

Oligoscoptthalmus weissi gen. et sp. nov., an Oligocene Scophthalmid Flatfish from Frauenweiler, S-Germany

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Abstract Flatfish fossil specimens were found at the Frauenweiler site (Oligocene, Rupelian), S-Germany. Among them, on the basis of the two elongated pelves extending anteriorly to the urohyal and the dorsal fin origin slightly behind the upper eye, one specimen was determined to be a new genus and species in the family Scophthalmidae, order Pleuronectiformes. This specimen was thus designated as the holotype for *Oligoscoptthalmus weissi* gen. et sp. nov.

Key words: Oligocene, Rupelian, Germany, Frauenweiler, flatfish, Pleuronectiformes, Scophthalmidae, *Oligoscoptthalmus weissi* gen. et sp. nov.

Introduction

The Frauenweiler fossil site (Rupelian stage of Oligocene), 13 km south of Heidelberg, Baden-Württemberg, S-Germany, is located in the upper part of the Rhine Valley Rift System (Fig. 1). Together with the contemporary locality of Froidefontaine, Belfort Territory, France, it is famous for its well-preserved and rich marine fish fauna (Micklich and Parin, 1996; Micklich, 1998; Pharisat and Micklich, 1998).

A flatfish fossil from Frauenweiler, which was collected and prepared by Mr. Klaus Weiß, was recently examined by the authors. After comparison with both Recent and fossil flatfishes known to date, it was determined to be a new genus and species of the Scophthalmidae based on its unique position of the dorsal fin origin compared to other members within this family.

Materials and Methods

Comparative materials of the extant Scophthalmidae: *Scophthalmus maximus*, HUMZ 101743, 265 mm SL (standard length); *S. maeoti-*

cus, HUMZ 101741, 278 mm SL, Dr. Oishi's coll., 235 mm SL; *S. rhombus*, HUMZ 101743, 324 mm SL; *S. aquosus*, HUMZ 80618–80620, 61–145 mm SL; *Lepidorhombus boscii*, BMNH 1973.10.29.581–600 (2 specimens), 179, 259 mm SL; *L. whiffiagonis*, HUMZ 86845, 368 mm SL; *Phrynorhombus norvegicus*, ZMA 112.946 (5), 63–85 mm SL; *P. regius*, HUMZ 101745, 98 mm SL, ZMA 109.869 (3), 95–135 mm SL, ZMA 111.147 (2), 87, 107 mm SL; *Zeugopterus punctatus*, HUMZ 101746, 171 mm SL, ZMA 101.746 (4), 94–140 mm SL.

Institutional codes: HLMD-WT=Fossil vertebrate collection of Hessisches Landesmuseum, Darmstadt, Germany. Others follow Leviton *et al.* (1984).

The specimen was prepared by the transfer method (e.g., Lippmann, 1987). Osteological terminology follows Hoshino (2001b).

