

ANDRZEJ RADWAŃSKI

A CONTRIBUTION TO THE KNOWLEDGE OF MIOCENE
ELASMOBRANCHII FROM PIŃCZÓW (POLAND)

Abstract. — Of several remains of elasmobranch fishes, found in the Lower Tortonian Leitha-limestones at Pińczów, 6 forms are briefly described, so far either unknown from the territory of Poland, or insufficiently known. An attention is paid to the occurrence of the two species, characteristic of tropical seas: *Hemipristis serra* Ag. and *Aetobatis arcuatus* Ag.

INTRODUCTION

Collecting the fauna from the Miocene sediments on the southern margin of the Holy Cross Mountains (Góry Świętokrzyskie), the present author found many remains of the elasmobranch fishes, occurring in the Lower Tortonian Leitha-limestones (quarries Nos. 1, 2 and 3 at Nowa Wieś near Pińczów). The forms found, as well as those, identified by previous authors (Kowalewski, 1930; Pawłowska, 1960) are listed in Table 1.

In addition to the Elasmobranchii, some bone fishes (Kowalewski, 1930; Jerzmańska, 1958; Pawłowska, 1960) are furnished by the Leitha-limestones at Pińczów.

The aim of the present paper is to discuss briefly the Elasmobranchii which so far were unknown in Poland, or were insufficiently known. In view of the vagueness in the synonymy of several genera and families (cf. Vitalis, 1942; Berg, 1955; Leriche, 1957; de Beaumont, 1960, and others), the present author keeps the names which were used by Leriche (1957). The names of larger taxonomic units of Elasmobranchii, such as sharks proper (Selachoidei) and rays (Batoidei), are given according to Berg (1955) who treats them as superorders within the subclass Selachii, class Elasmobranchii.

Table 1
Elasmobranch fishes found in Leitha-limestones at Pińczów

Species	Kowalewski (1930)*	Pawłowska (1960)	Radwański (present paper)
<i>Notidanus primigenius</i> Ag.	—	—	+
<i>Odontaspis acutissima</i> Ag.	—	+	+
<i>Odontaspis cuspidata</i> (Ag.)	+	—	+
<i>Oxyrhina desori</i> Ag.	—	—	+
<i>Oxyrhina hastalis</i> Ag.	—	—	+
<i>Carcharodon megalodon</i> Ag.	+	+	+
<i>Eugaleus latus</i> (Storms)	—	+	—
<i>Galeus</i> cf. <i>canis</i> Bonaparte	—	+	—
<i>Carcharias</i> (<i>Aprionodon</i>) cf. <i>collata</i> Eastman	—	+	—
<i>Carcharias</i> (<i>Hypoprion</i>) sp.	—	+	—
<i>Carcharias</i> (<i>Prionodon</i>) sp.	—	+	—
<i>Galeocерdo aduncus</i> Ag.	+	+	+
<i>Hemipristis serra</i> Ag.	—	—	+
<i>Myliobatis</i> cf. <i>meridionalis</i> Gervais (dental plates)	—	+	+
<i>Myliobatis</i> e gr. <i>meridionalis</i> Gervais (caudal spines)	—	—	+
<i>Aetobatis arcuatus</i> Ag.	—	—	+
<i>Raja</i> sp.	—	+	—

+ present, — absent

* Besides, *Oxyrhina* sp., *Myliobatis* sp. and *Notidanus serratissimus* Ag. were mentioned. The latter denotation is rather uncertain (see p 269).

DESCRIPTION OF THE FORMS COLLECTED

SHARKS PROPER (SELACHOIDEA)

Family Notidanidae

Genus *Notidanus* Cuvier, 1817

Notidanus primigenius Agassiz, 1843

(Pl. I, figs. 1, 2)

Synonymy: cf. Woodward (1886), Leriche (1927, 1957), Vitalis (1942).

Material. — One complete tooth, 1 crown and 3 fragments of crowns (an anterior denticle and median denticles). The best-preserved specimens (Pl. I, figs. 1, 2) come from the left-side of the lower jaw. According to the reconstruction of the dentition of *Notidanus primigenius* Ag., made by Vitalis (1942, Table 1), the first of the specimens discussed (Pl. I, fig. 1) comes from file 1, situated on the side of the symphyseal file, while the second (Pl. I, fig. 2) — from file 5, that is last but one.

