

DESCRIPTION OF THE NEW TAXON *ALOSA MEGALOSOMA* N.SP., EXTENDED DESCRIPTION OF *ALOSA BREVICAUDA* NOV. NOM. AND *SCORPAENA ACANTHOPHORA* AND ASSOCIATED FAUNA OF THE SARMATIAN OF PINARHISAR/ THRACE (TURKEY)

YENİ TÜR *MEGALOSOMA* N. SP'NİN TANIMLANMASI İLE *ALOSA* *BREVICAUDA* NOV. NOM. ve *SCORPAENA ACANTHOPHORA*'NİN GENİŞLETİLMİŞ TANIMLARI VE BUNLARLA İLİŞKİLİ PINARHISAR-TRAKYA SARMASIYEN FAUNASI

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ABSTRACT: Two *Alosa*-species are described from the Sarmatian Fish Beds of Pınarhisar: *Alosa brevicauda* nov. nom. with four specimen and *Alosa megalosoma* n. sp. The name of the first taxon described as *Alosa brevis* Rückert-Ülkümen 1965 was changed to *A. brevicauda* nov. nom. because it is preoccupied. *A. brevicauda* is compared with the Sarmatian *Alosa spinosa* (Rückert-Ülkümen 1965, 1994) of Pınarhisar and with *Alosa inflata* from the Upper Miocene of Podsuset, Croatia. *Alosa megalosoma* n. sp. is compared with *Alosa elongata* Agassiz. The skull bones of a newly found specimen, of *Scorpaena acanthophora* were described in detail. All specimens indicate a brackish environment. The so far assumed Sarmatian age is confirmed by the contemporary investigated associated fauna.

Key Words: Clupeidae, *Alosa*, Scorpaenidae, *Scorpaena*, brackish water, Sarmatian, Thrace, Turkey.

ÖZ: Pınarhisar'ın Sarmasiyen-Balıkli serisindeki katmanlarda iki *Alosa* cinsi ele alınmıştır: İlk dört örnek *Alosa brevicauda* nov. nom., ikinci bir örnek ise *Alosa megalosoma* n. sp. ile temsil edilmiştir. Birincisi; *Alosa brevis* RÜCKERT-ÜLKÜMEN 1965 olarak isimlendirilmişse de bu isim daha önce verilmiş olduğundan *A. brevicauda* nov. nom. olarak değiştirilmiştir; *A. brevicauda* Pınarhisar Sarmasiyenin'de bulunan *Alosa spinosa* (Rückert-Ülkümen 1965, 1994) ile ve daha önce Hırvatistan'ın (Podsuset) Üst Miyosen katmanlarında bulunan *Alosa inflata* ile; *Alosa megalosoma* n. sp. ise *Alosa elongata* AGASSIZ ile mukayese edilmiştir. 2005 senesinde bulunan *Scorpaena acanthophora* nın kafa kemikleri bugüne kadar bulunanlardan daha iyi korunmuş olduğundan tekrar ele alınmıştır. Bu cinslerin hepsi acısu ortamında bulunur ve yaşlarının Sarmasiyen olduğu beraberindeki fauna ile bir kez daha kanıtlanmıştır.

Anahtar Kelimeler: Clupeidae, *Alosa*, Scorpaenidae, *Scorpaena*, acısu, Sarmasiyen, Trakya, Türkiye.

INTRODUCTION

The material described here was collected from the Sarmatian Fish Beds of Pınarhisar (Thrace). The Fish Beds are situated in the Ergene Basin, part of the Eastern Paratethys. Four well preserved specimens of *A. brevis* Rückert-Ülkümen 1965 were found. *Alosa brevicauda* nov. nom. is suggested for substitution of *A. brevis* Rückert-Ülkümen 1965 because of

preoccupation. Further collected specimens belong to *Alosa megalosoma* n. sp. and *Scorpaena acanthophora*. Because of the better preservation of the skull in the new collected specimen than in the holotype of *Scorpaena acanthophora* an extended description is given. The morphological description of the skull follows the traditional way, using the terms "frontal" and "parietal".

The Sarmatian Fish Beds of Pınarhisar are overlain by a Mytilid Bed containing *Congeria ornitopsis* BRUSINA (Pannonium) and underlain by a Lucinid Bed containing *Lucina (Loripes) dentata* BASTEROT (Sarmatium). Both taxa are characteristic elements of the Sarmatian to Pannonian of the Vienna Basin and allow dating (PAPP 1951, 1952).

All specimens are deposited in the Bavarian State Collection (BSP) and in the Istanbul University Geology Museum.

GEOLOGICAL SETTING AND BIOSTRATIGRAPHY

- Sedimentation starts with alternating limestones, sandy limestones, sandstones and conglomerates of Eocene/Oligocene age.
- The basal beds are overlain by the Lower Congeria Beds of about 45 meters thickness. The Lower Congeria Beds consist of conglomerates, calcareous sandstones

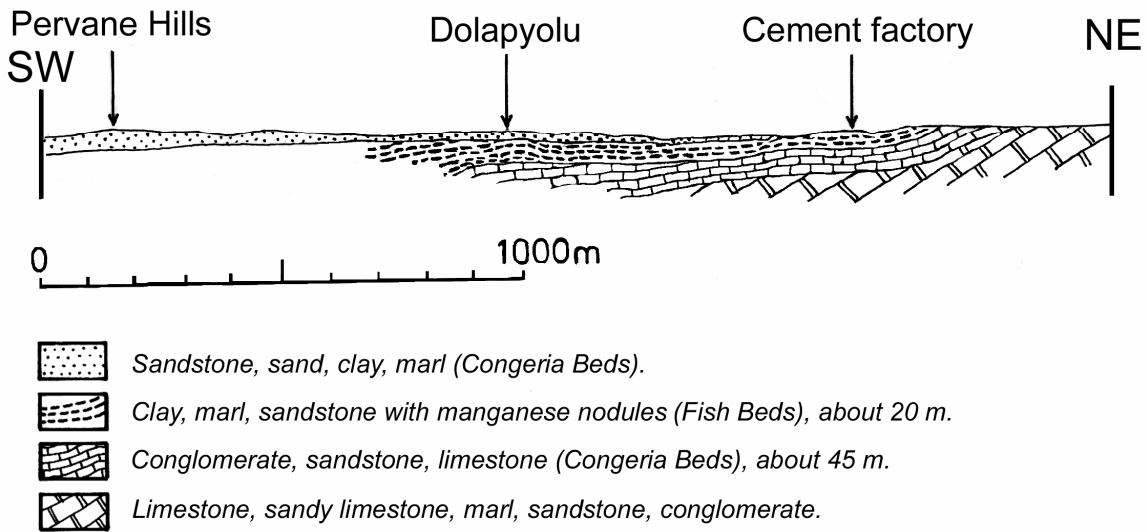


Figure 1: Stratigraphic section of the Fish Beds (from Rückert-Ülkümen, 1965).

