The genus Gymnogonos (Anthoathecata: Capitata: Corymorphidae)—redescription of known species and description of a new species from the North Pacific

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Four valid species of the genus Gymnogonos are known at this point of investigations: G. crassicornis (northern Atlantic and the Arctic Seas); G. obvolutus (northern Atlantic and the Arctic Seas); G. ameriensis (circumantarctic distribution) and the new species G. pacificus (northern Pacific). Other species, such as Corymorpha antarctica (Pfeffer, 1889) and Tubularia cingulata (Vanhoffen, 1910) from the southern hemisphere are recognized as 'species inquirendae'. New descriptions and taxonomic discussions of the known Gymnogonos species have been proposed. This genus has a typical bipolar distribution in the classical meaning of this term. This genus origin may rise from tropical Corymorphidae by neoteny in the period of glacial cooling.

Keywords: genus Gymnogonos, new species, bipolar distribution, North Pacific

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INTRODUCTION

Gymnogonos was described by Bonnevie (1898, 1899) from the collection of the Norwegian North Sea Expedition. The type-species of this genus is Gymnogonos crassicornis, described by Bonnevie (1898) from a tiny, solitary polyp from the Trondheim Fjord (Norway), at 400 m deep (Figure 1A).

About this time and later new species from the southern hemisphere were described: Corymorpha antarctica (Pfeffer, 1889; Hartlaub, 1905) and Tubularia cingulata (Vanhoffen, 1910). Judging from the short descriptions and illustrations these species are similar to Gymnogonos crassicornis, but faulty illustrations (T. cingulata) or their absence (G. antarctica), and lack of description of the typical species characters and differential diagnosis allow us to consider these species as 'species inquirendae' (International Code of Zoological Nomenclature, 1999, Glossary). Myriothela sp. (Hickson & Gravely, 1907) was described based on the small juvenile specimen from the Ross Sea (see below). Finally a new Antarctic species Corymorpha ameriensis was described (Stepanjants, 1979). Later, the aforementioned species from the southern hemisphere were preliminarily classified as belonging to the genus Gymnogonos (Stepanjants & Svoboda, 1999).

Another species similar to Gymnogonos crassicornis, Corymorpha obvoluta, is known from the northern hemisphere (Kramp, 1933). In the context of the redescription of the Antarctic species Corymorpha ameriensis, this and the other species were added to Gymnogonos (Stepanjants & Svoboda, 2001).

In the collection of the Zoological Institute of the Russian Academy of Sciences additional material from the North Pacific (the Kurile Islands area) was found. It consists of an aggregate colony and solitary polyps, evidently from the same colony (see Materials and Methods section), belonging to the genus Gymnogonos. The morphological description suggests that the colony belongs to a new species which we name Gymnogonos pacificus. It is the first representative of Gymnogonos from the North Pacific.

MATERIALS AND METHODS

The material was collected by the Norwegian North Sea Expedition by dredging in the Norwegian Sea at the end of 19th Century, by the Russian expeditions to the Barents Sea with the vessels ‘Andrey Pervosvanniyi’ (1900), ‘Romuald Mukhlevich’ (2003), ‘Ivan Petrov’ (2003), from the East Siberian Sea with ‘Sadko’ (1937), and close to the Novosibirskiye Islands (1973) by diving. The collections of Gymnogonos of The Natural History Museum, London (one specimen of Myriothela sp.) and of the Museum für Naturkunde of the Humbold University Berlin (type-specimen of Tubularia cingulata) were investigated. Slides of Gymnogonos ameriensis from the collections of the Zoological Institute of the Russian Academy of Sciences (ZIN RAS) were considered too. Finally the type colony and separate polyps of a new species G. pacificus were investigated in detail and illustrations were prepared. Details of the dredging stations of the specimens are described in Table 1.

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RESULTS AND DISCUSSION

Gymnogonos crassicornis Bonnevie, 1898 (Figures 1A–F, 5; Tables 1–3)

Gymnogonos crassicornis Bonnevie, 1898: 181, 182, Taf.XXV, figures 1–11; 1899: 16, 19; Kramp, 1949: 11; 1949: 200, 202, figure 8; Petersen, 1990: 148; Schuchert, 2001: 41, figures 1(1, 2); Stepanjants & Svoboda, 1999: 47–54, figures 1, 2, 8, 9; Epifanova, 2007: 140; 2007: 16, 19, figure 2A, B.