Occurrence. — *Notidanus primigenius* Ag. has not so far been described from the Pińczów limestones, while another species, *Notidanus serratissimus* Ag. which, formerly, was also mentioned, with a certain reservation, by Roemer (1870) from the Miocene of Upper Silesia, from

Zabrze (Roemer, 1870, Pl. 48, fig. 1) and from Boguchwałów (Hohndorf) near Głubczyce, was recorded from Pińczów by Kowalewski (1930). However, it was already Woodward (1889, p. 162) who indicated that the specimen, presented by Roemer, may also belong to the species *N. primigenius*. In his revision of fossil species of the genus *Notidanus*, Woodward points out that *N. serratissimus* is an Eocene species. *N. primigenius* was once more revised by Vitalis (1942) who has shown (*l.c.*, p. 36) that *N. serratissimus*, presented by Roemer from Zabrze, is actually a tooth of file 2 of the lower jaw of *N. primigenius*. Considering the fact that *N. serratissimus* also was never mentioned in recent monographs of the Miocene ichthyofauna, it seems that the occurrence of this species in the Miocene limestones at Pińczów (Kowalewski, 1930) may arouse justified doubts. Unfortunately, no illustrations of the specimen found was ever presented by Kowalewski who, of the literature referred to, cites only Roemer's paper, mentioned above. In the light of these remarks it may be judged that it was *N. primigenius* that really was met with by Kowalewski at Pińczów.

Notidanus primigenius Ag. occurs from the Eocene to the Pliocene, in most countries of the Western and Southern Europe, as well as in the U. S. A. (Woodward, 1886, 1889; Leriche, 1927, 1942, 1957; Vitalis, 1942; Kruckow, 1959). Of Miocene sediments situated nearest the territory of Poland, this specimen occurs in the Pannonian Basin (Koch, 1903; Vitalis, 1942).

Family Isuridae

Genus *Oxyrhina* Agassiz, 1835

Oxyrhina hastalis Agassiz, 1843

(Pl. I, fig. 3)

Synonymy: cf. Leriche (1927, 1957).

Material. — One complete, 1 almost complete tooth (with slightly damaged root) and 3 crowns. The complete tooth (Pl. I, fig. 3) comes from the left side of the upper jaw.

Occurrence. — *Oxyrhina hastalis* Ag. has not so far been known from the territory of Poland, while it is widely distributed all over the world from the Oligocene to the Pliocene. It is mostly met with in the Miocene of Southern and Western Europe, of the U.S.A., Mexico, Cuba, Patagonia, North Africa and Japan (Woodward, 1889; Arambourg, 1927; Leriche, 1927, 1938, 1957; Kruckow, 1957, 1959). The Central European localities where *O. hastalis* occurs in the Miocene sediments, situated near the territory of Poland, should be added to those, mentioned or cited by the authors listed above. These are: Podolya (Kudrin, 1957), northern parts of the Pannonian Basin (Koch, 1903; Hano & Seneš, 1953) and the edge of the Vienna Basin near the slopes of the Little Carpathians (Kornhuber, 1865). The last three authors (Kornhu-

ber, 1865; Koch, 1903; Kudrin, 1957) describe the specimen in question as *Oxyrhina xiphodon* Ag., this name being included in the synonymy of the species *O. hastalis* Ag. (cf. Woodward, 1889; Leriche, 1927).

It was only the genus itself that so far was mentioned from the territory of Poland. Roemer records *Oxyrhina* sp. from the Leitha-limestones at Boguchwałów near Głubczyce, and Kowalewski (1930) — from the discussed Leitha-limestones at Pińczów and Szczaworyż near Busko, from the oyster lumachelles and marls of the sub-Lithothamnium horizon at Korytnica, as well as from the sands at Rybnica near Klimontów.

Oxyrhina desori Agassiz, 1843

(Pl. I, fig. 4)

Synonymy: cf. Leriche (1927, 1957).

Material. — Four crowns and 1 fragment of a tooth, consisting of a part of the crown and of the root (Pl. I, fig. 4).

