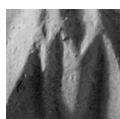


Revision of the rhynchonellid and atrypid brachiopods from the lower Pragian (Devonian) of Southeast Alaska (Heceta Island)

VALERYI V. BARANOV & ROBERT B. BLODGETT



A new collection of brachiopods made in 2003 from lower Pragian beds of the northeastern part of Heceta Island of Southeast Alaska allows us the opportunity to reevaluate some of the rhynchonellid and atrypid brachiopods that were previously described by Kirk & Amsden (1952) and Savage (1981) from the same locality. We here describe the following taxa: *Kirkirhynchus* gen. nov. with *Ancillotoechia reesidei* Kirk & Amsden, 1952 designated type species, *Savagerhynchus hecetaensis* gen. et sp. nov., *Dubovikovia* cf. *kuzmini* (Cherkesova, 1968) and *Rugosatrypa flexibilis* (Cherkesova in T. Modzalevskaya & Cherkesova, 1994). The occurrence of the two last species allows correlation of the lower Pragian beds of Heceta Island with Uryumskay, Tolbatskay and basal part of Daksanskay layers of Taimyr, Russia and the Soda Creek Limestone of west-central Alaska. Close faunal ties are clearly evidenced by Pragian brachiopod faunas of Southeast Alaska, southwest Alaska, Northeast Asia, and Taimyr. • Key words: rhynchonellids, atrypids, brachiopods, lower Pragian, Southeast Alaska, Heceta Island.

BARANOV, V.V. & BLODGETT, R.B. 2015. Revision of the rhynchonellid and atrypid brachiopods from the lower Pragian (Devonian) of Southeast Alaska (Heceta Island). *Bulletin of Geosciences* 90(1), 21–32 (9 figures, 4 tables). Czech Geological Survey, Prague. ISSN 1214-1119. Manuscript received December 9, 2013; accepted in revised form May 5, 2014; published online November 25, 2014; issued January 26, 2015.

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The present paper describes and revises the taxonomic assignment of rhynchonellid and atrypid brachiopods from a new collection made by R.B. Blodgett at the now “classic” USGS locality 2689-SD on the northeast part of Heceta Island, Southeast Alaska (Fig. 1). This important locality was originally thought to be late Silurian in age (Kirk & Amsden, 1952), but subsequently revised to an early Pragian age (Savage 1977, 1981; Blodgett *et al.* 2010; Baranov & Blodgett 2011, 2012, and herein). The material used in this study was collected by R.B. Blodgett (his locality 03RB16) and A.E.H. Pedder on June 30, 2003 from free-weathering fossils in shaly limestones in the northeast corner of Heceta Island, Southeast Alaska (Fig. 1). The locality was visited by them in a small boat, as there are no roads that allow access. The GPS coordinates for this locality are latitude 55°48.265' N, longitude 133°20.979' W, and is situated in the NE1/4 of the NW1/4 of the SE1/4 of the NE1/4 of section 18, T. 70 S, R. 79 E, Craig D-5 1:63,360 scale quadrangle (Map edition 1996). This locality is the same as USGS locality 2689-SD [= field locality 47-AH-R120(F) of G. Donald Eberlein which he and his USGS field party collected in 1947 during

regional geologic mapping]. The geographic coordinates given for this locality in Savage (1977) is latitude 55°48' N and longitude 133°21' W. This exposure of limestone, shaly limestone and shale was included within the red-bed clastic unit named the Karheen Formation by Eberlein & Churkin (1970), and is surrounded along the adjoining shoreline to the north and south by typical exposures consisting of red colored sandstones of the Karheen Formation (see Savage 1981, fig. 2 for an even more detailed map location). The locality was also shown as locality 16 in Eberlein *et al.* (1983). Subsequently, Blodgett *et al.* (2010) suggested placing this exposure rather in the overlying Devonian age Wadleigh Limestone, and having it fault-bounded to the north and south by structurally discordant beds of the latest Silurian age Karheen Formation.

Previous studies

The fossil fauna from USGS locality 2689-SD includes brachiopods, rugose corals, trilobites, tentaculitids, and

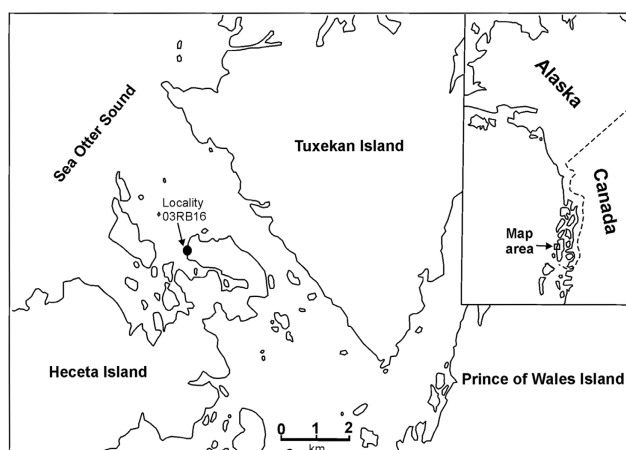


Figure 1. Map of the Southeast Alaska showing the location of collection 03RB16 on Heceta Island.

conodonts, with only detailed taxonomic descriptions or illustrations being provided for on the brachiopods (Kirk & Amsden 1952, Savage 1981, and herein), rugose corals (Merriam in Oliver *et al.* 1975), and conodonts (Savage 1977). Kirk & Amsden (1952) in their monographic study “Upper Silurian brachiopods of Southeastern Alaska” described brachiopods from seven U.S. Geological Survey collections, one of which (USGS locality 2689-SD) (see Fig. 1 for location) was subsequently shown to be early Pragian (Middle Early Devonian) in age by Savage (1977, 1981). The six other collections are correctly assigned a late Silurian age. From USGS locality 2689-SD they described two species of rhynchonellids – *Camarotoechia reesidei* Kirk & Amsden, 1952 and *Camarotoechia* sp., and one atrypid species – *Atrypa* cf. *Atrypa reticularis* (Linnaeus).

C.W. Merriam in Oliver *et al.* (1975, p. 37, pl. 22, figs 11, 12) cited and illustrated the presence of a rugose coral he identified as *Phaulactus* sp. cf. *P. cyathophylloides* Ryder from USGS locality 2689-SD (= USGS loc. M1294 of that paper). Another species of *Phaulactis*, *P.* sp. cf. *P. angusta* (Lonsdale) was noted by him as being present on the nearby Ham Island, which is located south-east of the eastern end of Heceta Island. The two collections served as the basis of his proposed *Phaulactis* Zone that he assumed occupied the uppermost strata of the upper Silurian succession near Heceta Island.

