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New sub-Arctic species of the tropical genus *Antropora* (Bryozoa: Cheilostomata): a gastropod–pagurid crab associate

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Antropora commandorica sp. nov. is described from the Commander Islands (Bering Sea). This species is unique within the bryozoan genus *Antropora* in its sub-Arctic distribution; all other known species are distributed in tropical and sub-tropical waters. This species is also most often found as an epibiont of gastropod shells, some with an associated pagurid crab. Whilst this is not unknown in other species of the genus *Antropora*, *A. commandorica* appears to use these substrata almost exclusively.

INTRODUCTION

Norman (1903) introduced the cheilostomate genus *Antropora* for *Membranipora granulifera* Hincks, 1880a, originally described from Madeira. This species has recently been redescribed and a neotype specimen designated by Tilbrook (1998). In the same paper Tilbrook (1998) reviewed some species previously assigned to this circum-tropical genus. He went on to describe six species of *Antropora* (not seven as noted in the paper's abstract) one of which was a new species, *Antropora erectirostra*. He also introduced a new genus, *Parantropora*, to accommodate *Membrendoecium lagunculum* Canu & Bassler, 1929 and a new species *Parantropora penelope*, both previously assigned to *Antropora* or a species thereof.

MATERIALS AND METHODS

The specimens of *Antropora commandorica* described here were obtained during the summers of 1991 and 1992 by one of us (A.V.G.) whilst on expedition to the Commander Islands (Bering Sea) organized by the Laboratory of Benthic Communities, Kamchatka Institute of Ecology and Nature Management (KIENM), Petropavlovsk-Kamchatsky, Russia. The material was gathered from nine collecting sites, two around Bering Island (Cape Vkhodnoy Reef and Toporkov Rock) and seven localities off Mednyy Island (Gladkovskaya and Korabelnaya Bays, Drovyanye Stolby, Glupyshinye Stolby and Matveya Capes, and Sivuchii Kamen Rock) from depths of 0–30 m. In total, 54 specimens of *A. commandorica* were collected from 24 benthic samples.

The specimens described here are deposited in the Bryozoa Section, Department of Zoology, Natural History Museum (NHM), London, UK, and in the Zoological Institution Russian Academy of Science (ZIRAS), Saint Petersburg, Russia. The remainder are in the personal collection of A.V.G.

SYSTEMATICS

Order CHEILOSTOMATA Busk, 1852
Suborder NEOCHEILOSTOMATINA d'Hondt, 1985
Superfamily CALLOPOROIDEA Norman, 1903
Family ANTROPORIDAE Vigneaux, 1949
Subfamily ANTROPORINAE Vigneaux, 1949
Genus *Antropora* Norman, 1903

Antropora Norman, 1903: 87.
Antropora: Tilbrook, 1998: 26 (cum syn.).

Generic diagnosis

Colony encrusting, unilaminar or multilaminar. Autozooidal cryptocyst moderately developed around opesia, gymnocyst moderately developed, negligible or absent. Spines absent. Small interzooidal avicularia present in all species. Large autozooid-sized vicarious avicularia present in some species. Ovicells endozooidal, generally indicated by a cap-like thickening at the distal end of the autozooid. Dietellae present.

Type species

Membranipora granulifera Hincks, 1880a.

Generic remarks

The taxonomic order follows that advocated by Tilbrook (1998) who moved *Antropora* from the Calloporidae Norman, 1903, a 'somewhat heterogeneous group' of genera (Ryland & Hayward, 1977), to the Antroporidae Vigneaux, 1949; the placement of *Crassimarginatella* Canu, 1900 in the Alderinidae Canu & Bassler, 1927 also eases the calloporid problem. Prior to Tilbrook's (1998) review and stabilization of the genus by the selection of a neotype specimen for Hincks' *Membranipora granulifera* some confusion had surrounded the precise identity of the type species. Having examined much type material Tilbrook (1998) synonymized two genera (*Membrendoecium* Canu & Bassler, 1917 and *Dacryonella* Canu & Bassler, 1917)

