

A NEW NORTH ATLANTIC SPECIES OF *BERINGIUS*, (GASTROPODA: BUCCINIDAE) WITH COMMENTS ON *B.* *TURTONI*

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Abstract A new species of *Beringius* (Buccinidae), *B. bogasoni* is described from the northernmost North Atlantic bathyal zone. It is compared to its nearest congener, *B. turtoni* (Bean, 1834), whose distribution, nomenclature and variation is revised for comparative purposes. *Beringius bogasoni* is a carnivore and scavenger; sea-anemone- and unidentified animal tissues were found in its gut.

Key words Gastropoda, new species, North Atlantic, Buccinidae, *Beringius*.

INTRODUCTION

The European marine mollusc fauna is quite well known, second only to the Arctic one, but some 15-35 species are being described every year (CLEMAM). These novelties are almost without exception small species, the majority being smaller than 3 mm. The new species described below is, however, a striking exception, being the largest new gastropod species from European waters since its congener *Beringius turtoni* was described by William Bean (1834).

The northern and deep species of the family Buccinidae are infamous for being troublesome with many species being highly variable and forming clines and local populations (Friele, 1879a; Clarke, 1978; Sneli & Mork, 1979; Bouchet & Warén, 1985; Sneli & Warén, 1992). Although it seems that so far no detailed or genetic investigations have been carried out, there is evidence (Warén unpubl.) suggesting that *Buccinum undatum* is exposed to disruptive selection similar to the case in *Littorina saxatilis* (Gastropoda, Littorinidae; Johannesson, Johannesson & Alvarez, 1993), and there is no reason to suppose this may not be the case with other buccinids. It is therefore important to scrutinize the distribution and variation of related species, before taxonomical changes are suggested.

This situation is probably the result of the great climatic changes that have taken place in the area during the Pleistocene, with the distributions being moved latitudinally forth and back following the retreat and progression of glaciations. Isolation of populations has probably also been

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important for speciation. However, no recent works on phylogeography include directly comparable groups since they are mainly based on shallow-water taxa.

MATERIAL AND METHODS

This paper is based on material accumulated in museums and newly obtained specimens from various exploratory marine projects. Much of the British material of molluscs from various deep-sea programs has during later years been located, gathered and deposited in the Royal Scottish Museum (NMSZ) by S. Smith. Two recent marine fauna surveys, BIOICE and BIOFAR, which cover the areas around Iceland and the Faroes, have brought together a larger material, than from all other East Atlantic coasts. We have also relied on the collections in the Swedish Museum of Natural History (SMNH). All material of *Beringius* is now catalogued and available via the Global Biodiversity Facility (GBIF) on <http://www.gbif.net>

SYSTEMATICS

FAMILY BUCCINIDAE

Genus *Beringius* Dall, 1886

Beringius Dall 1879: Plate 2, fig. 1 (only in legend and privately distributed, rejected ICZN Opinion 469 (1957)).

Jumala Friele, 1882: 6, type species *Fusus turtoni* (Bean, 1834) by original designation. Supposed

to be blasphemous, an assumption confirmed by ICZN Opinion 469 (1957)

Beringius Dall, 1886: 304, type species *Chrysodomus crebricostatus* Dall, 1877, by original designation. *Ukko* Friele in Norman, 1893: 352, new name for *Jumala* (cf. above), replacement name for and takes the type species of *Jumala*, *Fusus turtoni* (Bean, 1834).

Neoberingius Habe & Ito, 1965: 21, 35, type species *Beringius frielei* Dall, 1895, by original designation (figured by Kosuge 1975, Plate 16, fig 1).

The genus *Beringius* is well known from fossils from the North Pacific, back to the Eocene (Marincovich 1981, MacNeil 1984, Kafanov, Ogasawara & Marincovich 2001, Ogasawara 2004), while in the surroundings of the North Atlantic, the earliest occurrences are Pliocene (British Crag formation and the Icelandic Crag at Tjörnes (ca 3 m.y. b.p., Eiriksson pers comm) of a species very similar to or identical with *B. turtoni* (Harmer 1914, Schlesch 1924). It seems not to have been reported from the Dutch or Belgian Pliocene formations. *Beringius turtoni* also occurs as a late glacial fossil in Sweden and Norway.

