

## On the First Find of Aptychi in Representatives of the Subfamily Proplanulitinae Buckman (Perisphinctidae, Ammonitida)

M. A. Rogov\* and D. B. Gulyaev\*\*

\*Geological Institute, Russian Academy of Sciences, Pyzhevskii per. 7, Moscow, 119017 Russia

\*\*Institute of Ultradeep Drilling "Nedra," ul. Svobody 8/38, Yaroslavl, 150000 Russia

Received January 10, 2002

**Abstract**—Body chamber molds of representatives of the genus *Proplanulites* have been found from the lower part of the *koenigi* Zone (lower Callovian) of the Kursk Region that contain aptychi of *Praestriptychus koenigi* parasp. nov. This is the first confirmed find of aptychi in the subfamily Proplanulitinae (family Perisphinctidae, suborder Perisphinctina). Its unusually elongated shape is similar to that of *Cornaptychus* Trauth and *Laevilmellaptychus* Trauth, which are thought to belong to ammonites of the suborder Haploceratina. The new find suggests that at least some elongated aptychi could belong to ammonites of the suborder Perisphinctina.

*Key words:* Aptychi, Proplanulitinae, Ammonitida, lower Callovian, Kursk Region.

### INTRODUCTION

Because aptychi are extremely rarely found in the body chambers of ammonites, an independent taxonomy is used for these fossils. Essentially, the only reliable way to link certain types of aptychi to certain taxonomic groups of ammonites is to study the aptychi found in their body chambers. Other criteria (cooccurrence or comparison of the measurements and shapes of aptychi with the respective parameters of ammonite apertures) are not completely reliable. Therefore, although aptychi are relatively widespread throughout the Jurassic, their morphology is not studied in many taxonomic groups of ammonites.

Aptychi have been recorded from the Callovian of Central Russia in the last quarter of the 19th century. Two small, but relatively well-preserved aptychi from the middle Callovian of the Ryazan Region were described and depicted by Lahusen (1883). Although these aptychi are considerably different in shape, they were identified by Lahusen as members of the same species, i.e., *Aptychus hectici* Quenstedt (1849), which previously was described from the Callovian of Württemberg in Germany. Later, Trauth (1927, 1930) assigned these specimens to the genera *Cornaptychus* and *Praestriptychus*, which he had established. Several years after the publication of Lahusen, Nikitin (1884, 1885) reported on the lower Callovian aptychi from the Kostroma Region, Russia. However, these aptychi were poorly preserved, and even the identification of these fossils as aptychi is uncertain. Subsequently, no paper mentioning Callovian aptychi from Central Russia has been published.

In 2000, D.B.G. found paired aptychi assigned to a new species *Praestriptychus ? koenigi* in the Callov-

ian rocks exposed by the open-pit mine of the Mikhailovskii Mining and Concentrating Plant near the town of Zheleznogorsk (Kursk Region) in the two molds of body chambers of *Proplanulites (Proplanulites) koenigi* (Sow.) from the *gowerianus* Subzone of the *koenigi* Zone.

The subfamily Proplanulitinae Buckman comprises early Callovian perisphinctid ammonites with high, relatively involute whorls, which possess a narrowly rounded venter and bear wide primary ribs that slant orad and are raised on the umbilical shoulder and thinner secondary ribs that are interrupted or weaken on the venter. At present this family is considered to include a single genus, *Proplanulites* Teisseyre, which is endemic to the subboreal region (Westermann, 1993; Gulyaev, 2001).

Proplanulitinae supposedly evolved from some Pseudoperisphinctinae Schindewolf at the very beginning of the *koenigi* Chron and immediately became widespread across the entire Boreal-Atlantic (Subboreal) Realm, i.e., from East Greenland (Callomon, 1993) in the northwest to the Mangyshlak Peninsula (Repin and Rashvan, 1996) in the southeast of its geographic range. In many regions, e.g., in western Europe, they played a dominant or subdominant role in the ammonite assemblages. The latest representatives of *Proplanulites* are known from the lower part of the terminal lower Callovian *enodatum* Subzone (Gulyaev, 2001; Kiselev, 2001).