Şekil 1: Balıklı tabakanın stratigrafik kesiti. (Rückert-Ülkümen, 1965 den).

and limestones. The occurrence of *Lucina (Loripes) dentata* Basterot 1825 (Papp 1952: Taf. 12, Fig. 14) within the uppermost Lower Congeria Beds allows dating to the Sarmatian (Rückert-Ülkümen 1965: 320, Pl. 29, Fig. 54, IÜP 1960 I 559). From these beds, numerous otolithes were found during the new collection (publication in preparation).

- The base of the Fish Beds is set lithostratigraphically at the base of porous calcareous sandstone with manganese nodules. The Fish Beds comprise clays, marls and sandstones. The thickness of the Fish Beds is estimated 20 m. The fish fauna indicates a Sarmatian age for the Fish Beds (Rückert-Ülkümen 1965, 1995).
- The Upper Congeria Beds are composed of sandstones, sands, clays and marls. AKARTUNA (1953) proposed "Pontium" age.

Occurrence of *Congeria ornithopsis* Brusina 1892 allows dating to Sarmatian to Pannonian (Rückert-Ülkümen 1965, Pl. 29 Fig. 55, BSP 1980 X 1304-1305).

MATERIAL AND METHODS

New collections were made from the outcrop in the north-western district of Pınarhisar described in Rückert-Ülkümen (1965, 1990, 1995). At present the outcrop exists no longer. The investigated specimens were collected in 1982 and 2005. Dr. W. Witt and Dr. R. Matzke-Karasz investigate the ostracod remains on the surface of one specimen. In addition to the entire fish specimens, some samples from a stratigraphically slightly older bed were taken to examine the accompanying microfauna. Prof. Dr. C. Tunoğlu investigated the ostracodes, Assoc. Prof. A. Yıldız the nannoplankton.

SYSTEMATIC PALAEOLOGY

Order Clupeiformes BLEEKER 1859

Family Clupeidae CUVIER 1817

Genus *Alosa* LINCK 1790

Shad

Alosa brevicauda nov. nom.

Pl. 1, Figs. 1-3, Text-Figs. 2-5, Table 1

v * 1965 *Alosa brevis* n. sp., RÜCKERT-ÜLKÜMEN: 334, Pl. 25, Fig. 25-26 (IÜP 1960 I 94 a, b).

Holotype: IÜP 1960 I 94 a, b.

Paratypes: BSP 1980 X 1183 (Pl. 1, Figs. 1-3), BSP 1980 X 1182, 1980 X 1184, 1980 X 1185 a, b.

Horizon: Sarmatian, Miocene.

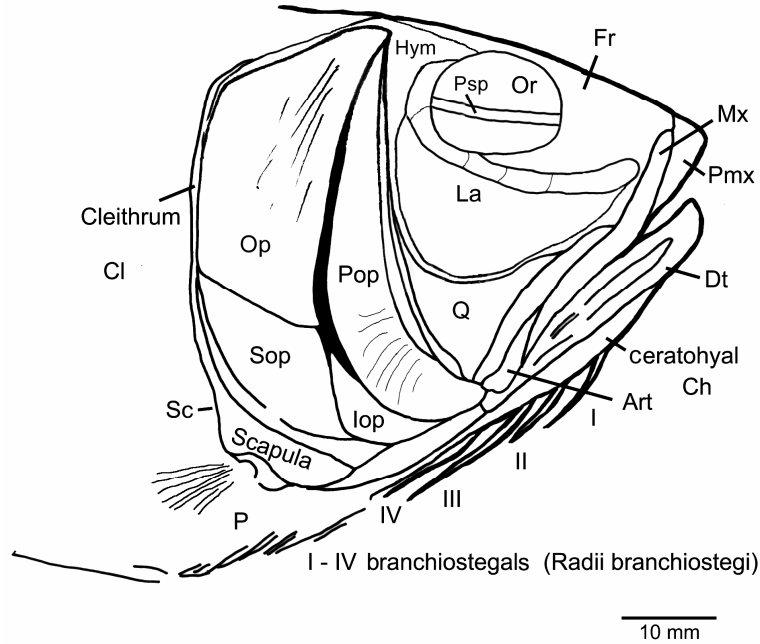
Type locality: Pınarhisar (Thrace, Turkey).

Derivatio nominis of nomen novum: brevis (lat.) = short, cauda (lat.) = tail, because of short caudal part.

Material: Four specimens.

Extended Diagnosis: Conspicuous overall morphological features are the short caudal part of the body and the small dorsal fin. There are seven short and robust predorsals (supraneurals) anterior to the dorsal fin. The ventral margin of the body bends upwards. The ctenoid scales show characteristic posterior serrations (Fig. 5).

Description: Body length of the better preserved specimen BSP 1980 X 1183 is 190 mm, body height is 60 mm, head length is 54 mm and head height is 50 mm. The total length equates three times the body height and 3,5 times the head length. The elliptic orbit is located near the frontal, the frontal and the parietal are lacking. Inclination of the mouth gap is 35 degrees. The operculum is ornamented with straight

Alosa brevicauda nom. nov.**Figure 2:** Skull bones of *Alosa brevicauda* nov. nom. (BSP 1980 X 1183).**Şekil 2:** *Alosa brevicauda* nov. nom. kafa kemikleri (BSP 1980 X 1183).

ridges oblique proceeding to the ventral margin, best seen in BSP 1980 X 1184. The operculum of *Alosa brevicauda* differs from the operculum of *Alosa megalosoma* in being trapezoid. The half-moon shaped praeoperculum is somewhat thicker at the posterior margin.

The interoperculum and the suboperculum are broad (Text-Fig. 2 and 3). The praemaxilla and the dentary are solid, the cleithrum is broad. The scapula is

robust. There are about 14 fin rays in the pectoral fin. The ceratohyal articulates with the heads of more than four branchiostegals (Figure 2).

The dorsal fin is located slightly anterior to the middle of the body. The number of dorsal fin rays is 16. Anterior to the dorsal fin there are seven short and robust predorsals (supraneurals). The anal fin is located posterior the dorsal fin near the tail. The number of anal fin rays and interhaemals is 18. Pelvic fins are located

opposite the dorsal fin. The number of pelvic fin rays is twelve. The upper part of the caudal fin has been damaged during collection. There are eight main fin rays and seven additional fin rays in the lower lobe of the caudal fin.

The axial skeleton is composed of 24 abdominal and 14 caudal vertebrae; each is as high as it

is wide. The neural spines have an angle of 65 degrees to the axis, the haemal spines 60 degrees. The 20 anteriormost pairs of ribs are very long and reach the ventral body margin. The posteriormost two pairs of ribs are shorter than the others. Two types of scales can be distinguished. At the ventral margin of the body, there are special elasmoid scales; the keel scales (Fig. 4). The whole body is covered with ctenoid scales.