Systematic Paleontology

Class Osteichthyes Huxley, 1880

Order Pleuronectiformes Bleeker, 1859

Family Scophthalmidae Jordan, 1923

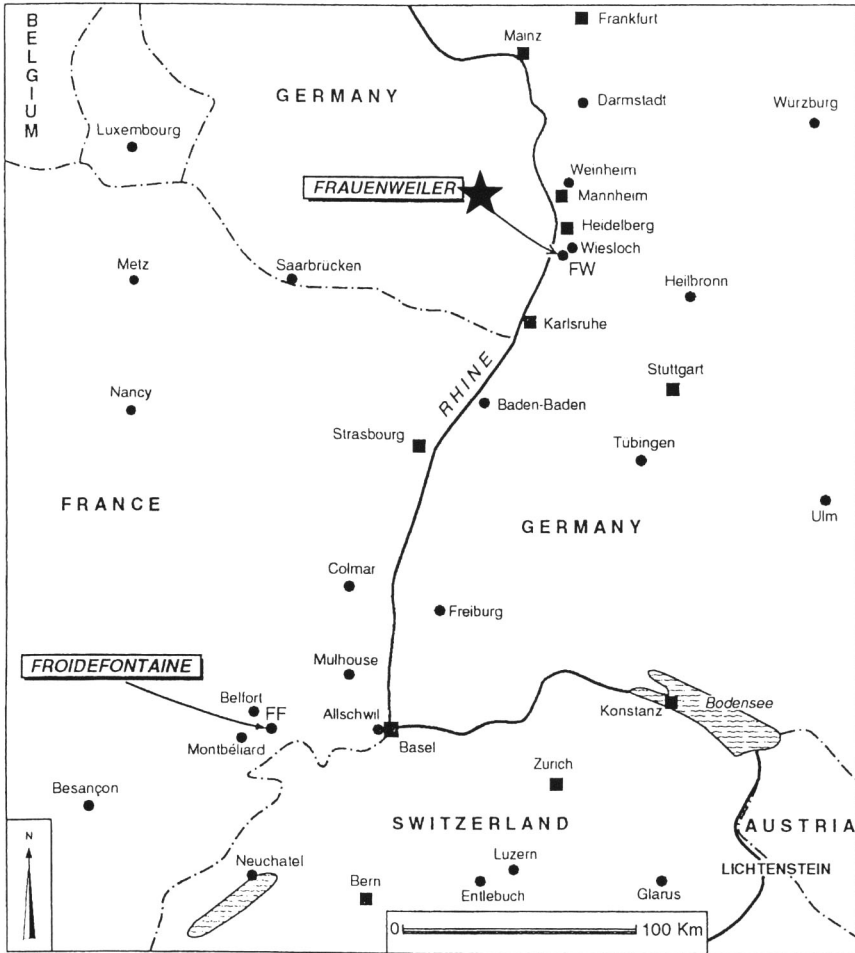


Fig. 1. Map showing the locality (★) that yielded the Oligocene scophthalmid flatfish *Oligoscoptthalmus weissi* gen. et sp. nov. From Pharisat and Micklich (1998: 163, fig. 1).

Genus *Oligoscoptthalmus* nov.

(11 abdominal and 19 caudal ones).

Type species: *Oligoscoptthalmus weissi* sp. nov., by monotypy.

Etymology: The genus name, *Oligoscoptthalmus*, is composed of two words: *Oligo* from Oligocene and *Scophthalmus*, type genus of the family.

Age and distribution: Known only from the Rupelian stage of Lower Oligocene.

Diagnosis: The dorsal fin originates slightly behind the upper eye. The urohyal is fish hook-like in shape, with about equisized main and sciotic parts forming the inner surface of the hook. The body is deep and its depth is about two times in standard length. The number of vertebrae is 30

Oligoscoptthalmus weissi sp. nov.

(Figs. 2–5)

Holotype: HLMD-WT 254, complete transfer-prepared skeleton, 14 mm in standard length.

Etymology: In honor of Mr. Klaus Weiß, Fischbach, Ts., the finder, preparator and donator of the holotype.

Type locality: Bott-Eder clay pit close to Rauenberg village, about 13 km south of Heidelberg, Baden-Württemberg, S-Germany.

Type horizon: “Fischschiefer” (FS A/B), standard Nannoplankton Zone NP 23, Dinnoflagellate-

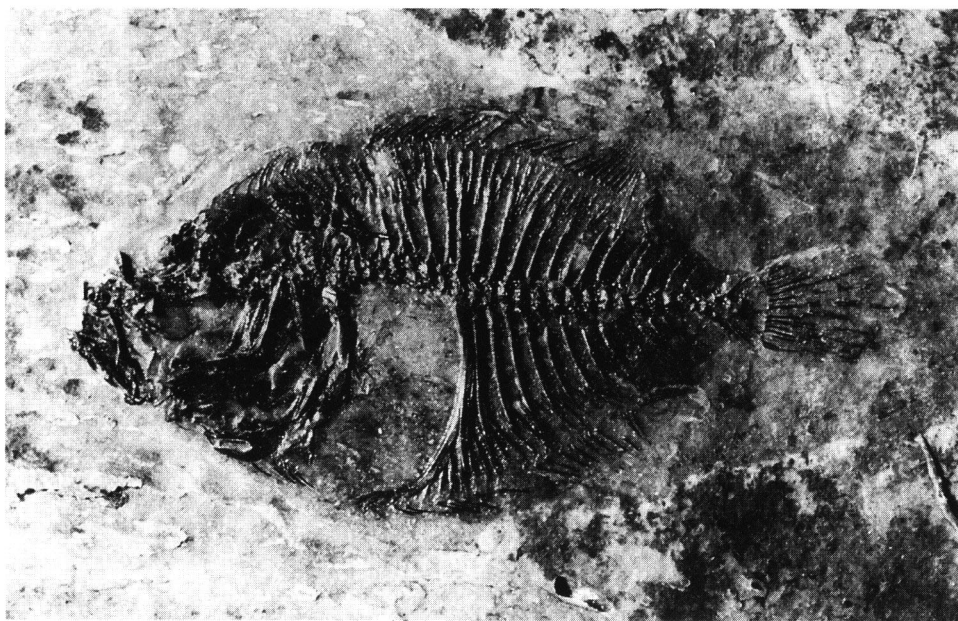


Fig. 2. Photograph of *Oligoscoptthalmus weissi* gen. et sp. nov., holotype, HLMD-WT 254, Oligocene (Rupelian), Frauenweiler, Germany. 14 mm in standard length.