Although Proplanulitinae were widespread, no reliable finds of aptychi have been recorded until recently. In contrast, aptychi have been found in the closely related subfamily Pseudoperisphinctinae: *Praestriptychus* is associated with the middle Callovian genus

*Binatisphinctes* Buckman (Page, 1991, pl. 24, fig. 6) and with taxonomically close groups of perisphinctid ammonites (Quenstedt, 1886-1887, pl. 82, fig. 15), and ?*Granulaptychus* is associated with the Callovian species "*Perisphinctes*" *desertorum* Steinmann (Trauth, 1930, pl. 5, fig. 1).

The Callovian marine series exposed by the Mikhailovskii open-pit mine has recently been described by many workers (Olfer'ev *et al.*, 1992; Gerasimov *et al.*, 1996; Mitta, 2000). This series is composed of a uniform calcareous clay unit, about 40 m thick, overlying the lacustrine-alluvial deposits of the Arkinskaya Formation (? upper Bathonian) and overlain by coastal clayish sands of the lower Valanginian Bogatishchevo Formation. Callovian deposits with numerous diastems range from the *elatmae* Biohorizon of the *elatmae* Zone to the supposedly upper part of the *coronatum* Zone and contain numerous similarly preserved fossils throughout, except in the uppermost part. Ammonites occurring in clay are most frequently represented by crushed nacreous shells, with the body chamber filled with light gray marl. More or less rounded and eroded molds of these body chambers form accumulations at the erosion levels. The molds of the body chambers of *P. (P.) koenigi* with aptychi come from a diastem at the top of the *gowerianus* Subzone.

Aptychi are described using the terminology and measurements suggested by Khalilov (1978), Kozlova (1999), and Kozlova and Arkadiev (2003) (Fig. 1).

MATERIAL

All material described is housed in the Vernadsky State Geological Museum (GGM), collection no. 571.

SYSTEMATIC PALEONTOLOGY

Genus *Praestriaptychus* Trauth, 1927

*Praestriaptychus* ? *koenigi* Rogov, parasp. nov.

Etymology. From the ammonite species *Proplanulites koenigi* (Sow.), with which these aptychi are associated.

Holotype. GGM, no. 571-2; Kursk Region, open-pit mine of the Mikhailovskii Mining and Concentrating Plant; lower Callovian, *koenigi* Zone, *gowerianus* Subzone.

Description (Fig. 2). Valves are narrow and strongly elongated. The outer and inner surfaces possess thin growth lines. Two layers are distinct: a thick inner layer composed of carbonized organic matrix and a thin calcite outer layer.

Dimensions in mm, ratios in %, and angles in degrees:

Specimen no.	L <sub>1</sub>	L	W	L/L <sub>1</sub>	W/L <sub>1</sub>	T	A
Holotype no. 571-2	23	21.1	10.7	91.7	46.5	60	105

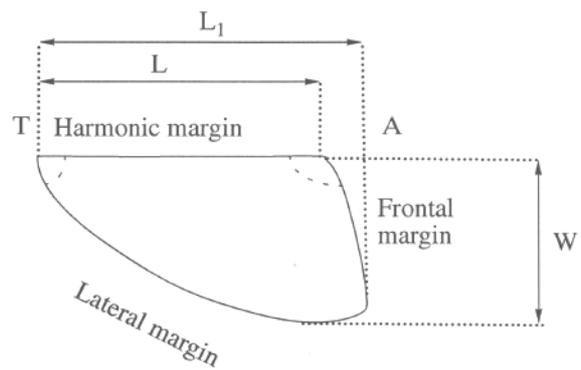


Fig. 1. Measurements used in this paper: (A) apical angle, (T) terminal angle, (W) width, (L) length of the harmonic margin, (L<sub>1</sub>) length of the aptychus.

