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How well are the northern whelks known? On the history of the Polar Whelk, *Buccinum polare* Gray, 1839 (Gastropoda: Buccinidae)

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Abstract: The identity of *Buccinum polare* Gray 1839 is investigated and its natural history discussed. The original description is compared with the type material stored in the NHMUK and to interpretations published by subsequent authors. Instead of the original spelling "*polaris*", the subsequent spelling "*polare*" is in prevailing usage for this taxon and, according to ICZN 33.3.1, deemed to be preserved. We confirm the species is restricted to the North Pacific and absent from the North Atlantic fauna. Most published subsequent records of *B. polare* belong to distinct species, usually with a more southern distribution in the North Pacific, while the Atlantic records are mainly specimens of *Buccinum terranovae* Beck *in* Mörch, 1869. We restore the status of the Atlantic *B. terranovae* Beck *in* Mörch, 1869 to the species level and compare it with similar species. We only briefly discuss the status of *Buccinum tottenii* Stimpson, 1865, a species commonly synonymised with *B. terranovae.* We also briefly discuss the status of *Buccinum ectomycina* Dall, 1907 and *Buccinum ectomycina beringense* Golikov, 1980 and compare them with *B. polare*.

Introduction: Most *Buccinum* species are moderately large and display quite well-visible features that may be characteristic of the species, such as sculpture and shape, making it seemingly easy to study them. But on the contrary! Deciphering these characteristics and figuring out if a certain shell is a variant rather than another *Buccinum* species, or vica versa, can be challenging. The morphological pliability of many *Buccinum* species is much higher than the differences between the species, causing a wide phenotypical overlap. Many *Buccinum* species show a high degree of variability in shape, size and intensity of sculpture, giving shells of a single species a rather distinct look while at the same time, shells that look similar at first sight, may turn out to belong to distinct species after close examination. In addition, some species have characteristics that are hard to describe in words, even harder in the usual technical terminology. The next citation, from more than 150 years ago, is still actual: "*There is a* facies*, difficult to describe, which makes the forms easily recognizable. But specific, tangible differences are hard to find.*" (from Stimpson, 1865: 379, while discussing *Buccinum*). We will return to this subject in a future paper. Subtile differences in sculpture and shape can cause a different appearance, while different degrees of erosion are responsible for a different appearance of the charactistics and a different, difficult to explain gloss. "*The shells of the genus* Buccinum *are peculiarly liable to variation both in form and sculpture, and to obsolescence or erosion of the surface-markings. .... The identification of imperfect or worn specimens is extremely difficult in this genus.*" (from Stimpson, 1865: 366). We therefore again argue that the comparative part is more important than the descriptive part, at least in a text about taxonomically hard-to-describe species such as *Buccinum* and *Neptunea*.

Literature on *Buccinum* becomes highly confusing when different species are illustrated under a single taxon, in some cases even incoherently, or when a taxon is illustrated by a wrong species. The general appearance of the shell is usually the main reason why authors list different-looking variants of the same species under different species names while shells of distinct species are lumped under a single name, a logic result of the wide phenotypical overlap mentioned above. Quite some authors took a shortcut through the systematic labyrinth by synonymising taxa, a logic result when no solution is

in sight. "*Finally, I cannot suppress my surprise that, while in some other genera the smallest deviation is used to distinguish species, and even hairs are split to make new species, that in buccinids one is making all trouble to throw known species together. That the resulting problems cause a jumble that we cannot solve, while everyone promotes another opinion about it, so that nobody knows who he has to follow.*" (from Verkrüzen, 1882: 170; translated from German).

While the previous citation may describe this problem only partially, our story of the Polar Whelk will illustrate it to its full extent. The species was originally compared with *B. glaciale* due to the moderately similar-looking spiral sculpture, while several years later, the name was used for other species with a tremendously different sculpture. In the meantime it also changed its spelling. Suddenly, it started its own journey in literature, acquired different identities and its range moved all together. All that time the real Polar Whelk stayed undercover. Species of the genus *Buccinum* are a prominent part of the Arctic and Boreal fauna and plenty of publications deal with them, yet the taxonomic and systematic status is poorly understood. With so many erroneous, or at least deviating identifications, it is hopeless to acquire a good understanding of the genus *Buccinum* and it becomes impossible to solve taxonomic and systematic problems with the common literature at hand. To make matters worse, original descriptions do not bring relief in many of these cases. A pilgrimage to museum collections in search of type species is the only bridge to cross this gap. Yet, even after a lot of taxonomic research, it remains difficult to draw correct conclusions without a lot of material for comparative study. Not only the taxonomy, but especially the systematics of the genus *Buccinum* are without doubt among the most complicated puzzles within **Buccinidae**.

The first piece of this puzzle landed before us on Friday 25 April 2004. During our search for the type of *Neptunea heros* (Gray, 1850) in the collections of the Natural History Museum, London (NHMUK), we came across the two syntypes of the Polar Whelk. Glazing at those two types, we saw shells similar to what we commonly know as *B. ectomycin,* but with a much smoother spiral sculpture, rather than what we expected to see (namely a *B. terraenovae*-like). It was immediately obvious to us that the current interpretation of what *B. polare* looks like, was far from the truth. At that time we missed all the other pieces, for example more material for a comparative study. We especially lacked time to unravel the exponentially growing amount of taxonomic and systematic details that play a role in the present history.

In the present paper we restore the original interpretation of *B. polare*. The syntypes are figured for the first time. In addition, we discuss the identity and status of *B. terranovae* Beck *in* Mörch, 1869 and also briefly that of *B. tottenii* Stimpson, 1865; two species commonly confused and/or synonymised with *B. polare*. In the present paper we restore the specific status of *B. terranovae*. The status and identity of *B. totteni* is tentatively only, because we could not find the type material. We also want to attract attention to I.C.Z.N. 33.2.3.1 and I.C.Z.N. 33.3.1, both mainly forgotten or ignored articles in the Code, that relativises the intrusive preference for the correct original spelling by allowing the use of a subsequent spelling if in prevailing usage.

Abbreviations:

RC: collection Roger Clark, USA
KF: collection Koen Fraussen, Belgium
NHMUK: Natural History Museum, London, England
MSF: Naturmuseum Senckenberg, Frankfurt am Main, Germany
ZMUC: Natural History Museum of Denmark, Copenhagen, Denmark

Systematics

Family **Buccinidae** Rafinesque, 1815
Genus ***Buccinum*** Linnaeus, 1758.
Type species: *Buccinum undatum* Linnaeus, 1758, subsequent designation by Montfort,1810: 463, I.C.Z.N. Opinion 94 (I.C.Z.N., 1926: 12), I.C.Z.N. Direction 72 (I.C.Z.N., 1957: 195).

***Buccinum polare* Gray, 1839**
Figs 1, 10-17

Buccinum polaris Gray, 1839: 128.
Buccinum polaris – Carpenter, 1857: 177.
Buccinum polare – Stimpson 1865: 366-367.
Buccinum polare – Stearns, 1868: 385.
Buccinum polare – Dall, 1874: 251.
Buccinum polare – Verkrüzen, 1881b: 285.
Buccinum glaciale var. *morchianum* – Macginitie, 1959: 104-105, pl. 9, fig. 7, 10, 13 (non Dunker, 1858)
Buccinum polaris – Kantor & Sysoev, 2006: 172.
Buccinum beringense – Clark, 2016: 77, fig. 36 (non Golikov, 1980).

Original description: "*Shell ovate, conical, rather ventricose, thin, white: whorls ventricose, closely transversely plaited, and deeply and closely spirally striated, the upper one with a subposterior, and the last with three or more elevated keels. Mouth ovate, inner lip much absorbed; canal only slightly recurved.*" Gray, 1839: 128.

Type material: Two syntypes (56.6 and 62.1 mm) in NHMUK, both stored under reference 1877.5.251 and accompanied by several old labels indicating their origin (see Fig. 1). Note that one of the old labels reads "*polare*", subsequently corrected to "*polaris*" with blue ink.

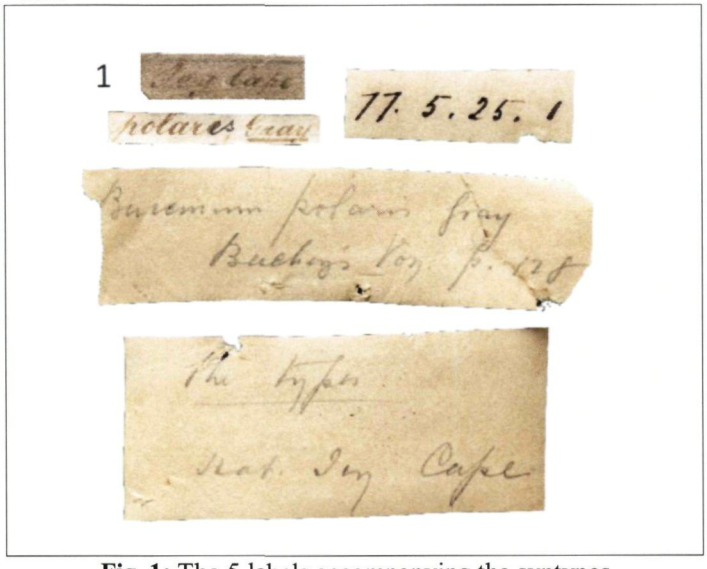

Fig. 1: The 5 labels accompanying the syntypes of *B. polare* in NHMUK.
Photo courtesy of Harry Taylor, NHMUK-Photgraphic Unit.

It was not so clear were the type(s) is (are) stored ("*Many of the descriptions of the animals are from specimens brought home by the expedition, and subsequently presented to the Naval Hospital at Haslar by Mr. Miller, a most able anatomist, and very accurate observer; others are taken from specimens in the collection of the British Museum; and very many from the collection of Mollusca in the Garden of Plants at Paris; …*" (from Gray, 1839: 103) and "*All the descriptions (with the exception of a few of the English species) are taken from animals preserved in spirits, and which had in consequence become much contracted in many of their parts.*" (from Gray, 1839: 104) until Verkrüzen confirmed they were indeed in NHMUK: "*B. polare, Gray (irrthümlich polaris) nach Gray's Typen im Britischen Museum. …*" (from Verkrüzen, 1881b: 285).

