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A New Shark Species of the Genus *Galeorhinus* (Chondrichthyes, Triakidae) from the Cenomanian of the Lower Volga River Basin

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Abstract—A new shark species *Galeorhinus glickmani* sp. nov. (Carcharhiniformes, Triakidae) from the Upper Cenomanian (Upper Cretaceous) of Saratov is described. Teeth of similar morphology (*"Corax jaekeli"*, *Paracorax unilateralis*) from the Santonian and Campanian of Lithuania, Russia, and Kazakhstan are conditionally referred to the genus *Galeorhinus* Blainville, 1816.

INTRODUCTION

The Cenomanian deposits of the Saratov Region in the Volga River Basin have long been distinguished by numerous parts of fossil chondrichthyan fishes (sharks, batoids and chimaeroids). The first shark teeth were collected here at the end of the nineteenth century (Sinzow, 1872). Most of the remains originated from the top of the Cenomanian sands in the vicinity of Saratov. Later shark remains were collected and systematically studied by Glickman (1953, 1957, 1958, 1980, etc.). However, Glickman's studies covered almost no microremains, usually not exceeding 1–2 mm wide (from small sharks and batoids). Extensive collecting of shark teeth in this area started by the authors of the present paper from the beginning of the 1990s revealed the presence of small shark microremains in the Cenomanian oryctocomplexes. These collections include, beside others, the teeth of the carcharhiniform sharks that are relatively scarce in the Cretaceous deposits.

MATERIAL

Two teeth assigned here to a new species of the family Triakidae *Galeorhinus glickmani* sp. nov. are the first find of carcharhiniforms in the Cenomanian of the Lower Volga area.

According to our information, there are seven chondrichthyan teeth localities in the Cenomanian in the outskirts of Saratov. One of them, the locality "Saratov-1a. Zavokzal'noye Canyon" is situated 900 m west from the railroad station (Saratov-1) in the lower part of the eastern slope of the Lysaya Hill. This is a small recultivated sand pit with a cone-like remainder in its central part. The uppermost Cenomanian and the overlaying Santonian deposits outcrop here. Teeth of the triakids *Galeorhinus glickmani* sp. nov. were found in the lens-like phosphorite bed ("c" by Arkhangelsky, 1911 (in 1952); "Bed 12" by Milanovsky, 1940) referred to the Upper Cenomanian (Ivanov, 1995) and situated 1.5–1.7 m lower from the Lower Santonian "sponge horizon." This layer also yielded chondrichthyan teeth, tooth plates, spiral coprolites, placoid scales and fin spines as well as actinopterygian scales, numerous scales and thin bones of the teleosts, vertebra and bone fragments of marine reptiles: plesiosaurs, turtles and ?crocodiles and scanty invertebrates. Phosphatized wood pieces are only rarely found. Invertebrates include the nuclei of the bivalve *Inoceramus* sp. and the gastropod molluscs *Margarites* sp., *Avellana* sp., *Haustator* sp., *Solariella sobetskii* Plamadiola, *Ascensovoluta (?)* sp., brachiopods *Terebratulina (?)* sp. and the remains of the crustaceans (?)"Scalpellum" (invertebrates identified by A.V. Ivanov, Scientific Research Geological Institute, Saratov State University). Chondrichthyan remains include *Notidanodon* sp., *Squalus* sp., *Eostriatolamia subulata* (Agassiz) (dominant species), *Cretolamna appendiculata* (Agassiz), *Cretoxyrhina denticulata* Glückman, *Pseudoisurus tomosus* Glückman, *Leptostyrax* sp., *Johnlongia* sp. 1, *J.* sp. 2, *Palaeoanacorax obliquus* (Reuss), *Paraorthacodus recurvus* (Trautschold), *Synechodus dispar* (Reuss), *Heterodontus canaliculatus* (Egerton), *Squatina* sp., *Cederstroemia* sp., *Ptychodus latissimus* Agassiz, *P. decurrens* Agassiz, *Polyacrodus* sp., *Squatirhina* sp., *Turoniabatis* sp. (identifications by one of the authors—E.V.P. and Dr. M. Siverson, Sweden), tooth plates of the chimaeroids *"Ganodus" kiprijanoffi* Nessov, *Ischyodus* sp., *Edaphodon* sp.

In order to study the histology, a cross section of a least preserved tooth was made (specimen SGU no. 155/2). Polished section revealed a typically orthodentine structure, namely the presence of a well defined pulp cavity. This was one of the reasons why the material was referred to the order Carcharhiniformes.

