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## Supplementary notes on elasmobranch and teleost fish remains from the Korytnica Clays (Middle Miocene; Holy Cross Mountains, Central Poland)

**ABSTRACT:** The assemblage of the elasmobranch and teleost fish remains from the Middle Miocene (Badenian) Korytnica Clays (Holy Cross Mountains, Central Poland) comprises a few taxa more than previously reported (Schultz 1977), viz. *Dasyatis* aff. *delfortriei* Cappetta, 1970, *Dasyatis applanata* (Probst, 1877), *Odontaspis* (*Synodontaspis*) *cuspidata* (Agassiz, 1844), *Spyraena substriata* (Münster, 1846), and *Labrodon* sp. Some additional data and comments and/or corrections to the former descriptions are also supplemented.

### INTRODUCTION

A relatively rich fish material contained in the world-famous Middle Miocene (Badenian) Korytnica Clays on the southern slopes of the Holy Cross Mountains, Central Poland (cf. Bałuk & Radwański 1977, 1979) has recently been analysed by the present author (Schultz 1977). Further sifting of the clay samples has supplied new specimens of the diverse fish, the presence of which enriches the content of the hitherto known fish assemblage from the Korytnica Clays.

The aim of the present paper is threefold: (i) to describe the new material from the Korytnica Clays (cf. Pl. 1, Figs 1—8); (ii) to make some corrections to the previous report (Schultz 1977); (iii) to revise some forms of the species that occur in the Korytnica Clays, and which have formerly been reported with incorrect determinations by Pawłowska (1960) from the neighbouring *Leithakalk*-type facies exposed in large quarries at Pińczów. In this respect, the list of the elasmobranch and teleost fishes known from that latter locality (cf. Kowalewski 1930, Pawłowska 1960, Radwański 1965) is also supplemented.

Some of the corrections offered in the present paper appeared from the results of new investigations of the rarely occurring and unsatisfactorily known fishes from the Middle Miocene (Badenian) deposits of the Vienna Basin (Schultz 1978; cf. also Schultz 1971). Consequently, the total amount of the hitherto recognized

elasmobranch and teleost fishes from the Korytnica Clays (see Table 1) makes this assemblage the richest one within the Miocene deposits of the Fore-Carpathian Depression in Poland.

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#### SYSTEMATIC DESCRIPTION

Class *Chondrichthyes*  
Subclass *Elasmobranchii*  
Order *Squatinida*

Suborder *Rajoidei*  
*Rajoidei* indet.

*Remarks:* The previously reported remains (Schultz 1977, p. 202) actually represent thorns of undeterminable *Rajoidei*

Family **DASYATIDAE**  
*Dasyatis* aff. *probsti* Cappetta, 1970

*Remarks:* To this taxon, previously reported from the Korytnica Clays (Schultz 1977), the forms collected in the *Leithakalk* type facies at Pińczów and determined by Pawłowska (1960, p. 424 and Pl. 2, Figs 9—13) as "*Raja* sp." should also be included.

*Dasyatis* aff. *delfortriei* Cappetta, 1970  
(Pl. 1, Figs 3—4)

1970. *Dasyatis delfortriei* nov. sp.; H. Cappetta, pp. 98—100, Pl. 22, Figs 14—22.

*Material:* Two teeth of females.

*Remarks:* Such morphological features of the investigated teeth as the shape, position and branching of their roots make an evidence for their close relationship to the species established by Cappetta (1970).

*Occurrence:* Lower Miocene of Hérault, southern France (*cf.* Cappetta 1970).

*Dasyatis applanata* (Probst, 1877)  
(Pl. 1, Fig. 5)

1877. *Raja (Placolithes) applanata* n. sp.; J. Probst, pp. 98—99, Pl. 2, Figs 9—11.

1890. *Trygon thalassia fossilis* Jaekel; O. Jaekel, pp. 365—366 (*partim*).

1894. *Trygon thalassia fossilis* Jaekel; O. Jaekel, p. 141 (*partim*).