Type locality: "Icy Cape", which is situated on the Alaskan coast of the Chukchi Sea (Collie, et all. 1839: 174). Most probably offshore Point Collie, in the afternoon of 14 August 1826, at a depth between 20 and 26 fathoms.

The two syntypes in NHMUK and an additional fragment were collected near Icy Cape (Gray, 1839: 128) during the voyage of the H.M.S. *Blossom* in 1825-1828 under command of Captain Beechey. In the summer of 1826 and 1827 the expedition reached Kotzebue Sound (waiting for Sir John Franklin's overland expedition along the Mackenzie river in vain, because it had already returned to the south) and moved onwards as far as Point Barrow (see Fig. 2) until ice obstructed the passage. While doing so and leaving stock and messages for Captain Franklin's expedition and making observations, they passed Icy Cape (see Fig. 3) (the same place where Captain Cook had had to return because of ice about 50 years earlier), where the syntypes were collected. After sifting through Captain Beechey's extensive and detailed narrative, we found a single record where *Buccinum* species had been dredged: in the afternoon of 14 August 1826. In between two visits (on 13 and on 14-15 August) to the packed ice in the north, the *Blossom* anchored at 2 miles from the coast in 5 fathoms of water, slightly SW off Point Collie, whose neighbourhood the crew went ashore in. When a strong fog came in, the *Blossom* had to sail away from the coast, and while heading to the NW they took the occasion to haul the dredge. "*At eight o'clock in the morning of the 13th, the fog cleared off, …* " and "*I again stood in for the land, which at eight o'clock at night was seen in a low unbroken line, extending to the westward as far as Icy Cape, and to the eastward as far as the state of the weather would permit. We tacked at nine, in five fathoms water, within two miles of the shore; and Lieutenant Belcher was dispatched in the cutter to examine some posts …*", "*The next morning a boat was again sent on shore, with Lieutenant Belcher, Messrs. Collie and Wolfe, to make observations, collect plants, and erect a mark for Captain Franklin.*" and "*Shortly after noon I landed myself, …*", "*A post was here put up for the land expedition, and a bottle buried near it. We then embarked and got on board, just as a thick fog obscured every thing, and obliged the ship to stand off the coast. In the course of the afternoon the dredge was put over, and supplied us with some specimens of shells of the area, murex, venus, and buccinum genus, and several lumps of coal. We stood to the N. W., and at midnight tacked amongst the loose ice at the edge of the pack in so thick a fog that we could not see hundred yards around us.*" (from Beechey, 1831: 372-374). According to the map (Beechey, 1831: opposite p. 458), the depth measured along that short voyage to the NW ranges between 20 and 26 fathoms (see Fig. 3).

Fig. 2: The small bark of H.M.S. *Blossom* off Cape Smyth, near Point Barrow
(taken from Beechey, 1831: opposite p. 429)

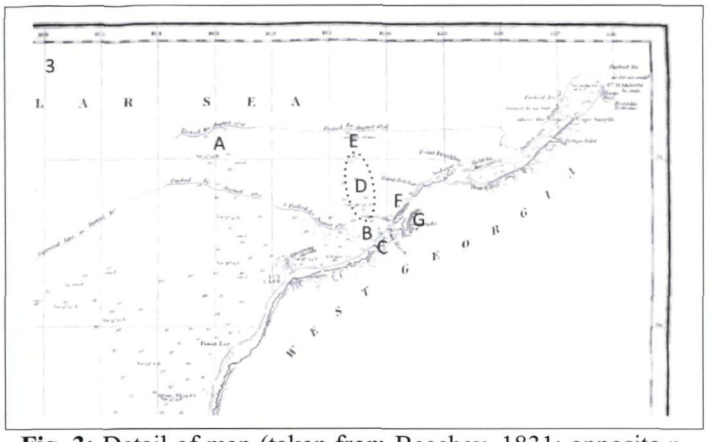

Fig. 3: Detail of map (taken from Beechey, 1831: opposite p. 458). **A:** 13/8/1826, 9 o'clock, at 71°08'N, 163°10'W, in 23 fathoms. **B:** 13/8/1826, 9 in the evening, at 2 miles off the coast, in 5 fathoms. **C:** 14/8/1826, landing at morning and at noon. **D** (dotted area)**:** 14/8/1826, dredging "in the course of the afternoon". **E:** 14/8/1826, midnight, "amongst loose ice". **F:** 15/8/1826, 6 o'clock, , at 3 miles off the coast, in 11 fathoms. **G:** 15/8/1826, landing point.

Range: With certainty known from Chukchi Sea and adjacent Beaufort Sea in the Polar Ocean, along the Bering Sea as far south as the Sea of Okhotsk.

Taxonomic history: The original spelling "*polaris*", as given by Gray (1839: 128), must be the correct original spelling according to I.C.Z.N. 32.2. All subsequent authors, however, with the exception of Carpenter (1857: 177) and Kantor & Sysoev (2006: 172), used "*polare*" instead. Among the 20 subsequent authors who refer to the species (and not to *B. terraenovae*, *B. totteni* or other names), listed in the extensive synonymy given by Golikov (1980: 344-345), 19 use the spelling "*polare*" and 1 (Carpenter) uses the spelling "*polaris*". We could not find a demonstratable intentional change (in the sence of I.C.Z.N. 33.2.1) in a work by Gray. We could not find any publication where the original spelling is regarded as incorrect and thus corrected to "*polare*". We therefore consider "*polare*" as a subsequent spelling in the sence of I.C.Z.N. 33.3, rather than an unjustified emendation. Whatever the case, being an unjustified emendation or an incorrect subsequent spelling, the subsequent spelling "*polare*" is in prevailing usage and is deemed to be or really is a justified emendation (I.C.Z.N. 33.2.3.1) or a correct "original" spelling (I.C.Z.N. 33.3.1).

Gray compared his new species with *B. glaciale*, a similar-looking Atlantic species, but Gray (1839: 128) also stated that *B. polare* may be a form of *B. glaciale*, which may have triggered the synonymisation of *B. polare* with *B. glaciale* by a number of subsequent authors. We have to remark, however, that in many of those cases *B. glaciale* was regarded as a circumpolar species including *B. polare*, rather than *B. polare* being regarded as an Atlantic species as interpreted by other authors. For differences between both species, we refer to the comparison below.

Stimpson (1865: 366-367) listed *B. polare* from the type locality (Icy Cape) with an additional record from the Arctic Ocean north of the Bering Strait. He clearly distinguished *B. polare* from *B. glaciale*. The description of his specimens is remarkably accurate, as is usual for Stimpson, and he for instance described the presence of fine secondary lines that cover the otherwise smooth primary spiral cords. His two specimens where dredged by Captain Rodgers on board of the USS *Vincennes* during the US North Pacific Exploring and Surveying Expedition (1853-1856) in August 1855, but no exact locality was given. Stimpson himself stayed at a survey camp set up at 65°N, 172°35'W (near Providence Bay, Russia, NW Bering Sea close to Bering Strait) under lieutenant Brooke, together with botanist Wright, the artist Kern and 8 other people, while Captain Rodgers continued to the north aboard the *Vincennes*, as far north as 72°N and as far west as Herald Island (Stefansson, (type writing, no date)), a part of the expedition that seems ignored in several subsequent reports. It seems plausible that the 2 specimens were dregded by Captain Rodgers during this trip to the north, however, we always have to take into account that they may have been dredged at another time during this expedition. Gould (1862: 122-123) did not mention those 2 specimens in his report on the shells that were (mostly) collected by Stimpson on this expedition; while, on the other hand, Stimpson (1865) did not mention those specimens collected by himself, but described by Gould.

Stearns (1868: 385) recorded *B. polare* from Captains Harbour at Unalaska "Captain's Harbor, Ounalaska". The shells where collected by W.G.W. Harford (California Academy of Natural Sciences) during the US Coast Survey Expedition to Alaska in 1867. We have not seen these specimens, but we rely on the expertise of Dr. W. Stimpson who identified the **Buccinidae** of this expedition. In that case, the record from Unalaska is the southernmost record of the species that we could find in literature.

Dall (1874: 251) listed *B. polare* from the type locality (Icy Cape) and added records (indicated with "D" (Dall, 1874: 248)) from Plover Bay (in Providence Bay, Russia) and Norton Sound (south of Seward Peninsula, Alaska) in the northern Bering Sea. He did not add any Atlantic record for the species and, because we know that Dall had sufficient knowledge about the Atlantic whelks, too, we can therefore assume that he considered *B. terraenovae* or *B. totteni* not conspecific. Yet, a few years later, as a contradiction, Verkrüzen mentioned that Dall had told him during a visit that he considered the Atlantic *Buccinum elegans* Verkrüzen, 1878 (which is a synonym of *B. terraenovae*) from Newfoundland a synonym of *B. polare* (Verkrüzen, 1878b: 350-351).

We do not know how reliable those early records are because we have not studied the specimens cited by Stimpson, Stearns or Dall, nevertheless we trust the expertise of those 3 authors.

Shortly afterwards, Jeffreys (1880: 423), while critically discussing the genus and the publication by Stimpson discussed above, again placed *B. polare* in synonymy with *B glaciale*.

