Two poorly known Arctic sea anemones, *Cactosoma abyssorum* and *Halcampa arctica* (Actiniaria: Halcampidae)

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ABSTRACT: Two arctic species of sea anemones of the family Halcampidae are re-described basing on newly collected specimens. The type material of *Cactosoma abyssorum* and its subjective synonym *Phellia crassa* is revised. It was shown, that the syntypes of *Phellia crassa* belong to at least three species. A lectotype was selected from the type material of *Phellia crassa*. *Phellia crassa* remains a junior synonym of *Cactosoma abyssorum*.
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KEY WORDS: Sea anemone, Actiniaria, Arctic, Halcampidae, *Cactosoma*, *Halcampa*.

Две слабо изученные арктические актинии, *Cactosoma abyssorum* и *Halcampa arctica* (Actiniaria: Halcampidae)

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РЕЗЮМЕ: На основании вновь собранного материала переописаны два вида арктических актиний семейства Halcampidae. Ревизован типовой материал *Cactosoma abyssorum* и его предполагаемого субъективного синонима *Phellia crassa*. Показано, что типовой материал *Phellia crassa* состоит из, по крайней мере, трех видов актиний. Из синтипов *Phellia crassa* выделен лектотип. *Phellia crassa* остается синонимом *Cactosoma abyssorum*.
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КЛЮЧЕВЫЕ СЛОВА: морские анемоны, актинии, Actiniaria, Арктика, Halcampidae, *Cactosoma*, *Halcampa*.

Introduction

Burrowing sea anemones of the family Halcampidae are widely distributed and may form dense settlements of many specimens on muddy or sandy bottom (see Fig. 5F). Despite this fact the halcampid species are surprisingly not often appear in the recent collections and many species of this family are poorly known, our knowledge on the morphology of most northern species, with a few exceptions, is based mostly on the old descriptions (e.g. works of Carlgren, 1893, 1921, etc.). In the present paper we provide descriptions of *Cactosoma abyssorum* Danielssen, 1890, the type species of the genus *Cactosoma*, and *Halcampa arctica* Carlgreen, 1893, a member of the type genus of the family. According to diagnoses given by Carlgren (1949) these genera are very similar in most features and differ in the ratio of the number of the tentacles and the mesenteries (*Cactosoma* has the same number of mesenteries and tentacles and *Halcampa* has more mesenteries than tentacles) and the number of the tentacles (no more than 12 in *Halcampa* and 24 or more in *Cactosoma*). In fact the differences are more profound. *Halcampa* species are typical burrowers living unattached in sediment. They have true ampullaceous physa, no traces of basilar muscles and have typical parietal muscles, which are symmetric on both side of the mesentery (no flap) and are similar to those found in other vermiform anemones living unattached in sediment, e.g. in *Edwardsia* (see Carlgren, 1921). In *Cactosoma* the basal part of the body is usually disc-shaped, flattened, not ampullaceous and usually attached to a firm object. The muscles running along the insertions of the mesenteries and the base apparently have transitional nature and were sometimes referred as basilar muscles (e.g. Carlgren, 1902), the parietal muscles of the mesenteries are not symmetric (there is well developed flap on one side of the macrocnemes, see Carlgren, 1921, fig. 151).

Materials and methods

The collected specimens were fixed in 4% seawater formaldehyde, and then transferred to 70% ethanol for long-term storage. The histological sections were prepared using isopropanol-mineral oil method (see Sanamyan et al., 2013). Size ranges of cnidae were measured on small pieces of macerated tissue and the details of distribution of cnidae in different tissues were studied on histological sections stained by basic stains (the method is described by Sanamyan et al., 2013). Cnidae terminology follows Weill (1934) and Carlgren (1949), but classification of *p*-mastigophores follows Schmidt (1969, 1972, 1974) with the modification of den Hartog (1995), for details see Sanamyan et al. (2012). The material is stored at the Zoological Institute (ZIN) in St. Petersbourg, Russia. Type specimens of *Cactosoma abyssorum* and *Phellia crassa* are stored in Museum of Zoology, University of Bergen (ZMBN).

Terminology of some morphological characters

There is some inconsistency in application of the terms "physa" and "capitulum" in previous descriptions of *Cactosoma* and *Halcampa*. Carlgren (1921, 1949) described the "physa" of *Cactosoma* as often flattened, not ampullaceous, attached to a hard objects. Such "physa" differs significantly from the true ampullaceous physa of *Halcampa*. According to Carlgren, Stephenson (1928: 15) the term "physa" "is accurately applicable only to the vesicular aboral extremity of a burrowing form" and is "a digging organ", and thus it cannot be applied accurately to an aboral extremity of *Cactosoma*. Thus we prefer to call the basal part of the body of *Cactosoma* as a "base" instead of "physa".

Both *Cactosoma* and *Halcampa* have a bare, free from incrustation and cuticle, distal region of the column referred to as "capitulum" by Carlgren (1949 and other works). At our opinion this region is a scapulus, not a capitulum. The term "scapulus" was introduced by Carlgren, Stephenson (1928: 19) for "comparatively thick-walled region, containing the sphincter (or, in the absence of the sphincter, well-developed mesogloea and endodermal muscle-sheet)". They restricted the term "capitulum" to

Table 1. Size ranges (length × width, in microns) and distribution of cnidae of *Cactosoma abyssorum*. Letters in brackets correspond to letters in Fig. 3.
Таблица 1. Размеры (длина × ширина, в микронах) и распределение стрекательных капсул *Cactosoma abyssorum*. Буквы в скобках соответствуют буквам на рис. 3.

Body region	Cnidae	Size ranges (μm)
Base and scapus	(A) basitrichs (few)	13–18 × 2.5–3.5
Scapulus	(B) basitrichs (very numerous)	22–28 × 3.5–5
Tentacles	(C) spirocysts (very numerous)	20–44 × 2.5–4
	(D) basitrichs (common)	18–25 × 2.5–4
Actinopharynx	(E) basitrichs (common)	17–21 × 2–4
	(F) *p*-mastigophores (common)	22–30 × 4–5.5
Filaments	(G) basitrichs (common)	15–21 × 2–3
	(H) *p*-mastigophores (common)	19–25 × 4–5
Endoderm	basitrichs (rare)	16–21 × 2.5–3.5

a thin walled region above the sphincter. In both *Cactosoma* and *Halcampa* the distal bare region of the column lies below the sphincter (which in these genera lies at and near the bases of the tentacles, see descriptions below, Fig. 2A, 6A) and is thick-walled, especially in *Cactosoma* (see Fig. 2A and Carlgren, 1902, Fig. 8).