1911. *Trygon cavernosus* Probst; M. Leriche, pp. 471—472 (*partim*).

1927. *Trygon cavernosus* Probst, 1877; M. Leriche, pp. 39—42 (*partim*).

1968. *Dasyatis molassicus* (Probst 1877); S. Jonet, pp. 251—252, Pl. 1, Fig. 3.

*Material:* One dermal tubercle.

*Remarks:* The investigated dermal tubercle (Pl. 1, Fig. 5) corresponds well to the "*Placolithes*" which Probst (1877, see especially Pl. 2, Figs 10 and 11) described as *Raja (Placolithes) applanata* Probst. An evident similarity is also apparent to the dermal tubercle assigned by Jonet (1968) to *Dasyatis molassicus* (Probst, 1877).

Jaekel (1890, p. 366; 1894, pp. 140—141) regarded such taxa as *Raja Philippii* Münster, *Acipenser molassicus* Probst, *Raja molassica* v. Zittel, *Acipenser tuberculatus* Probst, *Acanthobatis tuberculatus* v. Zittel, *Dynobatis* Larrazet, *Raja mammillaris* Probst, *Raja appianata* Probst, and *Raja conica* Probst, as nomenclatorily invalid, and he included all these forms, being either the dermal tubercles or the scales from the tail („Hautschilder und Schuppen auf dem Schwanz”), into one new subspecific taxon, viz. *Trygon thalassia fossilis* Jaekel.

Leriche (1911, pp. 471—472; 1927, pp. 39—42) proceeded in a similar way, but he decided to use the name *Trygon cavernosus* Probst, 1877. Concerning the tooth taxa discussed by Jaekel, and by Leriche, it is to note that in recent revisions (Cappetta 1970) both *Dasyatis cavernosa* (Probst) and *D. rugosa* (Probst) are regarded as separate species. Moreover, when Probst was analysing the Baltringen material, he was sure that the scales, dermal plates, caudal spines, and teeth partly at least belong to one species of fish; as he could not prove that evidently, he was keeping in a common use such general names as „Bates” for caudal spines, and „*Raja (Placolithes)*” for dermal tubercles. The present author has no Baltringen material at his disposal, although he is of the opinion that Probst has offered the best approach to the treatment of the discussed fish remains, while both Jaekel and Leriche have undoubtedly simplified the taxonomical matter of this subject.

The assignation of the investigated dermal tubercle to *Dasyatis* is based on its similarity to the plates of the present-day species of the genus *Dasyatis* and, on the other hand, on the fact that in the Korytnica basin this very genus of the comparable rays was the only hitherto recognized within the teeth material (*see* Schultz 1977).

### Table 1

The list of the elasmobranch and teleost fish remains (except the otoliths) from the Korytnica Clays (*cf.* Schultz 1977); asterisked are the forms described or illustrated for the first time in this paper

#### ELASMOBRANCHS:

- Hexanchus primigenius* (Agassiz, 1843)
- Squatina subserrata* (Münster, 1846)
- Rajoidei* indet.
- Dasyatis* aff. *probsti* Cappetta, 1970
- Dasyatis* aff. *cavernosa* (Probst, 1877)
- \* *Dasyatis* aff. *delfortriei* Cappetta, 1970
- \* *Dasyatis appianata* (Probst, 1877)
- Myliobatis* sp. and/or *Rhinoptera* sp.
- Mobula* aff. *loupianensis* Cappetta, 1970
- Scyliorhinus distans* (Probst, 1879)
- Carcharhinus priscus* (Agassiz, 1843)
- ?*Galeocercus aduncus* (Agassiz, 1843)
- Galeorhinus affinis* (Probst, 1878)
- Paragaleus pulchellus* (Jonet, 1966)
- Sphyrna* sp.
- Odontaspis (Synodontaspis) acutissima* (Agassiz, 1844)
- \* *Odontaspis (Synodontaspis) cuspidata* (Agassiz, 1844)
- \* *Procarcharodon megalodon* (Agassiz, 1843)
- ?*Isurus hastalis* (Agassiz, 1843)

#### TELEOSTEANS:

- Teleostei* indet.
- \* *Sphyræna substriata* (Münster, 1846)
- Sparus* sp.
- Diplodus* sp.
- Dentex* sp.
- \* *Labrodon* sp.
- ?*Labridae* indet.
- ?*Scomberomorus* sp.
- ?*Balistes* sp.