Kobelt (1883: 86) reproduced the description of *B. polare* as given by Stimpson, but figured a subadult *B. percrassum* Dall, 1881 (1883: pl. 91, fig. 4). He stated that the shell on figure 4 (see Fig. 4) is the original specimen from Stimpson's collection, drawn from a photograph sent to him by Dall (Kobelt 1883: 85); while figure 5 (see Fig. 5) is named "var. *percrassum*" (Kobelt 1883: 86). Both shells (fig. 4 as well as fig. 5), however, do not correspond with Stimpson's description. It is without doubt correct that Kobelt's figure 5 is *B. percrassum,* but we also regard the subadult shell on his figure 4 as belonging to that species. Apart from abundantly obvious differences in shape and sculpture, *B. pecrassum* lives in more southern waters: from Japan in the south up to southern Kamtschatka in the north. While the southernmost point at the western coast visited by the expedition under Belcher was Avatscha Bay on Kamtchatcka Peninsula (Collie et all, 1839: 167).

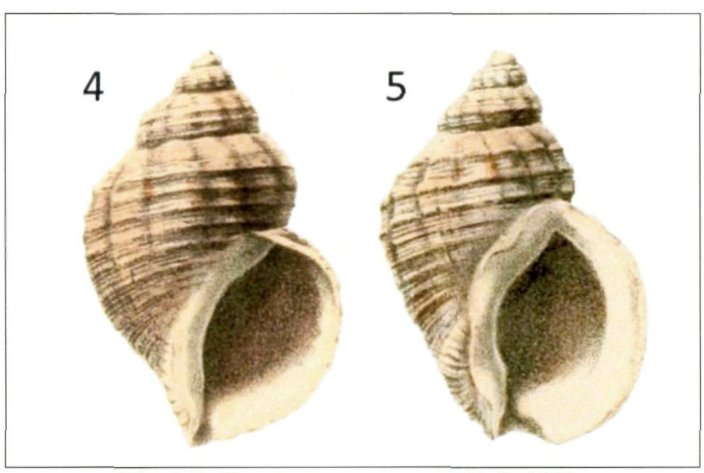

Fig. 4-5: *Buccinum percrassum* Dall, 1881.
4: Figure 4 of Kobelt (1883, pl. 91) as "*B. polare*". (Kobelt, 1883).
5: Figure 5 of Kobelt (1883, pl. 91) as "*B. polare* var. *percrassum*".
(Both taken from Kobelt, 1883: pl. 91, fig. 4-5).

In Japanese literature, this interpretation by Kobelt (1883: 86, pl. 91, figs 4-5) became the prevailing standard and the name *B. polare* became commonly used as the nominal species for a number of subspecific combination. All those subspecific names, however, being the distinct species *B. mirandum* Smith, 1875, *B. percrassum* Dall, 1881 and *B. simplex* Middendorff, 1848 or, in a single occasion, being a form of *B. ochotense* Middendorff, 1848. The combination "*Buccinum polare mirandum* Smith, 1875" was used for *B. mirandum* Smith, 1875 (Hirase,1934; Kuroda, 1935; Kuroda & Kinoshita, 1951; Habe,1961; Habe & Ito,1965; Habe & Kosuge,1967; Ishikawa,1969; Habe & Sato,1972), "*Buccinum polare* var. *percrassa* Dall, 1881" for *B. percrassum* Dall, 1881 (see Golikov, 1980) and "*Buccinum polare schrenckii* Verkrüzen, 1882" for a form of *B. ochotense* (Kuroda, 1935: 156). Both references "*Buccinum* (*polare* var. ?) *simplex* Middendorff, 1848" by Kuroda, 1935: 31 and "*Buccinum polare simplex* Middendorff, 1848" by Kuroda & Kinoshita, 1951: 1 are *B. simplex* Middendorff, 1848. A syntype of *B. simplex* was figured by Kantor & Sysoev (2006: pl. 85, fig. A).

So far for the Pacific and adjacent Polar Ocean, where the species is at home. A quite similar scenario happened in the Atlantic, starting on 19 September 1846 in Kiel (Germany). That Saturday, as part of *the 24th meeting of the naturalists and doctors*, a zoological and mineralogical exhibition opened in the *Schiff'schen Hause* in the Schloßstrasse in Kiel, where two particular specimens from "Spitzbergen" (Svalbard) are labelled "*Tritonium polare*". The report on this meeting was written down by an unspecified author, but it is plausible to attribute it to H. Beck (1847: 115), as also indicated by Golikov (1980: 344). In this report, the meeting is said to have been the first session of this 24th meeting, which was on Friday 18 September, while the exhibition, however, opened but on Saturday 19. It is commonly known that H. Beck had a drinking problem and the differences in date are maybe the result of this. Whatever the exact day may be, this report is the earliest publication we could trace that attributed the name *B. polare* to an Atlantic species. These two shells in the exhibition actually belong to *B. terraenovae*, a species described by Beck (MS) and published by Mörch (1869: 18-19); as we discuss in the taxonomic history under *B. terraenovae* - see below.

Yet, four years prior to this description of *B. terraenovae*, Stimpson (1865: 385-386) described *B. totteni*. We briefly discuss this species in the taxonomic history of *B. terraenovae* - see below. The prevailing, but in our opinion wrong interpretations among authors is that *B. totteni* and *B. terraenovae* are conspecific.

Notwithstanding the descriptions of *B. totteni* in 1865 and *B. terraenovae* in 1869, quite some authors continued to use the name *B. polare* for them. Both *B. totteni* and *B. terraenovae* have a sculpture that is different from that of *B. polare*, consisting of much finer spiral cords (instead of broad spiral cords separated by a fine line). We wonder how it happened that the *glaciale*-like sculpture was overlooked in these cases.

Tryon (1881: 186) referred to Stimpson's opinion on *B. polare* but, nevertheless, concluded that the only

difference is the thickness of the shell and decided to place "var. *polare*" under *B. glaciale*. He (Tryon, 1881: 185-186, pl. 78, fig. 373) also synonymised the Atlantic *B. groenlandicum* Hancock, 1846 with "var. *polare*". This *B. groenlandicum* described by Hancock is not the same species as *Buccinum novum Gröenlandicum* of Chemnitz (1788: 182, pl. 152, fig. 1448), causing quite some additional confusion. It is not the scope of the present paper to discuss the taxonomic history and status of *B. groenlandicum* and we tentatively do not include it in the references under *B. polare*.

The publications discussed above are only a few, but in our opinion the most important or striking ones, among the numerous records in literature. Two more records that we want to refer to are the next ones. At first Dautzenberg and Fischer (1912: 120), because they returned *B. polare* to its specific status, they confirmed that it only lives in the Bering Sea and used the names *B. totteni* and *B. terranovae* for the Atlantic species. Secondly, the extensive revision of the genus *Buccinum* produced by Golikov (1980). In this otherwise great work, he regrettably continued to place *B. terraenovae* and *B. totteni* in synonymy with *B. polare*. We refer to his extensive list with references for a complete overview of all authors involved (Golikov, 1980: 344-349), where one will see that this synonymisation was rather persistent.

The story however, does not end here yet. Apart from the taxonomic and systematic history of the species, we also have the features of the actual type specimens, too. We were surprised while studying the smooth and glossy sculpture of the two syntypes of *B. polare*, to discover some traces of fine secondary spiral lines on top of some short stretches of primary spiral cords (see Figs 12-15). It seems as if both shells have been polished too much and the secondary spiral sculpture has disappeared. This confirms Stimpson's observation and his description (1865: 366) of the presence of such fine secondary spiral lines in his two specimens. We were glad to recognise similar, slightly more prominent but still obscure, spiral lines (see Fig. 17) on the specimen collected by R. Clark along the Alaskan shore (Clark, 2016: 77, fig. 36). In addition, an identical sculpture is known from a population on Kashevarova Bank in the central Sea of Okhotsk, where specimens of the otherwise more prominently sculptured *B. ectomycina* have exeptional smooth and glossy spiral cords (see Figs 18-25). Only under magnification these obscure, almost invisible, fine secondary spiral cords are discernable. It is the question how many specimens and populations assigned to *B. ectomycina* are in fact southern specimens or populations of *B. polare*. Placing *B. ectomycina* in synonymy with *B. polare* is far beyond the scope of the present paper. A thorough study of the variability of all North Pacific *Buccinum* species is needed to find out where 'to draw the line' between the species and to discuss *B. ectomycina* in a broad context.

Original comparison: "*This shell is very like* B. glaciale *in form, but the whorls are deeply striated and closely plaited. The shells of this kind appear to be formed of two coats, an opale dead white external one, and a hard pellucid white inner one; the outer one is often eroded, from the apex of the Polar species leaving the under one exposed, which being smooth, polished, and without striae give the tips of the shell quite a different appearance from the rest. In one specimen the last whorl has three equidiqtant keels – in the other the hinder keel is prominent, and there are three close slight keels in front. There was a fragment of a shell brought from the same place with the former, which is deeply spirally striated, longitudinally plaited, and slightly keeled like the former, but it is rather more solid, more deeply striated, and the whorl has an extra strong prominent keel just before the suture, which gives the shell a very different appearance. I am inclined to consider it only a variety of this species.*" Gray, 1839: 128.

Comparison: *B. polare* is charactised by the presence of at least two and usually more prominent spiral folds or carinae and its broad and flattened spiral cords separated by a narrow, but deep line or narrow interspace. These spiral cords are usually smooth and glossy, but under magnification fine secondary spiral lines are detectable. The periostracum -if present- is thin, glossy, greenish and well-adherent. The operculum is large, semi-oval, with the nucleus a slightly acentric. The species is, however, highly variable in shape and sculpture. Both syntypes are quite different already: one of them having a much broader shape, while the slenderer shell has a rather stretched base. The broader syntype has a higher amount of axial ribs (20 on the penultimate and 22 on the body whorl, instead of 18 on both the penultimate and body whorls of the slender shell) in combination with a lower amount of spiral cords (17 to 19 on the penultimate and about 43 on the body whorl, instead of 21 to 23 on the penultimate and about 50 on the body whorl of the slender one). The position of the spiral keels differs considerably along the base. We see a similar variability in specimens of what is called *B. ectomycina*. The spiral cords of the types are broad, flattened and glossy. Because of the polished appearance, no secondary spiral lines are seen on top of the spiral cords; but when looking carefully under magnification, one may detect some traces of fine spiral lines.

