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Pripyatispirifer, a new Lower Famennian genus from Belarus

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Abstract

A new lower Famennian cyrtospiriferid genus, *Pripyatispirifer*, is described from the Pripyat' Depression of Belarus. Its type species, *P. belorussicus* (LYASHENKO, 1959), gives its name to a brachiopod community.

Key-words: *Pripyatispirifer* n. gen. - brachiopods - Cyrtospiriferidae - Devonian - Belarus.

Résumé

Un nouveau genre cyrtospiriféride, *Pripyatispirifer*, est décrit dans le Famennien inférieur de la Dépression de la Pripiat en Belarus. Son espèce-type, *P. belorussicus* (LIACHENKO, 1959) donne son nom à une communauté à Brachiopodes.

Mots-clefs: *Pripyatispirifer* n. gen. - Brachiopodes -Cyrtospiriferidae - Dévonien - Belarus.

Introduction

Cyrtospirifer belorussicus LYASHENKO, 1959 is a relatively rare species in the middle part (Tonezh Beds) of the lower Famennian Zadonsk Horizon of the Pripyat' Depression in the southeastern part of Belarus, where it has only been found in a few boreholes. The study of its distinctive internal and external characters leads the author to propose a new genus, *Pripyatispirifer*, which apparently derives from the genus *Cyrtospirifer* NALIVKIN, 1918 (*in* FREDERIKS, 1924). Both genera belong to the family Cyrtospiriferidae TERMIER, H. & G., 1949.

Pripyatispirifer n. gen.

DERIVATIO NOMINIS

Pripyat' Depression, southeastern part of Belarus, plus *Spirifer*.

DIAGNOSIS

Small cyrtospiriferid with complex deltidial covering, euseptoidum, small cardinal process and subparallel rudimentary crural plates in the brachial valve.

TYPE SPECIES

Cyrtospirifer belorussicus LYASHENKO, 1959.

SPECIES ATTRIBUTED TO THE GENUS

Only the type species. *Cyrtospirifer quadratus* NALIVKIN, 1937 from the lower Famennian (*meisteri* Beds) of Kazakhstan, and *C. miculus* LYASHENKO, 1960 from the Famennian of the western slope of the southern Ural Mountains could eventually be assigned to the new genus on account of their quadratic or trapezoidal outline and their small size. These species have been described by NALIVKIN (1937, p. 90), SIMORIN (1949, p. 17; 1956, p. 158), LYASHENKO (1960, p. 30), and MARTYNOVA (1961, p. 111), but the inner structures have still to be investigated.

DESCRIPTION

General external characters

Small cyrtospiriferid with subquadratic contour in ventral and dorsal views (subtrapezoidal in young forms). Uniplicate. Moderately ventribiconvex. Cardinal margin long, straight, equivalent to greatest width of shell, slightly, sometimes very, mucronate. Lateral margins subparallel, antero-lateral margins rounded. Anterior margin weakly truncated.

Pedicle valve

Moderately convex. Interarea long, low, strongly curved, gutter-like, apsacline. Margins of interarea parallel or subparallel. Delthyrium narrow, completely or almost completely covered with a convex deltidial covering in adult forms. Well-marked sulcus starting from the beak. Tongue rather low and rounded. Width of sulcus at the anterior margin 25 to 45% of width of valve. Lateral margins more or less abrupt, convex near sulcus and frontal margin, flat or even concave postero-laterally.

Brachial valve

Brachial valve always less convex than the pedicle valve. Fold distinctly separated from flanks, rather high. Top of fold gently convex. Flanks generally slightly convex.

