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A Triggerfish (Osteichthyes: Balistidae: *Balistes*) from the Badenian (Middle Miocene) of the Vienna and the Styrian Basin (Central Paratethys)

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(With 14 textfigures and 1 plate)

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Summary

The genus *Balistes* can be identified by isolated teeth and the first spines of the dorsal fin resp. the first spine of the trigger apparatus from different localities of the Badenian (Middle Miocene) in the Vienna Basin, Austria and Slovakia. MÜNSTER 1846 initially described such teeth as *Capitodus dubius*. However, a species *Balistes dubius* was already described by BLAINVILLE, 1818. So the species name *dubius* cannot be used for the *Balistes* teeth from the Vienna Basin. Because no younger synonym exists a new name must be created: *Balistes muensteri* nov. nom.

This paper also describes inner tooth plates of the premaxilla from the Badenian of the Vienna Basin.

Balistes muensteri nov. nom. is also evident from the Badenian (Middle Miocene) of the Styrian Basin and the Ottnangian (Lower Miocene) of the Molasse Basin.

Zusammenfassung

Die Drückerfisch-Gattung *Balistes* wird auf Grund von Zähnen und ersten Flossenstacheln der Rückenflosse (= erster Stachel des Trigger-Apparates) aus mehreren Fundorten des Badenium (Mittel-Miozän) im Wiener Becken (Österreich und Slowakei) nachgewiesen. Schon MÜNSTER 1846 beschrieb derartige Zähne mit dem Namen *Capitodus dubius*. Da bereits eine Art *Balistes dubius* BLAINVILLE, 1818 besteht, kann –aus nomenklatorischen Gründen– dieser Name aber für die Zähne aus dem Wiener Becken nicht mehr verwendet werden. Da auch kein jüngerer Synonym bekannt ist, wird einer neuer Name vergeben: *Balistes muensteri* nov. nom.

Als besondere Spezialität liegen aus dem Badenium des Wiener Beckens sogar einige Zahnplatten von der Innenseite des Prämaxillare vor.

Auf Grund von Zahnfundun wird *Balistes muensteri* nov. nom. auch aus dem Badenium des Steirischen Beckens und dem Ottnangium des Molasse-Beckens belegt.

Introduction

Numerous teeth have been recovered from the Badenian, Middle Miocene, of the "Blue Quarry" ("Blauer Bruch") near of Kaisersteinbruch and of the "Kreide quarry" ("Kreide-Steinbruch") near of Müllendorf in the East of Austria as well as from the "Sandberg" near of Devinská Nová Ves (= Neudorf/March) in Western Slovakia (Figs. 1-3). These

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tooth types were described by MÜNSTER 1846: 17-18, Pl. 2/10-13 as *Capitodus dubius*. Some other teeth were described by MÜNSTER 1846: 18, Pl. 2/14-16 but these teeth belong to other fish families and will not be discussed in the present paper. The provenance of the teeth is reported by MÜNSTER 1846: 1 in his introduction: Neudörfl unweit Pressburg", later Neudorf an der March, today Devinská Nová Ves, Slovakia.

Some years ago H. Zapfe presented the author with two fin spines for the collection of the Natural History Museum Vienna –one of them almost complete, one as a fragment. Later some additional fragments of such spines were found in the collection of the Natural History Museum Vienna. These spines emerged as the first spines of the trigger apparatus of Balistidae (NHMWien/GPA 1994/0218/0001; see Fig. 12a-c).

The study of the teeth together with the first spines of the trigger apparatus provided a sound basis for the evaluation of this taxon in the Miocene deposits.

S y s t e m a t i c s

Tetraodontiformes

Balistoidei

Balistidae

Balistes LINNAEUS, 1758

***Balistes muensteri* nov. nom.**

(Figs. 1-3 and 8-12)

- non 1796 *Ostracion turrilus* – VOLTA: 172-174, Nr. LXX, Pl. 42/1 [Eocene: Monte Bolca, Italy.- according LE DANOIS 1961 and TYLER 1975: 104 *Proaracana dubia*, Aracanidae].
- non 1796 *Cyclopterus lumpus* – VOLTA: 272-273, Nr. CXIX, Pl. 65/2 [Eocene: Monte Bolca, Italy.- according LE DANOIS 1961 and TYLER 1975: 104 *Proaracana dubia*, Aracanidae].
- non 1818 *Balistes dubius* (nobis), *Ostracion turrilus* [...] *Cyclopterus lumpus* – DE BLAINVILLE: 337-338 [Eocene: Monte Bolca, Italy. - according LE DANOIS 1961 and TYLER 1975 *Proaracana dubia*, Aracanidae].
- non 1823 *Balistes dubius*, BLAINV. – DE BLAINVILLE: 86, Nr. 7 [Eocene: Monte Bolca, Italy.- NHMParis 10974+10975, Holotype.- according LE DANOIS 1961 and TYLER 1975 *Proaracana dubia*, Aracanidae].
- non 1839² *Ostracion micrurus* – AGASSIZ: 263-264, Pl. 74/4-5 [Eocene: Monte Bolca, Italy.- NHMParis 10974+10975, Holotype of *Balistes dubius* DE BLAINVILLE, 1818.- according LE DANOIS 1961 and TYLER 1975 *Proaracana dubia*, Aracanidae].
- non 1842³ *Acanthoderma ovale* AGASS. – AGASSIZ: 251-252, Pl. 75/3 [Lower Oligocene: Glarus, Switzerland.- according WETTSTEIN 1886: 49 in synonymy of *Acanthoderma spinosum*, according PATTERSON 1993: 653 and TYLER & SANTINI 2002: 71-77 as *Balistomorphus ovalis* (AGASSIZ, 1842) arranged in Balistidae].
- non 1842 *Acanthoderma spinosum* AGASS. – AGASSIZ: 252, Pl. 75/4 [Lower Oligocene: Glarus, Switzerland.- according PATTERSON 1993: 653 and TYLER & SANTINI 2002: 71 + 77 arranged as *Balistomorphus spinosus* (AGASSIZ, 1842) in Balistida].
- non 1842 *Acanthopleurus serratus* AGASS. – AGASSIZ: 253-254, Pl. 75/1+2 [Lower Oligozän: Glarus, Switzerland.- according beside WETTSTEIN 1886: 46 and BROILI & SCHLOSSER 1923: 140 a Triacanthidae].

² In the caption for Pl. 74 it is written that this plate was edited within the tenth to twelfth issue. The 10th to 12th issue was published in "Avril 1839" (see AGASSIZ 1839a: 117, 123). In AGASSIZ 1839b: 1 this fact is confirmed: "10^e Livraison, texte et planches. Avril 1839" bzw. "12^e Livraison, texte et planches. Avril 1839". – TYLER 1975: 118 used for the plate the year 1842, for the text the year 1844.

³ Pl. 75 was published in the "14^e Livraison" 1842.