Okutani (2000) listed six species, Higo. Callomon & Goto (1999) 10 species, and Tiba & Kosuge (1981) six species from Japanese waters, Abbott (1974) nine species (of which three probably belong to other genera) from the American northwestern coast, a striking contrast to the conditions in the Atlantic. This fact, combined with the importance of the genus during a large part of the Pacific Tertiaries suggests that *Beringius* spread to the North Atlantic via the Polar Sea, before the early Pliocene.

Beringius crebricostatus, the type species, with its strong spiral sculpture (figured by Kosuge 1975 Plate 16, fig 4 and Okutani 2000 Plate 225, fig. 1) looks quite different from *B. turtoni*, but the shape of the shell, especially the peristome, and the unusual radular morphology (Dall 1886: 304, not figured) indicate close relations. No anatomical information seems to be available on any species of *Beringius*, which hampers comparisons.

The generic name *Neoberingius* is based on *Beringius frielei*. The shell was figured by Kosuge (1975, type) and Okutani (2000), and the radula by Habe & Sato (1972, Plate 2, fig. 13). In these characters, *Beringius frielei* is quite similar to *B. turtoni*, and *Neoberingius* is here considered a junior synonym of *Ukko*.

Beringius turtoni (Bean, 1834)

Figures 1-4

Fusus turtoni Bean, 1834: 493.

Fusus turtoni Jeffreys 1867: 331.

Neptunea ossiania Friele, 1879b: 279 [misprint for *ossiani*].

Fusus turtoni Marshall 1911: 207.

Beringius turtoni Bouchet & Warén 1985: 197.

Type materials *Fusus turtoni*, Scarborough Museum of Natural History, Scarborough, U.K. or Yorkshire Museum, York, U.K., not seen; *Neptunea ossiani*, lectotype, here selected, Universitetets zoologiske Museum, Bergen ZMBN no. 20715, Vøringen sta 362, off northwestern Svalbard, in 839 m depth; 1 paralectotype ZMBN 20711, from northern Norway.

Distribution & Material Examined From Canada, Foxe Basin, ca 70°N, 80°W (Mcpherson 1971) south to off Newfoundland ca 45°N (Dautzenberg & Fischer 1912, Bouchet & Warén 1985); Western Greenland to 76°N in 10-500 m (Thorson 1951, SMNH); eastern Greenland, Franz Joseph Fjord, 250 m (SMNH old collection 2699, Hägg 1905); all around Iceland in 60-1000, usually 100-350 m (Thorsson 1941, Oskarsson 1982, Institute of Natural History, Reykjavik); The Faroes (Spärck & Thorson 1933); W of Ireland, Porcupine Bank, 320-350 m (SMNH 74321); W of Shetland (Jan Light, pers. comm); the deeper parts of the North Sea, north of ca 56°N and far east of the British coasts (E of Petershead in 77 m, 70 miles E of Aberdeen in 72 m; Shetland Fishing grounds (Jeffreys 1867, Simpson 1904, Marshall 1911); Witch Ground, 58°N, 01° E, ca 156 m (C. Delongueville pers. comm.); Bressay banks 146 m (2 records, S.M. Smith); Jutland Reef, 56°52'N, 180-270 m and Dogger Bank, 73-91 m (3 records, SMNH); Norwegian coast, also in the fjords, from 58°30'N and northwards, 14 records in 150-450 m (SMNH); Svalbard, 27 m (SMNH) and the Siberian coast, at least to 155°E in 100-600 m (Gorbunov 1946). Whether or not the distribution is continuous along the Siberian coast and it connects to the very similar North Pacific *Beringius frielei* is not known.

More detailed data on specimens in SMNH are available via the Global Biodiversity Information Facility (GBIF) on <http://www.gbif.se>.

