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Revision of the Upper Tithonian brachiopods from Inwałd (Polish Carpathians)

ABSTRACT: Described are seventeen brachiopod species, belonging to nine genera of Terebratulida and Rhynchonellida. Revision of the inner morphology of all species is presented. Two new genera are described: *Carpatothyris* and *Zeuschneria* with one type-species in every one.

INTRODUCTION

This article presents description of the collection of Upper Tithonian brachiopods from the Polish Carpathian district of Inwałd, studied and first published by L. Zeuschner (1857). The aim of this article is to precise the systematics composition of the brachiopods, on the basis of the study of the shell's internal morphology. In the Zeuschner's collection there are about 190 specimens in various stage of preservation, about half of the total quantity shows destroyed margins and beaks. A good state of preservation made it possible to study the internal structure of all the species considered and to determine their generic affinity. The elucidation of generic composition of the Upper Tithonian brachiopods made it possible to note the succession of the Upper Tithonian and Lower Cretaceous representatives in the Mediterranean realm. In the Upper Tithonian there appeared first genera, which became widely distributed in the Lower Cretaceous. These are: *Tropeothyris* Smirnova, 1972, *Weberithyris* Smirnova, 1969, *Zeillerina* Kyansep, 1959, *Terebrataliopsis* Smirnova, 1962, *Cyclothyris* M'Coy, 1884.

The Zeuschner's monograph describes thirteen species of brachiopods, this article describes seventeen species. The author has distinguished two new species, one of which, according to Zeuschner, was assigned to the species *Terebratella repanda* Zeuschner, and the other one — to *Tere-*

bratula simplicissima Zeuschner. The study of internal structure of both species has shown that they are not only independent species, but belong to different new genera namely *Carpatothyris* and *Zeuschneria*. The species *Tropeothyris carpathica* (Zittel, 1870) and *T. isomorpha* (Gemmelaro, 1871) were not described in Zeuschner's monograph of 1857, but only designated by labels. These species are described for the first time.

This note was impossible without very important monographs on Tithonian brachiopods: Glocker E. F. (1845), Zeuschner (1855, 1856, 1860), Suess (1858, 1861), Remes (1899, 1902), Moisseev (1934).

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SYSTEMATIC PART

Order Rhynchonellida

Family *Cyclothyridae* Makridin, 1964

Genus *CYCLOTHYRIS* McCoy, 1884

Cyclothyris astieriana (d'Orbigny, 1847)

(Pl. 1, Fig. 1a—d)

1847. *Rhynchonella astieriana* d'Orbigny; A. d'Orbigny, vol. 4, pp. 14—15, Pl. 482, Figs 1—4.
 1857. *Rhynchonella subdepressa* Zeuschner; L. Zeuschner, p. 7, Pl. 1, Figs 1a—9a.
 1859. *Rhynchonella astieriana* d'Orbigny; E. Suess, p. 52, Pl. 6, Figs 2—3.
 1913. *Rhynchonella astieriana* d'Orbigny; Ch. Jacob & P. Faillot, pp. 43—44, Pl. 5, Figs 7—8.
 1917. *Rhynchonella astieriana* d'Orbigny; L. Rollier, part 2, p. 176.
 1934. *Rhynchonella astieriana* d'Orbigny; A. Moisseev, pp. 79—80, Pl. 7, Figs 29—36.

Material. — Twenty-two specimens, including ten complete shells, seven of them having their beak broken off, five shells with their lateral margins destroyed.

Dimensions (in mm):

Col. No.	L	W	T	W:L	T:L
4529/1	23.5	23.0	13.2	0.98	0.56
4529/2	22.8	24.4	13.0	1.70	0.57
4529/3	23.2	25.8	14.0	1.11	0.64
4529/4	18.7	20.0	9.0	1.08	0.49

Description.

External morphology: Shell subround-triangular with slightly convex valves with width being usually more, than its length and rarely equal. The maximum width is near the anterior margin, the maximum thickness being in the middle. The shell lacks sulcus and fold. Anterior margin asymmetrical, the right and the left sides of shells may be elevated or lowered to the same degree. Anterior commissure asymmetrical, lateral commissures being slightly curved. Cardinal margin long, extremely curved. Costae thin, sharpened, from twenty eight to thirty on each valve. Beak high, curved, with high deltidial plates and small foramen. False area concave, apical angle 85—90°.

Internal morphology: Dental lamellae long, slightly inclined, dividing umbonal cavity into the deltidial and two large lateral umbonal cavities. Teeth wide with

small denticulum. Cardinal plates rather slender, slightly concave ventrally, sharpened in the middle. Crura raduliferous (Fig. 1).

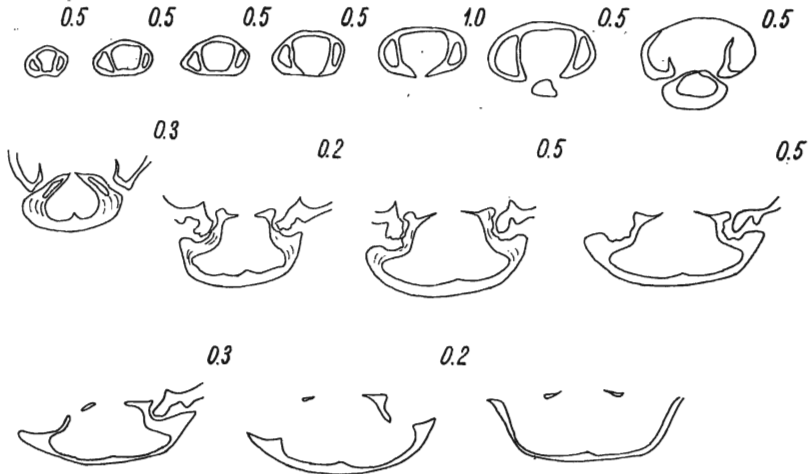


Fig. 1

Cyclothyrus astieriana (d'Orbigny, 1847), series of transverse sections

Remarks. — *Cyclothyrus astieriana* (d'Orbigny) differs from *C. airgulensis* (Moisseev) by less convex valves, smaller apical edge and asymmetrical anterior margin; it differs from *C. irregularis* (Pictet) by having also asymmetrical anterior commissures, by a smaller number of costae on valves, and slightly convex valves and smaller dimensions of shell.

Occurrence. — Upper Tithonian of the Pieniny Klippen Belt (Rogoźnik), Czechoslovakia (Štramberk), France, USSR (Crimea, Caucasus).

Family Basiliolidae Cooper, 1959

Genus *LACUNOSELLA* Wiśniewska, 1932

Lacunosella lacunosa (Schlotheim, 1813)

(Pl. 1, Fig. 3a—d)

1857. *Rhynchonella lacunosa* Schlotheim; L. Zeuschner, p. 7.

1859. *Rhynchonella lacunosa* Schlotheim; E. Suess, pp. 53—55, Pl. 6, Figs 5—7.

Material. — Two complete specimens.

Dimensions (in mm):

Col. No.	L	W	T	W : L	T : L
4540/1	31.8	31.5	21.0	0.99	0.66
4540/2	21.4	21.2	12.7	0.99	0.56

Description.

External morphology: Shell large, subround-pentagonal in outline, with wing-like sides and width close to its length. The greatest width and thickness in the middle. Sinus broad, not deep. There are four costae in the sinus, from two to four costae are on the lateral sides. New costae are developed by dichotomy. Anterior commissure broad, trapeziform, lateral commissures sharply bent in the anterior

part. Cardinal margin long, extremely curved. The beak is sharpened, apical angle 90° .

Internal morphology: Dental lamellae short, slightly recurved and close to the valve sides. Teeth broad with crenulation or notch denticle developed. Cardinal plates broad, ventrally convex, merging in inner socket ridges. Crural bases have long dorsal and short ventral ends. Crura broad, falciferous. Low dorsal euseptum developed (Fig. 2).

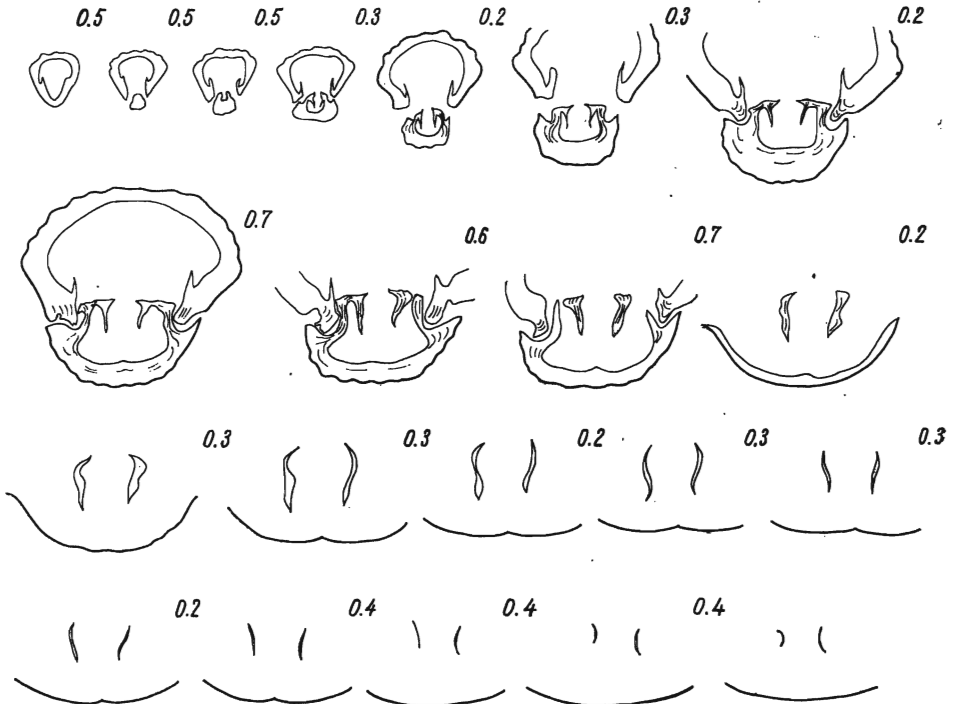


Fig. 2

Lacunosella lacunosa (Schlotheim, 1813), series of transverse sections

Remarks. — This species differs from *L. Pachytheca* (Zeuschner) by not so broad shell, less number of costae, moderate convex valves, more stout beak, less convex winglike sides, less broad crura and less developed dorsal ends of crural bases. It differs from *L. trilobata* by smaller shell, subround-pentagonal outline and less elongated anterior margin.

Occurrence. — Upper Tithonian of the Polish Carpathians (Inwałd), Czechoslovakia (Štramberk), Germany.

Lacunosella pachytheca (Zeuschner, 1855)

(Pl. 1, Fig. 2a—d)

1855. *Rhynchonella pachytheca* Zeuschner; L. Zeuschner, vol. 18, p. 48, Pls 1—2

1857. *Rhynchonella pachytheca* Zeuschner; L. Zeuschner, p. 8.

1855. *Rhynchonella pachytheca* Zeuschner; L. Zeuschner, vol. 18, p. 48, Pls 1—2.

Material. — Thirteen specimens, including eight complete shells, five — with broken off margins.

Dimensions (in mm):

Col. No.	L	W	T	W : L	T : L
4530/1	22.5	24.0	21.5	1.07	0.95
4530/2	25.0	25.8	20.0	1.03	0.80
4530/3	21.5	25.4	17.0	1.13	0.79
4530/4	19.7	21.3	18.6	1.08	0.99
4530/5	23.0	24.7	20.4	1.07	0.88

Description.

External morphology: Shell has extremely convex valves with the width always exceeding the length, subround-pentagonal in outline. Maximum width in the middle of the shell, maximum thickness slightly displaced toward anterior margin. Anterior commissure uniplicate, lateral commissures slightly bent, close to the anterior margin. Sinus of the ventral valve not deep. The fold of the dorsal valve hardly noticeable. Ventral valve more convex than the dorsal one. Number of costae on the valves from 18—20, 7—8 costae being on the sinus. Costae are coarse, rounded, dichotomous. Beak low, broad, apical angle 90—95°.

Internal morphology: Typical for the genus *Lacunosella*. The crural bases have very long dorsal ends. Crura are broad, convex toward sides, close to the dorsal valve (Fig. 3).

Remarks. — The species described above differs from the all known species of the genus *Lacunosella* by its extremely convex valves and great number of costae, and rectangular anterior commissures.