Later, Savage (1977, 1981) described conodonts and brachiopods, respectively, from USGS locality 2689-SD. Among the conodonts (Savage 1977) reported the zonal subspecies-index of the lower Pragian *Eognathodus sulcatus sulcatus* Philip and the following species: *Ozarkodina eberleini* sp. nov., *Pandorinellina exigua philipi* Klapper and *Pelekysgnathus klamathensis* Savage. Subsequently, Savage (1981) in his study of the brachiopods described a species complex consisting of *Schizophoria* cf. *S. fragilis* Kozłowski, *Mesodouvillina* (*Protocymostrophia*) cf. *M. (P.) costatula* (Barrande), *Eoschuchertella* sp., *Gypidula*

aff. *G. pelagica* (Barrande), *Ancillotoechia reesidei* (Kirk & Amsden), *Linguopugnoides carens* (Barrande), *Monado-toechia?* sp. nov., *Atrypa reticularis* (Linnaeus), *Prota-thyris?* sp., *Nucleospira hecetensis* Kirk & Amsden, *Reticulariopsis* sp., *Cyrtina* sp., and *Howellella amsdeni* sp. nov., which in his opinion represented a typical cosmopolitan Pragian Old World Realm fauna. Savage in his 1981 paper assigned Kirk & Amsden’s *Camarotoechia reesidei* to the genus *Ancillotoechia* Havlíček, 1959, their *Camarotoechia* sp. to the genus *Linguopugnoides* Havlíček, 1961, and their *Atrypa* cf. *Atrypa reticularis* to *Atrypa reticularis*.

Savage had visited the locality in 1975 together with G.D. Eberlein and M. Churkin, Jr. to collect conodont samples, resulting in the publication by Savage *et al.* (1977) on the conodont fauna. Subsequently, N.M. Savage and several student assistants visited the general vicinity in 1979 and spent two days collecting brachiopod and new conodont samples from a measured section they made here (the brachiopods being the subject of the paper published by Savage in 1981). Eberlein *et al.* (1983) provided faunal lists for a number of fossil localities in the Craig Quadrangle and noted for USGS locality 2689-SD the presence of brachiopods, the coral *Phaulactus*, the tentaculitid genus *Nowakia*, and conodonts. Blodgett *et al.* (2010) suggested these carbonate exposures represent a down-faulted block of the overlying Devonian age Wadleigh Limestone.

Blodgett *et al.* (2010) noted that many of the brachiopods recorded by Savage (1981) from this locality showed striking similarities with undescribed brachiopods from the Soda Creek Limestone of west-central Alaska (then thought to be early Emsian in age, but now known to also be of early Pragian age).

Repository

The brachiopods described in this paper are deposited in the Geology Museum of the Institute of Diamond and Precious Metals Geology (GM IDPMG), Yakutsk, Sakha Republic (Yakutia), Yakutsk, Russia, collection N 201.

Systematic palaeontology

Order Rhynchonellida Kuhn, 1949

Superfamily Rhynchotrematoidea Schuchert, 1913

Family Trigonirhynchiidae Schmidt, 1965

Subfamily Trigonirhynchiinae Schmidt, 1965

Genus *Kirkirhynchus* gen. nov.

Type species. – *Camarotoechia reesidei* Kirk & Amsden, 1952; lower Pragian (Middle Early Devonian) of Heceta Island, Southeast Alaska.

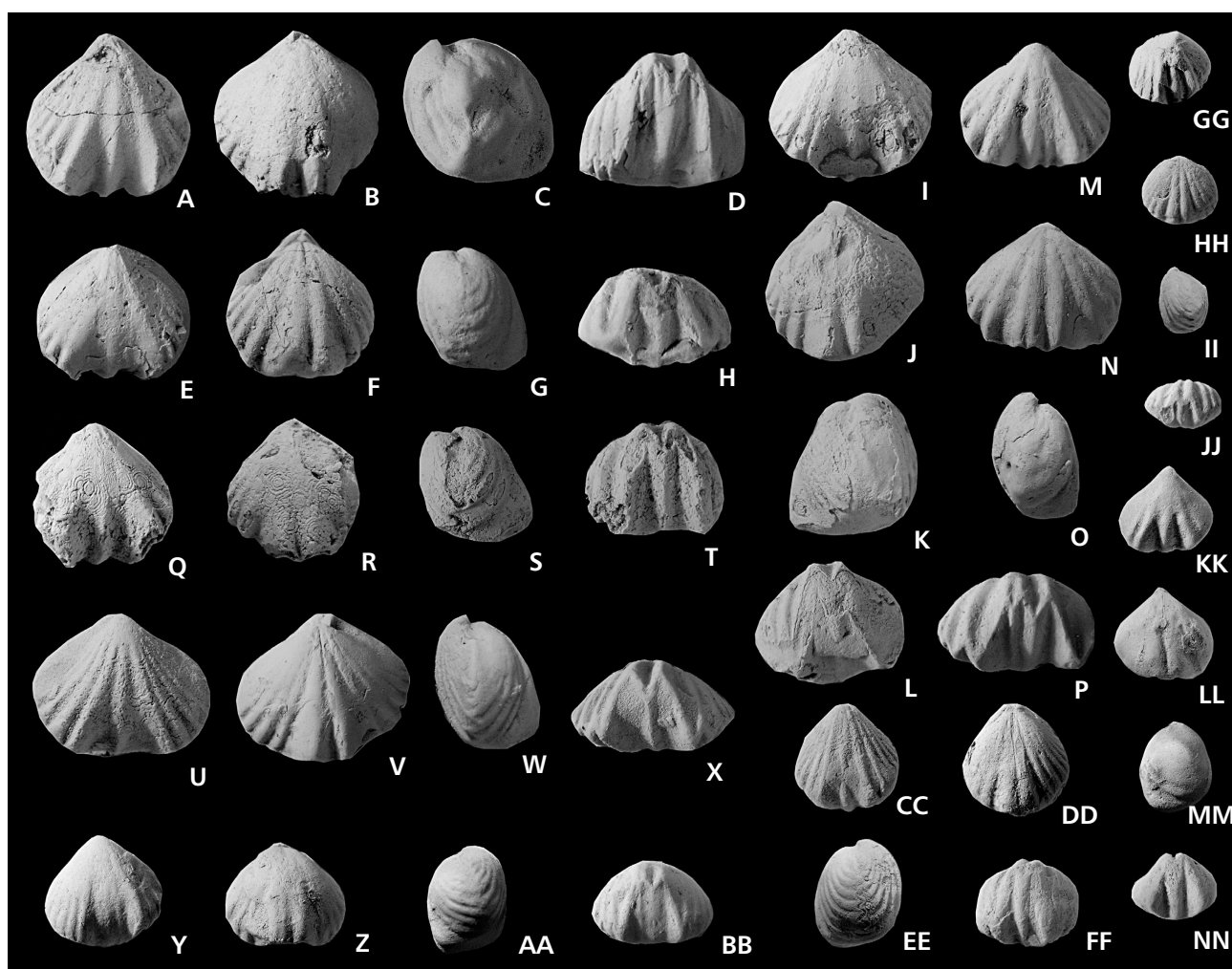


Figure 2. *Kirkirhynchus reesidei* (Kirk & Amsden, 1952). • A–NN – ventral, dorsal, lateral and anterior views of hypotypes, A–D – GM IDPMG 1/201, $\times 2$; E–H – GM IDPMG 2/201, $\times 2$; I–L – GM IDPMG 3/201, $\times 2$; M–P – GM IDPMG 4/201, $\times 2$; Q–T – GM IDPMG 5/201, $\times 2$; U–X – GM IDPMG 6/201, $\times 2$; Y–BB – GM IDPMG 7/201, $\times 2$; CC–FF – GM IDPMG 8/201, $\times 2$; GG–JJ – GM IDPMG 9/201, $\times 2$; KK–NN – GM IDPMG 9/201, $\times 2$; Lower Devonian, lower Pragian, Heceta Island, Southeast Alaska.

