

THE ATRYPOID BRACHIOPOD GENERA *SPINATRYPA* AND *SPINATRYPINA* IN LATE EMSIAN (LATEST EARLY DEVONIAN) STRATA OF THE SHELLABARGER LIMESTONE, DENALI NATIONAL PARK & PRESERVE, SOUTH-CENTRAL ALASKA

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Abstract—We here describe and establish two new distinctive atrypoid brachiopod species, *?Spinatrypa* n. sp. and *Spinatrypina mimsae* n. sp. from the late Emsian (latest Early Devonian) age Shellabarger Limestone of the Shellabarger Pass area, Denali National Park & Preserve, Talkeetna C-6 quadrangle, south-central Alaska. In addition, we also recognize another atrypoid species, *Spinatrypa* (*Togatrypa*) cf. *salagaensis* Alekseeva and Komarov 1996, which is close if not conspecific with the latter species described from North-East Russia. The host formation (Shellabarger Limestone) forms the oldest stratigraphic interval within the Mystic sequence of the Farewell terrane. The fauna of this interval is biogeographically distinctive and shows closely affinities with coeval fauna of the Kolyma region of northeastern Russia and elsewhere in Eurasia.

INTRODUCTION

In this paper we describe three distinctive spinatrypinids of late Emsian age from the Shellabarger Pass area of south-central Alaska (Fig. 1). Brachiopods are both diverse and abundant in a late Emsian (latest Early Devonian) age stratigraphic interval earlier established as the Shellabarger Limestone by the same authors (Blodgett et al., 2022) from the Shellabarger Pass area, Denali National Park & Preserve, Talkeetna C-6 quadrangle, south-central Alaska (Figs. 1, 2). A number of papers have previously appeared (Baranov and Blodgett, 2022; Blodgett, 1998; Blodgett and Boucot, 1999; Blodgett et al., 1997, 2002, 2021, 2022; Garcia-Alcalde and Blodgett, 2001) on the brachiopods from this unit, which is minimally 38.7 m (127 ft) thick and composed of lime mudstone and wackestone (Fig. 3). It is our aim in the near future to complete the description of the entire extensive brachiopod fauna and point out its distinctive paleobiogeographic affinities. In this paper we document the presence of three spinatrypinid brachiopod taxa: *?Spinatrypa* n. sp., *Spinatrypa* (*Togatrypa*) cf. *salagaensis* Alekseeva and Komarov, 1996 and *Spinatrypina mimsae* n. sp. The fauna from the Emsian limestone includes sponges (Rigby et al., 2009), rugose (see Blodgett et al., herein this volume) and tabulate corals, approximately 20 or more species of brachiopods, and trilobites. Common brachiopod genera observed from the Emsian outcrop include *Carinagypa*, *Ivdelinia*, *Clorinda*, *Myriospirifer*, *Sibirhynchia*, *Spinatrypa*, *Spinatrypina*, *Variatrypa*, *Carinatina*, *Opsiconidion*, and *Teichertina*. Previous work (Blodgett and Brease, 1997, Blodgett, 1998, Blodgett and Boucot, 1999, Garcia-Alcalde and Blodgett, 2001, and Blodgett et al., 2002) indicates a much stronger Eurasian component to the Farewell terrane, as opposed to the Cordilleran fauna known from east-central Alaska and Yukon Territory of westernmost Laurentia. This overwhelmingly Eurasian aspect suggests that the host terrane, the Farewell terrane, was a continental fragment of Siberian origin.

GEOLOGIC SETTING

In recent years, the concept that nearly all of Alaska, as well as much of the western Cordillera of North America, is composed of numerous, discrete accreted tectonostratigraphic (or lithotectonic) terranes (Coney et al., 1980; Jones et al., 1981, 1982, 1986, 1987; Silberling et al., 1992, 1994; Nokleberg et al., 1994) has come into general acceptance within the scientific community. The only exception to this is the triangular area

of east-central Alaska, more or less bounded on the northwest by the Porcupine River, to the west by the Cretaceous flysch belt of the Kandik Basin, and to the southwest by the Yukon River. This region, which includes the Nation Arch, represents a continuation of Precambrian and Paleozoic rocks exposed farther east in the Ogilvie Mountains of the Yukon Territory.

