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## New record of the sea anemone *Kadosactis antarctica* (Carlgren, 1928): re-description of an Antarctic deep-sea sea anemone, and a discussion of its generic and familial placement

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**Abstract** *Sagartiogeton antarcticus* Carlgren, 1928 is an Antarctic deep-sea species of sea anemone only known from its holotype. The species has been assigned to the genera *Sagartiogeton* and *Kadosactis*, and is currently placed within the family Kadosactidae Riemann-Zürneck, 1991. *Kadosactis antarctica* is re-described based on 11 specimens collected during the cruise of the R/V *Polarstern* ANT XIX/3 (ANDEEP-I) to the Scotia Sea and off the South Shetland Islands (Antarctica). The description includes a complete account of cnidae and photographs. Because the mesogloea is thickened on the aboral surface on the base of the tentacles, this feature becomes a generic character of *Kadosactis* rather than a differential specific character among the species of the genus as previously proposed. Furthermore, the known distribution of the species is enlarged to include the southern branch of the Scotia Sea.

**Keywords** *Kadosactis* · Kadosactidae · *Sagartiogeton* · Actiniaria · Deep-sea · South Shetland Islands

### Introduction

The modern classification of sea anemones is largely based on Carlgren's (1949) survey of the Actiniaria.

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Other proposals for grouping the infraordinal categories of actiniarian sea anemones have been made (Stephenson 1920–1922; Schmidt 1972, 1974), but these have not been followed.

Carlgren (1949: 42) grouped all families of sea anemones with acontia within the subtribus Acontia. Carlgren himself (1949: 42) recognized its heterogeneity, but justified it for practical reasons. The acontia are believed to have evolved once and have been modified and reduced independently on several occasions (Stephenson 1920; Riemann-Zürneck 1991). However, this possibility is not taken into account in Carlgren's survey, resulting in complex and heterogeneous grouping. Taxonomic revision based on newly collected material and the re-description of the type of material quite often can help reduce the change of species between taxa. One example is the revision of the family Kadosactidae Riemann-Zürneck, 1991. Riemann-Zürneck (1991: 191–204) established this family after re-describing newly sampled material of *Kadosactis sulcata* Carlgren, 1934, and revising the species included in *Kadosactis* Danielsen, 1890. According to her revision, the monogeneric family Kadosactidae includes three species: *K. rosea* Danielsen, 1890, *K. sulcata* and *K. antarctica* (Carlgren, 1928). This family was characterized among the Nynantheae with acontia by an archaic nematocyst configuration: large “*p*-rhabdoids B” in all tissues, no “*p*-rhabdoids A” (sensu Schmidt 1969) and large “*hormathiid*” spirocysts.

Eleven specimens identified as the deep-sea anemone *Sagartiogeton antarcticus* Carlgren, 1928 were collected during the R/V *Polarstern* ANDEEP-I cruise to the Scotia Sea and off the South Shetland Islands (Antarctica). This species was previously only known from its original description (Carlgren 1928: 231–233). It had been transferred from *Sagartiogeton* Carlgren, 1924 (Carlgren 1928: 231–233; 1949: 106) to *Kadosactis* (Carlgren 1942: 9; Riemann-Zürneck 1991), but neither the type nor additional material of *Kadosactis antarctica* have ever been re-examined, except for a label placed by D. Fautin in 1996 indicating that the holotype had dried

up (Fautin 2004). The study of the newly collected material and the type material has offered new data about specific and generic characteristics of the species, and also extended its geographic and bathymetric distribution.

## Materials and methods

The studied material was collected on the R/V *Polarstern* cruise ANT XIX/3 (ANDEEP-I), sponsored by the Alfred-Wegener-Institut für Polar-und Meeresforschung in Bremerhaven, during the austral summer of 2002 to the Scotia Arc, Antarctica. The material studied in the present work was sampled off the South Shetland Islands (Fig. 1).

Sea anemones were relaxed on board using menthol crystals and subsequently fixed in 10% seawater formalin. Fragments of three specimens were dehydrated in butanol (Johansen 1940), and embedded in paraffin. Histological sections 7–8  $\mu\text{m}$  thick were stained with Ramón y Cajal's Triple Stain (Gabe 1968).

Squash preparations of cnidae from the preserved material were measured at 1000X magnification with Nomarski differential interference contrast optics. The nomenclature used for the cnidae is from Mariscal (1974) and Östman (2000), with modifications: the nomenclature for basitrichs and *b*-mastigophores is from Carlgren (1940) and Mariscal (1974), due to the obscure distinction between these categories (see Östman 2000: 42). Frequencies given are subjective impressions based on squash preparations. Mean and standard deviation of the size ranges of cnidae measurements are provided. Presence of each type of cnidae in each tissue has been confirmed in the histological sections of the tissues.

The newly collected material has been deposited in the Zoologisches Institut und Zoologisches Museum in

Hamburg (ZMH), the National Museum of Natural History, Smithsonian Institution in Washington (USMN), and the collection of research team "Biodiversidad y Ecología de Invertebrados Marinos" at the University of Seville in Spain (BEIM).

For the purpose of comparison, the following material deposited at the Museum für Naturkunde in Berlin (ZMB) was examined:

*Sagartiogeton antarcticus*, Carlgren, 1928. (ZMB Cni 8441). Typus: Carlgren determ. Leg: 1898–99, Deutsche Tiefsee-Exp., St 152, 63°16.5'S 57°51'E, 4636 m depth.

Remarks: This material was examined by Daphne G. Fautin twice (in 1996 and 2001). She included an additional label: "had dried 1996".