Taxonomy

Order Actiniaria
Family Halcampidae

Cactosoma abyssorum Danielssen, 1890
Tables 1, 2; Figs. 1–4.

Cactosoma abyssorum Danielssen, 1890: 82; Carlgren, 1921: 124.

Phellia crassa Danielssen, 1890: 60 (part).

Isophellia crassa: Carlgren, 1900: 72.

Phelliomorpha crassa: Carlgren, 1902: 44.

MATERIAL EXAMINED. Drifting Station NP-22 (North Pole 22), Station 112, 75°15′ N, 171°03.3′ W, 450–460 m, 10–11.03.1979, collectors I.F. Afanasiev and L.I. Moskalev, one specimen.

Additional material examined.

Cactosoma abyssorum: holotype, ZMBN 9797.

Phellia crassa: syntypes, ZMBN 585, five specimens and ZMBN 2351, three specimens (one specimen from ZMBN 585 is here selected as a lectotype and received museum number ZMBN 105402, all other specimens become paralectotypes).

DESCRIPTION. Our specimen is 19 mm in height. The column is 9 mm in diameter in its middle, 4 mm in diameter in its distal and proximal ends. The column is divisible into base, scapus and scapulus. Naked base is flattened and somewhat invaginated, well demarcated from the scapus (Fig. 1D). The scapus is covered by thin cuticle incrusted by sand grains (Fig. 1A); it has numerous tenaculi (Fig. 2F). The upper part of column is not invaginated into the body and the scapulus and the tentacles are visible externally. The scapulus is naked, free from sand, and has six well defined scapular ridges, hexagonal in outline (Fig. 1C). Ectoderm of the scapulus is thicker (50–80 μm) than the ectoderm of the scapus (10–30 μm) and the mesogloea of the scapulus is much thicker (up to 300 μm) than that of the scapus.

Twenty four tentacles are arranged hexamerously in three cycles (6+6+12). In contracted state they blunt tipped, up to 2 mm long and 1 mm in diameter. The oral disc is small and hidden by the tentacles.

The marginal mesogloeal sphincter muscle is compact and small; on longitudinal sections it has rhomboid shape, 300 μm in length and up to 40 μm in thickness in its middle part. It is located at the bases of the outer tentacles, (Fig. 2A, B), close to ectodermal side. It is separated from the ectoderm by very thin (1–1.5 μm) mesogloeal layer, and separated from the endoderm by much thicker layer of mesogloea (10 μm and more). The sphincter is mostly reticular, but alveolar at its proximal end. The longitudi-

Table 2. Size ranges (length × width, in microns) and distribution of cnidae of the specimens #5, #6 and #7 of *Phellia crassa*.
Таблица 2. Размеры (длина × ширина, в микронах) и распределение стрекательных капсул экземпляров #5, #6 и #7 *Phellia crassa*.

Body region	Cnidae	Specimen #5 (lectotype ZMBN 105402)	Specimen #6	Specimen #7
Base and scapus	Basitrichs	13–20 × 2.5–3.5 (common)	15–17 × 2.5–3 (few)	14–16 × 2.5–3.5 (few)
Scapulus	Spirocysts	27–32 × 3.5–5 (common)	(very rare)	20–40 × 3–4 (very rare)
	Basitrichs	20–27 × 3–4 (very numerous)	21–26 × 3–4.5 (very numerous)	20–25 × 3–4 (very numerous)
Tentacles	Spirocysts	20–40 × 2.5–4.5 (very numerous)	20–37 × 2.5–4 (very numerous)	17–36 × 1.5–4 (very numerous)
	Basitrichs	15–20 × 2.5–3.5 (few)	14–18 × 2.5–3.5 (few)	16–18 × 3 (rare)
Actinopharynx	Basitrichs	17–21 × 2.5–3.5 (common)	–	–
	p-mastigophores	18–25 × 4–6	–	–
Filaments	Basitrichs	16–25 × 2–3 (common)	–	–
	p-mastigophores	23–26 × 5–6.5 (common)	–	–

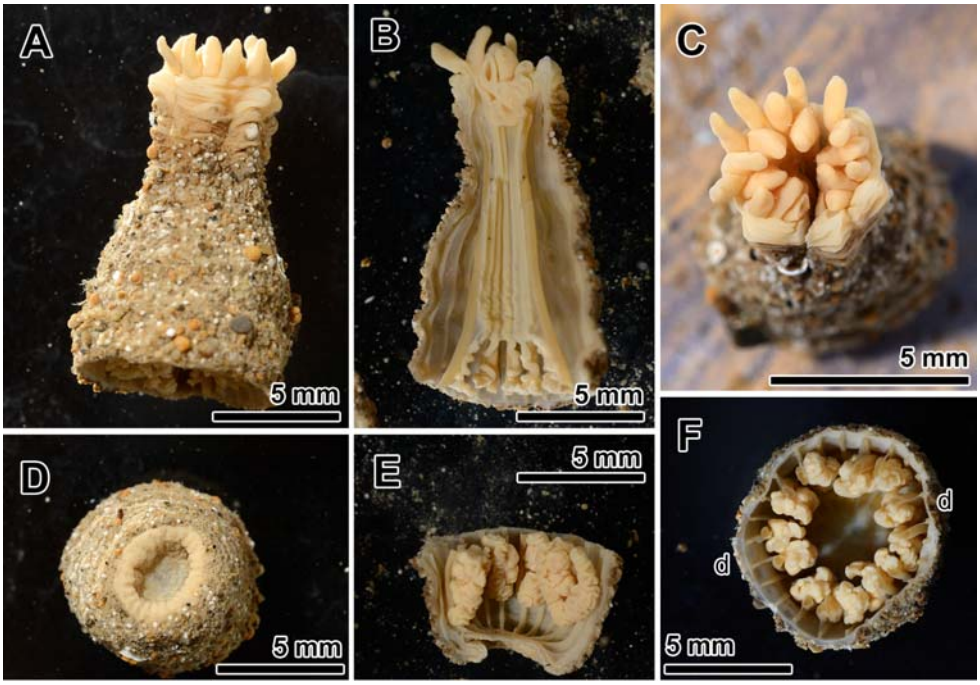

Fig. 1. *Cactosoma abyssorum*, specimen from NP-22. A — distal half of the body; B — distal half of the body, longitudinally sectioned; C — distal part, top view; D — aboral part of the body; E — proximal part of the body, longitudinally sectioned; F — transverse section of the body below actinopharynx.
Abbreviations: d — directives.

nal muscles of the tentacles are ectodermal and well developed (Fig. 2G). The radial muscles of the oral disc are ectodermal. Circular endodermal muscles of the column are well developed.