Occurrence. — The species *Oxyrhina desori* Ag. has not so far been known from the territory of Poland. It is fairly common in the Oligocene and Miocene of Europe (Woodward, 1889; Leriche, 1927, 1947; Kruckow, 1959), although it results from the list of species, found in particular countries that it is less frequent than *O. hastalis*. The species *O. desori* is also described from the Upper Eocene of the U.S.A. (cf. Woodward, 1889) and from the Miocene of Cuba (Leriche, 1938). Nearest Poland, it is met with in the Miocene of the northern part of the Pannonian Basin (Hano & Seneš, 1953).

Family **Carcharinidae**

Genus *Hemipristis* Agassiz, 1843

Hemipristis serra Agassiz, 1843

(Pl. I, figs. 5, 6)

Synonymy: cf. Leriche (1927, 1938, 1957).

Material. — One complete tooth, 1 fragment including a part of the crown and of the root, as well as 3, partially damaged, crowns. The complete tooth (Pl. I, fig. 5) comes from the right side of the upper jaw of an adult individual. One of the damaged teeth of the upper jaw (Pl. I, fig. 6) probably belonged to an old individual (cf. Leriche, 1927, Pl. 14, fig. 14).

Occurrence. — *Hemipristis serra* Ag. has not so far been recorded in Poland, while it is very common in the Miocene and occurs almost all over the world, for instance, in Western and Southern Europe,

North Africa, on Atlantic coasts of the South Africa, eastern and western (California) coasts of the U.S.A., in Cuba, Venezuela, Argentina, Burma, Java (cf. Leriche, 1927, 1938, 1942, 1954, 1957), Mexico (Kruckow, 1957) and India (Ghosh, 1959). Nearest Poland, *Hemipristis serra* appears in the Miocene of the northern part of the Pannonian Basin (Koch, 1903; Hano & Seneš, 1953) and on the edge of the Vienna Basin near the Little Carpathians (Kornhuber, 1865).

The occurrence of *Hemipristis serra* in the Eocene, Oligocene and Pliocene is, in most cases, doubtful and the determinations given are, according to Leriche (1957), either uncertain, or erroneous. The synonymy of the species *H. serra* is rather complex since Agassiz (1843), erecting the new genus and species, had only a fossil material at his disposal. The Recent sharks of the genus *Hemipristis* have been found only later on. We owe the reconstruction of the dentition of the fossil species *Hemipristis serra* to Leriche's investigations and, particularly, to his 1938 publication. It results from these investigations that these were only lateral teeth of the upper jaws that were described by Agassiz (1843) as *H. serra*. The remaining teeth were described by him and by other authors with different specific and even generic names since their shape and serration were very variable in both jaws.

RAYS (BATOIDEI)

Family Myliobatidae

Genus *Myliobatis* Cuvier, 1817

Myliobatis e gr. *meridionalis* Gervais, 1852

(Pl. II, figs. 1, 2)

Synonymy: cf. Leriche (1957).

Material. — Two fairly long fragments of caudal spines (Pl. II, figs. 1, 2) and a few smaller fragments. The best-preserved specimen (Pl. II, fig. 1) includes the median part of the spine with its base partially preserved, but with the distal end broken off. The length of this fragment amounts to 15.5 cm. On the basis of the comparison with other fragments and their mutual ratio, the entire length of the spine should be estimated as about 23 cm.

The specific determination of caudal spines in rays of the genus *Myliobatis* is difficult and not always reliable since different species had very similar spines. In literature, the determination of these forms is carried out rather cautiously (cf. Arambourg, 1927; Leriche, 1957; Ghosh, 1959). As a matter of fact they are very rare fossils.

The specimens found may belong to the species *Myliobatis meridionalis* Gervais, relatively most common in the Miocene and already formerly

recorded from the Pińczów limestones (Pawłowska, 1960 — dental plates of *Myliobatis* cf. *meridionalis* Gervais). The specimens collected are fairly similar to the spine, figured by Arambourg (1927, Pl. 46, fig. 12) from the Miocene of Oran as *Myliobatis crassus* Gervais (which is a synonym of *M. meridionalis* Gervais — cf. Leriche, 1957), as well as to the spine of *M. meridionalis*, presented by Leriche (1957, Pl. 47, fig. 8) from the Miocene of the vicinities of Dinan, Brittany, France. However, since it is impossible to exclude the possibility that the spines found belong to some related species, the present author determines them as *Myliobatis* e gr. *meridionalis* Gervais.

