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The First Discovery of an Anglerfish (Teleostei, Lophiidae) in the Eocene of the Northern Caucasus

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Abstract—A new genus and species of anglerfish (Lophiidae), *Eosladenia caucasica* gen. et sp. nov., is described based upon a complete partly disarticulated skeleton from the Middle Eocene (Bartonian, Kuma Regional Stage) of the northern Caucasus (Gornyi Luch locality). This is the first finding of a fossil anglerfish in Russia.

Key words: Lophiidae, anglerfish, new taxa, Middle Eocene, northern Caucasus, Russia.

INTRODUCTION

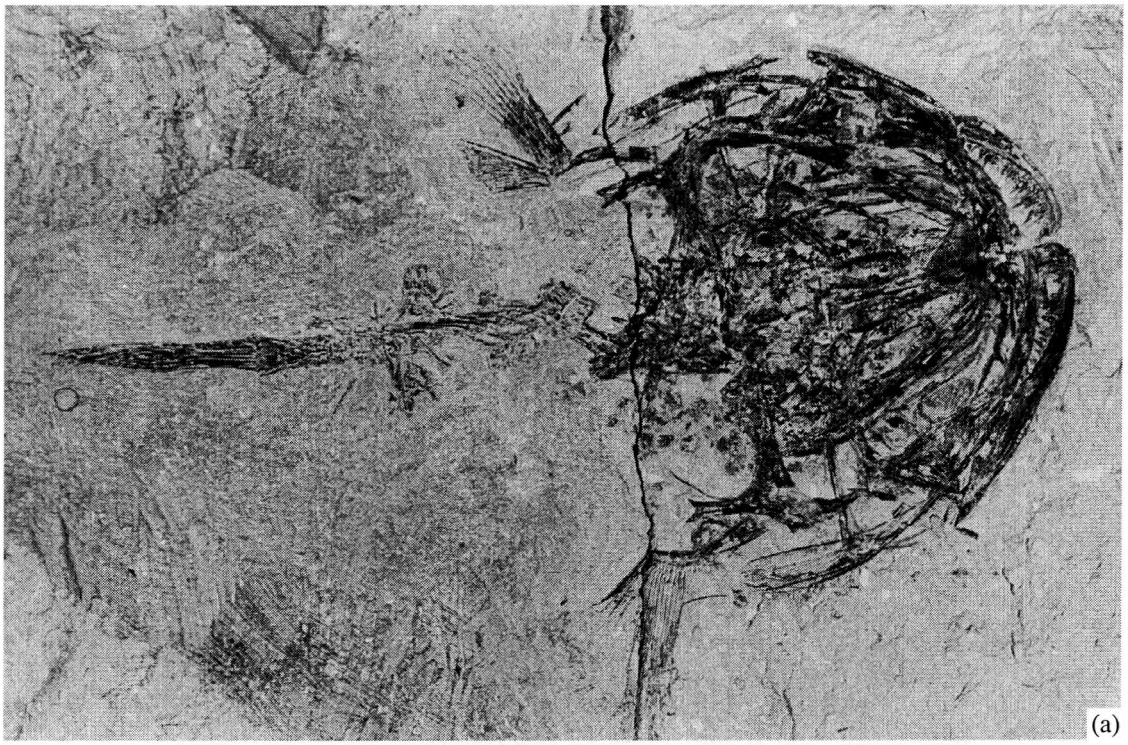
The anglerfish family Lophiidae (Paracanthopterygii) is represented in the Recent fauna by four genera and at least 25 species, according to the revision of this family undertaken by Caruso (Caruso and Bullis, 1976; Caruso, 1981, 1983). Anglerfishes dwell at the bottom, habitually, at significant depths in the tropical and moderately warm waters of the Atlantic, Indian, and Pacific oceans. Fossil anglerfish records—especially in the form of articulated skeletons—are very rare. The earliest anglerfish was described from the Middle Eocene (lowermost Lutetian) of northern Italy (Bolca locality) as *Lophius brachysomus* (Agassiz, 1833–1844; Zigno, 1874). Based on the relatively small number of vertebrae in this species, Arambourg (1927) placed it close to *Lophiomus* Gill rather than *Lophius* L. Arambourg (1921, 1927) described the extant species *Lophius budegassa* Spinola, 1809 based on several poorly preserved specimens from the Upper Miocene of Algeria (Oran).