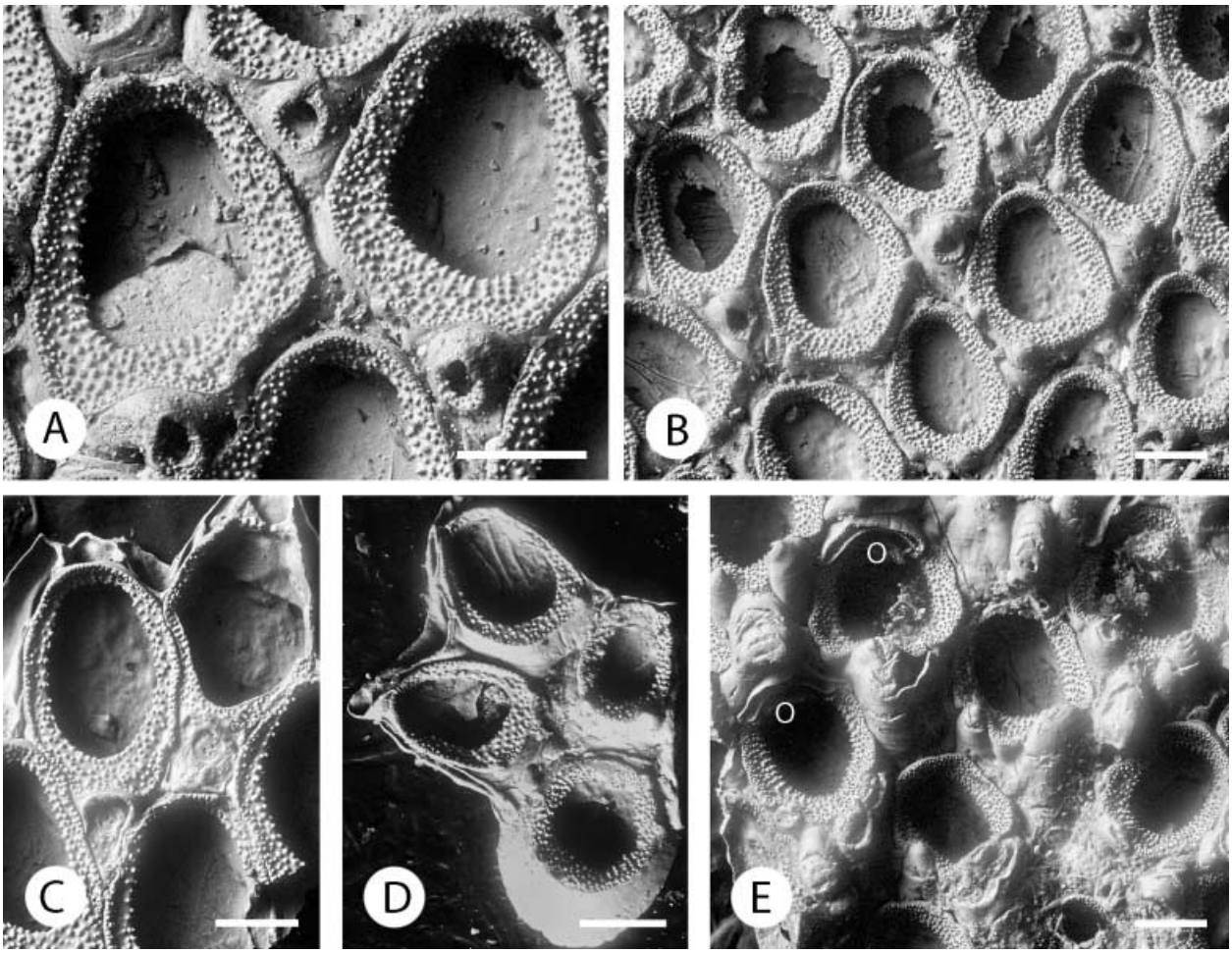

Figure 1. *Antropora commandorica* sp. nov: (A,B) normal autozooids; (C) autozooids from the growing edge of the colony; (D) ancestrula and periancestrula zooids; (E) autozooids later in ontogeny, with inflated kenozooids and two ovicells (marked O). All scale bars: 200 μm.

within his more concise concepts of the genus *Antropora*. This also led him to synonymize eight species under just three of the six *Antropora* species he described: *Antropora granulifera*, senior synonym of *Dacryonella trapezoides* Canu & Bassler, 1929; *Antropora minor*, senior synonym of *Amphiblestrum papillatum* Busk, 1884, *Membranipora marginella* Hincks, 1884, *Membrendoecium claustracrassum* Canu & Bassler, 1929, *Membrendoecium ovatum* Canu & Bassler, 1929 and *Dacryonella ogivalina* Canu & Bassler, 1929; and *Antropora typica*, senior synonym of *Membrendoecium strictorostris* Canu & Bassler, 1928 and *Crassimarginatella cookae* Hayward, 1988. Tilbrook (1998) noted that a further 19 nominal species of *Antropora* remained in the literature, five Recent and 14 fossil, which he was not able to cover due to a lack of original material. He suggested that after examination it would transpire that a number of these species would be synonymized with one or more of the species he described.