Subzone D14 na (see Grimm *et al.*, 2002: 240–241).

Diagnosis: Same for genus.

Description: The specimen is well preserved. The body is deep and oval in shape, depth being greatest at about the middle of the body. Greatest depth is about two times in standard length.

The head region is well preserved and several bones are identifiable.

Head length is 5.5 mm. The mouth is rather large, the upper jaw length of the left (=ocular, see below) side being about 2.8 times in head length. The premaxillary and maxillary of the upper jaw as well as the dentary, anguloarticular and retroarticular of the lower jaw are preserved, but teeth are not observed.

Although the cranial elements are rather well preserved, only the ethmoid, lateral ethmoid and frontal in the orbital region are identifiable, but their individual shapes cannot be well determined (Fig. 3A).

The skull is asymmetrical, and both eyes are located on the left side (Figs. 2, 3A). A small protuberance is recognizable as the upper eye,

being located at the dorsolateral edge of the left side of the head. The placement of the lower eye can be recognized from the orbit which is surrounded by the lateral ethmoid anteriorly, the frontal dorsally and the entopterygoid mesially (these three elements are of the left side). Patches of melanophores of upper and lower eyes are preserved at both the dorsal and ventral sides of the frontal that forms the interorbital region.

In the suspensorial and opercular regions, almost all elements are preserved, however, some bones are slightly dispersed and the shapes of only a few elements can be distinguished (Figs. 2, 3A).

No elements of the branchial apparatus can be observed.

In the hyoid arch, only the anterior three branchiostegal rays remain incompletely. The urohyal, located just in front of the lower part of the cleithrum, is fish hook-like in shape, with about equisized main and sciatic parts forming the inner surface of the hook (Figs. 3B, 4).

The dorsal fin originates slightly behind the upper eye (Figs. 3A, 5). Although the posterior-

