

Description of a new species of *Aporrhais* (Gastropoda, Stromboidea) from the Upper Eocene of Western Siberia

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Abstract

Material from the Upper Eocene Tavda Formation of Western Siberia contains a new species, *Aporrhais siberica* sp. nov. It has been misidentified as *A. cornuta* Korobkov, 1949, an aporrhaid originally described from the Upper Eocene / Lower Oligocene of the Turan Sea. The main difference between *A. siberica* and *A. cornuta* is the missing spire-adnate digitation of *A. siberica*. Publications referencing both morphologies are analyzed, and revised synonymies are presented.

Keywords

Aporrhaidae, Paleogene, Siberia, Tavda Formation, Taxonomy

Introduction

The Eocene and Oligocene marine fauna of the East Peri-Tethys and adjacent regions contains several gastropod morphs of the family Aporrhaidae (Ryabinin and Korobkov 1949; Il'ina 1953; Alekseev 1963; Amitrov 2005), which are usually lumped under the name *Aporrhais cornuta* Korobkov, 1949 that was originally described from the Oligocene of the North Aral region. New fossil aporrhaid material from the Trans-Ural region of Western Siberia, collected in recent years (Popov et al. 2019), is examined in this publication, and a new species from that region is described, replacing Turbina's (1959, 1962) attribution to "*Aporrhais cornutus* Alexeiev". The similar *A. cornuta* from the Paleogene of North Aral is re-evaluated herein and compared to the new species.

Material and methods

The research material encompasses six lots and was collected in the Kyshtyrla quarry (55°55'15"N, 65°49'26"E), situated on the south-western periphery of Western Siberia, which is recognized as the Trans-Ural region (Fig. 1). The material is stored in the Museum of the Tyumen Industrial University (MTIU) and the Slovtsov Museum Complex of Tyumen (SMCT) (Tyumen, Russia).

Based on detailed studies of pollen, dinoflagellate cysts, and magnetostratigraphy, the Tavda Formation is considered as Middle and Upper Eocene in age (Akhmet'ev et al. 2004, 2010, 2012; Iakovleva 2000, 2011; Iakovleva and Heilmann-Clausen 2010; Gnibidenko et al. 2020; Kuzmina et al. 2021). Further stratigraphic and paleoenvironmental information on the formation has been provided by

