

EWA POPIEL-BARCZYK

Brachiopod genus *Cryptopora* Jeffreys from the Miocene deposits of the Lublin Upland

ABSTRACT: Three species of the brachiopod genus *Cryptopora* Jeffreys are described from the Middle Miocene (Badenian) sands of the Lublin Upland, eastern Poland. The form of their deltidial plates resembles considerably some Recent shallow-water cryptoporids.

INTRODUCTION

The Middle Miocene (Badenian) sands of the Huta Lubycka village in the Roztocze region, Lublin Upland, eastern Poland (Text-fig. 1B), yielded a rich invertebrate fauna (Jakubowski & Musiał 1977) making up an assemblage unique in the Polish Miocene. The assemblage includes a hundred gastropod species but among its dominant members are also the brachiopods, represented mostly by the genus *Cryptopora* Jeffreys, whereas *Lingula* Bruguière, *Discina* Lamarck, *Megathiris* d'Orbigny, and *Argyrotheca* Dalí are much less common. The abundance of *Cryptopora* in the Miocene of the Lublin Upland was already reported by the present author (Popiel-Barczyk 1977a, b). In fact it is remarkable, as being among a few Tertiary records of these poorly known rhynchonellids. The rich investigated material permitted a study of the shell internal structure of *Cryptopora*, which resulted in supplementary description of its two species.

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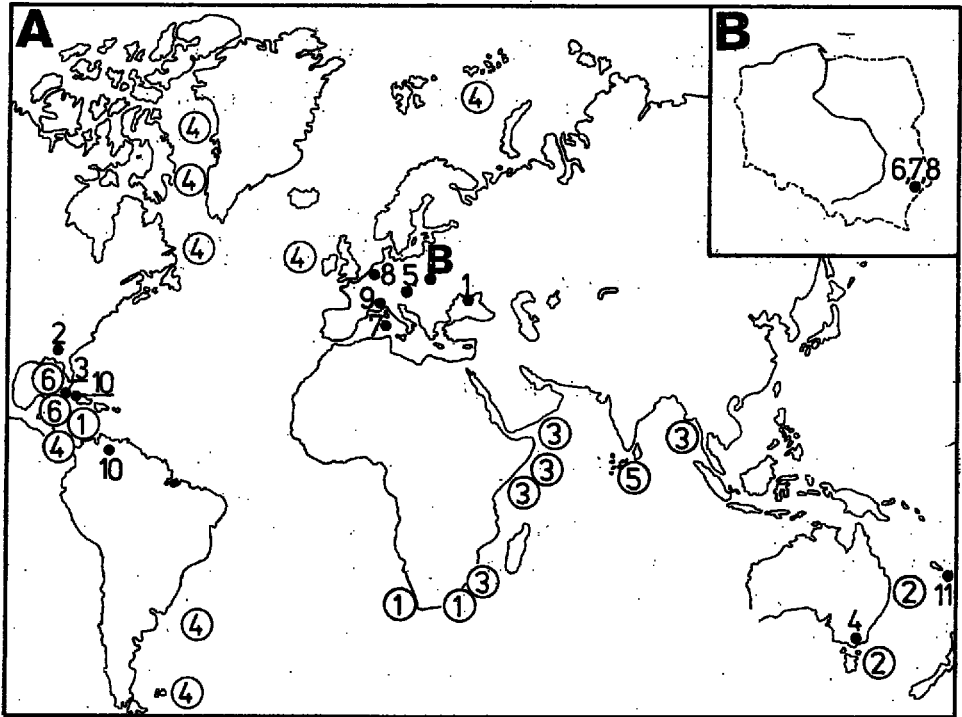


Fig. 1. Stratigraphic and geographic distribution of the genus *Cryptopora* in the world (A; based on Davidson 1874, 1886; Dreger 1889, 1911; Sacco 1902; Thomson 1927; Toulmin 1940; Cooper 1959, 1973a,b, 1978, 1979; Ager 1965; Zezina 1976), and in the Roztocze region of the Lublin Upland, Poland (B)