Occurrence. — Upper Tithonian of the Polish Carpathians (Inwald), Czechoslovakia (Štramberk).

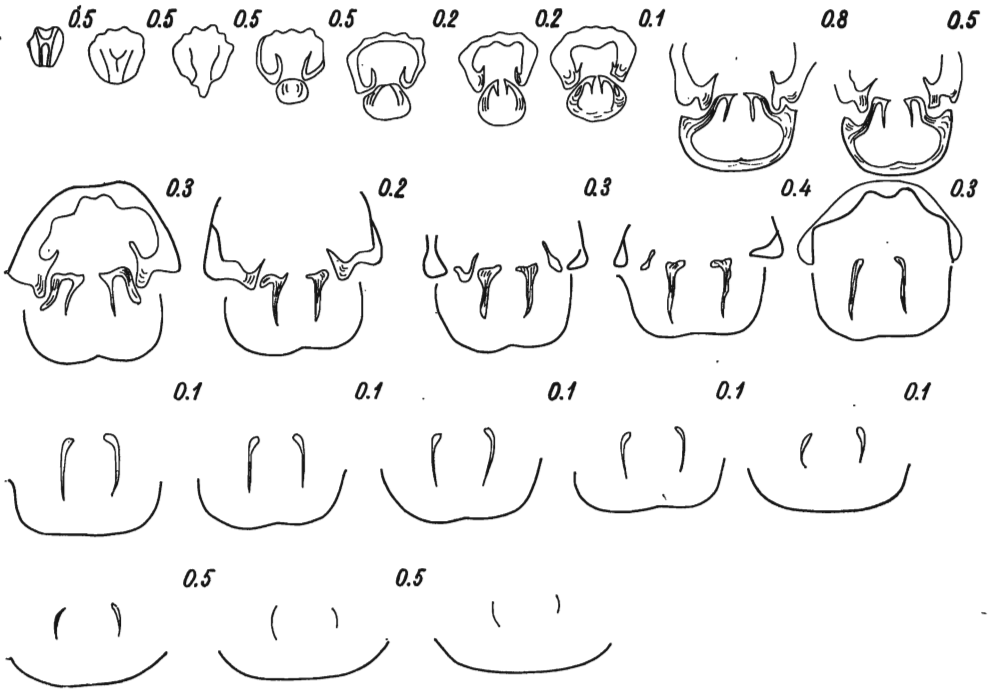


Fig. 3

Lacunosella pachytheca (Zeuschner, 1855), series of transverse sections

Order Terebratulida
 Superfamily Terebratulacea Gray, 1840
 Family Terebratulidae Gray, 1840
 Genus *WEBERITHYRIS* Smirnova, 1969
Weberithyris moravica (Glocker, 1845)
 (Pl. 1, Figs 4a—d, 5a—d)

1857. *Terebratula noszkovskiana* Zeuschner; L. Zeuschner, pp. 14—16, Pl. 4, Figs 1d—7d.
 1858. *Terebratula moravica* Glocker; E. Suess, p. 29, Pl. 2, Figs 4—6.
 1860. *Terebratula moravica* Glocker; L. Zeuschner, p. 685.
 1863—1868. *Terebratula moravica* Glocker; F. Pictet, p. 268, Pl. 41, Fig. 2.
 1871. *Terebratula moravica* Glocker; G. Gemmellaro, pp. 9—11, Pl. 1, Figs 8—13.
 1934. *Terebratula moravica* Glocker; A. Moisseev, pp. 123—124, Pl. 17, Figs 4—7.

Material. — Forty-two specimens, including ten complete shells, eighteen — with the ends of the beak broken off, fourteen — with damaged lateral margins.

Dimensions (in mm):

Col. No.	L	W	T	W : L	T : L
4533/1	40.0	23.0	13.4	0.57	0.33
4533/2	35.0	20.0	13.5	0.57	0.38
4533/3	28.0	16.0	10.7	0.57	0.38
4533/4	44.6	23.2	21.5	0.52	0.48
4534/5	35.5	20.6	14.5	0.48	0.41

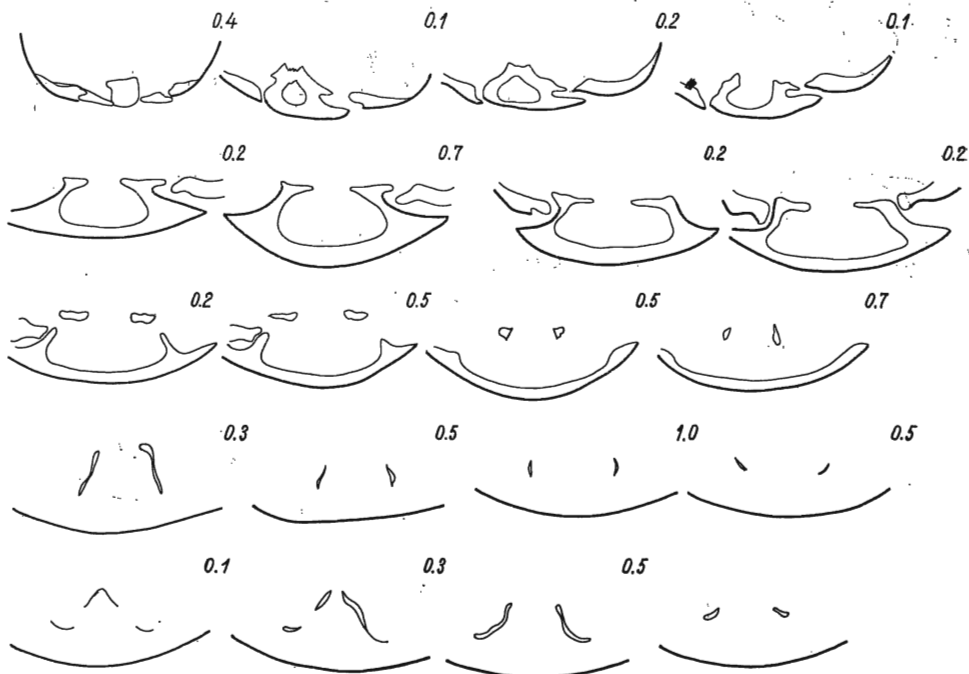


Fig. 4

Weberithyris moravica (Glocker, 1845), series of transverse sections

Description.

External morphology: Shell ovally elongated or subround-rhomboidal, narrow with slightly curved beak, flattened along the margins. Maximum width and thickness in the middle or slightly displaced toward the anterior margin. Lateral commissures straight. Anterior commissure straight or widely arched in semicircle. Anterior margin rounded. Dorsal valve equally convex with hardly seen sinus. Ventral valve more convex than the dorsal one, ridgelike, curved especially distinct in the umbonal part of the shell. Beak extremely elongated, slightly curved and narrow. Apical angle 50—65°. Symphythium distinct and high.

Internal morphology: Cardinal process small, concave, slightly bilobate. Cardinal plates slightly concave. Crural bases broad. Crural processes curved. Crura slender, massive. Transvers band of the loop sharply arcuate (Fig. 4).

Remarks. — *W. moravica* (Glocker) differs from the similar species *W. moissevi* (Weber) from the Valanginian of the USSR by its elongated slender shell, higher weakly curved beak, less apical angle and more convex dorsal valve.

Occurrence. — Upper Tithonian of the Polish Carpathians (Inwałd), Czechoslovakia (Štramberk), Germany, Italy, USSR (Crimea).

Genus *TROPEOTHYRIS* Smirnova, 1972*Tropeothyris immanis* (Zeuschner, 1857)

(Pl. 2, Fig. 1a—d)

1857. *Terebratula immanis* Zeuschner; L. Zeuschner, pp. 9—10, Pl. 1, Figs 1b—4b; Pl. 2, Figs 5—11; Pl. 3, Fig. 12.
 1858. *Terebratula immanis* Zeuschner; E. Suess, pp. 27—28, Pl. 2, Fig. 2.
 1858. *Terebratula formosa* Suess; E. Suess, p. 27, Pl. 1, Figs 10—13.
 1871. *Terebratula immanis* Zeuschner; G. Gemmellaro, pp. 6—7, Pl. 1, Figs 8—9.
 1918. *Terebratula immanis* Zeuschner; L. Rollier, part 3, p. 248.
 1934. *Terebratula formosa* Suess; A. Moisseev, p. 3, Pl. 13, Figs 13—16.

Material. — Fifteen specimens of satisfactory preservation, among them eleven — are intact, four — have their beaks and lateral sides broken off.

Dimensions (in mm):

Col. No.	L	W	T	W:L	T:L
4524/1	57.7	58.0	30.0	1.01	0.52
4524/2	59.9	45.2	35.0	0.75	0.58
4528/1	47.4	35.9	23.7	0.74	0.50
4528/2	64.7	68.3	40.5	1.05	0.62
4526/1	81.9	77.5	43.5	0.94	0.53

Description.

External morphology: Big shell subround and subround-pentagonal in outline with the length usually exceeding its width. Valves equally convex but the ventral a little more convex than the dorsal one. Maximum width in the middle. Maximum thickness close to the beak, more rarely in the middle. Anterior margin uniplicate. Near the anterior margin lateral commissures slightly curved. Cardinal margin long, slightly curved. Sinus of ventral valve and the elevation of the dorsal valve begin at a distance of 1/3 to the beak. Along the sides they are limited by shallow depressions. Beak massive. There are smooth shells with weakly detectable folding. False area narrow. Symphythium low. Foramen round, apical. Apical angle 95—110°.

Internal morphology: Cardinal process low, slightly trilobate. Teeth bladelike with denticulum. Cardinal plates wide, slightly concave ventrally. Crural bases with high ventral ends and well expressed dorsal keels. Branches of the loop wide. Dorsal euseptoid low (Fig. 5).

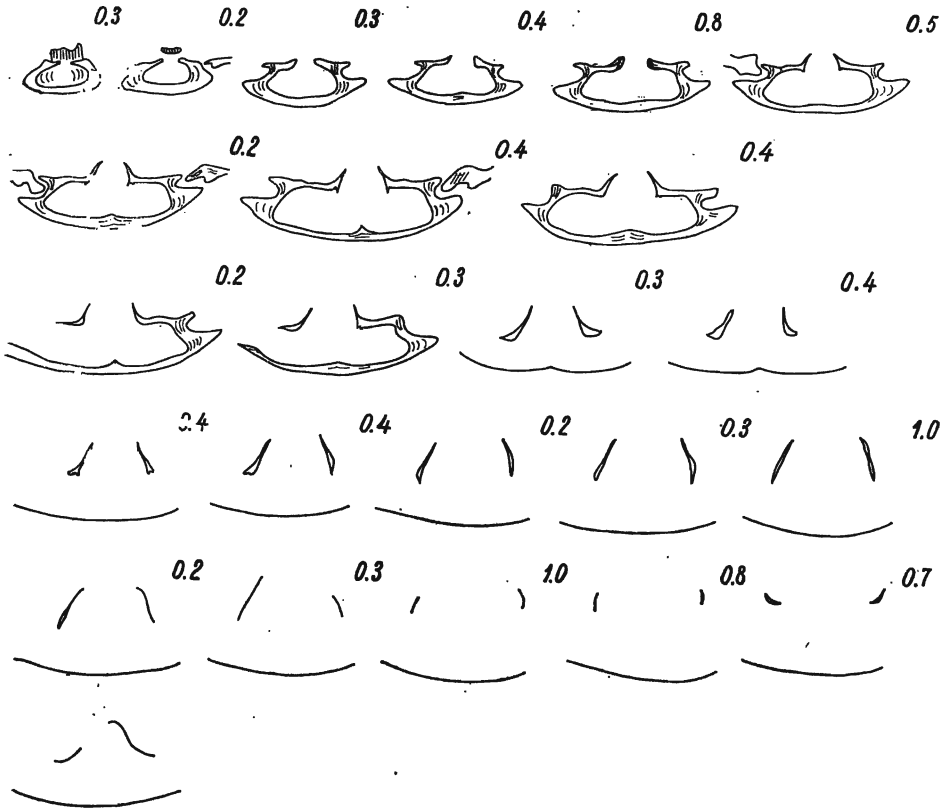


Fig. 5

Tropeothyris immanis (Zeuschner, 1857), series of transverse sections

Remarks. — The species described differs from the all known species of *Tropeothyris* by its larger dimensions of the shell, reaching 100 mm in length. It differs from *T. cyclogonia* Zeuschner with its round outlines, by the wide beak, large foramen, and more sharply expressed folding of its anterior margin.