Etymology. – In honor of Edwin Kirk (1884–1955), USGS paleontologist, who made many pioneering contributions to Alaskan paleontology (including papers on brachiopods, gastropods, bivalves, and crinoids) and stratigraphy.

Diagnosis. – Shell small, oval-subpentagonal with intraplicate anterior commissure and costae arising from the beak or within 2.5 mm from it; dorsibiconvex; sulcus deep with a central costa and with one to two costellae on each side; beak low, erect, pierced by small foramen; fold high with two flat costae which can bifurcate anteriorly; four to five costae located on the flanks; dental plates thin and short; lateral cavities filled with callus in mature shells; teeth massive; septalium short; dental sockets deep; inner hinge plate completely covered by a septalium which is concave dorsally and has an U-shaped outline in mature shells; crura raduliform, sharply curved ventrally.

Comparison. – *Kirkirhynchus* gen. nov. differs from the majority of genera belonging to the Trigonirhynchiinae in the character of the external ornament and in the presence of a U-shaped inner hinge plate completely covered by a septalium in mature shells (see Fig. 3). *Kirkirhynchus* differs from *Ancillotoechia* Havlíček, 1959 and *Myrmirhynch* Havlíček, 1982 in the presence of an apical callus in the ventral valve, a central costa in the sinus and by one to two costellae on each flank, a bifurcating flat costa on the fold, and an U-shaped inner hinge plate completely covered by a septalium in mature shells; from *Trigonirhynchia* Cooper, 1942, *Agarhynchia* Havlíček, 1982, *Cupularostrum* Sartenaer, 1961, *Hercotrema* Jin, 1989, and *Oxypleurorhynchia* Plodowski, 1973 it differs in having a central costa on the sinus and by the presence of one to two costellae on each flank, by the bifurcation of costae on the fold, and in having an U-shaped inner hinge plate completely covered by the septalium in mature shells.

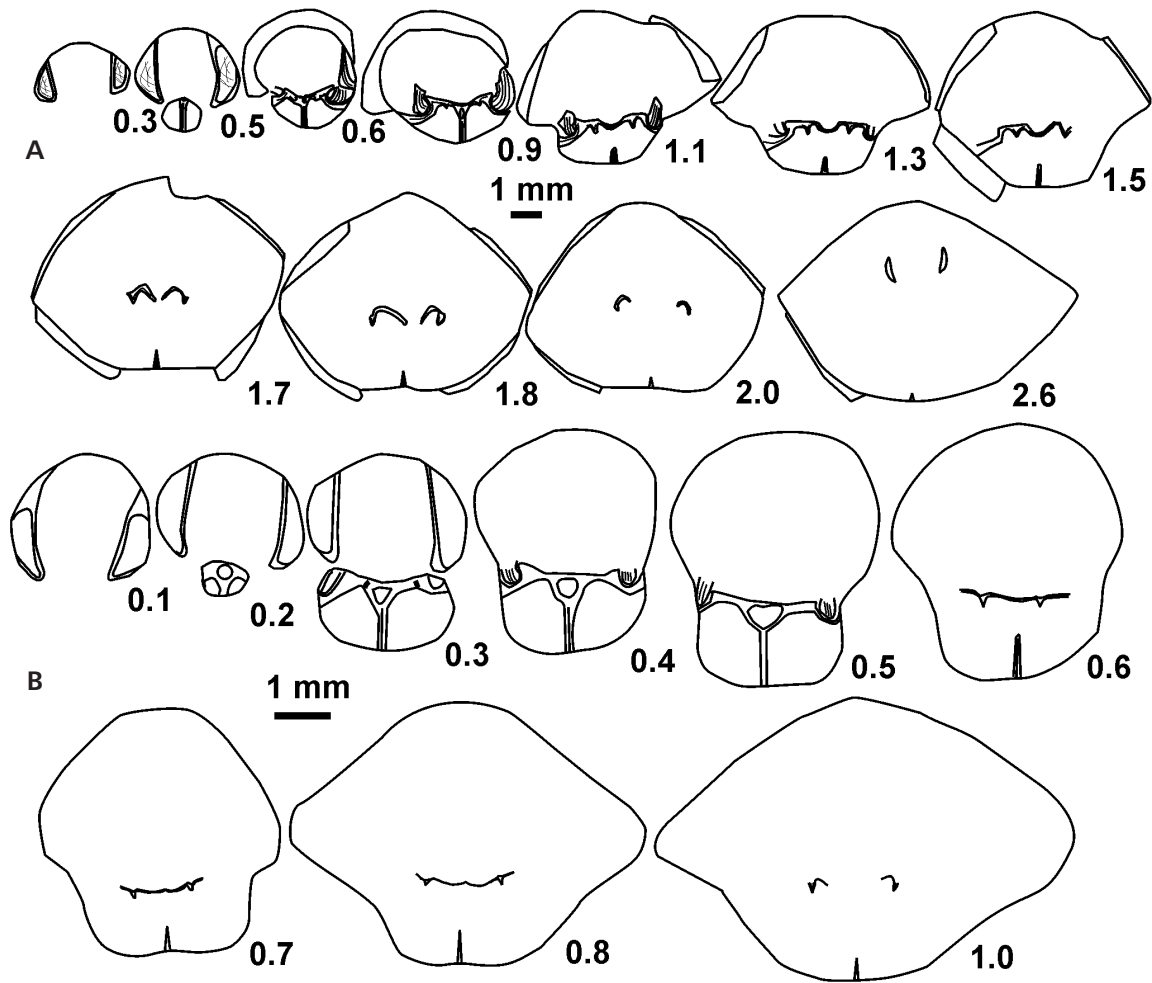


Figure 3. Selected transverse serial sections illustrating the internal structures in *Kirkirhynchus reesei* (Kirk & Amsden, 1952). • A – hypotype, GM IDPMG 11/201, B – hypotype, GM IDPMG 12/201, Lower Devonian, lower Pragian, Heceta Island, Southeast Alaska. Scale bar represents 1 mm; length of sectioned specimens, 10.3 mm and 7.7 mm.

Species assigned. – Only the type species is known.

***Kirkirhynchus reesei* (Kirk & Amsden, 1952)**

Figures 2A–NN, 3

1952 *Camarotoechia reesei*; Kirk & Amsden, p. 57, pl. 8, figs 1–7.

1981 *Ancillotoechia reesei*. – Savage, p. 364, pl. 3, figs 1–18.

Diagnosis. – Because of monotypy, see that of genus.