## Results

Order Actiniaria Hertwig, 1882

Suborder Nynantheae Carlgren, 1899

Family Kadosactidae Riemann-Zürneck, 1991

Genus *Kadosactis* Danielssen, 1890

*Diagnosis* (from Carlgren 1949: 105 and after Riemann-Zürneck 1991; amended according to the re-descriptions of the three species currently included in the genus; changes italicized): Nynantheae with basilar muscles present. Body with well-developed base. Column divisible into scapus and scapulus, the former usually with a cuticle, usually deciduous, and with *tenaculi*(?). Column with cinclides formed by ectoderm as well as by endoderm and situated *between scapus and scapulus*. Margin more or less distinct. Sphincter strong, mesogloae. Tentacles of variable length, conical, hexamerously arranged. *Outer tentacles thickened on the aboral side of their bases*. Same number of tentacles and mesenteries, up to 48. Longitudinal muscles of tentacles and radial muscles of oral disc ectodermal. Two si-

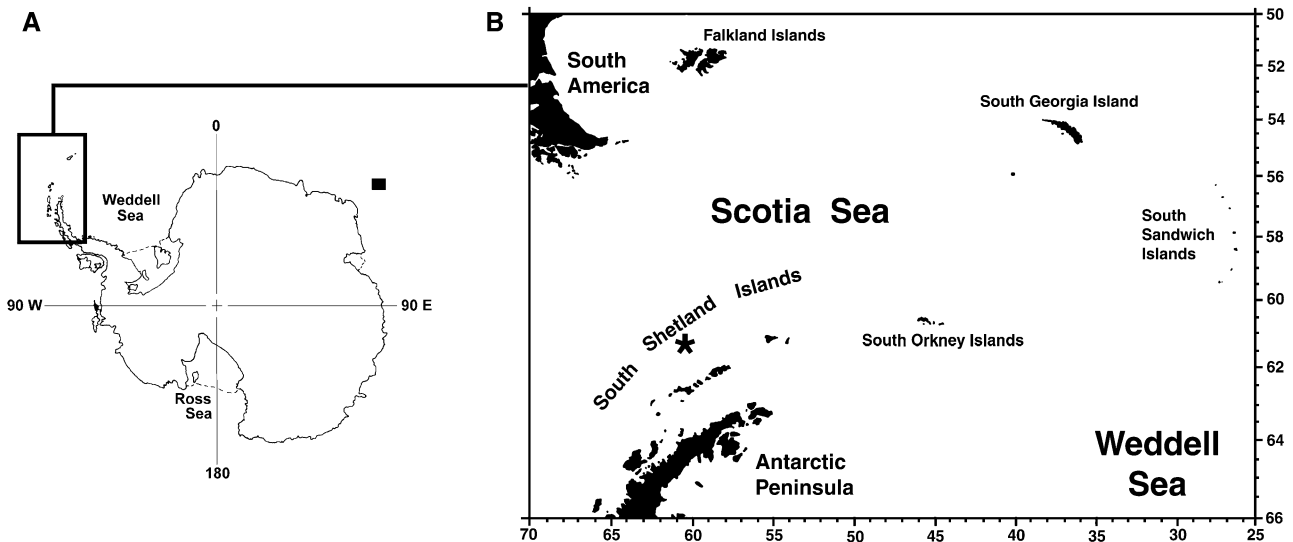
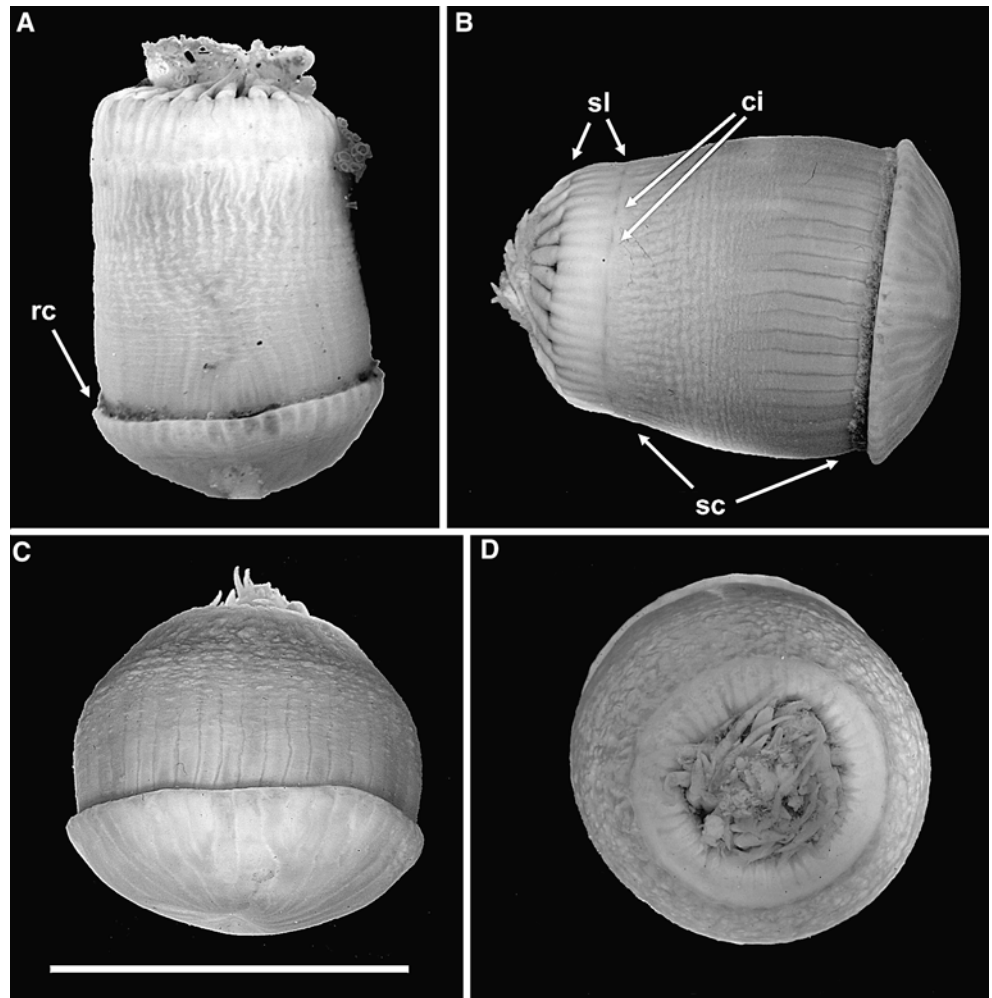