Solitary polyps 5.0–17.0 mm length and diameter of head of polyp about 1–2 mm. Polyps covered by very thin, membranous, transparent perisarc. Constriction between head of polyp and caulus clear (Figure 1A–D). Head of polyp with two sets of hollow, cylindrical (oval in cross-section) filiform oral tentacles, up to 20 in number, distributed in 2–3 compact whorls around mouth; their length up to 1 mm. Up to 12 moniliform, hollow aboral tentacles, each 3–4 mm in length, distributed in one row. Gonophores styloids, distributed between oral and aboral tentacles, solitary, each attached to its own style. There are no branched blastostyles. Solid papillae below aboral tentacles, distributed in several rows (Figure 1A–C, E, F). Rooting filaments on basal part of caulus; no longitudinal gastric canals in caulus. No parenchymatous diaphragm between gastric cavity of head of polyp and caulus (Figure 1F).

Nematocysts (μm): stenoteles 14.0–16.0 × 10.0 (Stepanjants & Svoboda, 2001); 15.0–21.0 × 11.0–19.0 (new specimens); desmonemes 5.0–10.0 × 5.0–7.0; unidentified rhabdoids 16.0–20.0 × 5.0–6.0; euryteles were not found.

Gymnogonos crassicornis specimens were found in Norwegian Sea (400 m deep), near Iceland (about 209 m) and in the Barents Sea (17.5–9.0 m; 260 m; 136 m; 167 m). It is a typical high boreal west-Arctic species.

Gymnogonos obvolutus (Kramp, 1933). (Figures 2A–G, 5, Tables 1–3)

Corymorpha obvoluta Kramp, 1933: 4–14; figures 1–9; 1949: 193, 194, figure 5.


Table 1. Investigated material of Gymnogonos species.

