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JUVENILES OF SOME OLIGOCENE *ANTIGONIA* (CAPROIDAE,
TELEOSTEI) FROM THE POLISH CARPATHIANS

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Juveniles of *Antigonia* were found in fossil state for the first time. The specimens described represent either unknown developmental stage of an extant species or a juvenile stage of a new species.

Key words: Teleostei, ontogeny, Oligocene, Polish Carpathians.

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INTRODUCTION

During recent field works in the Polish Carpathians, some early ontogenetic stages of a species of *Antigonia* Lowe (Caproidae) were first found in fossil state in the upper part of Menilite Beds of the Subsilesian (Przysietnica locality) and Skole (Białowa Rzeszowska locality) units, Oligocene. Their incomplete skeletons cannot serve as a basis for specific determination. In fossil state *Antigonia* species are most often represented by otolithes (Stinton 1963; Jonet 1972—1973; Śmigielska 1979; Steurbaut 1984). Only one imprint of *Antigonia veronensis* Sorbini (Sorbini 1983) from Eocene of Italy (Monte Bolca) and one imprint of the skull from Oligocene of the Polish Carpathians (Świdnicki 1986) described as *Antigonia* sp. have been known till now. The newly found specimens tentatively determined as *Antigonia* sp. A differ significantly from both above mentioned forms and cannot be considered as belonging to either of them.

Three juvenile specimens (30.8—38.0 mm SL; Nos. ZPALWr W/31—33) of *Antigonia capros* found in the stomach of a tuna caught in mid Atlantic, as well as one adult specimen of this species (111.0; mm SL No. ZPALWr W/30) caught in Atlantic off north-west Africa have been used as comparative material.

The osteological analysis has been based on a skeleton of an adult specimen (pl. 10) and on the data of Starks (1902), Regan (1910) and Rosen (1984). The osteological description of the new fossil form has been given in the form of a comparison with the adult specimen of *A. capros*.

Early ontogenetic stages of extant species of the genus *Antigonia* are very poorly known. Morphological descriptions and osteological data (table 1) refer only to larval stages of two species: *Antigonia rubescens* (Uchida 1936) and *A. capros* (Nakahara 1962; Weiss *et al.* 1987). Some general remarks can be found in the literature and they concern, e.g. ontogenetic changes in the structure of some cranial bones (Tighe and Keene 1984) or an appearance of larval spiny scales (Johnson 1984). Abundant data illustrating variability of morphometrical characters in

Table 1
Record of fossil and Recent juveniles of *Antigonia*

Body length (mm)	Species	References
2.7 SL	<i>A. capros</i> , R	Weiss <i>et al.</i> 1987
3.0 TL	<i>A. rubescens</i> , R	Uchida 1936
3.0 SL	<i>A. capros</i> , R	Weiss <i>et al.</i> 1987
3.2 TL	<i>A. capros</i> , R	Nakahara 1962
3.6 SL	<i>A. capros</i> , R	Weiss <i>et al.</i> 1987
3.8 SL	<i>A. capros</i> , R	"
4.0 SL	<i>A. capros</i> , R	"
4.2 SL	<i>A. capros</i> , R	"
4.3—4.4 SL	<i>A. capros</i> , R (3 specimens)	"
4.5 TL	<i>A. rubescens</i> , R	Uchida 1936
4.6 SL	<i>A. capros</i> , R	Weiss <i>et al.</i> 1987
4.75 TL	<i>A. capros</i> , R	Nakahara 1962
5.1 SL	<i>A. capros</i> , R	Weiss <i>et al.</i> 1987
6.2 SL	<i>A. capros</i> , R	Berry 1959
ca 9.6 SL	<i>Antigonia</i> sp. A, O	described herein
10.4—10.6 SL	" (2 specimens), O	"
ca. 14.3—16.9 SL	" (6 specimens), O	"
ca. 18.0 SL	" O	"
19.0 SL	<i>A. combatia</i> , R	Berry 1959
22.0 SL	<i>A. rubescens</i> , R	"
ca. 22.7 SL	<i>Antigonia</i> sp. A, O	described herein
23.5 SL	<i>A. combatia</i> , R	Berry 1959
24.5 SL	<i>A. eos</i> , R	"
25.0 SL	<i>A. veronensis</i> , E	Sorbini 1983
25.5—26.0 SL	<i>A. capros</i> , R (2 specimens)	Berry 1959
26.0 SL	<i>A. combatia</i> , R	"
ca. 30.0 SL	<i>Antigonia</i> sp., O	Świdnicki 1986

E Eocene of Monte Bolca, O Oligocene of Carpathians, R Recent, SL standard length, TL total length

two species: *Antigonia combatia* Berry et Rathien and *A. capros* Lowe (Berry 1959) pertain to early developmental stages only to a small extent. Berry (1959) is one of a few authors who gave some measurements for *Antigonia* species (*A. rubescens* Günther and *A. eos* Gilbert) (Table 1).