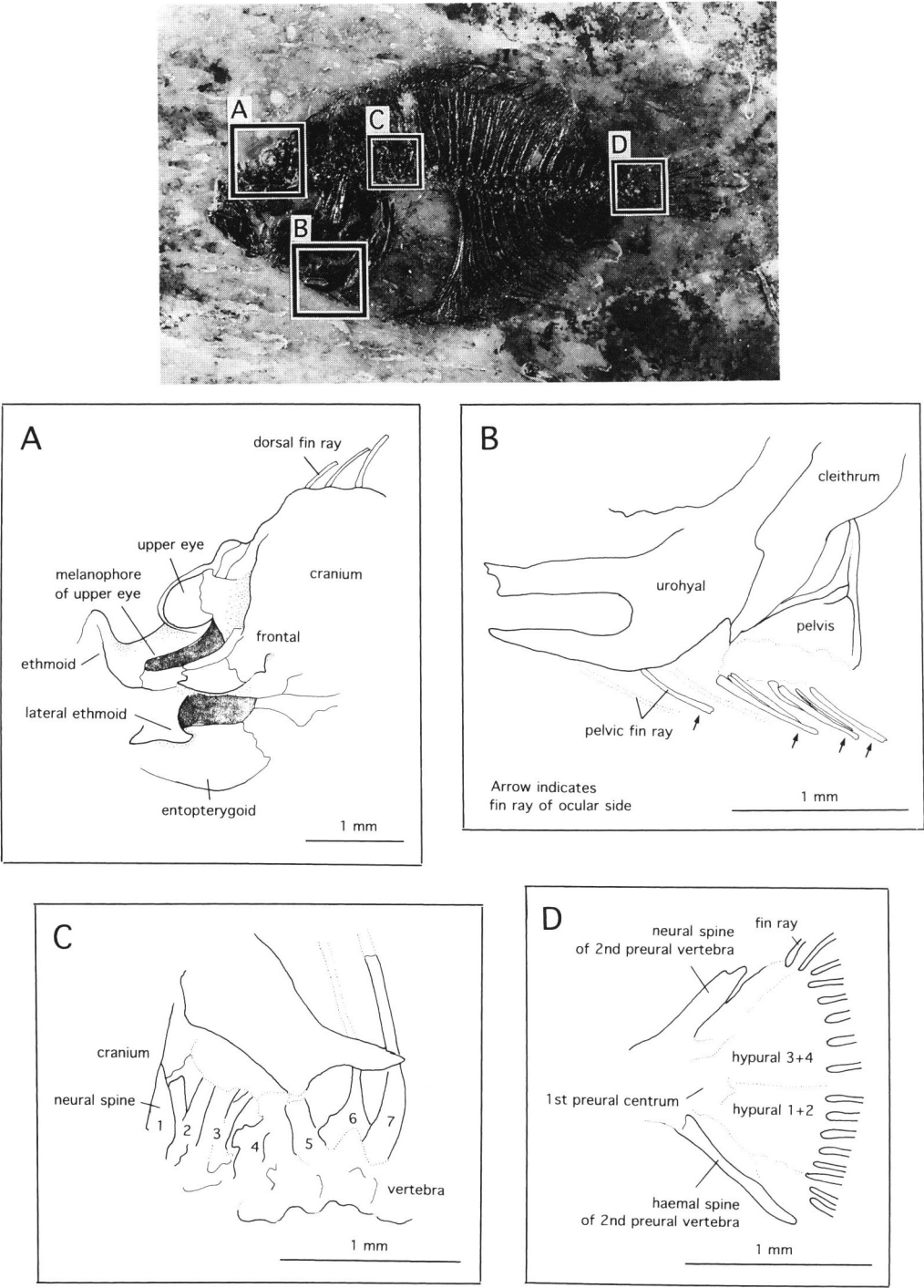


Fig. 3. Drawings of details of the holotype of *Oligoscoptthalmus weissi* gen. et sp. nov. A, orbital region; B, urohyal and pelvic fin; C, anterior abdominal vertebrae; D, caudal skeleton and fin.

most region appears not to be preserved, 37 rays (of an estimated 42 or more in total) including their traces and 38 proximal pterygiophores (total cannot be estimated) remain. The proximal pterygiophores for the anteriormost four rays are not visible.

In the anal fin, the posteriormost region appears not to be preserved, 26 rays and 23 proximal pterygiophores remain, but their total cannot be estimated. The anteriormost proximal pterygiophore supporting the anteriormost rays is enlarged, elongated, and attached to the anterior surface of the first haemal spine. Its anteroventral end curves forward.

In the shoulder girdle, the supracleithrum, cleithrum, coracoid and two postcleithra are incompletely preserved. Ten incomplete pectoral fin rays remain.

In the pelvic fin, four rays of the left side and five of the right side remain, but the total of each cannot be estimated. The anteriormost ray preserved [of the right (=blind) side] is under about an anterior third of the sciatic part of the urohyal (Fig. 3B). The pelvis of the left (=ocular) side, its dorsal tip being inserted between the cleithra, is located just behind and ventral to the cleithrum (probably the anteroventral part of pelvis extends anteriorly ventral to the sciatic part of the urohyal on both sides, as indicated by preserved pelvic fin rays).

There are 11 abdominal vertebrae with neural spines. In the anteriormost abdominal vertebrae, the first neural spine is well developed. The second one is broken, so that its relation to the cranium cannot be determined (Fig. 3C). Two feeble ribs remain under the 11th to 12th abdominal vertebrae. There are 19 caudal vertebrae with neural and haemal spines.

Sixteen caudal fin rays, being composed of eight in both the upper and lower lobes, are preserved. Although the caudal skeleton is incompletely preserved, the first and second, and third and fourth hypurals appear to be fused to each other respectively; the first preural centrum appears to be fused to the third+fourth hypurals, and articulated with the first+second hypurals

(Fig. 3D).

No scales and intermuscular bones such as epipleurals, epicentrals, epineurals and myorhabdoi can be observed.