The described teeth are housed in the Saratov State University, Paleontology Department, collection no. 155. Tooth terminology is used according to Cappetta (1987).

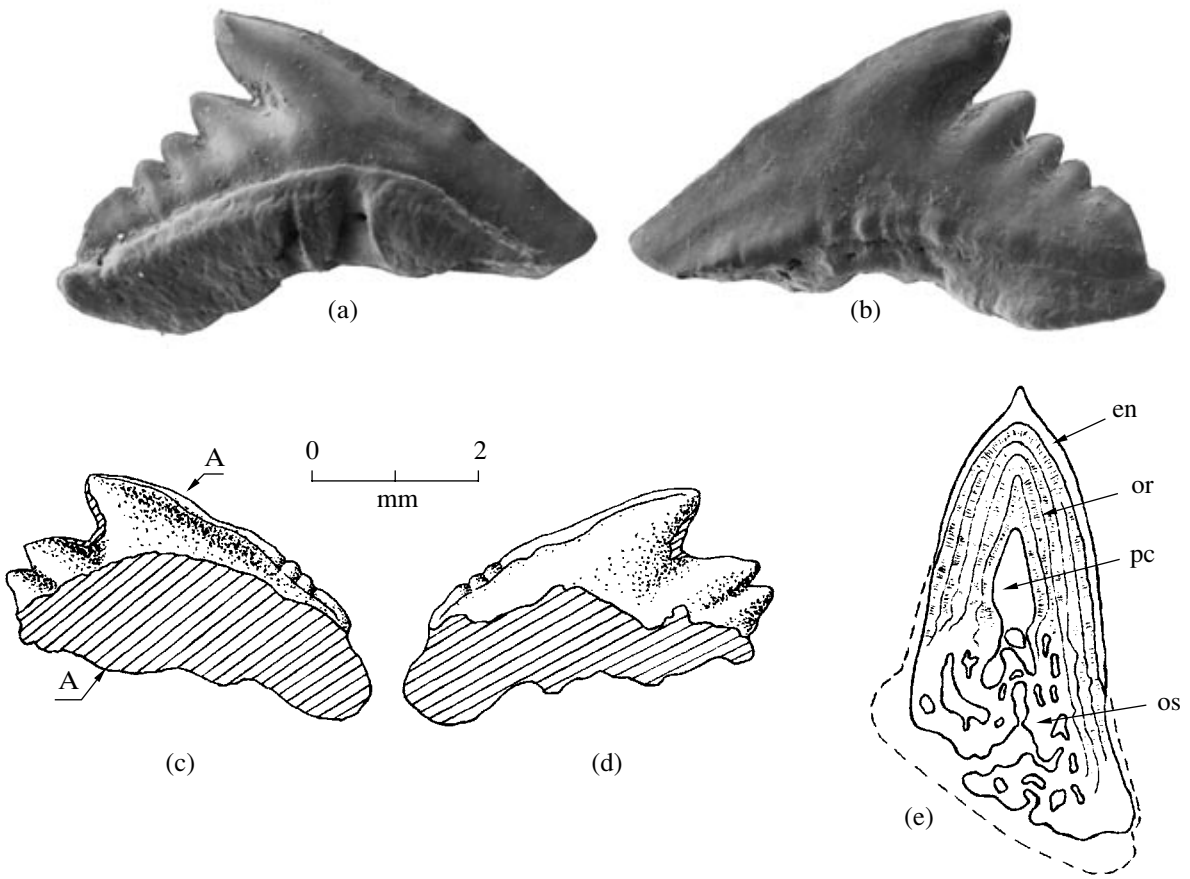

Fig. 1. Left (?)lower lateral teeth of *Galeorhinus glickmani* sp. nov., ×14; (a) and (b) holotype SGU no. 155/1; (a) lingually, (b) labially; (c)–(e) paratype SGU no. 155/2, (c) lingually, (d) labially, (e) polished section through line AA, magnified. Broken surfaces dashed. Designations: en—enamel; or—orthodentine; pc—pulp cavity; os—osteodentine.

SYSTEMATIC PALEONTOLOGY

Order Carcharhiniformes

Family Triakidae Gray, 1851

Genus *Galeorhinus* Blainville, 1816

***Galeorhinus glickmani* Popov, sp. nov.**

Etymology. After paleoichthyologist L.S. Glickman.