Occurrence. — Upper Tithonian of the Polish Carpathians (Inwałd), Czechoslovakia (Štramberk), Sicily, USSR (Crimea).

Tropeothyris bieskidensis (Zeuschner, 1857)

(Pl. 2, Fig. 2a—d)

1857. *Terebratula bieskidensis* Zeuschner; L. Zeuschner, p. 14, Pl. 4, Figs 1c—4c.

1858. *Terebratula bieskidensis* Zeuschner; E. Suess, p. 30, Pl. 2, Figs 9—11; Pl. 3, Fig. 1.

1918. *Terebratula bieskidensis* Zeuschner; L. Rollier, part 3, p. 249.

1934. *Terebratula bieskidensis* Zeuschner; A. Moisseev, p. 123, Pl. 17, Figs 1—3.

Material. — Eight specimens out of which six are intact, two — with broken off margins.

Dimensions (in mm):

Col. No.	L	W	T	W : L	T : L
4538/1	17.0	14.3	8.5	0.84	0.50
4538/2	30.0	23.0	14.0	0.78	0.46
4538/3	29.3	23.0	13.2	0.78	0.45
4538/4	35.5	29.0	16.5	0.81	0.46

Description.

External morphology: Shell of a medium size circular-pentagonal or circular-quadrangular with the length exceeding its width and more or less rounded anterior margin. Valves slightly convex, uniformly curved along their whole length. Anterior margin tongue-like. Lateral commissures straight to the anteriorly curved ones. Cardinal margin long, slightly curved. Ventral valve has no sinus. Fold of the dorsal valve rather low. Shell surface smooth with distinct, thin growth lines. Beak slender, curved with large, round foramen. False area indistinct. Apical angle 75° .

Internal morphology: Cardinal process low. Cardinal plates narrow, ventrally slightly concave. Crural bases recede from the cardinal plates at right angle. Transverse band of the loop slightly curved (Fig. 6).

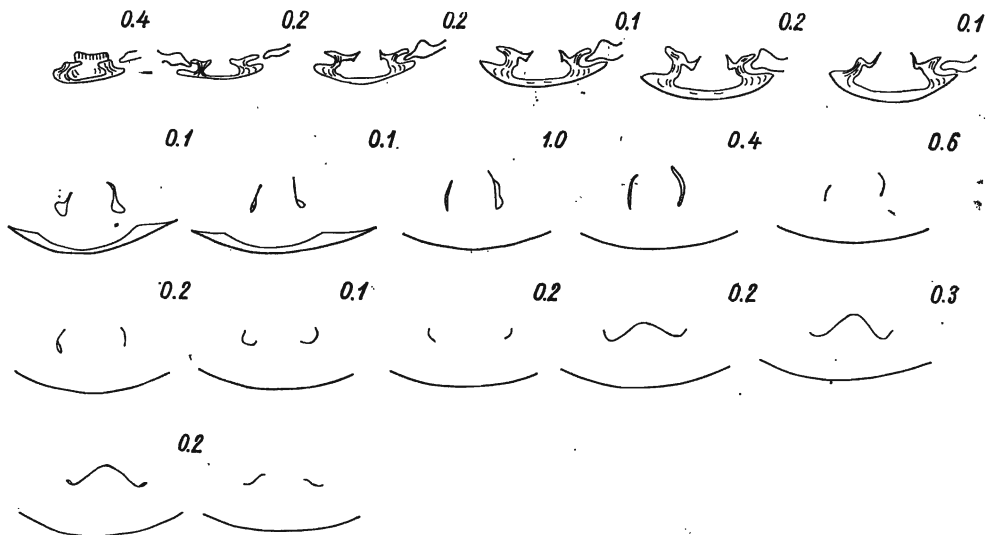


Fig. 6

Tropeothyris bieskidensis (Zeuschner, 1857), series of transverse sections

Remarks. — The described species differs from internally analogous *T. cyclogonia* (Zeuschner) by its lower beak, less sharply expressed folding of the anterior margin, absence of striae on the internal mould, and less distinctly circular-quadrangular outlines.

Occurrence. — Upper Tithonian of the Polish Carpathians (Inwałd), Czechoslovakia (Štramberk), Germany, USSR (North Caucasus-river Baksan).

Tropeothyris tychoviensis (Suess, 1858)

(Pl. 2, Fig. 3a—d)

1858. *Terebratula tychoviensis* Suess; E. Suess, pp. 30—31, Pl. 3, Figs 2—4.

1918. *Terebratula tychoviensis* Suess; L. Rollier, part 3, p. 247.

Material. — Four specimens of good preservation.

Dimensions (in mm):

Col. No.	L	W	T	W:L	T:L
4552/1	41.0	30.0	23.3	0.73	0.57
4552/2	60.7	41.4	39.9	0.66	0.65
4759/3	60.5	36.5	32.2	0.61	0.53
4759/4	57.7	32.7	35.1	0.57	0.61

Description.

External morphology: Shell elongated, rounded-pentagonal, slightly sulcate at the anterior margin. Valves moderately convex and nearly uniformly. Maximum width and thickness slightly displaced toward the anterior margin. Anterior margin wide trapezlike, slightly curved. Lateral commissures with a slight curve at the anterior margin. Cardinal margin long. Ventral valve uniformly curved in the longitudinal and transversal directions. A high fold on the dorsal valve begins close

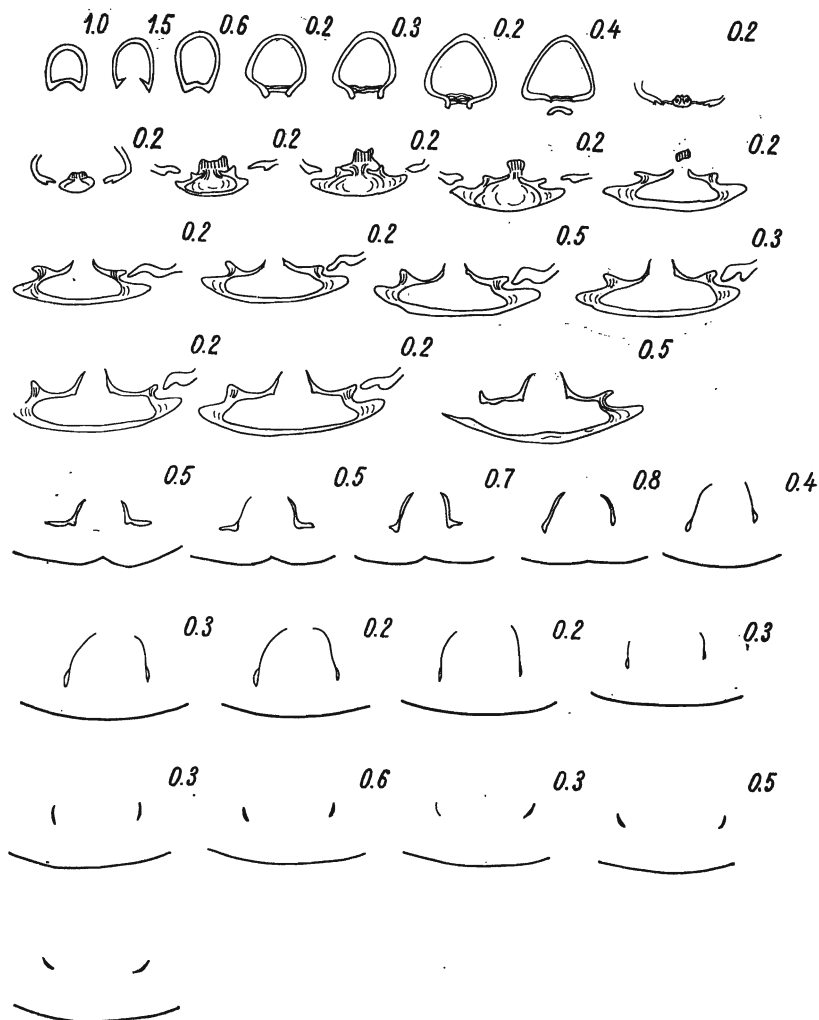


Fig. 7

Tropeothyris tychoviensis (Suess, 1858), series of transverse sections

to the beak and is complicated by a depression close to the anterior margin. Slender radial striae visible on the mould. Beak thick and curved. Apical angle 80—85°.

Internal morphology: Pedical collar developed. Cardinal process high, concave. Cardinal plates wide, concave. Crural bases concave in the middle with high ventral ends. Dorsal keels distinct. Crural processes wide. Loop branches slender (Fig. 7).

Remarks. — *T. tychoviensis* (Suess) differs from externally similar species *T. isomorpha* (Gemmellaro) by its rounded-pentagonal outline of the shell, smaller dimensions, absence of the median curvature on the anterior margin and the low cardinal process.

Occurrence. — Upper Tithonian of the Polish Carpathians (Inwałd), Czechoslovakia (Štramberk, Kopřivnica).

Tropeothyris carpathica (Zittel, 1870)

(Pl. 3, Fig. 1a—d)

1870. *Terebratula carpathica* Zittel; K. Zittel, pp. 255—256, Pl. 38, Figs 6—8.

Material. — Two intact specimens of good preservation and one with broken off margin.

Dimensions (in mm):

Col. No.	L	W	T	W : L	T : L
4554/1	18.3	12.0	10.0	0.65	0.54
4554/2	20.4	14.9	10.9	0.73	0.53
4554/3	17.9	11.3	9.9	0.63	0.55

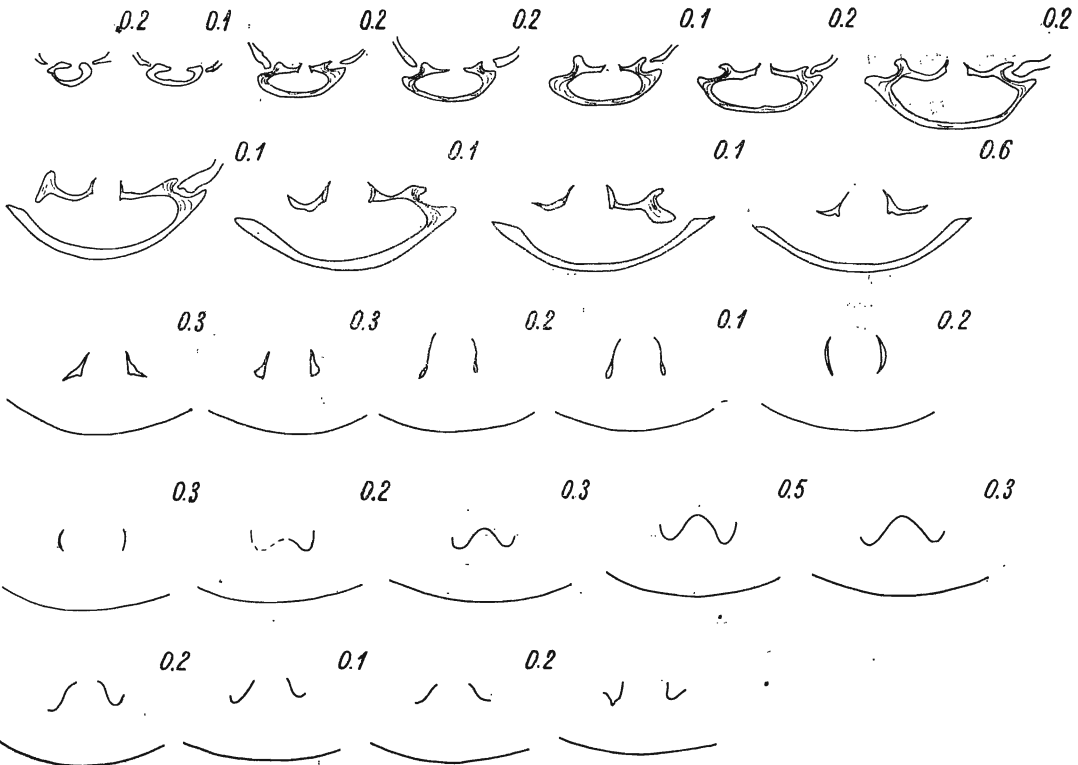


Fig. 8

Tropeothyris carpathica (Zittel, 1870), series of transverse sections

Description.