Material examined. – Fifty-eight conjoined valves from locality 03RB16, Heceta Island, Southeast Alaska.

Types. – Hypotypes, GM IDPMG, 1/201, Fig. 2A–D; GM IDPMG 2/201, Fig. 2E–H; GM IDPMG 3/201, Fig. 2I–L; GM IDPMG 4/201, Fig. 2M–P; GM IDPMG 5/201,

Fig. 2Q–T; GM IDPMG 6/201, Fig. 2U–X; GM IDPMG 7/201, Fig. 2Y–BB; GM IDPMG 8/201, Fig. 2CC–FF; GM IDPMG 9/201, Fig. 2GG–JJ; GM IDPMG 10/201, Fig. 2KK–NN; GM IDPMG 11/201, Fig. 3A; and GM IDPMG 12/201, Fig. 3B.

Measurements (in mm). –

Specimen	L	W	T	L/W	L/T
1/201	12.0	11.8	11.9	1.01	1.0
2/201	9.9	11.0	7.2	0.9	1.4
3/201	9.9	10.5	8.3	0.94	1.2
4/201	9.3	10.8	6.4	0.86	1.5
5/201	10.0	9.2	7.2	1.09	1.39
6/201	9.6	11.4	9.3	0.84	1.03
7/201	7.4	7.0	5.5	1.06	1.35
8/201	7.0	7.7	5.3	0.9	1.32
9/201	5.0	6.0	4.0	0.83	1.25
10/201	5.1	5.2	5.4	0.98	0.94

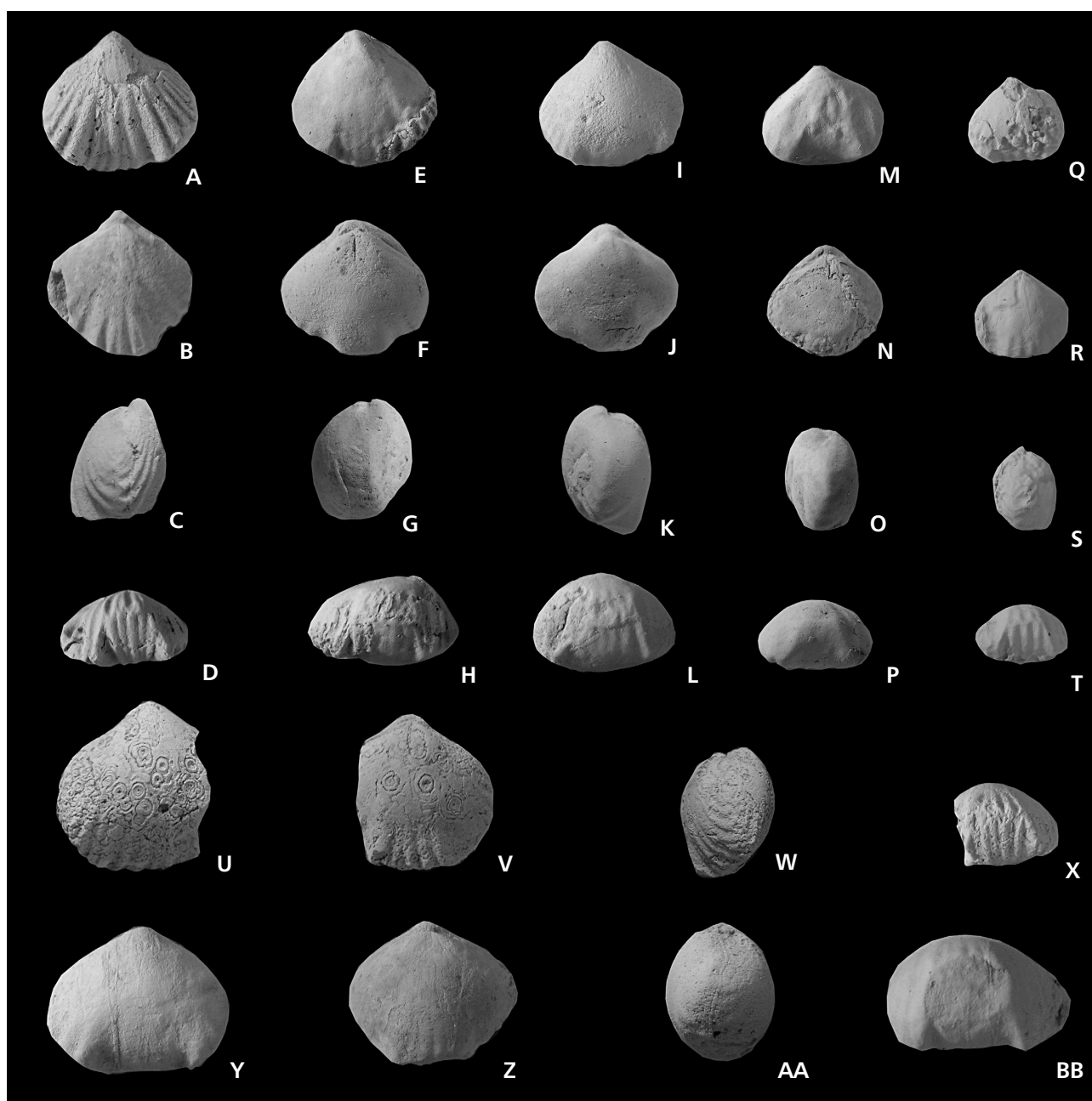


Figure 4. *Savagerhynchus hecetaensis* gen. et sp. nov. • A–D – ventral, dorsal, lateral and anterior views of holotype, GM IDPMG 21/201, $\times 2$. • E–BB – ventral, dorsal, lateral and anterior views of paratypes: E–H – GM IDPMG 22/201, $\times 2$; I–L – GM IDPMG 23/201, $\times 2$; M–P – GM IDPMG 24/201, $\times 2$; Q–T – GM IDPMG 25/201, $\times 2$; U–X – GM IDPMG 26/201, $\times 2$; Y–BB – GM IDPMG 27/201, $\times 2$. Lower Devonian, lower Pragian, Heceta Island, Southeast Alaska.

Genus *Savagerhynchus* gen. nov.

Type species. – *Savagerhynchus hecetaensis* gen. et sp. nov.; lower Pragian (Middle Early Devonian) of Heceta Island, Southeast Alaska.

Etymology. – In honor of Norman M. Savage, Department of Geological Sciences, University of Oregon, Eugene,

Oregon, USA, who made many contributions to the study of Paleozoic brachiopods and conodonts of Southeast Alaska.

Diagnosis. – Shell small, transversely oval-subpentagonal in outline, dorsibiconvex with dorsal valve more strongly arched than the ventral valve; the greatest width and thickness are located at mid-length; anterior margin

truncated, anterior commissure denticulate. Costae rounded, arising in the posterior half of the valves, intercalating on the sinus and bifurcating on the fold. Ventral valve gently convex in lateral profile; flanks flat; beak incurved. Sulcus and fold are developed in the anterior half of valves; fold low and wide, weakly delineated from the lateral flanks; sulcus shallow and wide with a flat bottom; tongue trapezoidal. Foramen small, permesothyrud. Three to five costae located on the sulcus; four to six costae are present on the fold; and five to six pairs are present laterally on the flanks. Dental plates thin and short; apical lateral cavities filled by callus. Septalium in the apical part open, anteriorly it is covered by the inner hinge plate, and can be traced up to the point where the crura branch. Dorsal medium septum thin, extending more than one seventh of the valve length; crura raduliform.