<table>
<thead>
<tr>
<th>NN</th>
<th>Species</th>
<th>Hemisph</th>
<th>Coll. No.</th>
<th>Location, depth</th>
<th>Expedition</th>
<th>Polyp length (mm)</th>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Gymnogonos crassicornis</td>
<td>N</td>
<td>Coll. of Zoological Museum of Oslo,</td>
<td>Trondheim Fjord (Norway), 400 m</td>
<td>Norwegian North Sea Expedition, 1896</td>
<td>15.0</td>
<td>Slides by Bonnevie with transversal sections of type polyp</td>
</tr>
<tr>
<td></td>
<td>Bonnevie, 1898</td>
<td></td>
<td>Norway</td>
<td></td>
<td></td>
<td></td>
<td>8 slides prepared by Bonnevie</td>
</tr>
<tr>
<td>2</td>
<td>Gymnogonos crassicornis</td>
<td>N</td>
<td>Coll. ZIN RAS, N1/10733</td>
<td>Trondheim Fjord (Norway), 400 m</td>
<td>Norwegian North Sea Expedition, 1896</td>
<td>12.0</td>
<td>One polyp and fragments</td>
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<tr>
<td></td>
<td>Bonnevie, 1898</td>
<td></td>
<td>part of slides of type-N1 material</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Gymnogonos crassicornis</td>
<td>N</td>
<td>Coll. ZIN RAS, N2/10731</td>
<td>The Barents Sea; 17.5 – 20.0 m; Amphitrite; 3054’N; 37°58’E; 55.0 m</td>
<td>ENPM – 'Andrey Pervosvanni'</td>
<td>7.0 – 17.0</td>
<td>Two polyps</td>
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<td></td>
<td>Bonnevie, 1898</td>
<td></td>
<td></td>
<td></td>
<td>Station 250, hydrological survey 552; 25 June 1900.</td>
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<td>Gymnogonos crassicornis</td>
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<td>Coll. ZIN RAS, N3/10732</td>
<td>The Barents Sea 71°15’36’N; 33°15’36’E; 260 m</td>
<td>'Romuald. Mukhlevich'; Rip 1, Station 39, mud, sand with cl 15.0</td>
<td>18.0</td>
<td>One juvenile polyp</td>
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<tr>
<td></td>
<td>Bonnevie, 1898</td>
<td></td>
<td></td>
<td></td>
<td>grab 4; 15 June 2003; leg N. Epifanova</td>
<td></td>
<td></td>
</tr>
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<td>5</td>
<td>Gymnogonos crassicornis</td>
<td>N</td>
<td>Coll. ZIN RAS, N4/10733</td>
<td>The Barents Sea 69°00’36’N; 40°02’56’E; 316 m</td>
<td>'Romuald. Mukhlevich'; Rip 1, Station 61; sand with fine stones; 18.0</td>
<td>12.0</td>
<td>One polyp</td>
</tr>
<tr>
<td></td>
<td>Bonnevie, 1898</td>
<td></td>
<td></td>
<td></td>
<td>17 August 2003; leg N. Epifanova</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Gymnogonos crassicornis</td>
<td>N</td>
<td>Coll. ZIN RAS, N5/10733</td>
<td>The Barents Sea 68°58’20’N; 37°58’25’E; 167 m</td>
<td>'Romuald. Mukhlevich'; Rip 1, Station 46; mud, sand and grab; 18.0</td>
<td>5.0</td>
<td>One juvenile polyp</td>
</tr>
<tr>
<td></td>
<td>Bonnevie, 1898</td>
<td></td>
<td></td>
<td></td>
<td>17 August 2003; leg N. Epifanova</td>
<td></td>
<td></td>
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<td>7</td>
<td>Gymnogonos crassicornis</td>
<td>N</td>
<td>Coll. ZIN RAS, N6/10734</td>
<td>The Barents Sea 76°59’52’N; 50°29’42’E; 350 m</td>
<td>BASICC - 2003 'Ivan Petrov' Norwegian Expedition, Station 38.3, 20 August 2003; leg S. Denisenko, A. Voronkov, S. Potin</td>
<td>7.0</td>
<td>One juvenile polyp</td>
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<tr>
<td></td>
<td>Bonnevie, 1898</td>
<td></td>
<td></td>
<td></td>
<td>'Sadko' Expedition; Station 37, 6 September 1937; ston 18.0</td>
<td>12.0</td>
<td>One polyp</td>
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<tr>
<td>8</td>
<td>Gymnogonos crassicornis</td>
<td>N</td>
<td>Coll. ZIN RAS, N7/10735</td>
<td>The Barents Sea 76°43’38’N; 32°44’56’E; 193 m</td>
<td>BASICC - 2003 'Ivan Petrov' Norwegian Expedition, Station 11-5 13 August 2003 leg S. Denisenko, A. Voronkov, S. Potin</td>
<td>5.0</td>
<td>Fragments only</td>
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<td></td>
<td>Bonnevie, 1898</td>
<td></td>
<td></td>
<td></td>
<td>'Sadko' Expedition; Station 37, 6 September 1937; stone fr 18.0</td>
<td>12.0</td>
<td>One juvenile polyp</td>
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<tr>
<td>9</td>
<td>Gymnogonos obvolutus</td>
<td>N</td>
<td>Coll. ZIN RAS, N1/10728</td>
<td>The East Siberian Sea; south side of Jeanette Island, 76°47’8’N; 158°04’5’E; 20 m</td>
<td>'Sadko' Expedition; Station 37, 6 September 1937; stone fragments, pebble; leg Gorbunov</td>
<td>18.0</td>
<td>One juvenile polyp</td>
</tr>
<tr>
<td></td>
<td>(Kramp, 1933)</td>
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<td>10</td>
<td>Gymnogonos obvolutus</td>
<td>N</td>
<td>Coll. ZIN RAS, N2/10729</td>
<td>Novosibirskiy Islands, Makar Island; 10 m</td>
<td>Sample 13h; Rip 4; 18 August 1973; temperature –2.3°C; sand 6.0 – 32.0</td>
<td>12.0</td>
<td>One juvenile polyp</td>
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<td></td>
<td>(Kramp, 1933)</td>
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<td>11</td>
<td>Gymnogonos obvolutus</td>
<td>N</td>
<td>Coll. ZIN RAS, N3/10730</td>
<td>Novosibirskiy Islands, Makar Island; 10 m</td>
<td>Sample 12b; Rip 2; 18 August 1973, temperature –2.3°C; sand 3.0 – 14.0</td>
<td>12.0</td>
<td>One juvenile polyp</td>
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<td></td>
<td>(Kramp, 1933)</td>
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<td>12</td>
<td>Gymnogonos obvolutus</td>
<td>N</td>
<td>Coll. ZIN RAS, N4/10740</td>
<td>Laptev Sea 79°29’32’N; 104°29’2’E; 166 m</td>
<td>'Polarstern'; 3 August 1995 Station 36/016 GKG; sand; temperature 1.46°C; salinity 34.32%0</td>
<td>12.0</td>
<td>One juvenile polyp</td>
</tr>
<tr>
<td></td>
<td>(Kramp, 1933)</td>
<td></td>
<td></td>
<td></td>
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(Continued)
Table 1. Continued