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All the specimens described in this paper are housed at the Department of Paleozoology, Institute of Zoology, Wrocław University (abbreviated as ZPALWr).

MATERIAL AND DIMENSIONS

The studied material consisted of 13 incomplete imprints of skeletons from the localities Przysietnica (ZPALWr A/2082—2092; 2094) and Błazowa Rzeszowska (ZPALWr A/2093). Geological descriptions concerning these sites can be found in the papers of Kotlarczyk (1985)—Błazowa Rzeszowska, and Jerzmańska and Kotlarczyk (in preparation)—Przysietnica. The standard length (SL) of all the specimens fits within the range ca 9.6—22.7 mm.

The dimensions (in mm) of the three best preserved specimens are as follows:

Specimen No. ZPALWr	A/2085	A/2092	A/2086
standard length	ca 16.9	10.6	10.4
body depth	ca 15.8	11.4	—
orbit diameter	2.6	1.6	1.7
head length	ca 8.0	5.0	5.0
length of III spine			
of dorsal fin	5.8	3.1	—
height of caudal peduncle	2.2	1.9	1.5

DESCRIPTION OF ANTIGONIA SP. A

Skull. Head profile very steep. Anterior edge margin of supraoccipital high and steep, with traces of numerous bone ridges, anteriorly reaching the midline of orbit (fig. 1). Frontals in their posterior part much broadened, with traces of fan-like arranged bone ridges (figs. 1, 3). Parasphenoid long, anteriorly narrow, posteriorly broadened and bent upwards. Operculum vertically elongate, with traces

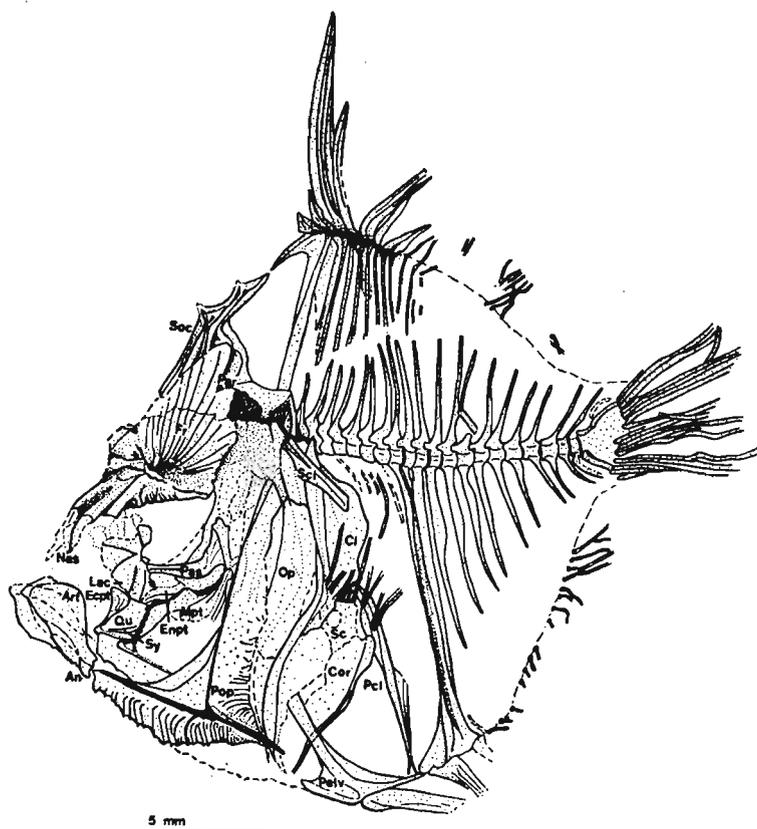


Fig. 1. *Antigonina* sp. A, ZPALWr A/2085, Menilite Beds, Przysietnica.

