The genus *Bouillonia* (Cnidaria: Hydrozoa: Anthoathecata). Three species from the northern and southern hemispheres, with a discussion of bipolar distribution of this genus

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Svoboda, A., S.D. Stepanjants & J. Ljubenkov. The genus *Bouillonia* (Cnidaria: Hydrozoa: Anthoathecata). Three species from the northern and southern hemispheres, with a discussion of bipolar distribution of this genus.
Zool. Med. Leiden 80-4 (14), 10.xi.2006: 185-206, figs 1-28, tabs 1-2.— ISSN 0024-0672.
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Key words: Cnidaria, Anthoathecata; *Bouillonia*; Arctic, Antarctic; taxonomy, bipolar distribution.
Representatives of three species of *Bouillonia* Petersen, 1990 are studied and described: syntype specimens of *Bouillonia cornucopia* Bonnevie (1898), from the Zoological Museum, University of Oslo; a putative new species from the Arctic ("Polarstern", 1995); and *Bouillonia denhartogi* spec. nov. from the Antarctic: Weddell Sea ("Polarstern", 2000, 2005), Antarctic Peninsula ("Lawrence M. Gould", 2002, 2003), S. Sandwich Is. ("Nathaniel B. Palmer", 2004), and the Ross Sea, ("Nathaniel B. Palmer", 2005). Characters given by Petersen for the genus are discussed and a new, wider description of *Bouillonia* is proposed. Questions concerning the bipolar distribution of this genus are also discussed.

Introduction

The Arctic species *Tubularia cornucopia* was first described by Bonnevie (1898: 474-476) from the Spitzbergen area (fig. 1). Later, Bonnevie (1899: 29, 30) questioned its classification with the genus *Tubularia*, mainly because of its distinct cone-shaped perisarc tube. The next record of polyps resembling this species was almost 100 years later, when Petersen (1990: 176, 177) identified specimens collected during the NORBI expedition to the Norwegian Sea (1975) as Bonnevie's species (fig. 7). This material enabled Petersen (1990) to constitute the new genus *Bouillonia*, with *Tubularia cornucopia* Bonnevie, 1898 as the type-species.

Petersen (1990) gave a diagnosis of the genus including general characters such as "Medusa… reduced to sessile gonophore… hydranth with rounded base, hypostome wide, cylindrical with wide mouth; several closely set whorls of short oral tentacles and one whorl of longer aboral tentacles; filmy perisarc covering neck region secreted from groove around base of hydranth just under aboral tentacle whorl; hydrocaulus curved, widening considerably from thin base attached by small, circular basal disc…" (Petersen, 1990: 176).

In 1995 several tubes with internal remains of soft tissue were collected in deep water of the Laptev Sea ("Polarstern" ARKXI/2, Stn 23A, fig. 20c). These tubes closely resemble those from the NORBI-expedition (figs 6, 20b) and the specimens from the Mid-Atlantic Ridge, Gulf of Guinea area, in the Leiden Museum (see "Material and Methods", fig. 6).

In 2000 and 2005 the RV "Polarstern" cruise to the Weddell Sea yielded numerous

specimens that we identified as a new species *Bouillonia denhartogi* (figs 3, 4). During the most recent "Icefish Cruise" of the RV "Nathaniel" to South Sandwich Islands (14.06.2004), our colleague Christoph Held picked off several *Bouillonia denhartogi* specimens attached to the carapaces and pereiopods of crabs (*Paralomis* cf. *formosa)* and he took live photographs (fig. 5). Specimens of the same species were collected during several Scripps Institute of Oceanography (SIO) cruises that laid out recording gear for whale acoustical research around Antarctica. Allan Sauter, specialist at SIO's Marine Physical Laboratory, and Amy Shields and Jenny Dreyer of the Virginia Institute of Marine Sciences, on the RV "Nathaniel B. Palmer", were able to collect 16 specimens (12 fertile) attached to their sampling gear recovered in February of 2005 from 2000 m depth in the Ross Sea. Finally, Sean Wiggins and Ana Sirović on the RV "Lawrence M. Gould", also from SIO, collected a total of 101 specimens from 9 stations west of the Antarctic Peninsula. These represent the broadest range of specimens in every stage of development, including apparently regenerating polyps (after being grazed?) and specimens in which the blastostyles are just developing.

Investigation of the syntype-specimens of *Bouillonia cornucopia* from the Zoological Museum, Oslo, as well as the material named below, enables us to give a new, corrected, diagnosis of *Bouillonia* and to include two other species: a possibly new species, described here as *Bouillonia* spec., from the Arctic and *B. denhartogi* spec. nov. from the Antarctic.

Material and methods

We have studied the following material (see also table 1):

1. Two syntypes of *Tubularia cornucopia* (N B582 from the Zoological Museum, University of Oslo; Norwegian North-Atlantic Expedition, Stn 353, 77°58'N 5°10'E; 10. viii.1878; depth 2438 m) (figs 1, 20a).
2. Three perisarc tubes with internal remains of soft tissue from the Laptev Sea (Arctic Ocean) without hydranths identified as *Bouillonia* spec.; "Polarstern" ARKXI/2, Stn 23A (78°16.22'N 130°02.8'E; 4.viii.1995, depth 2470 m; N 1, collections of Zoological Institute of the Russian Academy of Sciences) (fig. 20c).
3. Three specimens from the Zoological Museum, University of Copenhagen; NORBI-expedition to the Norwegian Sea identified as *Bouillonia* spec., CP 08 (69°04.8'-69°05.3'N 04°41.6'-04°43.7'E; vii.1975; depth 3213 m) and CP 10 (69°21.9'-69°20.6'N 10°25.2'-10°28'E; 27.vii.1975; depth 2966 m) (figs 7, 20b).
4. Slide no. 4148 with two polyps, from the National Museum of Natural History of Leiden, The Netherlands (RMNH-Coel. no. 27867 from the Mid-Atlantic Ridge (western Gulf of Guinea) identified as *Bouillonia* spec., 1.vi.1992. Stn Eumeli 4, MAC 05; 18°32.04'N 21°07.22'W, depth 3116 m) (fig. 6).
5. Holotype of *B. denhartogi* in collection of the National Museum of Natural History, Leiden (RMNH-Coel. 30580) (figs 3, 9, 18).
6. Thirteen specimens from the eastern Weddell Sea (Antarctic; Glacial Sub-region) identified as *Bouillonia denhartogi*, three specimens were prepared for slides; "Polarstern" ANT XVIII/3, from Mooring AWI233-4, 20.xii.2000, 69°23.79'S 0°0.84'W; depth 2026 m. F. Hinz from AWI picked these and the specimens below from the retrieved oceanographic gear, took macro-photographs and preserved the specimens in formalin-seawater; RMNH Coel. 33830, two specimens (figs 2b, 3, 4, 9).

7. Twenty specimens from the eastern Weddell Sea (Antarctic Ocean; Glacial Sub-region), "Polarstern" ANT XVIII/3, from Mooring AWI227-6, 29.xii.2000, 59°04.2'S 0°4.36'E; gear depth (substrate) 1500-2000 m, anchoring depth 4700 m (figs 10, 14, 17b, 20d, 24, 28); RMNH Coel. 33828, two specimens.
8. Twelve polyps collected by Mrs K. Linse from AWI, "Polarstern" ANT XXII/3: Stn P 67/35-1, Hol No. 228/6, 56°57'S 00°01'E; anchoring depth 2699 m, polyps taken from release cable at 550-2700 m, 3.ii.05; Stns 67/063-2 and -6 on 17.ii.05. The mooring was anchored at 3369 m depth at 68°59'S 0°00'W. Most specimens settled between 750-1265 m, at a distance of 2-5 m from each other; RMNH Coel. 33829 two specimens.
9. Thirteen specimens from the S. Sandwich Islands ("Icefish" Cruise of the RV "Nathaniel", vi.2004); 7 from Stn BT29-49, 56°15.49'S 27°34.42'W, depth 336 m; 3 from Stn BT30-49, 56°15.49'S 27°27.03'W, 330 m depth, RMNH Coel. 33831, one specimen; 3 from Stn BT31-49, 56°15.18'S 27°26.54'W, 350 m depth; all 3 stations from 14.vi.2004. C. Held from AWI picked the polyps from legs and carapax of the crab *Paralomis* cf. *formosa*, took macro-photographs and preserved the specimens in ethanol (without prior relaxation) (figs 5, 11).
10. Sixteen specimens from the Ross Sea (RV "Nathaniel B. Palmer"; 2.ii.2005); from 71°25'S 172°40'E, 2000 m depth. Allan Sauter, Amy Shields, and Jenny Dreyer hand collected all specimens from plastic and steel parts of acoustical gear when it was brought on board. Most specimens were hanging upside down on parts that would have been between 0.5 meter and 10 meters from the bottom (figs 12, 27).
11. One hundred and one specimens in 9 lots from the Antarctic Peninsula region (RV "Lawrence M. Gould", 9.ii.2002 to 28.ii. 2003), see table 1. Specimens were hand collected by Sean Wiggins and Ana Sirović of SIO from Acoustical Recording gear positioned west of the Antarctic Peninsula at depths ranging from 1651 to 3450 m.