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<th>NN</th>
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<th>Hemisph</th>
<th>Coll. No.</th>
<th>Location, depth</th>
<th>Expedition</th>
<th>Polyp length (mm)</th>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>13</td>
<td><em>Gymnogonos obvolutus</em> (Kramp, 1933)</td>
<td>N</td>
<td>Coll. ZIN RAS, N5/10741</td>
<td>Laptev Sea 79°29′3 N; 104°29′7″E 101 m</td>
<td>'Polarstern'; 13 August 1995 Station 36/010 GKG; sand; temperature 1.46° C; salinity 34.32‰</td>
<td>12.0</td>
<td>One juvenile polyp</td>
</tr>
<tr>
<td>14</td>
<td><em>Gymnogonos ameriensis</em> (?) <em>Corymorpha antarctica</em> Pfeffer, 1889</td>
<td>S</td>
<td>Zoological Museum of the University of Hamburg data from Pfeffer,1889 (specimens got lost in 1945), only description was investigated</td>
<td>South Georgia Island, 0 m</td>
<td></td>
<td>7.0</td>
<td>Several polyps</td>
</tr>
<tr>
<td>15</td>
<td><em>Gymnogonos ameriensis</em> (?) <em>Tubularia cingulata</em> (Vanhoffen, 1910)</td>
<td>S</td>
<td>Museum für Naturkunde, Berlin: Zmb Cn 14856 holotype</td>
<td>Gaußberg, Twist 70 m</td>
<td>Deutsche Südpolarexpedition, November 1902</td>
<td>3.0</td>
<td>One type-polyp</td>
</tr>
<tr>
<td>16</td>
<td><em>Gymnogonos ameriensis</em> (Myriothela sp)</td>
<td>S</td>
<td>BMNH coll. CR 05/55</td>
<td>Winter station, Ross Sea area</td>
<td>Antarctic Expedition 'Discovery' 13 November 1902</td>
<td>8.0</td>
<td>One polyp</td>
</tr>
<tr>
<td>17</td>
<td><em>Gymnogonos ameriensis</em> (Stepanjants, 1979)</td>
<td>S</td>
<td>Coll. ZIN RAS, N1/9410 holotype-specimen</td>
<td>Soloduzesta Sea; Aimery Glacier; 30 – 35 m</td>
<td>16 CAE; Stations 3558 and 3567; 18 February 1972; rocks; Collected by diving Gruzov, Sheremetevskyi</td>
<td>3.4</td>
<td>One type-specimen</td>
</tr>
<tr>
<td>18</td>
<td><em>Gymnogonos ameriensis</em> (Stepanjants, 1979)</td>
<td>S</td>
<td>Coll. ZIN RAS, N2/9411 Paratypes</td>
<td>Soloduzesta Sea; Aimery Glacier; 15 m,</td>
<td>16 CAE; Stations 3558 and 3567; 18 February 1972; rocks; Collected by diving Gruzov, Sheremetevskyi</td>
<td>–</td>
<td>Transversal sections were prepared</td>
</tr>
<tr>
<td>19</td>
<td><em>Gymnogonos ameriensis</em> (Stepanjants, 1979)</td>
<td>S</td>
<td>Coll. ZIN RAS, N3/9412 slide sections</td>
<td>Soloduzesta Sea; Aimery Glacier; 25 m</td>
<td>16 CAE; Stations 3558 and 3567; 18 February 1972; rocks; Collected by diving Gruzov, Sheremetevskyi</td>
<td>–</td>
<td>Slides with longitudinal sections</td>
</tr>
<tr>
<td>20</td>
<td><em>Gymnogonos pacificus</em> sp. nov., Stepanjants &amp; Svoboda</td>
<td>N</td>
<td>Coll. ZIN RAS, N1/10850 holotype-specimen</td>
<td>48°02′17″N; 154°24′05″E Kurile Island, Lovushka Rocks; 580 m</td>
<td>'Odyssey', 3 August 1984; Sand with gravel; drag leg Sirenko, Kolesnikov</td>
<td>2.0 – 20.0</td>
<td>One colony and several solitary polyps belonging to the same colony</td>
</tr>
</tbody>
</table>