B. cf. *ectomycina* Dall, 1907 (see Figs 18-25) from Okhotsk Sea is identical to *B. polare* apart from its axial sculpture consisting of irregular waves (rather than ribs) that are more diagonally oriented and lower in number and in its much larger adult size.

Buccinum ectomycina Dall, 1907 (148-149) from the Bering Sea and Sea of Okhotsk (type locality: "*Albatross* stn 5023, on the east coast of Sakhalin, - 75 fthms") has a similar spiral sculpture and especially the angulated forms (see Figs 26-27) are similar in shape, but differs from *B. polare* by the weaker axial ribs and the more prominent secondary spiral lines on top of the primary spiral cords (see Figs 29, 32). When freshly caught, most shells of *B. ectomycina* are easily recognisable because of a striking purplish-coloured apex. Most shells of *B. ectomycina* have a lower numer of spiral keels, also shells with very convex whorls are known, which is a feature that widely varies in quite some *Buccinum* species. It is beyond the scope of the present paper to discuss the variability within this species or to discuss which morphotypes may belong to other species. A syntype of *B. ectomycina* was figured by Kosuge (1972: pl. 18, fig. 7).

Buccinum ectomycina beringense Golikov, 1980 (246-247, pl. 17, fig. 2a-b) from the Bering Sea (type locality: Gulf of Oljutor) has a similar shape, but differs from *B. polare* in the rough spiral sculpture consisting of primary spiral cords that are covered by more prominent secondary spiral cords. Clark (2016: 77, fig. 36) erected *Buccinum beringense* to the specific level, basing his observations on specimens of *B. polare*. It is striking, indeed, that *B. beringense* has a similar or identical shape to *B. polare*, in combination with an overlap in range. Golikov, however, shows a shell with a rough sculpture (Golikov, 1980: pl. XVII, 2a-b) and his original description mentions a different spiral sculpture consisting of rough spiral cords rarther than smooth ones. "*Axial sculpture raised, consisting of incremental lines and axial folds, at upper whorls running until suture and on last whorl until periphery. Intervals between these folds of equal width or a little wider. Last whorl with 18 folds. Spiral sculpture formed by groups of ribs. These groups of ribs (secondary ribs) differ in width and degree of convexity. A high keel formed on shoulder (and on last whorl also on the level of the aperture and the base). Last whorl with 4 keels and upper whorls with a single keel turning around middle. Each spiral cord with 3-4 spirals. On 5 mm surface about 4-5 secondary spiral ribs. 12 primary spiral ribs are present.*" and "*From subspecies* B. ectomycine ectomycina *it differs by the sharper appearance, more developed axial ribs and rough spiral sculpture.*" from Golikov (1980: 246-247, translated from Russian). It is beyond the scope of the present paper to discuss the taxonomic status of this taxon, whether it is a subspecies of *B. ectomycina* or a species on its own. A syntype of *B. ectomycina beringense* was figured by Kantor & Sysoev (2006: pl. 80, fig. C).

B. glaciale (see Figs 33-39) has a similar sculpture consisting of broad, flattened spiral cords separated by a narrow interspace (see Fig. 35), but differs from *B. polare* in having the carina situated more abapically, resulting in a much broader subsutural slope and a conical spire without angulated shoulder, in combination with a more constricted base, the more convex whorls, the presence of fewer carinae (or none) along the base, weaker axial ribs, the often yellowish to reddish-brown pattern and a yellow to brownish periostracum. The presence of fine secondary spiral lines on top of the primary spiral cords (see Fig. 35) is rare in *B. glaciale*.

B. terraenovae (see Figs 43-63) considerably differs from *B. polare* in its finer spiral sculpture consisting of numerous sharp primary and secondary spiral cords, usually separated by a narrow, but obvious interspace (see Figs 50, 55, 58, 63), the more constricted base, the axial ribs that are more diagonally oriented and usually higher in number, the broader shape with a shorter spire, the broader aperture, usually with an adapically flared outer lip forming a broad sinus, and the usually smaller adult size.

B. totteni differs from *B. polare* in its much finer spiral sculpture consisting of numerous fine spiral cords, the weaker axial ribs that are higher in number, the convex whorls, the broader shape with a convex base and the smaller adult size. We could not locate the type of *B. totteni*, making a correct identification impossible. The species has a very complicated taxonomic history, but we follow the original interpretation by Stimpson (1865: 366-367, 385-386) and the subsequent ones by Friele (1882: 33), Kobelt (1883: 34-35, 47-48), Dautzenberg & Fischer (1912: 126), amongst others. We will return tot his subject in a future paper.

Buccinum terraenovae Beck in Mörch, 1869
Figs 43-63

Buccinum donovani – Reeve, 1846: Species 2, pl. 1, fig. 2 (non Gray)
Buccinum terrae-novae Beck in Mörch, 1869: 18-19.
Buccinum terrae-novae var. α Mörch, 1869: 19.
Buccinum elegans Verkrüzen, 1878a: 216, 221-222, pl. 4, fig. 1-2..
Buccinum elegans – Verkrüzen, 1881a: 92, pl. 4, fig. 1-2..
Buccinum terrae novae var. *grandis* Brøgger, 1901, pl. 2, fig. 6a-b.
Buccinum terrae novae – Brøgger, 1901: 43-44, pl. 10, fig. 2a-b.
Buccinum Terrae Novae var. *tenuisculpta* Dautzenberg & Fischer, 1912: 128, pl. 8, fig. 2-3.
Buccinum Terrae Novae var. *producta* Dautzenberg & Fischer, 1912: 128, pl. 8, fig. 4-5.
Buccinum Terrae Novae var. *abbreviata* Dautzenberg & Fischer, 1912: 128, pl. 8, fig. 6-8.
Buccinum terraenovae – Friele, 1882: 33, pl. 3, fig. 13-16).

Buccinum terraenovae – Kobelt, 1883: 47-48, pl. 83, fig. 3-4.
Buccinum orotundum Dall 1907: 152.
Buccinum solenum Dall, 1919: 325.
Buccinum pemphigus orotundum – Dall, 1921: 99, 215 (as *B. orotundum*), pl. 12, fig. 9.
Buccinum solenum – Dall, 1925: 8, pl. 4, fig. 1.
Buccinum polare – Stearns, 1959: 108-109, pl. 10, fig. 2-4 (non Gray).
Buccinum polare var. *orotundum* – Stearns, 1959: 109, pl. 10, fig. 1.
among others

Type material: Three possible syntypes: one syntype in NHMUK (NHMUK-20180165) (see Figs 7, 44-46) and maybe two syntypes in ZMUC (not retrieved yet).

Beck (Mörch, 1869: 18) refers to the figure of *Buccinum donovani* by Reeve (1846: pl. 1, fig. 2) and to two shells from "Bellsound" (Svalbard). The shell figured by Reeve (1846: Species 2, pl. 1, fig. 2) is a syntype of *B. terraenovae* according to I.C.Z.N. 73.1.4. This syntype in NHMUK (see Figs 44-46) is accompanied by 2 other specimens but as at least 1 and probably both of them belong to a distinct species, we exclude them from the type series. Dautzenberg & Fischer (1912: 127) already stated that Reeve's figure has to be regarded as the type: "*C'est donc cette figure de Reeve qui doit être regardée comme type de l'espèce.*". Mörch (1869: 19), after giving this reference to Reeve's figure and the description by Beck, also described the species again under "α" (*alpha*) while referring to the two shells from "Bellsound" in the Krøyer collection, "Bellsound, deux exemplaires (H. Krøyer)." Those two specimens from "Bellsound" are syntypes of *B. terraenovae,* too. We have not been able to trace those type specimens in ZMUC yet.

Both *B. orotundum* Dall, 1907 (USNM-110538) and *B. solenum* Dall, 1919 (USNM-222485) are commonly regarded as synonyms or forms of *B. terraenovae* (perhaps under the erroneous name *B. polare*, see above) and until the contrary has been proved, we tentatively follow this opinion. See Figs 59-63.

Original description: "*T. tenuis, anfr. postice angulates, spiraliter liratis, transversim plicatis, labro postice sinuato. Long. 60 mm.: apert. long. 27 mm.; diam. 35 mm.*" Beck in Mörch, 1869: 18; and: "*α. Spira elongata; anfractus ultimus postice angulatus, linea funiculari expressa. Long. 60 mm.; apert. long. 28 mm.; diam. testae 30 mm.*" in Mörch, 1869: 19.

The figure by Reeve (1846) was accopanied by the following description: "*Buccinum donovani* Buc. testa ovato-conica, tenuicula, spira acuta; anfractibus rotundatis, transversim lineatis et obscure carinatis, apicem versus concentrice plicatis; columella brevi, apertura subquadrata-ovata; albida aut fuscescente, epidermide induta. *Donovan's Buccinum. Shell ovately conical, rather thin, spire sharp; whorls rounded, transversely lineated and obsurely ridged, cencentrically plicated towards the apex; columella short, aperture somewhat squarely ovate; whitish or light brown, covered with an epidermis.*" in Reeve, 1846: Species 2 (pl. 1, fig. 2).

Type locality: NW Atlantic, Newfoundland.

Reeve (1846: Species 2, pl. 1, fig. 2) attributed his specimen of "*B. donovani*" (the type figure of *B. terraenovae*) to "Massachusetts, United States (inhabits the Bank fishing grounds); Gould.".

Mörch (1869: 18) attributed the two specimens from the Krøyer collection to "Bellsound" (NE Atlantic, Greenland Sea, Svalbard, southwestern Spitzbergen, Bell Sound).

Type locality of *B. orotundum* is "Station 3254, in 46 fathoms, north of Unimak Island, Bering Sea" (Dall 1907: 152), not that far from the type locality of *B. solenum*, which is "US Fish Commission station 3518, off Nunivak Island, Bering Sea, in 36 fathoms, mud" (Dall, 1919: 325).