- 1846 *Capitodus dubius* – MÜNSTER 1846: 17-18 [non Fig. 14-16], Pl. 2/10-13 [non. Fig. 14-16] [all: Badenian, Middel Miocene: Neudorf].
- 1848 *Capitodus dubius* MÜNSTER – HÖRNES: 14, Nr. 54 [Badenian, Middel Miocene: Neudorf]
- non 1876 *Balistes Caifassii*. LAWLEY – LAWLEY: 76, Pl. 1/7+7a-c [Lower Pliozän: Orciano, Tuskany].
- p.p. 1901 *Capitodus dubius*, G. von MÜNSTER – WOODWARD: 537 [only MÜNSTER 1846: Pl. 2/10-13: Badenian, Middel-Miocene: Vienna Basin].
- non 1901 *Ostracion micrurus* L.AGASSIZ [...] (1833-44) – WOODWARD: 569 [Eocene: Monte Bolca, Italy.- NHMParis 10974+10975, Holotype of *Balistes dubius* DE BLAINVILLE, 1818.- according LE DANOIS 1961 and TYLER 1975 arranged as *Proaracana dubia* in Aracanidae].
- non 1905 *Balistes capriscus* GM. – BASSANI: 34-35, Pl. 1/9 ["plisticeniche di Taranto"]
- non 1905 *Ostracion meretrix*, DAIMERIES, 1891 – LERICHE: 167-168, Pl. 12/11-15 [Eocene: Belgium.- in PATTERSON 1993: 653 arranged in Ostracioidea incertae sedis].
- non 1906 *Ancistrodon armatus* GERVAIS, 1852 – LERICHE: 168-169, Fig. 32-35 [Eocene: Belgium.- on account of the tooth type no Balistidae].
- non 1910 *Balistes capriscus* GMELIN – DE STEFANO: 639 [Pliocene: Orciano].
- non 1923 *Ancistrodon* RÖMER – BROILI & SCHLOSSER: 141 [Upper Cretaceous + Eocene + Oligocene: Egypt.- on account of the tooth type no *Balistes*].
- non 1926 *Marosia huismanni* n. g. et n. sp. – de BEAUFORT: 142, Pl. 5/5 (Miocene: Celebes.- Triacanthidae, *Marosichtys* WHITLEY 1951).
- ? 1926 *Balistes* spec. juv. – de BEAUFORT: 142-143, Pl. 5/3 (Miozene: Celebes).
- non 1927 *Balistes procapriscus*, Nov. sp. – ARAMBOURG: 217-219, Pl. 44/1 [Messinian, Upper Miocene: Algeria].
- non 1949 *Balistes Lerichei* n.sp. – BAUZÁ RULLÁN: 519-521, Pl. 27 ["Vindobonien": Mallorca].
- non 1951 *Marosichthys*, nov. [nom.] (Triacanthidae). Type *M[arosia]. huismanni* (BEAUFORT) – WHITLEY: 68 (Miocene: Celebes.- Triacanthidae, instead *Marosia huismanni* BEAUFORT 1926).
- non 1958 *Balistes crassidens* n.sp. – CASIER: 74-75, Fig. 7a-d (Lower Miocene: Trinidad).
- non 1960 *Oligobalistes robustus* sp. nov. – DANIL'CHENKO: 165-167, Fig. 32, Pl. 17/1-2 [Chadum horizon, Lower to Middle Oligocene: Ciskaukasien, Russia. – also by PATTERSON 1993: 653 and TYLER & SANTINI 2002: 71 + 80-82 arranged in Balistidae].
- non 1961 *Proaracana dubia* (BLAINVILLE) (1818) – LE DANOIS: 314-315, Fig. 56 [Eocene: Monte Bolca, Italy.- NHMParis 10974+10975, Holotype of *Balistes dubius* DE BLAINVILLE, 1818, Aracanidae].
- non 1968 *Balistes crassidens* CASIER – BAUZÁ RULLÁN: 29-30, Fig. 1-4.
- non 1968 *Balistes lerichei* BAUZÁ. – BAUZÁ RULLÁN: 30, 33, Fig. 5-9 ["Vindobonien": Mallorca].
- non 1968 *Balistes capriscus* LINN. – BAUZÁ RULLÁN: 33, Fig. 10-13 [Recent].
- non 1968 *Spinacanthus cuneiformis* (BLAINVILLE, 1818) – TYLER: 47 ff [Eocene: Monte Bolca, Italy: arranged in Triacanthodidae, especially in Spinacantinae TYLER, 1968. – see also PATTERSON 1993]
- non 1968 *Protobalistus imperiale* (MASSALONGO, 1857) – TYLER: 47 ff [Eocene: Monte Bolca, Italy: arranged in Triacanthodidae, especially in Spinacantinae TYLER, 1968; in PATTERSON 1993: 653 arranged in Spinacantidae]
- ? 1969 *Balistes* sp. – CAPPETTA: 240-241, Pl. 21/44 [Langhian, Middle Miocene: Loupian, Southern France]
- non 1975 *Proaracana dubia* (BLAINVILLE, 1818) – TYLER: 103, 104 [Aracanidae], 114-117, Fig. 7, Pl. 6 [Eocene: Monte Bolca, Italy.- NHMParis 10974, Holotype], Pl. 7 [Eocene: Monte Bolca] and 8/1 [Eocene: Monte Bolca].
- non 1980 *Proaracana dubia* (DE BLAINVILLE 1818) TYLER, 1975. / *Ostracion dubia* DE BLAINVILLE, 1818, nomen nudum – BLOT: 382 [Eocene: Monte Bolca, Italy.- Balistoidei, Ostraciontoidea, Aracanidae.- NHMParis 10974+10975, Holotype].
- non 1985 *Amanes sulcifer* STINTON, 1966 – NOLF: 105 [Otolith.- Lower Eocene: Southern England].
- non 1992 *Eospinus daniltschenkoi* new species – TYLER & BANNIKOV: 2 ff., Fig. 1-3 [Lower Eocene: Turkmenistan: Balistidae. – in PATTERSON 1993: 653 arranged in Infra-Ordo Balistoideo, recte Balistoidei, incertae sedis].
- non 1993 *Spinacanthus cuneiformis* (DE BLAINVILLE, 1818) – PATTERSON: 653 [Eocene: Monte Bolca, Italy: arranged in Spinacantidae TYLER, 1968]
- non 1993 *Protobalistus imperiale* (MASSALONGO, 1857) – PATTERSON: 653 [Eocene: Monte Bolca, Italy. – arranged in Spinacantidae TYLER, 1968].
- non 1993 *Balistomorphus orbiculatus* (HEER, 1865) – PATTERSON: 653 [Oligocene of Glarus, Switzerland. – arranged in Balistidae].

- non 2003 *Balistes lopezi* n. sp. – MENDIOLA & MARTINEZ: 8-11, Fig. 4 + 5, Pl. 1/1+2 + 4, Pl. 2/2-3d [Messinian of Sierra de Columbares, SE Murcia, SE-Spain].
- non 2003 *Balistes* sp. – MENDIOLA & MARTINEZ: 11-12, Pl. 1/3a+b [Tortonian of Elche, SE-Spain].

Studied material:

1) Incisors (teeth of the outer row) isolated:

Ottangian, Lower Miocene: Höch near Passau, Bavaria, Germany: 1 small isolated incisor (Coll. H. Temmel, Vienna).

Badenian, Middle Miocene

Devinská Nová Ves (= Neudorf/March), Slovakia: 160 incisors (NHMWien/GPA: 115 incisors: 1857/XIX/30; see Fig. 1 and 2. – 2 incisors: o.Nr., leg. Blaschke 1906. – 2 incisors: 1997z0178/1965, further Coll. H. Zapfe. – 17 incisors: 2002z0120/0005, don. O. Lienhart. – 5 incisors: 2002z0184/0001, old stock. – 19 incisors: 2002z0183/0001, old stock).

"Blue quarry" ("Blauer Bruch") near Kaisersteinbruch, Burgenland: 258 isolated incisors (NHMWien/GPA: 67 incisors: 2002z0187/0001-0008 (see Fig. 3); 191 incisors (2002z0187/0010-0015, leg. 1988 and 1996; 2002z0187/0016, leg.+ don. H. Schwengersbauer 1996).

Müllendorf, "Kreide quarry" ("Kreide-Steinbruch"), Burgenland: more than 270 incisors (70 of these are first incisors of the dentary, the other are from the other positions in the upper and lower jaw) and additionally probably more than 500 tooth fragments (Coll. H. Temmel, Vienna). – 1 tooth on matrix (NHMWien/GPA 1989/13/12).