RECENT (number in circles): 1 *Cryptopora boettgeri* Helmeke, 2 *C. brazeri* (Crane), 3 *C. curiosa* Cooper, 4 *C. gnomon* (Jeffreys), 5 *C. maldivensis* Muir-Wood, 6 *C. rectimarginata* Cooper

PLEISTOCENE-PLIOCENE: 11 *Cryptopora* sp., Fiji

MIOCENE: 10 *Cryptopora* sp., Cuba and Venezuela; 9 *Cryptopora parvillima* (Sacco), Italy; 8 *C. nysti* (Davidson), Belgium and Poland; 7 *C. lovisati* (Dreger), Sardinia and Poland; 6 *C. cf. discites* (Dreger), Poland; 5 *C. discites* (Dreger), Austria; 4 *C. acutirostra* (Chapman), Australia (Victoria)

OLIGOCENE: 3 *Cryptopora* sp., Cuba

EOCENE: 2 *Cryptopora* sp., USA (Alabama)

PALEOCENE: 1 *Cryptopora* sp., USSR (Crimea)

SYSTEMATIC DESCRIPTION

Family Cryptoporidae Muir-Wood, 1955

Genus CRYPTOPORA Jeffreys, 1869

Cryptopora lovisati (Dreger, 1911)(Text-figs 2A—A₁ and 3—4; Pl. 2, Figs 1—12)1911. *Rhynchonella Lovisati* n. sp.; J. Dreger, p. 136, Figs 3—6.1977a. *Cryptopora cf. lovisati* (Dreger); E. Popiel-Barczyk, p. 247, Figs 3—5.

Material: 240 shells, over 400 singular valves, and more than 200 damaged shells from Monastyrz and Długi Góraj near Huta Lubycka; 68 shells from the type locality Cadreas, Sassari province, Sardinia.

Dimensions (in mm):

Coll. No.	Length	Width	Locality
1269/1	4.0	3.6	Monastyrz
1269/2	3.5	3.0	"
1269/3	3.2	2.8	"
1272/1	4.3	3.5	Długi Góraj
1272/2	3.0	2.6	"
1203/1	4.8	3.8	Cadreas
1203/2	3.6	3.2	"
1203/3	3.5	3.2	"
1203/4	3.2	3.0	"
1203/5	2.6	2.2	"

Supplementary description. — Shell shape and dimensions and the circular outline of dorsal valve (Text-fig. 2A—A₁) are entirely consistent with the characteristics given by Dreger (1911) and observed in the investigated specimens from the type locality.

Shell internal morphology (Text-figs 3—4) shows a small-sized cardinal process in form of a rounded boss located among high socket ridges (see Pl. 2, Figs 4 and 7). Prominent median septum does almost reach mid-length of the dorsal valve with its anterior end but it is rather weakly raised above the valve bottom in its posterior part. The septum is split in all the investigated specimens from both the Lublin Upland and Sardinia, which is probably due to the preservation state (cf. Text-figs 3—4). Deeply sunk, crescent shaped adductor scars occur at both the sides of median septum. Maniculifer crura are long, parallel, bifurcating at the end. Massive teeth and parallel to somewhat divergent dental plates occur at the ventral valve. Deltoidal plates in form of triangular, wing-like structures turned outside the large-sized, oval-elongate foramen (see Pl. 2, Figs 3a, 6a, and 10a).

Remarks. — The species *Cryptopora lovisati* (Dreger) differs from *C. nysti* (Davidson) mostly in the circular outline of its dorsal valve and the shape of deltoidal plates. Its deltoidal plates resemble actually those of *C. curiosa* Cooper. The circular dorsal valve makes also a difference between *C. lovisati* (Dreger) and *C. discites* (Dreger). The specimens from the Lublin Upland show better developed growth lines than those from Sardinia.

Occurrence. — Middle Miocene (Badenian) of Monastyrz and Długi Góraj (Jakubowski & Musiał 1977; Popiel-Barczyk 1977a, b); Miocene of Cadreas (Dreger 1911, Thomson 1927, Cooper 1959)

Cryptopora nysti (Davidson, 1874)
(Text-figs 2B—B₁ and 5; Pl. 1, Figs 1—8)

1959. *Mannia nysti* Davidson = *Cryptopora nysti* (Davidson): G. A. Cooper, pp. 22 and 73 Pl. 1A, Figs 1—4.

