymnogonos ameriensis* (Stepanjants, 1979) and comments on other species of the genus *Gymnogonos* (Cnidaria, Hydrozoa: Corymorphidae, Corymorphinae)

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The genus *Gymnogonos* Bonnevie, 1898 and the Antarctic species *G. ameriensis* (Stepanjants, 1979) are redescribed. Comments on other species of the genus and a key to *Gymnogonos* species are given.

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Introduction

Bonnevie (1898, 1899) has described a new genus and species *Gymnogonos crassicornis* for a very unusual small solitary polyp found at a depth of 400 m in the Trondheim Fjord (Norway). She compared this species with representatives of two close genera: *Corymorpha* described by M. Sars (1835) and her new genus *Lampra* (preoccupied name subsequently replaced with *Monocaulus* Allman). *Gymnogonos* (Fig. 1) was characterized by her by (1) the thin transparent perisarc, which clothes hydrocaulus of polyp up to the level of proximal tentacles; (2) the solid papillae around the basal part of polyp head, below the aboral whorl of the tentacles; (3) the styloid gonophores without blastostyles.

Kramp (1933) has described a new species *Corymorpha obvoluta* from a specimen found by him in the collection of the East Greenland Expedition 1932 (Kangerdlugssuag, depth of 175 m). This species is closely related to *G. crassicornis*, but Kramp placed it in the genus *Corymorpha* mainly because its polyp had solid capitate oral tentacles of the same type as in *Corymorpha nutans*, the type species of *Corymorpha*.

Stepanjants (1979) has described a new species *Corymorpha ameriensis* from the Antarctic (Amery Glacier, depth of 15-35 m). She compared her species with *Corymorpha antarctica* described by Pfeffer (1889) from one, apparently juvenile specimen collected off South Georgia in the Magellan area. Hartlaub (1905) has given a more detailed description of this *C. antarctica* specimen, but the identity of the species remained unclear because of lack of illustrations and species-specific details. Now, nearly 100 years later, after knowing other species and many stages of Antarctic Corymorphinae, we guess that Pfeffer's species could be very close to or even identical with *C. ameriensis*. Two juvenile hydroid specimens probably belonging to *Gymnogonos* were found earlier in the Antarctic region. One of them, collected near the Ross Sea area, was described as *Myriothela* sp. (?), by Hickson & Gravely (1907). This specimen is lacking gonophores and has very short tentacles only, but carries papillae around the basal part of polyp head and rooting filaments at the base of the hydrocaulus. In this connection, it may be placed in *Gymnogonos*. The second larval specimen was found by the Deutsche Süd-Polar-Expedition at Gauss-berg and described as *Tubularia cingulata* by Vanhoeffen (1910). This specimen consisted of the tiny polyp head only; unfortunately, it is impossible to find essential characteristics in the description for a certain identification, but from the figure it looks very close to a juvenile *G. ameriensis*.

Stepanjants & Svoboda (1999: 52-53) placed all species discussed above (*crassicornis*, *ameriensis*, and with some doubt *antarcticus*, *obvolutus*, *cingulatus* and "*Myriothela* sp.") in *Gymnogonos*.

Terminology

First of all, we need to explain several terms which we use in our taxonomic investigation.

The terminology of tentacles construction is accepted according to Millard (1975) and Petersen (1990): (a) filiform tentacle has its whole surface covered more or less uniformly with nematocysts; (b) moniliform tentacle is covered with annular nematocyst rings; (c) capitate tentacle has nematocysts concentrated at its terminal knob. We do not use the term "pseudofiliform" (Petersen, 1990: 109), because it practically does not differ from "filiform".

We use the terms "hollow" and "solid" tentacles according to Millard (1975: 8).

The term "diaphragm" is used for the gastric septum, which divides the gastral cavity of polyp head between oral and aboral tentacles (Rees, 1957).

The terminology of gonophore construction is accepted according to Kuhn (1913): (a) eumedusoid: marginal tentacles reduced; exumbrellar cavity, velum, radial canals, and lamella present; may produce aborted medusa, which cannot feed; (b) cryptomedusoid: no radial canals; no velum; there is a narrow subumbrellar cavity; lamella thin; rudiments of tentacles may be present; (c) styloid: radial canals, velum, subumbrellar cavity, lamella and tentacles are missing; there is only spadix covered with gastroderm.