Discussion

Because the skull is asymmetrical and the dorsal fin origin is at the cranial region, representing two of the three synapomorphies for the Pleuronectiformes (Chapleau, 1993), the present species can be assigned to the flatfish order. Also, because it has the following three characters: hypurals 1+2 (the first and second hypurals fused to each other), hypurals 3+4, hypurals 3+4+first preural centrum, and hypurals 1+2 articulated with first preural centrum (see *Description*), it can be included in Clade F of Hoshino (2001b: see p. 401, fig. 7) comprising the Scopthalmidae, Paralichthyidae, Pleuronectidae and Bothidae. Although these three characters in the caudal skeleton shared by members of Clade F are also found in a citharid *Brachypleura* [see Hoshino (2001b)], the present species appears not to be related to *Brachypleura*. This is because in this fossil specimen the anteriormost anal proximal radial (pterygiophore in the present study) is elongated, versus short in *Brachypleura*, a character considered a reversal by Hoshino (2001b). Two other characters, both reversals, which could support placement in Clade F, the second neural spine detached from the cranium and 17 "principal" [sensu Hoshino (2001a)] caudal fin rays, cannot be adequately confirmed in the present fossil specimen.

Except for one of the three synapomorphies for the Bothidae, the neural spine is absent on the first abdominal vertebra (but present in the present fossil specimen), characters defining families within Clade F of Hoshino (2001b) cannot be observed in the present fossil specimen. It can, however, be assigned to the Scopthalmidae, because of the [probable] possession of one of the two autapomorphies for that family suggested by Chapleau (1993) [=the two probable synapomorphies by Chanet (1999)], two elongated pelvic-fin

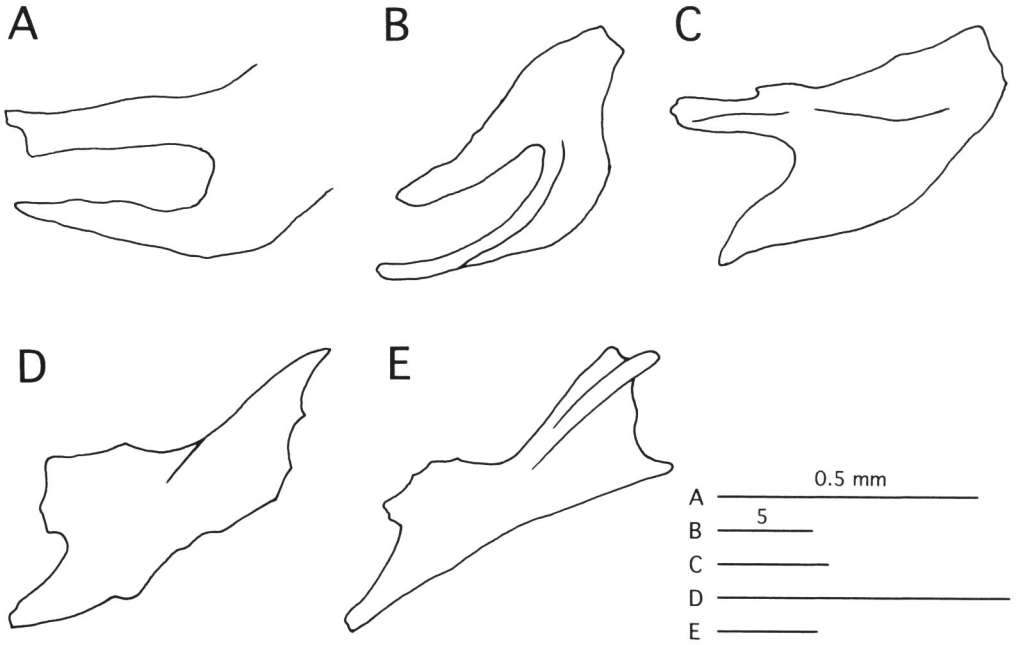


Fig. 4. Urohyal of five scophthalmid fishes. A, *Oligoscoptthalmus weissi* gen. et sp. nov., holotype, HLMD-WT 254; B, *Scophthalmus aquosus*, HUMZ 80618; C, *Lepidorhombus boscii*, BMNH 1973.10.29.581-600; D, *Phrynorhombus norvegicus*, ZMA 112.946; E, *Zeugopterus punctatus*, HUMZ 101746.