Results and Discussion

The investigation of the syntype material from the Zoological Museum, Oslo and other material from the Arctic, Mid-Atlantic Ridge, and Antarctic Oceans (collections of the museums of Oslo, Copenhagen, Leiden, St. Petersburg, the Ruhr-University/Bochum, and Scripps Institute of Oceanography) as well as literature data (cf. table 1), allows us to give an extended diagnosis of the genus *Bouillonia*, to redescribe the two syntype specimens of *Tubularia cornucopia* Bonnevie, 1898 (collection number N B582), and to describe two species: *Bouillonia* spec., a probably new species from the Mid-Atlantic Ridge (Gulf of Guinea area) (slide in Leiden museum, identified as *B. cornucopia* by W. Vervoort), the Norwegian Sea (NORBI-collection, identified as *Bouillonia cornucopia* by Petersen, 1990) and the Laptev Sea (Arctic Ocean), as well as *Bouillonia denhartogi* spec. nov., described after material from the eastern Weddell Sea, the South Sandwich Islands area, the Antarctic Peninsula area, and the Ross Sea (Antarctica).

Genus *Bouillonia* Petersen, 1990

Description.— Perisarc tubes of hydrocaulus curved ("horn-shaped") (fig. 20a-d); tubes (c. 5.0-120.0 mm in length) attached to substrate either by hydrorhizal stolons, by

Table 1. Collection data and general characters of the material of the holotype and paratype specimens of three *Bouillonia* species (superfamily Tubularioidea), based on new material and literature. In brackets "( )": smallest individual of the sample; "dich" = dichotomously branched blastostyle stalks present.

N	*Bouillonia* species	hemisphere	expedition reference	station date depth no. of specimens temperature	coordinates	oral tentacles		aboral tentacles 1 row		Hydro rhiza/ Disc	N blastostyles	perisarc tube size		
						N	L mm	N	L mm			L mm	Dmax mm	Dmin mm
1	*B. cornucopia* (Bonnevie 1898) type	N	Norweg. N. Atlant. Exp. Bonnevie 1898	10.viii.1878 2438 m -1.4°C 2 specim.	77°58'N 5°10'E	35-40 many rows	2.0	30	up to 30.0	+H	10 dich.	110.0-120.0	5.0-9.0	0.4-1.0
2	*B. cornucopia* sensu Petersen 1990 = *B. sp.*	N	NORBI CP08 Petersen 1990	25.vii.1975 3213 m	69°04.8'-69°05.3'N 04°41.6'-04°43.7'E	100 5 rows	2.0	40-50	5.0-10.0	+D	16-32 dich.	77.0	4.0-5.0	1.0
3	*B. cornucopia* sensu Petersen 1990 = *B. sp.*	N	NORBI CP10 Petersen 1990	27.vii.1975 2966 m	69°21.9'-69°20.6'N 10°25.2'-10°28'E	5 rows	2.0	40-50	5.0-10.0	+D	?	67.0-80.0	5.0	0.3
4	*B.* labelled as *cornucopia* = *B.* sp.	N	Leiden RMNH Coel 27867 Slide 4148 G. of Guinea	1.vi.1992 Eumeli 4 MAC 05 2 specim. large/small	18°32.04'N 21°07.22'W	?	?	25/ 17	3.0-3.5/ 2.0-2.5	+D	2 dich.?	18.0/ 9.0	1.2/ 0.65	0.55/ 0.25
5	*B.* sp.	N	"Polarstern" ARKXI/2 Laptev Sea	St. 23A 4.viii.1995 2470 m	78°16.22'N 130°02.8'E					?		65.0-90.0	3.5-2.5	0.1-0.3
6	*B. denhartogi* sp. n.	S	"Polarstern" ANTXVIII/3 Weddell Sea	20.12.2000 mooring AWI1233-4 2026 m 13 specim.; 2 RMNH-Coel. 33830	69°23.79'S 0°084'W	>100 without order	0.5	30	3.0-10.0 (7.0)	+D	20-50 dich.	16.0-40.0 (14.0)	0.9-2.6 (0.7)	0.3-0.4
7	*B. denhartogi* sp. n.	S	"Polarstern" ANTXVIII/3	29.12.2000 mooring AWI1227-6 1500-2000m 20 specim.; 2 RMNH-Coel. 33828	59°04.2'S 0°4.36'E	~80-100 without order	1.2-1.6	22-30	5.0-15.0	+D	25-30	15.0-30.0	0.9-1.5	0.35-0.4
8	*B. denhartogi* sp. n.	S	"Polarstern" ANTXXII/3 Stat. 67/35-1 Hol 228/6 Stat. 63/2 Hol 232-6 Moor./releaser	3.ii.2005 550-2700 m 17.ii.2005 765-1265m 12 specim.; 1 RMNH-Coel. 33829	56°57'S 0°01'E 68°59'S 0°00'W	~80-160 without order	2.2-3.5	40-46	12.0-22.0	+D	25-50	30.0-42.0	1.6-2.6	0.4

9	*B. denhartogi* sp. n.	S	"Nathaniel B. Palmer" Ice Fish cruise S. Sandwich Isl.	14.vi.2004 BT29-49 BT30-49 BT31-49 330-350 m 13 specim.; 1 RMNH-Coel. 33831	56°15.49'S 27°34.42'W 56°15.49'S 27°27.03'W 56°15.18'S 27°26.54'W	~80 with-out order	1.0-2.0	25-30	3.0-4.0	+D	~10-30	10.0-13.0	1.2-1.6	0.3-0.4
10	*B. denhartogi* sp. n.	S	SIO-MPL cruises	2.ii.2005 2000 m 16 specim.	Ross Sea 71°25'S 172°40'E	25-40	3.3	30-80	11.5	+D	8-10 dich.	5.0-27.0	2.1	0.3
11	*B. denhartogi* sp. n.	S	LMG 03-02 SOGLOBEC	S1A 28.ii.2003 1658 m 12 specim.	W. Antarctic Peninsula 62°16.42'S 62°10.04'W	>80 with-out order	1.9	24	12.3	+D	~10-12	10.0-21.6	1.6	0.33
12	*B. denhartogi* sp. n.	S	LMG 03-02 SOGLOBEC	56A 21.ii.2003 3099 m 12 specim.	W. Antarctic Peninsula 67°18.25'S 74°10.15'W	many with-out order	0.74	30	7.0	+D	~10	10.4-24.8	1.5	0.25
13	*B. denhartogi* sp. n.	S	LMG 03-02 SOGLOBEC	S5A 20.ii.2003 3421 m 15 specim.	W. Antarctic Peninsula 66°34.99'S 72°41.43'W	~80 with-out order	1.4	25	7.0	+D	?	5.6-18.0	1.8	0.33
14	*B. denhartogi* sp. n.	S	LMG 03-02 SOGLOBEC	S2A 19.ii.2003 3043 m 11 specim. (fragments)	W. Antarctic Peninsula 63°50.4'S 67°7.84'W	~80 with-out order	1.4	25	4.1	+D	?	7.2-22.4	1.9	0.25
15	*B. denhartogi* sp. n.	S	LMG 03-02 SOGLOBEC	S4A 20.ii.2003 2944 m 6 specim.	W. Antarctic Peninsula 65°58.43'S 71°2.90'W	~40 with-out order	0.8	20	7.4	+D	8-12	10.4-19.5	1.6	0.41
16	*B. denhartogi* sp. n.	S	LMG 02-01A GLOBEC Mooring	Site 4 16.ii.2002 2962 m 9 specim.	W. Antarctic Peninsula 65°58.4'S 71°4.1'W	~70 with-out order	2.1	25-30	5.7	+D	10-12	5.8-14.4	1.2	0.33
17	*B. denhartogi* sp. n.	S	LMG 02-01A GLOBEC Mooring	Site 5 10.ii.2002 3450 m 14 specim.	W. Antarctic Peninsula 66°35.197'S 72°42.36'W	~40 with-out order	2.1	25-27	13.1	+D	8-10	11.5-23.5	1.6	0.33
18	*B. denhartogi* sp. n.	S	LMG 02-01A GLOBEC Mooring	Na 9.ii.2002 1651 m 5 specim.	Antarctic off Livington Is. 62°16.47'S 62°10.00'W	~40 with-out order	2.1	25-27	13.1	+D	8-10	9.4-23.4	1.9	0.33
19	*B. denhartogi* sp. n.	S	LMG 02-01A GLOBEC Mooring	Site 6 15.ii.2002 3057 m 21 specim.	W. Antarctic Peninsula 67°17.9'S 74°10.8'W	70-80 with-out order	1.1	40-50	9.0	+D	?12	8.2-22.4	1.6	0.33

an oval perisarc disc, or by short, radially spreading stolons connected by a perisarc film, changing shape with increasing size (figs 8-12**).** The hard perisarc tube, measuring about 0.1-0.4 mm at its base, widens considerably towards the top, with maximum diameters about 1.5-9.0 mm. Sometimes the basal perisarc has numerous "ripples" which give them an annulated appearance (fig. 10). Along the length of all tubes there are irregularities or a waviness which make the tubes uneven (specimens from the Ross Sea). At the end of the thin-walled, rigid tube the diameter of the neck tissue reduces by about half. This region is protected by a soft, elastic, gelatinous collar of clear, transparent perisarc. Its outer diameter is about twice that of the end of the hard perisarc tube, the length about two or three times its diameter (fig. 28). According to Petersen (1990) this collar is produced by the groove situated below the aboral tentacles. After rapid dehydration in strong ethanol the collar shrinks considerably in thickness and loses its transparency.