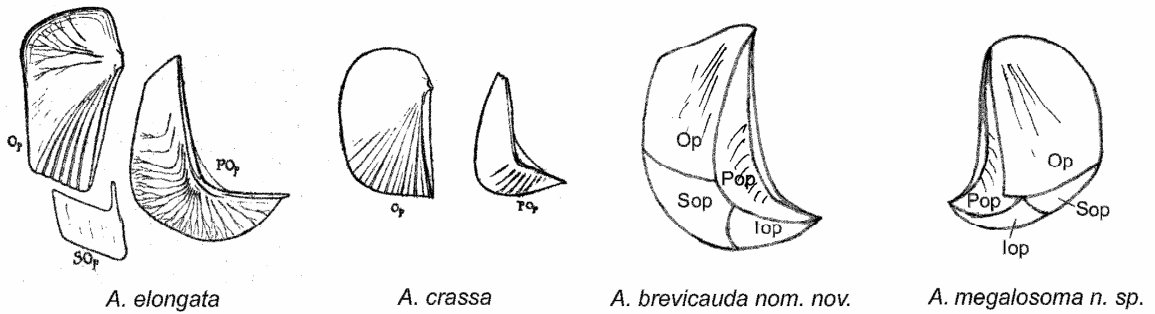


Figure 3: Opercular series of different species of *Alosa* from Pınarhisar for comparison (*A. elongata* and *A. crassa* taken from Arambourg 1927: Fig.5, Fig. 7 A).

Şekil 3: Pınarhisar *Alosa* cinslerinin Opercullerinin mukayesesi (*A. elongate* ve *A. crassa* ARAMBOURG 1927: Şekil 5, Şekil 7 A) alınmıştır.

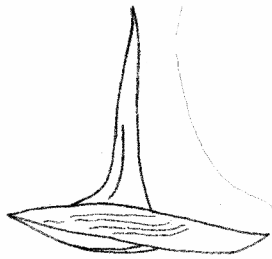


Figure 4: Keel scale of *Alosa brevicauda*.

Şekil 4: *A. brevicauda* nin karın karinalı pulu.

The ctenoid scales are of 2,5 mm height, exhibit numerous thin concentric rings and eight to ten characteristic posterior serrations (Figure 5). The number of lateral line scales is not determinable. Occurrence: *Alosa brevicauda* nov. nom. occurs only in Pınarhisar.

Discussion: *Alosa brevicauda* nov. nom. resembles *Alosa spinosa* (Rückert-Ülkümen, 1965: 328-329, Pl. 23, Fig. 11) in overall body shape, short caudal part of the body and upwards bending ventral margin of the body. However, *Alosa spinosa* differs in having postparietal spines (RÜCKERT-ÜLKÜMEN 1994 Figure 4) and a lower ratio of head length to body length. The

dorsal fin of *Alosa brevicauda* nov. nom. is located more anteriorly and the origin of the ventral fin is not located opposite the centre of the dorsal fin but exactly at the origin of the dorsal fin.

The recent *Alosa brevis* BLEECKER (Bleeker 1848: 638) from Simbabwe differs clearly from *Alosa brevicauda* nov. nom. in having a shorter head and distinctive number of fin rays (Table 1).

Alosa brevicauda nov. nom. also resembles *Alosa inflata* (Vukotinović 1870) (Kramberger - Garjanovic 1884: 75, Pl. 14, Fig. 3), originally described as *Clupea inflata* in overall body shape and upwards bending ventral margin of the body. However, *Alosa inflata* distinguishes from *Alosa brevicauda* nov. nom. in exhibiting a reduced angle between the neural spines and the axis; 40 to 45 degrees instead of 65 degrees in *Alosa brevicauda* nov. nom.

Furthermore, *Alosa inflata* has a clearly shorter head, distinctly more vertebrae (Table 1) and cycloid scales instead of ctenoid scales (Figure 5). *Alosa brevicauda* nov. nom. differs from all other species of *Alosa* described from Pınarhisar in the morphology of the bones of the opercular series (Figure 3). In Table 2, all characteristic quantitative features of the endemic fauna of Clupeidae from Pınarhisar are given for comparisons.

Alosa megalosoma n. sp.

Holotype: BSP 1980 X 1186 (Pl. .II, Figs. 1-2).

Pl. II, Figs. 1-2, Figure 3, 5, Table 3

Horizon: Sarmatian, Miocene.

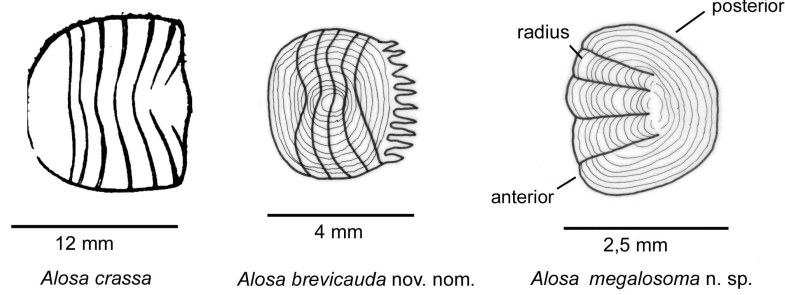


Figure 5: Scales of *Alosa crassa* SAUVAGE (from ARAMBOURG 1927: Fig.7 B), *Alosa brevicauda* nov. nom. (BSP 1980 X 1183), *Alosa megalosoma* n. sp. (BSP 1980 X 1186).

Şekil 5: *Alosa crassa* SAUVAGE (ARAMBOURG 1927: Fig.7 B) den, *Alosa brevicauda* nov. nom (BSP 1980 X 1183), *Alosa megalosoma* n. sp. (BSP 1980 X1186) pullarının karşılaştırılması.

Tabel 1: Major quantitative features of *Alosa brevicauda* and of the comparable species *A. spinosa*, *A. inflata* and *A. brevis* (recent).

Çizelge 1: *Alosa brevicauda* nın *A. spinosa*, *A. inflata* ve *A. brevis* (güncel) ile mukayesesi: Vücut ölçü oranıtısı, yüzgeç ışınlarının, omurga ve kaburga sayıları.

Name	BL:BH	BL:HL	D	A	V	P	C	Ver	R
<i>Alosa brevicauda</i>	3	3,5	16	18	12	14	?+8.7	24+14	22
<i>Alosa spinosa</i>	2	2,9	18-20	19	9	12-14	30	30	22
<i>Alosa inflata</i>	3	5	16	?	?	12	22	42-44	20
<i>Alosa brevis</i>	3	4	I.17	I.17?	I.7	I.16	19+		

Table 2: Characteristic quantitative features of the endemic species of Clupeidae from Pınarhisar

Çizelge 2: Sarmasiyenin Endemik Clupeidae Familyasının Pınarhisardaki *Alosa* ve *Clupeonella* cinsleri ile mukayesesi