1977a. *Cryptopora nysti* (Davidson); E. Popiel-Barczyk, p. 247, Figs 1—2.

Material: 80 shells, some 200 singular valves, and more than 100 damaged shells from

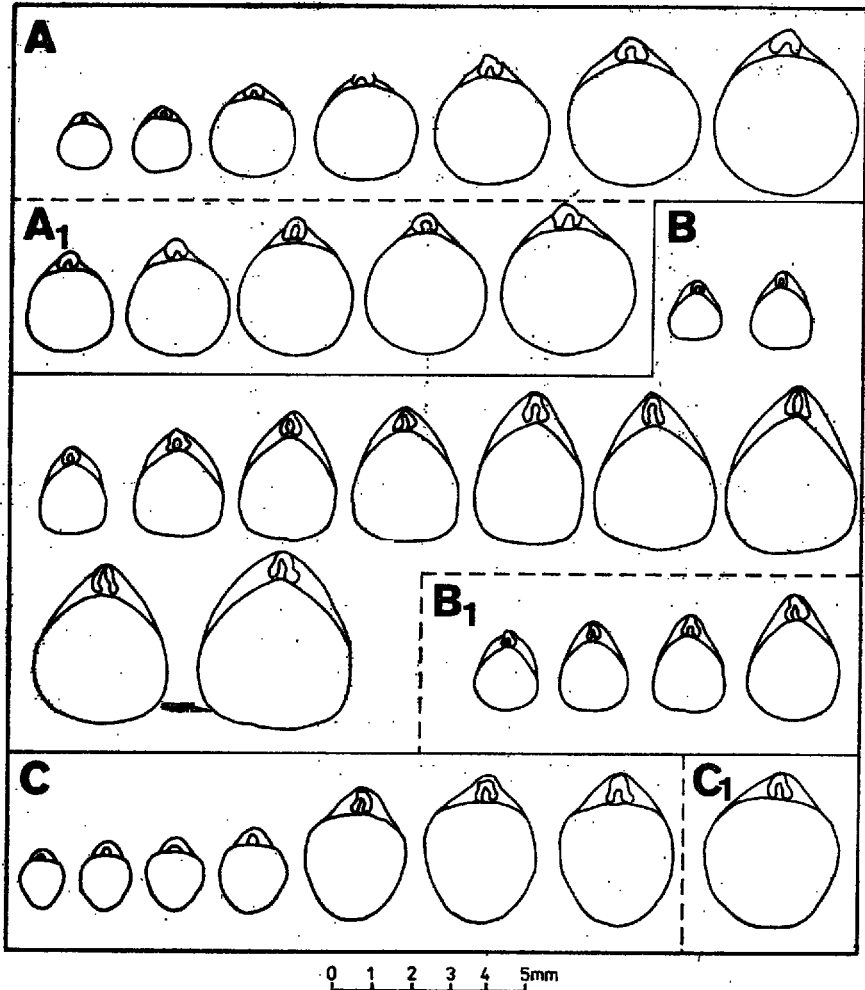


Fig. 2. Outline of the dorsal valve at some successive ontogenic stages in investigated species of the genus *Cryptopora*

A — *Cryptopora lovisati* (Dreger) from the Roztocze region of the Lublin Upland;

A₁ — from type locality Cadreas, Sardinia

B — *Cryptopora nysti* (Davidson) from the Roztocze region; B₁ — from type locality Wommelgem, Belgium

C — *Cryptopora* cf. *discites* (Dreger) from the Roztocze region; C₁ — *C. discites* (Dreger) from type locality Möllersdorf, Austria (after Dreger 1889, Pl. 5, Fig. 15)

Monastyrz and Długi Goraj near Ełta Lubycka; 5 shells from the type locality Wommelgem by Antwerp, Belgium.