Fossil: Pliocene, Great Britain, Waltonian Crag,

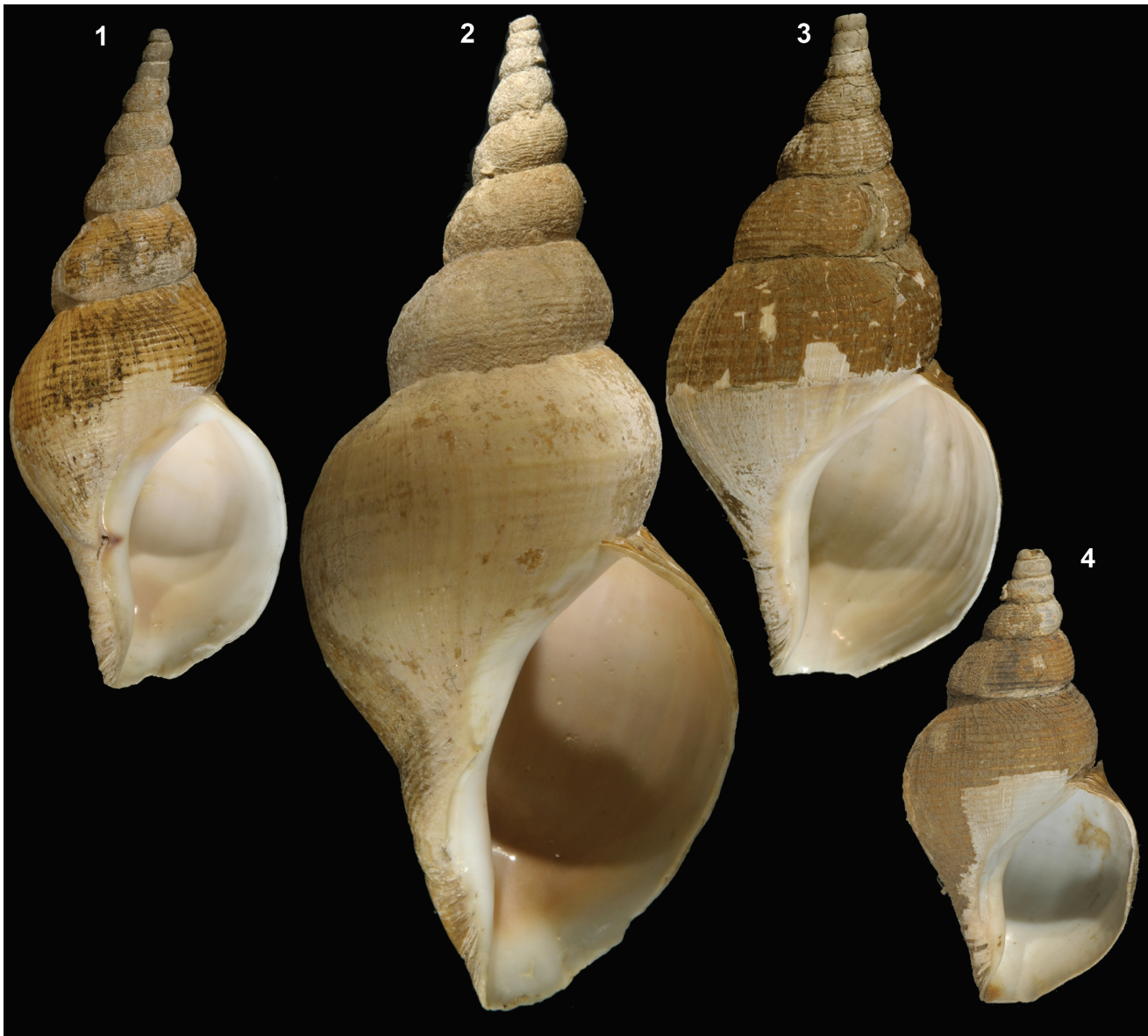
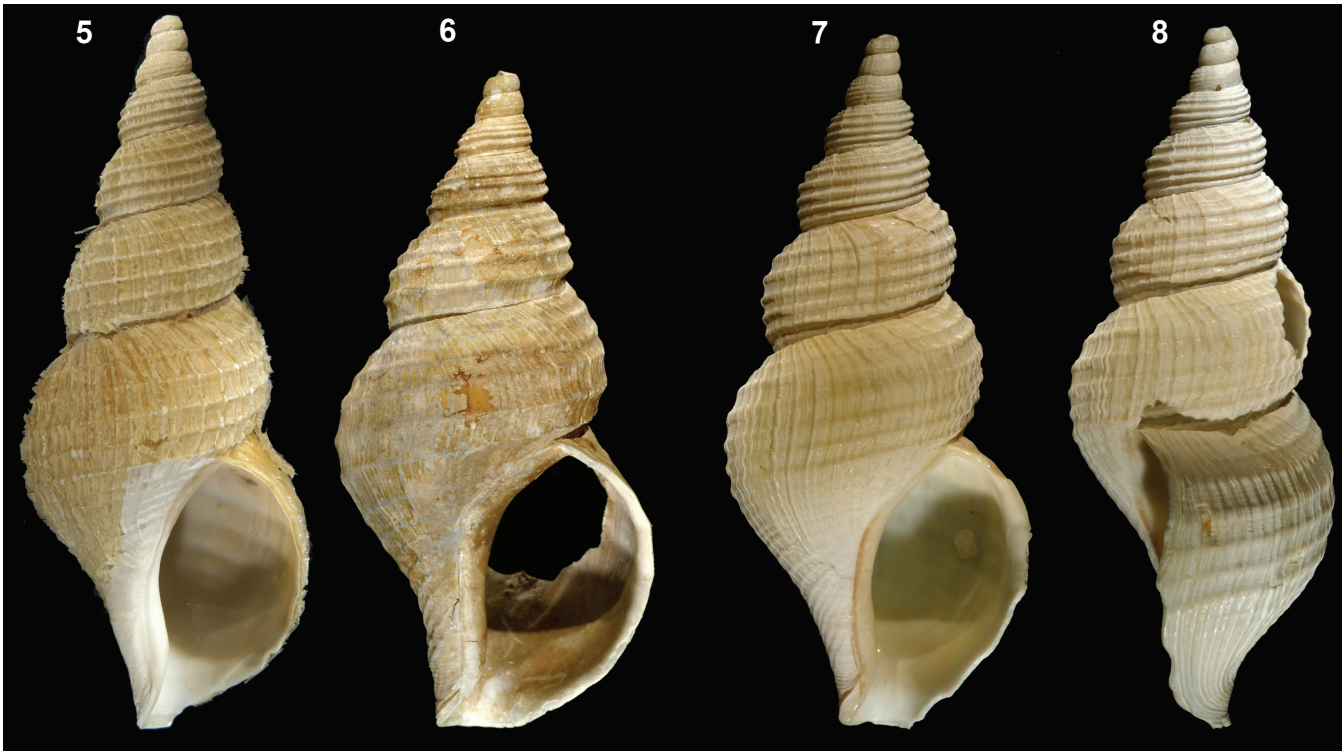