External morphology: Shell small, ovaly-elongated with straightened anterior margin. Anterior commissure short, rectimarginate. Lateral commissures long, nearly straight along their whole length. Cardinal margin long and curved. Maximum width in the middle, maximum thickness close to the beak. Lines of growth clearly seen. Shell lacks folding, slightly flattened at the anterior margin. Beak low, curved, hides the deltidium and is adjacent to the dorsal valve. Foramen small, false area indistinct. Apical angle 60° .

Internal morphology: Cardinal process not observable. Cardinal plates wide, strongly concave ventrally. Crural bases high, concave, inclined in the middle. Socket ridges distinct. Crural processes wide. Transversal loop band high, strongly curved (Fig. 8).

Remarks. — The described specimen differs from the known species of the genus *Tropeothyris* by its shell of small dimensions and by absence of folding. It differs from *T. bieskidensis* (Zeuschner) by its oval outlines, smaller apical angle, small foramen, wide cardinal plates, strongly curved transverse loop band.

Occurrence. — Upper Tithonian of the Polish Carpathians (Inwałd), Germany.

Tropeothyris isomorpha (Gemmellaro, 1871)
(Pl. 3, Fig. 2a—d)

1871. *Terebratula isomorpha* Gemmellaro; G. Gemmellaro, pp. 14—15, Pl. 3, Fig. 7.

Material. — Ten specimens, eight intact and two without beaks.

Dimensions (in mm):

Col. No.	L	W	T	W : L	T : L
4531/1	52.0	39.0	29.0	0.75	0.56
4531/2	44.0	31.9	20.6	0.72	0.47
4531/3	49.7	34.2	26.9	0.68	0.54
4531/4	47.3	37.4	26.8	0.79	0.54
4531/5	36.4	27.8	19.2	0.80	0.53

Description.

External morphology: Shell pear-shaped, elongated, slightly sulcate at the anterior margin. Length always exceeds width. Ventral valve a little more convex than the dorsal one. Maximum width somewhat closer to the anterior margin or in the middle of shell length. Maximum thickness in the middle. Anterior margin gently W-like with the median curvature. Lateral commissures curved, wave-like near the anterior margin. Cardinal margin strongly curved and short. Sinus hardly seen near the anterior margin on the ventral valve. Fold of the dorsal valve not high with shallow median depression. Beak high, massive, curved. False area low. Apical angle $80-85^\circ$.

Internal morphology: Pedical collar present. Cardinal process very high, slightly convex, not cleaved into the lobes. Notches for muscles attachment well visible. Wide cardinal plates slightly concave ventrally. Crural bases have hardly noticeable dorsal keels. Transverse band of the loop sharply curved (Fig. 9).

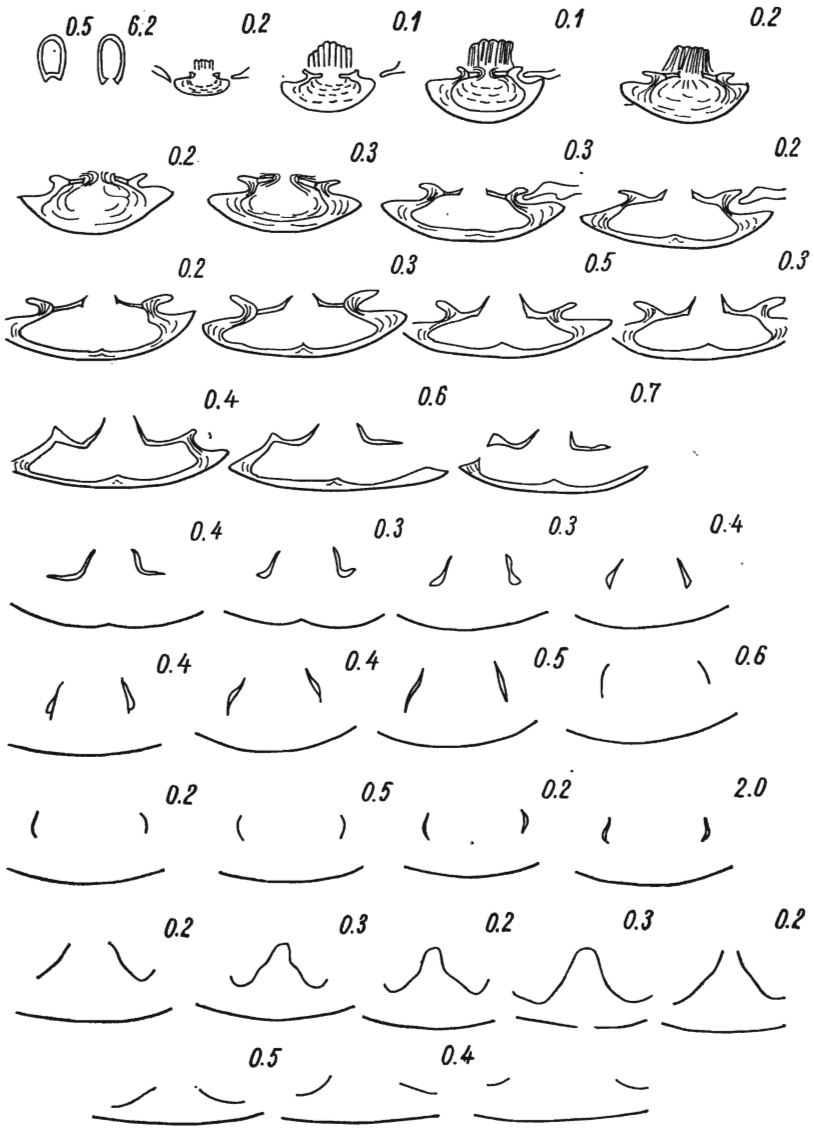


Fig. 9

Tropeothyris isomorpha (Gemmellaro, 1871), series of transverse sections

Remarks. — This species differs from *T. immanis* (Zeuschner) by smaller dimensions of the shells, more elongated valves, narrow beak, slightly developed folding, high cardinal process, concave cardinal plates.

Occurrence. — Upper Tithonian of the Polish Carpathians (Inwald), Northern Italy.

Tropeothyris cyclogonia (Zeuschner, 1857)

(Pl. 3, Fig. 3a—d)

1857. *Terebratula cyclogonia* Zeuschner; L. Zeuschner, pp. 11—12, Pl. 3, Figs 1a—4d.
 1858. *Terebratula haldingeri* Hohenegger; E. Suess, pp. 28—29, Pl. 2, Fig. 1a—b.
 1860. *Terebratula cyclogonia* Zeuschner; L. Zeuschner, pp. 685—686.
 1871. *Terebratula cyclogonia* Zeuschner; G. Gemmellaro, p. 8, Pl. 2, Figs 5—6.
 1899. *Terebratula cyclogonia* Zeuschner; M. Rames, p. 216.
 1934. *Terebratula kokkozensis* Moisseev; A. Moisseev, pp. 119—120, Pl. 120; Pl. 15, Figs 1—8.

Material. — Nineteen specimens, fifteen intact, two representing dorsal valves and two ventral ones.

Col. No.	Dimensions (in mm):				
	L	W	T	W : L	T : L
4761/1	31.0	26.0	14.5	0.84	0.47
4761/2	49.3	45.3	22.0	0.93	0.44
4536/1	28.7	28.4	13.0	0.99	0.46
4542/2	47.7	47.0	21.2	0.98	0.44
4547/3	37.5	32.3	19.6	0.86	0.52

Description.

External morphology: Shells smooth with slightly convex valves and wide flattened sides, rounded quadrangular in outline. Shell margins discoidal. Anterior margin rounded. Lateral and anterior commissures straight, lie in one plane. Maximum width and thickness in the middle part of shell. Radial striae seen on the internal mould of shell. Beak high, narrow, slightly curved or curved. False area distinct and concave. Symphytium high. Foramen apical. Apical angle 80—95°.

Internal morphology: Teeth long, narrow, gently entering dental sockets. Denticulum clear. Cardinal plates extremely curved ventrally, sharply separated from the inner socket ridges. Crural plates ventrally directed, sharpended dorsally keel-like. Crural processes clear. Branches of the loop slender. Transverse band low (Fig. 10).

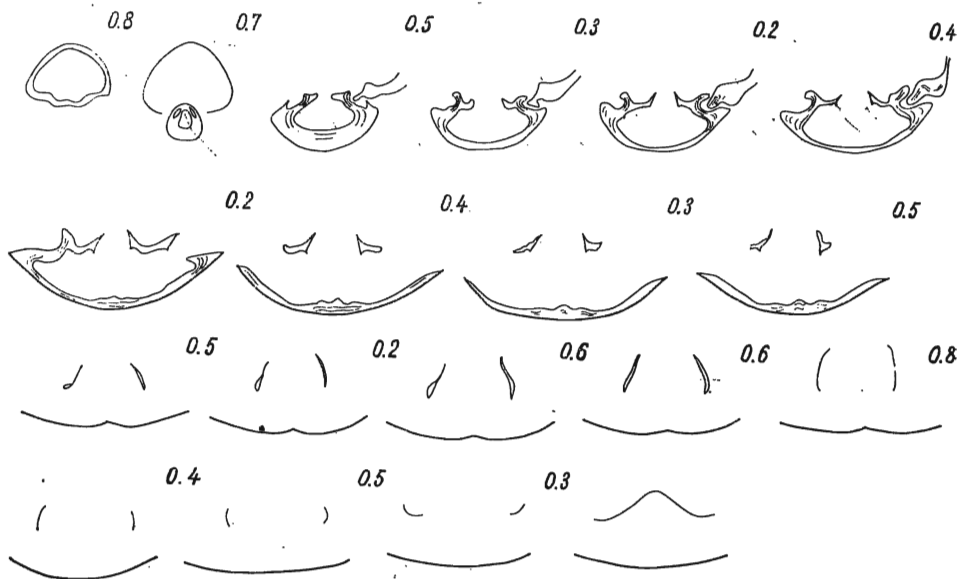


Fig. 10

Tropeothyris cyclogonia (Zeuschner, 1857), series of transverse sections

Remarks. — The species here described differs from *T. bilimeki* (Suess) by its rounded quadrangular outlines, narrow margins of shell, slender beak, less convexity of valves. From *T. cyclogonia* (Zeuschner) it differs by its less curved beak and straight commissures.

Occurrence. — Upper Tithonian of the Polish Carpathians (Inwałd), Czechoslovakia (Štramberk), Sicily, USSR (Crimea).

Tropeothyris testatus sp. n.
(Pl. 3, Fig. 4a—d)

Holotype: specimen No. 4532/9, kept in Lwow in the Museum of Natural Sciences, collection of L. Zeuschner.

Derivation of the name: Latin *testatus* — indubitable.

Material. — Three specimens, two of them intact, one has lateral margins and the apical part of the beak broken off.

Dimensions (in mm):

Cod. No.	L	W	T	W : L	T : L
4532/9	32.5	23.5	15.0	0.72	0.46
4532/10	27.8	20.5	13.6	0.73	0.51

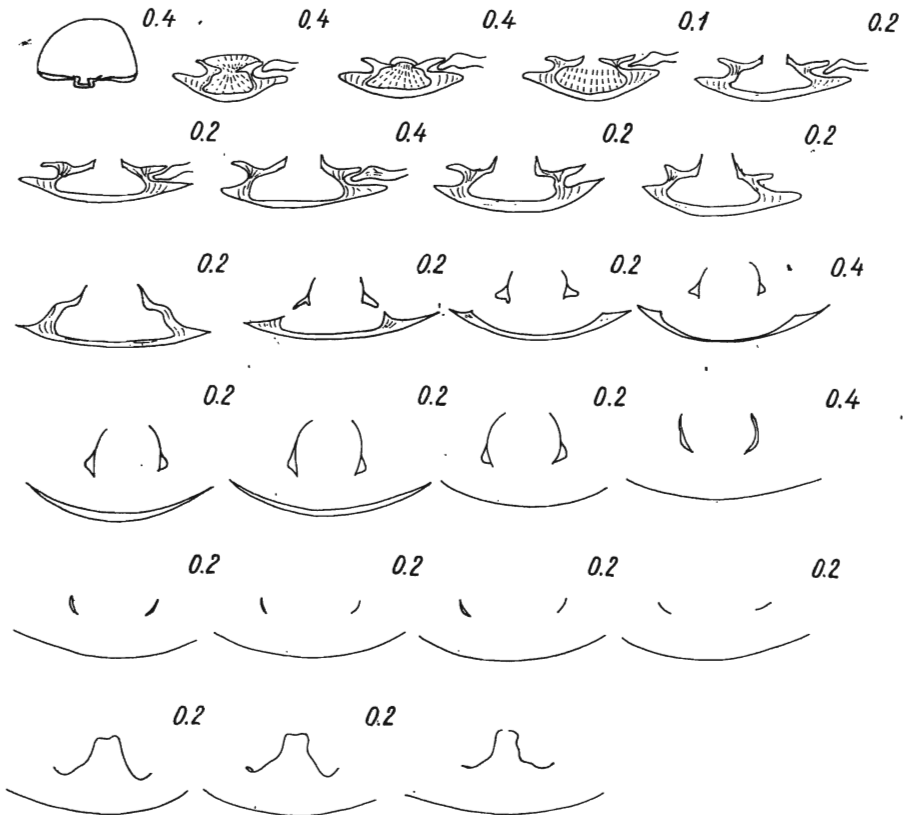


Fig. 11

Tropeothyris testatus, sp. nov., series of transverse sections

Description.

