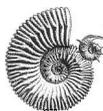


***Heckerella*, a new genus of the early Frasnian (Late Devonian) atrypid brachiopod**

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A new atrypid genus *Heckerella* from early Frasnian (*Palmatolepis transitans* Zone) of northwestern East European Platform is proposed. It includes only *Heckerella heckeri*, originally referred to *Anatrypa*. The new genus is characterised by weakly paraplicate anterior commissure, well-developed carina on the ventral valve, sulcus on the dorsal valve and coarser radial ornament. *Heckerella* has restricted geographic distribution in northwestern Russia, Latvia, northeastern Lithuania where it forms high-density associations with *Pseudoatrypa velikaya*.

Key words: Atrypida, Brachiopoda, Late Devonian, East European Platform.

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Introduction

The pronounced mid-Palaeozoic evolutionary history of the brachiopod order Atrypida was terminated by the end of the Frasnian. Significant ecosystem changes during the Frasnian strongly affected benthic faunal assemblages in a shallow shelf environments and, consequently, the diversity of atrypides (Copper 1986, 1998; Racki 1998). In spite of the remarkable environmental and biotic changes, atrypides continued till the F-F boundary to be an important component in some shallow-water brachiopod communities (e.g., Day 1998; Racki & Baliński 1998; Rzhonsnitskaya *et al.* 1998).

The purpose of this paper is to describe a new atrypid genus *Heckerella*, with *Anatrypa heckeri* Nalivkin, 1941 as a type species, which has a restricted geographic distribution in northwestern regions of East European Platform.

Geologic and geographic setting

A geographical distribution of *Heckerella heckeri* (Nalivkin, 1941) is confined to the northern and western part only of so-called the 'Main Devonian Field' (northwestern Russia, Latvia and northeastern Lithuania) of northwestern part of East European Platform (Sorokin 1978), where it forms low diversity and high density associations together with the brachiopods *Pseudatrypa velikaya*, *Elita fimbriata*, sometimes with *Anatrypa micans*, rugose corals, stromatoporoids and calcareous algae (Fig. 1). In particular, *Heckerella heckeri* is abundant at some levels within the Chudovo Beds exposed along the Velikaya River (Vybuty section; Fig. 1) and in the outskirts of the town of Stary Izborsk (Izborsk section) southwest of Pskov.

The Vybuty section represents a natural outcrop on the western side of the Velikaya River near the Vybuty rapids about 10 km upstream of Pskov (Fig. 1). The Chudovo Beds in this section comprise mostly slightly dolomitic limestones and argillaceous limestones more than 3 m thick. *Heckerella heckeri* is abundant in the uppermost part of this section, where it forms lens-like coquina accumulations of disarticulated valves.

The Izborsk section is located near an old Izborsk quarry in the town of Izborsk (Fig. 1). The Chudovo Beds are represented in this section by slightly dolomitic limestone, about 8 m thick, with *Heckerella heckeri* restricted to the lower part of the unit. According to the local stratigraphic terminology the Chudovo Beds belong to the Sargaevo Regional Substage and are correlated with the *Palmatolepis transitans* Zone [= Lower *Polygnathus asymmetricus* Zone by Rzhonsnitskaya & Kulikova (1990)].

The brachiopod specimens described in this paper are housed in the Tschernyshev Central Geological Museum, St. Petersburg (abbreviated CNIGR).

Systematic palaeontology

Order Atrypida Rzhonsnitskaya, 1960

Family Atrypidae Gill, 1871

Genus *Heckerella* nov.

Type and only species: *Anatrypa heckeri* Nalivkin, 1941; p. 173, pl. 8: 1.

Derivation of name: In honour of the late Professor Roman F. Hecker.

Diagnosis. — Weakly paraplicate anterior commissure, well-defined carina on the ventral valve and dorsal sulcus in combination with coarser radial ornament differ *Heckerella* from *Anatrypa* Nalivkin, 1939. It differs from the later Frasnian genus *Gibberosatrypa* Markovskii & Rzhonsnitskaya, 1998 by more elongate hinge line, stronger dorsal sulcus, and by higher, narrower ribs.

Remarks. — Originally *Heckerella heckeri* was referred by Nalivkin (1941, 1947) to *Anatrypa*. The latter is a relatively rare brachiopod taxon, which has a more convex ventral valve and is characterised by *Desquamatia*-like shell ornamentation (small, low, tubular ribs).