Wiesfleck, Burgenland: 1 tooth (NHMWien/GPA: 2002z0178/0001, don. R. Kunz).

Retznei, Styria: 9 incisors (NHMWien/GPA 2004z0053/0001, coll.+don. E. Seel, Vienna: 1 very large first incisor of the right dentary; see Fig. 8a-c. – Coll. G. Wanzenböck, Gainfarn: 8 incisors).

2) Inner tooth plates, isolated only:

Badenian, Middle Miocene

Müllendorf, "Kreide quarry" (Kreide-Steinbruch), Burgenland: 21 inner tooth plates (Coll. H. Temmel, Vienna), see Fig. 9a+b.

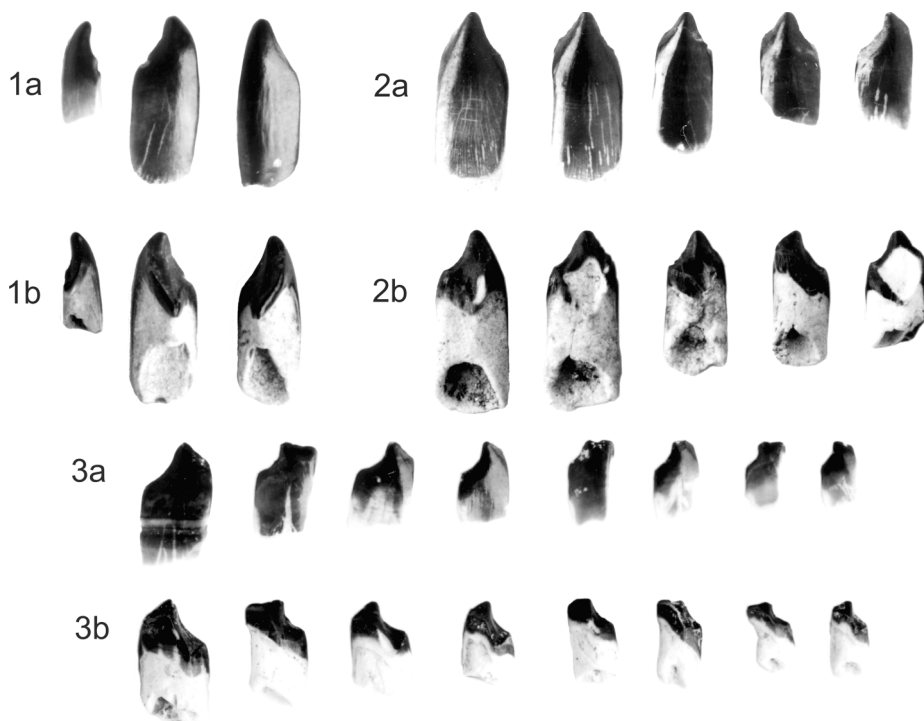
3) First spine of dorsal fin respectively of the trigger apparatus (see Fig. 10-12):

Badenian, Middle Miocene

"Blue quarry" ("Blauer Bruch") near Kaisersteinbruch, Burgenland: 3 specimens of the first spine of the dorsal fin (Coll. G. Wanzenböck, Gainfarn): 1 large und two small fragments (see Fig. 10a+b and 11a+b).

Devinská Nová Ves (= Neudorf/March), Slovakia: 3 specimens of the first spine of the dorsal fin (NHMWien/GPA: 1 fragment of the first spine of the dorsal fin (2002z0184/0002, old stock Nr. 948), 1 mostly complete specimen of the first spine of the dorsal fin together with a fragment (1994/0218/0001 + 0002; don. H. Zapfe) (see Fig. 12a-c).

Remarks upon the list of synonymies above: In this list the most important references of fossil Balistidae are listed together with their modern systematic position. The refer-

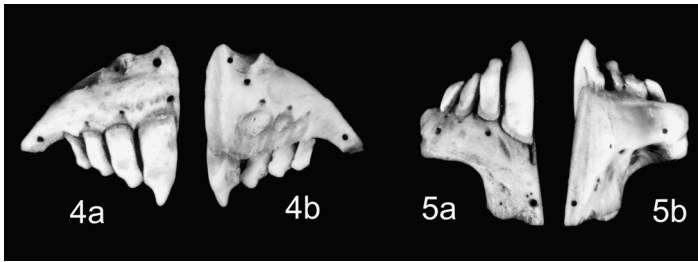


Figs. 1-3: *Balistes muensteri* nov. nom.; (1) first incisors of the dentary, from the left, from the right and from the left side. (1, 2) Devinská Nová Ves (= Neudorf/March), Slovakia; Badenian, Middle Miocene. – NHMWien/GPA 1857/XIX/30/1-3. – The tooth type documented here is identical with that of MÜNSTER 1846: Pl. 12, fig. 13. (2) teeth of the premaxillary, the first four from the right side, the last from the left side. – NHMWien/GPA 1857/XIX/30/4-8. (3) teeth of the left premaxillary; "Blue Quarry" ("Blauer Bruch") south of Kaisersteinbruch, Burgenland, Austria; Badenian, Middle Miocene. – NHMWien/GPA 2002z0187/0001-0008. – (a) labial view, (b) lingual view. – 2x natural size.

ences with "non" have no nearer relation with the incisors known from the Badenian of the Vienna Basin, the references with "non" are not arranged within the Balistidae today.

T e e t h r e s p. i n c i s o r s (Figs. 1-3 and 8):

D e t e r m i n a t i o n of the genus: The incisors from the "Blue quarry" near Kaisersteinbruch, from the "Kreide quarry" near Müllendorf and from Devinská Nová Ves (= Neudorf/March) are extremely similar to Recent Balistidae, such as the Recent *Balistes chrysopilos* BLEEKER, 1853 [NHMWien 91778, see Fig. 4 and 5], *Balistes capriscus* GMELIN, 1789 [NHMWien 92616, see Fig. 6a+b and 7a-c], *Balistes polylepis* STEINDACHNER, 1876 [TYLER 1980: 121, Fig. 67A; 124, Fig. 69], *Balistapus undulatus* (PARK, 1797) [TYLER 1980: 111, Fig. 51 and 112, Fig. 53 above], *Canthidermis maculata* (BLOCH, 1786) [TYLER 1980: 127, Fig. 72], *Melichthys niger* (BLOCH, 1786) [TYLER 1980: 121, Fig. 67D], *Rhinecanthus aculeatus* (LINNAEUS, 1758) [NHMWien 91878],



Figs. 4, 5: *Balistes chrysospiolos* BLEEKER, 1853. (4) Right premaxillary with incisors, the teeth of the inner row are dropped out; Recent. (5) Dentary with incisors; Recent. – a: labial view, b: lingual view. – NHMWien 91778. – Natural size.

Rhinecanthus assasi (FORSSKAL, 1775) [NHMWien 83356], *Rh. rectangularis* (BLOCH & SCHNEIDER, 1801) [TYLER 1980: 126, Fig. 71], *Sufflamen bursa* (BLOCH & SCHNEIDER, 1801) [NHMWien 91896], *Sufflamen fraenatus* (LATREILLE, 1804) [TYLER 1980: 125, Fig. 70], *Xanthichthys lineopunctatus* (HOLLARD, 1854) [TYLER 1980: 121, Fig. 67B; 128, Fig. 73]. The similarities are especially clear in the common overall shape and in the profile of tooth ridge.