External morphology: Shell oval having root-like curved, rounded in the middle ventral valve and flattened dorsal valve. Maximum width and thickness in the middle of shell. Anterior and lateral commissures straight. Shell smooth, sinus and fold absent. Shell sides flattened. Cardinal margin slightly curved and long. Beak high and curved. False area flat. Apical angle 75° .

Internal morphology: Cardinal process low, indistinctly expressed. Cardinal plates ventrally concave, slightly keel-like in the bending point. Crural processes wide. Transversal band of the loop sharply curved ventrally (Fig. 11).

Remarks. — In the Zeuschner's labels these specimens were called "*Terebratella repanda*". Short beak, absence of median flattened surface of the ventral valve differ them from typical *T. repanda* Zeuschner. The study of internal morphology confirmed these doubts. The new species is typical for the representatives of the genus *Tropeothyris*. From *T. immanis* (Zeuschner) it differs by small dimensions, root-like curved ventral valve and a straight commissures.

Occurrence. — Upper Tithonian of the Polish Carpathians (Inwałd).

Genus *GALLIENNITHYRIS* Rollet, 1966*Galliennithyris insignis* (Zeuschner, 1857)

(Pl. 3, Fig. 5a—d)

1857. *Terebratula insignis* Zeuschner; L. Zeuschner, p. 11, Pl. 3, Figs 1c—4c.

Material. — Eleven specimens, six being intact, the rest are shell fragments.

Dimensions (in mm):

Col. No.	L	W	T	W : L	T : L
4551/1	35.6	23.8	22.0	0.67	0.61
4551/2	47.7	34.2	25.3	0.71	0.53
4551/3	54.7	34.2	30.2	0.62	0.55
4551/4	33.2	25.1	19.3	0.75	0.58
4551/5	46.2	29.7	27.0	0.64	0.59

Description.

External morphology: Shell oval, compact, of medium size, elongated. Valves convex, the ventral valve much more than the dorsal one. Maximum width and thickness in the middle of shell. Anterior margin narrow, uniplicated. Lateral commissures slightly bent. Cardinal margin long, strongly curved. Ventral and the dorsal valves weakly flattened in the anterior part. Growth lines distinct. Beak high, curved with round, large foramen. False area hardly noticed. Apical angle $65-75^{\circ}$.

Internal morphology: Cardinal process small, narrow. Cardinal plates horizontal and wide. Crural bases have small ventral ends and more clearly dorsal ends. Crural processes wide. Loop have slender branches, the transversal band moderately curved (Fig. 12).

Remarks. — By its external morphology this species is close to *T. tychoviensis* (Suess). Zeuschner (1860) believed these species are synonyms. Zeuschner's collection analysis and its comparison with the pictures from Suess collection (1858, 1859) allowed to find specific differences. *G. insignis* differs from *T. tychoviensis* by smaller dimensions of shell, less bulged valves, elongated oval shell and not so

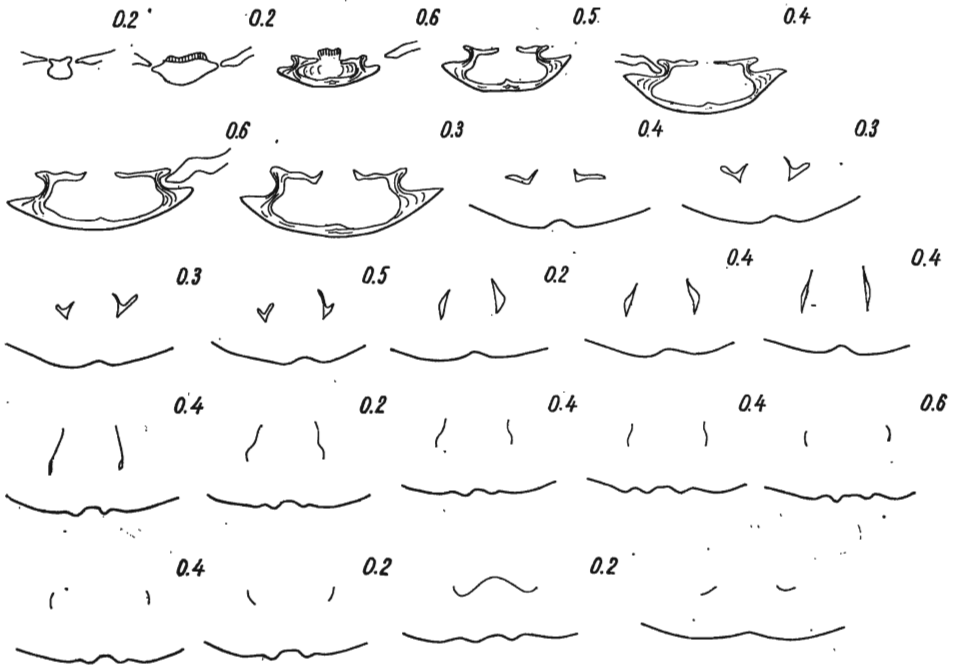


Fig. 12

Gallienithyris insignis (Zeuschner, 1857), series of transverse sections

sharp folding of the anterior margin. Sections of the elements of the inner morphology have shown their different generic affinity.

Occurrence. — Upper Tithonian of the Polish Carpathians (Inwałd).

Gallienithyris simplicissima (Zeuschner, 1957)

1857. *Terebratula simplicissima* Zeuschner; L. Zeuschner, pp. 13–14, Pl. 4, Figs 1a–4a.

1858. *Terebratula simplicissima* Zeuschner; E. Suess, p. 26, Pl. 1, Figs 4–6.

1871. *Terebratula simplicissima* Zeuschner; G. Gemmellaro, p. 12, Pl. 3, Fig. 3.

1899. *Terebratula simplicissima* Zeuschner; M. Remes, p. 214.

Material. — Six specimens in all, three intact.

Dimensions (in mm):

Col. No.	L	W	T	W:L	T:L
4539/2	34.6	22.1	16.0	0.64	0.46
4539/3	24.8	17.6	14.1	0.71	0.57

Description.

External morphology: Shell ellipsoid (in outline) with rounded anterior margin, elongated. Sinus and fold absent. Ventral valve a little more convex than the dorsal one. Maximum width and thickness in the middle of shell. Anterior commissure rectimarginate or slightly arcuated. Lateral commissures straight. Cardinal margin long and curved. Beak elongated, high, slightly curved. Foramen large. Apical angle 70°.

Internal morphology: Pedical collar clear. Cardinal plates horizontal, weakly concave. Crural bases concave with well developed ventral and dorsal ends. Transversal band of the loop rectangularly curved (Fig. 13).

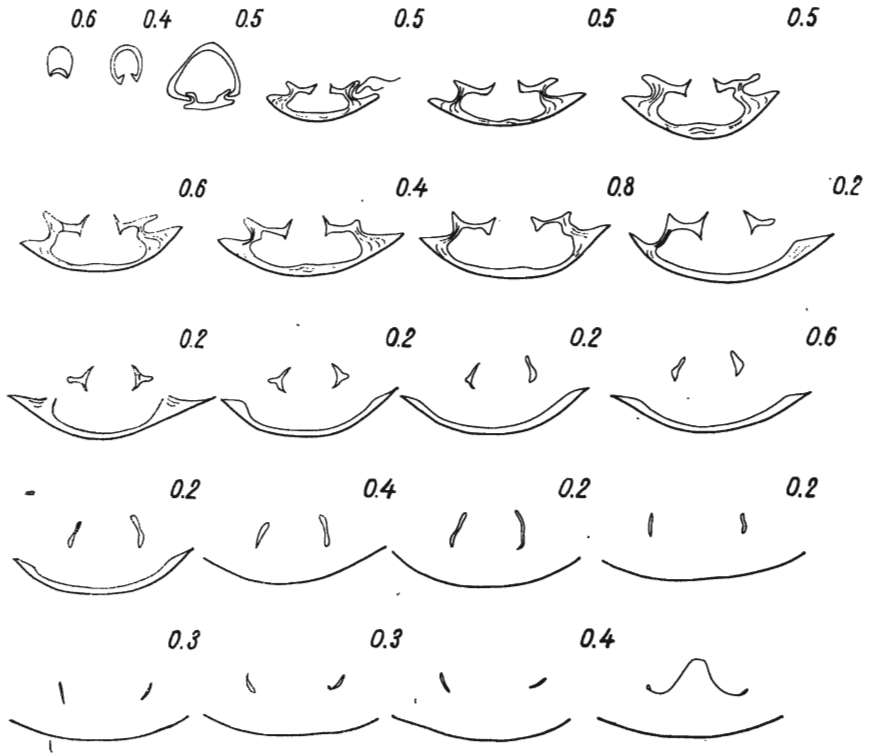


Fig. 13

Gallienithyris simplicissima (Zeuschner, 1857), series of transverse sections

Occurrence. — Upper Tithonian of the Polish Carpathians (Inwałd), Czechoslovakia (Štramberk), Sicily.

Family **Dallinidae** Beecher, 1893

Genus **ZEILLERINA** Kyansep, 1959

Zeillerina magasiformis (Zeuschner, 1856)

(Pl. 4, Fig. 1a—d)

1856. *Terebratula magasiformis* Zeuschner; L. Zeuschner, p. 233.
 1857. *Terebratula magasiformis* Zeuschner; L. Zeuschner, pp. 16—17, Pl. 4, Figs 1c—4e.
 1859. *Waldheimia lugubris* Suess; E. Suess, p. 40, Pl. 4, Figs 11—12.
 1860. *Terebratula magasiformis* Zeuschner; L. Zeuschner, p. 689.
 1871. *Terebratula magasiformis* Zeuschner; G. Gemmellaro, pp. 21—22, Pl. 4, Figs 5—6.

Material. — Eleven specimens, seven intact, two have their beaks destroyed, and two with broken off margins.

Dimensions (in mm):

Col. No.	L	W	T	W:L	T:L
4535/1	20.4	16.0	9.0	0.78	0.44
4535/2	22.4	22.9	13.4	1.04	0.61
4535/3	19.2	16.0	9.3	0.83	0.48
4535/4	22.4	19.9	9.0	0.89	0.41
4535/5	16.6	14.3	6.0	0.86	0.34

Description.

External morphology: Shell rounded-quadrangular, rounded-pentagonal in outline with strongly convex ventral valve and flattened dorsal one. Lateral commissures straight, anterior commissure is incipiently uniplicate. Ventral valve strongly convex, transversally roof-like. Valve sides flattened. Cardinal margin long, weakly curved. Beak sharpened, curved, strongly hanging over the dorsal valve. Beak ridges clear, long, limiting concave false area. Foramen small, is on tip of beak. Apical angle 90° .

Internal morphology: Dental plates short, slightly curved. Cardinal plates slender, supported by massive, wide medium septum. Inner socket ridges gently, hardly separated from the cardinal plates. The descending branches of loop wide. Loop long, free of the septum, zeilleriid (Fig. 14).

Remarks. — It differs from similar in external features *Zeillerina quenstedti* Kyansp by its larger dimensions, absence of pedical collar and curved dental plates.