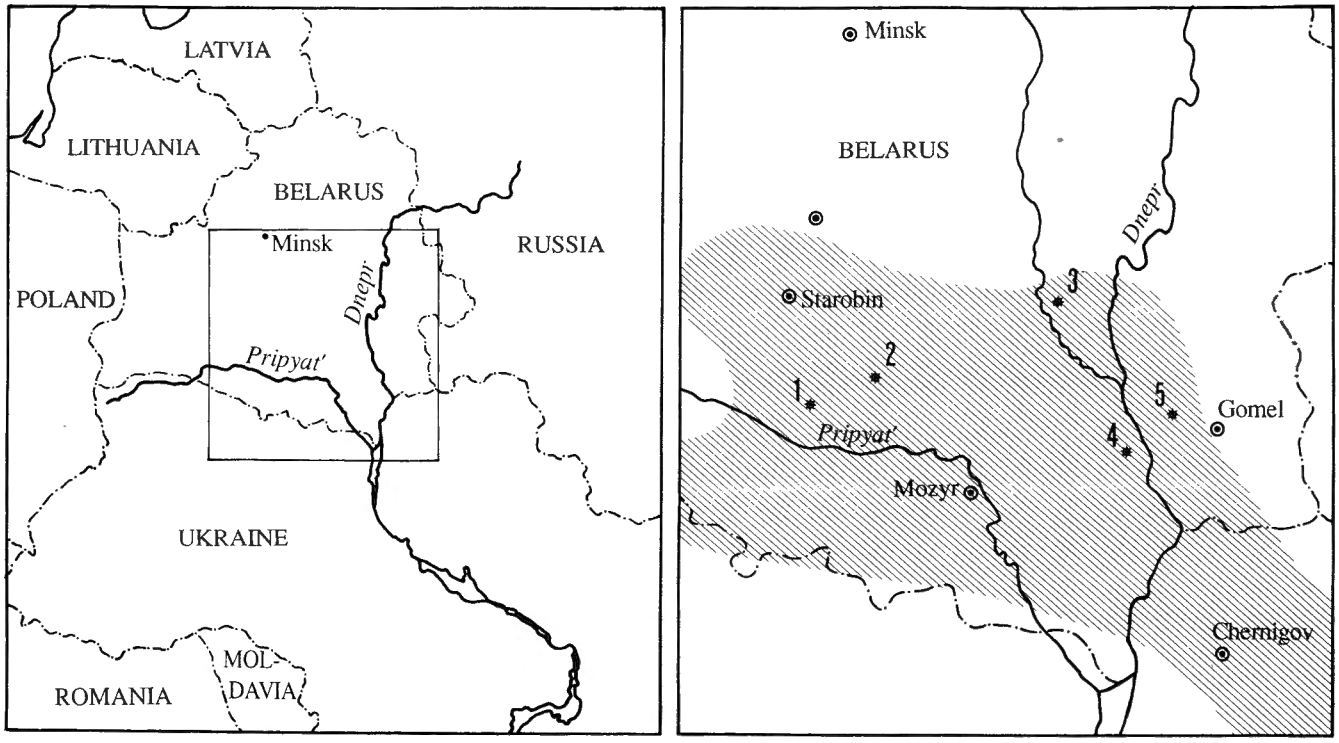

Fig. 1 — Boreholes in which *Pripyatispirifer belorussicus* (LYASHENKO, 1959) has been found in the lower Famennian deposits of the Pripyat' Depression (shaded area).
1 = Lyakhovichi 54, 2 = East-Vetchin 1, 3 = Novyi Svet (Zhlobin) 42, 4 = Krasnoe Selo 215, 5 = West Aleksandrovka 3.

Ornament

Shell covered with numerous rounded costae separated by furrows of equal width. Costae in sulcus and on fold somewhat narrower than on the flanks. Costae and furrows covered with clear concentric growth lines. Thin radial striae rarely observed.

Internal characters

Pedicle valve with relatively short (3-4 mm), slightly divergent dental plates supporting short spade-like teeth with a small median groove. Layers of lamellae on the dental plates grow to form a delthyrial plate generally occupying half the height of the delthyrium. Muscle field oval, limited by dental plates: diductors composed of markings faning out from median line; adductors very narrow, longitudinally elongated, and completely encompassed by the diductors.

Brachial valve with small (about 1 mm wide), thin, slightly multilobate cardinal process. A small distance anterior to the cardinal process there is a narrow euseptoidum, reaching mid-length of valve. Rudimentary crural plates, thickened, subparallel and perpendicular to the cardinal margin. Dental sockets elongated, subparallel to the narrow interarea.