Fragmentary remains of fossil fish were repeatedly identified as belonging to the Lophiidae. The genus *Trichiurides* Winkler—established for isolated fish teeth from the Cenozoic of Belgium (Winkler, 1874)—was reduced by Leriche (1906) to a synonym of *Lophius*, and the teeth of *Lophius* (= *Trichiurides*) *orpiensis* Leriche and *L.* (= *T.*) *sagittidens* (Winkler) were considered to come from the Paleocene and Eocene of Belgium, respectively (Leriche, 1906). The species *L. dolloi* was described (Leriche, 1908, 1910) based on cranial fragments from the Oligocene of Belgium. Jaw fragments from the Pliocene of Orciano (Toscana, Italy) were identified as belonging to the Eocene species *Lophius brachysomus* Agassiz (Lawley, 1875, 1876) or to the living *L. piscatorius* L. (de Stefano, 1910). The Lophiidae have been mentioned twice from the United States: several jaw and palatal bones and vertebrae from the Pliocene (Zanclian) of the Lee Creek Mine (North Carolina) were identified as *Lophius* cf. *L. americanus* Valenciennes (Purdy *et al.*, 2001), and a dentary fragment and a scapulocoracoid from the Pleistocene of Virginia were determined to only family rank (Ray *et al.*, 1968). Nolf (1985) reported two Lophiidae species based on otoliths: *Lophius crenulatus* (Frost) from the Upper Eocene of England and the "genus *Lophiidarum*" *gibbosus* Nolf from the Oligocene of Belgium.