Fig. 1 Known distribution of *K. antarctica* (Carlgren, 1928). a Type locality (■). b New records from ANDEEP cruise (\*)

**Fig. 2** External anatomy of *K. antarctica* (Carlgren, 1928). **a** Living and relaxed specimen, lateral view. **b–d** Preserved specimens. **b** ZMH (C11690) in lateral view; note the annulus of cinclides at the borderline between the scapus and the scapulus. **c** Lateral view (ZMH C11690) showing the aboral end. **d** Oral view (ZMH C11690). *ci* cinclides, *rc* remains of cuticle, *sc* scapus, *sl* scapulus. Scale bar: **a–d** 30 mm



phonoglyphs, two pairs of directives. Arrangement of mesenteries hexamerous. *Twelve pairs of perfect mesenteries*. Perfect mesenteries and sometimes the stronger imperfect ones with strong diffuse retractors, which are extended over the whole surface. Parietobasilar muscles not strong. The stronger mesenteries, including the directives, fertile. Acontia poorly developed. Cnidom: spirocysts, basitrichs, and microbasic *p*-mastigophores (*p*-rhabdoids B).

Nominal species: *Kadosactis rosea* Danielssen, 1890 (type species); *K. antarctica* (Carlgren, 1928); *K. sulcata* Carlgren, 1934

*Kadosactis antarctica* (Carlgren, 1928; Figs. 1–6, Table 1)

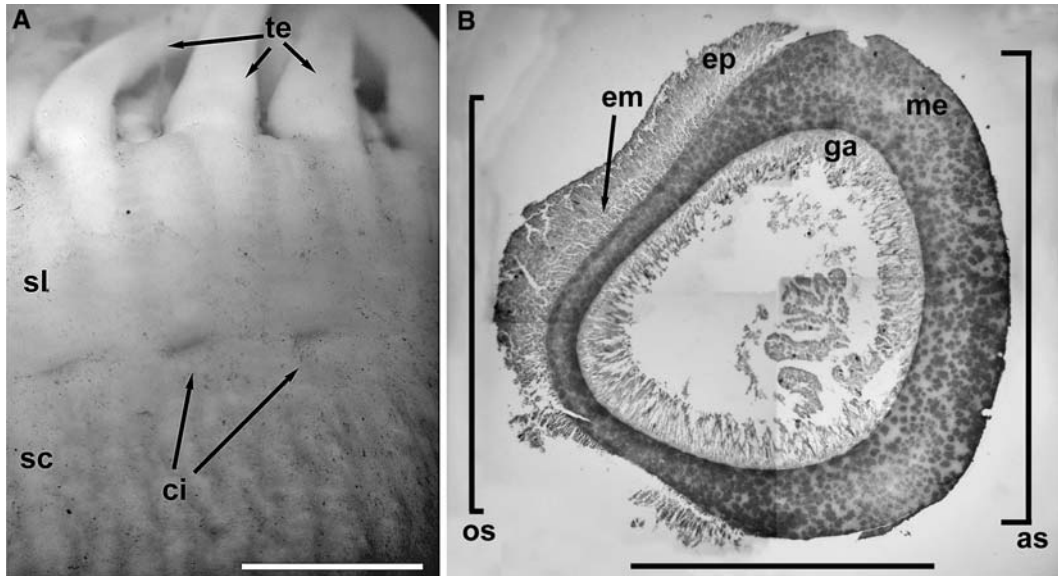
*Sagartiogeton antarcticus* Carlgren, 1928: 231–233 (109–111), Taf. II, Fig. 2; Carlgren 1949: 106

*Kadosactis antarctica* Carlgren, 1942: 9; Riemann-Zürneck 1991: 191–204.

**Material:** ZMH (C11690), four specimens, Polarstern ANT XIX/3, stn. PS61/114-10, Scotia Sea, 61° 43.70'S 60° 42.62'W, 2852.9–2856.2 m depth, 19 Feb 2002, Agassiz trawl; BEIM (ANT-4075), four specimens; BEIM (ANT-4037), one specimen; USMN (1078161), two specimens. Sg data same for all lots of material.

**Diagnosis:** Firm, cylindrical body with well-developed pedal disc. Column divisible into scapus and scapulus, the former with easily deciduous cuticle. Borderline between scapus and scapulus marked with annulus of 22 cinclides. Same number of mesenteries and tentacles (48). Mesenteries arranged in three cycles: first and second cycle, perfect and fertile, and third, imperfect and sterile. Retractor musculature diffuse. Parietobasilar and basilar musculature weak, poorly developed. Sphincter muscle mesogloea, strong and reticular. Cnidom: Spirocysts, basitrichs, and microbasic *p*-mastigophores (*p*-rhabdoids B).

**Description:** External anatomy (Figs. 2, 3): Body firm, cylindrical to globular, about 30 mm diameter and 39 mm height in preserved specimens (Fig. 2a, c). Aboral end well developed, about 31 mm diameter, conical in most specimens with mesenteric insertions visible (Fig. 2c). No cuticle observed on pedal disc. Column divisible into scapus and scapulus (Fig. 2b). Scapus with stratified cuticle that is almost totally eroded in all specimens. Mesenteric insertions visible in the most proximal part of scapus. Distal part of scapus with minute mesogloea papillae whose true nature is hard to define because of the condition of specimens. Annulus of



**Fig. 3** *K. antarctica* (Carlgren, 1928). **a** Detail of the cinclides at the borderline between scapus and scapulus. **b** Cross-section of the basal part of an outer tentacle showing the mesogloal thickening of the aboral side. *as* aboral side, *ci* cinclides, *em* ectodermal longitudinal musculature, *ep* epidermis, *ga* gastrodermis, *me* mesogloea, *os* oral side, *sc* scapus, *sl* scapulus, *te* tentacles. Scale bar: **a** 5 mm, **b** 1 mm

22 cinclides, corresponding with endocoels, encircle borderline between scapus and scapulus (Fig. 3a). Scapulus smooth, 6 mm.