The actinopharynx is long (9 mm) with 12 longitudinal ridges corresponding to insertions of macrocnemes (Fig. 1B) and with two shallow siphonoglyphes supported by two pairs of directives. The mesenteries are arranged hexamerously in two cycles (6+6 pairs), all are present along the whole length of the body, from the base to margin (Fig. 1E, F). The mesenteries of first cycle are macrocnemes, those of the second cycle are microcnemes. Large vertically elongated marginal stomata, up to 1.5 mm in length and small oral stomata, up to 0.25 mm, are present on macrocnemes. The retractor muscles of macrocnemes are strong, restricted, and reniform. The parietal part of the macrocnemes has well defined flap (Fig. 2C), which is better developed in the proximal part of the body, below the actinopharynx, but disappears at the base. The microcnemes resemble in the shape the parietal part of macrocnemes, but have no flaps. There is a concentration of muscle fibers running along the insertion of the mesenteries into the base (Fig. 2D).

All macrocnemes are fertile, containing ova up to 0.5 mm in diameter.

Cnidom. Cnidom includes spirocysts, basitrichs, *p*-mastigophores (see Table 1 and Fig. 3). Numerous basitrichs form a dense basitrichs pad in the distal part of scapulus (Figs 2E, 3B). Spirocysts are present only in the tentacles and almost absent in the scapulus (several spirocysts were found only in most distal part of the scapulus). We failed to determine the type of *p*-mastigophores in the actinopharynx and filaments, the structure of unfired *p*-mastigophores is not visible clearly on examined old material and there were no fired capsules.

REMARKS. *Cactosoma abyssorum* is a type species of the genus *Cactosoma* Danielssen, 1890. The original description of this species, based on one specimen dredged from Norwegian Sea provided by Danielssen (1890), is rather long but may be not very accurate (see opinion of Carlgren, 1902). Nevertheless, nothing in Danielssen's (1890) original description contradicts with the features observed in the present specimen. The figure of the living specimen, provided by Danielssen (1890, tab. VI, fig. 5), shows a specimen rather similar to the specimen we examined (see Fig. 1), they both have elongated body, densely covered by sand, with bare upper region with six noticeable ridges and with 24 tentacles. The arrangement of the mesenteries of our specimen is also in agreement with those described by Danielssen (1890). The holotype of this species (ZMBN 9797, Fig. 4A, B) is now represented by a small piece of the upper part of the body which is in poor condition and not allows detailed study (see Sanamyan et al, 2015). We tried to study nematocysts of the holotype but were able only to find numerous spirocysts (24–46 × 3–4 μm) and several basitrichs in the tentacles (15–19 × 2–3 μm) and in the scapulus (about 20 μm). The size ranges of these nematocysts correspond to those of the present specimen, and the absence of spirocysts in the scapulus of both specimens (in contrast with *Halcampa*, where they are very numerous in the scapulus) is noteworthy.

Carlgren (1921) synonymized *Phellia crassa* Danielssen, 1890 with *Cactosoma abyssorum* and redescribed the latter species basing on type specimens of *P. crassa* and *C. abyssorum*. He sectioned a piece of the distal part of the holotype of *C. abyssorum* and gave figures of its sphincter muscle and transverse sections of parietal muscles of macro- and microcnemes (Carlgren, 1921, figs.149, 151 and 152). These figures correspond well to that we see on the sections of our specimen, especially the shape of parietal muscle of the macrocnemes, which have well defined flap (compare Carlgren, 1921, fig. 151 and Fig. 2C in the present paper). Thus, the specimen described in the present paper

Рис. 1. *Cactosoma abyssorum*, экземпляр с СП-22. A — дистальная половина тела; B — дистальная часть тела, продольный разрез; C — дистальная часть, вид сверху; D — аборальная часть тела; E — проксимальная часть тела, продольный разрез; F — поперечный срез тела ниже глотки.
Сокращения: d — направляющие пары мезентериев.