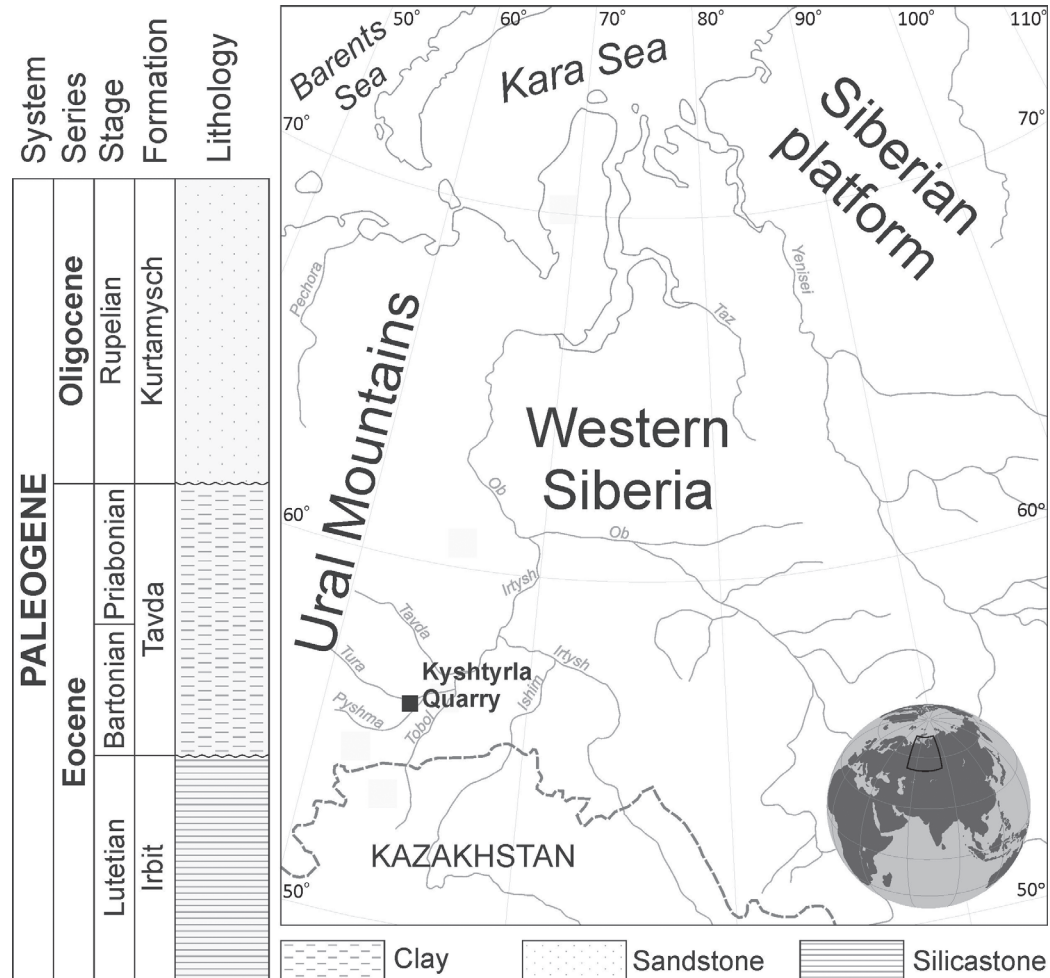


Figure 1. Location of the Kyshtyrla quarry and stratigraphic subdivision of the Tavda Formation after Gribidenko et al. (2020) and Kuzmina et al. (2021).

foraminiferal assemblages (Subbotina et al. 1964; Podobina 1975, 1998, 2020). In this context, we note that the Kyshtyrla Quarry is a unique site where nearly all recent important palaeogeographical insights about the Eocene of the West Siberian Sea were made, including findings of shark teeth (Malyskina 2006, 2012, 2021), Teleostei bone remains (Marrama et al. 2019), otoliths (Schwarzshans et al. 2021), mollusks (Trubin 2018; Popov et al. 2019), and trace fossils (Nesterov et al. 2018). Recent foraminiferal studies, accompanied by geochemical data, indicate that the quarry deposits belong to the Tavda Formation, recognized as Upper Eocene (Trubin et al. 2024) and associated with a shallow subtidal environment at the stage of increasing isolation of the West Siberian Basin from the world ocean.

The quarry is approximately 15 m deep. The deposits are polymineralic illite-smectite and montmorillonite blue-green clays with admixtures of pyrite, marcasite, siderite, quartz, and gypsum (Smirnov et al. 2019).

Sedimentary processes reflect the dynamics of a semi-isolated epicontinental sea in shallow-water environments during the Late Eocene. (Akhmet'ev et al. 2010). From the palaeogeographic point of view, the West Siberian Sea was isolated from the Arctic Ocean and connected to the Peri-Tethyan Sea via the Tyrgay Strait (Palcu and Krijgsman 2022); see Fig. 2.

To account for the numerous taxonomic and nomenclature changes a species might have undergone, we utilize chresonymies. This practice provides a comprehensive record of a species's historical names. To be exact, we use the original spelling, although this may lead to different spellings, e. g., for the author's name. While aiming to include all published occurrences, achieving complete coverage can be challenging. Despite our efforts, some entries might be missing. The names in the chresonymy are sorted into two sections. The top ones contain those that belong to the species, and the ones that bear in the reference the according name of the discussed species but do not belong to it begin with "non".

Criteria for classifying the references:

- Primary source evidence: Direct examination of the original material, high-quality figures, or detailed descriptions are prioritized for classification.
- Stratigraphy and geography: When primary source evidence is unavailable, the fossil record's stratigraphy and geographic origin are considered.
- If insufficient information exists for clear categorization, a question mark ("?") precedes the chresonymy entry.