Oral disc slightly smaller in diameter (29 mm) than pedal disc in preserved specimens. Tentacles not retracted in most preserved specimens, stout, conical, shorter than the diameter of oral disc. Inner tentacles more or less equal in length (about 12 mm) to outer ones, about 48 in number, appear—in the preserved state—to be arranged in two cycles, an inner and an outer one. Tentacles thickened on aboral surface; mesogloal thickenings just visible in histological sections (Fig. 3b)

Internal anatomy (Figs. 4, 5): equal number of mesenteries both distally and proximally. Mesenteries hexamerously arranged in three cycles: first and second cycle, perfect and fertile; third cycle, imperfect and sterile (Fig. 4a). Two pairs of fertile directives, connected with two strong, thickened and well-developed siphonoglyphs (Fig. 4a). Mesogloea and gastrodermis of siphonoglyph wider than mesogloea and gastrodermis of actinopharynx. Retractor musculature diffuse (Fig. 4c). Parietobasilar musculature weak, poorly differentiated (Fig. 4b). Basilar musculature poorly developed (Fig. 4d). Acontia difficult to discern in dissection but visible in histological section (Fig. 4e). Gametogenic tissue well developed in specimens collected in February; gonochoric; developing oocytes to 0.2 mm in diameter in the histological sections of preserved specimens.

Sphincter muscle mesogloal, strong and reticular, restricted to scapulus and occupying its entire length (Fig. 5a). Tentacles and oral disc with ectodermal longitudinal musculature (Fig. 5d). Column wall of similar thickness on entire length; epidermis 0.13–0.23 mm;

mesogloea 0.35–0.40 mm thick, and gastrodermis 0.17–0.35 mm thick. Cuticle 3–6  $\mu$ m thick.

Cnidom (Fig. 6): spirocysts, basitrichs, and microbasic *p*-mastigophores (*p*-rhabdoids B). A survey of the cnidae is presented in Table 1 and Fig. 6.

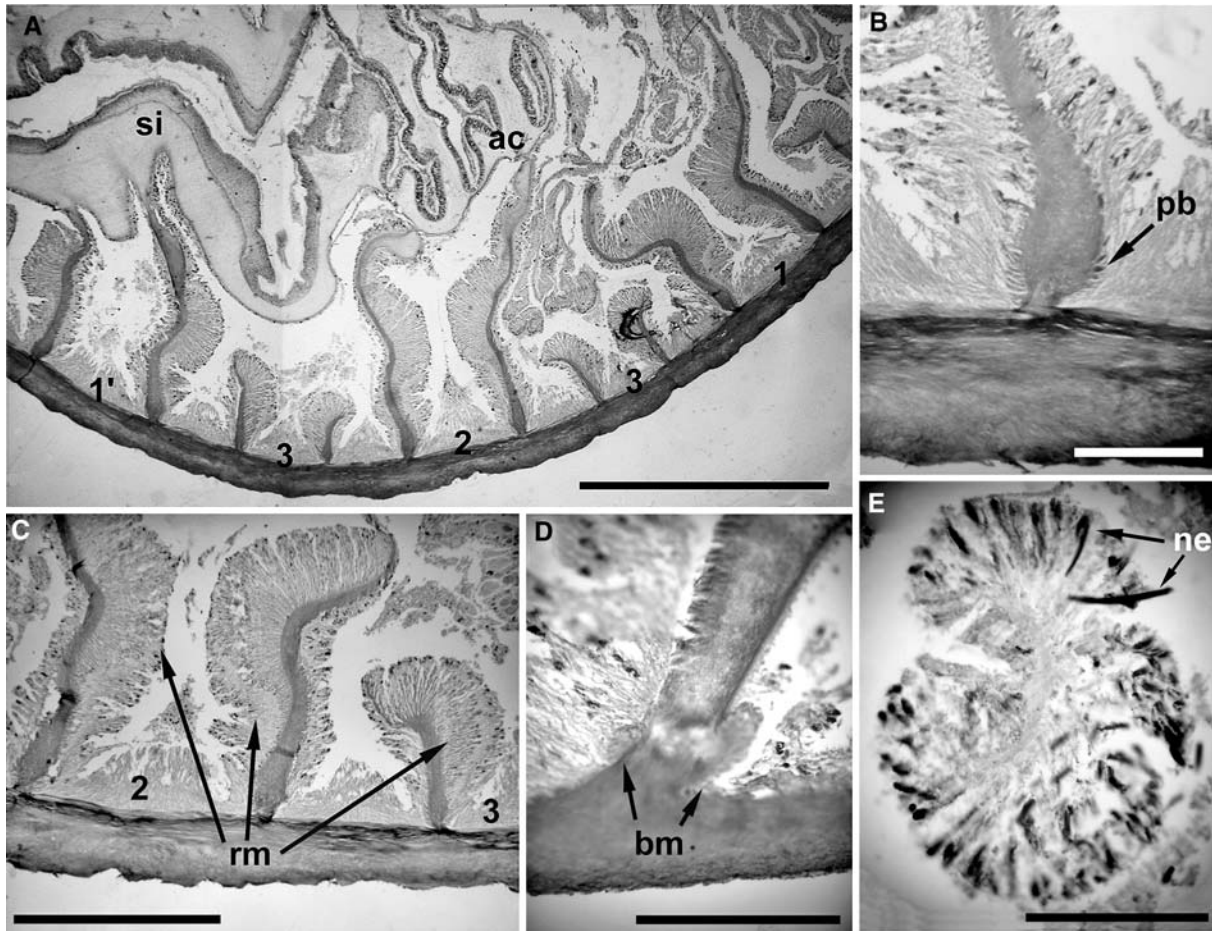
Colour: living material with whitish tentacles and pale salmon-coloured scapulus, actinopharynx and mesenteric filaments; scapus similar in colour to scapulus distally where it lacks cuticle, brownish proximally because of cuticle. Preserved material pink coloured.