Antropora commandorica sp. nov.
(Figure 1A–E)

Bidenkapia spitzbergensis: Grischenko 1997: 159 (part).

Type material

Holotype: NHM 2003.10.8.1, (dry) Station 1, 54°44.3′N 167°43.9′E, Gladkovskaya Bight, Beringian coast, Mednyy Island, Commander Islands, 30 June 1992; one large colony encrusting shell of *Nucella* sp., flattened rocky reef with crevices, middle horizon of rocky-boulder intertidal, *Laminaria* sp. biocoenosis, collector A.V. Grischenko.

Paratypes: NHM 2003.10.8.2, 3, (2 slides) (locality data as above); NHM 2003.10.8.4, (slide) (locality data as above) ancestrula and periancestrula zooids.

Other material examined

NHM 2003.10.8.5, Station 13, 55°11.5′N 165°58.6′E, Cape Vkhodnoy Reef, Pacific coast, Bering Island, Commander Islands, 25 July 1991; two colonies encrusting shell of *Nucella* sp., lower horizon of rocky-boulder intertidal, crevices, *Laminaria dentigera* and *Alaria fistulosa* biocoenosis, collector A.V. Grischenko; NHM 2003.10.8.6, Station 17, 55°11.5′N 165°58.6′E, Cape Vkhodnoy Reef, Pacific coast, Bering Island, Commander Islands, 8 August 1991; one colony encrusting broken shell of *Cryptonatica jantostoma* (Deshayes, 1839), shoreline drift, collector A.V. Grischenko; ZIRAS 1/50329, Station 10, 55°11.5′N 165°58.6′E, Cape Vkhodnoy Reef, Pacific coast, Bering Island, Commander Islands, 22 July 1991; colony encrusting gastropod shell of *Nucella* sp.; middle horizon of rocky intertidal, intertidal pool (depth 0.5 m), from lower surface of the boulder, *Thalassiophyllum clathrus* and *Ulva fenestrata* biocoenosis, collector A.V. Grischenko.

Description

Colony encrusting, unilaminar or multilaminar, almost exclusively encrusting nucellid gastropods shells. Autozooids oval, bordered by a distinct, thin mural rim, separated by deep, often wide grooves ($0.60 \pm 0.04 \times 0.38 \pm 0.03$ mm; N=30). Gymnocyst generally minimal early in ontogeny, developing over time, particularly proximally, a small unilateral tuberosity formed proximolaterally or laterally at junction with cryptocyst in most autozooids. Cryptocyst coarsely granular, concave, deeper proximally than laterally, sloping basally, becoming thicker with ontogeny. Opesia oval, occupying one half to two-thirds of the frontal area, depending on ontogenetic state of autozooid ($0.32 \pm 0.04 \times 0.21 \pm 0.05$ mm; N=30). Single, small interzooidal avicularium seated in the angular interzooidal spaces, raised on a small cystid, directed distally, rostrum raised, opesia teardrop-shaped, crossbar absent, mandible triangular. No vicarious avicularia observed. Kenozooidal papillae are also found at proximal ends of autozooids, in interzooidal angles, either in place of, or in conjunction with, the interzooidal avicularia, often becoming inflated with ontogeny and arching over the proximal opesial cryptocyst. Ovicells endozooidal, indicated by vestigial, bilaminar, cap-like structure distally. Ancestrula autozooid-sized and shaped but smaller ($\sim 0.46 \times 0.38$ mm), producing a small primary autozooid distally and two secondary autozooids disto-laterally. Colonies bright yellow or pinkish when alive, drying to a translucent light pinkish yellow.

Remarks

Named for the type locality, *Antropora commandorica* is characterized by the presence of papillae-like kenozooids and interzooidal avicularia on raised cystids proximal to the autozooids. It is very similar in appearance to *A. minor* but differs from it by having autozooids, and more particularly kenozooids, with a greater extent of gymnocystal calcification. The presence of the gymnocystally derived unilateral process is unique within this genus.