The pedal disc and the hard perisarc are light yellow to dark brown, the soft part clear like glass. In living and freshly preserved specimens longitudinal canals are visible in the upper part of the caulus (figs 7, 13, 14, 15). After decades of preservation these canals may disappear because of increased opaqueness of the tissue. The base of the polyp below the aboral tentacles is wide and has a circular groove into which the filmy neck region terminates (fig. 28). There is one row of long aboral tentacles. Between aboral and oral tentacles there is one row of dichotomously branched, orange to pinkish (fresh material) blastostyles with numerous, densely packed gonophores (figs 17, 18), appearing like a solid ring with a cauliflower-like appearance. According to Petersen (1990) the gonophores are cryptomedusoid, but from our data the reduction of the gonophores in *B. cornucopia* and *B. denhartogi* spec. nov. correspond to the styloid stage (figs 16, 19). In none of the species mature gonophores could be found. The hypostome, dark brownish-red both in life and after preservation, has numerous short oral tentacles, irregularly arranged (fig. 25) or in many closely approximated rows, with the same pigmentation. In very young specimens the pigmentation is not developed. Often the mouth is wide open allowing a direct view into the gastric cavity (fig. 26).

It is significant that some specimens are represented by "aggregated" colonies which develop when young polyps attach to the mother polyp by settling on the swollen basal tubules connected with the perisarc of the pedal disc (Petersen's data for *Bouillonia* spec. from the Norwegian Sea and specimens of *B. denhartogi* from the Weddell and Ross Seas) (figs 7, 27). This is similar to aggregated colonies of other Tubularioidea described earlier for *Monocaulus, Monocoryne* and *Candelabrum* (Hewitt & Goddard, 2001; Stepanjants et al., 2001; Stepanjants et al., 2003). In the opinion of Bravermann (1974), Chapman (1966) and others, these types of unstable colonies result from a process of formation of structures by undifferentiated cells of polyps, and thereby connected with the common colonial coenosarc, common gastric cavity, and with podocyst formation. They have a tendency to fall from the adult as individual polyps.

In all investigated species the cnidome is composed of four different types of nematocysts: stenoteles (in three size classes), desmonemes, rhabdoids and euryteles (figs 21-24, table 2).

Petersen (1990) classified *Bouillonia* in the family Tubulariidae, despite the incompatibility of *Bouillonia* with the generic characters of this family, such as (1) the presence of reduced or fully developed marginal tentacles in the medusoids (absent in *Bouillonia*); (2) moniliform oral tentacles of the polyp (filiform in *Bouillonia*); (3) one or several

Table 2. Nematocysts of the 3 *Bouillonia* species (µm)

N		Stenoteles larger	medium	smaller		Microbasic heteron. Rhabdoids?	Euryteles?
1	*B. cornucopia* (Bonnevie, 1898) Type specimens	16.0-18.0 × 14.0x16.0	15.0-16.0 × 11.0-12.5	10.0-12.5 × 9.0-11.5	6.0-7.0 × 4.5-5.0	14.0-17.5 × 5.5-7.5	10.5-13.0 × 4.5-6.0
2	*B. "cornucopia"* Petersen 1990, NORBI CP8	17.0-17.5 × 15.0-15.5	15.5 × 11.5-12.5	10.0 × 9.0-9.5	7.0 × 5.0	16.0-17.5 × 6.0-7.0	12.0-13.0 × 4.5-5.0
3	*B. "cornucopia"* Petersen 1990, NORBI CP10	17.0-18.0 × 14.0-17.0	15.0-17.5 × 10.0-12.5	10.0-11.5 × 9.0-10.0	6.5-7.0 × 5.0-5.5	15.5-16.5 × 5.0-6.0	12.0 × 4.2-4.5
4	*Bouillonia* spec. Laptev Sea	16.0-17.0 × 15.0	13.5-16.0 × 10.0-12.0	9.0-10.0 × 8.5-9.0	5.5-6.0 × 4.5-5.0	?	12.5-15.0 × 4.5-5.5
5	*Bouillonia denhartogi* spec. nov. Holotype W.S.	16.5-17.5 × 15.0-15.7	15.0-16.0 × 10.0-12.5	9.5-11.3 × 8.0-10.0	7.0-7.5 × 5.0-6.0	17.5-20.0 × 6.0-7.5	?
6	*B. denhartogi* Paratype, W. S. St. P. N10378	15.0-17.5 × 13.8-15.0	13.0-16.3 × 10.0-12.5	7.7-11.0 × 6.5-9.5	7.0-8.0 × 5.0-6.3	15.0-17.5 × 5.0-6.0	10.0-12.5 × 4.0-5.0
7	*B. denhartogi* 20.12.2000 W. S., 2000 m	17.5-19.0 × 15.0-16.3	12.0-17.0 × 10.0-12.5	7.5-11.5 × 7.0 × 10.0	8.0-9.0 × 5.5-6.0	17.0-20.0 × 5.2-7.0	10.0-12.0 × 3.5-5.0
8	*B. denhartogi* Weddell Sea From different slides	17.5 × 13.5-15.0	13.8-15 × 10.0-12.5	8.8-10.5 × 7.5-9.5	6.3 × 4.5	15.0 × 6.3	12.5 × 4.0
9	*B. denhartogi* South Shetland Isl.	15.5-16.0 × 13.0-13.5	10.0-13.0 × 8.5-11.0	8.0-9.0 × 7.0-7.5	7.0-8.0 × 5.5-6.2	13.5-15.0 × 5.0-6.0	11.0-11.5 × 5.0-5.5
10	*B. denhartogi* W. Ant. Peninsula CO2114	16.0-17.0 × 15.0	10.0-15.0 × 8.0-12.0	8.5-9.5 × 8.0-9.0	7.0-8.0 × 5.5-6.5	15.0-17.0 × 5.5-6.8	12.5 × 5.0-5.5
11	*B. denhartogi* W. Ant. Peninsula CO2099	16.0-18.5 × 15.0-16.0	12.5-15.5 × 9.5-12.5	10.0-11.0 × 9.0-10.0	8.0-9.0 × 6.0-7.0	14.5-17.0 × 5.5-6.0	10.5-11.5 × 5.5-6.0
12	*B. denhartogi* Ross Sea CO2151	14.5-15.5 × 13.0-14.0	12.0-13.0 × 9.0-10.0	8.0-11.0 × 7.0-10.0 8.0-10.0 × 6.5-8.0	5.5-6.5 × 4.5-5.5	?	12.0-13.5 × 5.0-5.5

closely set whorls of oral tentacles on the distal surface of the hypostome, while species of *Bouillonia* have numerous closely set tentacles without order or in many whorls on the entire surface of the hypostome. The cnidome in *Bouillonia* species is also different from that present in other genera of Tubulariidae because *Bouillonia* has neither anisorhizas nor isorhizas (see table 2).

Based on an investigation of characters of the various genera of the family Tubulariidae (Marques & Migotto, 2001: fig. 3), the genus *Bouillonia* differs markedly from other tubulariid genera such as *Tubularia, Hybocodon, Ralpharia* and *Zyzzyzus*. Undoubtedly we still need additional, well preserved material of the various species of *Bouillonia* prior to constituting a new family for this genus.
Type species: *Tubularia cornucopia* Bonnevie, 1898.

The Arctic species

Bouillonia cornucopia (Bonnevie, 1898)
(figs 1, 2a, 8, 13, 16, 17a, 20a, 21a-d, tables 1, 2)

Tubularia cornucopia Bonnevie, 1898: 474-476, pl. XXVI fig. 20.
Tubularia? cornucopia; Bonnevie, 1899: 29, 30; pl. II figs 1, 1a, 1b, 1c.
? *Tubularia cornucopia*; Jäderholm, 1902: 5.

Before redescribing the syntype-specimens, we present the original descriptions of these specimens by Bonnevie (1898, 1899). She gave an excellent, detailed original account of the two specimens, collected nearly a quarter of a century before by M. Sars during the Norske Nordhavs Expedition (Norwegian North-Atlantic Expedition).

Original data by Bonnevie, 1898.— "Hydrocaulus besteht aus einer blanken, gebogenen hornartigen 11-12 cm langen Röhre; 6 mm oberer Durchmesser, nach unten zu eine feine Spitze verengt; weder Ringe, noch Streifung; grosser durchscheinender Kragen unter dem Hydranthen; mit ca. 30 proximalen, 3 cm langen Tentakeln, in einem Kreise angeordnet; der Durchmesser des Hydranthen ist an der Mundöffnung am grössten, diese von kurzen, distalen Tentakeln umgeben; ca. 12 Blastostyle innerhalb der proximalen Tentakel, bei den zwei vorhandenen Exemplaren Gonophoren nur als Anlage vorliegend; einige Gonophoren mit Anlage eines Glockenkerns (fig. 16). Zeichnung von Sars nach lebendem Exemplar (fig. 1): Stamm gelb, Hydranth tief rot."