We distinguish the following types of gonophores attachment according mainly to the presence or absence and structure of blastostyles (blastostyle: reduced gonozooid deprived of tentacles and covered with gonophores; it may be branched or not): (a) no blastostyles; only solitary gonophores attached with their legs on polyp head; (b) no blastostyles; cluster of gonophores attached with their legs on polyp head; (c) there are unbranched blastostyles covered with gonophores, each gonophore attached with its leg; (d) there are branched blastostyles.

The following nematocyst types are distinguished: stenoteles, desmonemes, atrichous isorhizas, anisorhizas.

Material examined

Gymnogonos ameriensis. Holotype, in series of slides, No. 1/9410, in the collection of Zoological Institute, Russian Academy of Sciences (ZIN RAS), St.Petersburg: Sodruzhestva Sea, Amery Glacier, depth 30-35 mm, XVI SAE (Soviet Antarctic Expedition), 17.02.1972. Paratypes No. 2/9411 and 3/9412 in collection of ZIN RAS: same locality, depths 25 m and 15 m respectively, XVI SAE, 18.02.1972.

Gymnogonos crassicornis. Slides of the holotype from the Oslo Zoological Museum.

Gymnogonos obvolutus. Slides of polyp tentacles of the holotype from the Copenhagen Zoological Museum.

Material of all other named species probably belonging to *Gymnogonos*, i. e. *Corymorpha antarctica*, *Tubularia cingulata* and *Myriothela* sp., is lost, and we could only use the original descriptions.

Genus **Gymnogonos** Bonnevie, 1898

Type species: *Gymnogonos crassicornis* Bonnevie, 1898.

Description. Polypoid stage represented by solitary polyp. Polyp body covered with thin, transparent membranous perisarc secreted below the aboral tentacles or polyp head. Polyp head not clearly or more or less clearly demarcated from hydrocaulus. Oral tentacles hollow or solid(?), moniliform and distributed in 1-3 compact whorls. Aboral tentacles hollow or solid(?), moniliform and gathered into 1-2 compact wohrls. No diaphragm between oral and aboral tentacles of the polyp head, no constriction between polyp head and hydrocaulus. Endoderm of hydrocaulus parenchimatic, with longitudinal canals in the aboral upper part (about a third) of polyp caulus. Thin rooting filaments at the basal part of hydrocaulus present or absent (possibly, missing). There are several compact rows of solid papillae below basal whorl of tentacles; a few papillae groups or solitary papillae may be scattered over the hydrocaulus. Within the papillae(?) and filaments, endodermal statocysts may be present. Generative stage represented by solitary or grouped styloid or cryptomedusoid gonophores always supported on short unbranched pedicels (without blastostyles) scattered along the area between the worls of oral and aboral tentacles. Neither fully developed, nor abortive free medusae are known.

Distribution. Members of this genus are found from the low-tidal to shelf-slope depths in Arctic and high boreal areas as well as in the Antarctic and notal zone.

Comments. This genus undoubtely belongs to the family Corymorphidae because its representatives are characterized by solitary (never colonial) polyps covered with a very thin membranous perisarc, with the rooting filaments, papillae, oral and aboral groups of tentacles (Petersen, 1990).

After the establishment of *Gymnogonos* by Bonnevie, taxonomists for a long time refused

to use this generic name. In the recent revision of Corymorphidae (Petersen, 1990), *Gymnogonos* was accepted as a separate genus. Petersen classified the genera of Corymorphinae based on the following features: (1) character of distribution of longitudinal endodermal canals; (2) presence or absence of the constriction between polyp head and hydrocaulus; (3) structure of the polyp tentacles; (4) presence or absence of solid papillae at the polyp head base.

Petersen did not take into account the presence or absence of blastostyles and their construction, and he rejected such characters as presence or absence of free medusae or type of gonophore construction. Though Petersen is one of the taxonomists acknowledging the genus *Gymnogonos*, he did not point out that all species of this genus are characterized by the presence of styloid gonophores (except *G. obvolutus*, see below) and absence of blastostyles. We have included these characters in the diagnosis of *Gymnogonos*.