*Geographic and depth distribution:* *Kadosactis antarctica* was previously known only from its type of locality, inhabiting abyssal waters (4636 m depth) off Kemp Coast (63°16.5'S 57°51'E) (see Fig. 1). This contribution extends the geographic and depth distributions of *K. antarctica* to the south branch of the Scotia Sea (61° 43.70'S 60° 42.62'W), and bathyal waters from 2852.9 to 2856.2 m depth. Riemann-Zürneck (1991: 200) misunderstood the longitude of the type of locality of *Sagartiogeton antarcticus* and cited it (as *K. antarctica*) in the South Shetland Trench.

## Discussion

*Differential diagnosis of the species of the genus Kadosactis* Danielssen, 1890: *K. antarctica* corresponds in most aspects of its general morphological structure and sizes ranges and distribution of cnidae to the other two members of the genus, *K. rosea* and *K. sulcata*. These three species are distinguished only by slight differences as the following differential diagnosis shows:

*Kadosactis rosea* Danielssen, 1890: *Kadosactis* with inverted cone-shaped column, 22 mm height. Scapus



**Fig. 4** Internal anatomy of *K. antarctica* (Carlgren, 1928). **a** Cross-section at actinopharynx level. **b** Detail of a mesentery showing the weak parietobasilar musculature. **c** Detail of the retractor musculature of mesenteries showing the basilar musculature. **d** Longitudinal section through the proximal part of the mesenteries showing the basilar musculature. **e** Acontium in cross-section; note the nematocyst on the tissue. *1'* directive pair of mesenteries, *1* pair of mesenteries of the first cycle, *2* pair of mesenteries of the second cycle, *3* pair of mesenteries of the third cycle, *ac* actinopharynx, *bm* basilar musculature, *ne* nematocyst, *pb* parietobasilar musculature, *rm* retractor musculature, *si* siphonoglyph. Scale bars: **a** 2.5 mm, **b** 250  $\mu$ m, **c** 1 mm, **d** 250  $\mu$ m, **e** 200  $\mu$ m

with a deciduous cuticle and weak tenaculi. Number of tentacles, 44. No microbasic *p*-mastigophores in the tentacles. Arctic deep-sea species.

*Kadosactis antarctica* Carlgren, 1928: *Kadosactis* with cylindrical to globular column, 39 mm height. Scapus smooth but with small mesogloal papillae and remains of deciduous cuticle. Number of tentacles, 48. Antarctic deep-sea species.

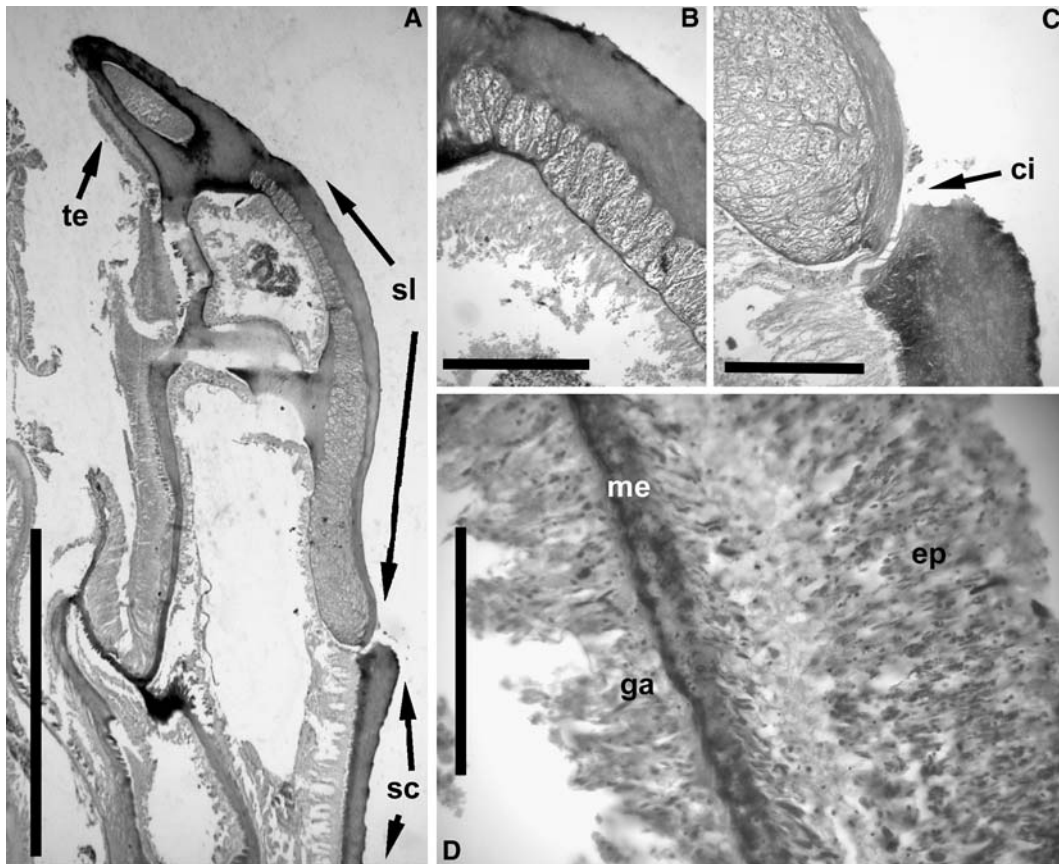
*K. sulcata* Carlgren, 1934: *Kadosactis* with globular column, 35 mm in height. Scapus faintly tuberculate and without cuticle(?). Number of tentacles, 40. North Atlantic deep-sea species.