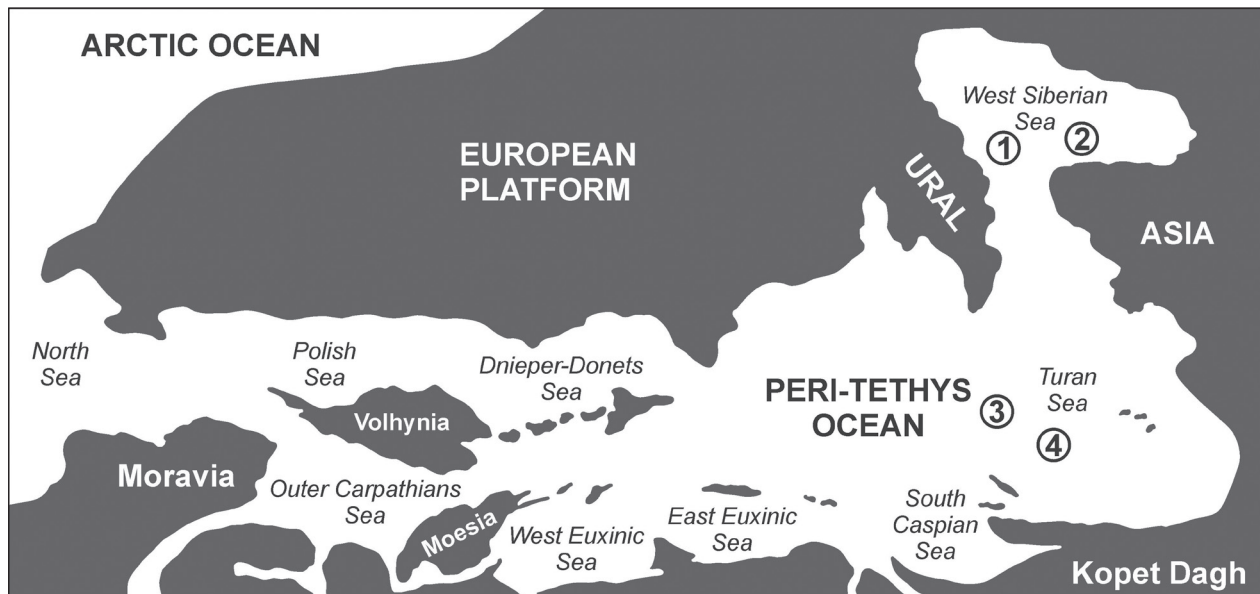


Figure 2. Paleogeography of the Peri-Tethys and subjected basins during the Late Eocene (modified after Akhmet'ev et al. 2012 and Palcu and Krijgsman 2022) and distribution of sites with *Aporrhais siberica* sp. nov.: (1) The Trans-Ural region of Western Siberia (Turbina 1959; Popov et al. 2019; this paper); (2) The central part of the Western Siberia (Turbina 1962); and *Aporrhais cornuta* Korobkov, 1949; (3) Ustyurt (Il'ina 1953, 1955, 1960; Alekseev 1963); (4) Northern Aral Sea region (Korobkov 1949; Ovechkin 1954).

The gastropod terminology is adapted from Manganelli et al. (2008).

Systematic Paleontology

Family Aporrhaidae Gray, 1850

Genus *Aporrhais* Mendes da Costa, 1778

Aporrhais siberica Wieneke & Trubin, sp. nov.

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Plate 1: figs 1–12

Synonymy.

1959. *Aporrhais cornutus* Alexeiev – Turbina, pp. 30–31, pl. 2, figs. 13, 14 [non *Aporrhais cornuta* Korobkov, 1949].

1962. *Aporrhais cornutus* Alexeiev, 1945 – Turbina, p. 312, pl. 10, figs. 10, 11 [non *Aporrhais cornuta* Korobkov, 1949].

2019 *Aporrhais* sp. – Popov et al., pl. 3, fig. 5.

Types. Holotype: Museum of the Tyumen Industrial University MTIU K6 (Plate 1: figs 1, 2); paratypes: Museum of the Tyumen Industrial University MTIU K7, MTIU K8, MTIU K45, Slovtsov Museum Complex of Tyumen SMCT MF33788, MF33789.