Dimensions (in mm):

Coll. No.	Length	Width	Locality
1271/1	4.5	3.8	Długi Goraj
1271/2	4.0	2.8	"
1271/3	3.8	2.8	"
1271/4	3.5	2.5	"
1271/5	2.0	1.6	"
1202/1	2.3	1.9	Wommelgem
1202/2	2.2	1.9	"
1202/3	2.0	1.7	"

Supplementary description. — Shell shape and the subtriangular-elongate outline of dorsal valve (Text-fig. 2B—B₁) are entirely consistent with the characteristics given by Cooper (1959) for specimens from the type locality. The investigated material from the Lublin Upland includes also specimens twice as large as those reported thus far from Wommelgem. Furthermore, the largest specimens from the Lublin Upland show a fine radial striation (Pl. 1, Fig. 8b) absent from the shells collected at the type locality. The specimens from the Lublin Upland display also stronger developed beak ridges (Pl. 1, Fig. 8a—b).

Shell internal morphology shows a wide, somewhat flattened cardinal process, prominent median septum, and maniculifer crura typical of the genus at the

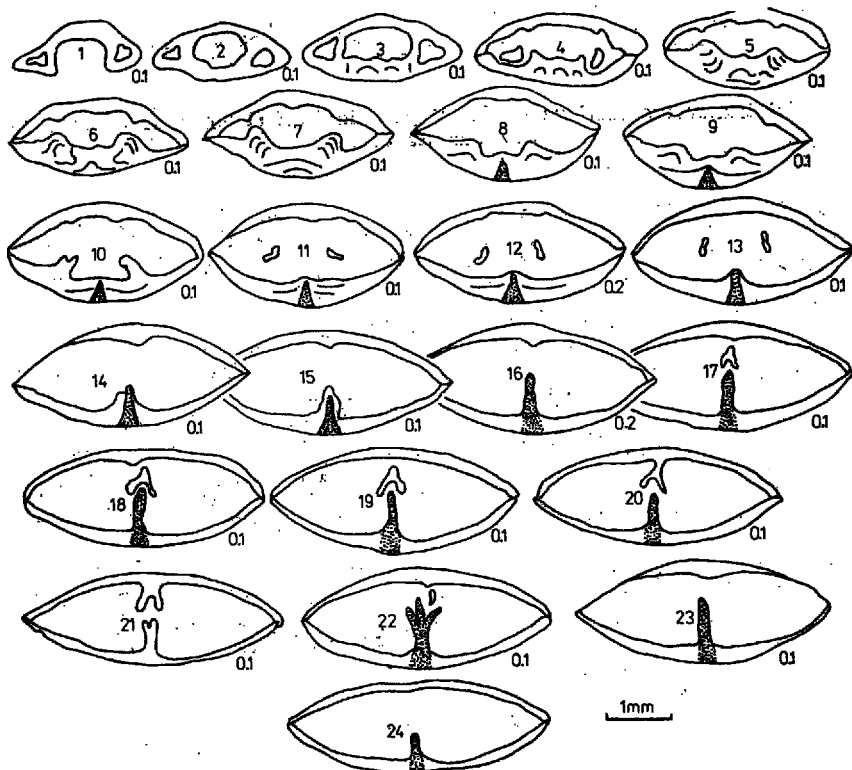


Fig. 3. Serial transverse sections of *Cryptopora lovisati* (Dreger) from locality Długi Goraj, Roztocze region of the Lublin Upland.