An angulare, *Art* articulare, *Cl* cleithrum, *Cor* coracoideum, *Ectp* ectopterygoideum, *Enpt* entopterygoideum, *Fr* frontale, *Lac* lacrimale, *Mpt* metapterygoideum, *Nas* nasale, *Op* operculum, *Par* parietale, *Pas* parasphenoideum, *Pcl* postcleithrum, *Pelv* pelvis, *Pop* praeoperculum, *Qu* quadratum, *Sc* scapula, *Scl* supraclathrum, *Soc* supraoccipitale, *Sy* symplecticum.

of numerous scales on its surface. Praeoperculum very large, bent at an angle less than 90° , on its surface a trace of a massive bone ridge and numerous traces of short small ridges (fig. 1, 4). Small triangular ectopterygoid joined with the anterior margin of quadratum (fig. 1). Mandible not large, broad, no free space between dentary and articular. Lachrymal large with traces of radially arranged bone ridges. On small maxilla traces of fine scales visible.

Main differences in comparison with *A. capros* consist in the presence of strong, short, ornamented spines on supraoccipital (fig. 2). Besides, in the region of preopercular angle there is a single spine of variable length related to the size of the studied specimens. In two smaller individuals it is longer but it does not reach the anal fin, while in the largest specimen the spine is barely marked (fig. 4).

Vertebral column (fig. 1). Ten abdominal and 12 caudal vertebrae. Atlas larger than the remaining vertebrae. Ribs of the penultimate abdominal vertebra contact the first, largest pterygiophore of the anal fin; short ribs of the last vertebra contact the first haemal process. Other ribs very poorly preserved. In general, no differences in the structure of this part of the skeleton have been observed.

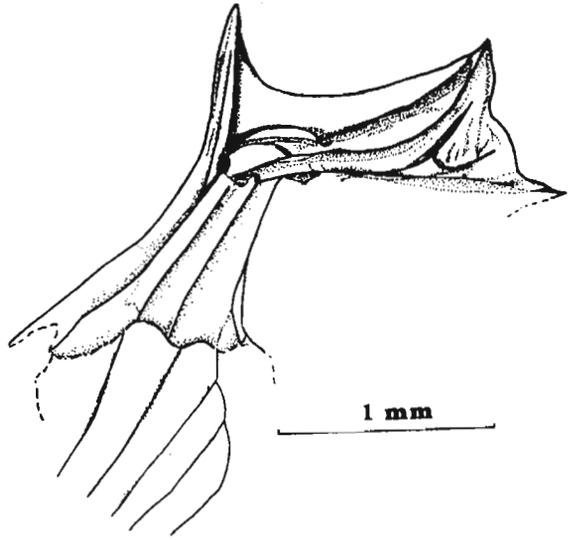
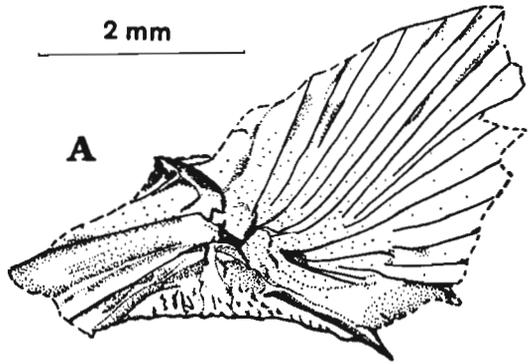
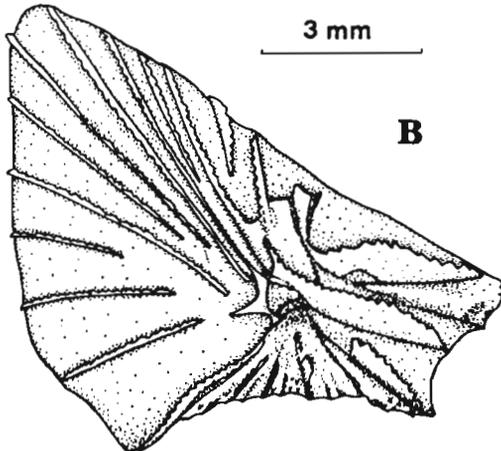


Fig. 2. *Antigonia* sp. A, ZPALWr A/2092, imprint of external surface of supraoccipital; Menilite Beds, Przysietnica.