Occurrence. — The caudal spines of rays of the genus *Myliobatis* have not so far been described from the territory of Poland. More important findings of analogous forms from the Miocene of Europe and North Africa are recorded in Arambourg's (1927) and Leriche's (1957) works, mentioned above. Recently, a fragment of the spine of *Myliobatis* sp. was also found in the Miocene of India (Ghosh, 1959).

Genus *Aetobatis* Müller & Henle, 1841

Aetobatis arcuatus Agassiz, 1843

(Pl. I, fig. 7)

Synonymy: cf. Leriche (1927, 1957).

Material. — A fragment of the lower jaw dentition, consisting of two plates with a characteristic arcuate shape and coalesced by means of a system of parallel ribs, matching each other (Pl. I, fig. 7).

Occurrence. — The rays belonging to the species *Aetobatis arcuatus* Ag. have not so far been known from the territory of Poland. On the other hand, they are fairly frequent in the Miocene of the Southern and Western Europe, particularly in the Alpine molasse and on the territory of France (Leriche, 1927, 1957). They also occur in the Miocene of Africa, North America, Venezuela (cf. Leriche, 1938, 1942) and India (Ghosh, 1959). Nearest Poland, this species occurs in the Miocene of the northern parts of the Pannonian Basin (Hano & Seneš, 1953).

CONCLUSIONS

The species of the Elasmobranchii from the Leitha-limestones of Pińczów, known so far, represent a very cosmopolitan assemblage, widely distributed in the Miocene deposits. It occurs in most countries of the Central, Southern and Western Europe, sometimes it also appears in Africa, America and Asia, showing, however, relatively only

slight differentiation, depending on age, climatic and, partially, facial conditions. As may be concluded on the basis of the distribution of particular genera of the elasmobranch fishes in Recent seas (Leriche, 1927, p. 104), this assemblage is particularly characteristic of the tropical and subtropical seas (cf. also Pawłowska, 1960, Table 2). The genera *Hemipristis* and *Aetobatis*, now living only in tropical seas (Leriche, 1927), constitute an undoubtedly most tropical element within the fish assemblage of the Pińczów limestones (cf. also Hano & Seněš, 1953; Leriche, 1957; Jerzmańska, 1958; Pawłowska, 1960).

The Elasmobranchii remains described above occur in the Pińczów limestones as single specimens, widely scattered and occurring mostly on the surface of the layers. On the other hand, the state of preservation of the surfaces of most teeth and spines is excellent. The cases of a partial encrustation of the teeth (particularly, roots) by the bryozoans are very rare. All these remains, therefore, although not found in the death places of the fishes under study, were not carried along the sea bottom for a long time. Most probably, they were dragged by waving, bottom currents and, partially, by some bottom dwellers, for relatively small distances and were quickly buried in sediments.

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ANDRZEJ RADWAŃSKI

PRZYCZYNEK DO ZNAJOMOŚCI MIOCENSKICH SPODOUSTYCH
(ELASMOBRANCHII) Z PIŃCZOWA

Streszczenie

Spośród różnych szczątków ryb spodoustych, znalezionych w dolno-tortońskich wapieniach pińczowskich (kamieniołomy Nr. 1, 2 i 3 w Nowej Wsi koło Pińczowa), opisano szczątki dotychczas nieznanymi ryb z terenu Polski, lub też poznanych

нидокładnie (vide Tab. 1). Z żarłaczy właściwych (nadrząd Selachoidei) są to: *Notidanus primigenius* Ag., *Oxyrhina desori* Ag., *Oxyrhina hastalis* Ag. i *Hemipristis serra* Ag., zachowane w postaci zębów lub ich fragmentów (Pl. I, fig. 1-6). Z płaszczyk (nadrząd Batoidei) są to: *Myliobatis* e gr. *meridionalis* Gervais, zachowane jako kolce ogonowe (Pl. II), oraz *Aetobatis arcuatus* Ag., reprezentowany przez płytki zębowe (Pl. I, fig. 7).