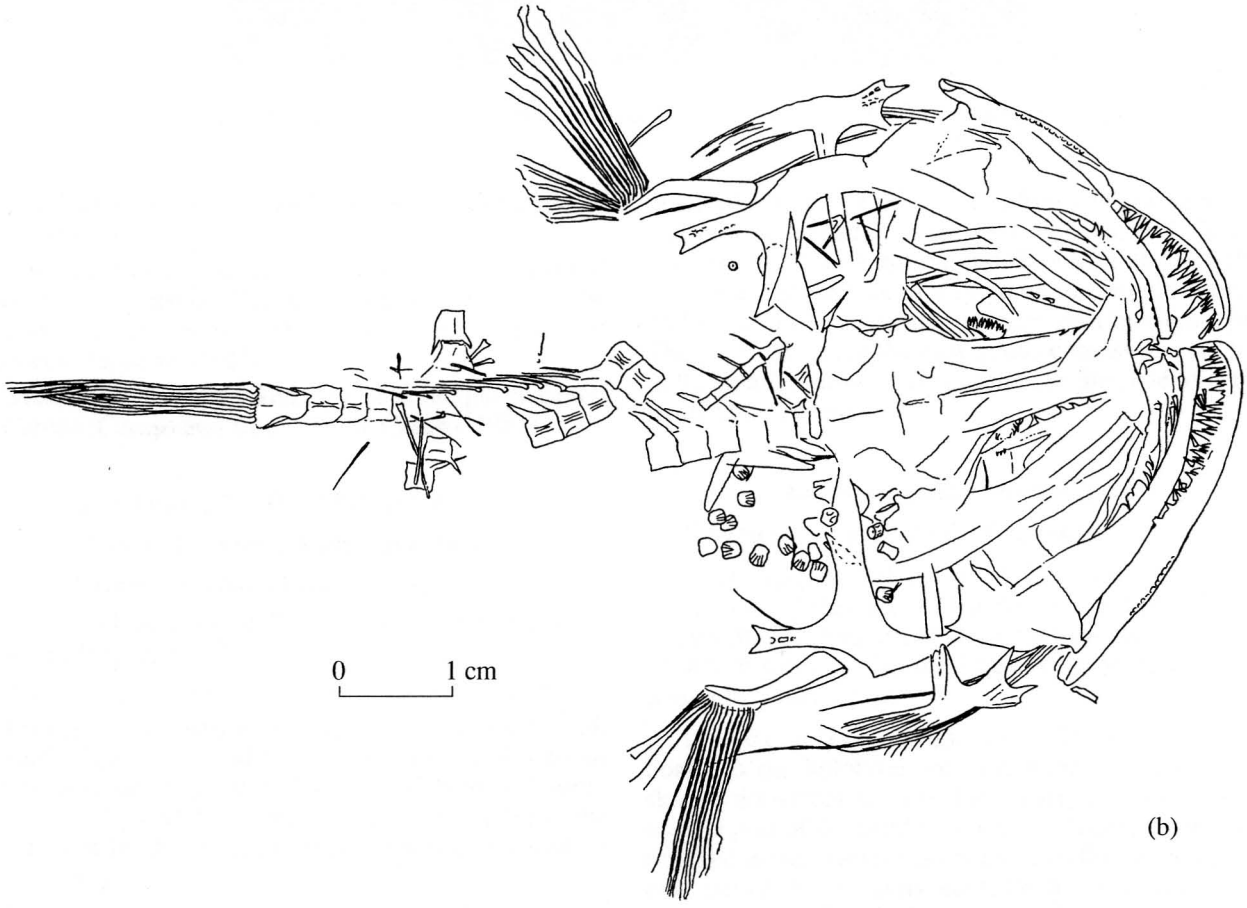
MATERIAL AND METHODS

A complete, partially disarticulated anglerfish skeleton was recently found in the Middle Eocene (Bartonian, Kuma Regional Stage) northern Caucasian locality near the Gornyi Luch farm in Krasnodar Region. This teleost locality, which has been regularly investigated by the author since 1990, is characterized by a rich marine ichthyofauna (Bannikov and Parin, 1997; Bannikov, 2004; and others) dominated by pelagic taxa. Bottom-dwelling fishes are extremely scarce in the Gornyi Luch Assemblage (Bannikov, 1997), since the bottom environment of the Kuma Basin was likely anaerobic. In connection to this, the Lophiidae find is of definitely interest. The anglerfish spend the larger part of their lifetime hiding at the bottom, only occasionally rising up into the water mass (Makushok, 1971). Apparently, it was such a rise of an Eocene anglerfish that resulted in its moving into the anaerobic zone at the bottom and subsequent burial.

The Middle Eocene anglerfish in question has 20 (21?) vertebrae. This excludes the possibility of assigning it to the genus *Lophius*, which is characterized by 26–31 vertebrae (Caruso, 1983). The other three genera of the extant Lophiidae have 19 vertebrae. The Caucasian anglerfish differs from two of these—*Lophiomus* Gill and *Lophiodes* Goode et Bean—in the absence of an angulo-articular spine. The available osteological characters of the Middle Eocene anglerfish are most similar to those of the fourth extant lophiid genus, *Sladenia* Regan, mostly differing in the some-



(a)



(b)

Fig. 1. *Eosladenia caucasica* sp. nov., holotype PIN, no. 4425-72: (a) general appearance, ×1.25, and (b) drawing.