Figure 1-4 *Beringius turtoni* 1 Slender form, Dogger Bank, 72-90 m depth, 100 mm, SMNH 73659. 2 Large specimen, off southwestern Norway, 182 m, SMNH 73134, 151 mm. 3 Greenland, Julianehaab, 9-18 m, SMNH 73646, 100 mm. 4 Svalbard, 27 m, SMNH 73644, 69 mm.

Newbournian and Butleyan Crag (Harmer 1914); Iceland, Tjörnes, "Bæjarlækur, 40-50 m" (Schlesch 1924, 1926, Albertsson & Eiríksson 1988).

Discussion *Neptunea ossiania* Friele, 1879 was described from the Norwegian North Atlantic Expedition from W of Svalbard (station 362, 79°59'N, 05°40'E, 459 fathoms). It was figured by Friele in the final report from the expedition (1882, Plate 1, fig. 1.) Here (p. 7) he also corrected the specific name to "*ossiani*", a misprint at its first publication (as also evidenced by being based on Georg Ossian Sars [1837 – 1928] and from

the spelling in the index in the "Jahrbücher der deutschen Malakozoologischen Gesellschaft". This assumed new species was supposed to differ by "a more fragile shell, a lighter and more hairy periostracum, a broader siphonal canal and differently shaped aperture, a more uniformly diminishing spire, and more depressed apex, as well as a different sculpture". Fig. 4 of a specimen from Greenland agrees well with Friele's type. Friele used only the specimen from Vøringen station 362 and gave the dimension for that one; a second specimen from station 124 (ZMBN no. 20711) is mentioned in the subsequent text; and



Figures 5-8 *Beringius bogasoni* sp.n. 5 Off Scotland, AT 229, 102 mm. 6 Off western Iceland, 94 mm. 7-8 Holotype, AT419, 102 mm.

becomes a paralectotype.