Differences in shape and size of the column are often due to the state of relaxation and the process of fixation. The structure of the column is not really clear in the three species of *Kadosactis* due to the limited number of specimens available and their poor condition. The presence of cuticle is usually a generic character; the absence of cuticle in one of the species, even more in such a homogenous genus, seems strange. Therefore, we think that the absence of cuticle in the scapus of

*K. sulcata* is probably due to the state of the material. The variability and boundaries of these characters have to be checked and their occurrence in isolation cannot be seen as specific characters until then.

The cnidae is very homogenous in the three species of *Kadosactis*; the size ranges of the capsules are very similar, overlapping in the three species (see Riemman-Zürneck 1991: 195–196 and 200–201 and Table 1). The absence of microbasic *p*-mastigophores in the tentacles of *K. rosea* can probably be accounted for by the fact that just one specimen was used for compiling the cnidae data (Riemman-Zürneck 1991: 199) and to their low frequency, although this is based on subjective impressions of this type of cnida in the other species (we have found only 19 capsules in five measured specimens).

The morphological diagnostic characters used until now do not provide enough evidence to separate clearly the three species of *Kadosactis*. The minor differences in the shape, structure and size of the column, and the worldwide distribution of the three species might render *Kadosactis*, a very homogeneous genus. The variability



**Fig. 5** *K. antarctica* (Carlgren, 1928). **a** Mesogloal sphincter in longitudinal section. **b** Detail of the distal part of the sphincter; note the reticular appearance of the mesogloal lacunae. **c** Detail of the proximal part of the sphincter showing a cinclide at the borderline between the scapus and the scapulus; note the appearance of the mesogloal lacunae. **d** Ectodermal longitudinal musculature of the tentacles. *ci* cinclide, *ep* epidermis, *ga* gastrodermis, *me* mesogloea, *sc* scapus, *sl* scapulus, *te* tentacle. Scale bars: **a** 2.5 mm, **b–c** 300  $\mu$ m, **d** 125  $\mu$ m

of the traditional diagnostic characters is not enough to discard the possibility of *Kadosactis* being a widely distributed deep-sea species. The slight differences in the three species might be interpreted then as different populations of one species. Such a wide distribution would be justified by the connection across the deep-sea bottoms.

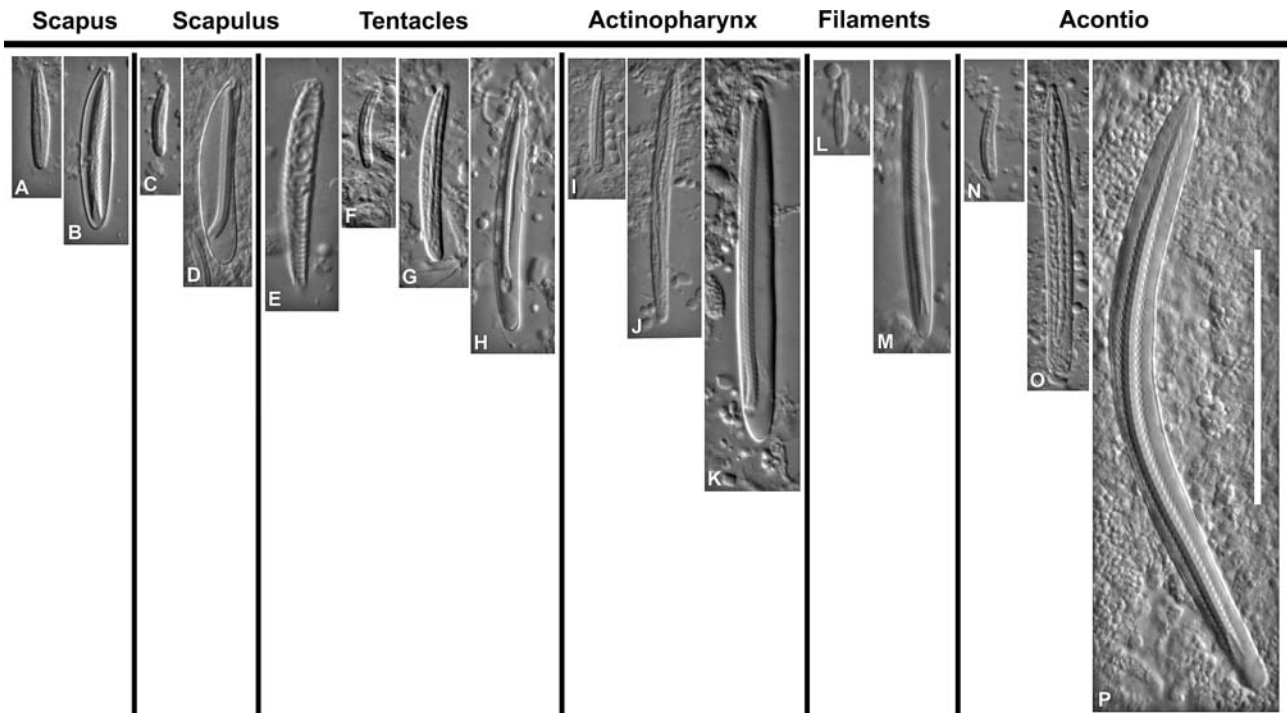
However, until more material is available for further and more clarifying studies, we prefer to maintain *Kadosactis* as a genus with three species, *K. rosea*, *K. sulcata* and *K. antarctica*, instead of promoting the idea of a species complex in this genus.