Range: Circumarctic; in the North Atlantic known from Newfoundland in the west along Greenland and Svalbard to Novaya Zemlya in the East, in the Polar Ocean from the Barentz Sea along the Kara, Laptev and East Siberian Seas to the Beaufort Sea, in the Pacific from the Gulf of Anadyr to the Aleutian Islands (*B. orotundum* and *B. solenum*).

Taxonomic history: The quite confusing taxonomic and systematic history of *B. terraenovae* in fact starts with the history of another, not less confusing species, which is *B. donovani* Gray, 1839. When Donovan (1803: pl. 154) figured a specimen (see Fig. 6) of what he called "*B. glaciale*", he explicitly stated that it was from Newfoundland. The shell in question is indeed not known from British waters. Gray (1839: 128) correctly observed that this shell figured by Donovan does not belong to *B. glaciale*, but that it belongs to a distinct species that deserves a name on its own. He named the species after Donovan, the type being the specimen figured by Donovan (1803: plate 154). We prefer to leave the discussion of the taxonomic and systematic history of *B. donovani* for a next paper, what matters for the present paper is that in the same year of the description, Reeve (1846: pl. 1, fig. 2) figured a shell (see Fig. 7) that looks very different from the species described by Gray under

the name "*B. donovani*". Reeve correctly stated that his figure "*does not agree very accurately either with the figures of Donovan or Dr. Gould*". In fact, Reeve figured a completely different species. We wonder if Reeve mistook *B. donovani* for *B. polare*, as both were described by Gray on the same page (Gray, 1839: 128). Whatever the case, both *B. donovani* and *B. polare* are distinct from the species figured by Reeve. Beck correctly concluded that this shell figured by Reeve does not belong to *B. donovani*, but that it belongs to a distinct species that deserves a name on its own. In a manuscript he named the species after the Bank fishing grounds mentioned by Reeve: "Terra Nova" or what we know as Newfoundland.

Mörch agreed with this opinion and published the description from Beck's abandoned manuscript in his famous work on the Mollusca from Spitzbergen. (1869: 18-19). He refers to the figure by Reeve (1846: pl. 1, fig. 2) and that shell is the syntype of "*B. Terrae Novae* Beck". We found a syntype in NHMUK (see Figs 44-45), matching Reeve's figure in shape and sculpture well. Still, apart from this figure by Reeve, Mörch also recorded two specimens under "*var. α*", (*alpha*), from Svalbard, "*Bellsound, deux exemplaires (H. Krøyer)*" (= Bell Sound, Spitzbergen, Svalbard) which, consequently, are syntypes too. These 2 syntypes of *B. terraenovae* have not been retrieved yet.

More than 20 years before Mörch's publication, *the 24th meeting of the naturalists and doctors* had taken place in Kiel, where two shells from "Spitzbergen" (Svalbard), labelled "*Tritonium polare*", were displayed in an exhibition (we discussed this exhibition in the taxonomic history under *B. polare*,see above). Like the 2 syntypes, the 2 specimens from the exhibition in Kiel have not been retreived, either. It seems that these two specimens at the exhibition in Kiel were the very same shells Beck used for his (unpublished) description of *B. terraenovae* for the following reasons: Beck was the curator of the collection of the king and of the exhibition in Kiel (Beck, 1847: 115) and he was the author who originally described *B. terraenovae* in a manuscript. We have to take into account that Beck was dismissed and had to leave the institute in 1848, two years after the exhibition in Kiel. The probability that two other specimens from Bellsound turned up to inspire Beck during this short time is rather neglectable. Both shells are said to belong to the collection of Dr. Krøyer (Beck, 1847: 115), but it is also possible that they belong to the collection of King Christian VIII who had ordered to send an exhibition to Kiel for this meeting. Krøyer had been inspector in the Kongelige Naturhistorisk Museum (Royal Natural History Museum) since 1842. Mörch had been working on the molluscan collection of the Royal Natural History Museum in Copenhagen since 1844 and was assistent of Beck whose work he took over in 1848. The King Christian VIII collection was a centerpiece in the exhibition at the Zoological Museum in Krystalgade in Copenhagen (see Fig. 9) and almost certainly the two specimens were among them. In the 1960s the exhibitions moved to the current building at the Univeristetsparken, the focus shifted to a more ecological approach and most specimens from the earlier exhibition returned to the collections. Quite some of those shells have not yet been reunited with their original label or vice-versa. Still, a particular label (see Fig. 8) in the collection of loose labels was brought to our attention by Tom Schiøtte. It reads "*Tritonium polare* Gray" with data exactly as expected: "Belsound", which is Krøyer's type locality given by Mörch, followed by "H. Krøyer" in combination with "Cviii" which refers to the Christian VIII collection, linking both the exhibition in Kiel and the type locality to a single sample.

Yet, four years prior to this description of *B. terraenovae*, Stimpson (1865: 385-386) described *B. totteni*. The species was not figured, but the description is elaborate, the comparison adequate and the context broad ("review of the northern buccinums"). Notwithstanding this, the highly variable and confusing character that is inherent to the genus *Buccinum* makes authors, including us, hesitate about the correct identity of *B. totteni*. At least two different interpretations are commonly published. The prevailing, but wrong interpretation in literature is that *B. totteni* and *B. terraenovae* are conspecific, sometimes together with *B. polare* (also see: Golikov, 1980: 344-346). It is beyond the scope of the present paper to discuss the extensive taxonomic history of *B. totteni*.

Syntypes of *B. totteni* must have been stored in USNM, "*Several specimens of this species, from the banks of Newfoundland, are in the museum of the Smithsonian Institution, donated by the late Gen. Totten...*" (Stimpson, 1865: 385). We have not been able to find those specimens yet, consequently we cannot prove the identity of *B. totteni* with certainity and making a taxonomic decision is therefore not advisable. Nevertheless, we trust the expertise of Stimpson (1865: 366-367, 385-386), Friele (1882: 33), Kobelt (1883: 34-35, 47-48), Dautzenberg & Fischer (1912: 126), among others and follow their opinion that *B. totteni* is not conspecific with *B. terraenovae*.

Despite the publication (Mörch, 1869: 18-19) with the description of *B. terraenovae*, the name *B. polare* stayed misinterpreted and used for the Atlantic *B. terraenovae* - if not explicitly, then as *B. terraenovae* in synonymy with *B. polare* (see Golikov, 1980: 344-349).

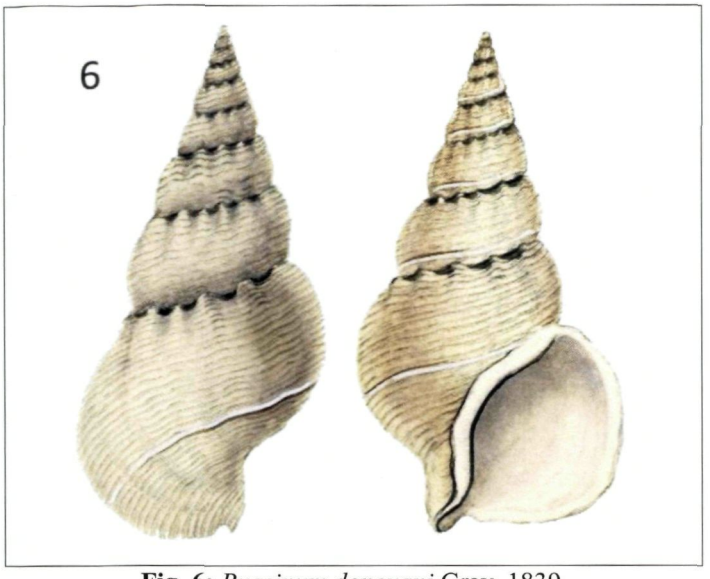

Fig. 6: *Buccinum donovani* Gray, 1839, type figure in Donovan, 1803: pl. 154, as "*Buccinum glaciale*" (non Linnaeus, 1761).

Fig. 7: *Buccinum terraenovae* Beck in Mörch, 1869, type figure in Reeve, 1846: Species 2, pl. 1, fig. 2, as "*Buccinum donovani*" (non Gray).
Fig. 8: *Buccinum terraenovae* Beck in Mörch, 1869, labels of the possible syntypes of "*Buccinum terrae-novae* var. α", in ZMUC. Photo courtesy of T. Schiøtte.

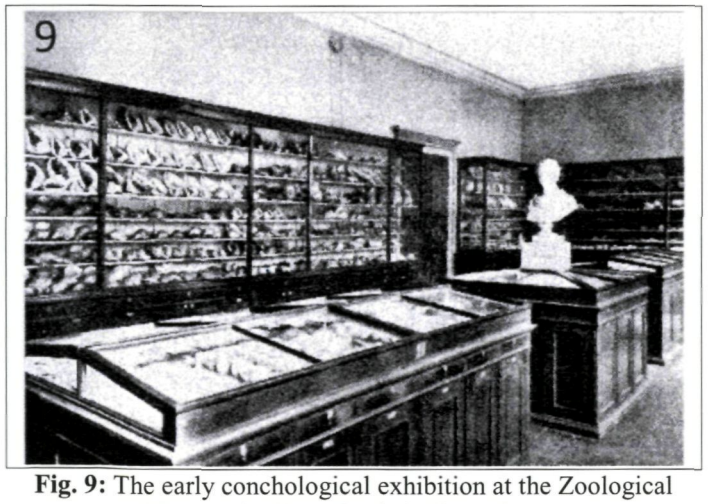

Fig. 9: The early conchological exhibition at the Zoological Museum in Krystalgade in Copenhagen (taken from Spärck 1945: 44, fig. 26)

We wonder why Verkrüzen, who had seen more *Buccinum* specimens (and species) from Newfoundland than anyone else at the time, did not discuss the species *B. terraenovae* in any of his many papers on the subject. He mentions the name only once (1881a: 92), as a synonym of *B. totteni*, but from the context and the following diagnosis we assume that he was dealing with a species distinct from *B. terraenovae* (and distinct from the interpretation of subsequent authors). In 1878, Verkrüzen described *B. elegans,* which appears to be a synonym of *B. terraenovae* according to authors (see Golikov, 1980: 344). We will return to this subject in a future paper.