Comparison. – *Savagerhynchus* differs from *Linguopugnoides* Havlíček, 1961 in having an inner hinge plate covered by a septalium; from *Astua* Havlíček, 1992 it differs in being smaller and in having costae that are developed in the anterior half of valves, flattened with short longitudinal grooves on lateral margins and a septalium covered by an inner hinge plate; from *Lissopleura* Whitfield, 1896 it differs in having a smaller number of stronger, unflattened costae, which are bifurcated on the fold and intercalated on the sinus, and in the presence of a thin, short median septum.

***Savagerhynchus hecetaensis* sp. nov.**

Figures 4A–BB, 5

1952 *Camarotoechia* sp.; Kirk & Amsden, p. 58, pl. 10, figs 2–4.

1981 *Linguopugnoides carens* (Barrande, 1879). – Savage, p. 365, pl. 3, figs 19–36.

1981 *Monadotoechia?* sp. nov. – Savage, p. 365, pl. 3, figs 37–46.

Diagnosis. – Because of monotypy, see that of genus.

Etymology. – After Heceta Island, Southeast Alaska.

Material examined. – Fifty-eight conjoined valves from locality 03RB16, northeast part of Heceta Island, Southeast Alaska.

Types. – Holotype, GM IDPMG, 21/201, Fig. 4A–D; paratypes, GM IDPMG 22/201, Fig. 4E–H; GM IDPMG 23/201, Fig. 4I–L; GM IDPMG 24/201, Fig. 4M–P; GM IDPMG 25/201, Fig. 4Q–T; GM IDPMG 26/201, Fig. 4U–X; GM IDPMG 27/201, Fig. 4Y–BB; GM IDPMG 28/201, Fig. 5.

Measurements (in mm). –

Specimen	L	W	T	L/W	L/T
21/201	12.0	11.2	7.0	0.9	1.71
22/201	10.6	11.3	7.8	0.94	1.36
23/201	10.2	11.4	8.0	0.89	1.28
24/201	8.9	9.1	5.8	0.98	1.53
25/201	6.8	7.0	4.8	0.97	1.42
26/201	12.2	?	8.8	?	1.39
27/201	11.5	14.1	9.6	0.82	1.2

Superfamily Uncinuloidea Rzhonsnitskaya, 1956
Family Innaechiidae Baranov, 1980

**Genus *Dubovikovia* Baranov
(in Baranov & Schischkina, 1995)**

Type species. – *Hebetoechia settedabanica* Rzhonsnitskaya in Alekseeva 1967; Settedaban Formation, Lochkovian, Sette-Daban Range, Siberia.

***Dubovikovia* cf. *kuzmini* (Cherkesova, 1968)**

Figures 6A–D, 7

1968 *Hebetoechia kuzmini*; Cherkesova, p. 16, pl. 1, figs 1–4, 10–12.

1981 *Lanceomyonia kuzmini* (Cherkesova). – Modzalevskaya, p. 177, pl. 1, figs 7–9.

Material examined. – One conjoined valve from locality 83RB16, Heceta Island, Southeast Alaska. This specimen has been serially sectioned (Fig. 7).

Figured specimen. – GM IDPMG, 30/201, Figs 6A–D, 7.

Description. – Shell small, transversely subpentagonal in outline, dorsibiconvex with dorsal valve more strongly arched than ventral valve. The greatest width and thickness are located at midlength. Anterior margin truncated. Anterior commissure denticulate, with short marginal spines. Costae appear in anterior half of the valves, and are flattened with longitudinal grooves on lateral and anterior shell margins, and crossed by closely spaced concentric lamellae. Ventral valve moderately convex in longitudinal profile, flanks flat. Ventral beak incurved. Dorsal sulcus and ventral fold are developed in the anterior half of valves; sulcus shallow and wide with a flat bottom; tongue rectangular. Sulcus marked by four costae and four costal pairs laterally. Delthyrium closed by narrow deltidial plates; foramen small, oval, permesothyrud; dental plates thin and short. Dorsal valve strongly convex in lateral profile. Fold ornamented by five costae and five costal pairs laterally. Flanks steep to vertical.

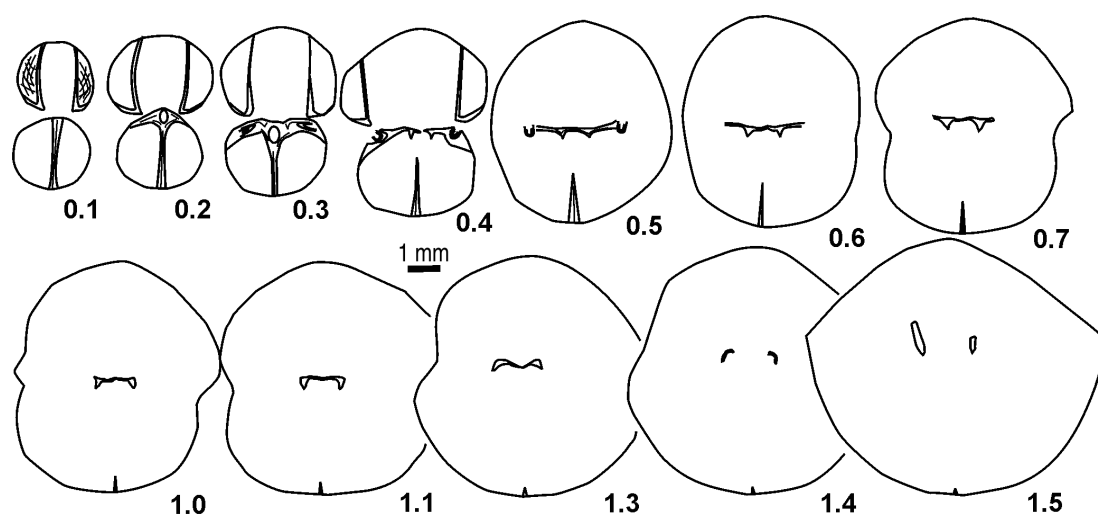


Figure 5. Selected transverse serial sections illustrating the internal structures in *Savagerhynchus hecetaensis* gen. et sp. nov., GM IDPMG 28/201, Lower Devonian, lower Pragian, Heceta Island, Southeast Alaska. Scale bar represents 1 mm; numbers represent distance from initial section through specimen; original length of section specimen 10.0 mm.