## Family MYLIOBATIDAE

*Myliobatis* sp. and/or *Rhinoptera* sp.

(Pl. 1, Figs 6—7)

*Remarks:* In addition to a lateral dental plate figured previously (Schultz 1977, Pl. 1, Fig. 4), two better preserved median plates are now illustrated (Pl. 1, Figs 6—7).

Order *Carcharhinida*

## Family CARCHARHINIDAE

*Carcharhinus priscus* (Agassiz, 1843)

*Remarks:* To this species commonly occurring in the Korytnica Clays (Schultz 1977), also the forms determined by Pawłowska (1960, p. 423 and Pl. 2, Figs 1—6) as "*Eugaleus latus* (Leriche) Weiler" from the *Leithakalk*-type facies at Pińczów should be included.

*Galeorhinus affinis* (Probst, 1878)

(Pl. 1, Fig. 2)

*Remarks:* The assignment of the previously investigated forms (Schultz 1977) to this species is undoubted (*cf.* Pl. 1, Fig. 2; and the forms discussed in Schultz 1977, p. 204), and therefore a question mark is to be deleted. There is also a correction to the previous remarks: The present-day representatives of the genera *Geleorhinus* Blainville, *Paragaleus* Budker, and *Hypoprion* Müller & Henle (*cf.* Bigelow & Schroeder 1948, Budker 1935, etc.) possess so much similar teeth that their assignment, especially when having isolated and damaged crowns, sometimes is almost impossible.

To this species also the forms determined by Pawłowska (1960, p. 424 and Pl. 2, Figs 7—8) as "*Galeus cf. canis* Bonaparte" from the *Leithakalk*-type facies at Pińczów should be included.

*Paragaleus pulchellus* (Jonet, 1966)

*Remarks:* The assignment of the previously presented forms (Schultz 1977) to this species is apparently correct, and therefore a question mark should be omitted. In addition, it is to note that two of the investigated specimens possess the denticles on their posterior ridge only, which matches well to the features of the species; the third specimen, however, otherwise quite similar, displays the denticles also on the anterior ridge (*see* Schultz 1977, Pl. 2, Fig. 5).