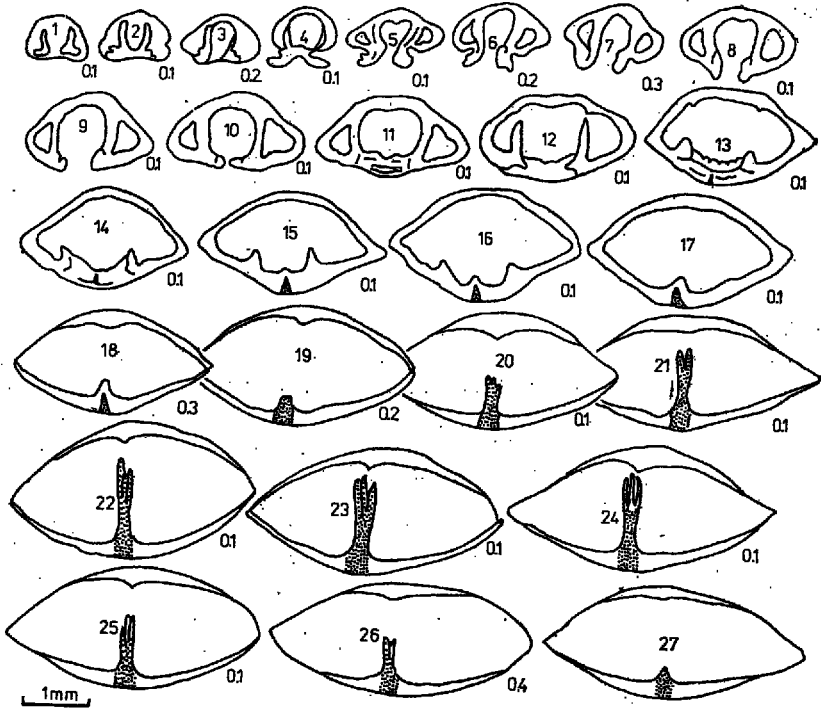


Fig. 4. Serial transverse sections of *Cryptopora lovisati* (Dreger) from type locality Cadreas, Sardinia

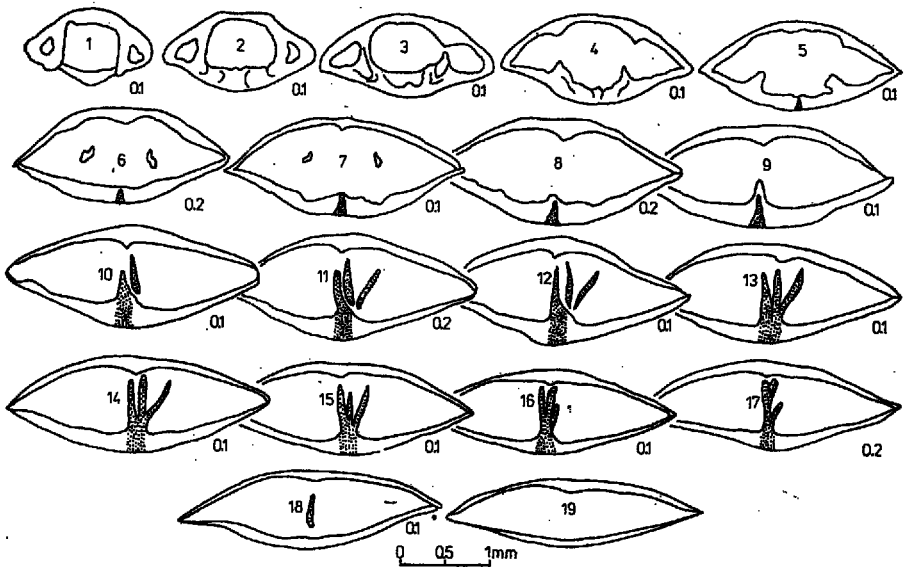


Fig. 5. Serial transverse sections of *Cryptopora nysti* (Davidson) from locality Długi Goraj, Roztocze region of the Lublin Upland

dorsal valve (see Text-fig. 5 and Pl. 1, Fig. 4). Ventral valve displays a considerably elongate beak (Pl. 1, Fig. 5) and massive teeth supported by a little divergent dental plates. Deltidial plates are in form of triangular, wing-like structures attaining their maximum width close to the cardinal margin of dorsal valve. Foramen is large-sized, subtriangular in outline.

Remarks. — The species *Cryptopora nysti* (Davidson) differs in the elongate beak of its ventral valve and the well developed beak ridges from its relatives *C. lovisati* (Dreger) and *C. discites* (Dreger). Its deltidial plates resemble a little those of *C. rectimarginata* Cooper. The fine radial striation at the shell surface makes a difference between *C. nysti* and *C. lovisati*, while it is a feature in common with *C. discites* from the Miocene of the Vienna Basin (cf. Dreger 1889, Pl. 1, Fig. 15).

Occurrence. — Middle Miocene (Badenian) of Monastyrz and Długi Goraj (Jakubowski & Musiał 1977; Popiel-Barczyk 1977a, b); Upper Miocene of Wommelgem (Thomson 1927, Cooper 1959).