Heckerella is unique among the late Atrypidae in having a weakly paraplicate anterior commissure. However, weak ventral carina and weak dorsal sulcus occur sporadically in some Frasnian spinatrypines, in particular, in *Spinatrypina* (*Exatrypa*) Copper, 1967. Subgenus *Exatrypa* is distinguished by an imbricate concentric ornament and coarse, tubular, interrupted rows of ribs. Furthermore, internally, it has short and bulky teeth and very small lateral cavities. Copper (1978) pointed on the affinity of *Anatrypa heckeri* to *Carinatrypa* Copper, 1973, which he assigned to the Carinatiniidae Rzhonsnitskaya, 1960 (Copper 1996). The latter genus, as difference has subtubular,

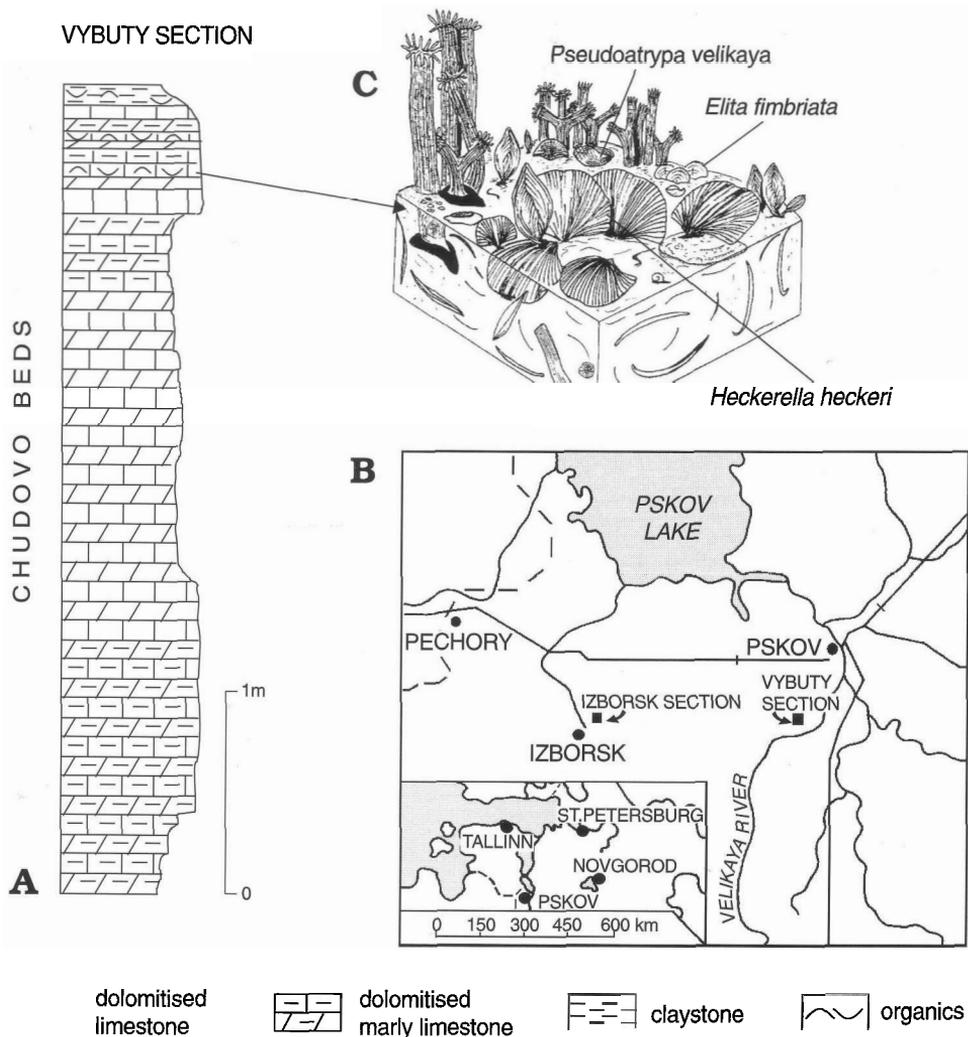


Fig. 1. Stratigraphical column of Vybuty section (A); schematic map showing position of localities with *Heckerella heckeri* in Pskov district discussed in the paper (B); and idealised reconstruction of the habitat of *Heckerella heckeri* showing dominant elements of associated faunal assemblage (C).

anteriorly expanding ribs and a frill or brim around the lateral and anterior commissures, which is ornamented by extremely coarse ribs intercalating with very fine costellae. The family Carinatinidae Rzhonsnitskaya, 1960 is referred by Copper (1996: p. 600) to the suborder Davidsoniina. This suborder is characterised by the strophic shell, which is otherwise known only in the family Tuvaellidae, and by well developed deltidial structures (see Copper 1996: fig. 8). The shell of *Heckerella* is astrophic, which is the main reason for a tentative assignment of the genus to Atrypidae. The subfamily status of *Heckerella* remains obscure. The external shell morphology suggests the affinity between *Heckerella* and late Frasnian *Gibberosatrypa* from West slope of South Urals (see Rzhonsnitskaya *et al.* 1998). It is possible that these two genera could be referred to a new subfamily, but further studies of their internal shell structure are needed.