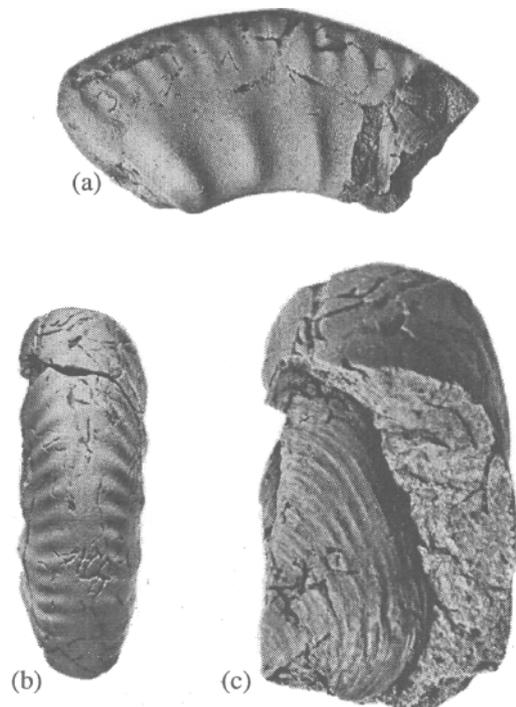


Fig. 2. *Praestriaptychus koenigi* parasp. nov. (a) specimen GGM, no. 571-1, fragment of an aptychus in the body chamber of *Proplanulites koenigi* (Sow.), x2; (b, c) holotype GGM, no. 571-2, body chamber of *Proplanulites koenigi* (Sow.), in which *Praestriaptychus* ? *koenigi* was found, ventral view, x1; (c) aptychus of *Praestriaptychus koenigi*, x2; Kursk Region, open-pit mine of the Mikhailovskii Mining and Concentrating Plant; Lower Callovian, *koenigi* Zone, *gowerianus* Subzone.

Comparison. The aptychi described are most closely similar to the middle-upper Callovian *Laevilmellaptychus xestus* (Trauth, 1930, pl. 3, fig. 3; pl. 4, fig. 7), the species that shows the least porosity of the outer layer compared to other species, and to the middle Callovian aptychi depicted by Lahusen (1883, pl. 11,

fig. 20), which were referred by Trauth (1930) to *Cornaptychus*. Gasiorowski (1962) suggested that these aptychi should be assigned either to *Praestriaptychus* or to *Granulaptychus*, most probably, they belong to the new species of the genus *Praestriaptychus*. The species described is distinguished from all *Praestriaptychus* species in its elongated shape.

Occurrence. Lower Callovian, *koenigi* Zone, *gowerianus* Subzone; Kursk Region.

Remarks. Because of the presence of a noticeable outer calcite layer, and the absence of ornamentation, the aptychi described should most likely be assigned to the genus *Praestriaptychus*, but in their elongated shape they resemble *Cornaptychus* and *Laevilamellaptychus*. The latter two genera are usually considered to belong to the ammonites of the suborders Ammonitina and Haplocerina. The assignment of some Carboniferous and Permian aptychi to *Cornaptychus* is doubtful; most probably they should be recognized as a separate genus (Harper, 1989). The characteristic features of *Cornaptychus* include a smooth shiny surface and a very thin calcite layer. However, both these characters can be related to the state of preservation rather to the original structure of the aptychus. *Cornaptychus* was found in the body chambers of *Leioceras* (Trauth, 1930, pl. 3, fig. 16), *Harpoceras* (Lehman, 1972, pl. 9, figs. 2,4; Hirano *et al.*, 1990) and *Sonninia* (Morton, 1973). Theories concerning the presence of these aptychi in Callovian representatives of Hecticeratinae are doubtful because they are based on the association *Aptychus hectici*-*Ammonites hectici*, while the ammonites containing *Aptychus hectici* in their body chambers (Quenstedt, 1886-1887, pl. 82, fig. 51; Trauth, 1930, pl. 3, fig. 5) belong to the suborder Perisphinctina. Only one of the ammonites with *Cornaptychus* depicted by Quenstedt (1849, pl. 8, fig. 10) may be assigned to Hecticeratina. *Laevilamellaptychus*, which is similar in shape to *Cornaptychus*, is distinguished from the latter by pores on the outer (convex) side.