Plate 1 ►

Fig. 1. *Tubularia (Bouillonia) cornucopia* Bonnevie, 1898. Sketch of living specimen from Spitzbergen area, drawn by M. Sars 1878, published by Bonnevie 1898.
Fig. 2. Two *Bouillonia* species investigated recently: *a. B. cornucopia*, the larger of the 2 type specimens, Zool. Mus. Oslo, N B582. *b. B. denhartogi* spec. nov., paratype from Zool. Institute, RAS; (Weddell Sea).
Fig. 3. *B. denhartogi*, holotype: RMNH-Coel. No. 30580 (the largest specimen) and 2 small paratype specimens, RMNH, Leiden (Weddell Sea).
Fig. 4. *B. denhartogi*, largest individual (paratype) from the Weddell Sea; "Polarstern" ANTXIII/3; 20.12.2000.
Fig. 5. Living *B. denhartogi*, on pereiopod of *Paralomis* cf. *formosa*; (S. Sandwich Isl.).

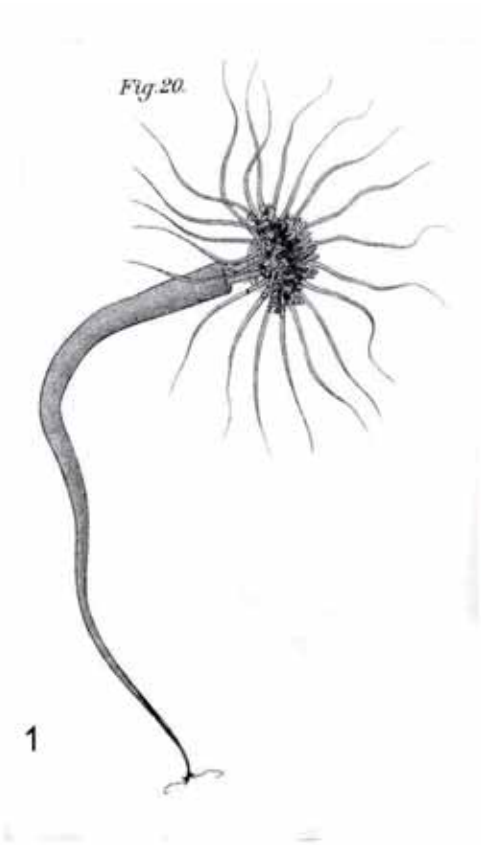
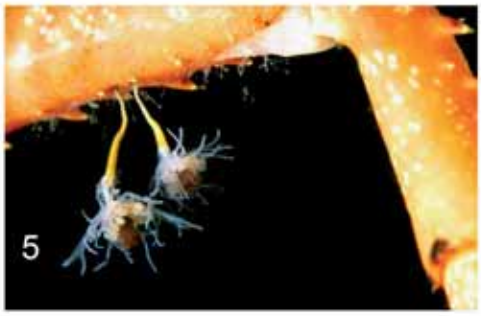


Fig. 20.
1


3
20 mm


4


10 mm
2 a
b


5

Original data by Bonnevie, 1899.— "No hydrorhiza, attached to stones or shell fragments; hydrocaulus horn-shaped, bright yellow; 10 mm high translucent collar; 30 tentacles, 30 mm long; several dense rows of distal tentacles, 2 mm long; increase of diameter towards mouth to 8-10 mm; upper diameter of hydrocaulus 5 mm, tapers down to fine point; one specimen on stone, one on *Serpula* tube."

We obtained several previously unpublished details from a study of Sars' sketch drawn after one of the living specimens, and from our recent study of both preserved specimens (figs 1, 2a). We conclude from Sars' sketch that originally there were two stolonal processes of about 6 mm length by which the perisarc tube crept over a serpulid tube. These processes were not described by Bonnevie (1898, 1899). The second specimen as Bonnevie (1899) mentioned was settled on a piece of stone.

The perisarc tube or hydrocaulus, starting at the base, measures about 0.4 mm in diameter and 7.0 mm from the base widens in a funnel-shaped manner to a diameter of 0.8 mm. From this funnel-shaped widening the tube of the hydrocaulus extends to its full length and a diameter of 6.0-9.0 mm. (fig. 8). Bonnevie's (1898) remark about the smooth surface of the hydrocaulus ("weder Ringe, noch Streifung") probably refers to the texture of the perisarc surface and not to an internal canaliculation. In a contrast-enhanced photograph, 12-16 internal canals run upward from close to the base, increasing in number up to about 40 towards the top (fig. 13).

Most blastostyles are branched dichotomously (fig. 17a); the gonophores are very small with a diameter no more than 0.05 mm.

Measurements of type specimens (in mm).— Tube length (L) 110.0-120.0; tube maximum diameter (Dmax) 5.0-9.0; tube minimum diameter (Dmin) 0.4-1.0; collar length 10.0; collar diameter 10.0; aboral tentacle length 30.0; oral tentacle length 2.0.

Nematocysts (investigated by Sheiko for the first time; fig. 21; table 2, measurements in µm): Stenoteles (large) 16.0-18.0 × 14.0-16.0, (medium) 15.0-16.0 x11.0-12.5, (small) 10.0-12.5 × 9.0-11.5; desmonemes 6.0-7.0 × 4.5-5.0; rhabdoids 14.0-17.5 × 5.0-7.5; euryteles 10.5-13.0 × 4.5-6.0.

This species is only known from the type-locality: 77°58'N 05°10'E (Spitzbergen area), 2438 m depth and, possibly, from the area between Greenland and Jan Mayen: 72°42'N 14°49'W (Jäderholm, 1902).

Plate 2 ▶

Fig. 6. *Bouillonia* spec. (*B. cornucopia* sensu Vervoort), RMNH-Coel. No. 27867, slide No. 4148, RMNH, Leiden (Mid-Atlantic Ridge).

Fig. 7. *Bouillonia spec.* (B. *cornucopia* according to Petersen, 1990, Fig. 28); French NORBI expedition; (Norvegian Sea).

Fig. 8. Basal part of the type specimen of *B. cornucopia*: funnel shaped widening of the tube near its base; (Spitzbergen).

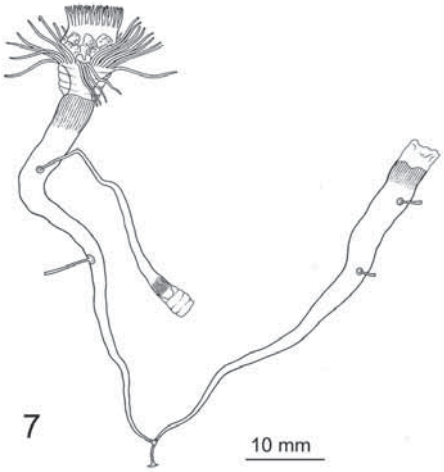
Fig. 9. Star-shaped pedal disc of *B. denhartogi*, holotype; (Weddell Sea).

Fig. 10. Oval pedal disc of young *B. denhartogi.,* with annulation of the tube; (Weddell Sea).

Fig. 11. Star-shaped basal disc of *B. denhartogi,* with branched internal stolonal tissues (S. Sandwich Isl.).

Fig. 12. Paw-shaped bases of young *B. denhartogi*; (Ross Sea).


6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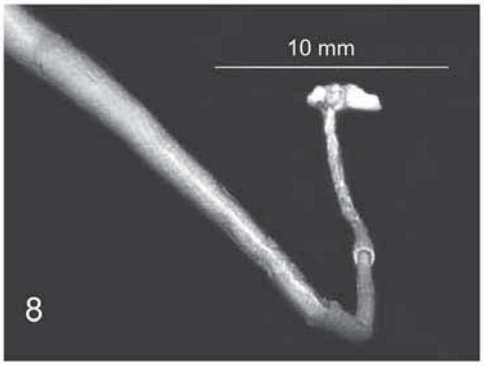
10 mm