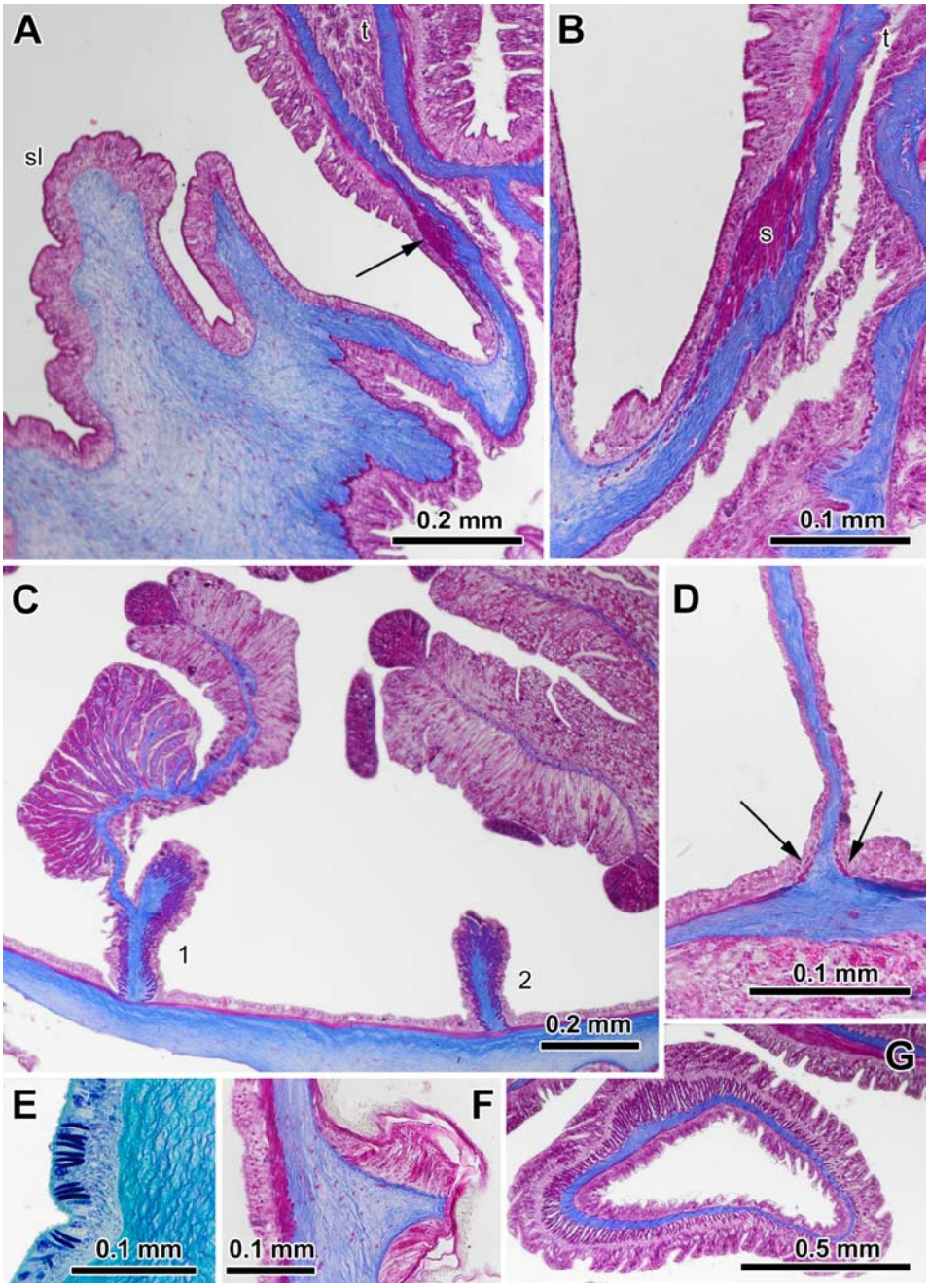

Fig. 2. *Cactosoma abyssorum*, histological sections. A — longitudinal section of the distal part of the body showing the sphincter muscle (arrow); B — the sphincter muscle, enlarged; C — transverse section of the scapus below actinopharynx showing macro- and microcneme; D — muscles running along the insertion of the mesentery to the base (arrows); E — numerous basitrichs in the ectoderm of the scapulus; F — tenacula; G — transverse section of the tentacle showing ectodermal longitudinal muscles.
Abbreviations: s — sphincter; sl — ectodermal side of scapulus wall; t — tentacle. The numbers indicate the cycles of the mesenteries.

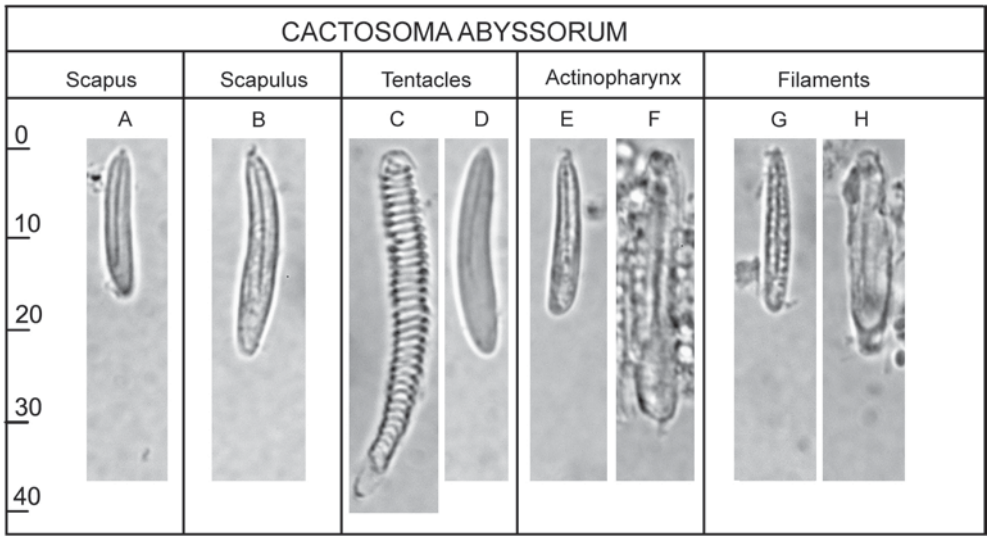

Fig. 3. *Cactosoma abyssorum*, distribution of cnidae (see Table 1 for size ranges).
Рис. 3. *Cactosoma abyssorum*, распределение книд (размеры указаны в табл. 1).

corresponds closely to description of the holotype of *C. abyssorum* as provided by Danielssen (1890) and Carlgren (1921) and we have no doubt in their conspecificity.

Whether *Phellia crassa* was correctly synonymized with *C. abyssorum* is a difficult question. According to Danielssen (1890) *P. crassa* is based on four specimens from station 290 of Norske Nordhavs-expedition. Museum of Zoology of the University of Bergen has two lots from station 290 labeled "*Phellia crassa*, Dan", ZMBN 585 (six specimens) and ZMBN 2351 (three specimens). These lots together contain eight polyps and one sponge (labeled by #1 to #8 on Figs. 4C, D). Polyps belong to at least three different species, and at least some of them may be considered as syntypes of *P. crassa*.

The specimens #1 (figured by Danielssen, 1890, tab. XIII, fig. 6) and #2 have wide base firmly attached to bivalve shell, the scapulus not visible externally and whitish scapus has remnants of cuticle. The specimen #3 is similar, but not attached to substratum and its actinopharynx is extruded out. The specimen #2 was cut transversely by previous investigators, it has six pairs of macrocnemes and six pairs of microcnemes, its tentacles are arranged in three cycles, probably 24 in number. These three specimens are most probably conspecific.

The identity of the specimen #1a (attached to the same bivalve shell as the specimen #1 and also figured by Danielssen, 1890, tab. XIII, fig. 6) cannot be established.

The specimen #4 is a sponge.