In Table 1: NN, column of ordinal number of investigated collection; Hemisph, column of N /northern/ and S /southern/ hemisphere; Coll. No, deposition of investigated collection and its number.
Solitary polyps 3–18 mm in length and 1–3 mm in diameter (in our juvenile polyps) and up to 32 mm in length and about 6 mm in diameter of the caulus. Polyps covered by thick, transparent, membranous perisarc, extending to border of base of aboral tentacles. There is no constriction between head of polyp and caulus. Head of polyp with two sets of ten-tacles: oral set, up to 20 tentacles, distributed in one whorl around mouth. They are filiform, hollow, cylindrical (oval in cross-section), their length of up to 1 mm. The up to 28 aboral tentacles are distributed in one row. In our material, the oral and aboral tentacles are moniliform, i.e. tentacles have transversal nematocyst bands (Figure 2A, C, D). Below the aboral tentacles, there are small solid papillae, which are poorly recognizable in juvenile polyps. Gonophores are cryptomedusoids and have a large manubrium (spadix), rudiments of 4 marginal tentacles, a bell cavity and no radial canals. The gonophores distributed between oral and aboral tentacles. They are not located on branched blastostyles, but in clusters of 2–3 gonophores on a common style (Figure 2E). There are no typical rooting filaments at the base of caulus. Occasionally such structures can be seen in the middle of caulus, but they are occasionally located at the base of caulus. There are longitudinal gastric canals in type-polyp (Kramp, 1933: p.6; this paper Figure 2A). In our material, there are poorly distinguishable longitudinal gastric canals of caulus in one of the polyps. There is no parenchymatous diaphragm between gastric cavity of the head of polyp and caulus.

Nematocysts (μm): stenoteles: 25.0 × 20.0 (Stepanjants & Svoboda, 2001); 8.0 × 10.0 (new specimens); (?)rhabdoids: 7.0–8.0 × 4.0–4.5 (Stepanjants & Svoboda, 2001); 16.0–18.0 × 6.0–7.0; 11.0 × 4.0; (?)euryteles were not found.

Gymnogonos obvolutus was found near south-east Greenland (175 m; Kramp, 1933), in the Laptev and the East Siberian Seas (10–106 m). It is a west-boreal high Atlantic and Arctic species.

Gymnogonos ameriensis (Stepanjants, 1979). (Figure 3A–F, 5 Tables 1–3)

Corymorpha ameriensis Stepanjants, 1979: 23, Table II, figure 6; Table XXV, figure 1;
Gymnogonos ameriensis Stepanjants & Svoboda, 1999: 52, 53;
Stepanjants & Svoboda, 2001: 247–252, figures 5, 10;
?Corymorpha antarctica Pfeffer, 1889: 17; Hartlaub, 1905: 543, 544;
?Tubularia cingulata Vanhöffen, 1910: 279, 280, figure 5;
Myriothela sp Hickson & Gravely, 1907 18, 19, Table III, figure 18;
Solitary polyps up to 34 mm in length, about 4–5 mm in diameter and light yellow in coloration. Constriction between the head of polyp and caulus visible. Polyp covered with thin, membranous, transparent perisarc, secreted below aboral tentacles. Head of polyp with two sets of tentacles. Up to 50 oral tentacles grouped in several compact whorls around hypostome; they are filiform, hollow, cylindrical (oval in cross-section), up to 1.5 mm in length with nematocyst rings and up to 40 aboral tentacles 2.5–4.5 mm in length, distributed in two rows and have markedly expanded basal parts. Below whorl of aboral tentacles there is a deep annular furrow, followed by closely packed solid papillae. Few papilla groups or solitary papillae are scattered along caulus. Basal part of caulus with many thin perisarcal rooting filaments. About 30 styloid gonophores (only male in our material) are situated in the upper part of head, between oral and aboral whorls of tentacles. Each gonophore attached to head of polyp with its own short leg. There are no branched blastostyles and no longitudinal gastral canals usually visible on caulus.