Antropora commandorica is unique within the known species of this genus in being found at such high latitude (55°N). All other *Antropora* species are found in tropical or sub-tropical waters.

Ecology

In the Commander Islands archipelago *Antropora commandorica* is found only in areas of hard bottom, i.e. the rocky plateau (including silted rocky surfaces with crevices and cracks), boulders, and rock outcrops, at depths 0–30 m.

Every specimen of *A. commandorica* obtained from shoreline beachcast was associated with shell fragments of the gastropod *Cryptonatica jantostoma* (Deshayes, 1839). Whilst these molluscs are found down to 80 m depth, *A. commandorica* has only been found down to 30 m. At the mid- to low-intertidal range, where laminarian algae communities dominate (Tarakanova, 1978; Kussakin & Ivanova, 1995), colonies of *A. commandorica* were noted almost without exception (96%) on the shells of nucellid gastropods. These gastropods are quite abundant in the intertidal rock pools and crevices (0.3–0.7 m depth) that exist under the cover of laminarian thalli. Approximately one-third of the *Nucella* shells collected with *A. commandorica* encrusting were domiciles for the Pacific red hermit crab *Elassochirus gilli* (Benedict, 1892), and the majority of these were entirely encrusted by colonies of *A. commandorica*. It is noteworthy that the ancestrular region of most colonies of *A. commandorica* was located near the shell apex, with subsequent colony development towards the aperture. Moreover, the growing margin of some colonies passed into the inner surface of the shell. Subtidally, in the shallow waters around the Commander Islands, two major zones have been distinguished (Ivanyushina et al., 1991)—an upper zone of kelp communities (0–15 m depth) and a lower zone of crustose coralline algae (15–40 m depth). Within both these zones *Antropora commandorica* uses a variety of hard substrata, including boulders, rock surfaces, calcareous tubes of polychaetes, as well as the inner surface of the calcareous red algae *Clathromorphum nereostratum* Lebednik, 1977. The colony size of *A. commandorica* from subtidal populations was always notably smaller than those encrusting gastropod shells within the intertidal zone. However, in common with observations from the intertidal, the greatest proportion of collected *A. commandorica* colonies (53%) was associated with gastropod shells, including *Buccinum baeri* (Middendorff, 1848) and *Plicifusus kroyeri* (Moller, 1842), some with hermit-crab occupants. Overall, over 80% of *A. commandorica* colonies are associated with gastropod shells within its 30 m depth-range.

Distribution

Antropora commandorica is a littoral–upper sublittoral species presently known only from the region of the Commander Islands (Bering Sea), high boreal, sub-Arctic Pacific Ocean.

DISCUSSION

Species of *Antropora* have only, until now, been found in tropical or sub-tropical waters circum-tropically. *Antropora commandorica* is unique within this genus in being found exclusively at high, sub-Arctic latitudes. *Antropora minor* (Hincks, 1880b) is the most widely distributed species, found circum-tropically, but also within the greatest range of latitudes, particularly in the Pacific Ocean, from Japan in the north to the Chatham Islands in the south. *Antropora tincta* (Hastings, 1930) and *A. typica* (Canu & Bassler, 1929) have also been found in Japanese waters but are otherwise found in more tropical waters. *Antropora erecta* Silén, 1941 is a Japanese endemic.

Antropora commandorica is most often found as an epibiont of gastropod shells, some with an associated pagurid crab. Whilst this is not unknown in other species of the genus *Antropora*, for instance *A. tincta* has been noted as often associated with gastropod shells (Tilbrook, 1998), *A. commandorica* appears to use these substrata almost exclusively. This association with gastropod shells, either inhabited by the mollusc itself or a pagurid crab, is not unusual amongst bryozoans. In fact certain bryozoans are common as epibionts of gastropod shells, often with associated pagurid crabs (Taylor, 1994). Species of the cheilostomate genera *Hippoporidra* Canu & Bassler, 1927 and *Odontoporella* Héjjas, 1894 are almost exclusively associated with the gastropod shell domiciles of pagurids (Taylor & Cook, 1981; Cook, 1985), with many other bryozoan species forming symbiotic, possibly mutualistic,

associations with pagurids (Taylor, Schembri & Cook, 1989).

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