COMPARISONS

The new genus is very close to *Cyrtospirifer* NALIVKIN, 1918 (*in* FREDERIKS, 1924) from which it apparently derives. It differs from it in the structure of cardinalia: developed euseptoidum, and small and thin cardinal process, which is generally large and massive in *Cyrtospirifer* as can be seen in RZHONSNITSKAYA (1952 p. 133, fig. 9), VANDERCAMMEN (1959, p. 25, fig. 13, p. 55, fig. 41, p. 81, fig. 64, p. 138, fig. 106), and SIDYACHENKO (1962, p. 36, fig. 4, p. 39, fig. 5, p. 41, fig. 6, p. 43, fig. 7, p. 48, fig. 8, p. 50, fig. 9, p. 71, fig. 12, p. 72, fig. 13, p. 74, fig. 14, p. 77, fig. 15, p. 82, fig. 16, p. 88, fig. 17, p. 94, fig. 18, p. 97, fig. 19, p. 111, fig. 24, p. 116, fig. 26). Besides, *Pripyatispirifer* n. gen., contrary to the representatives of *Cyrtospirifer*, has a specific, rather complex deltidial covering (deltidium), a subquadratic contour, shorter dental plates, and short parallel rudimentary crural plates perpendicular to the cardinal margin.

Pripyatispirifer n. gen. differs from *Cyrtiopsis* GRABAU, 1923 in the structure of the deltidium: the foramen is centrally located in the new genus while it is at the apex in *Cyrtiopsis*. In its initial stage the deltidium is a simple deltidial cover composed of laminated plates developing first near the umbonal region, and then gradually closing the delthyrium completely with a convex layered deltidial plate (Pl. 2, Fig. e). In subsequent stages an opening for the pedicle muscle appears in the middle part of the deltidium (Pl. 2, Figs. b, f); this deltidium is analogous to the one described by SARTENAER (1955, p. 7, figs. 3-7) in Belgium in lower Famennian specimens of the *Cyrtiopsis murchisoniana* (DE KONINCK, 1842) (*non* de VERNEUIL, 1845) group, which were later identified as *Cyrtiopsis senceliae* SARTENAER, 1956. The new genus is also different in combining a radial and a concentric micro-ornamentation (there is only a radial micro-ornamentation in *Cyrtiopsis*), and in its ventral beak, which is more hooked.

Pripyatispirifer belorussicus (LYASHENKO, 1959)

(Plate 1, Figures 1-35; Plate 2, Figures a-g; Text-figure 2)

SYNONYMY

1959 *Cyrtospirifer belorussicus* Ljaschenko (in litt.) - LYASHENKO, p. 207, pl. 77, figs. 1a, b, v, g, d, e, 2a,b, 3, 4;
1960 *Cyrtospirifer belorussicus* Ljasch. - LYASHENKO, p.31;
1966 *Cyrtospirifer belorussicus* - LINNIK, p. 137, p. 138;
1966 *Cyrtospirifer belorussicus* Ljasch. - CHUPRIN & *al.*, p. 48;
1967 *Cyrtospirifer belorussicus* Ljasch. - LYASHENKO, A.I. & G.P., p. 521;
1968 *Cyrtospirifer belorussicus* Ljasch. - LINNIK, p. 11;
1969 *Cyrtospirifer belorussicus* - LYASHENKO & *al.*, p. 3, p. 5;
1969 *Cyrtospirifer belorussicus* Ljasch. - LINNIK, p. 18;
1971 *Cyrtospirifer belorussicus* - GOLUBTSOV, p. 133;
1974a *Cyrtospirifer belorussicus* Ljasch. - LINNIK, p. 125, p. 126;
1974b *Cyrtospirifer belorussicus* Ljasch. - LINNIK, p. 153;
1975 *Cyrtospirifer belorussicus* Ljasch. - GOLUBTSOV & *al.*, p. 45;
1975 *Cyrtospirifer belorussicus* Ljasch. - KRUCHEK, p. 10;
1976 *Cyrtospirifer belorussicus* Ljasch. - GOLUBTSOV & KRUCHEK, p.21;
1977 *Cyrtospirifer belorussicus* Ljasch. - LINNIK, p. 54;
1978 *Cyrtospirifer belorussicus* Ljasch. - BELOUSOVA, LINNIK & PUSHKIN, p. 196;
1979 *Cyrtospirifer belorussicus* Ljasch. - KRUCHEK & NEKRYATA, p. 20;
1981 *Cyrtospirifer belorussicus* - MAKHNACH & *al.*, p. 26;
1981 *Cyrtospirifer belorussicus* Ljasch. - NEKRYATA, KRUCHEK & DEMIDENKO, p. 57;
1981 *Cyrtospirifer belorussicus* Ljasch. - LINNIK, p. 78;
1990 *Cyrtospirifer belorussicus* Ljasch. - PUSHKIN, p. 1032, p. 1033;
1992 *Cyrtospirifer belorussicus* Ljasch. - MAKHNACH, PUSHKIN & UR'EV, p. 612, p. 613, p. 614.