10 mm
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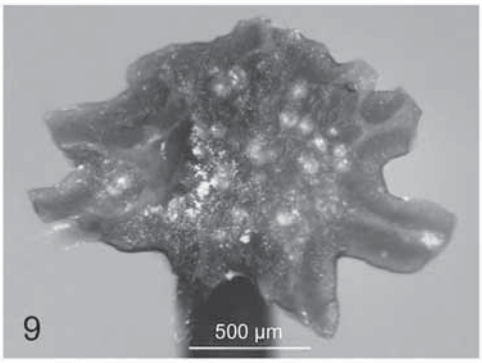
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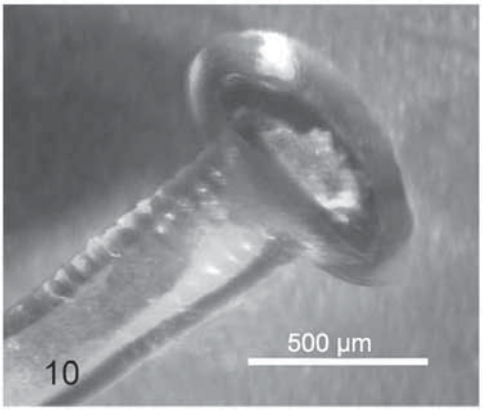
500 µm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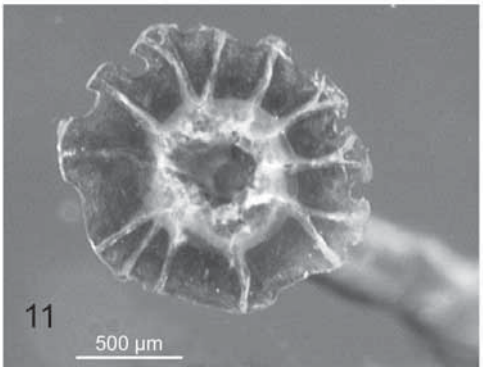
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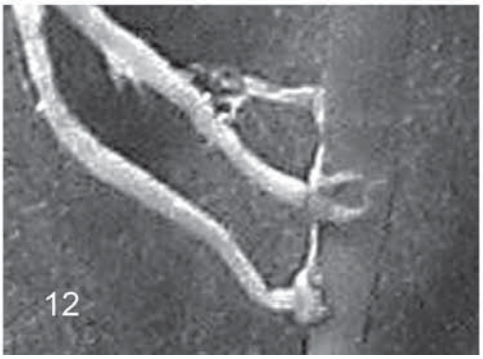
500 µm


12

Bouillonia spec.
(figs 6, 7, 20b, c, 22, 23; tables 1, 2)

Bouillonia cornucopia; Petersen, 1990: 176-177, fig. 28 (not Bonnevie, 1898)
?*Bouillonia cornucopia*; Schuchert, 2001: 42-43.

During the Russian-German expedition to the Laptev Sea with the RV "Polarstern" in 1995, several specimens with typically curved, horn-shaped tubes were found. Only the perisarc tubes with some tissue inside and without pedal disc were collected. In spite of the scarcity of other characters, we suppose that these specimens belong to *Bouillonia* because of the characteristic horn-shaped perisarc tubes and the composition of the cnidome (see below). Moreover, they seem to belong to a species different from *B. cornucopia*, because the tubes are much thinner and narrower and characterized by a different ratio between maximum and minimum diameter of the perisarc tube (figs 20a-c; identification key). Concerning the cnidome, the euryteles of *Bouillonia* spec. have longer capsules (12.0-15.0 mm) than those of the syntypes of *B. cornucopia* (10.0-13 mm) (figs 22, 23; table 2).

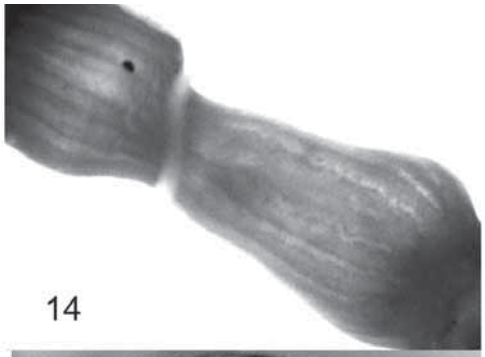
Later we received specimens collected by the NORBI-expedition to the Norwegian Sea, which Petersen (1990) assigned to *B. cornucopia*. The study of these specimens, and of Petersen's description (1990), led us to conclude that specimens with such horn-shaped tubes belong to the same species as those from the Laptev Sea, described below. Two specimens from the Mid-Atlantic Ridge (Gulf of Guinea area) possibly belong to the same species (table 1).

Description.— Horn-shaped perisarc tubes of about 60-90 mm in length (if we judge material from the Gulf of Guinea correctly, juveniles may be 18 mm), with largest diameter of 2.5-5.0 mm and smallest of 0.2-0.3 mm (figs 20b, c), attached to substrate, possibly with oval discs, which were absent in the Laptev Sea specimens, but present in the NORBI- and Mid-Atlantic Ridge (Gulf of Guinea) specimens. According to Petersen's description, hydranths with about 100 oral tentacles (about 2 mm long), arranged in five closely set whorls around the wide and open mouth, and with 40-50 aboral tentacles (5-10 mm in length). Bulb-shaped "neck" region enclosed in a transparent, much inflated perisarc (Petersen, 1990: 176-177, fig. 28) (fig. 7). According to Petersen's data (NORBI material), there are about 10 radially arranged longitudinal canals in the hydrocaulus with parenchymatic tissue in the center. Longitudinal canals could not be

Plate 3 ▶

Fig. 13. Tube of *B. cornucopia*, type specimen (for basal part see fig. 8).
Fig. 14. Living *B. denhartogi* with canals in caulus under the collar (fig. 28).
Fig. 15. Cross section of the caulus of *B. denhartogi* with entodermal caulus canals (caulus filled with entodermal parenchymatic cells).
Fig. 16. Blastostyle of *B. (Tubularia) cornucopia*, drawing from Bonnevie, 1899.
Fig. 17. Blastostyles of different *Bouillonia* species: a. *B. cornucopia*, syntype specimen. b. *B. denhartogi*, paratype specimen.
Fig. 18. *B. denhartogi*, large blastostyle of the holotype specimen.
Fig. 19. Semi-thin section of the gonophores of *B. denhartogi*


13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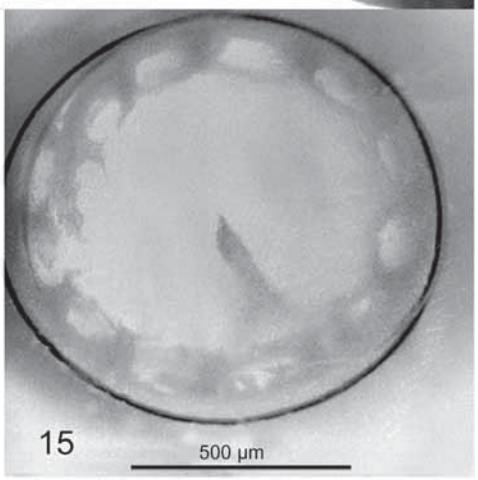
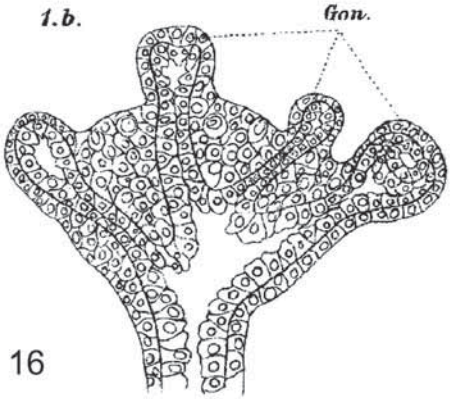
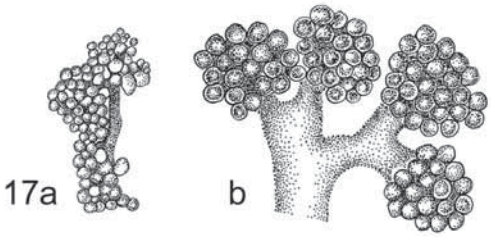
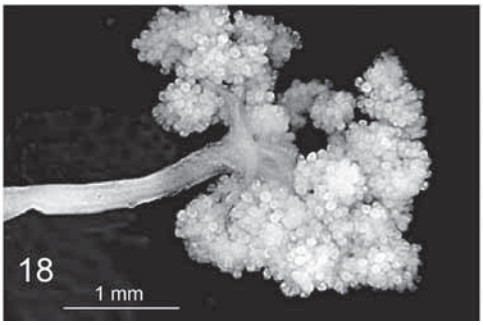
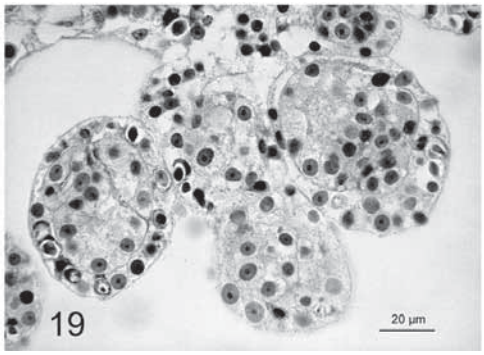

15
500 µm


1.b.
Gon.
16


17a
b


18
1 mm


19
20 µm

detected in the cauli of the Gulf of Guinea specimens. Thirty-two dichotomously branched blastostyles with small, immature cryptomedusoid gonophores are reported for the NORBI material. For the two specimens from the Mid-Atlantic Ridge (western Gulf of Guinea) (Leiden Museum), prepared as a slide, the dimensions of the perisarc tubes are closer to the Laptev and Norwegian Seas specimens than to those of *B. cornucopia* (table 1; fig. 7). The size of nematocysts of the western Gulf of Guinea specimens could not be measured because they were imbedded in a slide.