Cryptopora cf. *discites* (Dreger, 1889)
(Text-fig. 2C—C₁ and Pl. 1, Figs 9—10)

1889. *Rhynchonella discites* n. sp.; J. Dreger, p. 183, Pl. 5, Fig. 15.

Material: 12 complete and a dozen or so damaged shells from Monastyrz and Długi Goraj.
Dimensions (in mm):

Coll. No.	Length	Width	Locality
1270/1	4.8	3.5	Długi Goraj
1270/2	3.8	3.0	"
1270/3	3.8	2.8	"

Remarks. — A score of the investigated cryptoporid specimens from the Lublin Upland show dorsal valve subrectangular to considerably narrowing anteriorly in outline (Text-fig. 2C—C₁). Such a valve outline makes them sharply different from *Cryptopora lovisati* (Dreger) and *C. nysti* (Davidson), while it results along with the shell shape in a close affinity to the only thus far described specimen of *C. discites* (Dreger) from the Miocene of Möllersdorf, Vienna Basin (cf. Dreger 1889). The present author lacks any comparative material of the latter species and hence, the investigated specimens are identified as *Cryptopora* cf. *discites*. The generic assignment of the species *discites* Dreger was established by the previous authors (Thomson 1927, Cooper 1959) with some reservations concerned mostly with morphology of deltidial plates. In fact, both Cooper (1959, 1973a), and the present author are of the opinion that the morphology of deltidial plates is among the diagnostic features of the genus *Cryptopora* Jeffreys, whereas the drawing given by Dreger (1889, Pl. 5, Fig. 15b) shows the deltidial plates rather poorly. It is therefore to be emphasized that the deltidial plates recorded in the investigated material from the Lublin Upland (eventhough merely in 2 specimens) are typical of the genus.

The specimens under discussion display also a resemblance in shell shape and dorsal-valve outline to the only illustrated specimen of *Cryptopora* sp. from the Upper Oligocene of Cuba (Cooper 1979, Pl. 5, Fig. 6). This very specimen is also illustrated in the present paper (Pl. 1, Fig. 11) in order to demonstrate its affinity to *Cryptopora* cf. *discites* from the Lublin Upland.

Occurrence. — Middle Miocene (Badenian) of Monastyrz and Długi Goraj (Popiel-Barczyk 1977a).

ECOLOGIC AND STRATIGRAPHIC REMARKS ON THE GENUS *CRYPTOPORA*

Brachiopods of the family Cryptoporidae Muir-Wood, 1955, represent a rhynchonellid group declining gradually since the Tertiary (Cooper 1973a), the extant representatives of which live mostly at a depth greater than 200 m. The genus *Cryptopora* Jeffreys, 1869, shows a considerable depth range (Cooper 1973a, Zezina 1976). Some morphological characteristics of the extant species may actually be related to the water depth (Cooper 1959, 1973a). Thus, deltidial plates are usually wide, wing-like, turned outside the foramen (Cooper 1959, Pl. 1, Figs 15—19; Cooper 1973a, Pl. 1, Figs 4—6) in the species inhabiting waters shallower than 200—300 m, e.g. *Cryptopora rectimarginata* Cooper from the Florida coast and *C. curiosa* Cooper from the Southeast Africa coast and the Andaman Islands. In turn, the species inhabiting deeper waters down to 3,000—4,000 m, e.g. *C. gnomon* (Jeffreys) from the Labrador coast, shows narrow deltidial plates in form of fine rolls limiting the foramen (Cooper 1959, Pl. 21, Figs 7—14; Cooper 1973b, Pl. 8, Figs 14—16). Whether this relationship between the morphology of deltidial plates and water depth can also be extrapolated into the geological past, may be disputable. In any case, one has then to take into account the preservation state of deltidial plates of the fossils material. As to the investigated species of *Cryptopora* recorded in the Miocene of the Lublin Upland, one may suppose that the basin ranged from 100 to 200 m in water depth (cf. Jakubowski & Musiał 1977, Popiel-Barczyk 1977a).