The specimens #5, #6 and #7 are similar to each other and differ from other specimens. They have relatively small base not attached to substratum. Their smooth naked scapulus and tentacles (24 in number) are visible externally. The scapus is covered by dark cuticle with rather dense layer of sand grains and mud. These tree specimens, with heavily incrusted

Рис. 2. *Cactosoma abyssorum*, гистологические срезы. A — продольный срез через дистальную часть тела, показывающий сфинктер (указан стрелкой); B — сфинктер, увеличено; C — поперечный срез через скапус ниже глотки, показывающий макро- и микромезентерии; D — мускулы, расположенные вдоль вхождения мезентерия в базу (стрелки); E — многочисленные базитрихи в эктодерме скапулюса; F — тенакуля; G — поперечный срез щупальца, показывающий продольные эктодермальные мускулы. Сокращения: s — маргинальный сфинктер; sl — эктодермальная сторона скапулюса; t — щупальце. Цифрами обозначены циклы мезентериев.

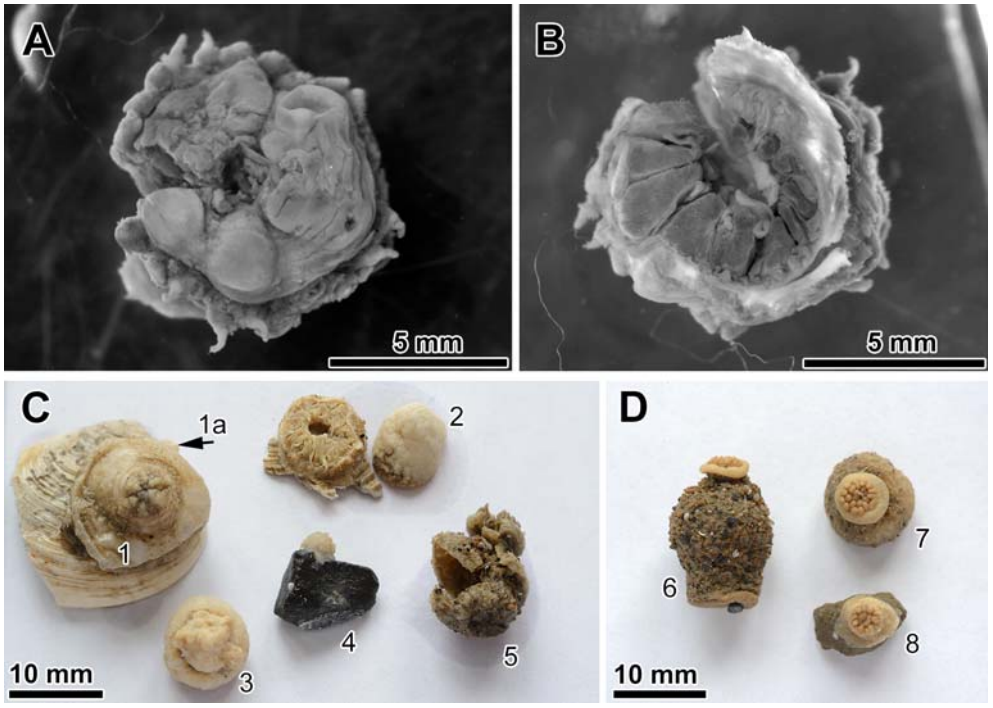

Fig. 4. Type specimens. A–B — *Cactosoma abyssorum*, holotype ZMBN 9797. A — from the top (the oral disk and the tentacles around it); B — from the lower side (the retractors of the macrocnemes are visible on transverse section). C–D — putative syntypes of *Phellia crassa*. C — ZMBN 585; D — ZMBN 2351. Numbers identify the specimens as used in the text.

Fig. 4. Типовые экземпляры. A–B — *Cactosoma abyssorum*, голотип ZMBN 9797. A — вид сверху (виден оральный диск и щупальца по краю его); B — вид с нижней стороны (на поперечном срезе видны ретракторы макромезентериев). C–D — предполагаемые синтипы *Phellia crassa*. C — ZMBN 585; D — ZMBN 2351. Цифрами обозначены номера экземпляров, использованные в тексте.

scapus and bare scapulus with visible longitudinal lines (mesenterial insertions), correspond most closely to figures of living specimens published by Danielssen (1890, tab. IV, fig. 9 and tab. XIII, fig. 5). The specimen #5 was studied by Carlgren (1902). His figure of this specimen (Carlgren, 1902, Fig.7) is entitled "Danielssen'schen Original-Exemplare". Basing on the study of this specimen Carlgren (1902) created a new genus *Phelliomorpha* and used the name *Phelliomorpha crassa* as a valid name for *Phellia crassa*. Later Carlgren (1921) synonymized *Phelliomorpha crassa* with *Cactosoma abyssorum*. This decision was made basing on the morphology of the specimen #5. Its internal features, as reported by Carlgren (1902), are in agreement with the features we found in our specimen of *C. abyssorum* from NP-22, and the known features for the holotype of *C. abyssorum*. These three specimens (#5, #6 and #7) have similar cnidom (Table 2), the most characteristic feature of which is very numerous basitrichs (20–27 × 3–4.5 μm) in the scapulus (battery?). Danielssen (1890: 62 and pl. XIV, fig. 3b) also reported this feature: "nematocysts appear here in such great abundance that they almost entirely conceal the ectoderm". However, spirocysts of the scapulus are very rare in the specimens #6 and #7, where they occur only in the most distal part of the scapulus (as in our specimen from NP-22), but are more common in the specimen #5. It is hard to say how important are these differences but we inclined to agree with Carlgren (1921) that the specimen he

studied (#5), and also the specimens #6 and #7, may be conspecific with *C. abyssorum*.

The specimen #8 has wide base firmly attached to a stone. It has no recognizable scapulus. The column is pale, with remnants of cuticle. Its distal part is not hidden and is visible externally. It has 48 tentacles arranged hexamerously in four cycles. The number of mesenteries at base (as seen by transparency of column near the limbus) also appears to be about 48. The column of this specimen has basitrichs (14–20 × 2.5–3.5 μm) and numerous holotrichs (21–28 × 2.5–4 μm) on the limbus, while all other putative syntypes have on the limbus only small basitrichs (10–20 × 2.5–4 μm) of the same type as on the scapus and on the base. The presence of the holotrichs and the presence of 48 tentacles distinguish this specimen from other putative syntypes of *P. crassa* therefore the specimen #8 can not be considered as conspecific with them.