Measurements.— Laptev Sea (in mm): L. tube 65.0-90.0; tube Dmax 2.5-3.5; tube Dmin. 0.1-0.3. Nematocysts (in µm) (table 2): Stenoteles (large) 16.0-17.0 × 15.0, (medium) 13.5-16.0 × 10.0-12.0; (small) 9.0-10.0 × 8.5-9.0; desmonemes 5.5-6.0 × 4.5-5.0; rhabdoids were not found; euryteles 12.5-15.0 × 4.5-5.5.

Norwegian Sea (in mm): L. tubes 60.0-80.0; tube Dmax 2.5-5.0, tube Dmin 0.1-0.3; oral tentacles L. 2.0, aboral tentacles L. 5.0-10.0. Nematocysts (in µm; table 2): Stenoteles (large) 17.0-18.0 × 14.0-17.0, (medium) 15.0-17.5 × 10.0-12.5, (small) 10.0-11.5 × 9.0-10.0; desmonemes 6.5-7.0 × 5.0-5.5; rhabdoids 15.5-17.5 × 5.0-7.0; euryteles 12.0-13.0 × 4.2-5.0.

Mid-Atlantic Ridge (Gulf of Guinea area) (in mm): L tube 18.0; tube Dmax 9.0; tube Dmin 0.25-0.55; aboral tentacles (17-25 in number) L 3.0-2.5; oral tentacles not found; gonophores (only one blastostyle) about 0.05.

Differential diagnosis (see Identification key below).— As stated above, this species is close to the type-species, *B. cornucopia*, but there are several major differences:

1. The horn-shaped tubes of *Bouillonia* spec. are markedly thinner and narrower than in *B. cornucopia* (fig. 20).
2. *Bouillonia* spec. has a basal disc for attachment of the polyp while *B. cornucopia* has a hydrorhiza (figs 1, 2a, 6, 7).
3. The oral tentacles are arranged in about 5 distal rows in *Bouillonia* spec. and there are "several dense rows of distal tentacles" (Bonnevie, 1899) in *B. cornucopia*.
4. Oral tentacles number about 100 in *Bouillonia* spec. and only about 35-40 in *B. cornucopia*.

Plate 4 ►

Fig. 20. Perisarc tubes of various *Bouillonia* species: *B. cornucopia*, syntype specimens (a); *B.* spec., Norvegian Sea, NORBI expedition (b); *B.* spec., Laptev Sea, "Polarstern" expedition (c); *B. denhartogi*, Weddell Sea, "Polarstern" expedition (d).

Fig. 21. Nematocysts of *B. cornucopia*, syntype specimen (Spitzbergen): stenoteles of 3 size classes: large (a), medium (b), small (c); desmonemes (d); microbasic heteronemes: rhabdoids? (e'), euryteles? (e").

Fig. 22. Nematocyst of *B.* spec. (Laptev Sea): stenoteles of 3 size classes: large (a), medium (b), small (c); desmonemes (d); microbasic heteronemes: euryteles? (e).

Fig. 23. Nematocyst of *B.* spec (= *B. cornucopia* sensu Petersen), Norwegian Sea: stenoteles of 3 size classes: large (a), medium (b), small (c); desmonemes (d) ;
microbasic heteronemes: rhabdoids? (e'), euryteles? (e").

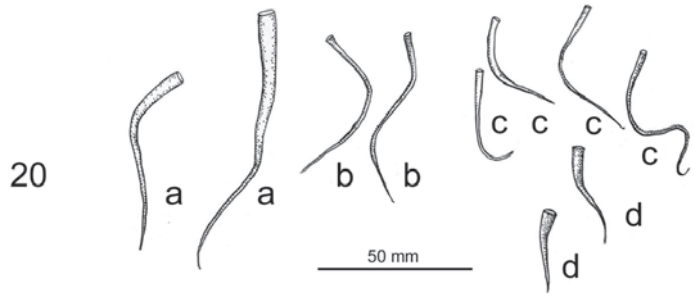
Fig. 24. Nematocysts of *B. denhartogi* (Weddell Sea): stenoteles of 3 size classes: large (a), medium (b), small (c); desmonemes (d); microbasic heteronemes: rhabdoids? (e'), euryteles? (e").

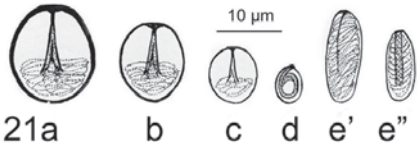
Fig. 25. Scheme of disordered distribution of oral tentacles of *B. denhartogi* hydranth.

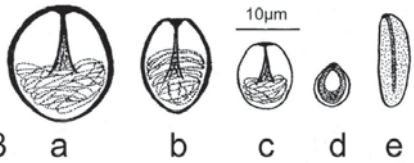
Fig. 26. Open mouth of. *B. denhartogi*, holotype with warty gut entrance.

Fig. 27. *B. denhartogi* – young polyp on maternal? organism (Ross Sea).

Fig. 28. *B. denhartogi* – clear collar, only visible by adhering particles, with collar-secreting groove below the aboral tentacles (Weddell Sea).


20
a
a
b
b
c
c
c
c
d
d
50 mm


10 µm
21a
b
c
d
e'
e"


10µm
23
a
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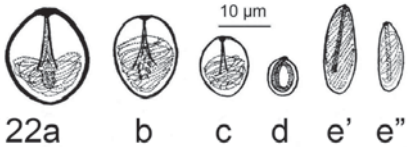
d
e


10 µm
22a
b
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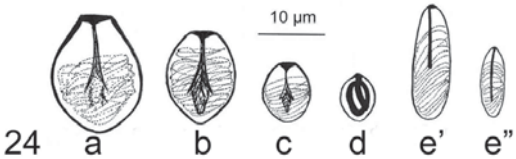
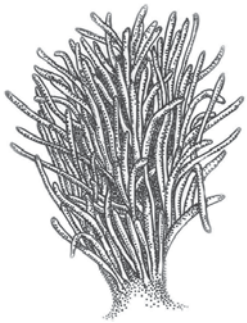

10 µm
24
a
b
c
d
e'
e"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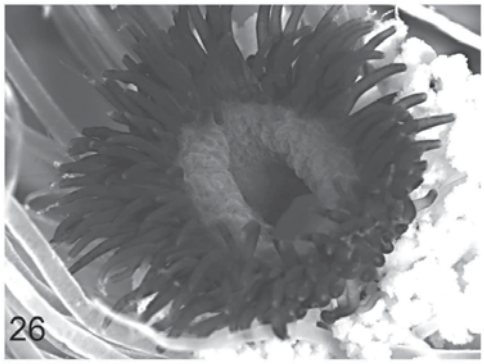
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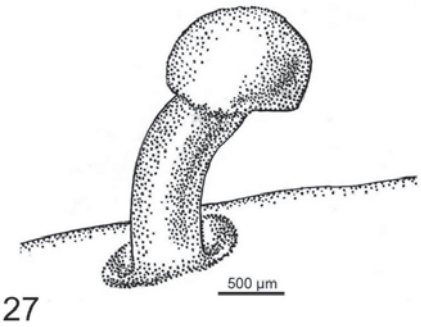
500 µm
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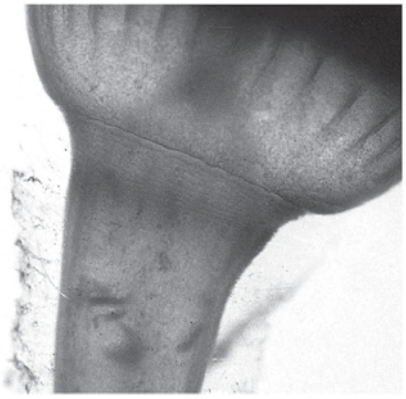
28

5. The ratios between minimum and maximum diameter of the tubes are about 1 : 15-30 in *Bouillonia* spec. and 1 : 9-10 in *B. cornucopia*.
6. The capsules of the euryteles are 12.5-15.0 µm in *Bouillonia* spec. and 10.5-13.0 µm in *B. cornucopia* (figs 21-23).

As indicated above, future investigations of living polyps may allow the description of a new species for this material. Representatives of this species come from deep-waters of the Laptev Sea, the Norwegian Sea and the Mid-Atlantic Ridge (Atlantic Ocean, western Gulf of Guinea).

The Antarctic species

Bouillonia denhartogi spec. nov.
(figs 2b-5, 9-12, 14-16, 17b-19, 20d, 24-28; tables 1, 2)

Description of the holotype (E. Weddell Sea, "Polarstern" ANT XVIII/3, from mooring AWI233-4, 20.12.2000; RMNH-Coel. 30580).— Horn-shaped perisarc tube 40 mm in length, with 2.0 mm maximum diameter and 0.3 mm minimum diameter at the base (figs 3, 9, 18, 26). Perisarc rigid, topped by a thick, gelatinous, clear collar of 9 mm length and 4 mm diameter. Soft tissue of neck region below the collar thinner than the cauline perisarc (1.2 mm) and about 9 mm long. About 40 longitudinal canals can be seen in transmitted light. Perisarc tube attached by an irregularly star-shaped, nine-angled pedal disc or plate of 1.8 × 1.25 mm diameter with 2 larger, broken stolonal processes (fig. 9). Minute connective opening (0.1 mm) to the pedal disc, from re-enforcing internal layers. Inside this disc there are up to 12 partly branched stolonal canals filled with tissues, fused to the disc's plate by a thin, tissue-less perisarc secretion (fig. 9, 11).