Gymnogonos ameriensis (Stepanjants, 1979)
(Figs 5, 10)

Corymorpha ameriensis Stepanjants, 1979, p.23, pl. II, fig. 6.
Gymnogonos ameriensis: Stepanjants & Svoboda, 1999: 52-53.

Redescription of holotype. Solitary polyp with a poorly demarcated constriction between its head and hydrocaulus, light yellow in alcohol, covered with a very thin membranous perisarc secreted below the polyp head. 2 groups of hollow tentacles are arranged at the polyp head. About 50 oral tentacles are grouped in compact whorls around the hypostom. Now, after 25 years of preservation, it cannot be seen anymore whether they were filiform or moniliform, but nematocysts rings are clearly seen on surface of several tentacles. That allows us to put these tentacles into the "moniliform" category (see Petersen, 1990). Aboral tentacles are longer and arranged in 2 close whorls. They are distinctly moniliform and have markedly expanded basal part. Below the whorl of aboral tentacles there is an annular deep furrow followed by closely packed solid papillae (see below). A few papillae groups or solitary papillae are scattered along the hydrocaulus. The basal part of hydrocaulus with many thin perisarcal rooting filaments. The hydrocaulus base, which is narrower than its central part, is lacking filaments. Solitary styloid gonophores (about 30, only male ones present) situated in the upper part of polyp head between the oral and aboral whorls of tentacles. Each gonophore is attached with its own short leg.

Measurements (in mm; D = diameter; L = length). Polyp L = 34; polyp head: L = 11, D at base = 4, D in central part = 5; hydrocaulus: L = 23, D below head = 3, D in middle part = 5, D at base = 2; tentacle L: oral = 0.9-1.5, aboral = 2.5-4.5; gonophore L = 1.1-1.5.

Nematocysts (in μm): stenoteles 12.5-15.0 × 10.5-12.0; anisorhizas? 17.5-20.0 × 15.0-16.5; atrichous isorhizas? 16.0-18.0 × 6.0-7.3; desmonemes? 6.0-9.0 × 6.0-7.0 (most capsules are hollow inside).

Paratypes. Without doubt, the specimens belong to the same species. After long preservation they are in very bad condition.

Distribution. The species is known only from the Sodruzhestva Sea (Antarctic, Glacial zone).

Discussion

We include in the genus *Gymnogonos* 6 species described to date. Their characters can be compared from the Table and Figs 1-10.

All of them can be brought together with their common characters. The comparison of characters allows us to conclude that all these species are more or less close to each other; the validity of the 3 first ones (*G. crassicornis*, *G. obvolutus* and *G. ameriensis*) is without doubt. Among them, *G. crassicornis*, the type species, and *G. ameriensis* are morphologically even closer allied. They differ only in the number of aboral tentacles and their whorls (Table).

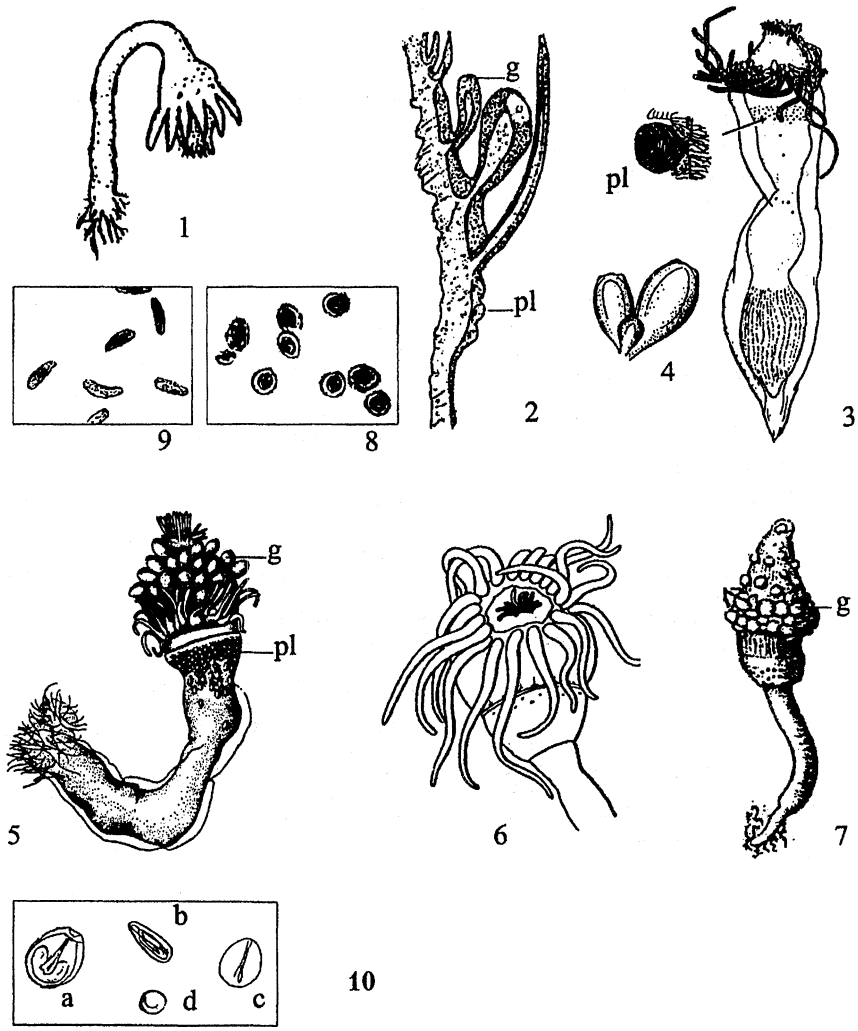
G. obvolutus Kramp, 1933 differs from other species of the genus in the following principal characters:

1. Root-filaments at the hydrocaulus are absent (present in all other *Gymnogonos* species).
2. The constriction between polyp head and hydrocaulus is absent (other species show a weak, more or less clear constriction).
3. According to Kramp's description, all tentacles are solid (hollow in other species of the genus). But according to Millard's (1975) terminology (see above), parenchimatose tentacles or such with two layers of endodermal cells (with some cavity between) should be considered as hollow tentacles too. Kramp (1933, p. 6) described his specimen as follows: "endoderm consists of a single row of discoidal cells, almost without protoplasm...", but "in basal part of tentacles there are several layers of endoderm cells, but still no hollow space...".
4. Oral tentacles are moniliform and yet slightly capitate (other species of *Gymnogonos* have only (?) moniliform oral tentacles).

Table. Characters of *Gymnogonos* species

Character	*G. crassicornis*	*G. obvolutus*	*G. ameriensis*	*G. antarcticus*	*G. cingulatus*	*Myriothela* sp.
POLYPE						
Size (mm)	L = 15, D = 2	L = 32, D = 6	L = 34, D = 4	L = 7	L = 3	L = 8
Colour	?	?	light yellow in alcohol	light yellow	?	?
Rooting filaments	on basal part of leg	absent	on basal part of leg	?	?	on basal part of leg
Papillae	below aboral tentacles	below aboral tentacles on basal part of leg	below aboral tentacles, on leg	?	below constriction	on basal part of leg
Ectodermal canals into leg	?	basal 1/3	basal 1/5	?	?	?
Perisarc border	below aboral tentacles			?	?	all along
Constriction between head and hydrocaulus	poorly visible	absent	poorly visible	absent	clearly visible	clearly visible
ORAL TENTACLES						
Length (mm)	1	1	0.9-1.5	?	?	?
Structure	hollow	solid	solid	hollow?	?	?
Type	filiform	capitate	filiform	filiform	filiform	?
Number	?	20	50	2	8	?
Rows	2-3	5	several	several	?	several
ABORAL TENTACLES						
Length (mm)	3-4	1.5	2.5-4.5	5.0	?	?
Structure	hollow	solid	hollow	hollow	hollow	?
Type	moniliform	moniliform	moniliform	filiform?	moniliform	?
Number	12	28	40	60?	20	?
Rows	1	1	2	?	?	several
GONOPHORES						
Size (mm)	1?	1?	1.0-1.5	?	?	?
Type	styloid	crypto-medusoid	styloid	?	?	?
Number	solitary	3-5 in every cluster	30, solitary	?	?	?
NEMATOCYSTS (size, μm)						
Stenoteles	14-16 × 10	25 × 20	12.5-15 × 10.5-12	?	?	?
Atrichous isorhizas	17-20 × 5-6	7-8 × 4-4.5	16-18 × 6-7.3	?	?	?
Anisorhizas?	?	?	17.5-20 × 15-16.5	?	?	?
Desmonemes	5-6 × 5-6	7-8 × 6-6.5	6-9 × 6-7	?	?	?