Etymology. The species is named after Siberia, where Anton Maslennikov collected the holotype.

Diagnosis. A medium-sized, heavily callused *Aporrhais* with long digitations and no digitation adnate to the spire.

Description. High conical shell of medium size [~43 mm], conical spire with about eight whorls, aperture bears two digitations. Protoconch unknown. First three teleoconch whorls rounded, with numerous opisthocyrt growth lines. Fourth teleoconch whorl with opisthocyrt axial ribs, 11 on the abapertural part of the whorl. On the penultimate whorl, ribs strengthened, 6 on abapertural part.

Last whorl with three keels, adapical keel most prominent, with about 5–6 ribs on the abapertural side, apertural side covered with callus, middle keel small with no ribs, abapical keel strongly reduced. Height of last whorl is almost half of the total height. Outer lip formed by two aperturally canaliculated digitations. Lateral adapical digitation is a spearhead-like elongation of adapical keel, long, adapically curved. Middle keel runs into the lateral abapical digitation, short, abapically directed. Abapical keel ends without building a digitation. Inner and outer lip of aperture thickly callused, columella heavily callused, callus covers the last whorl aperturally completely, adapical part of aperture also callused. Rostrum triangular, channeled.

Material. Six specimens: Four shells, MTIU K6, K7, K8, and K45. The shell MTIU K6 is fully preserved, K7 and K8 have a broken apertural extension, and K45 is a fragment. Two shells, MF33788 and MF33789, are stored in the STMC. The specimen with the number MF33788 is fully preserved. These six specimens are figured in plate 1. In the specimen with the number MF33789, the early whorls are broken off.

Measurements. fully preserved specimens: MTIU 6 (holotype), height: 43 mm; SMCT MF33788 (paratype), height: 46 mm.

Locus typicus. Northeastern wall of Kyshtyrla quarry (55°55'15"N, 65°49'26"E), Western Siberia, Trans-Ural region, Russia.

Stratum typicum. Upper part of Tavda Formation, Priabonian, Eocene, Paleogene.

Distribution. Trans-Ural region, including the type locality (Turbina 1959; this paper) and the southern part of Western Siberia near Omsk (Turbina 1962).

Discussion. *Aporrhais siberica* sp. nov. differs from *A. cornuta* by an adspiral digitation, that is absent in *A. siberica* (Plate 2: fig. 1b). The lateral adapical