Fewer similarities are to be found with the Monacanthidae, for example at *Monacanthus chinensis* (OSBECK, 1765) [NHMWien 91887], *Stephanolepis hispidus* (LINNAEUS, 1766) [TYLER 1980: 155, Fig. 102], *Paramonacanthus cryptodon* (BLEEKER, 1855) [TYLER 1980: 156, Fig. 103] etc. No similarities are shared with the Triacanthidae, for example at the Recent *Pseudotriacanthus strigilifer* (CANTOR, 1849) [TYLER 1980: 89, Fig. 33], *Trixiphichthys weberi* (CHAUDURI, 1910) [TYLER 1980: 92, Fig. 40], *Triacanthus biaculeatus* (BLOCH, 1786) [NHMWien 91954, 93351]: these are low and have a slightly bent or plane cutting edge.

Fortunately TYLER 1980: 121, Fig. 67 found genus-level differences at the incisors of Recent Balistidae: especially the first incisors in the jaw can be used as diagnostic elements. Also the key to genera in SMITH & HEEMSTRA 1986: 877 uses these characters to help separate nine Recent genera. In spite of the numerous isolated incisors which are in hand – see chapter material – always only the same tooth types (Fig. 1-3) are represented. The tooth type "high, with an erected cusp and a cutting edge distally and proximally and inside basally relatively flat" (Fig. 2 and 3) is characteristic for incisors of the premaxilla. The tooth type "high, slender, front edge is ending pointed, behind this point with a steep cutting edge and a triangular transverse section" (Fig. 1) is represented in the first incisor only in the dentary of *Balistes* (see TYLER 1980: 121, Fig. 67A), does not exist in *Odonus* and *Melichthys* (see TYLER 1980: 121, Fig. 67C+D) and in *Xanthichthys* in reduced form only (see TYLER 1980: 121, Fig. 67B). In the dentary of *Odonus* the first incisor has after a low cusp an almost horizontal tooth ridge, and the fourth tooth has the cusp near the middle: these tooth types do not exist in the fossil material from the Vienna Basin. Also the tooth type "with a profile like a hook", typical for *Xanthichthys* (see TYLER 1980: 121, Fig. 67B), is not present. *Rhinecanthus aculeatus* (LINNAEUS, 1758) [NHMWien 91878] and *Rh. assasi* (FORSSKAL, 1775) [NHMWien 83356], *Sufflamen bursa* (BLOCH & SCHNEIDER, 1801) [NHMWien 91896] and *S. fraenatus* (LATREILLE, 1804) (see TYLER 1980: 125, Fig. 70) as *Canthidermis maculata* (BLOCH, 1786) (see TYLER 1980: 127, Fig. 72) possess first incisors with a slowly inlined cutting edge: these tooth types are also not represented in the studied material. Finally, *Balistapus undulatus* (PARK, 1797) (see TYLER 1980: 111, Fig. 51 und 112, Fig. 52) shows similar incisors as *Sufflamen* and *Rhinecanthus* auf (SMITH & HEEMSTRA 1986: 877). The

result therefore is, that the fossil incisors from the Vienna Basin, when compared to extant taxa are closest to the genus *Balistes*.

Especially characteristic in *Balistes* are the first incisors of the dentary because of their distinct triangular transverse section (see Fig. 1b and 7c). The following three incisors⁴ have also a triangular transverse section but in a more and more reduced form. Therefore the determination of these incisors is possible only with complete teeth. In account of the high number of the present incisors from the "Kreide quarry" (Kreide-Steinbruch) near Müllendorf all the incisors of the dentary should be represented.

Besides the characters described above the incisors of the premaxillary are flat also lingually (see Fig. 2 and 3).

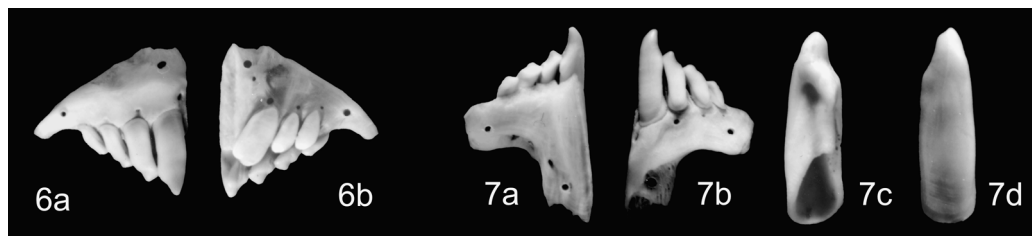
D e t e r m i n a t i o n o f t h e s p e c i e s : As mentioned above in the introduction MÜNSTER 1846: 17-18, Taf. 2/10-13 described incisors of Balistidae as *Capitodus*⁵ *dubius*, which agree completely with the present incisors (Figs. 1-3). Also the especial typical and therefore for determination especial important first incisor of the dentary is figured by MÜNSTER (1846: Taf. 2/13), and is often existing in the present tooth material (Fig. 1). So the species name would be *Balistes dubius* (MÜNSTER, 1846).

But already BLAINVILLE 1818 –see also BLAINVILLE 1823– introduced for a fish print from the Eocene of Monte Bolca [NHMParis 10974+10975, among others see BLOT 1980: 382] the name *Balistes dubius*, which has nothing to do with the incisors from Miocene of the Vienna Basin studied here. DE BLAINVILLE 1818 bzw. 1823: 86 recognized, that the determination by VOLTA 1796 as "*Ostracion turritus*, BLOCH.⁶ aus dem indischen und rothen Meere" as well as a determination as "*Panzerfisch (Ostracion)*" is incorrect. The same is available for VOLTA's determination as a lumpfish *Cyclopterus lumpus* LINNAEUS, 1758. Therefore DE BLAINVILLE 1818: 382 introduced correctly the name *Balistes dubius* for the Monte Bolca species. The name *Ostracion micrurus* introduced by AGASSIZ for the same fish print [NHMParis 10974+10975] must be disposed as a younger synonym. Investigations by LE DANOIS 1961: 314-315 needed the assingment in the new genus *Proaracana* LE DANOIS, 1961, family Aracanidae. TYLER 1975: 104 ff confirmed these results. Because DE BLAINVILLE 1818 resp. 1823: 86 produced a description in words together with an indication with figures published by VOLTA 1796 the comprehension by BLOT 1980: 382 as "nomen nudum" is not correct. Although the species has today the name *Proaracana dubia* (BLAINVILLE, 1818) and is arranged within the family Aracanidae the name *Balistes dubius* DE BLAINVILLE, 1818 is valid and must be protected. Therefore the name *dubius* is preoccupied for the genus *Balistes* and MÜNSTER's *dubius* must be replaced by a younger synonym or if this is impossible a new

⁴ In Balistidae and therefore also in *Balistes* itself eight strong incisors are developed in the upper and also in the lower jaw.

⁵ Already WOODWARD 1901: 323 and finally BÖHME 2002: 153-154 point out, that *Capitodus* MÜNSTER, 1842 –with the type species *Capitodus subtruncatus* MÜNSTER, 1842– is a "Cyprinidae" resp. is a "cyprinid genus". The additional species –*C. truncatus*, *C. angustus*, *C. dubius* und *C. ? interruptus*– arranged by MÜNSTER 1842 and 1846 to *Capitodus*, are given to the Sparidae by WOODWARD 1901: 536-537 and BÖHME 2002: 153-154 with following comments: "Various indeterminable fossil teeth have also been referred to Sparidae under the following names" resp. "belong not to the Cyprinidae but to the Sparidae". On account of my studies *Capitodus dubius* MÜNSTER, 1846 is not a Sparidae, but a Balistidae; see the text.

⁶ Correct *Ostracion turritus* FORSSKAL, 1775, today a synonym of *Tetrosomus gibbosus* (LINNAEUS, 1758) (see ESCHMEYER 2002).