Holotype. SGU, no. 155/1, incomplete left (?) lower lateral tooth; Volga region, Saratov, Lysaya Hill, locality "Saratov-1a. Zavokzal'noye canyon"; Upper Cretaceous, Upper Cenomanian.

Referred material. Paratype SGU, no. 155/2, incomplete left (?) lower lateral tooth; Volga region, Saratov, Lysaya Hill, locality "Saratov-1a. Zavokzal'noye canyon"; Upper Cretaceous, Upper Cenomanian.

Description (Figs. 1a and 1b). The holotype crown is swollen in the middle. The mesial cutting edge of the principal cusp is slightly arched. Labially the basal part of the crown is concave, it overlaps the root substantially in its middle. More distally there is no overlap. Labially the basal part of the crown surface is puckered; this sculpturing is concentrated in the central part of the crown, where it overlaps the root. There are no mesial crown cusplets. Four distal cusplets gradually decrease in size towards the rear. The principal cusp slants distally, it is only slightly larger than the first distal cusplet. The cusplets and the principal cusp are hardly separated from each other. The cutting edge runs along the principal cusp and lateral cusplets to the root margin. Lingually the crown is smooth. The tooth neck is not expressed.

The root is low, slightly arched, the medial part of the root is damaged. The basal root surface is flat and faces lingually. From the lingual side the root projects behind the crown. Labially the root is low. The vascularization system belongs to the holoaulacorhizid type (sensu Hovestadt and Hovestadt-Euler, 1993). Two nutrient furrows are placed in the middle part of the root lingually, the mesial one is wider, it runs almost to the boundary between the root and the crown, the distal one is narrower and less stretched lingually. One nutrient foramen occurs in each nutrient furrow. A row of nutrient foramina is placed along the root and crown boundary from the lingual side mesially and distally.

Labially four-five nutrient foramina are concentrated in the middle part of the root below the crown projection. Several smaller nutrient foramina are situated at the distal lobe of the root close to its contact with the crown.

The paratype SGU no. 155/2 (Figs. 1c and 1d) is more poorly preserved. The mesial cutting edge of the principal cusp is slightly arched and serrated basally. Two distal cusplets that are hardly separated from each other and from the principal cusp are present.

Measurements, mm:

	Specimen no.	Width	Depth
Holotype	SGU no. 155/1	5.1	3.1
Paratype	SGU no. 155/2	4.6	3

Comparison. The new species differs from the extant type species of the genus *Galeorhinus galeus* (Linnaeus) (Herman *et al.*, 1988) by the presence of crown labial surface ornamentation and a smaller number of distal cusplets (up to eight in *G. galeus*). From *G. girardoti* Herman from the Campanian–Maastrichtian of Belgium (Herman, 1977; Cappetta, 1987) the new species differs by the presence of enameloid puckering in the basal part of the labial surface of the crown and absence of striations. From both species the new one differs by the more expressed arched construction of the root and presence of two poorly expressed nutrient furrows.

From *?Galeorhinus unilateralis* from the Upper Santonian of the Penza Region and Campanian of Lithuania (Dalinkevičius, 1935, pl. 4, fig. 8; Averianov, 1997, text-figs. 1 and 2) and *"Corax jaekeli"*, which may actually turn out to be a *Galeorhinus* (see above) from the Upper Campanian of Kazakhstan (Tyk-Butak River, Primugodzharye) (Glickman, 1980, pl. 31, fig. 19), the new species differs by a less arched shape of the root, presence of enameloid puckering at the basal part of the lingual surface of the crown, and presence of two nutrient furrows at the root. Apart from this, it differs from the latter species by a smaller separation of the side crown cusplets from each other and the principal cusp, absence of clear serration of the medial part of the crown and considerably smaller size.

Remarks. The new species is close to the type species of other genera of recent triakid sharks: *Hypogaleus* Smith, 1957 and *Hemytriakis* Herre, 1923 comparing in the reduced number (up to 3–4) distal cusplets of the crown (Herman *et al.*, 1988).

Material. Holotype and paratype SGU, no. 155/2, incomplete left (?) lower lateral tooth from the type locality. Collected by A.V. L. in 1996.

DISCUSSION

The teeth under description were related to the genus *Galeorhinus* of the family Triakidae based upon a combination of the following characters: small, less than 5 mm height, distally slanting principal cusp bears a long mesial cutting edge, distal crown cusplets decrease in size distally, the crown slightly overlaps the root labially, the latter is wide, its lobes separated by a nutrient groove, are hardly seoarated and bent.