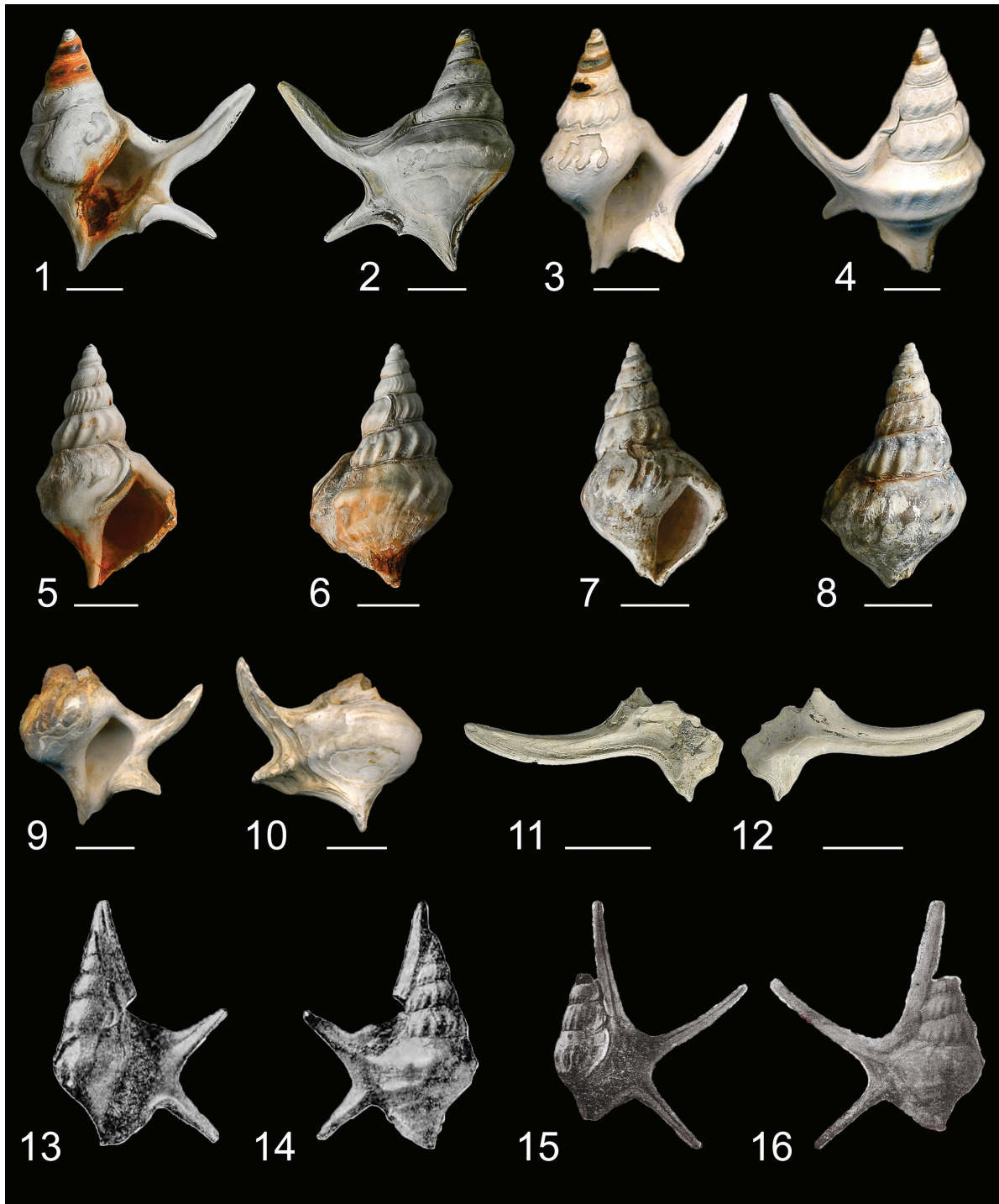


Plate 1. 1–12. *Aporrhais siberica* sp. nov. (1, 2. Holotype MTIU 6; 3, 4. Paratype SMCT MF33788; 5, 6. Paratype MTIU 7; 7, 8. Paratype MTIU 8; 9, 10. Paratype SMCT MF33789; 11, 12. Paratype MTIU 45.); 13–16. *Aporrhais cornuta* Korobkov, 1949 (13, 14. Korobkov 1949, pl. 65, figs 16a, b respectively, representing a syntype; 15, 16. Alekseev 1963, pl. 16, figs 7, 11 respectively). Scale bar: 10 mm.

digitation is slightly curved in *A. cornuta* (Plate 2: fig. 2a) but more strongly curved in *A. siberica* (Plate 2: fig. 1a). A thick callus covers the apertural part of the last whorl of *Aporrhais siberica* (Plate 2: fig. 1c), while *A. cornuta* only has a thin callus restricted to the columella (Plate 2: fig. 2c) (see also Table 1). Turbina (1959, 1962) considered the Trans-Ural morph as a subadult of *Aporrhais cornuta*. The thick apertural callus, which occurs only in an adult stage, is an argument to reject this assumption.

***Aporrhais cornuta* Korobkov, 1949**

Plate 1: figs 13–16

- 1949 *Aporrhais cornutus* Alexeev nov. sp. – Korobkov, p. 245, pl. 65, figs. 15, 16a, b. [basionym].
 1954 *Apporhais* [sic] *cornutus* Alex. – Ovechkin, p. 76, pl. 9, fig. 22–23.
 1955 *Aporrhais cornutus* Alex. – Korobkov, p. 272, pl. 57, figs. 11–13.
 1955 *Chenopus* cf. *cornutus* Alex. – Ovechkin, p. 86.
 1955 *Chenopus cornutus* Alex. – Ovechkin, p. 87.