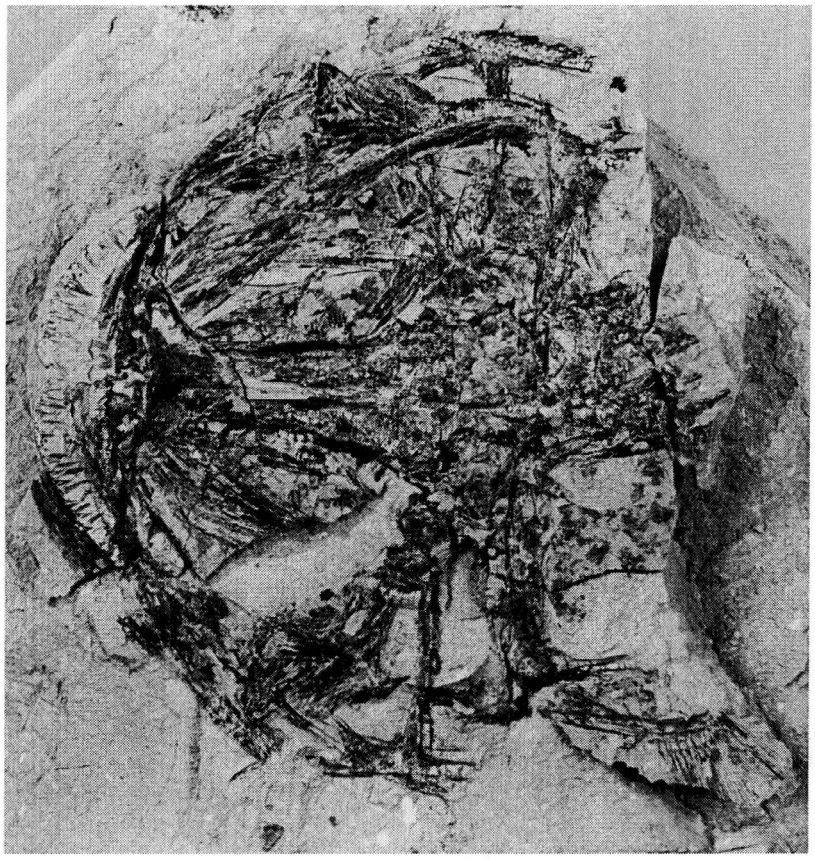


Fig. 2. *Eosladenia caucasica* sp. nov., holotype PIN, no. 4425-72, ×1.8: skull counterpart.

what larger number of vertebrae and the presence of humeral spines.

The new Eocene genus is the first record of a fossil anglerfish in Russia. The specimen is housed at the Paleontological Institute of the Russian Academy of Sciences, Moscow (PIN).

Measurements were taken using a technique proposed by Caruso (Caruso and Bullis, 1976; Caruso, 1981).

SYSTEMATIC PALEONTOLOGY

Family Lophiidae Rafinesque, 1810

Genus *Eosladenia* Bannikov, gen. nov.

Etymology. From *Eocene* and the generic name *Sladenia* Regan, 1908.

Type species. *Eosladenia caucasica* sp. nov.

Diagnosis. Anglerfish with large flattened head. Frontal ridge with small transverse crests and without spines. Angulo-articular lacking spine. Humeral spine and 20 or 21 vertebrae present. Soft dorsal fin composed of at least nine rays. Pectoral fins consisting of about 17 rays.

Species composition. Type species.

Comparison. The new genus differs from the extant lophiid genera in the presence of 20 (21?) vertebrae, which is less than in *Lophius* (26–31 vertebrae) and more than in *Lophiomus*, *Lophiodes*, and *Sladenia* (19 vertebrae). In addition, it differs from the first three genera in the absence of a spine on the angulo-articular and from *Sladenia* in the presence of a humeral spine. The pectoral fins of the new genus consist of a substantially smaller number of rays than in the case of *Lophiomus* and *Lophius*.

Eosladenia caucasica Bannikov, sp. nov.

Etymology. From the Caucasus.

Holotype. PIN, no. 4425-72, complete, partially disarticulated skeleton with a skull counterpart; Russia, Krasnodar Region, left bank of the Pshekha River 1 km upstream from the Gornyi Luch farm; Middle Eocene, Kuma Regional Stage.

Description (Figs. 1–3). Most of the skull bones in the holotype are in natural articulation. The skull is dorsoventrally crushed. Nine vertebrae from the middle part of the axial skeleton are disarticulated. This resulted in the destruction of the anal fin, while the second dorsal fin remains completely preserved and is present *in situ* (Fig. 1). The skull and the anterior part of the trunk are overlain by scales and disarticulated bones of another small fish (probably, a prey to anglerfish).