Nematocysts of type-specimen (μm): stenoteles: 12.0–19.0 × 9.0–12.0; desmonemes 6.0–10.0 × 6.0–7.0; rhabdoids (?) 16.0–18.0 × 6.0–7.0; euryteles (?) 28.0 × 25.0.

The older literature contains the descriptions of several species from the southern hemisphere which are comparable with *G. americensis*. The first one is *Corymorpha antarctica* from the South Georgia area (Pfeffer, 1889, Hartlaub, 1905). The description of this species suggests that it is a juvenile polyp (not fully developed gonophores and small size—only 7 mm in length). Both polyps have a yellow coloration, no evident constriction between the head of the polyp and caulus. They have hollow, filiform oral tentacles (about 20 in number) and a large number of aboral tentacles (40 in *G. americensis* and about 80 in *G. antarctica*). The gonophores are not fully developed (according to Pfeffer, 1889) but more or less mature, with radial canals, but without tentacles and ring formation.

**Fig. 2.** *Gymnogonos obvolutus* (Kramp, 1933). (A) type-specimen from the Kangerdluggsuak Fjord (south-eastern Greenland, 175 m deep—after Kramp, 1933); (B) elongated specimen from the Novosibirskiye Islands area (the East Siberian Sea, 10 m deep); (C) short specimen from the same place; (D) oral tentacles distributed around the mouth; aboral tentacles distributed under gonophores; schematically; (E) cryptomedusoid gonophore group on common style, schematically; (F) short specimen collected at Makar Island, 18 August 1975, near Novosibirskiye Islands. Scale bars: A–C, F, 5.0 mm.
canal (Hartlaub, 1905). No branched blastostyles. There is no possibility to draw a final conclusion, because the type specimen of Corymorpha antarctica was lost after 1945 and there are no illustrations or species-specific details in previous publications. We suggest C. antarctica as ‘species inquirenda’ and consider C. antarctica with doubt as synonym with G. ameriensis.

Two juvenile specimens, probably belonging to Gymnogonos, were found later in the Antarctic region. We could obtain both related specimens from the British Museum of Natural History and from the Museum für Naturkunde, Berlin. One of them, collected near the Ross Sea area, was described as Myriothela sp. by Hickson & Gravely (1907: 18). This specimen (8 mm in length) lacks mature gonophores and has short tentacles, but bears papillae around the basal part of the head of polyp below deep annular furrow and rooting filaments at the base of caulus. The aboral tentacles of this polyp are distributed in two whorls, what may be concluded both in the illustration of Myriothela sp. (Hickson & Gravely, Table III, figure18) and after investigation of the type-polyp. These morphological details suggest that it is a juvenile specimen of G. ameriensis (Figure 3C). The second juvenile specimen was found by the Deutsche Süd-Polar-Expedition at Gauss-Berg and described as Tubularia cingulata by Vanhöfen (1910). The illustration shows only the head of the polyp, but the specimen (3 mm in length) shows more details than were described originally (Figure 3D). The polyp consists of a tiny head, the aboral tentacles (about 20) are distributed in two whorls. There is a deep annular furrow and papillae below the oral tentacles and rooting filaments at the caulus. The incomplete description and unclear illustration allows us to classify this species as ‘species inquirenda’ and it is probably a juvenile polyp of G. ameriensis. New additional material is needed to decide this question ultimately.