- 1955 *Aporrhais* [sic] *cornutus* Alex. – Ovechkin, p. 110.
 1960 *Aporrhais cornutus* Alexeev – Orlov, pl. 21, fig. 10.
 1963 *Chenopus cornutus* n. sp. – Alekseyev, pp. 78–81, pl. 15, figs. 5–16; pl. 16, figs. 5–11.
 1971 *Aporrhais cornuta* Ilyina – Amitrov, pp. 68, 69, pl. 1, fig. 8.
 1972 *Aporrhais* (*Chenopus*) *cornuta* Alex. – Sidorenko, p. 447.
 1975 *Aporrhais cornutus* Alex. – Martynov et al., p. 227, 299, 322.
 1985 *Chenopus cornutus* – Malchevskaya et al., 1985, p. 161.
 1994 *Aporrhais cornutus* Korobkov, 1949 – Amitrov, pp. 104, 105, 107 [partim]
 non 1858 *Rostellaria sowerbyi* Sow. – Abich, 1858, p. 21[557], pl. III [in plate caption: II], fig. 1a, b [= *Aporrhais aralensis* Eichwald, 1868]
 ?non 1859 *Rostellaria Sowerbyi* Sow. – Trautschold, p. 307.
 ?non 1868 *Aporrhais Sowerbyi* Sow. – von Koenen, pp. 158, 159
 non 1953 *Aporrhais cornutus* Alexeev – Il'ina, p. 105, pl. 6, fig. 14, pl. 7, fig. 2a, b [= *Aporrhais* sp.].
 non 1955 *Aporrhais cornutus* (Alexeev) – Il'ina, p. 61, pl. 22, figs. 1, 1a, 4, 5 [= *Aporrhais* sp.].
 non 1958 *Aporrhais* (*Chenopus*) *cornutus* var. – Klyushnikov, pp. 288, 289, pl. 34, fig. 9 [= *Aporrhais* sp.].
 non 1959. *Aporrhais cornutus* – Turbina, pp. 30–31, pl. 2, figs. 13, 14 [= *Aporrhais siberica* n. sp.].
 ?non 1960 *Aporrhais* cf. *speciosa* – Il'ina, p. 285, pl. 3, figs. 12, 13a, 14 [= *A. cornuta* fide Amitrov (1971), not seen]
 non 1962 *Aporrhais cornutus* – Turbina, p. 312, pl. 10, figs. 10, 11 [= *Aporrhais siberica* n. sp.].

Original description by Korobkov, 1949 (in Russian).

Крупная (высота до 57 мм), сильно расширяющаяся книзу, слегка изогнутая раковина, состоящая из 8 оборотов, разделенных глубоким узким швом. Последний оборот большой, несущий на поверхности 3 гранулированных кия, из которых нижний часто бывает совершенно гладкий. Поверхность более ранних оборотов покрыта спиральными ребрышками, количество которых колеблется в пределах от 15 до 18, пересеченными поперечными так, что образуется характерная сетчатая скульптура. На поздних оборотах сетчатая скульптура неотчетливая, вследствие сильного развития спиральных ребер. Устье узкое с 3 характерными пальцевидными отростками наружной губы. Верхний отросток, приросший по всей длине поверхности оборотов, у некоторых экземпляров значительно выступает над спиралью раковины. Второй, изогнутый отросток под углом в 50–70° к первому направлен вбок и

вверх, а нижний прямолинейный отросток примерно под таким же углом к предыдущему — вбок и вниз. Верхний сильно бугорчатый киль поверхности последнего оборота в виде грубого гладкого ребра продолжается на среднем отростке, а средний киль — на нижнем. Пальцевидные отростки с внутренней стороны несут узкие каналы, открывающиеся в устье.