Name	BL:BH	BL:HL	D	A	V	P	C	Ver	R
<i>A. baykali</i>	3,2	3,3	16	23	8	12		38	
<i>A. pinarhisarensis</i>	4,2	3,5	14	16	8	I.7	20	39	18
<i>A. weileri</i>	2,9	2,9	18	18	6	13		38	
<i>A. fortipinnate</i>	3,14	3,46	I.16	I.18	9	18	20	35	22
<i>Cl. ovalis</i>	3,5	4	14	18	5	12		38	
<i>A. crassa</i>	4,2	3,3	14	18	8	15		40	
<i>A. spinosa</i>	2	2,9	18	19	9	12		?+16	
<i>A. avcileri</i>	3,2	3,7	10	14	5	14	22	34	?
<i>Cl. trigonokephale</i>	3,75	3,6	14	18	6	7		41	
<i>Cl. humilis</i>	4,6	4,6	16	14	8	15		40	
<i>Cl. marmorensis</i>	6	2,6	12	18	6	8		38	
<i>Cl. breviceps</i>	6	3,75	9	12	6	12		35	

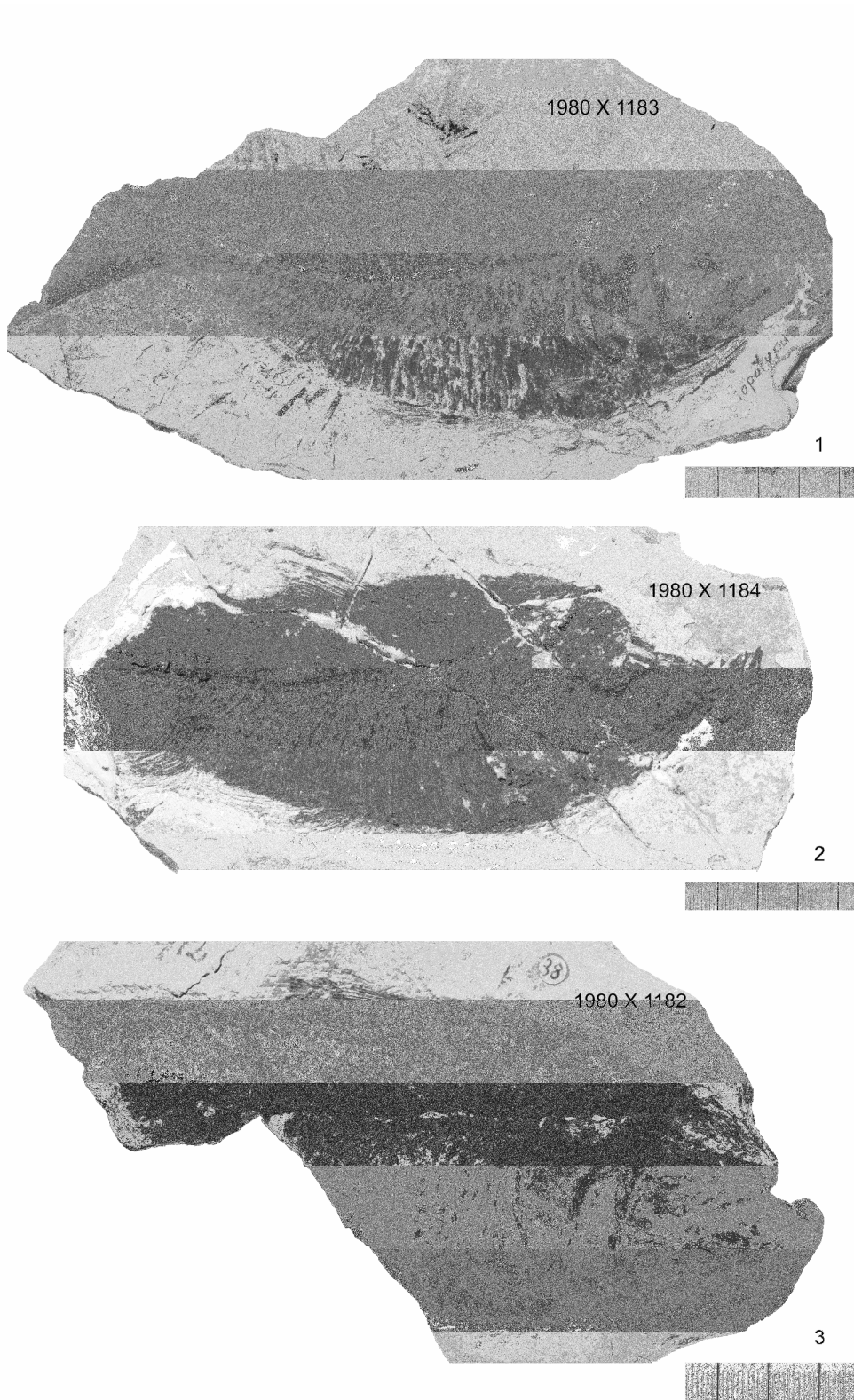


Plate 1 Levha 1

Fig. 1 – 3: *Alosa brevicauda* nov. nom. (BSP 1980 X 1183, 1184, 1182) from the Sarmatian of Pınarhisar, Turkey.

Alosa megalosoma n. sp.

Pl. II, Figs. 1-2, Figure 3, 5, Table 3

Holotype: BSP 1980 X 1186 (Pl. II, Figs. 1-2).

Horizon: Sarmatian, Miocene.

Type locality: Pınarhisar (Thrace, Turkey).

Derivatio nominis: megas, megalos (gr.)= long; soma (gr.) = body.

Material: Only holotype.

Diagnosis: The body is elongated and slender with numerous secondary ribs (epipleurals) in the abdominal part of the body. The vomer bears numerous small vomer teeth. The body is covered with medium-sized shiny cycloid scales. The dorsal fin is located a little more anterior to the middle of the body. The big mouth gap tends upwards.

Description: The ventral part of the body has been partially damaged during collection. Total length is 220 mm, body height is 55 mm and head length is 67 mm. The body length equates four times the body height and 3, 3 times the head length. The bones of the skull are disarticulated. The oval orbit is displaced towards the dorsal region. The dental is separated from the visceral skeleton. The length of the dental exceeds the length of the maxilla, both are robust. The praemaxilla is lacking. The vomer bears numerous small, prolate and slightly hooked teeth. The bones of the opercular series are poorly exposed. Only the outlines of the bones of the opercular series are well defined. The posteriorly rounded operculum is ornamented with slight, straight ridges oblique proceeding to the ventral margin. The anterior margin of the operculum is nearly straight, the ventral margin weakly convex. The praeoperculum is narrow, the interoperculum and the suboperculum are small (Figure 3). The quadrate is large. The cleithrum is broad. Only two fin rays are identifiable in the pectoral fin. The dorsal fin is located a little more anterior to the middle of the body and consists of three small spines and eleven rays. Anterior to the dorsal fin there are nine praedorsals (supraneurals). The anal fin is located far behind the dorsal fin and nearly extends to the caudal fin. The number of anal fin rays is not determinable. The number of interhaemals is 17. In BSP 1980 X 1186, an imprint of the intestine is visible from the cleithrum to the anus. Ventral fins are lacking.

The axial skeleton is composed of 16 abdominal and 18 caudal vertebrae. The caudal vertebrae are longer than high. The 15 anteriormost pairs of ribs are very long and reach the ventral body margin. The posteriormost three pairs of ribs are shorter than the

others. Numerous secondary ribs (epipleurals) are visible in the abdominal part of the body.