Dall (1907: 152) described *B. orotundum* from the Pacific Ocean, comparing it (in fact mentioning the similarities) with *B. polare*. From the context, we can conclude that he had *B. terraenovae* in mind rather than *B. polare.* Indeed, the sculpture of *B. orotundum* is identical to that of *B. terraenovae*. It only differs by the broader shape resulting in a much blunter apex. *B. orotundum* was placed in synonymy with "*B. polare*" by Golikov (1980: 344-349) and Kantor & Sysoev (2006: 172), together with *B. terraenovae* and *B. totteni*. We agree that *B. orotundum* may be a synonym, being a broad form of *B. terraenovae*, but not a synonym of *B. polare*. The type was figured by Dall (1921: pl. 12, fig. 9) and Kosuge (1972: pl. 22, fig. 3). A specimen of *B. orotundum* from the Gulf of Anadyr (Bering Sea) was excellently illustrated under the name *B. polare* by Alexeyev (2003: 139-140, pl. 58, fig. 1)

Twelve years later, Dall (1919: 325) added *B. solenum* from the Pacific Ocean. For this species, too, he mentions the similarities with "*B. polare*". *B. solenum* was also placed in synonymy with "*B. polare*" by Golikov (1980: 344) and Kantor & Sysoev (2006: 172), together with *B. terraenovae* and *B. totteni*. We have not studied the type, but we follow this opinion, *B. solenum* being a rather weakly sculptured form of *B. terraenovae*, but not a synonym of *B. polare*. The type was figured by Dall (1925: pl. 4, fig. 1) and Kosuge (1972: pl. 21, fig. 7). In the meantime, Dautzenberg and Fischer (1912: 120) confirmed that *B. polare* lives in the Bering Sea and used the names *B. totteni* or *B. terranovae* for the Atlantic species.

Remarks: *Buccinum terraenovae is* characterised by the medium to rather large size, the moderately thin shell, ornamented with fine but well-defined spiral cords of different strength, the presence of sharp axial ribs on the upper spire whorls, the usually large aperture and the outer lip that often has a broad and strong sinus.

Degner (1934: 142-145, pl. 9) discussed and figured a giant egg-mass, weighing 14.1 kg, from Kolguev Island (Kara Sea).

B. polare (Figs 10-17) differs from *B. terraenovae* in its much broader spiral cords that are flattened and smooth, separated by a narrow interspace, the often slightly stretched base, the axial ribs that are straighter and usually lower in number, the slenderer shape with a higher spire, the narrower aperture, usually with a finer lip and the usually larger adult size.

The specific status of *B. totteni* is not certain yet, but the specimens that agree with the description differ from *B. terraenovae* in having a much finer sculpture consisting of fine primary spiral cords with 3 or 4 slightly finer secondary spiral cords and of up to 23 regulary-spaced, straight axial ribs that are moderately weak on the upper spire whorls and gradually fade away along the penultimate and body whorl, the convex whorls, the large aperture comprising about 2/5 to ½ of the total shell length and the pale yellowish periostracum.

Conclusions: In the present paper, *Buccinum polare* is studied, the type material figured for the first time and more details about the type locality are found. *B. polare* appears to be more similar to the *B. ectomycina*-group, rather than to the *B. glaciale*-group and is confirmed as a distinct species, excluded from synonymy with *B. glaciale*. Only the type specimens and similar morphotypes from near the type locality are studied, it is therefore uncertain how far to the south the species occurs and how its variability may behave within such southern populations. The specimens/species within the *B. ectomycina*-group must be studied in more detail to find out which morphotypes belong to *B. ectomycina* and/or if other morphotypes may be a form of *B. polare*.

In the present paper, *B. terraenovae* is also excluded from synonymy with *B. polare*. The syntype in NHMUK is found while two syntypes in ZMC have not been retrieved yet. Also the type material of *B. totteni* has not been found yet. The specimens/species within the *B. terraenovae* group must be studied in more detail to find out which morphotypes belong to *B. terraenovae* and which morphotypes may be a form of other species to confirm that *B. totteni*, *B. orotundum* and *B. solenum* are synonyms or to prove they are distinct species.

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Plate 1: ***Buccinum polare*** (Gray, 1839) .

10-16: Syntypes, Chukchi Sea, Alaska, Icy Cape, NHMUK-1877.5.251, 10-12: 62.1 mm, **13-15:** 56.61 mm. Courtesy of Harry Taylor (NHMUK-Photographic Unit).

17: 68 mm, Alaska, NW of Cape Lisburne, 70°29.57 N, 168°29.42 W, 36 m. Photo courtesy of R. Clark.

Plate 2: ***Buccinum* cf. *ectomycina*** Dall, 1907, Central Sea of Okhotsk, Kashevarova Bank, 230-280 m.

18-22: 138.7 mm, KF-4387,
23-25: 45.3 mm juvenile, KF-1793.

Plate 3: ***Buccinum ectomycina*** Dall, 1907

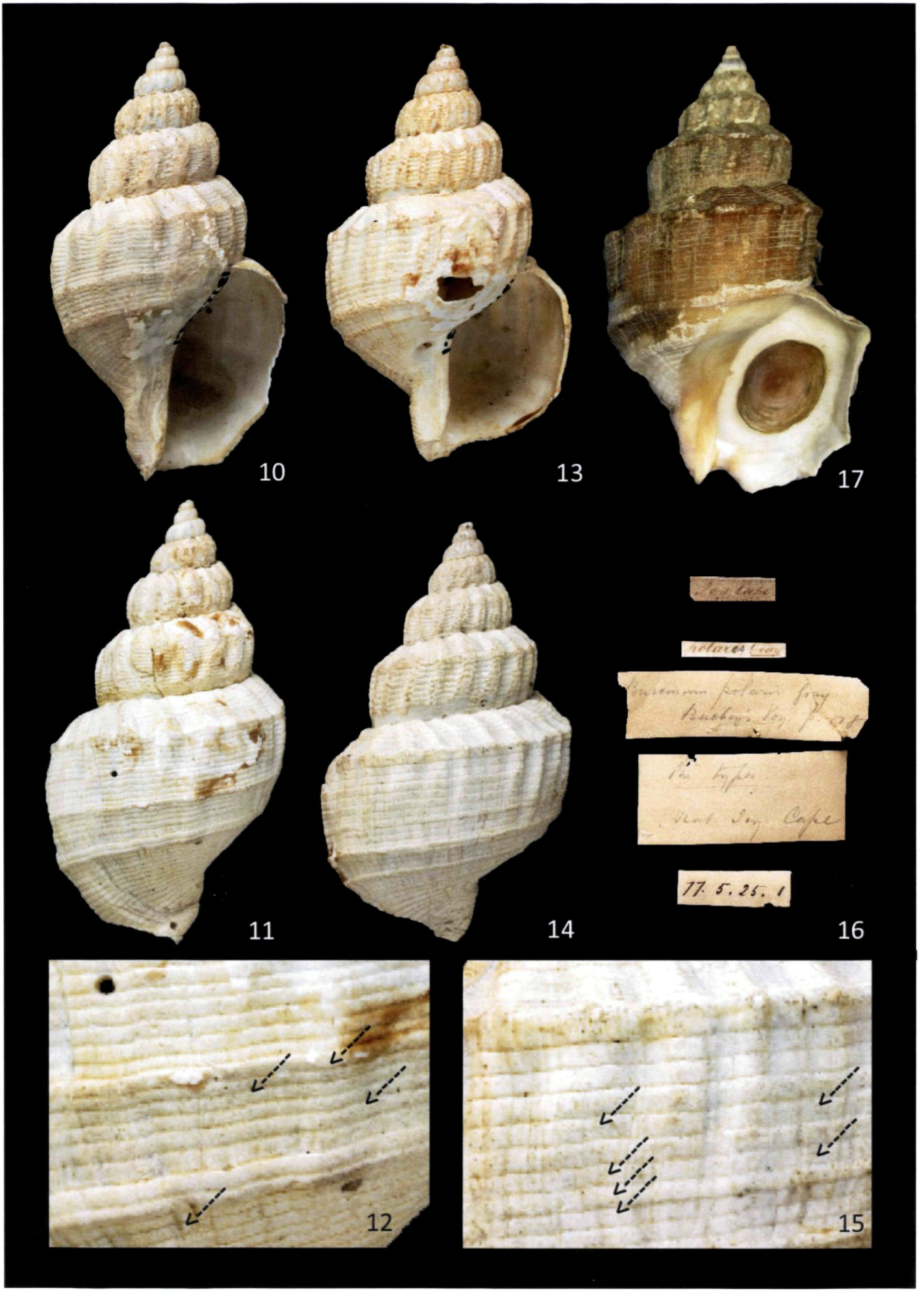
26-29: 97.7 mm, Sea of Okhotsk, 120 m, KF-3245.
30-32: 109.9 mm, Sea of Okhotsk, 200 m, KF-3415.

Plate 4:

33-39: ***Buccinum glaciale*** Linnaeus, 1761

33-35: 60.6 mm, Barentz Sea, off Novaya Zemlia, KF-1027.
36-37: 72.5 mm, NE Atlantic, Svalbard, Adventfjord, beach, KF-3442.
38-39: 43.2 mm, Barentz Sea, Ivanovskaya Bay, off Nokuev Island, 17-18 m, KF-6418.