DIAGNOSIS

Small, subquadratic with straight cardinal margin equivalent to greatest width of shell. Interarea of pedicle valve strongly curved, apsacline. Delthyrium narrow, covered with a convex deltidium. Well-marked sulcus starting from the beak. Ventral flanks more or less abrupt, convex near sulcus and frontal margin, flat postero-laterally. Brachial valve always less convex than pedicle valve. Fold distinctly marked with top gently convex. Shell covered with rounded costae. Costae in sulcus and on fold narrower than on the flanks. Costae and furrows covered with sharp concentric growth lines. Thin radial striae rarely observed. Short dental plates, spade-like teeth, and delthyrial plate in pedicle valve. Diductors composed of markings faning out from median line, adductors very narrow, longitudinally elongated. Small cardinal process; narrow euseptoidum, thickened subparallel rudimentary crural plates perpendicular to the cardinal margin in brachial valve.

TYPES

Holotype: pl. 77, figs. 1a, b, v, g, d, e *in* LYASHENKO (1959).

The following hypotypes are deposited in the Belorussian Geological Prospecting Research Institute (BelNIGRI): Hypotype A, 19/8-3 (Pl. 1, Figs.26-30), borehole Krasnoe Selo 215, depth 3858.5 m; Hypotype B, 19/24-1 (Pl. 1, figs. 6-10), borehole Lyakhovichi 54, depth 157.6 m; Hypotype C, 19/24-2 (Pl. 1, Figs. 1-5), same borehole, same depth; Hypotype D, 19/24-3 (Pl. 1, Figs. 16-20), same borehole, same depth; Hypotype E, 19/24-4 (Pl. 1, Figs. 11-15, Pl. 2, Fig. g), same borehole, depth 157.6 m; Hypotype F, 19/24-5 (Pl. 1, Figs. 21-25), same borehole, same depth; Hypotype G, 19/24-6 (Pl. 2, Fig. a, Text-fig. 2), same borehole, depth 155.2 m; Hypotype H, 19/24-12 (Pl. 2, Fig. f), same borehole, depth 152.0 m; Hypotype I, 19/24-13 (Pl. 2, Fig. b), same borehole, depth 153.0 m; Hypotype J, 19/24-14 (Pl. 2, Figs. c, d), same borehole, depth 154.0 m; Hypotype K, 19/24-16 (Pl. 2, Fig. e), same borehole, depth 158.5 m; Hypotype L, 19/25-1 (Pl. 1, Figs. 31-35), borehole East Vetchin 1, depth 1766.0 m.

LOCUS TYPICUS

LYASHENKO (1959, table 77, Explanation of figures 1-4) indicated Starobin, borehole 54 as the *locus typicus*. This borehole is presently referred to as borehole Lyakhovichi 54, Pripyat' Depression, Belarus (MAKHNACH, PUSHKIN & UR'EV, 1992).

STRATUM TYPICUM

LYASHENKO (1959, table 77, Explanation of figures 1-4) indicated that the core-samples of depth 154-158 m belong to the Zadonsk Horizon D_3zad(?). This is confirmed by MAKHNACH, PUSHKIN & UR'EV (1992, p. 612), who assigned the core-samples of depth 149.5-162.5 m to the Tonezh Beds of the Zadonsk Horizon.

MATERIAL. STATE OF PRESERVATION

582 specimens. Most of them are in good or satisfactory state of preservation.

DESCRIPTION

General external characters

Shell small, subquadratic in ventral and dorsal views, subtrapezoidal in young forms. Uniplicate. Moderately ventribiconvex. Thickness of pedicle valve varying from 59 to 73.4%, most of the values 66-70%, of thickness of shell. Cardinal margin straight coinciding with the greatest width of shell, always mucronated (sometimes much; Pl. 1, Figs. 21-25). Lateral margins subparallel, and so the subquadratic shape of shell. Anterior margin weakly truncated. Width of shell almost always exceeds its length (l/w = 0.50 - 1.05, most values 0.83 - 0.97).