Figs. 6, 7: *Balistes capriscus* GMELIN, 1789 (in synonymy: *Balistes forcipatus* GMELIN, 1789). (6) Right premaxillary with complete dentition: four incisors and the three inner tooth plates; Recent. (7a, b) Left dentary with incisors; Recent. (7c,d) Incisor of the right dentary; Recent. – 6a, 7b+d: labial view. 6b, 7a+c: lingual view. – NHMWien 92616. – a+b natural size; c+d 2x natural size.

name must be created (ICZN 1999: 26 [Article 23.3.5], 62-63 [Article 60]). Therefore in the following stratigraphically arranged list all possible synonyms are compared with MÜNSTER's species based on incisors.

Eocene and Oligocene taxa:

- *Balistomorphus ovalis* (AGASSIZ, 1842), syn. *Acanthoderma ovale* AGASSIZ, 1842: Lower Oligocene: Glarus, Switzerland (see AGASSIZ 1842, WETTSTEIN 1886, PATTERSON 1993, and TYLER & SANTINI 2002).
- *Balistomorphus spinosus* (AGASSIZ, 1842), syn. *Acanthoderma spinosum* AGASSIZ, 1842: Lower Oligocene: Glarus, Switzerland (see AGASSIZ: 1842, PATTERSON 1993, and TYLER & SANTINI 2002).
- *Eospinus daniltshenkoi* TYLER & BANNIKOV, 1992: Lower Eocene: Turkmenistan. – By TYLER & BANNIKOV: 2 ff., Fig. 1-3 this species was assigned as a Balistidae, by PATTERSON 1993: 653 it was not included in a family but only in the Infra-order Balistoideo incertae sedis].
- *Oligobalistes robustus* DANIL'CHENKO, 1960: Chadum-Horizont, Lower to Middle Oligocene: Ciskaukasien, Russia (see DANIL'CHENKO 1960, PATTERSON 1993, TYLER & SANTINI 2002: 80-82).
- *Balistomorphus orbiculatus* (HEER, 1865): Oligocene of Glarus, Switzerland (see PATTERSON 1993: 653, and TYLER & SANTINI 2002: 78-80).

All these species are represented as prints. Therefore no comparison with the tooth material from the Vienna Basin is possible. As discussed above the species from the Badenian of the Vienna Basin is a representative of the genus *Balistes*, but the representatives from the Eocene and Oligocene are arranged within other genera. Therefore these species have no relevance for the species from the Vienna Basin.

Taxa from the Miocene, Pliocene and Pleistocene:

- *Capitodus dubius* MÜNSTER, 1846: Badenian, Middel Miocene: Devinská Nová Ves (= Neudorf/March), Slovakia (see MÜNSTER 1846, HÖRNES: 1848, WOODWARD 1901): it is the species of the present investigation.

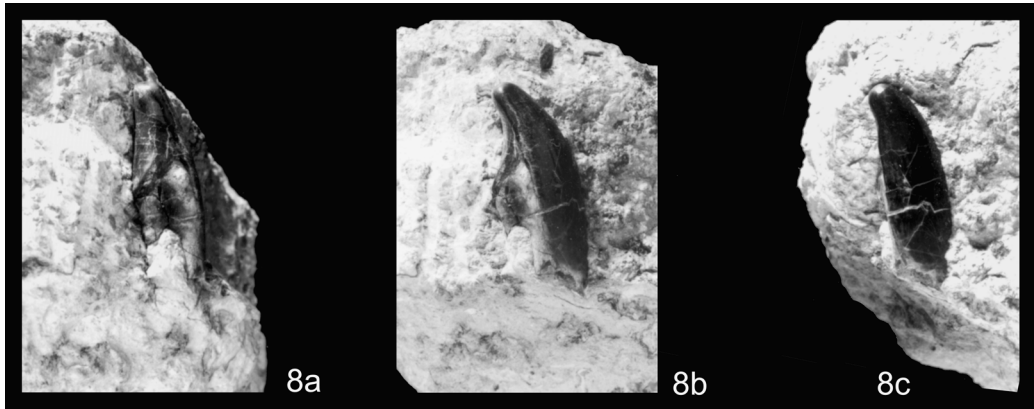


Fig. 8: *Balistes muensteri* nov. nom., first incisor of the right dentary; Retznei, Styria, Austria; Badenian, Middle Miocene. – a, b: lingual views, part; c: labial view. – NHMWien/GPA 2004z0053/0001, coll.+don. E. Seel, Vienna.

- *Balistes Caifassii* LAWLEY, 1876: Lower Pliocene: Orciano, Tuscany (see LAWLEY 1876): the figured tooth has a cusp in the middle of the tooth: this tooth type is not existing within the material from the Vienna Basin studied here. Therefore *B. caifassii* cannot be arranged within the list of synonyms of the species from the Vienna Basin.
- *Balistes capriscus* GMELIN, 1789: Recent, and Pliocene: Orciano, Tuscany (see DE STEFANO 1910) and "plioceniche di Taranto" (see BASSANI 1905, BAUZÁ RULLÁN 1968. – The incisors of the dentary of *B. capriscus* are distinctly more slender: the relation of highness to width of the tooth is 2,81, the rate of the incisors from the Vienna Basin is 2,45. Additionally the point of the tooth of *B. capriscus* begins distinctly higher resp. before the true point a little inclined edge is developed. In contrast the arc to the tooth point of the Vienna Basin incisors begins distinctly lower what produce also a larger tooth area with dental enamel (see Fig. 1 and 7a-c).
- *Balistes spec. juv.*: Miozän: Celebes (de BEAUFORT 1926): of no value for nomenclature.
- *Balistes procapriscus* ARAMBOURG 1927: Messinian, Upper Miocene: Algeria (see ARAMBOURG 1927). J. GAUDANT compared worthwhily isolated incisors from the Vienna Basin with the holotype (MNHNParis ORA 134 G) and comes to following statement (personal note of 9. Nov. 2002): "It seems to be clear that these are quite different from those" of the Vienna Basin (Fig. 2). "Especially the largest one has a rather wide, slightly rounded distal part, exhibiting what seems to be a shallow furrow which is parallel to the distal edge of the tooth."
- *Balistes lerichei* BAUZÁ RULLÁN, 1949: Langhian: Mallorca (BAUZÁ RULLÁN 1949 und 1968): The relation of highness to width of the incisor amounts 1,88 against 2,45 at the incisors from the Vienna Basin, which are much more slender. Additionally, the tooth ridge running to the tooth point is bent in a widely arc. This tooth type was not to find in the whole tooth material from the Vienna Basin.
- *Balistes crassidens* CASIER, 1958: Lower Miocene: Trinidad (see CASIER 1958, BAUZÁ RULLÁN 1968). These incisors are much more massive developed and are therefore of

no more interest in this case. Also the geographical (Caribbean resp. Central Paratethys) and the stratigraphical (Lower resp. Middle Miocene) distribution speak against a specific unity of *muensteri* nov. nom. and *crassidens*.

- *Balistes* sp.: Langhian, Middle Miocene: Loupian, S-France (see CAPPETTA 1969): of no value for nomenclature.
- *Balistes lopezi* MENDIOLA & MARTINEZ, 2003: Messinian: Sierra de Columbares, SE Murcia, SE- Spain. The relation highness to width of the tooth amounts 2,9 against 2,45 at the the incisors from the Vienna Basin. Additionally the edge running to the tooth point is distinctly flatter. These characters are not find in the tooth material from the Vienna Basin. Therefore *muensteri* nov. nom. and *lopezi* are two different species. The study of the first spine of the first dorsal fin resp. of the trigger apparatus confirms this statement (see below), what finally is supported by the different stratigraphical and the different palaeogeographical occurrences.
- *Balistes* sp.: Tortonian: Elche, SE-Spain: of no value for nomenclature.