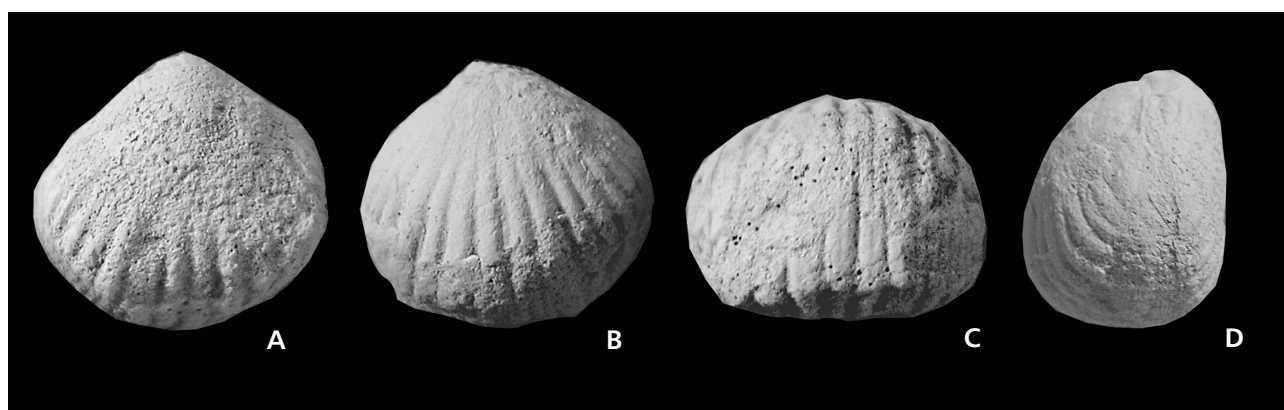


Figure 6. *Dubovikovia* cf. *kuzmini* (Cherksova, 1968). A–D – ventral, dorsal, anterior and lateral views, GM IDPMG 30/201, $\times 3.5$; Lower Devonian, lower Pragian, Heceta Island, Southeast Alaska.

The inner ends of outer hinge plates are curved dorsally. Septalium small. The dorsal median septum thin, extending more than one fifth of valve length (Figs 6, 7).

Measurements (in mm). –

Specimen	L	W	T	L/W	L/T
30/201	12.0	12.6	9.2	0.9	1.3

Remarks. – On the basis of both external and internal features the Alaskan *Dubovikovia* cf. *kuzmini* does not differ from representatives of this species described by Cherksova (1968) from the Uryumskay layers of Central Taimyr. Alaskan *Dubovikovia* cf. *kuzmini* are characterized by a larger shell size. The paucity of material (only one specimen) does not allow us to assign it with complete confidence to this species. *Dubovikovia* cf. *kuzmini* differs from mature shells of “*Lancemyo-*

nia” *varia* Cherksova (1968) by being smaller and in having its costae appears in the anterior part of the valves.

Occurrence. – Middle Lower Devonian, lower Pragian, Heceta Island, Southeast Alaska and possibly Uryumskay layers, Central Taimyr, East Siberia.

Order Atrypida Rzhonsnitskaya, 1960
Subfamily Atrypoidea Schuchert & LeVene, 1929
Family Atrypidae Gill, 1871

Genus *Rugosatrypa* Rzhonsnitskaya, 1975
(= *Anulatrypa* Havlíček, 1987)

Type species. – *Rugosatrypa tschernyschewi* gen. et sp. nov.; Emsian, Southern Siberia.

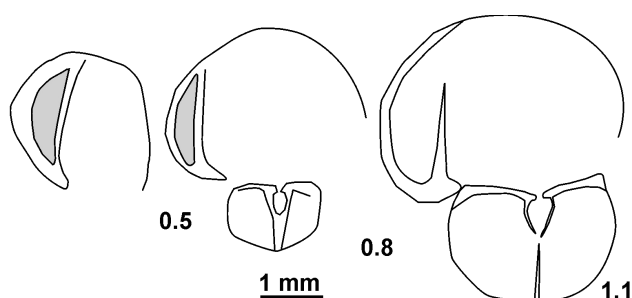


Figure 7. Selected transverse serial sections illustrating the internal structures in *Dubovikovia* cf. *kuzmini* (Cherkesova, 1968), GM IDPMG 30/201, Lower Devonian, lower Pragian, Heceta Island, Southeast Alaska. Scale bar represents 1 mm; numbers represent distance from initial section through specimen; length of sectioned specimen 10.0 mm.

***Rugosatrypa flexibilis* Cherkesova, 1994**
(in T. Modzalevskaya & Cherkesova 1994)

Figure 8A–L, 9

- 1952 *Atrypa* cf. *Atrypa reticularis* (Linnaeus). – Kirk & Amsden, p. 63, pl. 8, figs 8–17.
1981 *Atrypa reticularis* (Linnaeus). – Savage, p. 85, pl. 2, figs 18–23.
1994 *Anulatrypa flexibilis*; Cherkesova (in T. Modzalevskaya & Cherkesova), p. 57, pl. 5, figs 8–11.

Description. – Shell medium-sized, oval in outline, strongly dorsibiconvex, egg-like, carinate in the apical region, with the greatest width and thickness at mid-length. Cardinal extremities rounded. Ventral valve weakly convex at mid-length. Lateral slopes flattened. Anterior commissure sulcate. Sinus moderately developed. Dorsal valve more convex than ventral valve. Maximum thickness located in the posterior half of valve. Lateral slopes abrupt. Fold absent. Surface ornamented by thin bifurcating and intercalating ribs which are crossed by concentric growth lamellae. Number of ribs on the ventral valve at 5 mm from the beak are 11–13. Apical part of shells thick. Dental plates absent. Dental nucleus present. Teeth smooth. Inner socket ridge high. Dental sockets deep. Crural base subhorizontal.

Discussion. – Representatives of *Rugosatrypa flexibilis* are clearly very closely related to *Anulatrypa nieczlaviensis tenuicostata* Cherkesova in Cherkesova & T. Modzalevskaya (1994, p. 56, pl. 5, figs 3–5) and differ only in having a more convex egg-like shell.

Material examined. – Seven conjoined shells from the locality 83RB16, Heceta Island, Southeast Alaska.

Types. – Hypotypes GM IDPMG, 31/201, Fig. 6A–D; GM IDPMG 32/201, Fig. 8E–H; and GM IDPMG 33/201, Fig. 8I–L.

Measurements (in mm). –

Specimen	L	W	T	L/W	L/T
31/201	22.3	22.6	13.8	0.98	1.61
32/201	17.3	18.9	12.1	0.92	1.43
33/201	18.8	17.4	11.3	1.08	1.7

Occurrence. – Middle Lower Devonian, lower Pragian, Heceta Island, Southeast Alaska and lower part of Daksanskay layers, Central Taimyr, East Siberia.