The caudal fin shows characteristic features of the family of Clupeidae. The first uroneural (Un1) and the first praeural vertebra (Pu1) are fused, the first of six hypurals (Hp1) is free, the second hypural (hp2) is fused with the first ural vertebra (U1) and the parhypural (Ph) is free at its base (Pl. 2, Fig. 2). The upper lobe of the caudal fin exhibits seven short spines, one longer spine and ten rays, the lower lobe exhibits nine rays, one longer spine and four short spines (Pl. 2, Fig. 2).

The whole body is covered with cycloid scales. The cycloid scales are of 5 mm height; show numerous concentric rings and three to four radii (Figure 5).

Discussion: *Alosa megalosoma* n. sp. belongs to *Caspialosa* BERG 1915 (Slastenenko, 1939: 64-65) because of the overall slender body shape, the large scales, big mouth gap and the existence of epipleurals. The investigated specimen BSP 1980 X 1186 is conform to the definition of *Caspialosa* BERG 1915 (Slastenenko, 1939: 64-65) due to the slender vomer teeth and the existence of epipleurals in the abdominal part of the body. Following Eschmeyer Catalogue of Fishes, *Caspialosa* is placed in *Alosa* by SVETOVIDOV 1973.

Alosa megalosoma n. sp. resembles *Alosa elongata* (Bennett 1830) from the Upper Miocene of Dolje (Croatia) (Agassiz, 1833: 113-114, Vol. 5, Tab. 64) in overall body shape. *Alosa megalosoma* n. sp. differs from *Alosa elongata* in having a longer head, a distinguishable shape of the bones of the opercular series (Figure 3) with a more rounded operculum and a smaller praeoperculum, longer vertebrae and a different total number of vertebrae (Table 3). The detailed description of *Alosa elongata* Agassiz 1843 (Vol. V, 2 part., Pl. 113, Pl. LXIV) is taken from ARAMBOURG (1927: 18-21, Pl. I, Fig.2-3; Pl. II, Fig. 1). Details of the description of *Alosa elongata* Agassiz 1843 are taken from Arambourg (1927: 18-21, Pl.I, Fig.2-3; Pl. II, Fig. 1). The operculum of *Alosa megalosoma* n. sp. is similar to the operculum of *Alosa crassa* (Arambourg 1927: 22-24, Pl. I, Fig. 4-5, Pl. II, Fig. 2-3, Pl. III, Fig. 1-2) (Figure 5) but *Alosa crassa* is smaller and differs in overall morphology of the body and number of the fin rays (Table 2).

Table 3: Major quantitative features of *A. megalosoma* and *A. elongata* shown for comparisons.**Çizelge 3:** *A. megalosoma* ve *A. elongata* nın mukayesesi.

Name	BL:BH	BL:HL	D	A	V	P	C	Ver	R
<i>Alosa megalosoma</i>	4	3,3	3.11	17?	?	?	7.I.10+9.I.4	16+18	15+3
<i>Alosa elongata</i>	4,2	4,2	17	15	19	14	I.5.3*3.5.I	37+16	?

Table 4: Major quantitative features of fossil *Scorpaena* shown for comparisons.**Çizelge 4:** Fossil *Scorpaena* cinslerinin mukayesesi.

Name	D	A	P	V	C	Ver
<i>Scorpaena acanthophora</i> RÜCKERT-ÜLKÜMEN 1995	VIII + 15	III+12	24	I+7		10+12
<i>Scorpaena jeannli</i> ARAMBOURG 1927	XII + 9-10	III+5	10-11 + 8-9	I+5	3 bis 4-I-11- I-3 bis 4	9+15
<i>Scorpaena pilari</i> KRAMBERGER 1882	II + 18	III+7	10	2?	14	8+14

Order Scorpaeniformes

Family Scorpaenidae RISSO 1826

Genus *Scorpaena* LINNAEUS 1758

Scorpionfish

Scorpaena acanthophora RÜCKERT-ÜLKÜMEN 1995

Pl. 3, Figs. 1-3, Figure 6

*1995 *Scorpaena acanthophora* n. sp.–RÜCKERT-ÜLKÜMEN: 65-86, Pl. 6, Figs. 1a,b; Pl. 7, Figs. 2, 2a, 3.

Material: One specimen, part and counterpart, BSP 1980 X 1306 a, b.

Horizon: Sarmatian, Miocene.

Locality: Pınarhisar (Thrace, Turkey).

Description: Total length of BSP 1980 X 1306 is 37 mm, body height is 12 mm and head length is 12 mm. The ventral part of the skull has been partially damaged. Nevertheless, most bones of the skull are well preserved and allow for the first time a detailed description. The head is round. At the dorsal margin of the frontal, there are five serrations (Pl. III, Fig. 2; Figure 6.4b). This feature is unique for *Scorpaena acanthophora* within the genus *Scorpaena* (see GREGORY 1933). Comparable spines at the dorsal margin of the frontal known from the recent species

Scorpaena scrofa and *S. plumieri* are irregular and broad (Figure 6.1b, 6.2b). The bones of the opercular series are well preserved in BSP 1980 X 1306 and allow detailed comparisons with the bones of the opercular series of other species of *Scorpaena* (Figure 6). The operculum of *Scorpaena acanthophora* has three divergent robust spines and the praeoperculum exhibits three spines at the posterior margin (Figure 6.4a). The large, round orbit is located near the frontal. The suborbital 1 has anteriorly six pointed spines and is fused with the praeoperculum. The crista occipitalis, located between the dorsal fin and the skull is triangular. The dorsal fin has two small spines, seven robust spines with serrations (Pl. III, Fig. 3) and 17 rays. The anal fin exhibits three spines and 12 rays. The second spine of the anal fin is the longest one (Pl. III, Fig. 1). The number of pectoral fin rays is 24. The ventral fin shows one spine and seven rays. At the caudal fin 5.16.5 rays are visible. The axis consists of ten abdominal and 12 caudal vertebrae. There are seven pairs of short ribs. The two anteriormost pairs of ribs are shorter than the others. Seven branchiostegals are visible. The ctenoid scales are oval (Figure 6.4c) with numerous concentric rings visible.