Pedicle valve

Moderately convex (tpv = 4.9 - 10.0 mm, most values 6.5 - 7.5 mm) with the maximum thickness varying between 30 and 65% of shell length measured from the beak. Interarea long, strongly curved, gutter-like, apsacline. Margins of interarea parallel or subparallel. Interarea

2 - 3.5 mm high in umbonal region. Delthyrium narrow with top angle around 30°, almost completely covered with a convex deltidium with central foramen in its apical part in adult forms (Pl. 2, Figs. b, f), partially covered in juvenile and ephebic forms (Pl. 2, Fig. e). Sulcus starting from the beak as a narrow and deep furrow. Well-marked sulcus with generally slightly concave bottom; it is separated from the flanks by distinct high costae, wider than the other median costae. At the anterior margin width of sulcus varying between 25% and 45% of width of valve. Beak small or moderately large, sharp, considerably overhanging the hinge line (slightly in young forms). Apical angle 90° to 100°. Lateral margins more or les abrupt, convex near sulcus and frontal margin, flat or even concave postero-laterally.

Brachial valve

Brachial valve always less convex than pedicle valve, distinctly subquadratic or subtrapezoidal in outline. Fold distinctly separated from flanks by two sharp and rather deep furrows beginning from the beak and diverging at an angle of 30° to 35°. Fold rather high with convex top, highest near frontal margin. Flanks generally slightly convex. Beak wide, almost imperceptible.

Ornament

Shell covered with numerous rounded, rather high, costae, separated by furrows of equal width. Number of costae increases by intensive dichotomy or intercalation in sulcus and fold. Costae in sulcus and on fold somewhat narrower than on the flanks. Costae and furrows covered with clear concentric growth lines (Pl. 2, Fig. g). Thin radial striae rarely observed. Generally 15 to 20 costae on flanks, 8 to 12 in sulcus. As a rule there are 5 to 7 costae per 5mm on the flanks, and 6 to 8 per 5mm in sulcus and on fold at the frontal margin.

Dimensions (see Table)

Hypotypes	l	w	t	tpv	tbv	l/w	t/w	t/l	nl	ns	nf
A 19/8-3	11.9	12.5	8.3	6.0	2.3	0.95	0.66	0.69	13	8	8
B 19/24-1	18.0	17.0	13.5	9.0	4.5	1.05	0.79	0.75	20	13	5.5
C 19/24-2	17.5	21.0	12.4	7.5	4.9	0.83	0.59	0.70	17	12	4.5
D 19/24-3	14.3	19.7	9.4	6.4	3.0	0.72	0.47	0.65	24	11	5
E 19/24-4	14.7	19.0	10.4	6.5	3.9	0.77	0.54	0.70	20	10	6.5
F 19/24-5	10.5	18.6	8.2	5.7	4.7	0.56	0.44	0.78	21	7	7.5
M 19/24-33	14.0	16.2	10.9	7.2	3.7	0.86	0.67	0.77	17	14	5.5
N 19/24-34	17.3	21.1	12.4	—	—	0.81	0.58	0.71	16	12	4.5
O 19/24-35	17.9	17.0	13.6	—	—	1.05	0.80	0.75	19	15	6
P 19/24-36	13.5	13.9	10.0	6.8	3.2	0.97	0.71	0.74	19	10	6.5
Q 19/24-37	12.7	16.4	9.7	6.7	3.0	0.77	0.59	0.76	16	11	6
R 19/24-38	13.0	19.1	10.4	6.6	3.8	0.68	0.54	0.80	21	11	6
S 19/24-39	16.3	19.6	12.0	—	—	0.83	0.61	0.73	20	14	5
T 19/24-41	9.6	18.9	8.2	4.9	3.3	0.50	0.43	0.85	19	7	8
U 19/24-42	13.4	14.0	9.8	7.2	2.6	0.95	0.70	0.73	15	8	7
V 19/24-43	14.2	17.8	10.9	8.0	2.9	0.79	0.61	0.76	22	11	7
W 19/24-44	17.0	19.0	14.5	—	—	0.89	0.76	0.85	19	9	5.5
X 19/24-45	16.5	19.6	11.0	7.8	3.2	0.84	0.56	0.66	19	10	5
Y 19/24-46	13.5	14.3	10.6	7.6	3.0	0.94	0.74	0.78	15	10	6
Z 19/24-47	17.2	17.7	14.2	10.0	4.2	0.97	0.80	0.82	16	11	6
ZZ 19/24-48	15.0	18.4	12.5	—	—	0.81	0.67	0.83	20	11	7
L 19/25-1	10.4	11.1	7.4	5.0	2.4	0.93	0.66	0.71	13	10	7

Measurements are in mm

Abbreviations: l = length, including mucronation; w = width; t = thickness; pv = pedicle valve; bv = brachial valve; nl = number of lateral costae; ns = number of costae in the anterior part of sulcus; nf = number of costae per 5 mm at the frontal margin.