Occurrence. — Early Frasnian, *P. transitans* Zone, northwestern regions of East European Platform.

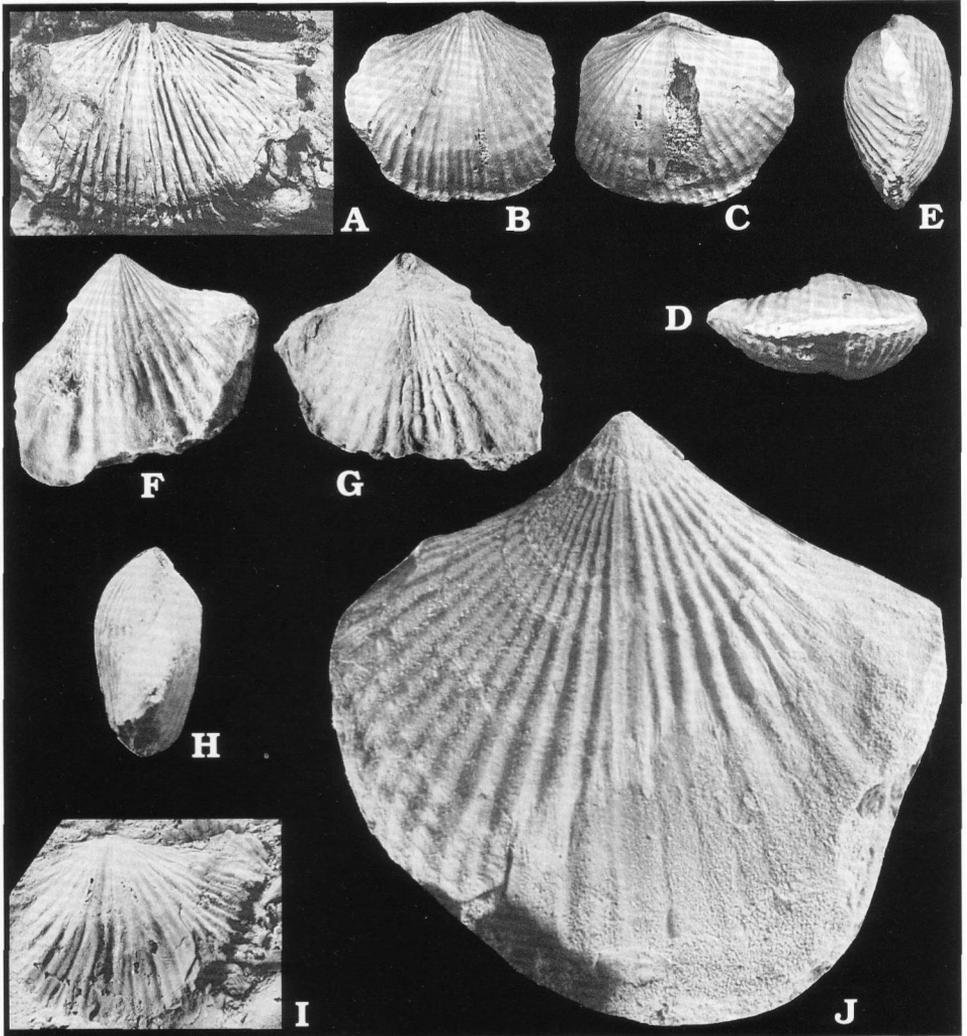


Fig. 2. *Heckerella heckeri* (Nalivkin, 1941), from the early Frasnian Chudovo beds, north-western European Russia. A. Holotype, Shelon river basin, Suchotka village, CNIGR 6993/96 ventral valve, $\times 1.5$. B–J. Velikaya river, Vybuty section. B–E. CNIGR 13057/1, conjoined valves, ventral, dorsal, lateral, and anterior views, $\times 1.5$. F–H. CNIGR 13057 in ventral, dorsal and lateral views, $\times 3$. I. CNIGR 13057/2 dorsal valve, $\times 1.5$. J. CNIGR 13057/8, details of ornamentation $\times 5$.

Heckerella heckeri (Nalivkin, 1941)

Figs. 2, 3.

Anatrypa heckeri sp. n.; Nalivkin 1941: p. 173, pl. 8: 1–5.

Anatrypa heckeri Nalivkin; Nalivkin 1947: p. 102, pl. 8: 8–10.

Diagnosis. — Shell moderately biconvex with long, slightly curved hinge line, and weakly paraplicate anterior commissure; ventral valve with carina and low triangular interarea, dorsal valve with deep median sulcus, radial ornament coarsely costellate, ventral interior with well developed dental plates.