Some authors (e.g. Golikov 1995) have kept *B. ossiani* and *B. turtoni* separate. All specimens of an “*ossiani* appearance” we have seen come from the northern part of the distribution, Greenland and Svalbard, as does the type of *B. ossiani*. Here the typical *B. turtoni* form is absent, and we interpret this as a latitudinal variation since intermediate specimens are common south of the typical ones.

In the Atlantic *B. turtoni* seems to have its southern limit at Newfoundland, southern Greenland, southern Iceland, the Faroes, Ireland, and the North Sea. It is evidently not rare in the North Sea, but west of the British Isles there are only two records. The details in the distribution there are uncertain due to most records being cited as “Shetland” only, while the specimens probably originate from Shetland fishing boats operating in the North Sea. In the south, Dogger Bank, at ca 56°N (SMNH 73659 and other collections) and western Ireland (52°45′N, SMNH 74321) seem to be the southernmost reliable localities.

A record from 1447 m in the northern part of the “Greenland Sea” (Golikov 1995) may be based on a “drop-shell” carried out by drifting ice, since nobody else has found it deeper than ca

1000 m. Another record from off Newfoundland (43.5°N, 55.7°W, in 3850 m) seems to be a misidentification. It was published as *Beringius turtoni frielei* [sic.], and was based on photos from a seep biotope at the Laurentian Fan (Mayer, Shor, Hughes & Piper, 1988). Judging from the rather poor photos, it may be a species of *Colus* (Buccinidae) or a turrid, with more evenly convex whorls, slender shape and longer siphonal canal than in *Beringius*.

The North Pacific *Beringius frielei* (Dall, 1895) is quite similar to *B. turtoni* both in shell and radular characters (see Okutani 2000, page 452, fig. 6). It is known from the Bering, Japan and Okhotsk Seas in 80-250 m (Okutani 2000, Abbott 1974). It is only if and when the two are found sympatrically that their relation can be better understood.

Beringius turtoni attains a height of at least 150 mm (SMNH 73134) (Fig. 6).

Beringius bogasoni sp.n.

Figures 5-13

Holotype and type locality. W of Scotland, AT (=Agassiz trawl) 419, 56°56′N, 09°50′W, 1908