Hypotype T is a juvenile specimen. Hypotypes P, Q, U, and Y are ephebic specimens

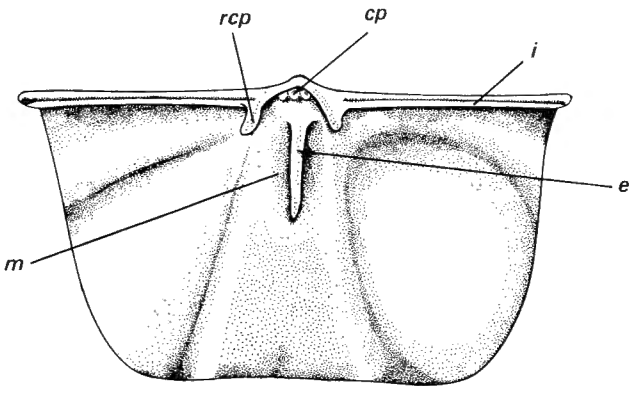

Fig. 2 — *Pripyatispirifer belorussicus* (LYASHENKO, 1959). Hypotype G, 19/24-6. Lyakhovichi 54 borehole, 155.2m. Interior of a brachial valve (x6). rcp = rudimentary crural plate, cp = cardinal process, i = interarea, m = muscle field, e = euseptoidum.

Internal characters

Pedicle valve with relatively short (3 - 4 mm), slightly divergent dental plates, supporting short spade-like teeth with a small median groove. Layers of lamellae on the dental plates grow to form in the umbonal region a delthyrial plate generally occupying half the height of the delthyrium adjoining the umbo. Muscle field oval, limited by the dental plates: greater part of field occupied by diductors composed of markings faning out from median line; adductors very narrow, longitudinally elongated, separated in the middle by an oval-shaped ridge, and completely encompassed by the diductors. The structure of the muscle field is analogous to that of "*Cyrtospirifer orbelianus* (ABICH, 1858)" figured by VANDERCAMMEN (1959, fig. 40, p. 54) from the Frasnian of Belgium.

Brachial valve with small (about 1 mm wide), slightly multilobate cardinal process negligibly bulging over a narrow (less than 1 mm) interarea. 3 to 4 mm anterior to cardinal process there is a narrow euseptoidum (euseptoid of IVANOVA, 1971, p. 51) about 5 mm long and about 0.5 mm high, distinctly separating the oval muscle field into two equal portions and reaching approximately mid-length of valve. Rudimentary crural plates, about 2 mm high, thickened, subparallel, and perpendicular to the cardinal margin. Shallow, oval, and elongated (about 1 mm) dental sockets, subparallel to the narrow interarea, are isolated by the internal bases of the rudimentary crural plates.

COMPARISONS

Cyrtospirifer quadratus (NALIVKIN, 1937) from the lower Famennian deposits (*meisteri* Beds) of Central Kazakhstan (NALIVKIN, 1937, p. 90; SIMORIN, 1949, p. 17; 1956, p. 158; MARTYNOVA, 1961, p. 111) is the closest to *Pripyatispirifer belorussicus* by its external features. But the latter differs by the distinct mucronation, the absence of a median furrow on the fold, and the always covered delthyrium.

Cyrtospirifer miculus LYASHENKO, 1960 differs from *Pripyatispirifer belorussicus* by a smaller size (length: 7 - 8 mm), a relatively coarser ornamentation, the absence of a deltidium, and mucronation.

GEOGRAPHICAL DISTRIBUTION AND STRATIGRAPHICAL POSITION

Pripyatispirifer belorussicus is found in the Tonezh Beds in the following boreholes of the Gomel' and Minsk regions of the Pripyat' Depression in the Republic of Belarus: Lyakhovichi 54, 149.5-162.5 m (see MAKHNACH *et al.*, 1992, p. 612) (500 specimens); East-Vetchin 1, 1766 m (9 specimens); Krasnoe Selo 215, 3857,5-3858,5 m (19 specimens); Noviy Svet (Zhlobin) 42, 330-337 m (27 specimens); West-Aleksandrovka 3, 3466 m (27 specimens).