40-42: ***Buccinum* sp.**, 64.3 mm, Bering Sea, E. off Cape Nawarin, 92 m, KF-3060.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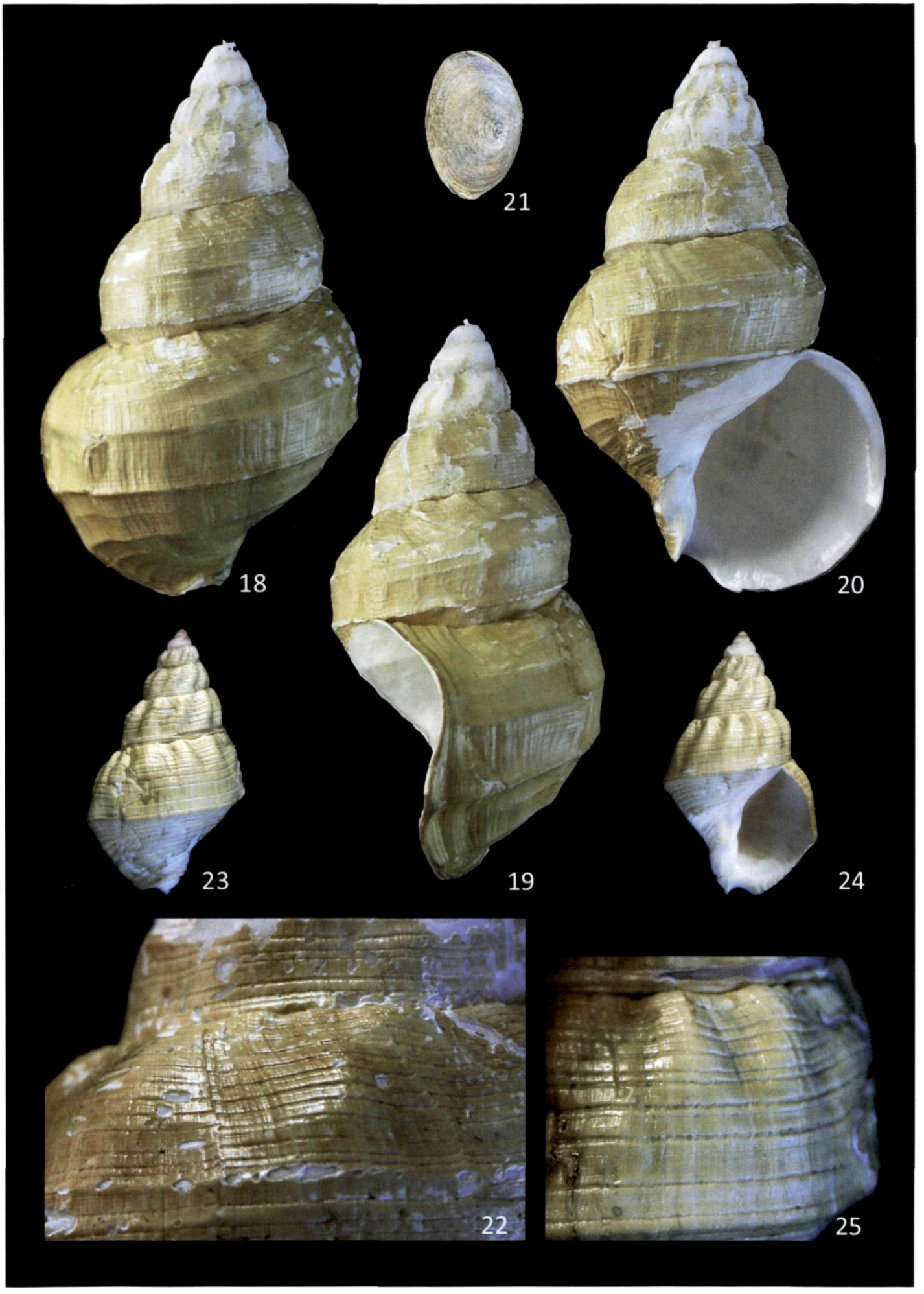
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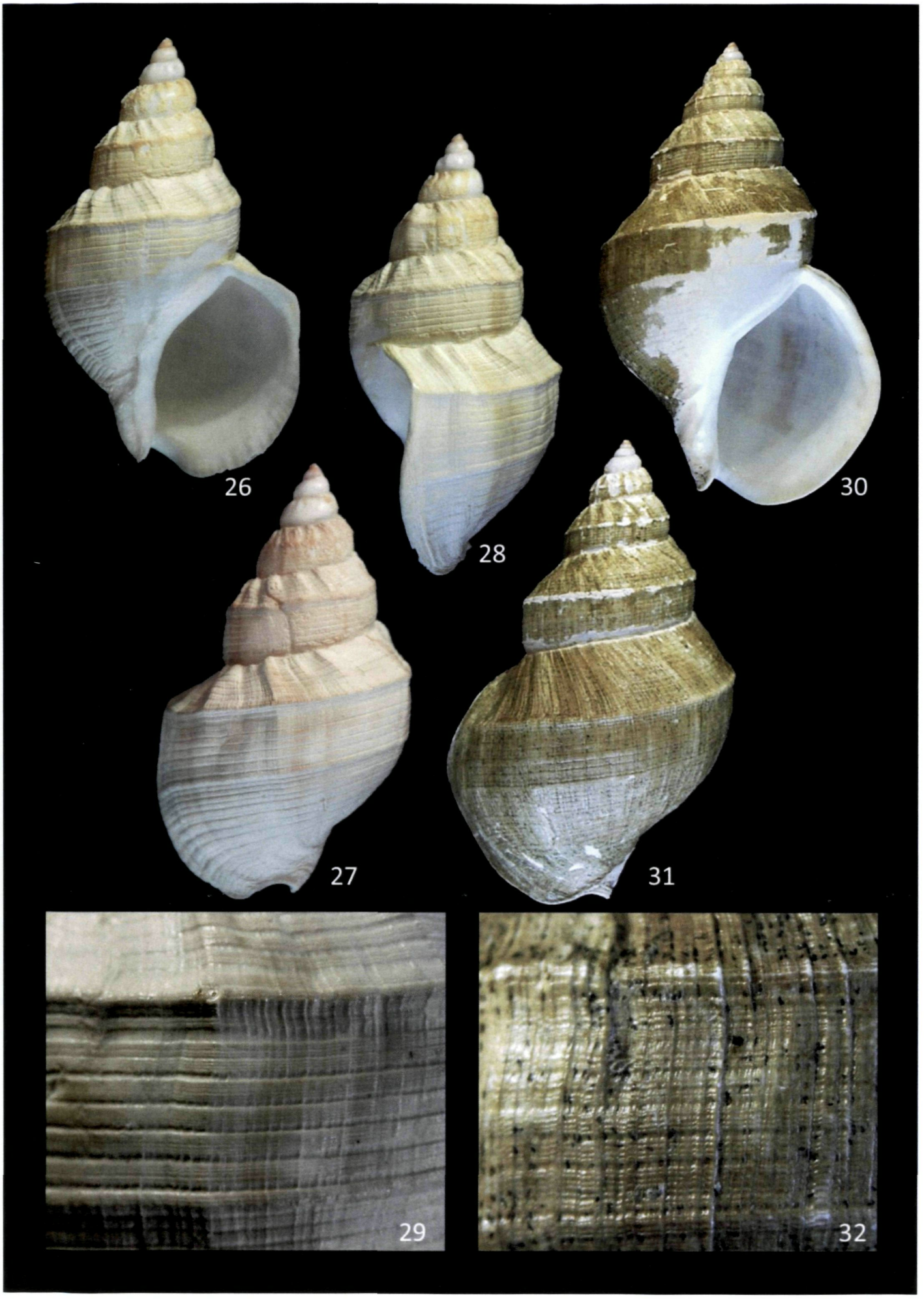
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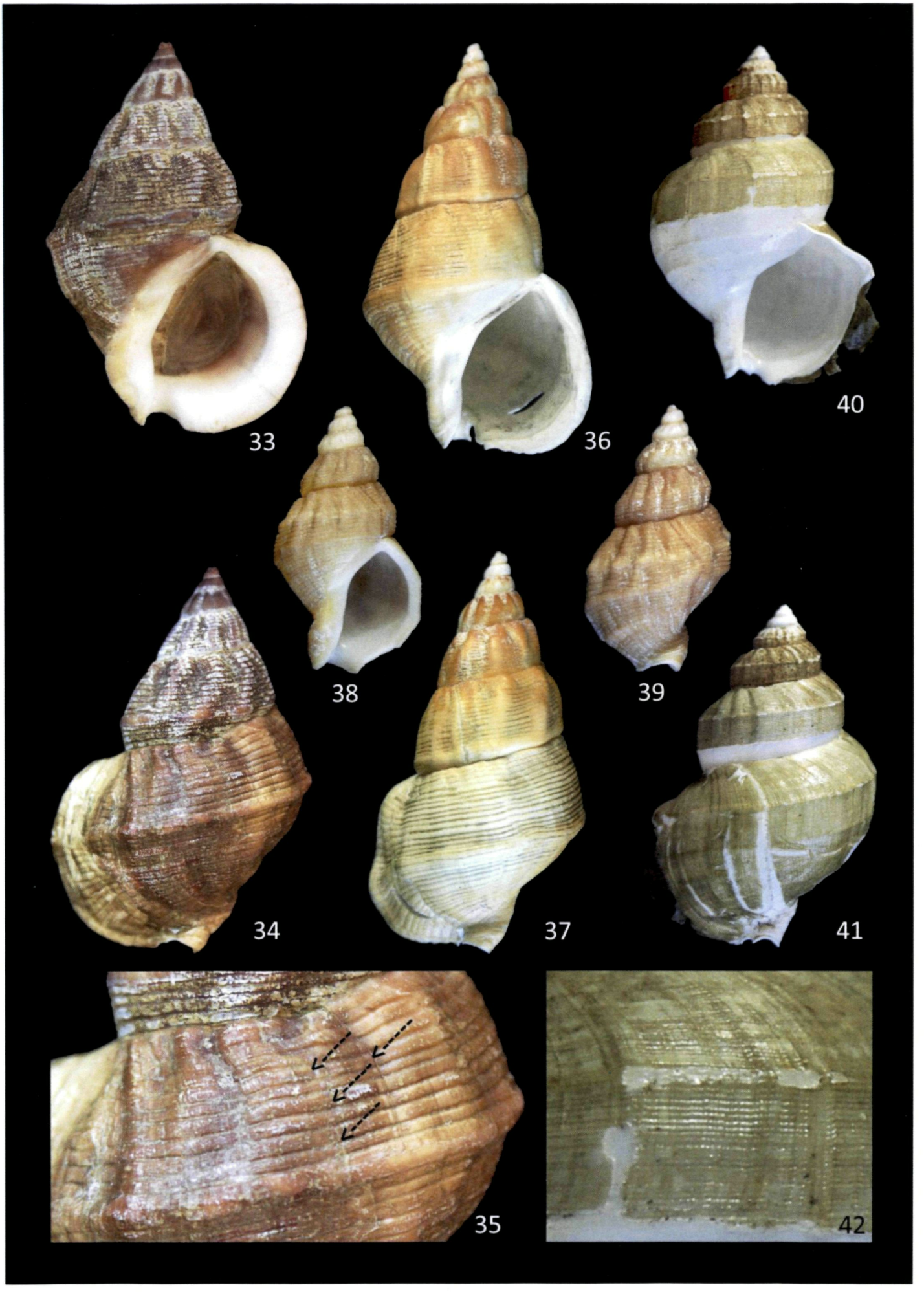
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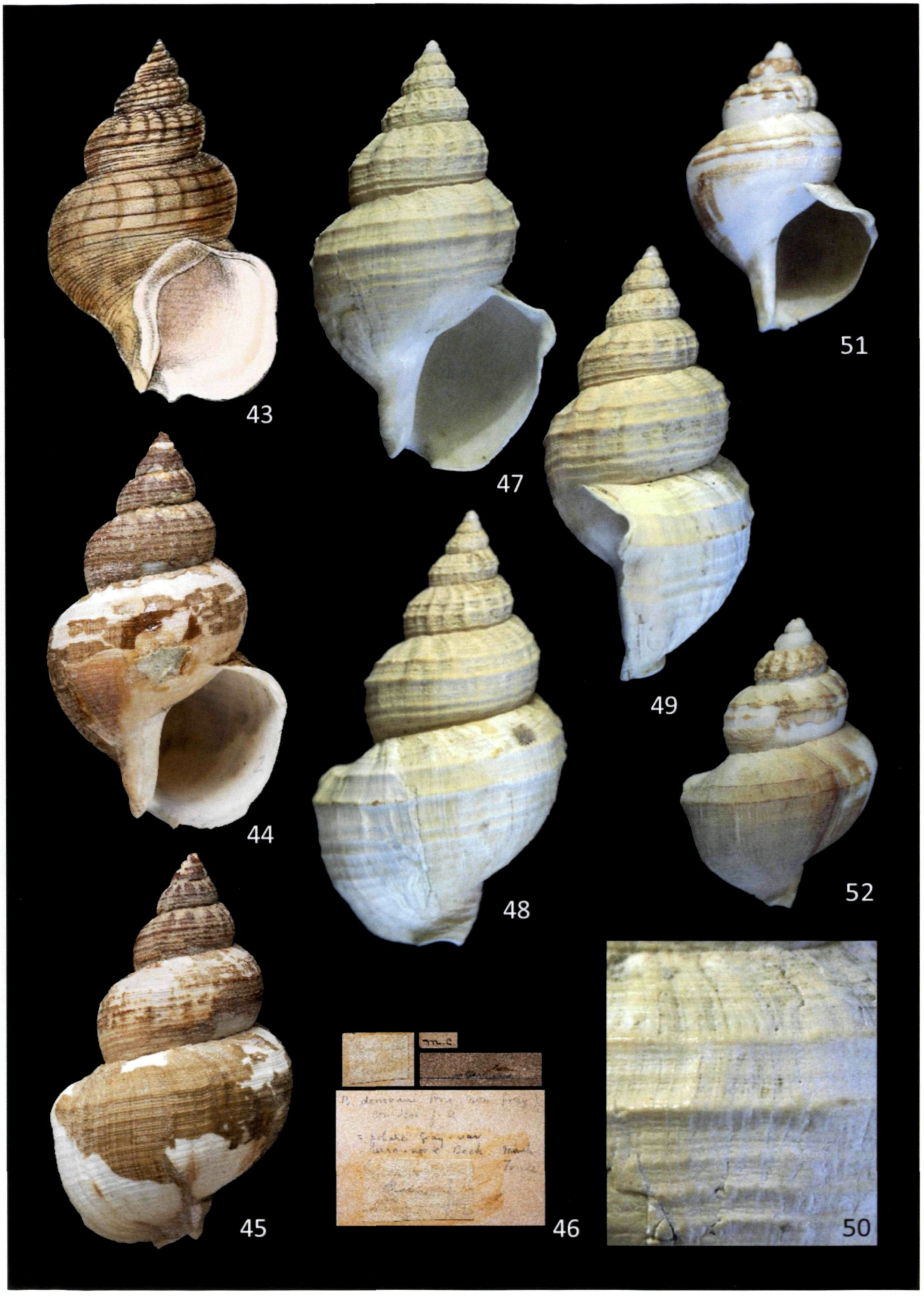
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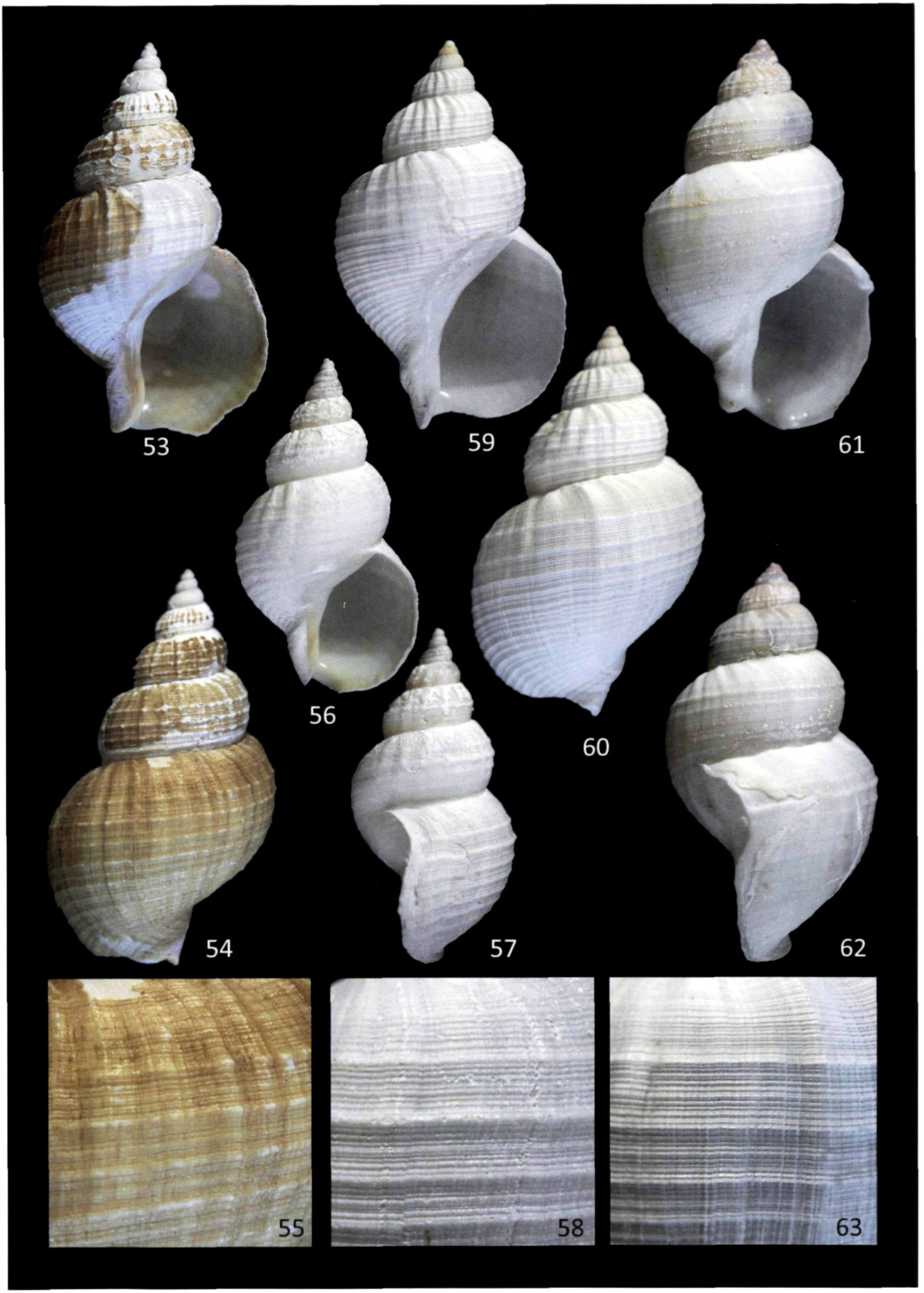
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Plate 5: ***Buccinum terraenovae*** (Gray, 1839)

43: Type figure, in Reeve, 1846: Species 2, pl. 1, fig. 2, as "*Buccinum donovani*" (non Gray).

44-46: 68 mm, syntype, syntype, in NHMUK (NHMUK-20180165). Courtesy of Harry Taylor (NHMUK-Photographic Unit).

47-50: 73.5 mm, Barentz Sea, old collection, KF-5041.

51-52: 52.2 mm, Polar Ocean, Russia, off Wrangel Island, KF-3512.

Plate 6: ***Buccinum terraenovae*** (Gray, 1839)

53-55: 70.5 mm, same locality as 56-58.

56-58: 55.4 mm, NW Atlantic , Newfoundland, Grand Banks, old collection, KF-2706.

59-61: 73.4 mm, "*orotundum*", Okhotsk Sea, 160 m, KF-3016.

62-63: 73.3 mm, "*orotundum*", Bering Sea, Alaska, St. Paul Island, 73 m, KF-2626.