The above indicated differences for the different taxa may be regarded as inadequate. However, when compared to Recent species it can be noticed that there the differences are in no case greater, but these are true different species differentiated by other characters. Unfortunately, all the tooth material from the Vienna Basin is represented by isolated incisors only. Incisors with jaw fragments or better with complete jaws would be much more informative and important; and the determination would be easier and would provide a clearer identification. In spite of a 150 years of collection activity such a material could not be found. Therefore it must be attempted, to arrange a good determination with the existing tooth types. The above given differences should be sufficient this context, for now. This means, that for the species from the Vienna Basin no younger synonym is existing and for *dubius* MÜNSTER, 1846 a new name must be introduced: ***muensteri* nomen novum.**

Derivatio nominis: Remembering G. v. MÜNSTER 1846 who reported as the first with "*Capitodus dubius*" Balistidae from the Vienna Basin and at all from the Neogene. It deals with isolated teeth which systematic position MÜNSTER did not recognized: he arranged these teeth in his own genus *Capitodus*, where he arranged also pharyngeal teeth of Cyprinidae (see footnote 5 resp. BÖHME 2002: 154).

Locus typicus: "Neudörfl unweit Pressburg", later Neudorf an der March, today Devinská Nová Ves, Slovakia.

Stratigraphical age of the locus typicus: Badenian, Middle-Miocene.

Lectotype: Bayerische Staatssammlung München (Pl. 2, Fig. 13 in MÜNSTER 1846).

Paralectotypes: Bayerische Staatssammlung München (Pl. 2, Fig. 10-12 in MÜNSTER 1846).

Assurance of the name *muensteri*: Before an introduction of a new name takes place it is necessary to control that this name is not used for the special genus. Therefore some fish reference books as WOODWARD 1901, HAY 1905 and 1928, NOLF 1981 and 1985, ESCHMEYER 2002 were controlled for Recent and fossil species of *Balistes* resp. Balistidae. The most important references of fossile Balistidae are listed in the list of synonymies above: no taxon *muensteri* was to find. Also no Recent species of *Balistes* could be found with the name *muensteri*.



Fig. 9: *Balistes muensteri* nov. nom., inner tooth plates of the premaxillary; "Kreide quarry" ("Kreide-Steinbruch") near Müllendorf, Burgenland, Austria; Badenian, Middle Miocene. – a: inner view, b: lingual view. – Coll. H. Temmel, Vienna.

Remarks: Finally it can be noticed that for the Vienna Basin a special species is less of interest, but it is of most interest that the genus *Balistes* and the family Balistidae can be determined now from the Badenian of the Vienna Basin.

The largest incisor – 28 mm high – comes from Retznei (see Fig. 8). Its determination as *Balistes muensteri* is only possible on the basis of the studied rich tooth material from the "Kreide quarry", because this material encloses not only small but also large incisors like that from Retznei.

Inner tooth plates (Fig. 9):

Owing to the great attention and to the kindness of H. Temmel also some inner tooth of *Balistes muensteri* from the "Kreide quarry" ("Kreide-Steinbruch") near Müllendorf, Austria, were available for the present investigation. It is a speciality of Balistidae to bear 3 tooth plates on each premaxillary lingually (see Fig. 6b and TYLER 1980: 104; SMITH & HEEMSTRA 1986: 876).

First spine of the first dorsal fin; see Figs. 10-12 (fossil material) and 13-14 (Recent material):

Determination of the genus and the species (see also the overview in Table 1):

It was possible to compare with four genera of the family Triacanthodidae. On account of characters like "less bent", "more slender" and "sculpture more minute" these four genera and probably the whole family have no similarities with the present spines.

Especially the distinctly weaker articulation and the distinctly less bent sinuosity of equivalent spine of two genera of the family Triacanthidae make it possible to take this family not into account.

The Monacanthidae could be compared directly only with one preparation. But the very instructive drawings in TYLER 1980 make possible to compare with species of 16 genera. On account of the sculpture, e.g. the sculpture with hooks at the posterior flanks of the spine, the massive construction without a furrow at the backside of the spine and some additional characters (see Table 1 in the appendix) the Monacanthidae are not suitable for the present spines from the Vienna Basin.

The general construction and the sculpture of the first spine of the first dorsal fin are mostly agreeing with that of the Balistidae. But the first spines of the trigger apparatus of the genera *Balistapus*, *Canthidermis* and *Melichthys* are more massive and therefore not suitable. Remaining are the genera *Balistes*, *Odonus*, *Rhinecanthus* and *Sufflamen*. Because the present spines are from the same localities as the incisors discussed above it is not only possible but probable, that spines and teeth (incisors and inner teeth) are



Figs. 10-12: *Balistes muensteri* nov. nom., (10) fragment of the (11, 12) first spine of the first dorsal fin resp. of the trigger apparatus; Badenian, (10, 11) Middle Miocene; (10, 11) "Blue Quarry" ("Blauer Bruch") near Kaisersteinbruch, Burgenland, Austria; Badenian, Middle Miocene; (12) Devinská Nová Ves (= Neudorf/March), Slovakia; Badenian. – 10a, 11b, 12b: upper view; 10b, 11a, 12a: lateral view; 12c: posterior view. – (10, 11) Coll. G. Wanzenböck, Gainfarn, Austria; (12) NHMW/GPA 1994/0218/0001, leg. + don. H. Zapfe. – (10) 2x (11, 12) natural size.

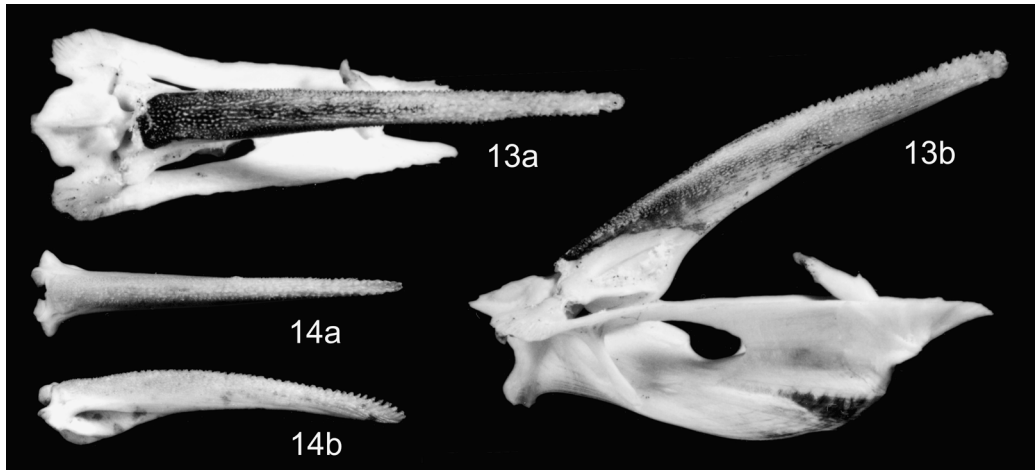
from the same taxon. The determination of the incisors has shown –see above– that among others *Odonus*, *Rhinecanthus* and *Sufflamen* are not suitable. As with some certainty the incisors are of the genus *Balistes*, so also the first spines of the first dorsalis –or of the trigger apparatus– should originate from a *Balistes* species, that is *Balistes muensteri* nov. nom.

From *Balistes lopezi* MENDIOLA & MARTINEZ, 2003 from the Messinian of the Sierra de Columbares, SE Murcia, SE- Spanien, also the first spine of the first dorsal fin is known (MENDIOLA & MARTINEZ 2003: Pl. 2, Fig. 3a-d). The sculpture at the front side is on the whole area largely homogenous coarse granulated. In contrary for it the sculpture of the spines from the Vienna Basin are in the lower half especially laterally minute granulated and arranged in rows; only in the upper half the spine is coarse granulated (see Fig. 12b). Also these different characters are arguments for two different species (see also the remarks discussing the incisors of *Balistes lopezi*).