Nematocysts of these juvenile polyps (μm). Myriothela sp: stenoteles 18.0 × 17.0; desmonemes 6.0–10.0 × 6.0–7.0; (?)rhabdoids 11.0–13.0 × 6.0–10.0; (?)euryteles 19.0–20.0 × 17.0; Tubularia cingulata: only (?)rhabdoids 11.0 × 5.0.

In sum, we conclude that at the moment there is only one valid species of Gymnogonos in the Antarctic and Subantarctic —G. ameriensis with a circumantarctic distribution.

Gymnogonos pacificus Stepanjants et Svoboda, sp. nov (Figures 4A–E, 5, Tables 1–3)

Material examined

Holotype specimen N 1/10830. Aggregate colony and its fragments—6 separated polyps of different age; 2 heads of polyps and, accordingly, 2 hydranths, possibly from the same colony. Type locality Kuril Islands; Rocks Lovushka Island 48°02′17″N, 154°24′05″E; ‘Odyssey’ e/s, voyage 33; 3 August 1984; depth 580 m; sand with gravel; drag; leg. Sirenko, Kolesnikov (Table 1).

Diagnosis. The first distinctive character is presence of the aggregate colony which consists of several polyps of different ages: from juvenile to mature stages. Each polyp has either no or a poorly recognizable constriction between head and caulos of hydranth. The oral tentacles are short and distributed around the mouth at the end of remarkable elongated hypostome. Elongated hypostome is the second character of this species. The aboral tentacles are much longer and distributed in two rows. Between the oral and aboral tentacles there are whorls of gonophores: 2–3 gonophores in each group on joint style. One gonophore of each group is significantly larger than the others (Figure 4E) (the third character of this species). They are cryptomedusoids (undifferentiated sex) and display several (~4) tentacles buds. Below the aboral tentacles, there is a poorly visible annular furrow. Below this furrow there are numerous papillae (typical for Gymnogonos). Another typical feature of this genus is the thin membranous, transparent perisarc covering the caulus up to the base of the polyp head.

Description. Aggregate colony (unstable colony, Stepanjants et al., 2002), sometimes separated into solitary polyps after fixation, consists of several polyps in all stages of age (Figure 4A). Size of polyps ranges from 2.0–20.0 mm in length. Each mature polyp has two sets of tentacles on its head: oral tentacles (about 20 in number) are very short (about 0.5 mm in length) and distributed in one row around mouth on oral part of elongated hypostome (Figure 4B). The aboral tentacles (more than 20 in number) are filiform, hollow, about 8.0 mm in length and distributed into two rows. Each mature polyp has an inconspicuous annular furrow at the base of head (Figure 4D). Below this furrow there are numerous papillae (Figure 4C). The perisarc covers the caulus up to border of head. It is membranous, thin and transparent. The gonophores distributed between the oral and aboral tentacles. They are in groups (2–3–4 in each group), but only one of each group is fully matured, and probably male. Each gonophore group is attached to a common style. Gonophores are cryptomedusoids and display tentacle buds. It is impossible to recognize other gonophore structures (Figure 4E).

Nematocysts (μm): stenoteles 18.0–23.0 × 12.0–20.0; desmonemes 7.0 × 10.0; (?)rhabdoids 11.0–15.0 × 4.0–6.0; (?)euryteles 17.5–20.0 × 15.0–16.5.

Differential diagnosis. The species of Gymnogonos are very similar to each other. There are only few features of Gymnogonos that differ among species: presence or absence of clear constriction between the head of polyp and caulos (1); size of the hypostome (2); the character of aboral tentacle distribution (3) and colonial or solitary polyp organization (4) (Table 2).

The new material extends the diagnosis of Gymnogonos compared with the original one from Bonnevie (1898): ‘Der Hydrocaulus (ist) von einem membranartigen Perisark bedeckt, an dessen proximalem Ende Haftfäden befestigt sind. Ein Kreis von Papillen am Übergang zwischen dem Hydrocaulus und Hydranthen. Styloide Gonophoren werden vom Hydranthen selbst entwickelt. Kommt einzeln vor’.