Wymienione spodouste wraz z formami znanymi poprzednio (Kowalewski, 1930; Pawłowska, 1960) stanowią zespół typowy dla utworów mioceńskich prawie na całym świecie. Najbliżej terenu Polski analogiczne zespoły występują w miocenie Podola, Basenu Pannońskiego i Wiedeńskiego (Kornhuber, 1865; Koch, 1903; Vitalis, 1942; Hano & Seneš, 1953; Kudrin, 1957).

Jak sądzić można z rozprzestrzenienia poszczególnych rodzajów ryb spoduustych w morzach współczesnych (vide Leriche, 1927), zespół występujący w wapieniach pińczowskich jest szczególnie charakterystyczny dla mórz tropikalnych i subtropikalnych (por. także Pawłowska, 1960, Tab. 2). Rodzaje *Hemipristis* i *Aetobatis*, żyjące obecnie tylko w morzach tropikalnych (Leriche, 1927), stanowią w obrębie ichtiofauny wapieni pińczowskich element niewątpliwie najbardziej tropikalny (por. także Hano & Seneš, 1953; Leriche, 1957; Jerzmańska, 1958; Pawłowska, 1960).

АНДРЖЕЙ РАДВАНЬСКИ

К ВОПРОСУ О ЗНАНИИ МИОЦЕНОВЫХ ЭЛАСМОБРАНХИЙ ИЗ ПИŃЧОВА (ПОЛЬША)

Резюме

Среди остатков рыб эласмобранхий, найденных в нижнетортонских известняках из Пиньчова (каменоломня 1, 2 и 3 в Новой Вси около Пиньчова), описано остатки форм до сих пор в Польше неизвестных или же недостаточно изученных (см. Таб. 1). Из настоящих акул (надотряд Selachoidei), это: *Notidanus primigenius* Ag., *Oxyrhina desori* Ag., *Oxyrhina hastalis* Ag. и *Hemipristis serra* Ag., сохранены в виде зубов или же их фрагментов (Пл. I, фиг. 1—6). Из скатов (надотряд Batoidei), это: *Myliobatis* e gr. *meridionalis* Gervais, сохранен в виде хвостовых шипов (Пл. II), и *Aetobatis arcuatus* Ag., представлен зубными пластинками (Пл. I, фиг. 7).

Приведенные эласмобранхии вместе с формами известными раньше (Kowalewski, 1930; Pawłowska, 1960) становятся сообщество типичное для миоценовых образований почти во всем мире. Наиболее близки к территории Польши

аналогические сообщества известны из миоцена Подолии, Паннонского и Венского бассейнов (Kornhuber, 1865; Koch, 1903; Vitalis, 1942; Hano & Seneš, 1953; Кудрии, 1957).

Местонахождение разных родов эласмобранхий в современных морях (см Leriche, 1927) позволяет судить, что сообщество находящееся в пиньчовских известняках особенно характерно для тропических и субтропических морей (см. также Pawłowska, 1960, Таб. 2). Роды *Hemipristis* и *Aetobatis*, живущие ныне в тропических морях (Leriche, 1927), являются в пределах ихтиофауны пиньчовских известняков элементом несомненно наиболее тропическим (см. также Hano & Seneš, 1953; Leriche, 1957; Jerzmańska, 1958; Pawłowska, 1960).

PLATES

Plate I

Notidanus primigenius Ag.

Fig. 1. Tooth of the left lower jaw (file 1); *a* outer view, *b* inner view.

Fig. 2. Crown of another tooth, left lower jaw (file 5); *a* outer view, *b* inner view.

Oxyrhina hastalis Ag.

Fig. 3. Tooth of the left upper jaw; *a* outer view, *b* side view, *c* inner view.

Oxyrhina desori Ag.

Fig. 4. Fragment of the tooth, a part of the crown and root; *a* side view, *b* inner view.

Hemipristis serra Ag.