Ecological statements:

The certain record of the family Balistidae (triggerfish) on account of teeth (incisors and inner teeth) and also with the first spine of the trigger apparatus is for the Vienna Basin during the Badenian a further indication for subtropical conditions (see among others also BELLWOOD & SCHULTZ 1991, SCHULTZ & BELLWOOD 2004). The Recent distribution of the most species of Balistidae reaches from tropical to subtropical seas only (see Plate 1/1). One species is distributed in the Mediterranean: *Balistes capriscus* GMELIN, 1789 (see Plate 1/2). The Gulf Stream makes it possible that *Balistes* on occasions may extend to North Sea of Scotland (TORTONESE 1986: 1336).

Most triggerfish species occur on coral reefs. The Recent fishes are individualists, which are living on rocky bottom between 10 and 100 meters. One of the favorite foods is the long-spined sea urchin, *Diadema* (see SMITH & HEEMSTRA 1986: 876).



Figs. 13, 14: first spine of the first dorsal fin resp. of the trigger apparatus; (13) *Odonus niger* (RÜPPELL, 1836); Safaga, Red Sea; Recent. – a: lateral view; b: upper view. – KS 7635. (14) *Balistes chrysopilos* BLEEKER, 1853, Recent. – NHMWien 91778. – Natural size.

The most of the teeth should be of individuals with a total length (TL) of ca. 45 cm, whilst the tooth from Retznei should originate from a fish of 100 cm total length. The largest Recent species of Balistidae are measuring approximately 60 cm (SMITH & HEEMSTRA 1986: 877-882).

Distribution in the Central Paratethys:

O t t n a n g i a n :

Molasse Basin:

Höch, near Passau, Bavaria (Coll. H. TEMMEL, Vienna).

B a d e n i a n (further details see studied material):

Vienna Basin:

Müllendorf, "Kreide quarry" (Kreide-Steinbruch), Burgenland (NHMWien/GPA, Coll. H. TEMMEL, Vienna, and Coll. G. WANZENBÖCK, Gainfarn).

"Blue quarry" (Blauer Bruch") south of Kaisersteinbruch, Burgenland (NHMWien/GPA and Coll. G. WANZENBÖCK, Gainfarn).

Devinská Nová Ves (= Neudorf/March), Slovakia (MÜNSTER 1846: 1, 17-18. – HÖRNES 1848: 14. – NHMWien/GPA).

Styrian Basin:

Wiesfleck, Burgenland (NHMWien/GPA).

Retznei, Styria (pers. communication by H. HIDEN, 22.IX.2002, and G. WANZENBÖCK, Gainfarn).

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Hans Lukaschek (+) spent a very long time to pick out a lot of samples from "Blue quarry" near Kaisersteinbruch, Burgenland. Also the new arrangement of the teeth collection from Devinská Nová Ves (Neudorf/March) at the NHMWien/GPA on account of morphological characters we thank to Hans Lukaschek.

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Appendix:

Tab. 1: First spine of the first dorsal fin resp. of the Trigger Apparatus. Overview of measurements and characters of the fossil and the Recent material⁷:

Abbreviations: NHMWien = Naturhistorisches Museum Wien, Ichthyological Collection. – NHMWien/GPA = Naturhistorisches Museum Wien, Geologisch-Paläontologische Abteilung. – KS = Material in the author's possession. – * Sculpture removed. – SL = Standard length. – TL = Total length.

	length in mm	width in mm	Index	TL ⁸ SL mm	First spine of first dorsal, characters	Result +: ● -: ▼
Coll. G. Wanzenböck, Gainfam (see Fig. 10a+b and 11a+b) Badenian, Middle Miocene	37 incompl. 56,8 compl.	7,8	7,28	----- -----	Lower edges smooth	
Blauer Bruch ["Blue Quarry"] south of Kaisersteinbruch, Burgenland						
NHMW 1994/0218/0001 (see Fig. 12a-c) Badenian.- Middle Miocene Devinská Nová Ves (= Neudorf/March), Slovakia	52	5,7	9,12	----- -----	Lower edges smooth	
Triacanthodidae						
Macrorhampnosodes uradoi (KAMOYARA, 1933) TYLER 1980: 69, Fig. 21 Recent.- Japan				----- 69,9	less bent, more slender, minute sculpture	▼
Parahollardia lineata (LONGLEY, 1935) TYLER 1980: 57, Fig. 6 Recent.- Gulf of Mexico to South Carolina				----- 45,7 -86,1	more slender, minute sculpture	▼
Triacanthodes anomalus (TEMMINCK & SCHLEGEL, 1850) TYLER 1980: 67, Fig. 19 Recent.- Japan				----- 71,5	less bent, minute sculpture	▼

⁷ according ESCHMEYER 2002, systematically arranged according ESCHMEYER 1990: 494

⁸ the measurements of the length in SMITH & HEEMSTRA 1986 are interpreted as TL

	length in mm	width in mm	Index	TL ⁸ SL mm	First spine of first dorsal, characters	Result +: ● -: ▼
<i>Tydemania navigatoris</i> (WEBER, 1913) TYLER 1980: 68, Fig. 20 Recent.- Bay of Bengal				----- 64,4	less bent more slender minute sculpture - "-	▼
SMITH & HEEMSTRA 1986: 890 Recent.- Japan to east coast of Africa				- 120 -----		▼
<i>Triacanthidae</i>						
<i>Pseudotriacanthus strigilifer</i> (CANTOR, 1849) TYLER 1980: 89, Fig. 33 Recent.- India				----- 79,0	less bent, more slender minute sculpture	▼
<i>Triacanthus biaculeatus</i> (BLOCH, 1786) NHMWien 91954 Recent: Schanghai	49	3,6*	13,61*	----- -----	less bent, more slender, articulation distinctly weaker not bent	▼
NHMWien 93351 [old labelling: <i>Triacanthus brevirostris</i>]	34	3,2	10,62	191 -----		▼
<i>Triphichthys weberi</i> (CHAUDURI, 1910) TYLER 1968: 362, Fig. 207 resp. TYLER 1980: 92, Fig. 40 Recent.- Bay of Bengal	42	--	--	----- 101	not bent minute sculpture	▼
<i>Balistidae</i>						
<i>Balistapus undulatus</i> (PARK, 1797) TYLER 1980: 111, Fig. 51, 116, Fig. 59 Recent.- Western Pacific	23,5	7,34	3,20	----- 120- 124 ----- -----	more robust	▼
NHMWien 91858 (<i>Balistes lineatus</i>) Recent.- see also MATSUURA 1979: 125, Fig. 51C	31,3	5,7	5,49		more robust, sculptured front: broader	▼
<i>Balistes capricornis</i> GÜNTHER, 1789 = <i>Balistes carolinensis</i> GÜNTHER, 1789 KS 7873/1 Recent.- Karpathos, Mediterranean	46	3,5	13,14	----- -----		●