Discussion: *Scorpaena acanthophora* resembles most *Scorpaena pilari* Kramberger 1882 (S.109-110, Pl. 22, Fig.19) from the Upper Miocene of Radoboj (Croatia) due to overall body shape and fin morphology. Nevertheless, *Scorpaenacanthophora* differs in the

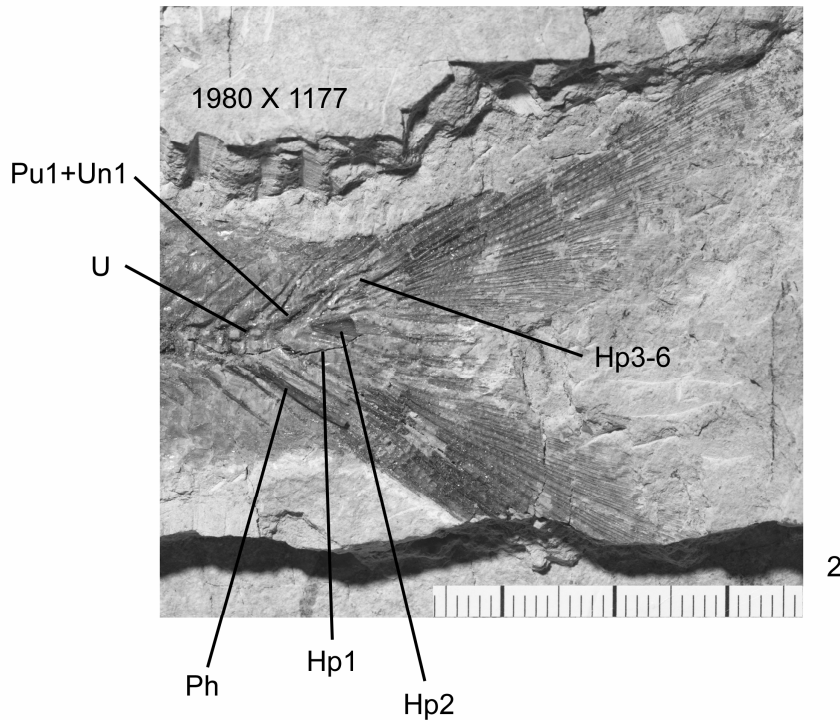
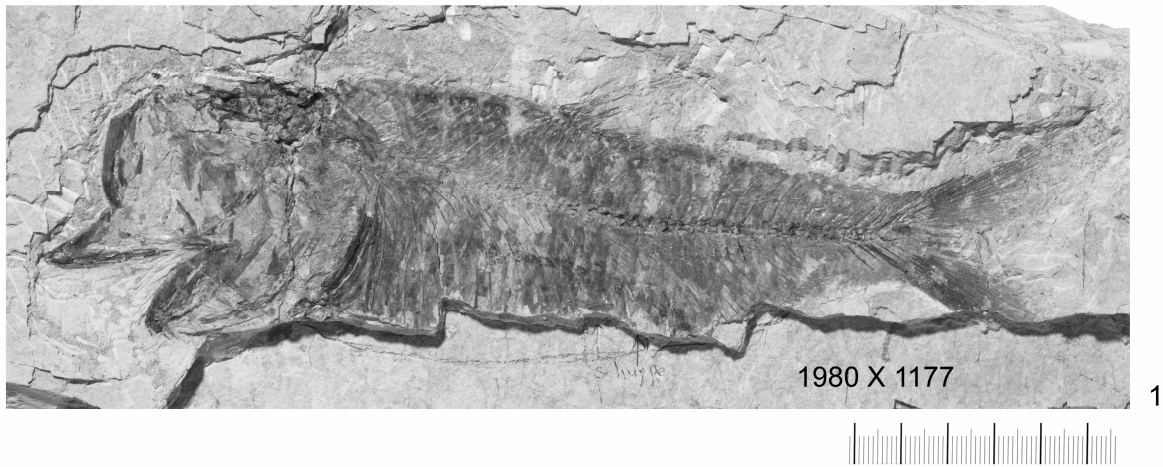


Plate 2 - Levha 2

Fig. 1: *Alosa megalosoma* n. sp. (BSP 1980 X 1186) from the Sarmatian of Pınarhisar, Turkey.

Fig. 2: *Alosa megalosoma* n. sp. enlargement of the tail fin of fig. 1 (BSP 1980 1186) from the Sarmatian of Pınarhisar, Turkey.

number of spines in the fins and the occurrence of serrations at the spines of the dorsal fin. Among all known species of Scorpaenidae, *Scorpaena acanthophora* and the recent *Starches albescens* Döderlein & Steindachner from Japan are the only ones showing three spines at the operculum. *Scorpaena jeanneli* ARAMBOURG has more and shorter spines at the praeoperculum than *Scorpaena acanthophora* and

quadrangular ctenoid scales (ARAMBOURG 1927: 188-189).

The genus *Scorpaena* appears in Middle Miocene strata with the species *Scorpaena prior* HECKEL 1861 described from the Leithekalk (Wien). In Upper Miocene strata, *Scorpaena* has a wide distribution from Algeria (*Scorpaena tesseri* Sauvage 1873) through Turkey (*Scorpaena pilari* Rückert-

Ülkümen 1965 and *Scorpaena acanthophora* Rückert-Ülkümen 1995) to Croatia (*Scorpaena minima* Kramberger 1882 and *Scorpaena pilari* KRAMBERGER 1882).

BIOSTRATIGRAPHICALY IMPORTANT FISH FAUNA AND ASSOCIATED MICROFAUNA

The following biostratigraphically important fish species from Pınarhisar have already been described in Rückert-Ülkümen (1965): *Clupeonella marmorensis* (Woodward 1904) is described from Sarmatian occurrences (Woodward 1904: 283-285 Pl.24, Fig.28); *Clupeonella humilis* (Meyer 1852) occurs in Lower to Upper Miocene strata from Württemberg; *Alosa sagorensis* (Steindachner 1863) is reported from the Lower to Middle Miocene of Croatia, Chiavon; *Alosa crassa* SAUVAGE 1873 occurs in the Younger Tertiary of Oran (Algerie) (Arambourg 1927: 22-24, Pl. I Fig. 4-5; Pl. II Fig. 2, 3; PL.III, Fig. 1-2), *Scorpaena pilari* Kramberger 1882 is originally described from Sarmatian beds of Croatia (Kramberger 1882: 24-25, 109-110 Pl. 22, Fig.1), just as *Caranx longipinnatus* Kramberger 1882 (Kramberger 1882: 128-130, Pl. 24, Fig.7-8).

Rückert-Ülkümen 1995 presents from Pınarhisar the following biostratigraphical important fish species: *Caranx abbreviatus* Bogacev 1933 occurs in Younger Tertiary beds of the Caucasus (BOGACEV 1933: 53, Pl. 10, Fig. 3-4), *Priacanthus croaticus* (Kramberger 1884) is described from the Sarmatian of Croatia (Kramberger, 1891: 50-51, Pl. III, Fig. 1, 1a-e), *Sparus intermedius* (KRAMBERGER 1902) (1902: 12-15, Pl.II) is reported from the Upper Miocene of Thrace.

Furthermore, the occurrence of *Scorpaena* in Pınarhisar indicates an age of no more than Middle Miocene. On the surface of BSP 1980 X 1306 a, b abundant remains of shell fragments of *Candona* sp. are visible beside the skeleton of *Scorpaena acanthophora*.