2 mm

A



3 mm

B

Fig. 3. A — *Antigonia* sp. A, ZPALWr A/2084, imprint of external surface of right frontal; Menilite Beds, Przysietnica. B — *A. capros* Lowe, Recent ZPALWr W/32, right frontal of specimen viewed from outside.

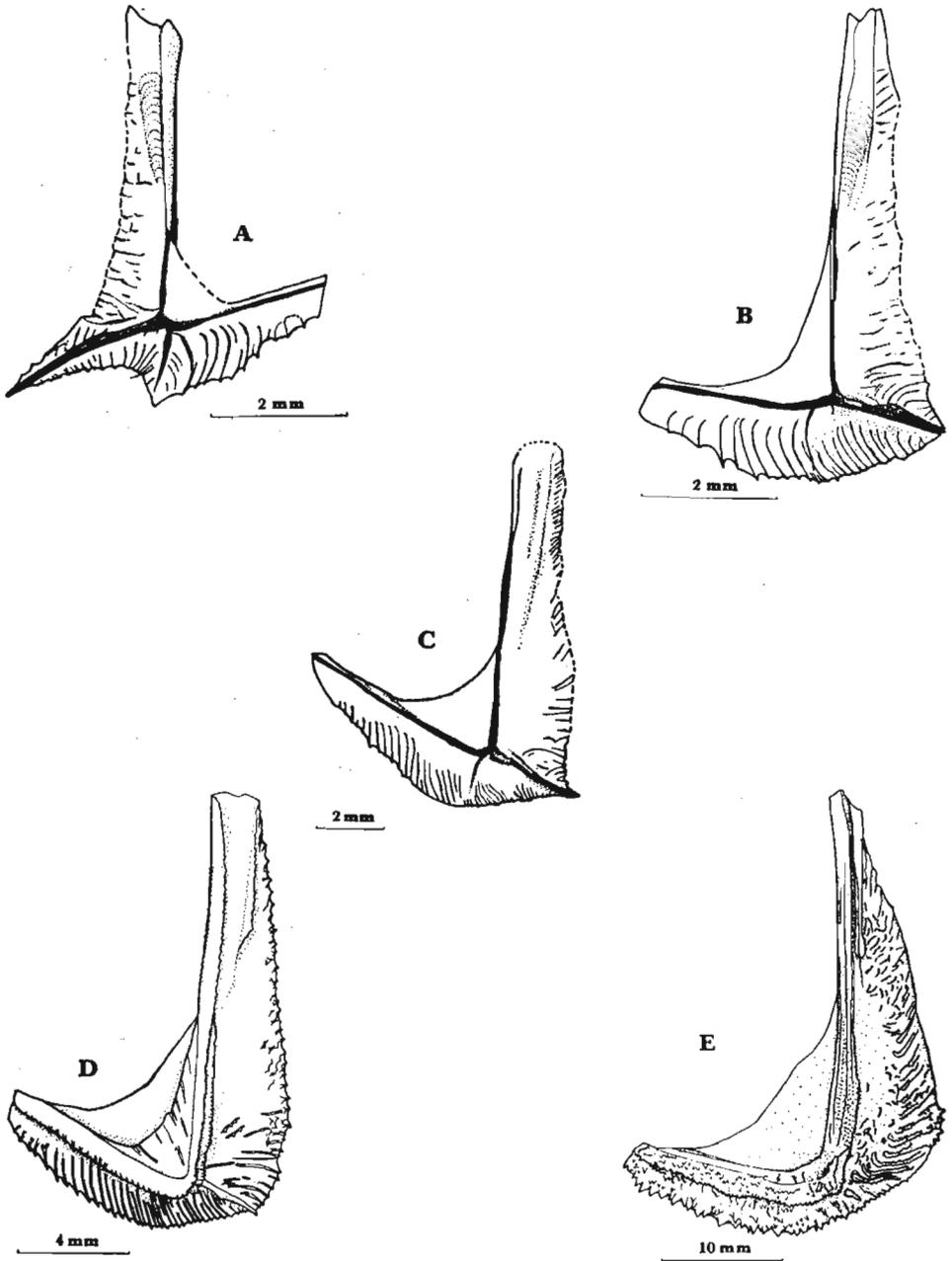


Fig. 4 A—*Antigonina* sp. A, ZPALWr A/2092, imprint of external surface of left praeoperculum, Menilite Beds, Przysietnica. A—*Antigonina* sp. A, ZPALWr A/2082, imprint of external surface of right praeoperculum; Menilite Beds, Przysietnica. C—*Antigonina* sp. A, ZPALWr A/2091, imprint of external surface of right praeoperculum, Menilite Beds, Przysietnica, D—*A. capros* Lowe, Recent, ZPALWr W/32, left praeoperculum of juvenile specimen viewed from outside. E—*A. capros* Lowe, Recent ZPALWr W/30, left praeoperculum of adult specimen viewed from outside.