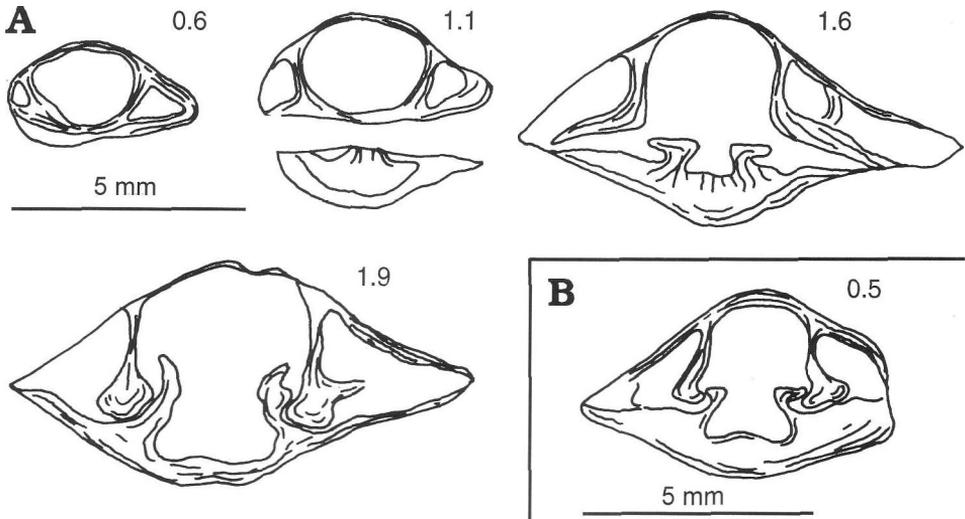


Fig. 3. Transverse serial sections of conjoined valves of *Heckerella heckeri* from the Early Frasnian, Sargaevo Regional Substage, Vybuty section, Velikaya river, Pskov region. Numbers refer to distances in mm from the top of the ventral umbo. A. CNIGR 13057/5. B. CNIGR 13057/6.

Material. — Three relatively well preserved shells (including two juvenile specimens) and 30 disarticulated and mostly exfoliated dorsal and ventral valves.

Description. — Shell medium sized, up to 16 mm long and 22 mm in wide, moderately biconvex, transversely subquadrate to subcircular in outline. Hinge line long and slightly curved. Cardinal extremities slightly acute to right angled. Anterior commissure weakly paraplicate. Ventral valve moderately convex, with well defined carina extending from the beak to the anterior valve margin. Interarea orthocline to slightly apsacline. Beak small, suberect to erect in some specimens. Pedicle foramen submesothyrid, flanked by well-developed deltidial plates. Dorsal valve moderately and evenly convex with a strong median sulcus originating at umbo and deepening anteriorly. In the anterior half of the valve the sulcus is bordered by two broad plications. Shell ornament costellate, consist of strong, bifurcate tubular ribs and superimposed fine, evenly spaced concentric microlines. Growth lines are rarely preserved and probably widely distributed (up to 1 mm; Fig. 2J).

Ventral interior with strong teeth and well developed dental plates. Dorsal interior with disjunct hinge plate and widely diverging crural basis (Fig. 3).

Occurrence. — Late Devonian, early Frasnian, *P. transitans* Zone, northwestern Russia; Latvia and northeastern Lithuania.

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Heckerella, nowy rodzaj wczesnofrańskich (późnodewońskich) atrypidowych ramienionogów

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Streszczenie

Poważne zmiany ekosystemowe we wczesnym franie spowodowały spadek różnicowania taksonomicznego wśród atrypidów, ale przedstawiciele tej grupy pozostali do końca franu ważnym składnikiem niektórych zespołów płytkowodnych ramienionogów.

Opisany w niniejszej pracy nowy rodzaj *Heckerella* należy do ostatnich przedstawicieli rzędu Atrypida. Jedyne znany gatunek tego rodzaju, *H. heckeri* (Nalivkin, 1941) pochodzi z wczesnego franu (poziom *Palmatolepis transitans*) północno-zachodnich rejonów Platformy Wschodnioeuropejskiej i pierwotnie został zaliczony do rodzaju *Anatrypa* Nalivkin, 1939. Od tego ostatniego rodzaju *Heckerella* gen. n. różni się słabo wyrażoną komisurą typu „paraplicate”, dobrze rozwiniętą kariną na skorupce nóżkowej i grubymi zębami.

Nowy rodzaj, chociaż podobny do późnofrańskiej *Gibberosatrypa* Markovskii & Rzonsnitskaya, 1998, różni się od niej bardziej wyciągniętym (wydłużonym) brzegiem zawiasowym, obecnością wyraźniejszej ośrodkowej zatoki na skorupce grzbietowej i wąskimi, wysokimi zębami.