The other microfauna comes from a different outcrop of slightly older age. The foraminifer *Quinqueloculina sarmatica* Karrer, 1877 (BSP 1980 X 1302) (autochthon) and the bryozoa *Crisiella carnuntina* Bobies, 1957 (BSP 1980 X 1303) (autochthon) indicate Sarmatian age. The ostracod fauna consists of *Aequacytheridea* sp., *Xestoleberis trigonalis* Krstic, X. pavlovici Krstic, *Paracytheridea bilocunosa* (Speyer), *Callistocythere* sp., *Leptocythere* sp., *Loxoconcha* sp., *Cyprideis* sp., *Fabaeformiscandona* sp., *Hermanites* sp., *Fabaeformiscandona balatonica* (Daday), *Aequacytheridea* sp., *Cytheridea eberti* Lienenklaus, *Haplocytheridea helvetica* (Lienenklaus). Freshwater ostracodes like *Fabaeformiscandona* sp. and especially *Fabaeformiscandona balatonica* (Daday) are described from Pannonian strata of Hungary and seem to be autochthon in the Fish Beds from Pınarhisar. *C. eberti* Lienenklaus, *H. helvetica* (Lienenklaus) are marine and

indicate Upper Eocene to Oligocene strata (Stampian) (Sönmez-Gökçen 1973). Because of the entire stratigraphical context, the latter are assumed to be allochthon in Pınarhisar.

Proposed Sarmatian age is consistent with the data from investigation of autochthone nannoplankton including *Helicosphaera minuta* Martini (Middle Miocene), *Helicosphaera pacifica* Müller&Brönnimann (Middle Miocene), *Reticulofenestra pseudoumbilica* (Gartner) Gartner (Middle Miocene to Lower Pliocene), *Micula decussata* Vekshina (Upper Cretaceous), *Microhabdulus decoratus* Deflandre (Upper Cretaceous), *Cribozentrum reticulatum* (Gartner&Smith) Perch-Nielsen (Middle Eocene) indicate partly allochthone deposition.

In the Central Paratethys the Sarmatian ends in the Middle Miocene, whilst in the Eastern Paratethys the Sarmatian extends to Upper Miocene (POPOV et al 2004: Stratigraphic scheme of the Late Palaeogene – Neogene Paratethys and mapped intervals). The Fish Beds of Pınarhisar are dated to Sarmatian (Upper Miocene) due to their location in the Eastern Paratethys, corresponding to Sarmatian/ Pannonian in the Central Paratethys.

CONCLUSIONS

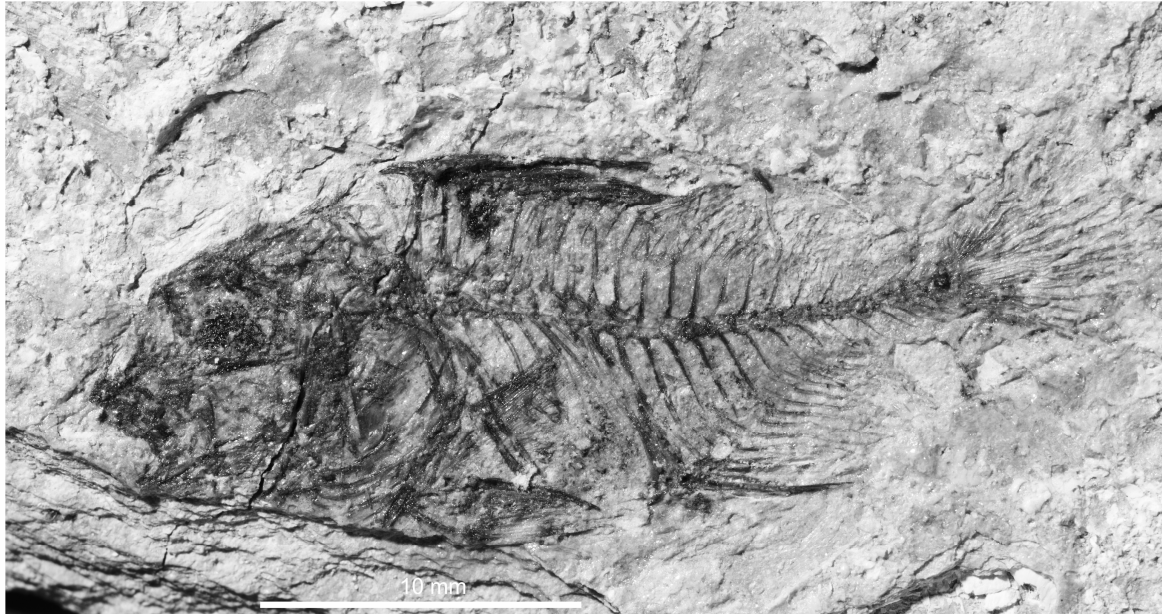
The fish fauna of Pınarhisar corresponds to the Upper Miocene fish fauna of Croatia, indicating an Upper Miocene age for the Fish Beds of Pınarhisar, equivalent the Sarmatian of the Eastern Paratethys. Common occurrence of *Scorpaena acanthophora* Rückert-Ülkümen and *Scorpaena pilari* Kramberger in Pınarhisar refers to an age of no more than Middle Miocene. The associated autochthone microfauna correspond to the Upper Miocene of the Vienna Basin. Allochthone faunal elements in Pınarhisar are marine ostracodes of Eocene/ Oligocene age and allochthone species of nannoplankton of the Upper Cretaceous and Eocene.

The Fish Beds of Pınarhisar contain several endemic species of *Alosa* und *Clupeonella* indicating reproduction among themselves for the group of Clupeidae. The diversity of Pınarhisar is explicated with hybridisation. Probably the Ergene Basin in Thrace was closed for a time. Young shad (*Alosa*) mainly feed on larva of insects and on ostracodes. The latter have been abundant in Pınarhisar. This may be a explication of the rich evolution of the Clupeidae in the Ergene Basin. Beside the Clupeidae other freshwater and brackish water fishes were reported: Carangidae, Sparidae, Serranidae, Percidae and Centropomidae. Even marine species of the Priacantidae and Scorpaenidae have been described from the same beds of Pınarhisar.

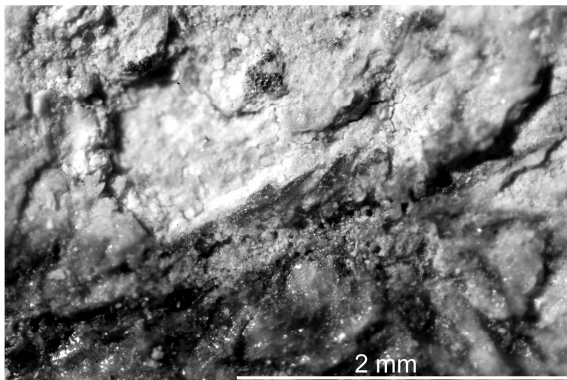
The following statements of ANDRUSOV (1902) are confirmed by the findings of Pınarhisar in the Ergene Basin: The main part of the Sarmatian fauna

consists of relicts from the Mediterranean and in the Paratethys evolved species. The fundamental stock of the Sarmatian fauna is autochthon. The Sarmatian fauna

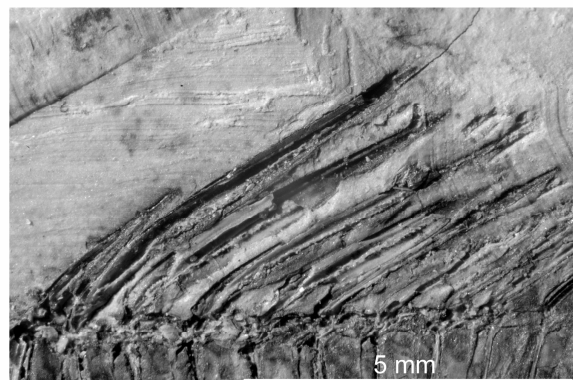
evolved under particular conditions in the nearly isolated Paratethys. The isolation presumably leads to extinction of the endemic fauna.