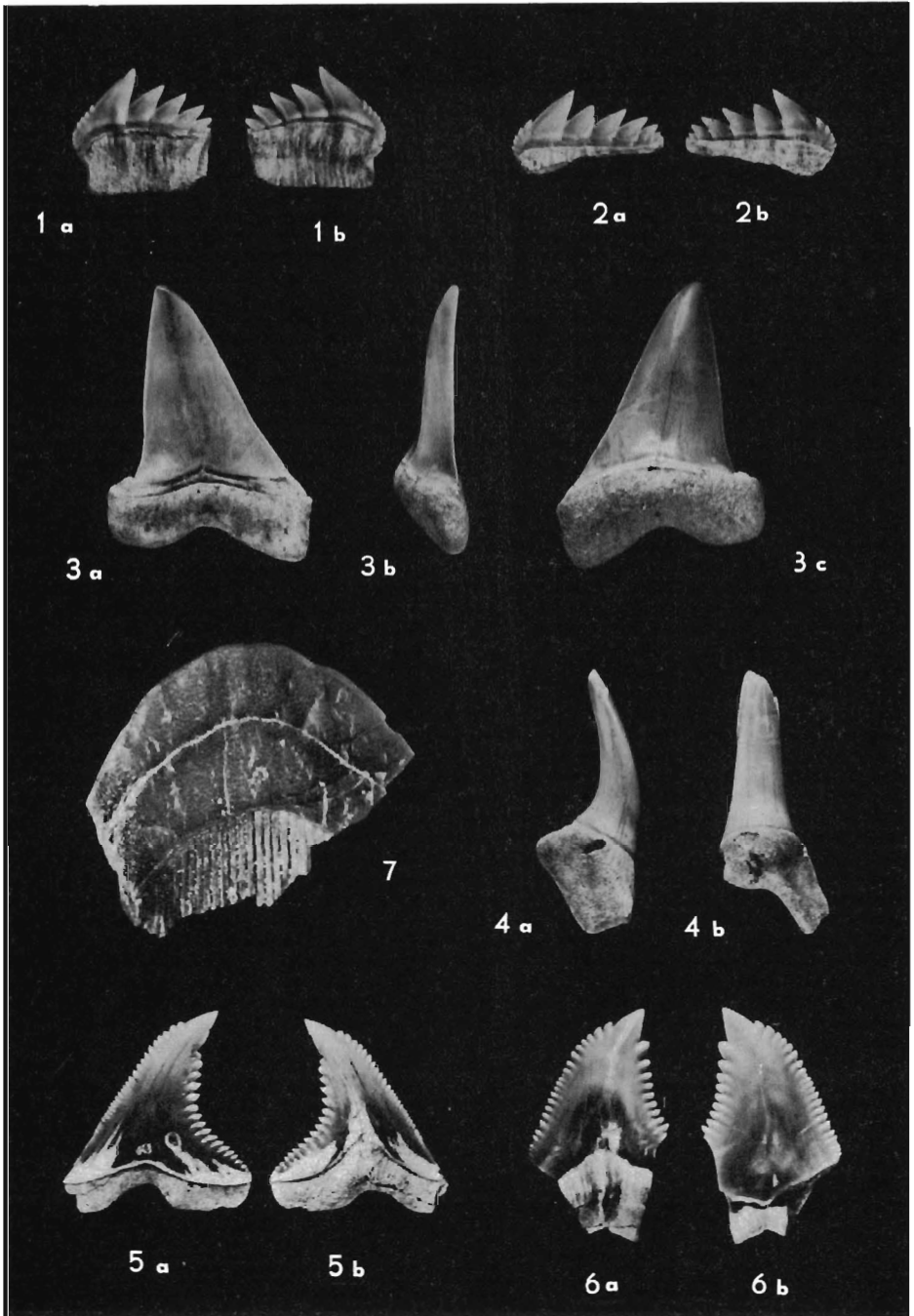
Fig. 5. Lateral tooth of the right upper jaw; *a* outer view, *b* inner view.

Fig. 6. Fragment of the lateral tooth of the left upper jaw, probably belonging to an old specimen; *a* inner view, *b* outer view.

Aetobatis arcuatus Ag.

Fig. 7. Dental plates from the lower jaw.

All photos of natural size, taken by B. Drozd, M. Sc.