Taxonomic summary

This study describes the rhynchonellid and atrypid brachiopods from this locality based on collections made by R.B. Blodgett in 2003 (his locality 03RB16). An internal hinge plate was found in both rhynchonellid genera, a feature present in *Ancillotoechia* but absent in *Linguopugnoides* (Havlíček 1959, 1961) and also in the diagnoses of these genera (Savage 1996, 2002a, 2002b). An inner hinge plate is found in various phylogenetic lines of the rhynchonellids (family Glossinotoechiidae Havlíček, 1992; subfamily Trigonirhynchiinae Schmidt, 1965; and the genus *Pseudouncinulus* Rzhonsnitskaya, 1968) and occurs at various taxonomic ranks. We have included *Ancillotoechia reesidei* Kirk & Amsden in our new genus *Kirkirhynchus*, which differs from *Ancillotoechia* both in external and internal structure (see “Description” below). The *Linguopugnoides carens* (Barrande, 1879) which was described by Savage (1981) we have included in *Savagerhynchus hecetaensis* gen. et sp. nov. Its differences from the genus *Linguopugnoides* are mentioned below. In the synonymy of *Savagerhynchus hecetaensis* we have also included *Monadotoechia?* sp. nov. (Savage 1981) as its external and internal structures do not differ from juvenile shells of *Savagerhynchus hecetaensis*. Moreover, we here document the occurrence of *Dubovikovia* cf. *kuzmini*, similar or identical to *D. kuzmini* described by Cherkesova (1968) from the Lochkovian (or lower Pragian as recently reinterpreted by Baranov & Blodgett 2011, 2012) beds of Taimyr. Kirk & Amsden (1952) from USGS locality 2689-SD described an atrypid – *Atrypa* cf. *Atrypa reticularis* (Linnaeus). The age of the brachiopod fauna from this locality was dated by them as late Silurian. However, Savage (1977) described an early Pragian conodont fauna from the same locality, and he subsequently described (Savage, 1981) the atrypid *Atrypa reticularis* (Linnaeus) among the brachiopods from the same locality. It is important to note that the holotype of this species was described from the lower Ludlow of Gotland, thus accounting for a large time interval between these two reported occurrences. Kozłowski (1929), and later Nikiforova (1954), described the variety *Atrypa reticularis* (Linné) var. *nieczlaviensis* from Lochkovian beds

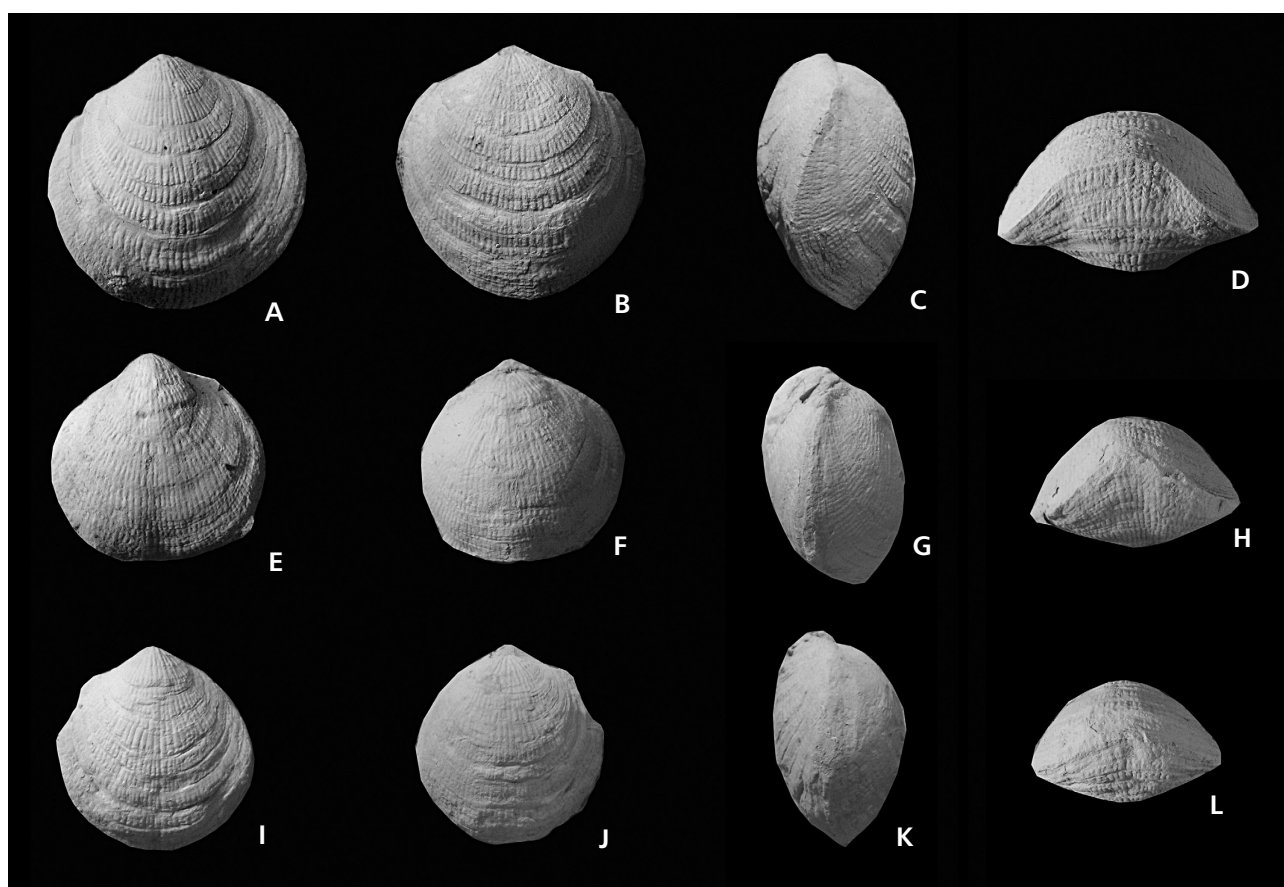


Figure 8. *Rugosatrypa flexibilis* (Cherkesova in T. Modzalevskaya & Cherkesova, 1994), ventral, dorsal, lateral and anterior views. • A–D – GM IDPMG 40/201, $\times 1.5$; E–H – GM IDPMG 41/201, $\times 1.5$; I–L – GM IDPMG 42/201, $\times 1.5$; Lower Devonian, lower Pragian, Heceta Island, Southeast Alaska.

(Borshchov Horizon) of Podolia, which differs from other varieties in having four costae grouped together in the apical part of the ventral valve. Rzhonsnitskaya (1975) and Cooper & Racheboueuf (1985) included *Atrypa nieczlawiensis* as a member of the genus *Rugosatrypa* Rzhonsnitskaya, 1975, but Havlíček (1987) included *Atrypa nieczlawiensis* in the genus *Anulatrypa* Havlíček, 1987. In his opinion it differs from *Rugosatrypa* also in the presence of frills. However, the absence of frills in *Rugosatrypa* may be explained by insufficient preservation in the shells of the type species, though the presence of sharp concentric growth lamellae already assumes the presence of frills. This view is also confirmed by the occurrence of frills in *Rugosatrypa moldavantzewi pjasinensis* (Cherkesova in T. Modzalevskaya & Cherkesova, 1994). Therefore, we believe that *Anulatrypa* is a junior synonym of the genus *Rugosatrypa*.