Fins. The general structure of fins in the studied imprints is typical of the genus *Antigonia* (fig. 1).

In the dorsal fin there are 8—9 spines, the third being the longest and the strongest, covered with longitudinal grooves; in the anal fin, 3 strong spines rest on the largest pterygiophore, the first spine being the longest. On both sides of the spines traces of scales visible (fig. 5). The first, largest pterygiophore contacts the first haemal process. In the soft part of the dorsal fin only 27 rays visible, in the anal fin only 15 rays being preserved. However, in no fin pterygiophores can be seen. In the pectoral fin (fig. 1) there are 13 soft rays and 1 short spine; in the ventral fin—1 strong spine and 5 soft rays, and on both sides of the spine there are imprints of scales (fig. 5).

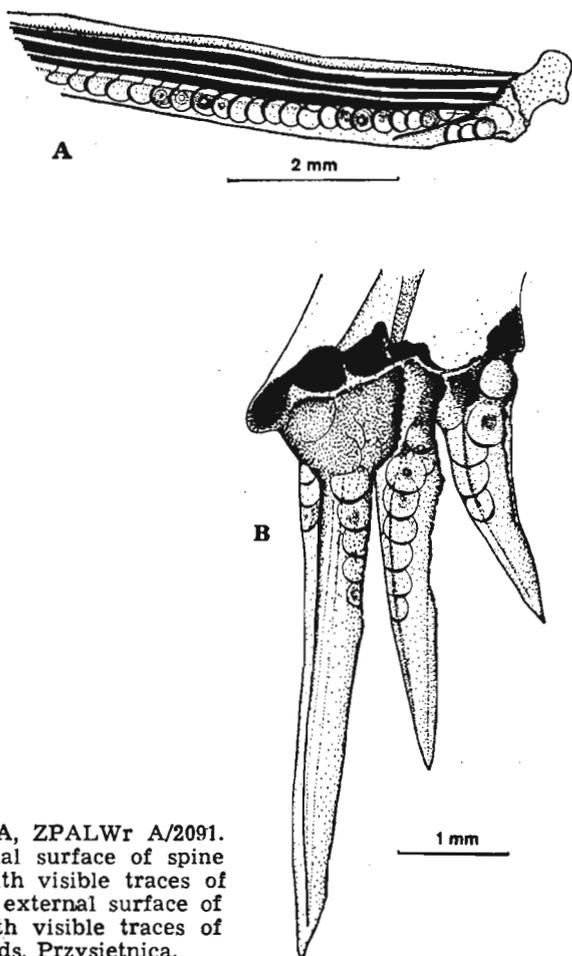


Fig. 5. *Antigonina* sp. A, ZPALWr A/2091. A—imprint of external surface of spine of left ventral fin with visible traces of scales; B—imprint of external surface of spines of anal fin with visible traces of scales; Menilite Beds, Przysietnica.

In the caudal fin 12 principal rays are visible and 5 accessory rays as compared with 7 accessory rays in extant species (Berry 1959). The difference may result from the state of preservation of the studied specimens.

The scales are vertically elongate, with a bone ridge along their posterior margin; they cover nearly all the body surface, and on the head operculum, sub-

operculum, partly maxilla and gena. The scales on the spines of ventral and anal fins are much smaller, circular, with traces of fine ridges or spines at their posterior margin (fig. 5).

DISCUSSION

Morphological characters of various ontogenetic stages of extant fishes (Kendall, Ahlstrom and Moser 1984) can be useful for identification of the developmental stages of the studied fossil specimens. Such characters of the latter as the structure of fins and scales, and the shape of body, seem to indicate that they are juvenile specimens. Some details of the structure of their skull and vertebral column might suggest that they represent a stage intermediate between the larval and the juvenile stages (the so called transformation stage). This supposition is contradicted, however, by the presence of the scales even in the smallest of the studied fossil specimens. The scales are developed just as in juvenile and adult individuals of extant species of the genus *Antigonia*, and unlike those of the above mentioned transformation stage of this genus. It is, however, unknown, whether a developmental stage resembling that of the studied specimens exists in extant species of *Antigonia*. It can not be excluded that within millions of years this stage was eliminated from the ontogenetic development of the fishes of the genus *Antigonia*.