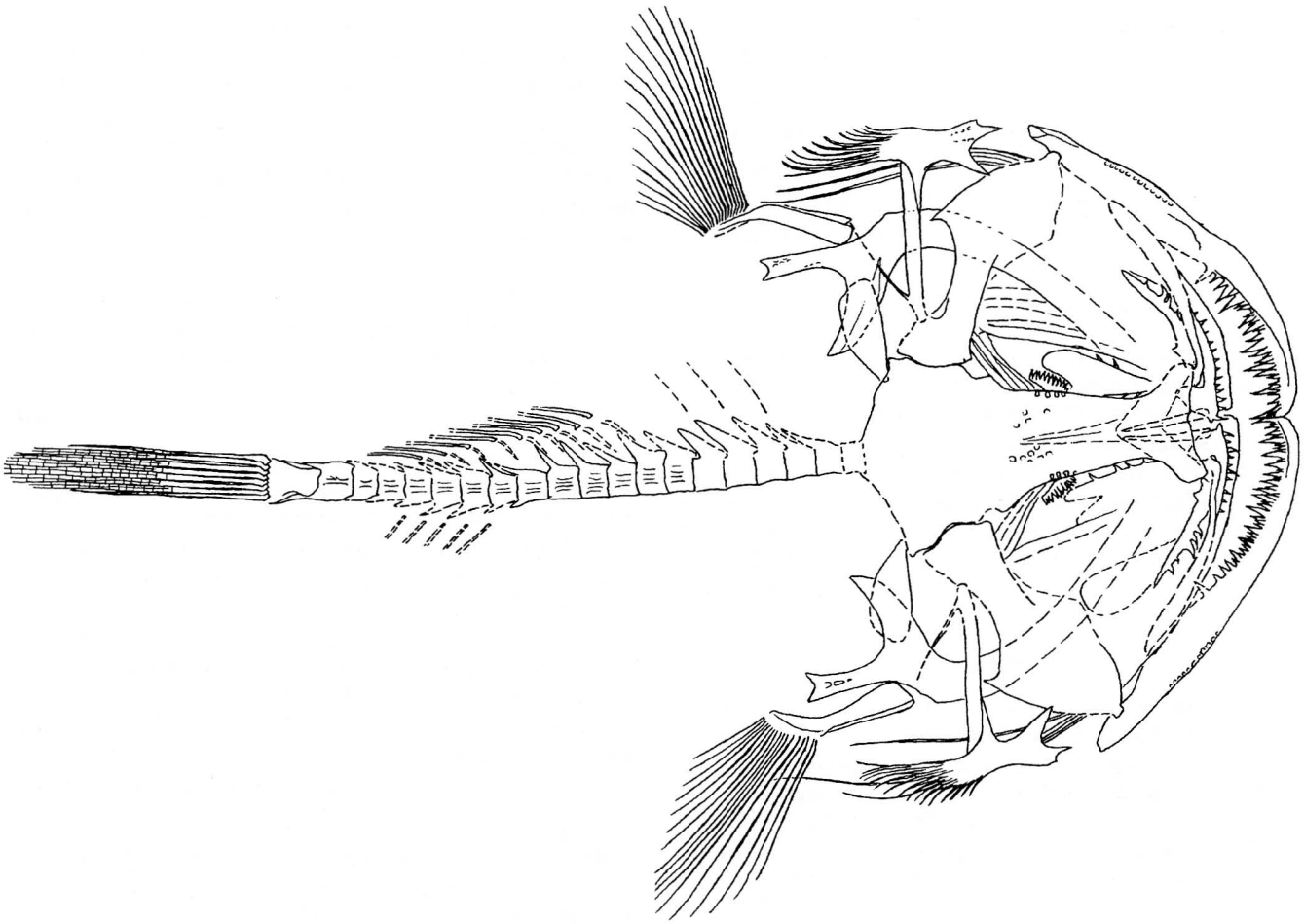


Fig. 3. *Eosladenia caucasica* sp. nov., reconstructed skeleton based on the holotype (PIN, no. 4425-72).

The trunk appears to be rather thin and tapering; the head is large and wide, and the extent to which it is flattened is uncertain. The caudal peduncle is rather short and slender. The head length (after Caruso) is about 38% of the standard body length (SL), and the head width is approximately 1.9 times less than its length.