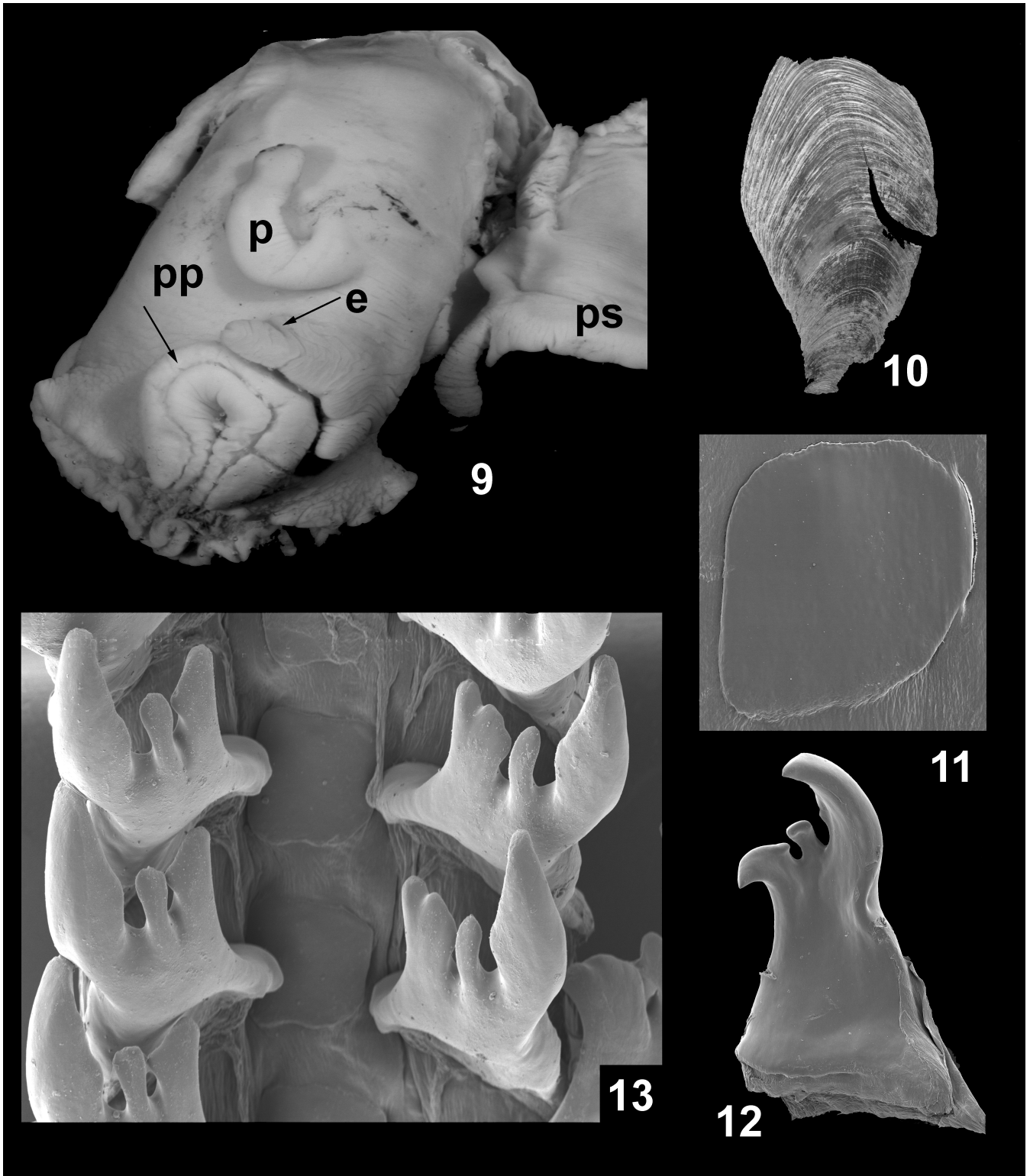


Figure 9-13 *Beringius bogasoni* sp.n. **9** Head-foot (from AT 427, NMSZ 1994128.12775). E – eye, concealed under cephalic tentacle and eye bulge; P – penis; PP – propodium; PS – pallial skirt. **10** Operculum of a 100 mm high spm (holotype), height 35 mm. **11-13** Radula of AT 229 NMSZ 1994128.12876 (Figured specimen). **11** Central tooth plate, width 85µm. **12** Lateral tooth, height 300 µm. **13** Radula, whole width, between outside of laterals, 500 µm.

m, 21 Feb. 1991, NMSZ (=National Museums of Scotland, Department of Zoology) register number 1994128.12774 (Fig. 1).

Other material examined (paratypes) W of Scotland, AT 229, 56°43'N, 09°30'W, 1587 m, 11 August 1982, 2 specimens, wet, NMSZ 1994128.12776 (Fig. 3-4) 56°33'N, 09°13'W 2400-2900 m, 23 October 1977, 1 specimen, wet, 105 mm. -- OTSB (=Semi balloon otter trawl) 03/85/17, 56°54'N, 10°00'W, 1955m, 21 Apr 1985, 1 specimen, wet, NMSZ 1994128.12772. -- OTSB 71/90/09, 56°52'N, 09°35'W, 1730 m, 9 Sep 1990, 2 specimens, dry, NMSZ 1994128.12773; 1 specimen, dry, S.M.Smith private collection. -- OTSB 71/90/09, 56°52'N, 09°35'W, 1760 m, 9 Sep 1990, 1 specimen, wet, SAMS, TC., - - R/V CHARLES DARWIN, AT 427, 57°18'N, 10°24'W, 1640 m, 19 Nov 1991, 1 specimen, NMSZ 1994128.12775. -- Challenger 16/77, haul 22, 56°31.5'N, 09°13.5'W, 23 Oct 1977, 1 specimen, 125 mm, Glasgow Museum, Z1977-259-141. -- **Off southwestern Iceland**, 64°44.7'N, 28°07.2'W, 1075 m, 1 shell, leg. Jón Bógason, now in Institute of Natural History, Reykjavik (Fig. 2).