In their general morphology these teeth are very similar to those referred to different taxa (*"Corax jaekeli"* and *Paracorax unilateralis*) described from the territory of the former USSR (Dalinkevičius, 1935; Glickman, 1980; Averianov, 1997) and earlier classed with the family Anacoracidae (order Lamniformes).

Paracorax unilateralis and *"Corax jaekeli"* are close both morphologically and in their functional construction to the teeth of the Cretaceous triakids (*Galeorhinus girardoti*, *G. glickmani* sp. nov.) and significantly differ from specialized teeth of the type species of the genus *Paracorax* Cappetta, 1977—*P. jaekeli* (Woodward). Insufficient material and absence of histological data make more definitive conclusions on their generic status difficult. These forms are here tentatively assigned to the genus *Galeorhinus* Blainville, 1816.

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REFERENCES

Arkhangelsky, A.D., Upper Cretaceous Deposits of the East of European Russia, *Izbrannye Trudy* (Selected Papers), Moscow: Akad. Nauk SSSR, 1952, vol. 1, pp. 133–466.

Averianov, A.O., Additions to the Selachian Fauna of the Russian Cretaceous. 2. A New Species of *Paracorax* Cappetta, 1977 (Chondrichthyes: Anacoracidae), *Zoosistematica Rossica*, 1996, vol. 6, no. 1/2, pp. 315–316.

Capetta, H., *Chondrichthyes II, Mesozoic and Cenozoic Elasmobranchii*, vol. 3B of *Handbook of Paleoichthyology*, Stuttgart, New York: Gustav Fischer Verlag, 1987.

Dalinkevičius, J.A., On the Fossil Fishes of the Lithuanian Chalk. I. Selachii, *Vyt. Didz. Univ. Mat. Gamt. Fak. Darbai*, 1935, vol. 9, pp. 1–63.

Glickman, L.S., Upper Cretaceous Vertebrates from the Vicinity of Saratov, *Uch. Zap. Sarat. Univ.*, 1953, vol. 38, pp. 51–54.

Glickman, L.S., On the Genetic Relationships of the Families Lamnidae and Odontaspididae and New Genera of the Upper Cretaceous Lamnids, in *Tr. Geol. Mus. A.N. Karpinskogo, AN SSSR*, 1957, no. 1, pp. 110–117.

Glickman, L.S., On the Rates of the Evolution of Lamnoid Sharks, *Dokl. Akad. Nauk SSSR*, 1958, vol. 11, pp. 568–571.

Glickman, L.S., *Evolyutsiya melovykh i kainozoiskikh lamnoidnykh akul* (Cretaceous and Cenozoic Lamnoid Sharks Evolution), Moscow: Nauka, 1980.

Herman, J., Les sélaciens des terrains neocréacés et paléocenes de Belgique et des contrées limitrophes. Eléments d'une biostratigraphie intercontinentale, *Mem. Expl. Cartes Géol. Miner. Belgique, Sér. Géol.,* 1977, no. 15, pp. 1–450.

Herman, J., Hovestadt-Euler, M., and Hovestadt, D.C., Contributions to the Comparative Morphology of Teeth and Other Relevant Ichthyodorulites in Living Supraspecific Taxa of Chondrichthyan Fishes. Part A: Selachii No. 2a. Order: Carcharhiniformes, Family Triakidae, *Bull. Inst. Roy. Sci. Natur. Belg. Biologie*, 1988, vol. 58, pp. 99–126.

Hovestadt, D.C. and Hovestadt-Euler, M., The Vascularization System in Teeth of Selachii, *Belg. Geol. Surv., Professional Papers, Elasmobranchii et Stratigraphie*, 1993, vol. 264, pp. 241–258.

Ivanov, A.V., *Marinakulaty—problematichnyi novyi tip zhivotnykh iz mela i paleogena Rossii* (Marinaculates—a Problematic New Type of Animals from the Cretaceous and Paleogene of Russia), Saratov: GosUNTs "College", 1995.

Milanovsky, E.V., *Ocherk geologii Srednego i Nizhnego Povolzhya* (Essay on the Geology of the Middle and Lower Volga Regions), Moscow–Leningrad: Gostoptekhizdat, 1940.

Sinzow, I.F., On the Jurassic and Cretaceous Fossils of the Saratov Gouvernement, *Materialy po geologii Rossii*, 1872, vol. 4, pp. 1–128.