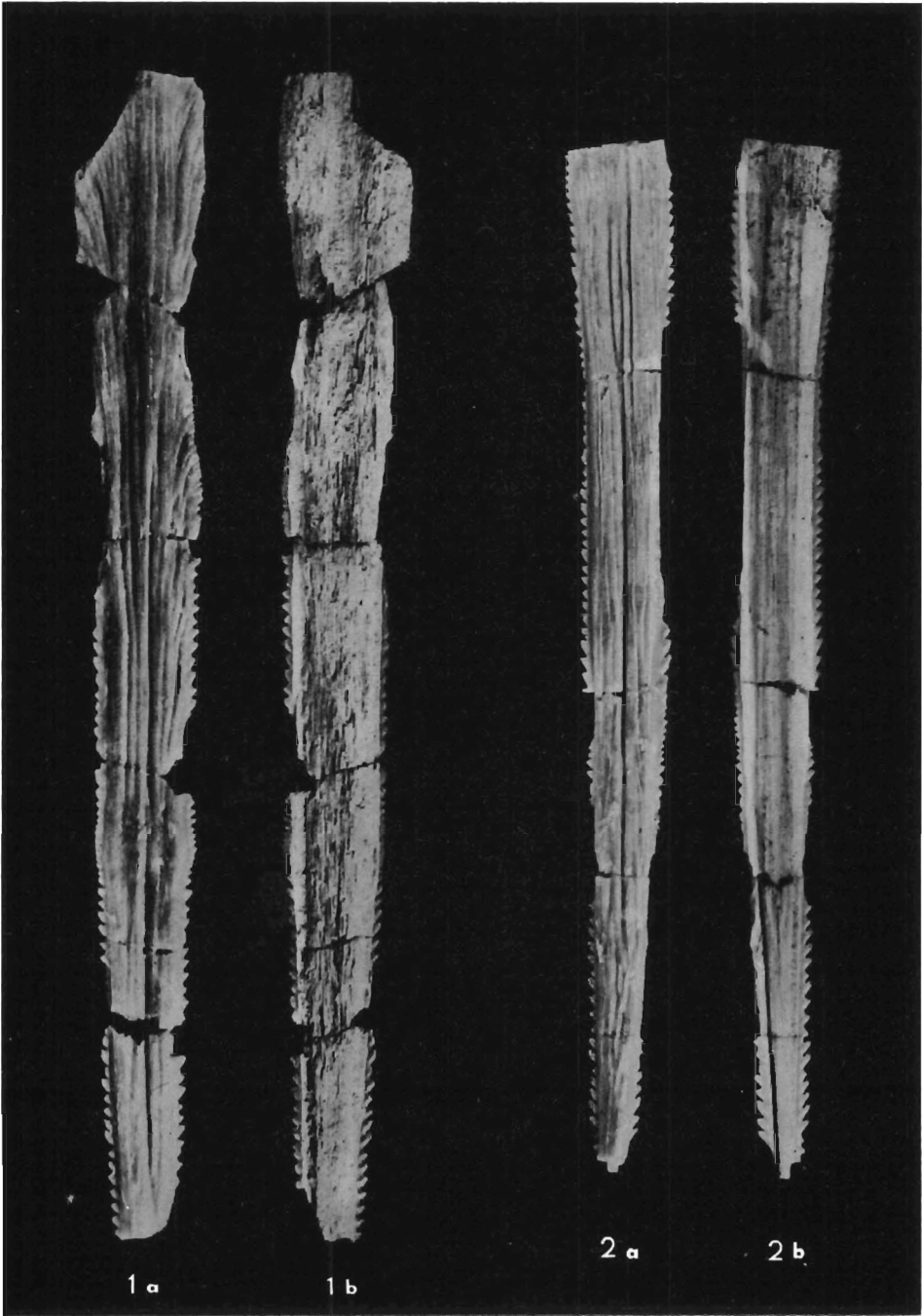


Plate II

Myliobatis e gr. meridionalis Gervais

Fig. 1-2. Caudal spines, somewhat crushed; *a* dorsal view, *b* ventral view.

All photos of natural size, taken by B. Drozd, M. Sc.