Order *Odontaspidida*

## Family ODONTASPIDIDAE

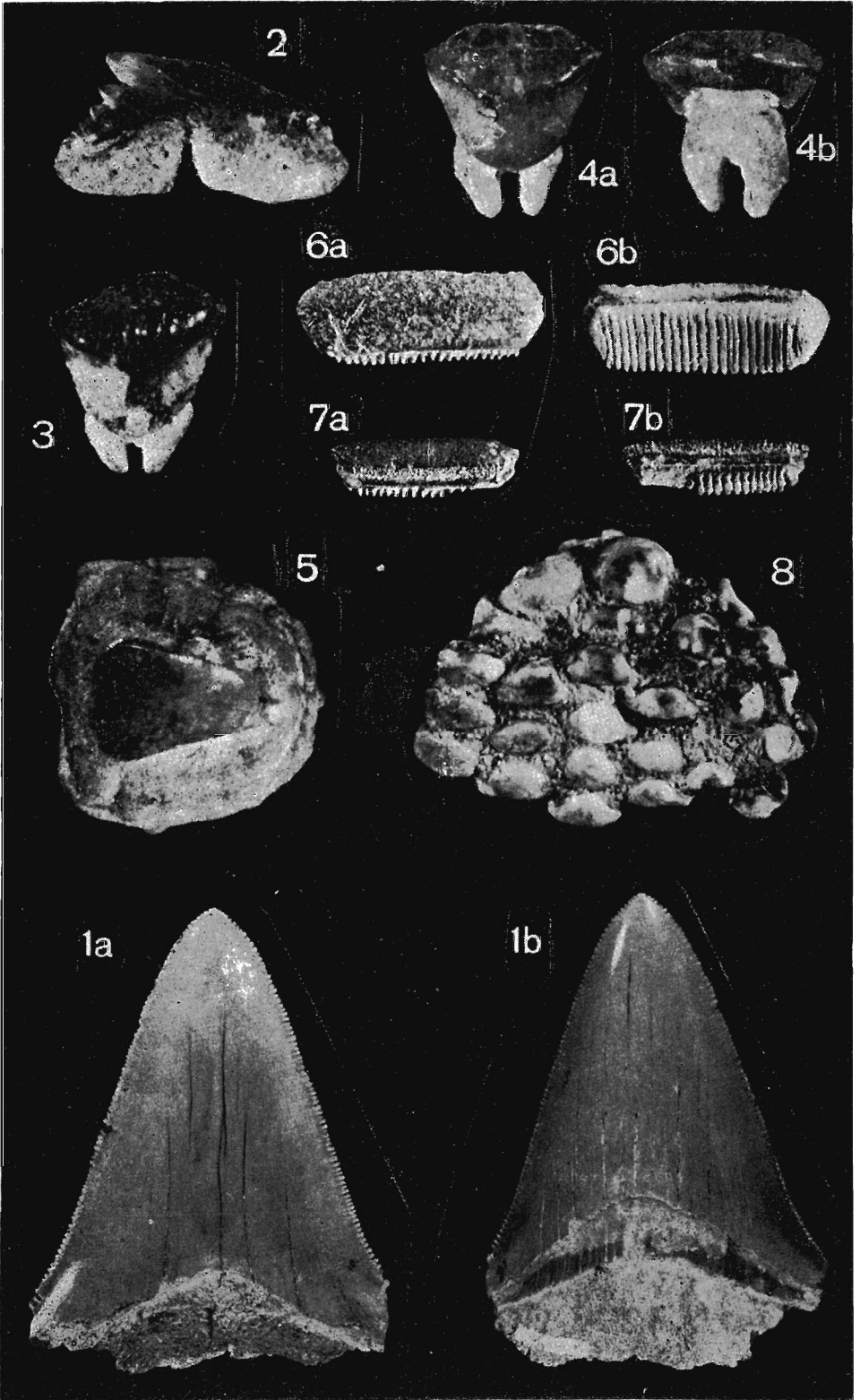
*Odontaspis* (*Synodontaspis*) *cuspidata* (Agassiz, 1844)

1970. *Odontaspis cuspidata* Agassiz; H. Cappetta, pp. 32—33, Pl. 3, Figs 6—10.

*Material:* One fragment of a tooth.

## PLATE 1

- 1 — *Procarcharodon megalodon* (Agassiz); anterior tooth of the lower jaw: *1a* outer view, *1b* inner view; nat. size. The specimen housed at the Museum of the Geological Survey of Poland (Catalogue number 27.II.526)
  - 2 — *Galeorhinus affinis* (Probst); posterior lateral tooth, inner view,  $\times 10$
  - 3—4 — *Dasyatis* aff. *delfortriei* Cappetta; 3 and 4a upper view, 4b basal view;  $\times 10$
  - 5 — *Dasyatis applanata* (Probst); dermal tubercle, upper view,  $\times 10$
  - 6—7 — *Maliobatis* sp. and/or *Rhinoptera* sp.; median dental plates: 6a and 7a upper views, 6b and 7b side views;  $\times 2$
  - 8 — *Labrodon* sp.; fragment of the pharyngeal dental plate;  $\times 10$
- All photos taken by F. Langenhagen



*Occurrence:* This cosmopolitan species is commonly known all over the world since the Lower Oligocene through the Upper Miocene (*cf.* Cappetta 1970). Within the *Leithakalk*-type facies at Pińczów, it is one of the most frequent species (*cf.* Kowalewski 1930, Radwański 1965). At Korytnica it was previously reported, with a question mark, by Kowalewski (1930).