Age and correlation

The Pragian age limestone, shaly limestone, and shale sequence exposed on the northeast side of Heceta Island,

which includes locality 03RB16 (= USGS locality 2689-SD), is associated with the late Silurian to Early Devonian age Karheen Formation as named and mapped by Eberlein & Churkin (1970). Savage (1977) firmly established an early Pragian age for this exposure on the basis of conodonts and included it as part of the Karheen Formation. Savage (1981) described in detail the Pragian age brachiopods from this same exposure. Blodgett *et al.* (2010) expressed doubt that this exposure belongs to the Karheen Formation (which is characteristically a red-bed clastic unit composed of conglomerate, sandstones, and minor siltstone), and indicated that the exposure was probably a fault-bounded block of the overlying Devonian age Wadleigh Limestone. Blodgett *et al.* (2010) suggested restricting the classic red bed strata of the Karheen Formation to the upper Silurian based on available paleontological identifications provided from these beds in Buddington & Chapin [1929, their Sgs (sandstone and graywacke) unit]. The Lower Devonian limestone exposure is structurally discordant, with strikingly differing bedding attitudes, with surrounding exposures of the Karheen Formation on the north-eastern tip of Heceta Island (see map of Savage 1981, fig. 2). Locality 03RB16 shares several brachiopod species

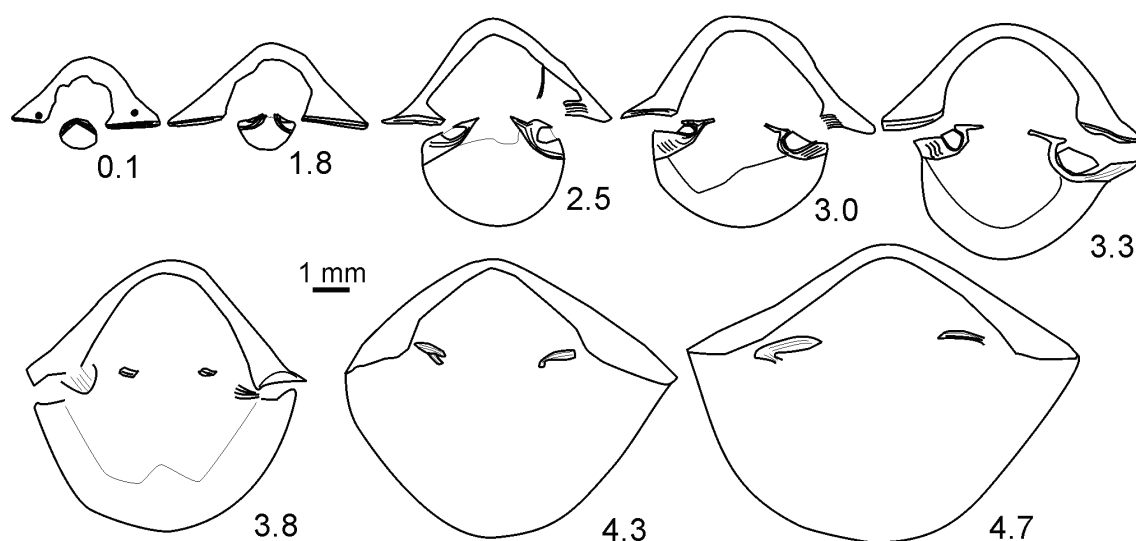


Figure 9. Selected transverse serial sections illustrating the internal structures in *Rugosatrypa flexibilis* (Cherkesova in T. Modzalevskaya & Cherkesova, 1994), GM IDPMG 42/201, Lower Devonian, lower Pragian, Heceta Island, Southeast Alaska. Scale bar represents 1 mm; numbers represent distance from initial section through specimen; length of sectioned specimen 18.8 mm.

in common (Blodgett and Baranov, personal observation) with the mapped outcrop of the Devonian age Wadleigh Limestone of the Ham Island group shown on Plate 1 of Eberlein & Churkin (1970, their Dw unit). This small island was initially collected for fossils (USGS locality 2038-SD) by A.F. Buddington and was cited as being Middle Devonian in age based on identifications by Edwin Kirk (Buddington & Chapin 1929, p. 105). It is indicated as locality F-43 in Eberlein *et al.* (1983). Our work indicates an early Pragian age based on the brachiopod fauna (sharing many species with 03RB16) and also by the fact that Savage (1977) reported early Pragian conodonts from here as well. Correlation of the Early Devonian age limestones of northeastern Heceta Island was previously discussed in papers published by Baranov & Blodgett (2011, 2012). It is necessary only to add that the findings here of *Dubovikovia* cf. *kuzmini* (Cherkesova) and *Rugosatrypa flexibilis* (Cherkesova) once again confirming correlation of the Early Devonian limestones of the northeast part of Heceta Island with the Uryumskay, Tolbatskay and basal part of Daksanskay layers (the lower Pragian beds) of Taimyr (Cherkesova 1968) and the early Pragian age Soda Creek Limestone (named by Blodgett *et al.* 2000) from west-central Alaska.

Conclusions

The rhynchonellid and atrypid brachiopods described and illustrated here considerably amplify our taxonomic knowledge of such faunal elements from the Pragian of northwestern North America and Southeast Alaska in particular. The brachiopods described here show their closest affinities to coeval brachiopod faunas from the Soda Creek Limestone

(Farewell terrane) of west-central Alaska, Taimyr, and Selennyakh Ridge in Northeast Asia. Most of Alaska is considered to be comprised of allochthonous accreted terranes that are not native to North America. None of the brachiopod species reported from the Pragian on Heceta Island have been reported from North American craton-bound strata in Alaska, the Yukon, or elsewhere in northwestern Canada. Blodgett *et al.* (2010) considered the Silurian and Devonian fauna of the Alexander and Farewell terranes of southern Alaska to be most similar to those of Siberia.

The fauna described by Savage (1981) from USGS locality 2689-SD is part of the Alexander terrane of Southeast Alaska, and shows strong undoubted biogeographic affinities with the coeval early Pragian Soda Creek Limestone (Blodgett *et al.* 2000) from west-central Alaska (part of the Farewell terrane), as well as Taimyr, and Selennyakh Ridge. This is clearly indicated by Soda Creek brachiopods that are conspecific or very similar to those described by Savage (1981) from USGS locality 2689-SD as *Schizophoria* cf. *S. fragilis* Kozłowski, *Mesodouwillina* (*Protocymostrophia*) cf. *M. (P.) costatula* (Barrande), *Nucleospira hecetasensis* Kirk & Amsden, and *Reticulariopsis* sp., which we intend to further investigate in the future.

Acknowledgments

We wish to express our profound gratitude to A.G. Stepanov from the Institute of Diamond and Precious Metals Geology, Yakutsk Research Center, Siberian Division, Russian Academy of Sciences for photographing the brachiopod specimens. Work was executed in part with financial support of the Russian Fund for Basic Research (grant 13-05-00520) and Program of the Presidium of the Russian Academy of Science No. 23, Project No. 23.1.

We also wish to gratefully acknowledge the useful reviews of Michal Mergl, Michael Sandy, Peter Isaacson, and Howard Feldman. We thank James F. Baichtal (U.S. Forest Service, Thorne Bay, Alaska) for providing logistical support which made possible the collection of the material described herein.

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