Sources of information. *G. crassicornis*: Bonnevie, 1898; Kramp, 1933, 1948-1949; Petersen, 1990; present data; *G. obvolutus*: Kramp, 1933, 1948-1949; Petersen, 1990; present data; *G. ameriensis*: Stepanjants, 1979; present data; *G. antarcticus*: Pfeffer, 1889; Hartlaub, 1905; *G. cingulatus*: Vanhoeffen, 1910; *Myriothela* sp.: Hickson & Gravely, 1907.
Type localities and depths. *G. crassicornis*: Arctic, Norway, Trondheim Fjord, 400 m; *G. obvolutus*: Arctic, Greenland, Kengerdlugssuak, 175 m; *G. ameriensis*: Antarctic, Sodruzhestva Sea, Glacier Amery, 15-35 m; *G. antarcticus*: Antarctic, South Georgia Isl., 0 m; *G. cingulatus*: Antarctic, Gauss-Berg, 70 m; *Myriothela* sp.: Antarctic, Ross Sea, WQ Hut Point.



Figs 1-10. *Gymnogonos*. **1**, **2**, *G. crassicornis* (after Bonnevie, 1898; schematized): **1**, type specimen; **2**, longitudinal section of half of polyp; **3**, **4**, *G. obvoluta* (after Kramp, 1933; schematized): **3**, polyp; **4**, cluster of gonophores; **5**, *G. ameriensis* (after Stepanjants, 1979); **6**, *G. cingulatus* (after Vanhoeffen, 1910); **7**, "*Myriothela* sp." (after Hickson & Gravely, 1907; schematized); **8**, **9**, *G. crassicornis*, nematocysts capsulae, schematically from photograph of cross section of holotype (**8**, stenoteles; **9**, atrichous isorhizsas); **10**, *G. ameriensis*, nematocysts, drawings by B. Anokhin (**a**, stenoteles; **b**, atrichous izorhizas?; **c**, anisorhizas?; **d**, desmonemes?). *g*, gonophore; *pl*, papilla.

5. Gonophores are grouped: 3-5 gonophores of different developmental stages are arranged in a cluster sitting on a short style.

6. Gonophores developed from the cryptomedusoid type (*G. crassicornis* and *G. ameriensis* are styloids).

All these differences suggest that a new genus can be established for *G. obvoluta* in the future. But at present, following Petersen's position here, we prefer to regard this species within *Gymnogonos*.

As noted above, all *Gymnogonos* species were found in Arctic, in high boreal zone, or in Antarctic, in natal zone. No *Gymnogonos* species were found in warm waters. It gives us convincing arguments to consider *Gymnogonos* as a bipolar genus (Stepanjants, Svoboda & Vervoort, 1996, 1997). It is especially remarkable that 2 species, the Arctic *G. crassicornis* and the Antarctic *G. ameriensis*, have extremely similar morphology. As it was noted above, the only essential difference is the pres-

ence of 1 whorl of aboral tentacles in the first species and of 2 whorls in the second species. Besides, *G. crassicornis* was found at a depth of 400 m, while *G. ameriensis* is known from more shallow waters (temperatures are accordingly, about 3-4 °C and 2-2.5 °C). On the other hand, this case is an example of ecological bipolarity (Andriashev, 1987; Svoboda, Stepanjants & Smirnov, 1997).

Key to *Gymnogonos* species

1(2). Constriction between polyp head and hydrocaulus absent or only poorly marked ..... **G. obvolutus**
2(1). Constriction between polyp head and hydrocaulus conspicuous.
3(8). Only one whorl of aboral tentacles.
4(5). 12 aboral tentacles ..... **G. crassicornis**
5(4). More than 12 aboral tentacles.
6(7). 20 aboral tentacles ..... **G. cingulatus**
7(6). 80 aboral tentacles ..... **G. antarcticus**
8(3). More than one whorl of aboral tentacles.
9(10). Rooting filaments present on the basal part of hydrocaulus, including its base .. **"Myriothela sp."**
10(9). Rooting filaments present on the basal part of hydrocaulus, but not on its base .... **G. ameriensis**

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