Taking into the consideration the fact that the putative syntypes of *Phellia crassa* belong to at least three species of sea anemones and one sponge we decide to designate a lectotype of *Phellia crassa*. The specimen #1 (figured in the original publication) and the specimen #5 (which morphology is well known) are better candidates than other syntypes. The specimen #1 was figured in the original description without doubt (Danielssen, 1890, tab. XIII, fig. 6). However the original description of the internal features of *P. crassa* is not based on this specimen (specimen #1 is intact, not sectioned). The internal features of this specimen are not known and hard to access now — this old specimen become firm in preservative, flattened, and detailed examination of its internal features with necessary sectioning may significantly damage it. On the other hand the morphology of specimen #5 (including its internal features) is well known, it was redescribed in details by Carlgren (1902) and its features are known better than the features of other syntypes. The specimen #5 is in good condition now. The designation of specimen #5 as a lectotype will not change the current status of *P. crassa* as a junior subjective synonym of *C. abyssorum* and preserves stability of Zoological Nomenclature. On the other hand, the designation of the specimen #1 as a lectotype of *P. crassa* will cause many problem, including potential synonymy with other species and servers no useful purpose — in this case *P. crassa* should be treated as valid species with an uncertain affinity (because its inner features are totally not known). Recommendation 74B of the International Code of Zoological Nomenclature (ICZN, 1999) says: "Other things being equal, an author who designates a lectotype should give preference to a syntype of which an illustration has been published". The "other things" (*sensu* Recommendation 74B) are not equal in the present case and the recommendation to prefer an illustrated specimen is not applicable here. According to Recommendation 74A (ICZN, 1999) "in order to preserve stability of nomenclature an author should act consistently with [...] previously accepted taxonomic restrictions of the application of the name." According to Recommendation 74A we designate here the specimen #5 as a lectotype of *Phellia crassa* (ZMBN 105402). This designation will not lead to changes in nomenclature and *P. crassa* stay as a junior subjective synonym of *Cactosoma abyssorum*.

Halcampa arctica Carlgren, 1893

Table 3; Figs. 5–7.

Halcampa arctica Carlgren, 1893: 45; 1921: 120.

MATERIAL EXAMINED. Franz Jozef Land, Wilton Island, 80°34.5′ N, 54°19.9′ E, Station 30, 18–25 m, 23.08.2013, collector S.D. Grebelnyi, one specimen.

DESCRIPTION. The specimen is 19 mm in height and 7 mm in greatest diameter, strongly contracted, with the distal part deeply invaginated into the body. The column is divisible into the physa, scapus and scapulus. The physa is naked, not invaginated in preserved specimen and visible externally. The scapus is covered by cuticle densely incrusted by fine sand grains (Fig. 5A) and has numerous tenaculi (Fig. 6F). The scapulus lacks cuticle and sand incrustation and has six prominent scapular ridges (Fig. 5C).

The tentacles on preserved specimen are short and thick, not visible externally, 12 in number, arranged hexamerously in two cycles.

Table 3. Size ranges (length × width, in microns) and distribution of cnidae of *Halcampa arctica*. Letters in brackets correspond to letters in Fig. 7.
Таблица 3. Размеры (длина × ширина, в микронах) и распределение стрекательных капсул *Halcampa arctica*. Буквы в скобках соответствуют буквам на рис. 7.

Body region	Cnidae	Size ranges (μm)
Physa and scapus	(A) basitrichs (common)	10–13 × 2–2.5
Scapulus	(B) spirocysts (very numerous)	18–28 × 2.5–3.5
	(C) basitrichs (common)	12–15 × 2
Tentacles	(D) spirocysts (very numerous)	20–42 × 2–4
	(E) basitrichs (rare)	15–16 × 2
Actinopharynx	(F) basitrichs (common)	15–16 × 2–2.5
	(G) *p*-mastigophores B1 (numerous)	29–40 × 5–6.5
Filaments	(H) basitrichs (few)	14–16 × 2–3
	(I) *p*-mastigophores B1 (common)	9–11 × 4–5
	(J) *p*-mastigophores B1 (common)	23–32 × 5.5–7.5

The marginal mesogloeal sphincter is small, 150 × 30 μm on longitudinal sections, reticular, situated in the outer side of the base of the tentacles (Fig. 6A). Longitudinal muscles of the tentacles and radial muscles of the oral disc are ectodermal. The columnar circular endodermal musculature is well developed.

The actinopharynx is transversely sulcated (Fig. 5C). The siphonoglyphs are shallow and poorly defined, supported by two pairs of the directives. The mesenteries arranged hexamerously in two cycles (6+6 pairs). The mesenteries of the first cycle are macrocnemes, those of the second cycle are microcnemes (Fig. 5B). The oral and marginal stomata were not found. The retractors of macrocnemes are very strong, restricted to circumscribed, reniform, with large pennon on its parietal side and with about 25 muscle processes, most of which are branched (Fig. 6B). Parietal muscles are small, oval or triangular on transverse sections, with few thick weakly branched lamellae (Fig. 6E). Parietal muscle fibers are expanded on the body wall. The microcnemes (Fig. 6D) resemble parietal parts of the macrocnemes.

All macrocnemes are fertile, containing ova up to 0.3 mm in diameter.

Cnidom. Cnidom includes spirocysts, basitrichs, *p*-mastigophores B1 (see Table 3 and Fig. 7). The ectoderm of the scapulus, the tentacles and the oral disc contains numerous spirocysts.

REMARKS. The original description of *Halcampa arctica* is based on several specimens from Spitsbergen collected at the depth from about 9 to 70 m. The present specimen from Franz Josef Land comes from about the same latitude. Both external and internal features agree closely to the original and so far the most detailed description of this species (Carlgren, 1893). In particular, the shape of retractors (Fig. 5B) and the number of their mesogloeal processes are similar to those described and figured by Carlgren (1893, Taf. V, Fig. 6) for *H. arctica*, but differ from those of *H. duodecimcirrata* (which has smaller retractors with less numerous mesogloeal processes, see Carlgren, 1893, Taf. V, Fig. 3). Fautin (2015) provide photographs of some of Carlgren's (1893) syntypes of *H. arctica* and some of them look almost identical to our specimen, they are similarly contracted in preservative, with the distal end invaginated into the body and being wider than the proximal end, similarly covered by sand and are of about the same size. Thus, although we have only one specimen of this species and cannot estimate degree of its variability, the morphological similarity and the fact that it comes from high Arctic location left no doubt that it is conspecific with Carlgren's (1893) specimens and belongs to *H. arctica*.