The osteological differences between specimens of *Antigonia* sp. A and adult individuals of *Antigonia*, listed below, suggest that the studied form may represent an ontogenetic stage hitherto unknown in Recent species. The differences consist in:

- 1) structure of the anterior margin of supraoccipital which, in the Carpathian forms, has two short, strong, unpaired spines connected by a bony lamella with a smooth margin (fig. 2); in the smallest larvae of extant *Antigonia rubescens* and *A. capros* the posterior spine is very long, and the anterior one is better marked in the former species (pl. 9);
- 2) length of the spine in the preopercular angle region (fig. 4); in young larvae of extant species the spine is much longer and reaches even beyond the anterior end of the base of the anal fin (pl. 9);
- 3) the junction of the vertebral column with the skull, which is situated above the line of the upper margin of the orbit (fig. 1); a feature not found in the known larval stages of extant species.

It seems that the ontogenetic changes in the structure of praeoperculum were similar both in fossil and extant forms. Some doubts arise when we compare the remaining two characters (1 and 3), especially the structure of the supraoccipital. The lack of the earliest developmental stages in the fossil material and incomplete data on the adult stages make it impossible to say whether or not the armature of the supraoccipital

underwent any changes during the ontogenetic development of these forms (in the largest specimen the head region is not preserved). Only further findings can show if the studied specimens represent an unknown developmental stage of extant species, or a new species of *Antigonia* with a different ontogeny. The presence of 20—22 bone ridges on each frontal seems to confirm the latter hypothesis. In extant species only 12—15 ridges occur on these bones (Berry 1959).

The studies made so far suggest that at the locality of Przysietnica, where most of the studied specimens have been found, there occurred another species, described as *Antigonia* sp. (Świdnicki 1986). This form has only 17 bone ridges on the frontals and its structure of the supra-occipital mandible, the bones of the operculum and the scales show great differences in comparison with the specimens studied as well as other known species of *Antigonia*.

Thanks to the photograph of *Antigonia veronensis*, kindly sent by Prof. L. Sorbini, I could observe that in this species the fourth and the fifth spines of the dorsal fin are the longest while in the other known species of the genus *Antigonia*, the third one is the longest.

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JACEK ŚWIDNICKI

MŁODOCIANA FORMA PEWNEJ OLIGOCEŃSKIEJ *ANTIGONIA* (CAPROIDAE, TELEOSTEI) Z POLSKICH KARPAT

Streszczenie

W górnej części profilu warstw menilitowych znaleziono po raz pierwszy w stanie kopalnym okazy młodocianych ryb z rodzaju *Antigonia* (pl. 11, oraz fig. 1—5). W stosunku do dorosłych osobników współczesnych gatunków tego rodzaju (pl. 9, 10, fig. 4) wykazują one różnice osteologiczne, które dotyczą: budowy przedniej krawędzi kości potylicznej górnej, zmian rozwojowych kolca w okolicy kąta praeoperculum, połączenia kręgosłupa z czaszką. Niepełna znajomość rozwoju ontogenetycznego zarówno form współczesnych jak i kopalnych nie pozwala rozstrzygnąć czy badane okazy reprezentują nieznanne stadium rozwojowe któregoś z dzisiejszych gatunków czy też należą do nowego gatunku rodzaju *Antigonia*.

Praca została wykonana w ramach problemu MR. II/6.

EXPLANATION OF PLATES 9—11

Plate 9

- A. *Antigonia rubescens* Günther, Recent larva, ca. 4.5 mm TL, after Uchida (1936).
B. *Antigonia capros* Lowe, Recent: larva, 4.75 mm TL after Nakahara (1962),
modified according to Weiss *et al.* (1987).

Plate 10

Antigonia capros Lowe, Recent: ZPAL Wr W/30, skeleton of adult specimen.

Plate 11

Antigonia sp. A, Oligocene, Przysietnica: ZPALWr A/2085, imprint of right body side with visible traces of scales.