Aptychi of most Middle Jurassic Perisphinctina have approximately equal length-to-width ratios. *P. ? koenigi* apparently represents the earliest aptychi of Perisphinctina, in which the length considerably exceeds the width. In the Jurassic these ammonites mostly had relatively wide aptychi, but from the early Callovian onward, many groups with narrow aptychi appeared. Although rare, they were permanently present in assemblages. Similar aptychi, but with a noticeable depression near the connecting margin, were depicted from the middle-upper Callovian of England by Phillips (1935, p. 109, pl. 5, fig. 8). In addition, narrow *Praestriaptychus* are known from the Oxfordian (Kulicki and Wierzbowski, 1983, pl. 8, fig. 1) and lower Tithonian (Schweigert and Dietl, 1999, pl. 2, fig. 5). Similar forms are also found in the middle Volgian *panderi* Zone. Apparently this case represents parallel evolution, because the ammonites associated with narrow *Praestriaptychus* are not phylogenetically related. Sup-

posedly, the aptychi of all Proplanulitinae are similar to those described above. Therefore, the geographic and stratigraphic distribution of these aptychi should be the same as in Proplanulitinae (see above). The species containing the above aptychi is known from the *gowerianus* Subzone of the *koenigi* Zone and is widespread within the Boreal-Atlantic Paleobiogeographic Realm. Material. Two well-preserved specimens (571-1 and 571-2) from the type locality.

## REFERENCES

- Callomon, J.H., The Ammonite Succession in the Middle Jurassic of East Greenland, *Bull. Geol. Soc. Denmark*, 1993, vol. 40, pp. 83-113.
- Gasiorowski, S.M., Aptychi from the Dogger, Malm, and Neocomian in the Western Carpathians and Their Stratigraphical Value, *Stud. Geol. Pol.*, 1962, vol. 8, pp. 1-134.
- Gerassimov, P.A., Mitta, V.V., Kochanova, M.D., and Tesakova, E.M., *Iskopaemye kelloveiskogo yarusa Tsentral'noi Rossii* (Fossils of the Callovian Stage of Central Russia), Moscow: VNIGNI-MosGorSYuN, 1996.
- Gulyaev, D.B., New Ammonites of the Subfamily Proplanulitinae Buckman from the Upper Lower Callovian of Central Russia, *Paleontol. Zh.*, 2001, no. 1, pp. 21-24.
- Harper, J.A., Occurrence of a Cephalopod Aptychi in the Ames Limestone (Virgilian) of Western Pennsylvania, *J. Paleontol.*, 1989, vol. 63, no. 1, pp. 119-121.
- Hirano, H., Fukuda, Y., and Sekiya, R., Microstructure of Some Jurassic Ammonoid (Hildoceratid) Jaw Plates, *Bull. Sci. Engin. Lab. Waseda Univ.*, 1990, no. 128, pp. 28-42.
- Khalilov, A.G., Lower Cretaceous Aptychi of the Greater Caucasus (Azerbaijani Portion), *Izv. Akad. Nauk Azerb. SSR, Ser. Nauki o Zemle*, 1978, no. 5, pp. 49-59.
- Kiselev, D.N., Zony, podzony i biogorizonty srednego kelloveya Tsentral'noi Rossii (Zones, Subzones, and Biohorizons of the Middle Callovian of Central Russia), Yaroslavl: Yaroslavsk. Gos. Pedagog. Univ., 2001 (Spets. Vyp. Tr. EGF YaGPU, no. 1).
- Kozlova, N.V., Aptychi of the Tithonian-Berriasian Deposits of the Crimean Mountains, in *Sb. Tr. Molodykh Uchenykh SPbGGI* (Collection of Pap. of Young Scientists of SPbGGI), SPbGGI, issue 5, St. Petersburg: SPbGGI, 1999, pp. 19-23.
- Kozlova, N.V. and Arkad'ev, V.V., Tithonian-Lower Cretaceous Aptychi (Ammonoidea) of the Crimean Mountains, *Paleontol. Zh.*, 2003, no. 4, pp. 36-44.
- Kulicki, C. and Wierzbowski, A., The Jurassic Juvenile Ammonites of the Jagua Formation, Cuba, *Acta Palaeontol. Polon.*, 1983, vol. 28, nos. 3-4, pp. 369-385.
- Lahusen, I., The Fauna of the Jurassic Formations of Ryazan Province, *Tr. Geol. Kom.*, 1883, vol. 1, no. 1, pp. 1-94.
- Lehmann, U., Aptychen als Kieferelemente der Ammoniten, *Paläontol. Z.*, 1972, vol. 46, nos. 1-2, pp. 34-48.
- Mitta, V.V., *Ammonity i biostratigrafiya nizhnego kelloveya Russkoi platformy* (Ammonites and Biostratigraphy of the Lower Callovian of the Russian Platform), Moscow: Vsesoyuz. Nauchno-Issled. Geologorazved. Inst. (Byull. KF VNIGNI; no. 3).
- Morton, N., The Aptychi of *Sonninia* (Ammonitina) from the Bajocian of Scotland, *Palaeontology* (London), 1973, vol. 16, part 1, pp. 195-204.