1



2



3

Plate 3 - Levha 3

Fig. 1: *Scorpaena acanthophora* Rückert-Ülkümen 1995 (BSP 1980 X 1306 a, b.) from the Sarmatian of Pınarhisar, Turkey.

Fig. 2: Dorsal margin of frontal with serrations.

Fig. 3: Dorsal fin ray with serrations.

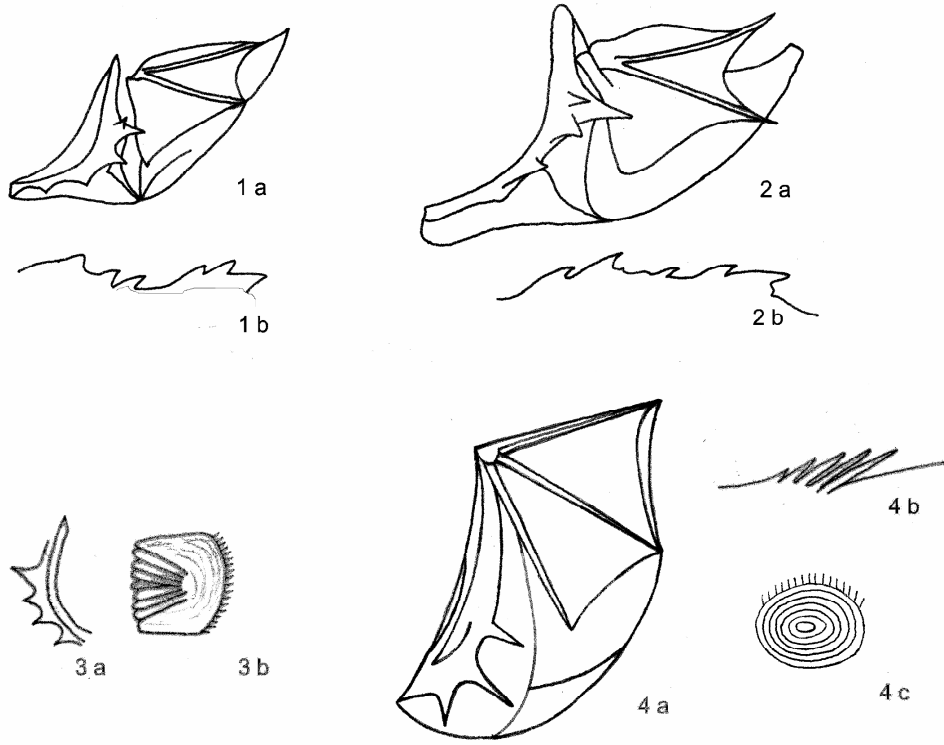


Figure 6 1: *Scorpæna plumieri* (recent), a: opercular series, b: frontal spines; 2: *Scorpæna scrofa* (recent), a: opercular series with spines, b: frontal spines; 3: *Scorpæna jeanneli* (Younger Tertiary from Sahelian of Oran/ Algeria), a: praeoperculum, b: scale; 4: *Scorpæna acanthophora* (Sarmatian of Pınarhisar), a: opercular series with spines, b: frontal spines, c: scale.

Şekil 6: *Scorpæna plumieri* (güncel), a: opercular diken, b: frontal diken; 2: *Scorpæna scrofa* (güncel), a: opercular diken, b: frontal diken; 3: *Scorpæna jeanneli* (geç Tersiyer, Sahelian, Oran), a: Praeoperculum, b: pul; 4: *Scorpæna acanthophora* (Sarmasiyen Pınarhisar), a: Opercular diken, b: frontal diken, c: pul.

Abbreviations: Art, articular; Br, branchiostegals (radii branciostegi); Ch, ceratohyal; Cl, cleithrum; Dt, dentary; Fr, frontal; Hp, hypural; BL, body length; BH, body height; HL, head length; Hym: hyomandibular; U, ural vertebra; Iop, interoperculum; La, lacrimal; Mx, maxilla; Op, operculum, Or, orbit; Ph, par hypural; Pr, praeoperculum; Pmx, praemaxilla; Psp: parasphenoid; Pu, praeural; Sc, scapula; Q, quadratum; Un, uroneural.

A, anal fin; C, caudal fin; D, dorsal fin; BL:BH, ratio of body length to body height; HL: head length, BL:HL, ratio of body length to head length; P, pectoral fin; R, ribs; V, ventral fin; Ver, vertebrae.

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ÖZET

Bu çalışmada, Pınarhisar (Kırklareli ili) dolaylarında Sarmasiyen Balıklı serisinde bulunan iki *Alosa* cinsi değerlendirilmiştir. Birincisi, *Alosa brevis* Rückert-Ülkümen 1965 olarak isimlendirilmişse de, bu isim daha önce kullanılmış olduğundan, *Alosa brevicauda* nov. nom. olarak değiştirilmiştir. İkincisi ise, *Alosa megalosoma* n. sp. olarak adlanan yeni bir türdür. *Alosa brevicauda* nov. nom. Pınarhisar Sarmasiyeninde bulunmuş olan *Alosa spinosa* ve Hırvatistan'ın (Podsuset) Üst Miyosen katmanlarında bulunan *Alosa inflata* ile mukayese edilmiştir. *Alosa megalosoma* sp. ise *Alosa elengota* Agassiz ile karşılaştırılmıştır. Bu cinslerin yanı sıra 2005 yılında bulunan *Scorpæna acanthophora* Rückert-Ülkümen 1995'nin kafa kemikleri bugüne kadar bulunanlardan çok daha iyi korunmuş olduğundan, yeniden değerlendirilmiştir.

Pınarhisar yöresindeki istifin Eosen yaşlı kireçtaşları üzerinde diskordan olarak oturduğu ve tabandaki *Congerina*'lı tabakalarla başladığı, bunların üzerine ise balık fosilli birimlerin geldiği saptanmıştır. Farklı fosil grupları yardımıyla, *Congerina*'lı birimin de Sarmasiyen-Pannoniyen yaşında olduğu gösterildiğinden, balıklı serinin de Sarmasiyen-Pannoniyen yaşında olduğu doğrulanmıştır. Balıklar ve beraberindeki fauna, bu birimlerin bir acı-su ortamında çökeldiğini göstermiştir.

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