Polyp-head about 6 mm in diameter at the base of the aboral tentacles, about 4.5 mm on the level of the blastostyle stalks and 7 mm in the mouth region. The length of hydranth is about 8 mm. There is one row of 42 aboral tentacles, 26-30 mm in length; about 200-240 oral tentacles distributed without any order, 4.5 mm in length (figs 25, 26), and about 8 to 12 dichotomously branched blastostyle stalks (figs 17b, 18). The gonophores have a diameter of up to 75 µm. They are styloid, without marginal tentacles, subumbrellar hole, or radial canals (fig. 19). The mouth at the end of the hypostome is open (5x3 mm) and allows a deep view into the warty gut (fig. 26).

Colour.— Basal perisarc dark brown; perisarc of tube rigid, yellowish. The blastostyle stalks have red spots; in fresh condition the gonophores appear pinkish, later colourless. The proboscis and aboral tentacles are purple red.

Nematocysts (in µm, fig. 24; table 2): Stenoteles (large) 16.5-17.5 × 15.0-15.7, (medium) 15.0-16.0 × 10.0-12.5, (small) 9.5-11.3 × 8.0-10.0; desmonemes 7.0-7.5 × 5.0-6.0; rhabdoids 17.5-20.0 × 6.0-7.5; euryteles were not measured.

Paratypes.— Since we have so many specimens from different Antarctic locations which have been designated as paratypes, we prefer to give a short description of specimens from each location separately rather than presenting a comprehensive description. All paratypes are morphologically very close one to the other and to the holotype.

Eastern Weddell Sea.— Twenty-nine specimens from the Eastern Weddell Sea are morphologically close to the holotype. The perisarc tubes have a length of 14-35 mm;

tube Dmax 0.9-2.5; tube Dmin 0.3-0.4. All specimens have gonophores, although on the smallest they look less developed. In the more southerly sample, there were obviously at least 2 recruitments, or even 3 (a little one settled on the collar of the biggest). From the period of time that the substrate (scientific gear) was anchored in the sea we conclude that the eldest polyps may be one year old. The small specimens have a round to oval pedal disc; in the larger ones we find large star-shaped discs, probably to improve the holdfast.

Nematocysts (in µm; table 2): Stenoteles (large) 15.0-19.0 × 13.8-16.3, (medium) 12.0-17.0 × 10.0-12.5, (small) 7.5-11.5 × 6.5-10.0; desmonemes 7.0-9.0 × 5.0-6.3; rhabdoids 15.0-20.0 × 5.0-7.0; euryteles 10.0-12.5 × 3.5-5.0.

South Sandwich Islands.— The specimens from the South Sandwich Islands have an average caulus length of 10-15 mm; tube Dmax 0.9-1.7; tube Dmin 0.3-0.4. Star-shaped pedal discs. Some gonophores are larger than those of the Weddell Sea specimens, up to 150 µm in diameter. The other morphological characters are close to those of the holotype.

Nematocysts (in µm; table 2): Stenoteles (large) 15.5-16.0 × 13.0-13.5; (medium) 10.0-13.0 × 8.5-11.0; (small) 8.0-9.0 × 7.0-7.5; desmonemes 7.0-8.0 × 5.5-6.2; rhabdoids 13.5-15.0 × 5.0-6.0; euryteles 11.0-11.5 × 5.0-5.5.

Ross Sea.— Sixteen specimens were collected during a cruise of the RV "Nathaniel B. Palmer" in the region of the Ross Sea at 2000 m depth, all similar in size and appearance. Perisarc tube lengths are 4.9 to 27.4 mm; tube Dmax 0.6 to 2.2 mm; tube Dmin 0.25 to 0.41 mm. Several specimens were lacking hydranths, number of oral tentacles ranged from 30 to 80, and aboral tentacle counts mostly ranged from 25 to 29. One specimen clearly had a small shoot developing from the tube above the dark part of the base. The perisarc was evenly depressed around the stalk of the shoot where it penetrated the perisarc, and the shoot's tip has a small hemispherical cap 0.08 mm in diameter (fig. 27). Inside the tube, adjacent to the insertion of the shoot, and on the coenosarc, were several discoid bumps. Two other small individuals, which were attached to a large specimen, had their claw-like basal discs actually touch and thereby form a small communicating hole between the "claw" tips; while the larger of these two juveniles also has a large shoot extending from the disc on the side opposite the smaller polyp. At the bottom of the tube, where it inserts into the lamellar disc base, the very dark perisarc usually has numerous "ripples" which give the tube base an annulated or twisted appearance. In all tubes the surface is irregular and uneven. There are, however, no apparent reduplications of the tubes.

Many specimens have unidentifiable "balls" or spherical/ovate fleshy bodies adhering to a few tentacles. Four smaller specimens (one degenerated and not measured) are growing on the tube of one of the larger specimens (fig. 12). It is possible that planulae are liberated and while the majority drifts away to settle at another spot, some also do not leave and settle on the parental tube. This is a two-way strategy; (1) some young develop in the shadow of the parent in obviously good conditions, while (2) others are distributed over a larger area.

The oral tentacles are scattered over most of the distal part of the hypostome, with their bases so closely packed that no order can be seen. At the base of these tentacles there are a few, very short tentacles. They are probably just small tentacles, and therefore adult specimens have oral tentacles distributed over nearly the entire surface of the

hypostome. The aboral tentacles are arranged in a single whorl but their bases are slightly offset from each other. There are roughly two to three times as many oral tentacles as aboral tentacles on each specimen. The branched blastostyles are attached to the base of the hypostome, between the hypostome and the tentacles. Each blastostyle has three or four short branches. The base of a blastostyle is about 0.36 mm and the clusters of gonangia are about 0.8 mm wide. Gonophores are roughly spherical and measure about 0.1 mm. It is difficult to determine whether they are cryptomedusoid or styloid, but we judge them to be styloid.

Colour.— There are gradations of darkness of the horny colour of the perisarc from light to dark brown. The hypostome and oral tentacles, purple-brown in life, are reddish-brown when preserved. The oral tentacles are filiform with slightly swollen tips; the tips have a yellow tinge over the basic reddish brown colour in preservation. The aboral tentacles are white.

Nematocysts (in µm; table 2): Stenoteles (large) 14.5-18.5 × 13.0-16.0, (medium) 10.0-15.5 × 8.0-12.5, (small) 8.0-11.0 × 6.0 (juv.?)-10.0; desmonemes 5.5 (juv.?)-9.0 × 4.5 (juv.?)-7.0; rhabdoids 14.5-17.0 × 5.5-6.8; euryteles 10.5-13.5 × 5.0-6.0. Note that the smallest capsules were found in the smallest specimen, which is possibly a juvenile whose capsules are not yet fully developed; rhabdoids are absent in all.

West Antarctic Peninsula.— One hundred and one specimens were collected on cruises of the RV "Lawrence M. Gould" in the region of the West Antarctic Peninsula in 1658 to 3450 m depth, all similar in size and appearance to the Ross Sea specimens. Perisarc tube lengths are 5.6 to 24.8 mm; tube Dmax 1.2 to 1.9 mm; tube Dmin 0.25 to 0.41 mm. Twenty-five specimens were lacking hydranths; oral tentacles ranged from 25 to 100, usually 50 or more, and most aboral tentacle counts ranged from 24 to 27 with one specimen having about 50. Oral tentacles ranged in length from 0.7 to 2.1 mm; aboral tentacle lengths were 4.1 to 13.1 mm. A few specimens appeared to have a regenerating polyp: a small hydranth was inside and below the margin of the tube; in one instance a thin film was over the opening of the regenerating hydranth.

Nematocysts (in µm, see table 2): Stenoteles (large) 16.0-18.5 × 15.0-16.0; (medium) 10.0-15.5 × 8.0-12.5; (small) 8.5-11.0 × 8.0-10.0; desmonemes 7.0-9.0 × 5.5-7.0; rhabdoids 14.5-17.0 × 5.5-6.8; euryteles 10.5-12.5 × 5.5-6.0.

All specimens are morphologically very similar and undoubtedly belong to the same species, *Bouillonia denhartogi* spec. nov.

Bouillonia denhartogi spec. nov. is close to the Arctic species in the shape of the perisarc tube, in the structure of the polyp head, in the distribution of the oral and aboral tentacles, and in the dichotomously branched blastostyles with styloid gonophores.

At present, the only polyps settled on a natural substrate (crabs) were collected from the S. Sandwich Islands. What other natural substrates are preferred is not known because all our other samples were collected from scientific gear or directly from moorings, with gear mostly anchored in 2000-5000 m depth. The planulae for these settlements must have come from somewhere in the neighbourhood, but polyps have never been found on a natural substrate at that depth. Although we have more than 100 specimens, collected in December-February and in June, no mature gonophores could be found.