NHMWien 91667 (<i>Balistes forcipatus</i> Gmelin) Recent. - Gorée	70	5,3	13,20	----	●
<i>Balistes chrysospilos</i> BLEEKER, 1853 NHMWien 91778 (see Fig. 14) Recent.	48	6,5	7,38	----- -----	● ?
<i>Canthidermis maculata</i> (BLOCH, 1786) TYLER 1980: 127, Fig. 72 Recent. - Alabama				----- 80,1	▼
<i>Melichthys niger</i> (BLOCH, 1786) KS 7798 Recent. - Aquarium	35	5,9	5,93	235 -----	▼
<i>Odonus niger</i> (RÜPPELL, 1836) KS 7635 (see Fig. 13a+b) Recent. - Safaga, Red Sea	67	6,5	10,30	----- -----	●
<i>Rhinecanthus aculeatus</i> (LINNAEUS, 1758) NHMWien 91878 (<i>Balistes aculeatus</i>) Recent.	25	4,4	5,68	----- -----	?
KS 7845 Recent. - Aquarium	12	2,0	6,0	73 -----	?
<i>Rhinecanthus assasi</i> (FORSSKAL, 1775) [old label: <i>Balistes assasi</i>] NHMWien 83356 Recent.	32,5	3,8	8,55	217 -----	●
<i>Rhinecanthus rectangulus</i> (BLOCH & SCHNEIDER, 1801) TYLER 1980: 126, Fig. 71 Recent. - Phoenix Islands			37,4	----- -----	▼
<i>Sufflamen bursa</i> (BLOCH & SCHNEIDER, 1801) NHMWien 91896 Recent. - Sandwich Inseln.	33,9	4,3	7,88	----- -----	●
<i>Sufflamen fraenatus</i> (LATREILLE, 1804) TYLER 1980: 125, Fig. 70 Recent. - Somalia see also MATSUURA 1979: 125, Fig. 51E	---	---	---	----- 74,3	▼

	length in mm	width in mm	Index	TL ⁸ SL mm	First spine of first dorsal, characters	Result +: ● -: ▼
Monacanthidae						
<i>Monacanthus chinensis</i> (OSBECK, 1765)						
NHMW 91887				---	massive: without hollow	▼
Recent: Sidney				---	at the back, with very	
					large thorns along both	
					posterior edges	
<i>Monacanthus ciliatus</i> (MITCHILL, 1818)						
TYLER 1980: 145, Fig. 80+81				---	hooks on	▼
Recent: - Florida				81,3	the back	
<i>Acanthaluteres spilomelanurus</i> (QUOY & GAIMARD, 1824)						
TYLER 1980: 161, Fig. 108				---	with coarse	▼
Recent: - Australia				63,7	thorns	
<i>Aluterus monoceros</i> (LINNAEUS 1758)						
SMITH & HEEMSTRA 1986: Pl. 137, Fig. 264, 1A				60	with coarse	▼
Recent: - Natal, South Africa				---	hooks	▼
SMITH & HEEMSTRA 1986: Pl. 137, Fig. 264, 1C				435		
Recent: - East coast, South Africa				---		
SMITH & HEEMSTRA 1986: Pl. 137, Fig. 264, 1B				570	very thin	▼
Recent: - Algoa Bay, South Africa				---		
<i>Aluterus heudelotii</i> HOLLARD, 1855						
TYLER 1980: 162, Fig. 109				---	more slender	▼
Recent: - Florida				107		
<i>Aluterus scriptus</i> (OSBECK, 1765)						
SMITH & HEEMSTRA 1986: Pl. 137, Fig. 264, 2A				190	very thin	▼
Recent: - Mozambique				---		
SMITH & HEEMSTRA 1986: Pl. 137, Fig. 264, 2B				510	very thin	▼
Recent: - Seychelles				---		
<i>Amanes scopas</i> (CUVIER, 1829)						
TYLER 1980: 160, Fig. 107				---	fine sculpture	▼
Recent: - Saipan				167	only	▼
SMITH & HEEMSTRA 1986: 883				- 200	with minute posteriorly-	
Recent				---	directed barbs along each	
					posterolateral edge	

<i>Brachaluteres jacksonianus</i> (QUOY & GAIMARD, 1824) TYLER 1980: 163, Fig. 111 Recent: - Australia	----- 55,5	articulation longer and weaker	▼
<i>Chaetodermis spinosissimus</i> (QUOY & GAIMARD, 1824) TYLER 1980: 157, Fig. 104 Recent: - Malaya	----- 33,0	coarse, irregular sculpture	▼
<i>Acanthaluteres spilomelanurus</i> (QUOY & GAIMARD, 1824) TYLER 1980: 151, Fig. 93 Recent		coarse hooks on front and back side	▼
<i>Oxymonacanthus longirostris</i> (BLOCH & SCHNEIDER, 1801) TYLER 1980: 165, Fig. 113; 171, Fig. 122 Recent: - Seychelles	----- 34,2 26,5	with coarse hooks	▼
<i>Paraluteres prionurus</i> (BLEEKER, 1851) TYLER 1980: 164, Fig. 112 Recent: - Seychelles	----- 46,4	more robust, near of the end the stoutest place	▼
<i>Paramonacanthus bamardi</i> FRASER-BRUNNER, 1941 SMITH & HEEMSTRA 1986: 885, Fig. 264.10 Recent: - East coast of Africa to Durban in the south	90 -----	with a row of downward directed barbs along each postero-lateral edge	▼
<i>Paramonacanthus cingalensis</i> (FRASER-BRUNNER, 1941) SMITH & HEEMSTRA 1986: 885, Fig. 264.10 Recent: - Tropical areas of Indian Ocean south to Ungazi River, Transkei	190 -----	with 4 rows of small downward- directed barbs	▼
<i>Paramonacanthus cryptodon</i> (BLEEKER, 1855) TYLER 1980: 156, Fig. 103 Recent: - Thailand	----- 68,5	coarse hooks	▼
<i>Paramonacanthus curtiorhynchus</i> (TILSUS, 1809) TYLER 1980: 149, Fig. 89 Recent.		with a flat low denticulation	▼

	length in mm	width in mm	Index	TL ⁸ SL mm	First spine of first dorsal, characters	Result +: ● -: ▼
<i>Pervagor melanocephalus</i> (BLEEKER, 1853) SMITH & HEEMSTRA 1986: 886, Fig. 264.11 Recent.- Tropical Indo-West-Pacific			- 160		a row of large barbs along each lateral edge	▼
<i>Pervagor spilosomus</i> (LAY & BENETT, 1839) TYLER 1980: 158, Fig. 105 Recent.- Hawaii				----- 80,0	lateral with thorns	▼
<i>Pseudalutarius nasicornis</i> (TEMMINCK & SCHLEGEL, 1850) TYLER 1980: 166, Fig. 114 Recent.- Philippines SMITH & HEEMSTRA 1986: 886 Recent.- Tropical/subtropical Indo-West Pacific				----- 108 - 180 -----	more slender very slender	▼ ▼
<i>Psilocephalus barbatus</i> (GRAY, 1830) TYLER 1980: 162, Fig. 110 Recent.- Singapore				137	minit	▼
<i>Rudarius ercodes</i> JORDAN & FOWLER, 1902 TYLER 1980: 150, Fig. 91 Recent					coarse thorns on back strongly bent	▼ ▼
MATSUURA 1979: 124, Fig. 50B Recent						
<i>Rudarius minutus</i> TYLER, 1970 TYLER 1980: 159, Fig. 106 Recent.- Borneo				17,9	with coarse thorns	▼
<i>Stephanolepis auratus</i> (CASTELNAU, 1861) SMITH & HEEMSTRA 1986: 886 Recent.- Known only from Knysna to Zanzibar				- 280	with a row of posteriorly- directed barbs along each posterolateral edge	▼
<i>Stephanolepis cirrifer</i> (TEMMINCK & SCHLEGEL, 1850) TYLER 1980: 149, Fig. 87 Recent.					distinctly shorter, laterally with coarse hooks	▼

<i>Stephanolepis hispidus</i> (LINNAEUS, 1766) TYLER 1980: 155, Fig. 102 Recent. - Florida	50,4	laterally with coarse hooks	▶
<i>Thamnaconus</i> SMITH, 1949: 10 species SMITH & HEEMSTRA 1986: 886 Recent.		with a row of laterally-directed barbs along each lateral edge	▶

Plate 1

Fig. 1: *Sufflamen chrysopterum* (BLOCH & SCHNEIDER, 1801); Indo-West-Pacific.

Fig. 2: *Balistes capriscus* GMELIN, 1789; Mediterranean.

Photographs by R. Patzner, Salzburg.



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