Thus far, 15 species of the genus *Cryptopora* are known, more than a half of them from the Tertiary (see Text-fig. 1). The oldest known representative of the genus is a specimen from the Lower Paleocene (Danian) sandy limestones of Crimea, found by Dr. V. A. Zelinskaya and housed at the Institute of Geological Sciences of the Ukrainian Academy of Sciences, Kiev. The specimen resembles in its shell dimensions and shape, septum at the dorsal valve, and the nature of cardinal margin the species *Cryptopora parvillima* (Sacco) from the Miocene of Italy (Sacco 1902, Pl. 1, Figs 38—40).

Several specimens of *Cryptopora* sp. occur in the Lower Eocene limestones of Salt Mountain, Clarke County, Alabama, United States (Toulmin 1940, Pl. 28, Figs 12—14). The presence or absence of septum at the dorsal valve and the morphology of deltidial plates remain still to be recognized because the illustrated specimens from Alabama seem to be incomplete. Toulmin's (1940, p. 230) claim that the Eocene species from Alabama is comparable to the Recent deep-water species *C. gnomon* (Jeffreys) and/or *C. brazeri* (Crane) is therefore disputable.

The only known specimen of *Cryptopora* sp. (see Pl. 1, Fig. 11) from the Oligocene of Finca Margarita, La Habana province, Cuba, was regarded by Cooper (1959, 1979) as comparable to the Recent shallow-water species *C. rectimarginata* Cooper because of its well developed wing-like deltidial plates. Its dorsal valve resembles also in outline *C. discites* (Dreger) from the Miocene of the Vienna Basin as well as *Cryptopora* cf. *discites* (Dreger) from the Middle Miocene of the Lublin Upland (cf. Pl. 1, Figs 9—10).

The other fossil species of *Cryptopora* were reported (cf. Text-fig. 1) from the Miocene of Australia (Thomson 1927), Cuba (Cooper 1979), Venezuela (Cooper 1979), Austria (Dreger 1889), Belgium (Thomson 1927, Cooper 1959), Italy (Sacco 1902), Sardinia (Dreger 1911), and Poland (Jakubowski & Musiał 1977; Popiel-Barczyk 1977a, b). The youngest fossil species of *Cryptopora* was recently recorded in the Pliocene and Plio-Pleistocene of Viti Levu Island, Fiji, and it was identified as *Cryptopora* sp. comparable to the Recent species *C. brazeri* (Crane) from Australia and Tasmania (Cooper 1978, p. 5, Text-fig. 3).

Recently, a new cryptoporid genus *Cryptoporella* Bitner & Pisera has been described from the Maastrichtian chalk facies of Mielnik, eastern Poland; this is the first record of the family Cryptoporidae in strata older than Tertiary (Bitner & Pisera 1979).

Polish Academy of Sciences,
Museum of the Earth,
Al. Na Skarpie 20/26,
00-488 Warszawa, Poland

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E. POPIEL-BARCZYK

**BRACHIOPODY Z RODZAJU *CRYPTOPORA* JEFFREYS
W MIOCENIE ROZTOCZA**

(Streszczenie)

Przedmiotem pracy jest opis brachiopodów z rodzaju *Cryptopora* Jeffreys, znalezionych w bogatym zespole faunistycznym z piaszczystych osadów środkowego miocenu (badanu) okolic Długiego Górcja i Monastyrza na Roztoczu (por. Jakubowski & Musiał 1977, Popiel-Barczyk 1977a,b). Rozpatrzono także dotychczasowe dane o rozprzestrzeleniu stratygraficznym poszczególnych gatunków rodzaju *Cryptopora* (patrz fig. 1), oraz informacje o ekologii współczesnych przedstawicieli tego rodzaju. Gatunki rozpoznane w miocenie Roztocza (patrz fig. 2—5 oraz pl. 1—2), *Cryptopora lovisati* (Dreger), *C. nysti* (Davidson) oraz *C. cf. discites* (Dreger), porównano z okazami pochodzącymi z typowych stanowisk w miocenie Belgii i na Sardynii, oraz z gatunkami współczesnymi. Stwierdzono, iż badane gatunki z miocenu Roztocza wykazują pod względem niektórych cech morfologicznych duże podobieństwo do współczesnych gatunków płytkomorskich.