The Tonezh Beds are the middle part of the Zadonsk Horizon, and are referred to the Upper *Palmatolepis triangularis* Zone (Late *P. triangularis* in present terminology) according to the following species (oral communication by T.V. STREL'CHENKO): *P. triangularis* SANNEMANN, 1955, *P. termini* SANNEMANN, 1955, and *Icriodus iowaensis* YOUNGQUIST & PETERSON, 1947. The threefold subdivision of the Zadonsk Horizon [Kuzmichi (lower part), Igraev (middle part), and Visha (upper part) Beds] has been replaced by PUSHKIN (1990) by a fourfold one (from base to top: Kuzmichi, Tonezh, Tremlya, and Visha Beds), the Igraev Beds having been divided into two parts: Tonezh (lower part) and Tremlya (upper part) Beds, and the Visha Beds having been reduced to the lower part of their former range. The following brachiopods occur with *Pripyatispirifer belorussicus*: *Insignitisinurostrum* sp., "*Brunnirhyncha*" *tichomirovi* (LYASHENKO, 1959), *Cyrtospirifer ljachovitchensis* (LINNIK, 1966) (rare), *C.* cf.*asiaticus* BRICE, 1971, *Sinotectirostrum furssenkoi* (LINNIK, 1966), *Rugaltarostrum* sp.

PALAEOECOLOGICAL OBSERVATIONS

The species occurs in relatively shallow marine facies, and forms great accumulations, e.g. in the Lyakhovichi-54 borehole, at a depth of 149.5.0-162.5 m; MAKHNACH, PUSHKIN & UR'EV (1992, p. 612) have mentioned sediments literally filled up with shells of the species. This seems to indicate the existence of large accumulation banks. In the shallow marine facies of the Zadonsk Horizon, especially in the Tonezh Beds, cyrtospiriferids are generally found in massive limestones full of remains of blue-green algae (usually oncolites), and form the *Cyrtospirifer asiaticus* Community (PUSHKIN, 1990, p. 1032) including the following dominant species: *Cyrtospirifer asiaticus*, *C.* aff. *zadonicus*, *Sinotectirostrum furssenkoi*, *Ptychomaletoechia* aff. *zadonica* (NALIVKIN, 1934).

Pripyatispirifer belorussicus is absent in these massive limestones, but is present in shaly limestones and marls containing either no or only an unimportant number of blue-green algae. The species gives its name to the *P. belorussicus* Community, which also contains the following dominant species: *Insignitisinurostrum* sp., "*Brunnirhyncha tichomirovi*", *Cyrtospirifer ljachovitchensis*

(rare), *C.* cf. *asiaticus*, *Sinotectirostrum furssenkoi*, *Rugaltarostrum* sp.

As indicated by their different composition, these communities lived in different environments, the *Pripyatispirifer belorussicus* Community occupying deeper parts of the marine basin, while the *Cyrtospirifer asiaticus* Community inhabited shallower parts of the basin, where clay and silt deposition was taking place.

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Explanation of plates

PLATE 1

Pripyatispirifer belorussicus (LYASHENKO, 1959)

Ventral, dorsal, lateral, frontal, and apical views.
All figures are x 1.5

Figs. 1-5 — Hypotype C, 19/24-2, Lyakhovichi 54 borehole, 157,6 m.
Figs. 6-10 — Hypotype B, 19/24-1, same borehole, 157,6 m.
Figs. 11-15 — Hypotype E, 19/24-4, same borehole, 157.6 m.
Figs. 16-20 — Hypotype D, 19/24-3, same borehole, 157.6 m.
Figs. 21-25 — Hypotype F, 19/24-5, same borehole, 157.6 m.
Figs. 26-30 — Hypotype A, 19/8-3, Krasnoe Selo 215 borehole, 3858.5 m.
Figs. 31-35 — Hypotype L, 19/25-1, East-Vetchin 1 borehole, 1766.0 m.

PLATE 2

Pripyatispirifer belorussicus (LYASHENKO, 1959)

Fig. a — Hypotype G, 19/24-6, Lyakhovichi 54 borehole, 155.2 m. Ventral beak, interarea, and deltidium (x 5).
Fig. b — Hypotype I, 19/24-13, same borehole, 153.0 m. Brachial interior showing rudimentary crural plates, cardinal process, and euseptoidum (x 5).
Fig. c, d — Hypotype J, 19/24-14, same borehole, 154.0 m. a = cardinal view of ventral valve; b = ventral interior showing dental plates, teeth, diductors, and adductors (x 5).
Fig. e — Hypotype K, 19/24-16, same borehole, 158.5 m. Apical view (x 5).
Fig. f — Hypotype H, 19/24-12, same borehole, 156.0 m. Apical view (x 5).
Fig. g — Hypotype E, 19/24-4, same borehole, 157.6 m. Microsculpture (x 10).