- Nikitin, S., Die Cephalopodenfauna der Jurabildungen des Gouvernements Kostroma, *Zap. Imp. S.-Peterb. Mineral. O-va*, Ser. 2, 1884, part 20, pp. 13-89.
- Nikitin, S.N., The General Geologic Map of Russia, Sheet 71: Kostroma, Makar'ev, Chukhloma, Lyubim, *Tr. Geol. Kom.*, 1885, vol. 2, no. 1, pp. 1-218.
- Olfer'ev, A.G., Meledina, S.V., and Azbel', A.Ya., New Data on the Stratigraphy of the Callovian of the Shchigry Arch of the Voronezh Anteclise, *Geologicheskaya istoriya Arktiki v mezozoe i kainozoe. Kniga 1* (Geological History of the Arctic in the Mesozoic and Cenozoic: Book 1), St. Petersburg: Vses. Nauchno-Issled. Inst. Okeangeol., 1992, pp. 49-59.
- Page, K.N., Ammonites, *Fossils of the Oxford Clay*, Martill, D.M. and Hudson, J.D., Eds., London: Palaeontol. Assoc., 1991, pp. 87-143.
- Phillips, J., *Illustrations of the Geology of Yorkshire; or, a Description of the Strata and Organic Remains: 1. The Yorkshire Coast*, London: Murray, 1835, XVI + 192 p.
- Quenstedt, F.A., *Petrefaktenkunde Deutschlands. Die Cephalopoden*, Tübingen: F. Fues, 1845-1849.
- Quenstedt, F.A., *Die Ammoniten des Schwäbischen Jura*, vol. 2: *Der Braune Jura*, Stuttgart: Schweizerbart, 1886-1887, pp. 441-815.
- Repin, Yu.S. and Rashvan, N.Kh., *Kelloveiskie ammonify Saratovskogo Povolzh'ya i Mangyshlaka* (Callovian Ammonites of the Saratov Portion of the Volga Region and the Mangyshlak Peninsula), St. Petersburg: Mir i sem'ya-95, 1996.
- Schweigert, G. and Dietl, G., Zur Erhaltung und Einbettung von Ammoniten im Nusplinger Plattenkalk (Oberjura, Süddeutschland), *Stuttg. Beitr. Naturk., Ser. B*, 1999, no. 272, pp. 1-31.
- Trauth, F., Aptychenstudien: 1. Über die Aptychen im Allgemeinen, *Ann. Naturhist. Mus. Wien*, 1927, vol. 41, pp. 171-259.
- Trauth, E., Aptychenstudien: 5. Die Aptychen des Dogger, *Ann. Naturhist. Mus. Wien*, 1930, vol. 44, pp. 315-405.
- Westermann, G.E.G., Global Bio-Events in Mid-Jurassic Ammonites Controlled by Seaways, in *The Ammonoidea: Environment, Ecology, and Evolutionary Change*, Oxford: Clarendon, 1993, pp. 187-226 (Syst. Assoc. Spec., vol. 47).