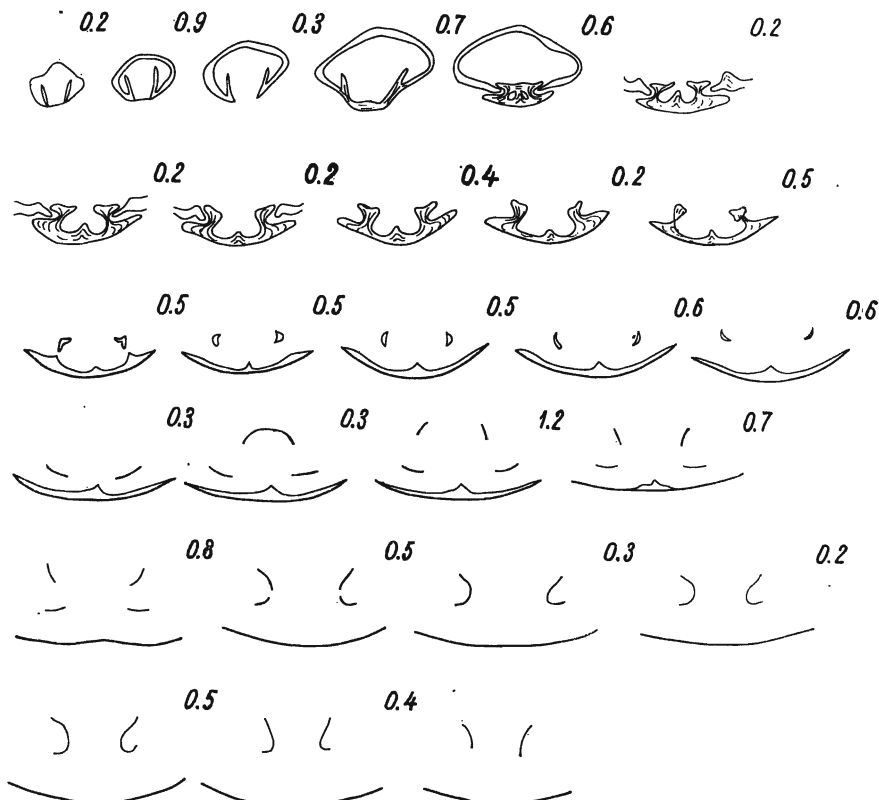


Fig. 14

Zeillerina magasiformis (Zeuschner, 1856), series of transverse sections

Occurrence. — Upper Tithonian of the Polish Carpathians (Inwald), Czechoslovakia (Štramberk), Sicily, USSR (Crimea).

Genus *TEREBRATALIOPSIS* Smirnova, 1962

Terebrataliopsis czapskiana (Zeuschner, 1857)

(Pl. 4, Fig. 2a—d)

1857. *Terebratula czapskiana* Zeuschner; L. Zeuschner, pp. 17—18, Pl. 4, Figs 1f—4f.
 1859. *Waldhelmia magadiformis* Zeuschner; E. Suess, pp. 40—41, Pl. 4, Figs 13—17.

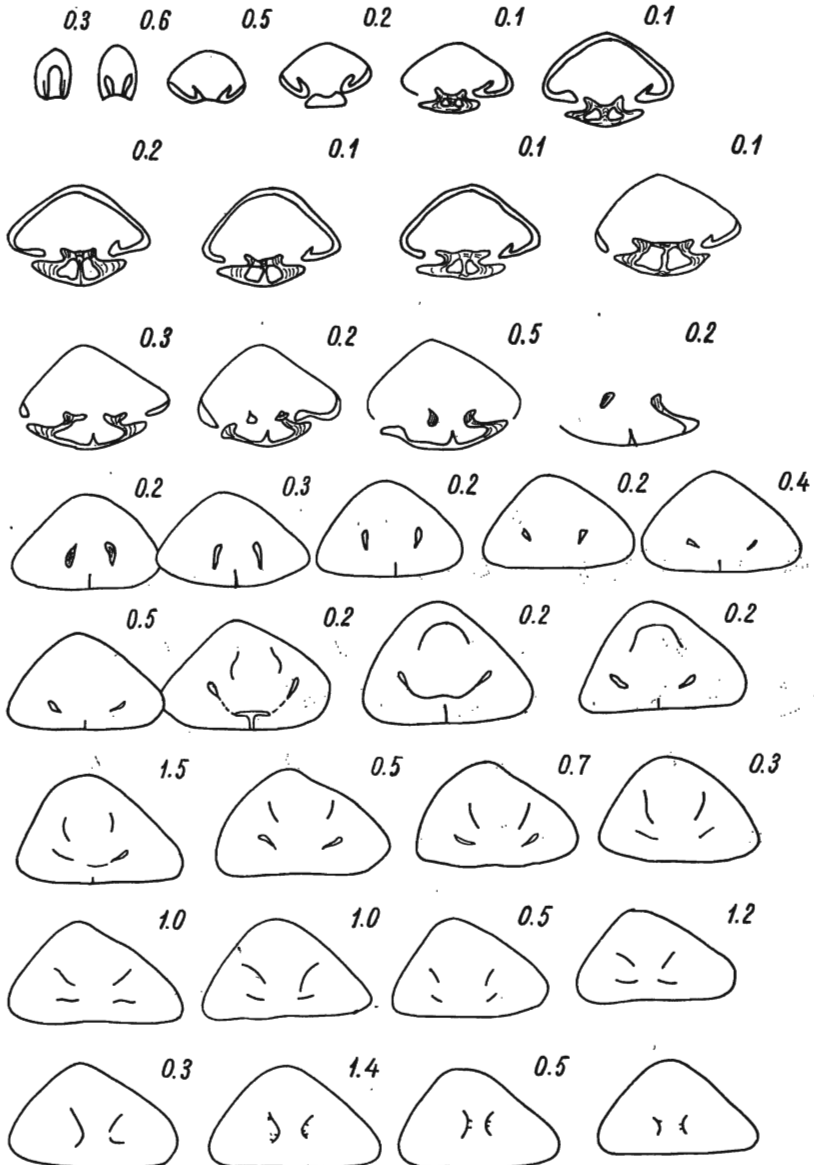


Fig. 15

Terebrataliopsis czapskiana (Zeuschner, 1857), series of transverse sections

Material. — Five specimens, three intact and two with broken off margins.

Dimensions (in mm):

Col. No.	L	W	T	W : L	T : L
4543/1	16.5	16.7	9.7	1.01	0.57
4543/2	21.0	17.9	10.6	0.85	0.59
4543/3	17.7	15.4	9.6	0.87	0.54

Description.

External morphology: Shell small, flatly-convex, rounded-pentagonal in outline with strongly curved beak. Anterior margin hollowed. Length close to width. Ventral valve highly convex in the middle. Dorsal valve flat. Anterior commissure weakly bent in the middle in form of a narrow tongue. Lateral commissures straight. Cardinal margin long, straightly curved. Deep narrow sinus developed on the ventral valve, beginning at the beak and widening toward the anterior margin. Sinus limited by two high, narrow folds. On the dorsal valve there is also a shallow sinus, symmetrical to that on the ventral valve. Shell surface covered with slender radial costae. Beak strongly curved, hanging over the dorsal valve. False area low, narrow. Foramen small. Apical angle 80—90°.

Internal morphology: Dental lammellae short, divergent. Septalium wide, shallow, rapidly flattening forward. Cardinal plates narrow, slightly inclined horizontally. Dorsal ends of the crural bases well developed. Descending branches of the loop narrow, connected with septum. Ascending branches wide. There are spines in the loop (Fig. 15).

Remarks. — The described species differs from *Terebrataliopsis quadrata* Smirnova by its larger size, rounded-pentagonal outlines, presence of sinus on the ventral and dorsal valves, and hollowed anterior margin.

Occurrence. — Upper Tithonian of the Polish Carpathians (Inwałd), Czechoslovakia (Štramberk).

Genus *CARPATOTHYRIS* gen. nov.

Type species: *Terebratella repanda* Zeuschner, 1857, Upper Tithonian of the Polish Carpathians (Inwałd).

Derivation of the name: after the Carpathians.

Description. — Large shell with strongly elongated narrow beak. Ventral valve rather convex, roof-like curved. Both valves flattened in the middle part of shell, trapez-like in transverse section. Pedical collar absent. Dental plates long, subparallel, near the wall of the valve. Cardinal process absent. There is developed an additional calcareous, ventrally convex plate resting on the cardinal plates. The real septalium absent. A small trench-like depression is formed in the point, where septum and additional plate join. Cardinal plates flattened, slightly inclined to the symmetry plane, not clearly separated in relief from the inner socket ridges. Crural bases have short, but distinct dorsal and ventral ends. Crural processes curved. Loop free, dalliniform with narrow descending branches and wide ascending branches, equal to 2/3 of the dorsal valve length. Transversal band very wide.

Remarks. — Long, free loop and the presence of additional calcareous plate in the cardinal area, allow to compare this new genus with *Zeillerina* Kyansep, 1959. The new genus is distinguished by its large shell with strongly elongated apical part, the convex ventral valve, absence of cardinal process and septalium, subparallel long dental plates, more sharply expressed crural bases and wide transversal band. It is possible that both genera are interrelated.

Carpatothyris repanda (Zeuschner, 1857)
(Pl. 4, Figs 3a—d, 4a—d)

1857. *Terebratella repanda* Zeuschner; L. Zeuschner, pp. 18—19, Pl. 4, Figs 1g—4g.

1859. *Terebratula repanda* Zeuschner; E. Suess, pp. 36—37, Pl. 4, Fig. 2.

Material. — Eight specimens, three with beaks broken off, two have not complete anterior margin.

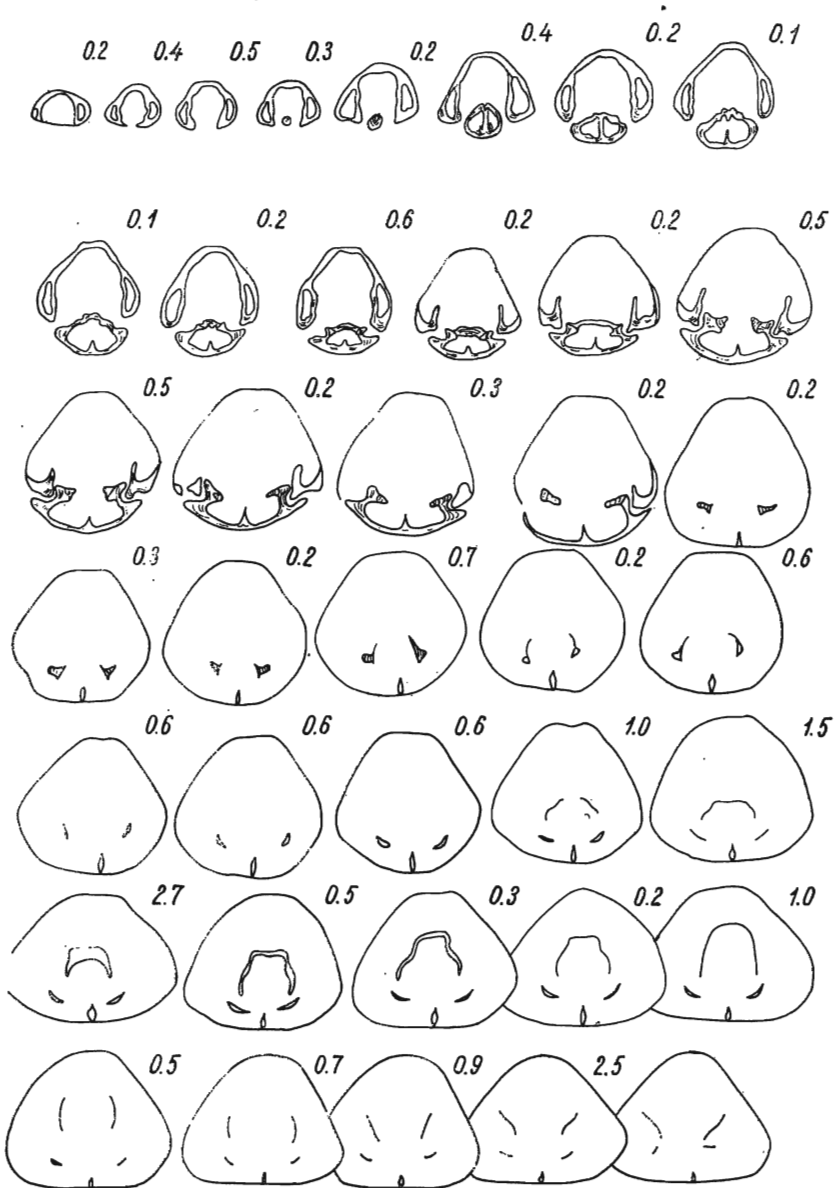


Fig. 16

Carpatothyris repanda (Zeuschner, 1857), series of transverse sections

Dimensions (in mm):

Col. No.	L	W	T	W : L	T : L
4532/1	32.3	20.0	16.6	0.62	0.51
4532/2	20.8	15.7	9.9	0.75	0.47
4532/3	35.4	25.6	21.7	0.72	0.61

Description.