*Background of the generic placement of Sagartiogeton antarcticus* Carlgren, 1928: Carlgren (1924: 26) erected the genus *Sagartiogeton* for the species *S. robustus* Carlgren, 1924. At that time, *Sagartiogeton* was differentiated from *Kadosactis* by the presence of tenaculi, cinclides, tentacles without thickenings on their aboral side, and acontia with two kinds of nematocysts in *Sagartiogeton*. Later, Carlgren (1928: 231) described a second species of *Sagartiogeton*, *S. antarcticus*, from a single specimen from deep Antarctic waters. In subsequent works, Carlgren (1932: 264; 1933: 21) first distinguished and then synonymized the genera *Kadosactis* and *Sagartiogeton*. His observations were made from

badly preserved material of *K. rosea*, and he confused the cnidom of the acontia and overlooked an annulus of small cinclides on the lower part of the scapulus of *K. rosea*. The cnidae of *K. rosea* was re-examined and illustrated by Riemann-Zürneck (1991: 200–201), clarifying this confusion.

Having taken into account other diagnostic characters, Carlgren (1942: 9) changed opinion, finally differentiating *Kadosactis* and *Sagartiogeton*. He gave a diagnosis of the genus *Kadosactis* and detailed descriptions of most of its species, including *K. abyssicola* (Koren and Danielssen, 1877), *K. (Sagartiogeton) antarctica*, *K. spitsbergensis* (Danielssen, 1890) and *K. (Sagartiogeton) sulcata*. Carlgren also gave the diagnosis and description of the genus and species of *Sagartiogeton*. He stated then that in *Sagartiogeton*, mesenteries grow proximally as well as distally but originate earlier proximally (the mesenteries are therefore more numerous proximally). For *Kadosactis*, he stated that the mesenteries grow proximally towards distally (so there are more mesenteries proximally than distally).

However, Carlgren (1949: 101) later listed *K. antarctica* under the genus *Sagartiogeton* again. He partly distinguished *Sagartiogeton* and *Kadosactis* by the



**Fig. 6** Cnidae of *K. antarctica* (Carlgren, 1928). **a** Basitrich 1. **b** Microbasic *p*-mastigophore. **c** Basitrich 1. **d** Microbasic *p*-mastigophore. **e** Spirocyst. **f** Basitrich 1. **g** Basitrich 2. **h** Microbasic *p*-mastigophore. **i** Basitrich 1. **j** Basitrich 2. **k** Microbasic *p*-mastigophore. **l** Basitrich 1. **m** Microbasic *p*-mastigophore. **n** Basitrich 1. **o** Basitrich 2. **p** Microbasic *p*-mastigophore. Scale bar: 50  $\mu$ m

number of mesenteries proximally and distally, and contradicted his earlier paper, stating that in *Sagartiogeton* the mesenteries grow simultaneously proximally and distally but originated earlier distally than proximally (Carlgren 1949: 105). In most of the well-known species of the genus *Sagartiogeton*, mesenteries originate earlier distally (Manuel 1988; López-González 1993, unpublished). Unfortunately, doubts about this character cannot be verified in the type material of *K. antarctica* due to the lack of information about the number of proximal and distal mesenteries in the original description of Carlgren (1928: 231–233) and also because of the current state of the only type specimen. The revision of the genus *Kadosactis* by Riemann-Zürneck (1991) does not help in this matter either, because she does not mention this character in either the descriptions or in the diagnosis of the species that she studied. The newly collected material of *K. antarctica* we examined has the same number of mesenteries proximally and distally. Nevertheless, until a revision of this character in the other species of *Kadosactis* is performed, we prefer not to include the number of mesenteries proximally and distally in the diagnosis of the genus.

One difference between *Kadosactis* and *Sagartiogeton* is that in *Kadosactis*, the mesogloea of the tentacles is thickened on the aboral side of the base, whereas in *Sagartiogeton*, this mesogloea is never thickened. Carlgren (1928) originally described *K. antarctica* as not having tentacles thickened on the aboral sides of their bases. Riemann-Zürneck (1991: 200) used this

character as a specific difference between *K. antarctica* and *K. sulcata* (absent and present, respectively). However, in the newly collected specimens of *K. antarctica*, we have found that the tentacles are thickened on the aboral side of their bases (Fig. 3b). Carlgren (1942: 9; 1949: 105) probably did not observe these basal mesogloal thickenings because they are only recognizable under histological sections, and this is probably also the reason why he listed *K. antarctica* under *Sagartiogeton* again in 1949. Thus, as the three species within *Kadosactis* have mesogloal aboral basal thickenings in the tentacles, we consider it a generic character for *Kadosactis* and therefore we included it in the diagnosis of the genus.

The differentiation of macronemes and micronemes is one character traditionally used to distinguish higher taxonomic levels in Actiniaria. Despite its unquestionable value for characterizing some taxa, several studies have revealed a few acontiarian taxa with intermediate states of this character (Stephenson 1920: 458–459; Pinto pers. comm., and pers. obser.). Therefore it has to be used carefully and should be re-evaluated in each particular case. Riemann-Zürneck (1991: 202) described the mesenteries for *Kadosactis* species as differentiable into macronemes and micronemes but does not provide pictures of them. In accordance with Stephenson (1920: 456), we neither consider the difference between the cycles of mesenteries in our material as macronemes and micronemes (Fig. 4), nor do we see this distinction in the holotype of *K. antarctica* (see Carlgren 1928: 232 Textfig.