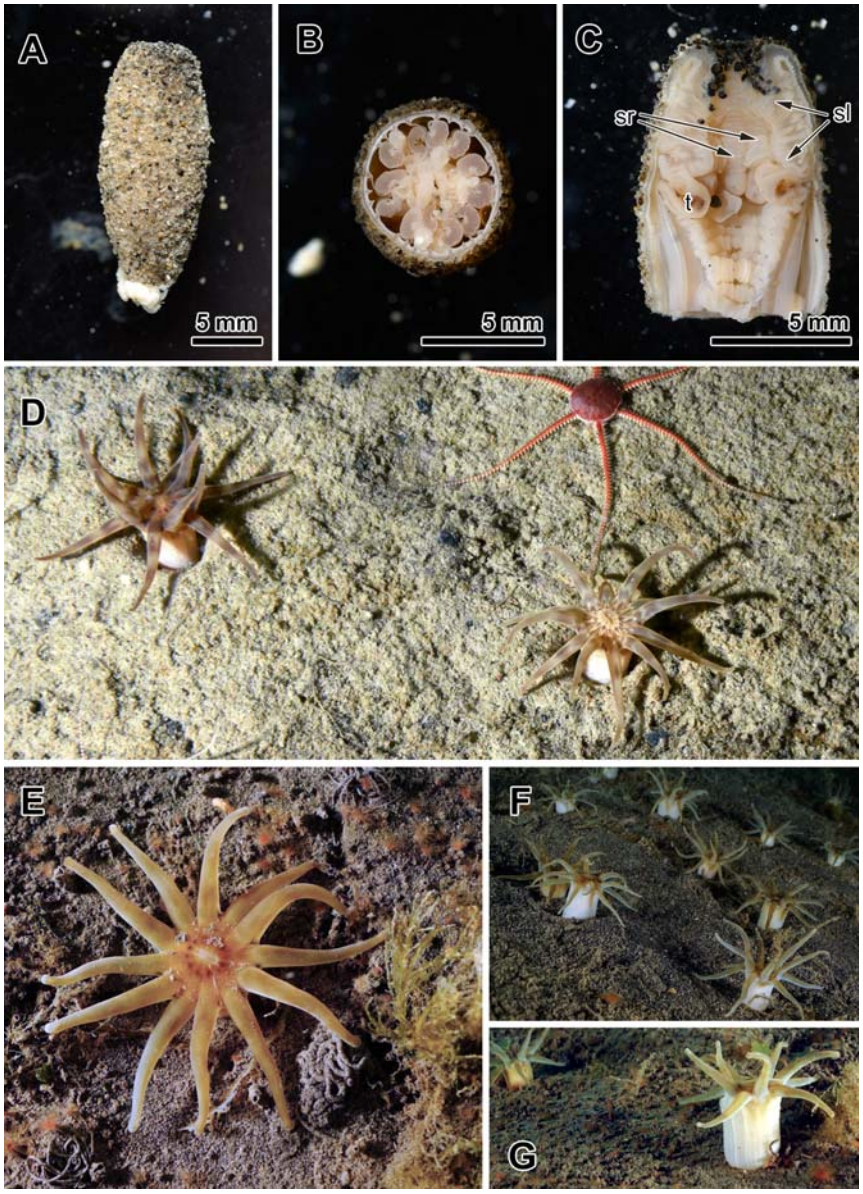

Fig. 5. *Halcampa arctica*, A–C — specimen from Franz Josef Land. A — intact preserved specimen; B — transverse section of the scapus showing arrangement of the mesenteries; C — longitudinal section of the distal half of the body; D — living specimens in coastal waters of Luidji Island, Franz Josef Land (photograph of O. Savinkin); E–G — living specimens in costal waters of Spitsbergen, the type locality of the species, (photographs of Dr. P. Bałazy).

Abbreviations: sl — scapulus; sr — scapular ridges; t — tentacle.

Рис. 5. *Halcampa arctica*, A–C — экземпляр, собранный в районе Земли Франца-Иосифа. A — фиксированный экземпляр; B — поперечный срез через скапус, показывающий организацию мезентериев; C — продольный срез через дистальную половину тела; D — живые экземпляры в прибрежных водах острова Луиджи, Земля Франца Иосифа (фотография О. Савинкина); E–G — живые экземпляры в районе архипелага Шпицберген, типовое местонахождение вида (фотографии Dr. P. Bałazy).

Сокращения: sl — скапулюс; sr — скапулярные гребни; t — щупальце.