External morphology: Shell with strongly convex valves, very high beak, elongated pear-like in outline. Ventral valve more convex, than the dorsal one. Maximum width is displaced a little toward the anterior end, maximum thickness — to the cardinal margin. Maximum convexity of the dorsal valve confined to the apical part. Anterior commissure trapeziform with sharp angles, the convexity being directed toward ventral valve. Lateral commissures straight. Cardinal margin curved and long. In the middle of the ventral valve there is a flattened surface, limited by sharpened keels. Keels followed from the tip of the beak to the anterior margin, making the anterior commissure angular in outline. Beak strongly elongated, narrow, weakly curved. Pseudodeltidium high, false area clear, in form of narrow, elongated plots. Foramen large, apical. Apical angle 60—70°.

Internal morphology: Dental plates parallel, long, bounding small apical cavities. Septum high, long. Additional plate wide, ventrally convex. Cardinal plates narrow. Crural bases have uniformly expressed dorsal and ventral ends. Crural processes not wide. Loop long, free, with wide ascending branches. There is a bulge, which is the joining point of descending branches with septum in the earlier growth stages (Fig. 16).

Occurrence. — Upper Tithonian of the Polish Carpathians (Inwałd), Czechoslovakia (Štramberk).

Genus *ZEUSCHNERIA* gen. nov.

Type species: *Zeuschneria imitabilis* sp. n.; Upper Tithonian of the Polish Carpathians (Inwałd).

Derivation of the name: in honour of L. Zeuschner.

Description. — Shells not large, ovaly-elongated, not sulcate with straight commissures. Ventral valve more convex, than the dorsal one. Beak high, curved with a circular foramen. Dental lamellae short, steeply inclined, bounding small apical cavities. Septalium broad, rather gentle. Dorsal septum high, long, bifurcating on the ventral end. Cardinal plate disjuncted, horizontal, slightly separated from the inner socket ridges. Crural bases hardly projecting in ventral and dorsal directions. Crural processes short. Loop frenuliniform, constituting about one half of the dorsal valve length. Ascending branches wide. Loop characterized by the formation of a specific cavity, bounded by bifurcated ventral end of median septum, by the dorsal side of hood and branches of the loop. The anterior half of the loop has spines.

Remarks. — The new genus is close to the Lower Cretaceous genus *Tulipina* Smirnova, 1962, which is similar by its frenuliniform loop, with broad ascending branches, short, nearing to the valve wall dental lamellae; it differs from *Tulipina* by larger dimensions, smooth shell, slightly convex valves, straight commissures, less curved beak, bifurcation of ventral end of septum with the formation of specific cavity between the branches of the loop and by the developing of spines on the loop.

Zeuschneria imitabilis sp. n.
(Pl. 4, Fig. 5a—d)

Holotype: specimen No. 4539/7, kept in Lwow, in the Museum of Natural Sciences, collection of L. Zeuschner.

Material. — Three specimens, two of them intact.

Dimensions (in mm):

Col. No.	L	W	T	W : L	T : L
4539/7	23.0	17.5	13.0	0.76	0.56
4539/8	21.3	16.0	11.8	0.75	0.55

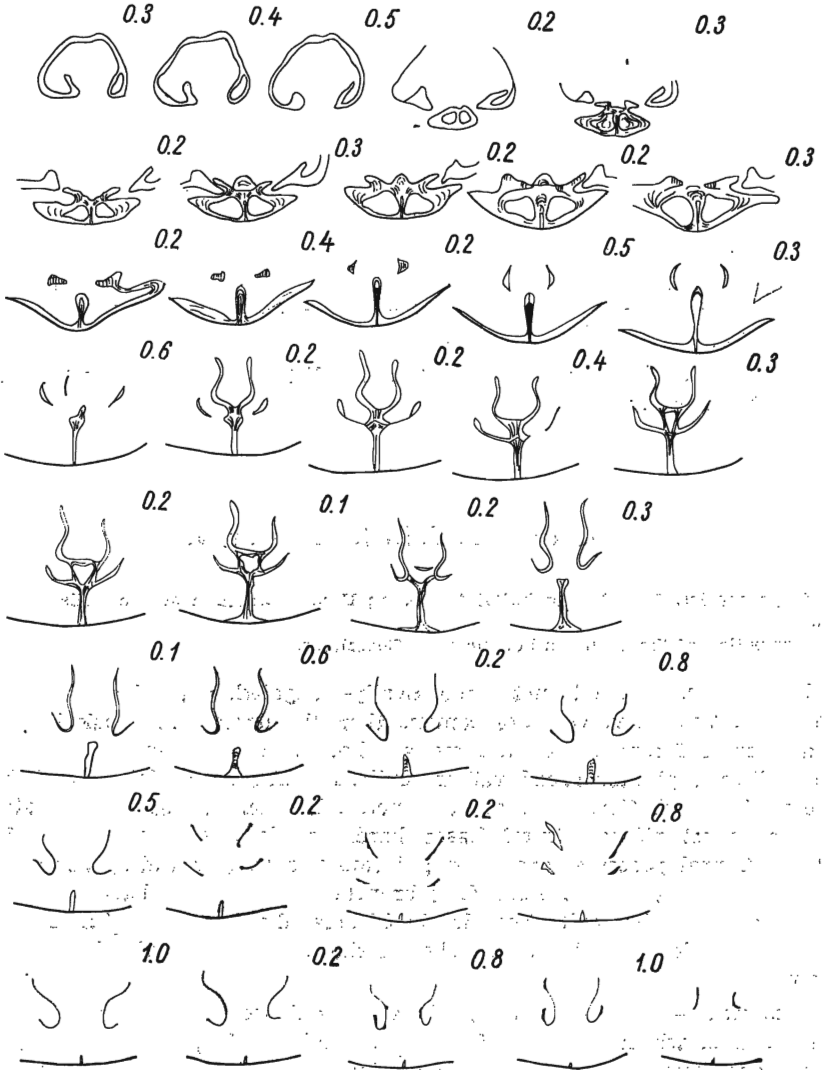


Fig. 17

Zeuschneria imitabilis, sp. nov., series of transverse sections

Description.

External morphology: Shell oval, slightly elongated, without sinus and fold. Ventral valve uniformly convex. Maximum width in the middle of the shell, maximum thickness near beak. Lateral commissures straight, anterior commissure etched. Beak low, wide. Foramen large. Apical angle 90° (Fig. 17).

Internal morphology is described in generic characteristic.

Occurrence. — Upper Tithonian of the Polish Carpathians (Inwald).

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Moscow, May 1974

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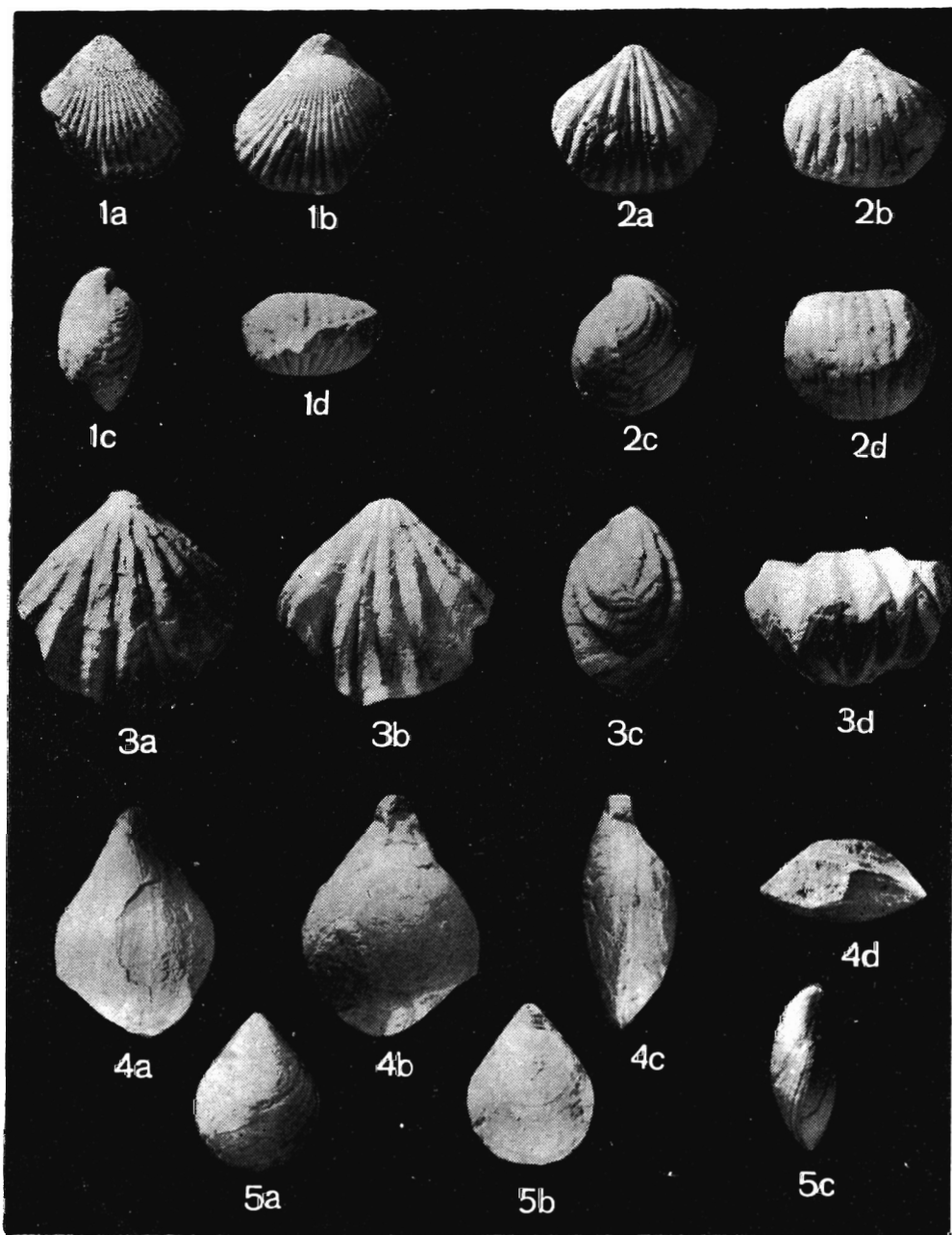
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T. SMIRNOVA