The new Gymnogonos diagnosis

Corymorphidae with solitary or colonial polyps covered with a more or less thin, transparent, membranous perisarc extending to base of the head of polyp. The hollow filiform tentacles are arranged in two—oral and aboral sets. The oral tentacles are arranged in one or several rows around the mouth; aboral tentacles longer than oral ones, arranged in one or two rows. The styloid or cryptomedusoid gonophores are solitary or in groups of 2–4 on a common style, distributed between oral and aboral tentacles of the head of polyp. No branched blastostyles.
Below aboral tentacles there is an annular furrow often poorly visible. Under furrow many solid entodermal papillae with ectodermal cover of glandular cells, probably secreting perisarc. Rooting filaments at the base or middle of the caulus. *Gymnogonos* cnidom consists of stenoteles, desmonemes, unrecognizable rhabdoids and euryteles. Capsule types not a characteristic feature for this genus, but dimensions of nematocysts are more or less specific for each species (Table 3).
As it was said, species-specific characters of *Gymnogonos* species are not so clearly marked. To have the possibility to identify species an identification key is required.

**KEY FOR GYMNOGONOS SPECIES IDENTIFICATION**

1(4). Aboral tentacles of polyp arranged in one row

2(3). Constriction between head of polyp and caulus is clear.

3(2). Constriction between head of polyp and caulus is absent.

4(1). Aboral tentacles of polyp arranged in two rows

5(6). Hypostom of polyp is elongated

6(5). Hypostom of polyp is short

... ... ...

4. *G. crassicornis*

3. *G. obvolutus*

1. *G. pacificus*

2. *G. ameriensis*

The *Gymnogonos* species were found in the northern hemisphere, as indicated in the world map (Figure 5): *G. crassicornis* and *G. obvolutus* were discovered in the North Atlantic and Eurasian Arctic Seas; *G. pacificus* in the North Pacific and *G. ameriensis* in the Antarctic and subantarctic. The genus has a typical bipolar distribution in the classical meaning of this term (Stepanjants *et al.*, 2006).

In spite of missing fossils of Corymorphidae, the aforementioned material suggests that *Gymnogonos* is a relict genus which, possibly, originated from the warm water family Corymorphidae with the largest part of warm water species (~11; see Svoboda & Stepanjants, 2001; Stepanjants *et al.*, 2006) by neoteny. This idea is supported by the morphological similarity of the *Gymnogonos* juvenile polyp with the larvae of some species of Corymorphidae, for example, *Corymorpha forbesi* (see Brinckmann-Voss, 1970). It is possible to assume that the tropical zone is possibly the centre of origin of this family. During the Quaternary cooling of the tropics during the glacial period the larvae of several warm water *Corymorpha* species were forced to migrate northwards and southwards of both hemispheres and adapted to the new environments with cold water. We hypothesize that closely related cold water *Gymnogonos* species originated by this way in the northern and southern hemispheres (Stepanjants *et al.*, 2006).

**CONCLUSIONS**

1. The genus *Gymnogonos* is characterized by several specific morphological features and its representatives are easily distinguishable from other Corymorphidae by the presence of a transparent perisarcal membrane and papillae at the base of the head of polyp.
2. The cnidome of Gymnogonos (capsule types) is not a genus specific feature, since all four capsule types are known from most Corymorphidae. On the other hand, the size of capsules may be used as characteristic for each Gymnogonos species.

3. Today 4 valid species of Gymnogonos are known.

4. Several species described earlier from the southern hemisphere on juvenile polyps, such as Corymorpha antarctica and Tubularia cingulata we suppose to be 'species inquirendae' and as possible synonyms of G. ameriensis. The juvenile polyp described as Myriothela sp. we consider a synonym of G. ameriensis without doubt.

5. The distribution of Gymnogonos species suggests that they belong to bipolar genus.

6. It is possibly a relict genus. Its origin may rise from tropical Corymorphidae by neoteny in the period of glacial cooling.

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REFERENCES


Epifanova N.E. (Zhuravleva N.E.) (2007) Species and zoogeographic composition of Hydrozoa (Cnidaria, Hydrozoa, Hydroidea) of the
Barents Sea. In Chernjakov S.M. (ed.) *Natural Scientific problems of the Arctic. The 7th Regional Scientific Student Conference, Murmansk*, pp. 15–21 [In Russian.]


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