### Family CARCHARODONTIDAE

#### *Procarcharodon megalodon* (Agassiz, 1843)

(Pl. 1, Fig. 1)

*Remarks:* This species also widely distributed all over the world since the Oligocene/Miocene boundary through the Pliocene has previously been reported from Korytnica (Schultz 1977, p. 205) where it is represented by a single specimen of the slightly damaged crown, collected by K. Kowalewski in 1957 from the marly sands overlying the Korytnica Clays (*cf.* Bałuk & Radwański 1977). The specimen figured in this paper (Pl. 1, Fig. 1) is housed at the Museum of the Geological Survey of Poland (Catalogue number 27.II.526).

#### Class *Osteichthyes*

#### Subclass *Actinopterygii*

#### Supraorder *Teleostei*

#### Teleostei indet.

*Remarks:* Some of the previously reported remains (Schultz 1977, p. 206) actually represent thorns of undeterminable Teleostei.

#### Order *Mugilida*

#### Family SPHYRAENIDAE

#### *Sphyraena substriata* (Münster, 1846)

1846. *Saurocephalus substriatus*, Münster; G. Münster, p. 26, Pl. 2, Fig. 20.

1846. *Saurocephalus inaequalis* Münster; G. Münster, p. 26, Pl. 2, Fig. 21.

1967. *Sphyraena ollstponensis* nov. sp.; S. Jonet, p. 187, Pl. 1, Figs 1—20.

1978. *Sphyraena substriata* (Münster); O. Schultz, p. 206, Pl. 1, Figs 1—3.

*Remarks:* The form being previously assigned to ?*Sphyraena* sp. (Schultz 1977, p. 206) should be correctly determined (*cf.* Schultz 1978) as *Sphyraena substriata* (Münster, 1846).

*Occurrence:* The species is known since the Lower through the Upper Miocene of Portugal and southern France, as well as from the Middle Miocene of the Vienna Basin (*cf.* Schultz 1978).

#### Order *Percida*

#### Family SPARIDAE

#### *Sparus* sp.

1960. *Chrysophrys* sp. (*cf.* *Sphaerodus cinctus* Münster, 1870); K. Pawłowska, p. 426, Pl. 3, Figs 1—6.

*Additional material:* Seventeen small conical teeth.

*Remarks:* These forms, reported previously from the Korytnica Clays (Kowalewski 1930; Schultz 1977, p. 201 and 206), are also present within the *Leithakalk*-type facies at Pińczów from where they were called erroneously (*cf.* synonymy). In the other Paratethys basins, the genus *Sparus* is represented (*see* Brzobohaty & Schultz 1978) by the otoliths determined as *Sparus doderleini* Bassoli & Schubert, 1906.

## Family LABRIDAE

*Labrodon* sp.

(Pl. 1, Fig. 8)

*Material:* One fragment of the pharynge.

*Remarks:* The investigated plate (*cf.* Pl. 1, Fig. 8) evidently belonged to a representative of the family Labridae, or generally to the genus *Labrodon*, or the "genus" established by Cocchi (1864), viz. *Pharyngodopilus*. Its specific determination is not however possible, as many species have been distinguished in the Neogene deposits of Europe (*see e.g.* Woodward 1901). Similar forms from the *Leithakalk*-type facies of Pińczów have been determined by Pawłowska (1960, p. 425 and Pl. 3, Fig. 17) as *Labrodon pavimentatum* Gervais.

## Order Tetrodontida

## Family BALISTIDAE

? *Balistes* sp.

*Remarks:* The previously reported remains (Schultz 1977, p. 207) actually represent thorns.

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