Original description by Korobkov (1949) (translation Trubin, Wieneke). Large (height up to 57 mm), strongly expanding downwards, slightly curved shell, consisting of 8 whorls separated by a deep narrow suture. The last whorl is large, bearing 3 granulated keels on the surface, of which the lower one is often completely smooth. The surface of the earlier whorls is covered by axial ribs, the number of which ranges from 15 to 18, crossed by transverse ones so that a characteristic reticulate sculpture is formed. On later whorls, the reticulate sculpture is indistinct due to the strong development of axial ribs. The aperture is narrow with 3 characteristic finger-like digitations of the outer lip. The adspiral digitation, grown along the entire length of the spire, in some specimens protrudes significantly above the spira. The second, curved process is directed laterally and upwards at an angle of 50–70° to the first one, and the lower rectilinear digitation is directed laterally and downwards at approximately the same angle as the previous one. The upper, strongly tuberculate keel of the surface of the last whorl, in the form of a rough, smooth rib, continues the middle digitation, and the median keel continues the lower digitation. The finger-like digitations on the inner side bear narrow canals that open at the aperture.

Types. Storage location unknown: Syntype 1 represented by Korobkov (1949), pl. 65, fig. 15, syntype 2 represented by Korobkov (1949), pl. 65, fig. 16 a, b.

Locus typicus. „Turnagly“ (=Турнаглы) (in old references also cited as Turangly or Turanghul), northern Aral region, Kazakhstan.

Stratum typicum. Upper Eocene of northern Aral region (Korobkov 1949: 245), Tshegan Formation (Amitrov 1994).

Material. (additionally seen to published specimens): 2 specimens Sedgwick Museum of Earth Sciences, University of Cambridge C11743-4, ex Coll. Bateson (see Lukovitch 1921); 3 specimens Coll. Stichting Schepel Schelp SSS54976; 5 specimens Coll. Elmar Mai, Durbusch; 10 specimens Coll. Ulrich Wieneke, Murnau.

Discussion

The genus *Aporrhais* is treated with a feminine gender (Manganelli et al. 2008), so the correct name is *Aporrhais cornuta*, as Amitrov (1971) pointed out.

Korobkov (1949) and others attributed the name *Aporrhais cornuta* to Alexeev and referred to a manuscript by this author. This manuscript was posthumously published in 1963. Korobkov (1949) and Alekseev (1963) included Abich's (1858) "*Rostellaria sowerbyi* Sow" (Abich 1858, pl. 3, figs 1a, b) in *Aporrhais cornuta*. Korobkov (1949) discovered that the English Eocene species *Rostellaria sowerbyi* (correct name *Aporrhais sowerbii* (Fleming, 1828))

Table 1. Comparison of *Aporrhais siberica* sp. nov. with *A. cornuta*.

Character \ Species	<i>Aporrhais siberica</i> sp. nov.	<i>Aporrhais cornuta</i>
adspiral digitation	no (Plate 2: fig. 1b)	long, protrudes the spire (Plate 2: fig. 2b)
lateral adapical digitation	shorter, stronger curved (Plate 2: fig. 1a)	long, only slightly curved (Plate 2: fig. 2a)
callus	thick, covering the apertural part of the last whorl (Plate 2: fig. 1c)	thin columellar callus (Plate 2: fig. 2c)