**REWIZJA FAUNY BRACHIOPODOWEJ GÓRNEGO TYTONU Z INWAŁDU
(KARPATY POLSKIE)**

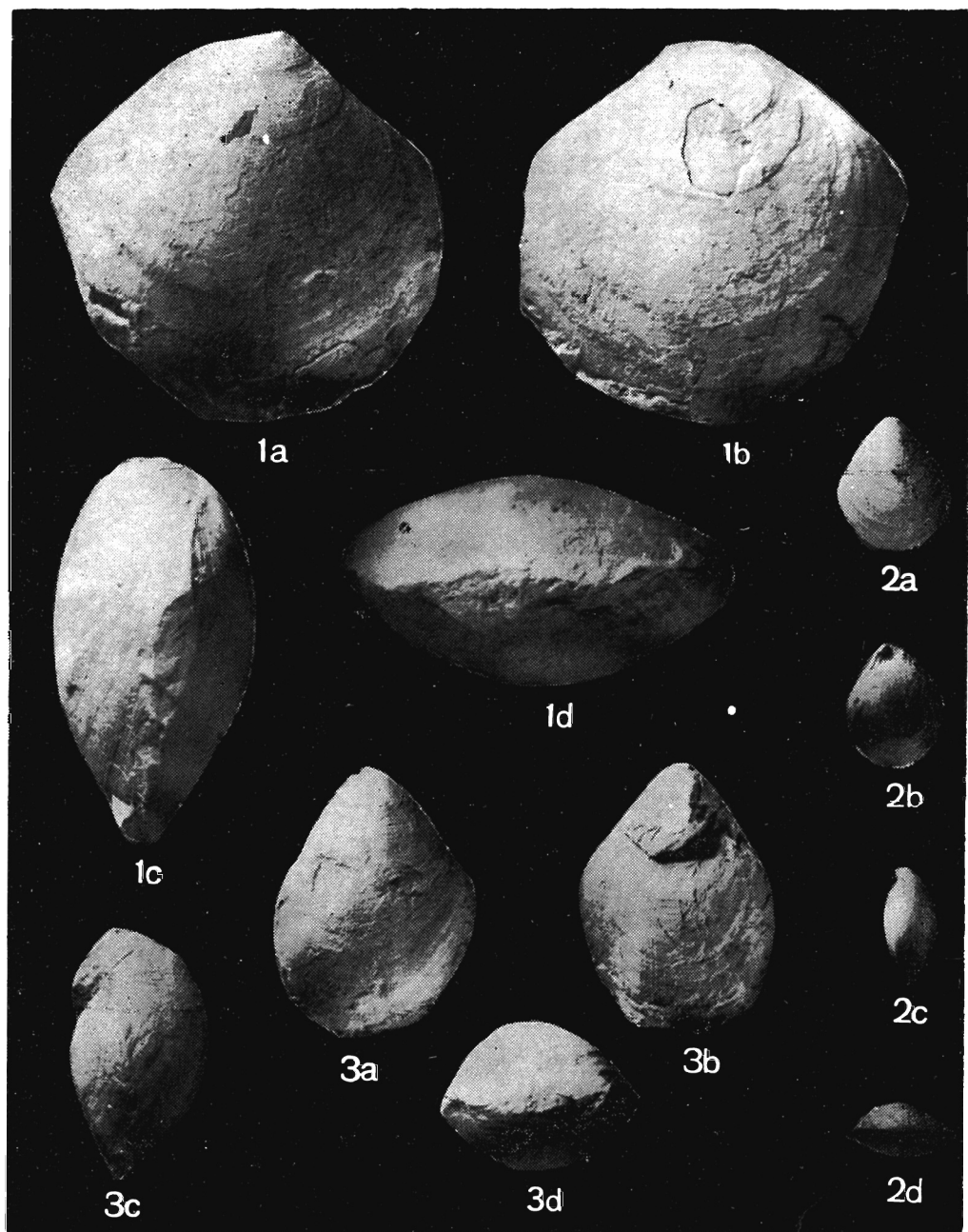
(Streszczenie)

Opisano siedemnaście gatunków brachiopodów należących do dziewięciu rodzajów z rzędów Terebratulida i Rhynchonellida. U wszystkich gatunków poddano rewizji wewnętrzną morfologię. Ustanowiono i opisano także dwa nowe rodzaje *Carpatothyris* i *Zeuschneria* z jednym typowym gatunkiem dla każdego z nich.



1a-d — *Cyclothyris estieriana* (d'Orbigny, 1847); specimen No. 4529/2.
 2a-d — *Lucinella pachytheca* (Zeuschner, 1855); specimen No. 4530/4.
 3a-d — *Lucinosella lacunosa* (Schlotheim, 1813); specimen No. 4540/1.
 4a-d — *Weberithyris moraviae* (Glocker, 1845); specimen No. 4533/7.
 5a-b — *Ditt*; specimen No. 4523/12.

In each plate: a — ventral view, b — dorsal, c — lateral, d — anterior view
 All specimens from the Upper Tithonian of the Polish Carpathians (Inwardy, n. t. size)

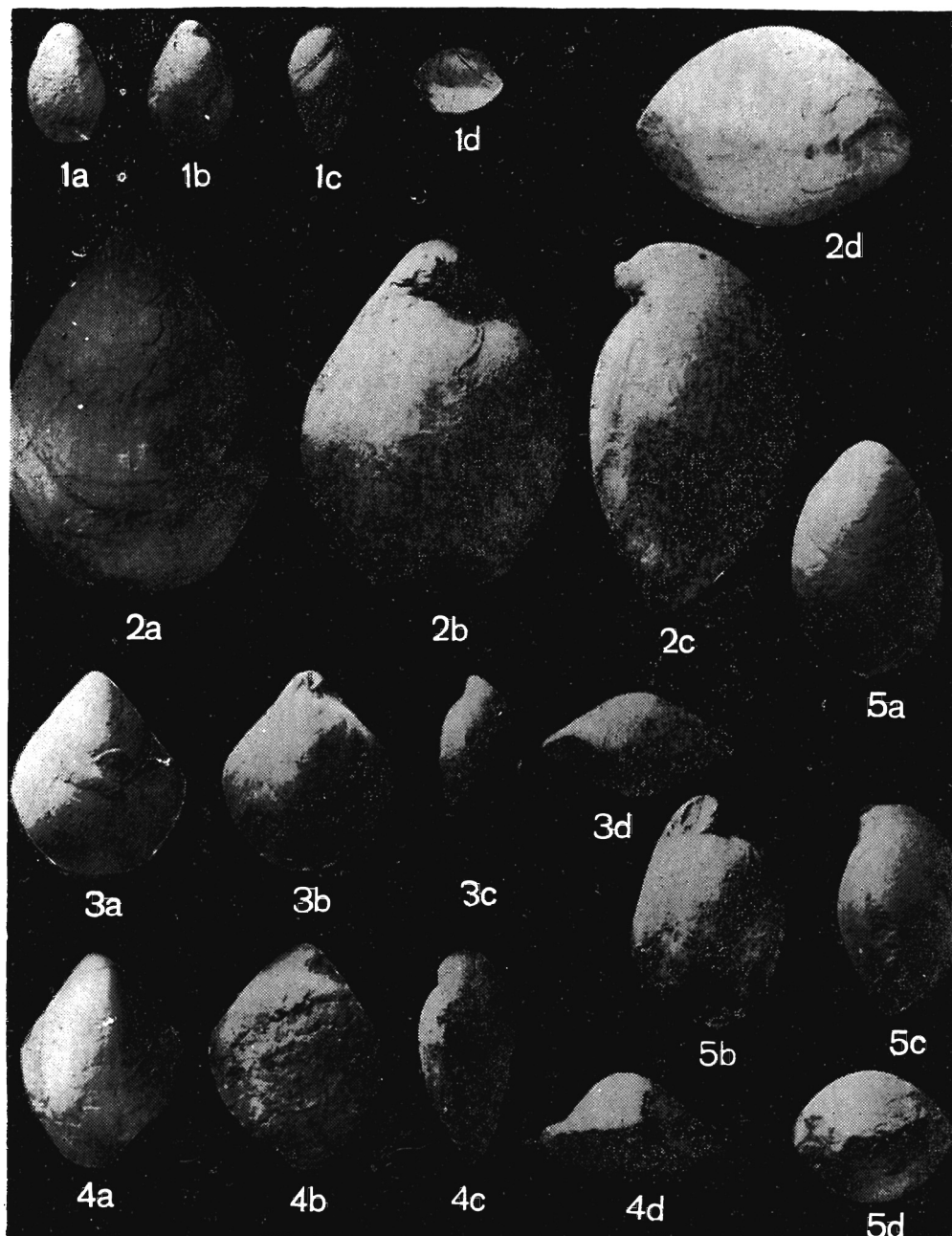


1a-d — *Tropeothyris immanis* (Zeuschner, 1857); specimen No. 4524/4.

2a-d — *Tropeothyris bieskidensis* (Zeuschner, 1857).

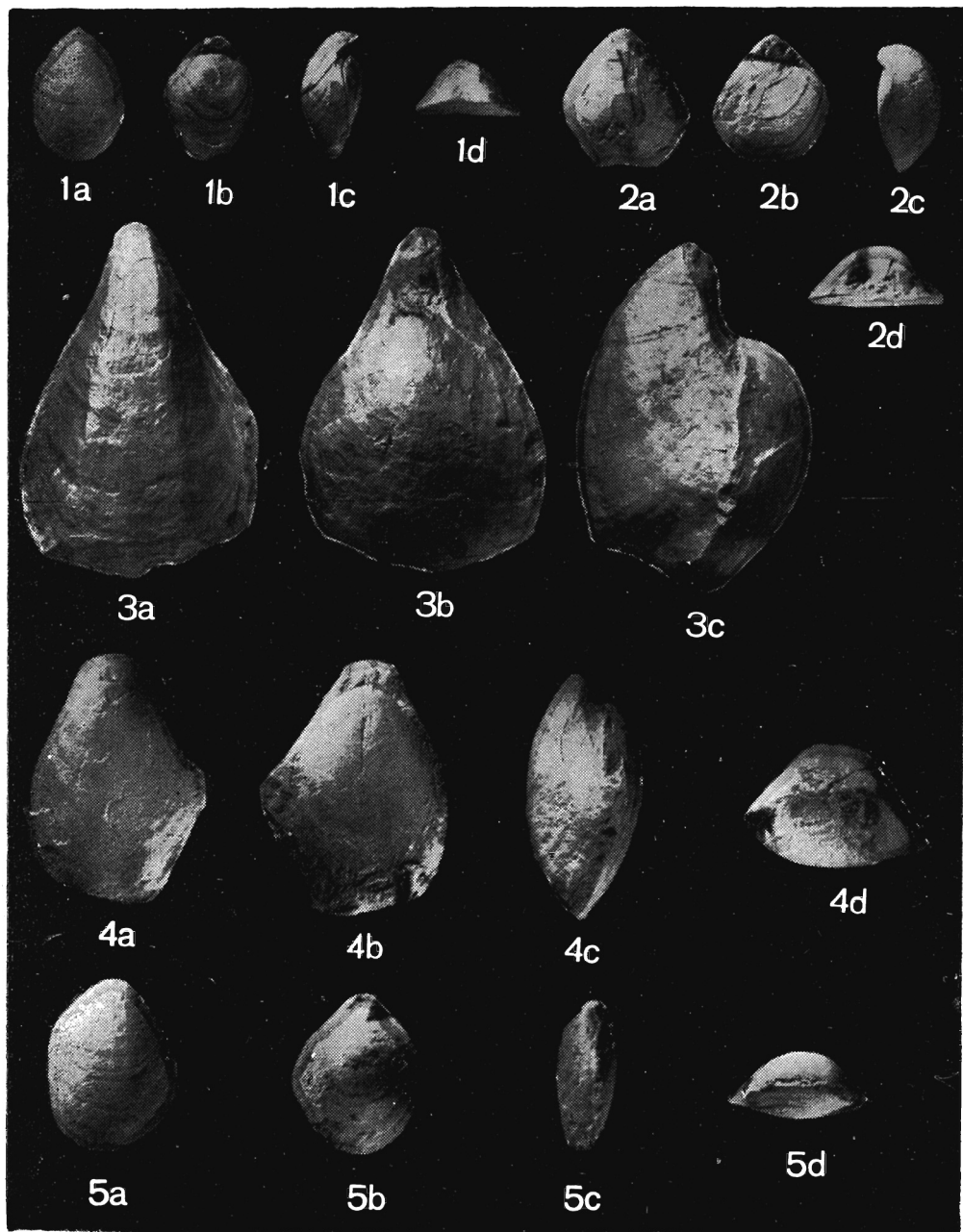
3a-d — *Tropeothyris tychoviensis* (Suess, 1858); specimen No. 4542/1.

All specimens from the Upper Tithonian of the Polish Carpathians (Inwald), nat. size



- 1a-d — *Tropeothyris carpathica* (Zittel, 1870); specimen No. 4554/1.
 2a-d — *Tropeothyris isomorpha* (Gemmellaro, 1871); specimen No. 4531/3.
 3a-d — *Tropeothyris cyclogonia* (Zeuschner, 1857); specimen No. 4536/1.
 4a-d — *Tropeothyris testatus* sp. nov.; specimen No. 4532/2.
 5a-d — *Galliennithyris insignis* (Zeuschner, 1857); specimen No. 4551/4.

All specimens from the Upper Tithonian of the Polish Carpathians (Inwald), nat. size



1a-d — *Zeilcrira magasiformis* (Zeuschner, 1856; specimen No. 4535/5.

2a-d — *Terebrataliopsis czapskiana* (Zeuschner, 1857; specimen No. 4543/3.

3a-d — *Carpatothyris reparda* (Zeuschner, 1857; specimen No. 4532/6.

4a-d — *Litto*; specimen No. 4.32/3.

5a-d — *Zeuschneria imitabilis* sp. nov.; specimen No. 4539/7.

All specimens from the Upper Tithonian of the Polish Carpathians (Inwald), nat. size