The tiny pedal disc of the young polyps is capable of enlarging with increasing size of the specimen by means of its star-shaped outgrowths (figs 9, 11, 12). The basal annulation of the caulus avoids shocks by changing its angle to the substrate with changing current speed and direction, factors which could cause a break of the stem from the basal disc and the substrate (fig. 10). The unique gelatinous collar (fig. 28) allows further bending of the hydranth downstream, which is also the usual feeding position among other hydroids.

Surprisingly in most of the collected specimens the mouth was wide open. A few specimens had remains of food (?crustacean cuticle) still in the open mouth. This physiologically unnatural condition may be a genus-specific artefact of preservation without prior relaxation, as is also occasionally found in polychaetes. However, the mouth may also be open a good deal of the time and only closes to engulf and digest prey.

Paratypes (reference number (N) from table 1) have been deposited in the National Museum of Natural History, Leiden, the Netherlands (6-9); Naturhistorisches Museum Vienna, Austria (6-10): NHMW no. 1913-1916; Zoologische Staatssammlung, Munich, Germany (7, 9, 11, 8): no. 20060395-20060398, 20060754; Zoologisches Museum der Humbold Universität, Berlin, Germany (7, 9, 10, 8, 10): ZMB Cni 14828-14831, 14938; Muséum d'Histoire Naturelle, Geneva, Switzerland (6, 7, 9): MHNG INVE 38696-38968; The Natural History Museum, London, U.K. (6-8): BMNH no. 2006.31-2006.33; Zoological Museum of the University of Copenhagen, Denmark (7, 8, 11, 17): ZMUC HYD 2, 1, 4, 3; the Royal Ontario Museum, Toronto, (7-9, 16, 17): ROMIZ B3623, 3622, 3621, 3626, 3624; Zoological Museum Oslo, Norway, (7, 8); Zoological Institute, Russian Academy of Sciences, St. Petersburg, Russia (6-8, 10) ZIN RAS NN1/10377, NN2/10378, NN3/10617, NN7/10675; the USNM, Smithonian Inst. Washington, USA (15): SIO-BIC Co 2111: USNM 1084303; and the collections of Scripps Institute of Oceanography, La Jolla, California, U.S.A. (6, 8, 10-19): SIO-BIC Co 2219, 2218, 2151, 2114, 2110, 2111, 2112, 2113, 2097, 2099, 2100, 2101.

Bouillonia denhartogi spec. nov. differs from *Bouillonia cornucopia* by:

1. The distribution of oral tentacles on the hypostome of the polyps is in regular "rows" in *B. cornucopia* and irregular in *B. denhartogi*.
2. The presence of a basal perisarc disc in *B. denhartogi* and the absence of this disc in *B. cornucopia*.
3. Ratio between maximal and minimal diameter of the horn-shaped tube (see identification key).
4. The maximum number of oral tentacles is about 40 in *B. cornucopia* and more than 200 in *B. denhartogi*.

Bouillonia spec. differs from *B. denhartogi* by:

1. The oral tentacles in *Bouillonia* spec. are distributed in regular order on the hypostome, but irregular in *B. denhartogi*.
2. Ratio between the maximal and minimal diameter of the horn-shaped tube (see key for identification)
3. The type of gonophore: styloid in *B. denhartogi* spec. nov. and cryptomedusoid (?) in *Bouillonia* spec. (see *B. cornucopia* sensu Petersen, 1990: 176).

Etymology.— The species name *denhartogi* is a tribute to our late friend and colleague Koos den Hartog, zoologist at the National Museum of Natural History, Leiden, the Netherlands, author and editor of numerous publications on Cnidaria and related subjects.

Key for the identification of three *Bouillonia* species

1(4). Oral tentacles of polyps distributed in several rows on distal part of hypostome; oral tentacles up to 100 or slightly more. Arctic region.

2(3). About 100 oral tentacles; L. of tube is about 60-80 mm; ratio between minimum and maximum diameter of tube is about 1:15-30**;** euryteles reach about 12.5-15.0 mm. Pedal discs are present. There is no typical hydrorhiza ..... *Bouillonia* spec.

3(2). 35-40 oral tentacles, L of tube is about 110-120 mm; ratio between minimum and maximum diameter of tube is about 1:9-10; euryteles reach about 10.5-13.0 mm. Pedal discs absent, hydrorhiza only ..... *Bouillonia cornucopia*

4(1). Oral tentacles of polyps distributed on entire surface of hypostome without any order, up to 200 or more being present. Antarctic region ..... *Bouillonia denhartogi*

Two species of *Bouillonia* were found in deep polar waters of the northern hemisphere and one species in the southern hemisphere. In addition, *Bouillonia* spec. was found in the Norwegian and the Laptev Seas, but was also found in the Western Gulf of Guinea between 2000 and 3000 m, a subtropical region. *B. denhartogi* has been found nearly around the Antarctic at 1500-3500 m, and as an epibiont on the crab *Paralomis* cf. *formosa* in the South Shetland Islands area (in rather shallow water 330-360 m), and as a fouling organism on plastic and steel parts of acoustical gear at depths **of** about 1600-3500 m, 0.5-10 m from the bottom. The shallower findings may be explained by migrations of the crab hosts over a large range of depths.

It is typical for coldwater representatives of bipolar genera such as *Monocoryne, Monocaulus,* and *Gymnogonos* to inhabit a large range of depths. For example, *Gymnogonos crassicornis* (Bonnevie, 1898) in the Arctic was found over more than 400 m of depth range, but in the Barents Sea it is found only at 240 m (unpublished observations); and *G. ameriensis* in the Antarctic is found at 15-35 m depth (Stepanjants, 1979; Stepanjants et al., 1997; Stepanjants & Svoboda, 2001; Svoboda & Stepanjants, 2001).

Previous opinion (Stepanjants et al., 2004) ranked *Bouillonia* amongst the Tubularioidea. This superfamily includes the older family Corymorphidae, composed of relict forms, which has a tropical origin (i.e. the largest number of its representatives is known from the tropics). It is possible that when cooling in the tropics occurred during a glacial period, some species of this group were established north and south of the borders of the tropical region, probably by larval migration (via neoteny). As a result, in cold waters of both hemispheres, some neotenic forms originated such as *Gymnogonos, Monocaulus, Monocoryne* and *Bouillonia*. Species of these genera are morphologically very similar on the northern and southern hemispheres. This type of distribution was named bipolar (i.e. distribution in cold water masses of polar origin on both hemispheres (cf. Stepanjants et al., 2004). In the case of *Bouillonia,* the centres of distribution of the three species are the Arctic and Antarctic regions; in addition *Bouillonia* spec. is found at great depths in water of polar origin in a subtropical area of the Atlantic which is otherwise an eviction zone for representatives of this genus.

Conclusions

1. Two valid species of the genus *Bouillonia* Petersen, 1990, one from the Arctic and the other from the Antarctic, and one putative species from the Arctic, are presently known to exist in the world oceans. All known species of *Bouillonia* have been found in the coldest water masses of both hemispheres.
2. The characteristics of these species are similar and they are difficult to separate, leading to the conclusion that the species of *Bouillonia* are closely related.
3. At present, the distribution of *Bouillonia* must be considered bipolar.
4. Records of *Bouillonia* spec. from a subtropical area of the Mid-Atlantic Ridge (deep cold water of the Gulf of Guinea area) indicates the possibility to find representatives of this genus in the deep waters of the subtropical or tropical areas; it is therefore possible to explain the origin of this bipolar distribution from the related relict forms distributed in the deep cold polar waters of both hemispheres.

Acknowledgements

O. Sheiko, A. Peňa Cantero and the late B.O. Christiansen have been instrumental in assisting in composing this paper. We are grateful to M. E. Christiansen for the loan of material of *B. cornucopia* from the Zoological Museum, University of Oslo; O. Tendal (Zoological Museum, Copenhagen) for loan of the NORBI specimens, and K. Riemann-Zürneck for sending us the first samples of Antarctic *Bouillonia* specimens, collected by F. Hinz, Alfred Wegener Institute (AWI); additional specimens were later sent by W. Arntz and K. Beyer (AWI). We also thank C. Held (AWI) for collecting specimens for us in the South Sandwich Islands (US-NFS grant OPP-0132032 and Deutsche Forschungs Gemeinschaft (DFG) 3391/3-1), L.L. Lovell, Invertebrate Collections Manager at Scripps Institute of Oceanography, for making available to us the many specimens collected by researchers of the Scripps Institute, J. Bouillon (Oignies, Belgium) for checking gonophores. Part of the histological preparations was made by A. Goldschmid (Salzburg), and G. Strieso (Bochum). We are thankful to O. Sheiko for her help in nematocyst investigation and also to Drs S. Grebelniy and I. Smirnov (ZIN, RAS, St. Petersburg) for their help to prepare the illustrations. S. Stepanjants was supported by Russian Project N16 "Investigation of Antarctic" of the program "World Ocean", A. Svoboda and S. Stepanjants were supported by grants from the DFG (Sv 4-4-1, RUS 17/134/94).

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Received: 15.xii.2005
Accepted: 23.i.2006
Edited: W. Vervoort