Plate 1.

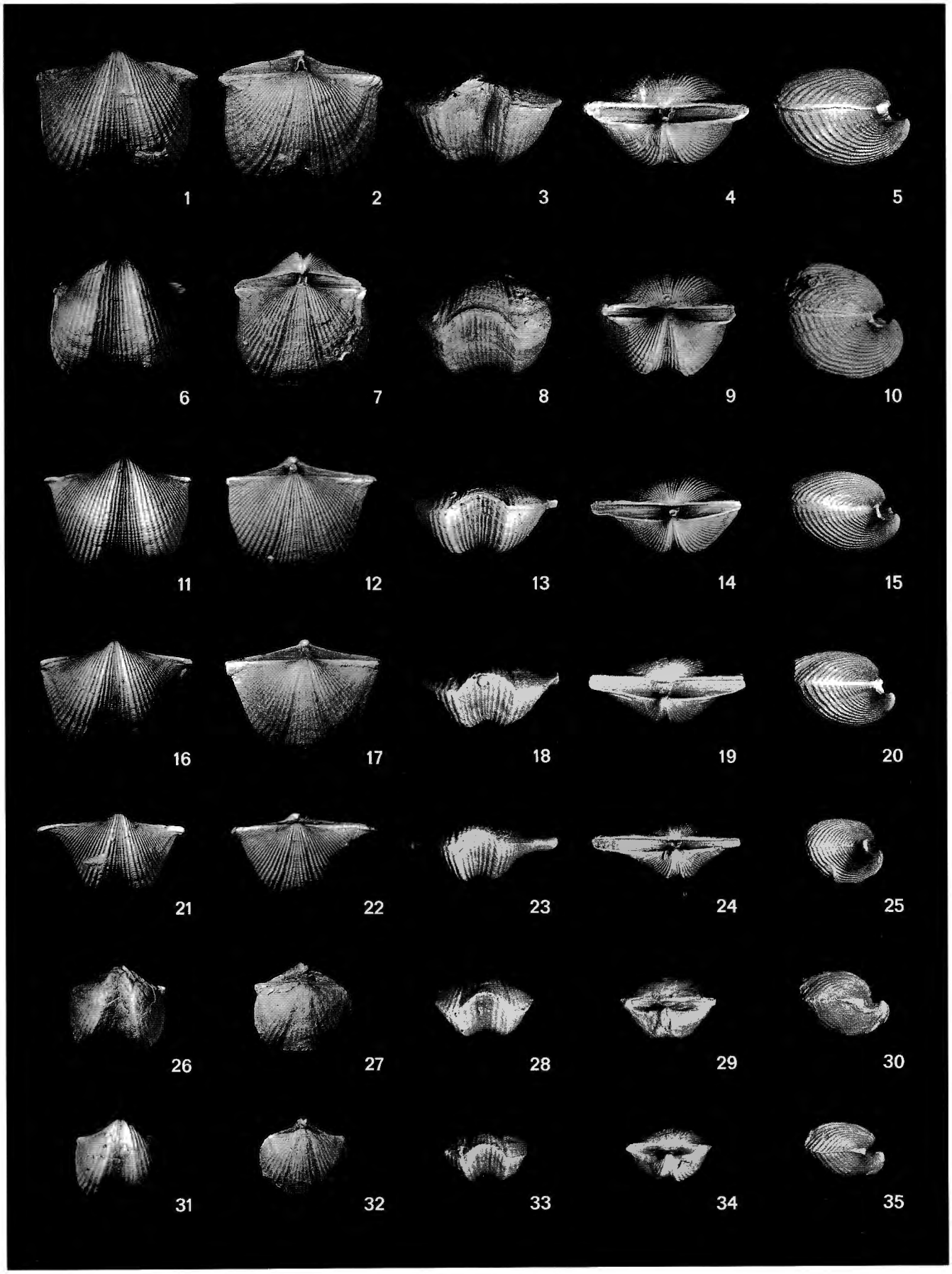
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Plate 2.