**Table 1** Summary of size ranges of the cnidae of *K. antarctica* (Carlgren, 1928)

Category	Figure	Range of length and width of capsules ( $\mu\text{m}$ )	$X \pm SD$	Sample	N	F	Data from Carlgren (1928) <sup>a</sup>
<b>SCAPUS</b>							
Basitrichs 1	A	(14.1–25.2)×(3.0–4.0)	19.8 ± 2.6×3.6 ± 0.5	3/3	62	+/+/+/+	(12–19)×1.5
M. <i>p</i> -mastigophores	B	(26.3–41.4)×(5.0–6.1)	33.0 ± 4.3×5.7 ± 0.5	3/3	52	+/+/+/+	(29–50)×(4–5)
<b>SCAPULUS</b>							
Basitrichs 1	C	(12.1–22.2)×(3.0–4.0)	16.2 ± 2.8×3.1 ± 0.4	3/3	51	+/+/+	No data
M. <i>p</i> -mastigophores	D	(31.3–46.5)×(6.1–9.1)	36.3 ± 3.1×7.0 ± 0.8	2/3	40	+/+/+	No data
<b>TENTACLES</b>							
Spirocysts	E	(25.2–60.6)×(4.0–9.1)	42.3 ± 8.2×6.0 ± 1.4	5/5	65	—/+/+/+	(24–60)×(2.5–6.5)
Basitrichs 1	F	(15.2–23.2)×(2.0–4.0)	17.6 ± 1.6×3.1 ± 0.3	5/5	62	+/+	
Basitrichs 2	G	(24.1–36.4)×(3.0–4.0)	30.5 ± 2.9×3.5 ± 0.5	5/5	73	+/+	(31–38)×3
M. <i>p</i> -mastigophores	H	(33.0–65.7)×(5.0–8.1)	47.6 ± 10.6×5.9 ± 0.9*	5/5	19	—/+/	(50–55)×5
<b>ACTINOPHARYNX</b>							
Basitrichs 1	I	(14.1–24.2)×(2.0–3.0)	16.4 ± 2.3×3.0 ± 0.4	3/3	50	+/+/+/+	(14–17)×1.5
Basitrichs 2	J	(40.4–57.6)×(4.0–5.0)	50.8 ± 5.0×4.1 ± 0.3	3/3	51	+/+/+	
M. <i>p</i> -mastigophores	K	(51.5–69.7)×(6.1–7.1)	62.2 ± 4.1×6.9 ± 0.6	3/3	59	+/+	(50–60)×(4.5–5)
<b>FILAMENTS</b>							
Basitrichs 1	L	(12.1–30.0)×(2.0–4.0)	16.2 ± 4.1×2.9 ± 0.6	5/5	70	+/+/+	No data
M. <i>p</i> -mastigophores	M	(36.4–56.6)×(4.0–7.1)	42.8 ± 2.3×5.2 ± 0.6	5/5	73	+/+/+	No data
<b>ACONTIA</b>							
Basitrichs 1	N	(12.1–26.3)×(2.0–3.0)	15.9 ± 2.4×3.1 ± 0.2	2/2	50	—/+/+/+	
Basitrichs 2	O	(39.4–65.7)×(5.0–6.1)	57.9 ± 5.1×5.5 ± 0.5	2/2	55	+/+/+/+	(48–65)×(3.5–4)
M. <i>p</i> -mastigophores	P	(104.0–136.4)×(8.1–12.1)	120.8 ± 7.2×9.7 ± 0.9	2/2	55	+/+/+	(98–115)×(6–6.5)

<sup>a</sup>Categories of the nematocysts were not specified in Carlgren (1928).  $X$  average,  $SD$  standard deviation, *Samples* the ratio indicates the number of specimens in which each cnidae was found out compared to the number of specimens examined,  $N$  indicates the total number of capsules measured,  $F$  frequency, + + + very common, + + common, + rather common, — sporadic. Abbreviation: *M* Microbasic. \*Average based on less than 40 measured capsules, the measurement of at least 40 capsules is usually considered enough to have significance. Some discharged capsules of microbasic *p*-mastigophores (size ranges (50–67)×(6–7) in 5/5 specimens) have also been found

65). Therefore, we do not include this character in the diagnosis of the species or in the diagnosis of the genus.

**Familial placement of the genus *Kadosactis*** Daniels- sen, 1890: The genus *Kadosactis* was at first placed in the family Paractidae Hertwig, 1882 (see Danielssen 1890: 8). However, Haddon (1898: 301) briefly reviewed and redefined the family Sagartiidae (Gosse, 1858), and included *Kadosactis* within it. Carlgren (1949: 86) redefined the family Sagartiidae as Thenaria (Acontaria) with mesogloea sphincter, usually strong, with mesenteries not divisible into macronemes and micronemes, and typical acontia with numerous nematocyst, basitrichs and microbasic amastigophores (microbasic *p*-amastigophores, sensu Östman 2000).

Riemann-Zürneck (1991) revised the genus *Kadosactis* and established the family Kadosactidae based upon the archaic nematocyst endowment of the family: large “*p*-rhabdoids B” and no “*p*-rhabdoids A” (sensu Schmidt 1969). She argued that the diagnosis of the genus is inconsistent with its position within the family Sagartiidae, wherein the archaic cnidom is considered to be of highest priority (Hand 1955: 190). Some discharged microbasic *p*-mastigophores have been observed in the acontia of the material of *K. antarctica* studied here; these have a distal tubule in the discharged capsules and are thus microbasic *p*-mastigophores rather than microbasic *p*-amastigophores). Thus, the newly collected specimens of *K. antarctica* (which have microbasic *p*-mastigophores rather than microbasic *p*-amastigophores in the acontia) support the exclusion of

*Kadosactis* from Sagartiidae and support the creation of Kadosactidae.

Currently, the determination of useful characters and their polarity within the different actiniarian families for a natural classification of the order is extremely complex. Therefore, both the position of the family Kadosactidae and the tentative grouping of the mesomyarian sea anemones into “early” and “late” mesomyarians (Schmidt 1972; 1974) awaits a more comprehensive study of the natural classification of the order Actiniaria, an aspect beyond the aim of this contribution.

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