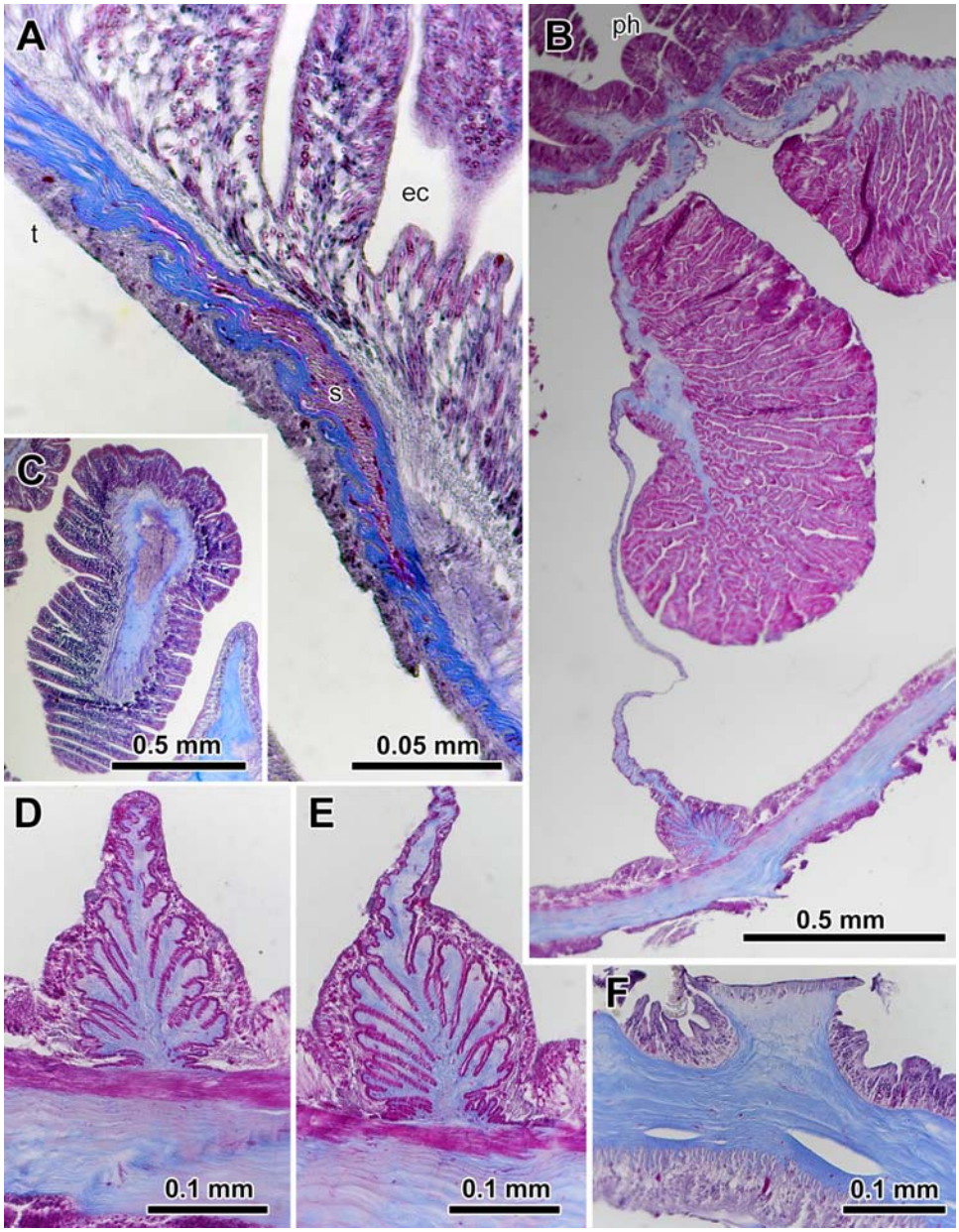

Fig. 6. *Halcampa arctica*, histological sections. A — longitudinal section of the distal part of the scapulus showing the sphincter muscle; B — transverse section of macrocneme; C — transverse section of the tentacle; D — parietal muscle of the microcneme; E — parietal muscle of the macrocneme; F — tenacula.
Abbreviations: ec — ectoderm; ph — actinopharynx; s — sphincter; t — tentacle.

Рис. 6. *Halcampa arctica*, гистологические срезы. A — продольный срез через дистальную часть скапулюса, показывающий сфинктер; B — поперечный срез через макромезентерий; C — поперечный срез щупальца; D — поперечный срез через париетальный мускул микромезентерия; E — поперечный срез через париетальный мускул макромезентерия; F — тенакуля.
Сокращения: ec — эктодерма; ph — глотка; s — сфинктер; t — щупальце.

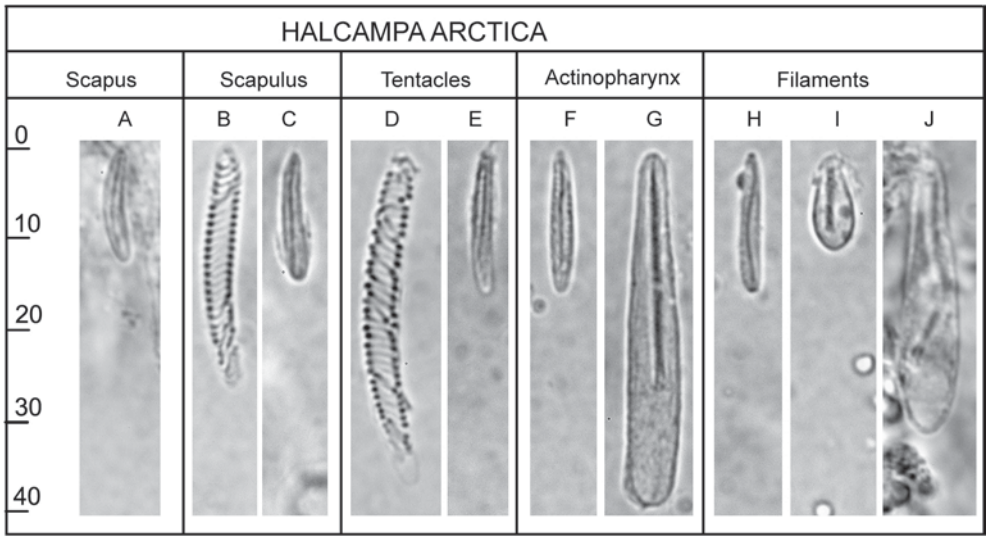

Fig. 7. *Halcampa arctica*, distribution of cnidae (see Table 3 for size ranges).
Рис. 7. *Halcampa arctica*, распределение книд (размеры указаны в табл. 3).

Carlgren (1933) reported a smooth specimen (without sand incrustation on the body and without tenaculi) which he with some hesitation referred to *H. arctica*. He suggested that if the species lives on the bottom which is not sandy the tenaculi do not develop. Without further investigation is hard to say whether this statement is correct.

Carlgren (1921: 122) had some doubt if *Halcampa arctica* (from Arctic locations) and *H. duodecimcirrata* (mostly from European shores) are separate species ("it is possible we have to do with only one species having its habitation proper in the Arctic Sea [...] but also distributed at the shores of Norway and Sweden and the Eastern sides of Denmark") but preferred to retain them separate. Hand (1954) provide rather detailed discussion of several *Halcampa* species and also preferred to keep them separate. At our opinion *H. arctica* is a valid Arctic species, which differs from *H. duodecimcirrata* by larger retractors, by the body more heavily covered with sand grains and, probably, by arrangement of cinclides on the physa.

Several living specimens were photographed underwater by O. Savinkin in coastal waters of Luidji Island, Franz Josef Land, 06 August 2013 (Fig. 5D). In its type locality, Spitsbergen, *Halcampa arctica* may form settlements of many specimens — several underwater photographs showing numerous specimens of this species on sandy and muddy bottom were taken on Spitsbergen by Dr. P. Bałazy (Fig. 5E–G). These photographs show the specimens burrowed in sandy bottom with the oral disc, tentacles and white bare scapulus exposed on surface. The oral disc and the tentacles are pale yellowish-brown, 12 darker reddish-brown spots are in the circle around the mouth on the disc. The specimens from Franz Josef Land have more contrast colour patter on the disc and tentacles (Fig. 5D).

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