The neurocranium is elongated and gradually tapers rostrally to the boundary between the frontals and the Lateral ethmoids. Opposite the lateral ethmoids, the neurocranium is almost twice as wide than directly behind them. The sutures between the neurocranial bones are indistinct, and the spines are not preserved. The frontals and many other cranial bones are cancellous, and their crests are mostly smooth and bear several small transverse ridges. The vomer is triangular, and its teeth are not preserved. In the dorsal plane, the hyomandibular is positioned at an angle of 65°–70° to the skull axis. The articular facet of the hyomandibular head is extended and round. The quadrate is large, and its ventral spine is not preserved, while the dorsal spine is well-developed. The ectopterygoid is lamellate, and its posterior edge is rounded. The palatine is elongated and bears pointed and curved teeth, the largest of which are in the middle of the bone. The mouth is very wide and oblique, and the lower jaw strongly protrudes anteriorly in relation to the upper jaw. The bones of the upper jaw are poorly preserved, being superimposed over the hyoids. The premaxilla bears pointed teeth, and its ascending process apparently developed as a separate ossification. The lower jaw length is about 40% of the SL; the jaw is slender, elongated, and moderately arched. The dentary teeth are numerous, pointed, and arranged in two irregular rows. The largest teeth are in the lingual row. The angulo-articular is cancellous, bears a stout retroarticular process, and definitely lacks spines on the external surface. The preopercle and interopercle are indiscernible. The opercle is a narrow and elongated bone. It supports a filamentous process that deviates distally at an acute angle from the posterior edge of the proximal part of the bone. The subopercle is articulated by its pointed proximal process with the anterodistal edge of the opercle. The subopercle is longitudinally extended, its anterior edge terminates in two strong spines, and the posterior edge is

finely fimbriated. It remains uncertain whether or not a lateral spine is present on the subopercle. The ceratohyal and the epihyal form a large, narrow bar that is moderately curved and slender anteriorly. The branchiostegal rays are thin and long, filamentous, and clearly scarce, although their exact number is uncertain. The branchial arches are partly seen external to the frontals of the holotype. The epibranchials are narrow and small; the ceratobranchials are larger and lack gill rakers. The teeth of the upper pharyngeal plates are closely spaced and blunt. The lower pharyngeal bone (posterior ceratobranchial) is lamellate, tapers rostrally, and bears pointed teeth on its mesial and lateral margins.

The posttemporal cannot be recognized, while the scapula and coracoid are clearly covered by the cleithrum. The supracleithrum is elongated and drop-shaped. The cleithrum is very large and hooked. The humeral spine is a long and apically forked process that originates from the cleithrum posterior to the point of its curvature and extends caudally. Two pectoral radials abut the cleithrum anterior to the base of this process; the first is very slender, while the second is large, curved distally, and slightly expanded toward the proximal end. The pelvic bones and pelvic fins are not visible, being hidden by the neurocranium.

There are 20 vertebrae; however, insufficient preservation of the anterior ones suggests that two very short vertebrae could have occupied the position of what is here interpreted as a single first vertebra. The vertebrae are subrectangular, and most are ornamented with longitudinal undulation on either lateral side. The neural spines are short and strongly caudally inclined, while the haemal spines are not visible in 11 anterior vertebrae; perhaps, in some vertebrae, the haemal spines are not preserved. Parapophyses are not observed. The hypurals are consolidated into an integrated plate together with the parhypural and the terminal vertebral centrum. The parhypurapophysis is horizontal and well-developed. The second preural vertebra is longer than the third and bears a longitudinal lateral ridge. One epural is present. There are no ribs and epineurals.

The rays of the spinous dorsal fin and pterygiophores are not preserved in situ (apparently, the illicium and the other rays of the cephalic portion of the fin are hidden by the neurocranium). Nine rays of the second dorsal fin (but not their pterygiophores) are preserved approximately *in situ*. The second predorsal distance is about 65% of the SL. The anal fin is disarticulated, and its exact position and number of rays are unknown.

The pectoral fins are moderately large; their length is approximately 23% of the SL. The fins are rather wide at the base, have a rounded edge, and consist of approximately 17 unbranched rays.

The caudal fin is narrow, rounded at the end, and consists of eight rays, the marginal of which are unbranched, while the others are branched. The fin length is 28% of the SL.

Scales are absent.

Measurements. Standard body length of the holotype is 83 mm.

Comparison. Monotypic genus.

Material. Holotype.

ACKNOWLEDGMENTS

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