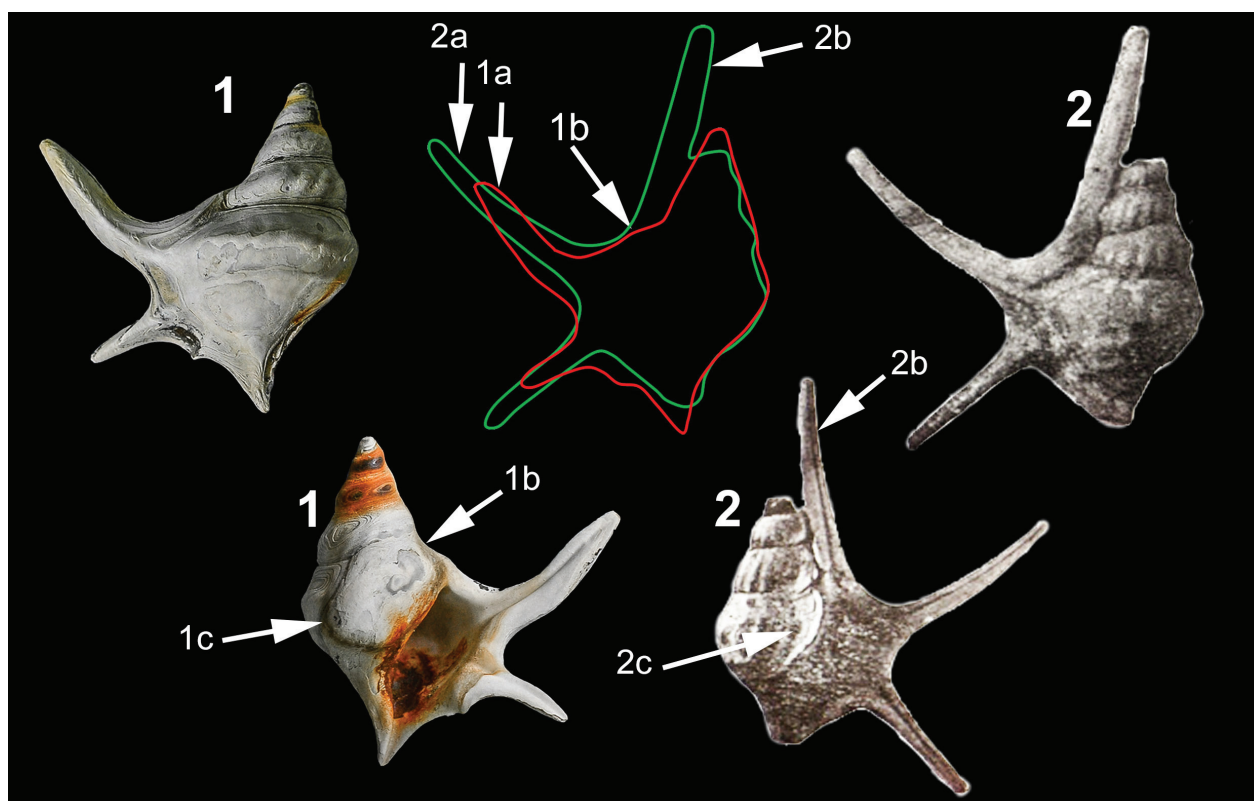


Plate 2. Differences between *Aporrhais siberica* (1) and *A. cornuta* (2), a. Lateral adapical digitation, b. Adspirals, c. Callus.

is not conspecific with the specimens from the Crimean Eocene and described the latter as “*Aporrhais cornutus*”, Amitrov (1994) revised the species *Aporrhais cornuta* and attributed it to Korobkov (1949). He also found that the specimen illustrated by Abich (1858, pl. 3, figs 1a, b) should be considered the illustration of the type of *Aporrhais aralensis* Eichwald, 1868, who cited Abich’s figure (Abich 1858, pl. 3, figs 1a, b). It is a much smaller species compared to *Aporrhais cornuta*. He also claimed that only Korobkov’s (1949) specimens should be regarded as syntypes. Although Alekseev (1963) lumped *A. aralensis* and *A. cornuta*, he pointed out how to distinguish them.

Before 1963, Alexeev’s manuscript was cited several times:

- Korobkov (1949) cited Alexeev as the author of *Aporrhais cornuta*, but gave a different description and used different material, as can be concluded from the posthumous publication of the manuscript (Alekseev (1963). Korobkov (1949) should be considered as the describing author (see ICZN 50.1. especially 50.1.1. in combination with article 10.1.1.), as pointed out by Amitrov (1994).
- Il’ina (1953, 1955) used the name “*Aporrhais cornutus*” for a morphologically different, still undescribed species from Kazakhstan. It differs from *Aporrhais cornuta* (Korobkov, 1949) and *A. siberica* sp. nov. by the different ornamentation of the spire and by having a triangular apertural extension missing the long spines (Il’ina 1953).
- Alexeev (1963) also included a drawing from Abich (1858) of *Rostellaria sowerbyi*, p. 21[557], pl.

III [in plate caption: II], fig. 1a, b for his description of *Aporrhais cornutus*. Trautschold (1859) and von Koenen (1868) also cited this drawing.

- Turbina (1959, 1962) used the name *Aporrhais cornutus* for another morphologically different species. This morph is described here as a new species: *Aporrhais siberica*.

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