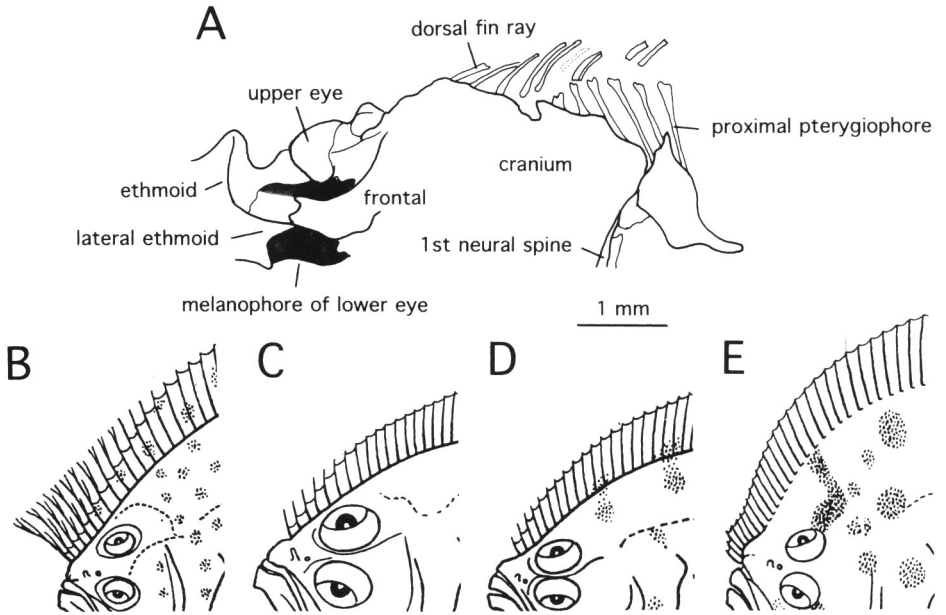


Fig. 5. Dorsal fin origin of five scophthalmid fishes. A, *Oligoscoptthalmus weissi* gen. et sp. nov., holotype, HLMD-WT 254; B, *Scophthalmus aquosus*; C, *Lepidorhombus boscii*; D, *Phrynorhombus norvegicus*; E, *Zeugopterus punctatus*. B–E, from Norman (1934).

Table 1. Numbers of vertebrae in the Scophthalmidae. Data from Norman (1934), Baciú and Chanet (2002) and the present study.

Species	Abdominal	Caudal
<i>Oligoscoptthalmus weissi</i> gen. et sp. nov.*	11	19
<i>Scophthalmus maximus</i>	11–12	18–19
<i>S. maeoticus</i>	11	20
<i>S. rhombus</i>	11–12	23–25
<i>S. aquosus</i>	11	23–25
<i>S. stamatinii</i> *	11	24–25
<i>Lepidorhombus bosci</i>	10	29–32
<i>L. whiffiagonis</i>	9–10	31–32
<i>Phrynorhombus norvegicus</i>	9–10	25–27
<i>P. regius</i>	9–10	24–26
<i>Zeugopterus punctatus</i>	9–10	25–28

* from Oligocene

bases (slightly asymmetrical) extending anteriorly to the urohyal. The anteriorly elongated parts of the pelves of both sides appear not to have been preserved in the present fossil specimen, probably because these parts were composed of cartilage as in Recent scophthalmids (Evseenko, 1996; personal observation). Judging from the rays of both sides preserved ventral to the sciatic part of the urohyal (Fig. 3B), it is highly probable that both pelves were elongated anteriorly to the urohyal. The other possible autapomorphies of the Scophthalmidae, an elongated supraoccipital process forming a bridge with the dorsal margin of the blind side frontal, suggested by Chapleau (1993), and the caudal vertebrae with asymmetrical transverse apophyses cited by Chanet (1998, 1999), cannot be observed in the present fossil specimen.

Currently, the Scophthalmidae are composed of nine Recent species in four or five genera distributed along the coast of the North Atlantic (Norman, 1934; Nielsen, 1986), and *Scophthalmus stamatinii* (Pauca, 1931) from the Middle Oligocene of Romania (Baciú and Chanet, 2002). The diagnostic characters for each genus given by Norman (1934) and Nielsen (1986) cannot be observed in the present fossil specimen, however the deep body, shape of urohyal and the number of vertebrae resemble species of *Scophthalmus* (see Baciú and Chanet, 2002; Fig. 4; Table 1). In

spite of these similarities with *Scophthalmus*, its dorsal fin origin slightly behind the upper eye is quite different from any other scophthalmids (including all *Scophthalmus* species), in which the dorsal fin origin is well in advance of the eyes (Fig. 5). Thus, the present species could not be assigned to any existing scophthalmid genera. Therefore, we concluded that it was best to erect a new genus to accommodate the present new species.

The only and oldest fossil record of the Scophthalmidae was from Middle Oligocene (Baciú and Chanet, 2002). However, due to the discovery of the present study, the rise of the scophthalmid fishes can be traced back to at least early Oligocene.

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