Derivation of name Named in honour of Mr. Jón Bógason, Reykjavik, who amassed a stunning collection of Icelandic marine invertebrates during his work at the Icelandic Fishery Board. This was recently donated to the Institute of Natural History, Reykjavik.

Description Shell (Figs 1-4) tall, fusiform, sturdily built with 2-2.5 smooth apical whorls; 7 evenly spaced spiral ridges start on 3rd whorl and continue to outer lip with no intercalation. Basal area of body-whorl with 14-15 weaker ribs. Axial growth ribs and striae appear on fourth whorl; become conspicuous on 5th. Spiral microsculpture, ca 4-8 fine furrows between and on a pair of spiral ridges, mainly visible as scratches of spiral sculpture. Whorls ca 7.3 in number (incl. embryonic ones), evenly convex or with a "bear-belly profile". Aperture pear-shaped, with a distinct columellar glaze. Outer lip with crowded growth lines forming a thickening; slightly sigmoid in profile. Siphonal canal distinctly set off, short and deep. Periostracum yellowish brown, well developed, forming protruding lamellae at incremental lines, often drawn out to triangular bristles at intersections with spiral sculpture. Maximum shell height at least 125 mm.

Operculum (Fig. 10) irregularly pear-shaped, thin, brownish to yellowish; anterior end pointed, usually much eroded; with a thickening running along the margin. most obvious along inner, anterior half. Growth lines irregularly spaced. Nucleus apical, missing, eroded

Soft parts (Fig. 9) of general buccinid appearance; cephalic tentacles short and contracted; eyes small, Ø 0.5 mm, black, almost concealed by the contraction, in a bulge abutting the cephalic tentacles. Male with long flattened, simple, tentacle-like penis of even width, distally rounded (not pointed). Penis situated quite far back, distance from base of penis to mouth same as distance between eyes in contracted specimen.

Radula (Figs 11-13) as normal for the genus; very long and slender, central plate low and inconspicuous, roughly square with rounded corners. Laterals, tall and robust with three slightly recurved cusps.

Discussion Still the distribution of *Beringius bogasoni* is poorly known, more or less from two localities since all the British records are close to each other. It seems, however, to have a deeper and more southern distribution than *B. turtoni*. It seems also to be quite rare since it was not found around Iceland during the BIOICE program, with more than 250 stations deeper than 1000 m. There is a small possibility that a record from off Newfoundland (in 1267 m, Dautzenberg & Fischer 1912) is based on our new species, but this could not be checked since the specimens could not be found when AW asked for it at Institut royal de Sciences naturelles (Bruxelles) and Institut Oceanographique (Monaco) some 20 years ago. We do, however, feel confident that Dautzenberg & Fischer should have commented on a specimen of this striking appearance.

Beringius bogasoni differs from *B. turtoni* by its less sturdily built shell, more pronounced spiral sculpture and more distinctly set off siphonal canal. It also has a straight conical spire, with no trace of a concave outline.

Beringius bogasoni is not a variable species; its known variation is shown in Figs 5-8.

The rectal content was examined in two specimens, from AT427 and AT419. The former had massive amounts of tissues and cnidocysts of sea anemones and scattered hydroids (identified by D.G. Fautin); the latter specimen had some partly digested animal tissues with no skeletal or other

identifiable content. The only earlier information on feeding biology of a species of *Beringius* was reported by Shimek (1980) who observed two specimens of *B. kennicotti* feeding on the sea anemone *Tealia crassicornis*, in a depth of ca 1 m, at ca 60° N in Alaska. Other specimens had eaten the polychete *Phyllodoce maculata* (L., 1767). Feeding on Cnidaria is rare among caenogastropods, mainly known from species of the families Coralliophilidae, Epitonidae and Ianthinidae (Kohn 1983) and may represent a specialization within the genus.

There is no "sister species" known from the North Pacific as is the case with *B. turtoni*; neither is this to be expected considering the great depth and southern distribution of *B. bogasoni*. It seems therefore likely that it entered the North Atlantic quite early probably even before the Pliocene and later became disconnected from its Pacific ancestor, to evolve independently.

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