The specimens described here are from the Mystic Subterrane of the Farewell terrane of southwestern and west-central Alaska. It was originally described (Jones et al., 1981) as a separate tectonostratigraphic entity of full terrane rank. More recently, Decker et al. (1994) recognized that the Mystic, as well as the Nixon Fork and Dillinger terranes, were genetically related and all were reduced in rank to subterrane of a larger terrane, termed the Farewell terrane. Gilbert and Bundtzen (1984) considered the Dillinger and Mystic terranes, each of whose type sections were close to one another, to represent a single stratigraphic succession of Paleozoic to Triassic age, preferring to apply the term “sequence” to each. They considered the underlying Dillinger sequence to be a Cambrian to Lower Devonian deep-water succession followed depositionally by the Mystic sequence – laterally variable



FIGURE 1. Index map of Alaska showing location of Shellabarger Pass.

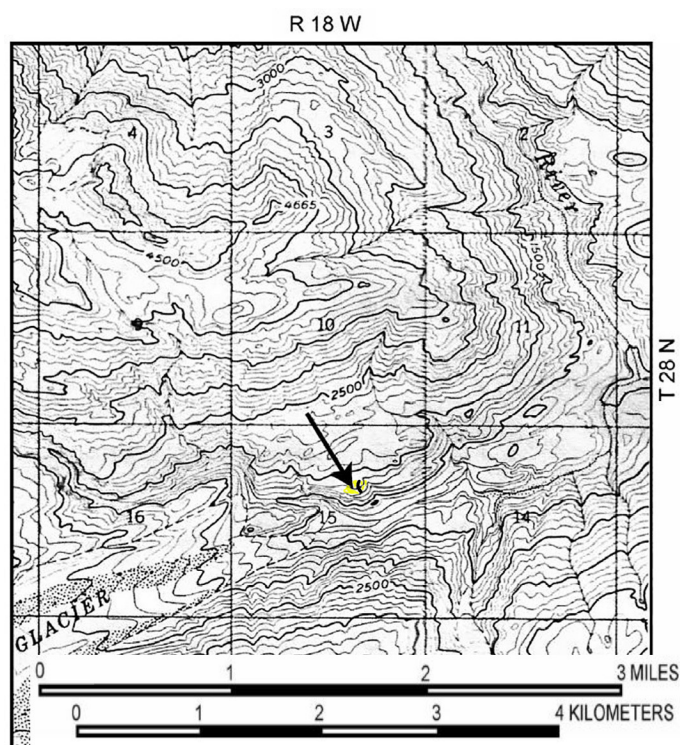


FIGURE 2. Map showing location of Late Early Devonian (Emsian) limestone outcrop in Shellabarger Pass, Denali National Park & Preserve and Preserve, Talkeetna C-6 quadrangle, south-central Alaska. Outcrop shown in yellow color surrounding the measured type section. Line indicates measured section. Base of section located at its north end.

Devonian to Triassic? shallow-water to nonmarine sedimentary rocks with intrusive and extrusive mafic and ultramafic rocks. The close stratigraphic relationship between the Dillinger and Mystic sequence (or subterrane) was supported by stratigraphic studies by Blodgett and Gilbert (1992) to the southwest in the Lime Hills 1:250,000 scale quadrangle. The Nixon Fork subterrane, defined originally as a full-rank terrane by Patton (1978), represents a predominately shallow-water carbonate platform, mostly laterally equivalent to deeper water Cambrian to Lower Devonian rocks of the Dillinger subterrane (Blodgett, 1983; Blodgett and Gilbert, 1983; Bundtzen and Gilbert, 1983; Gilbert and Bundtzen, 1983).

Richly fossiliferous Devonian rocks of the basal part of the Mystic sequence are well exposed in the Shellabarger Pass area, Talkeetna C-5 & C-6 quadrangles of south-central Alaska. The pass is situated in the remote western part of the Preserve portion of Denali National Park & Preserve (Fig.4). Field work was first

FIGURE 3. Measured type section of the Shellabarger Limestone. This section forms a single isolated limestone outcrop and constitutes the oldest Devonian interval within the D1 unit of Reed and Nelson (1977, 1980) and forms the oldest stratigraphic interval within the Mystic sequence of Gilbert and Bundtzen (1984). This outcrop is situated on the eastern side of a small hillock situated near the center of the NE¼, SW¼, NE1/4, sec. 15, T28N, R18W, Talkeetna C-6 1:63,360 scale quadrangle, latitude 62°31'21" N., longitude 152°35'32" W. The measured section type section of the outcrop indicates a minimum thickness of 38.7 m (127 ft) of lime mudstone and wackestone for the unit (Blodgett et al., 2022, see Fig. 3 and 4). The brachiopods discussed here were found within two intervals at 13.41-14.04 m (44-46 ft.) above the base of the section.

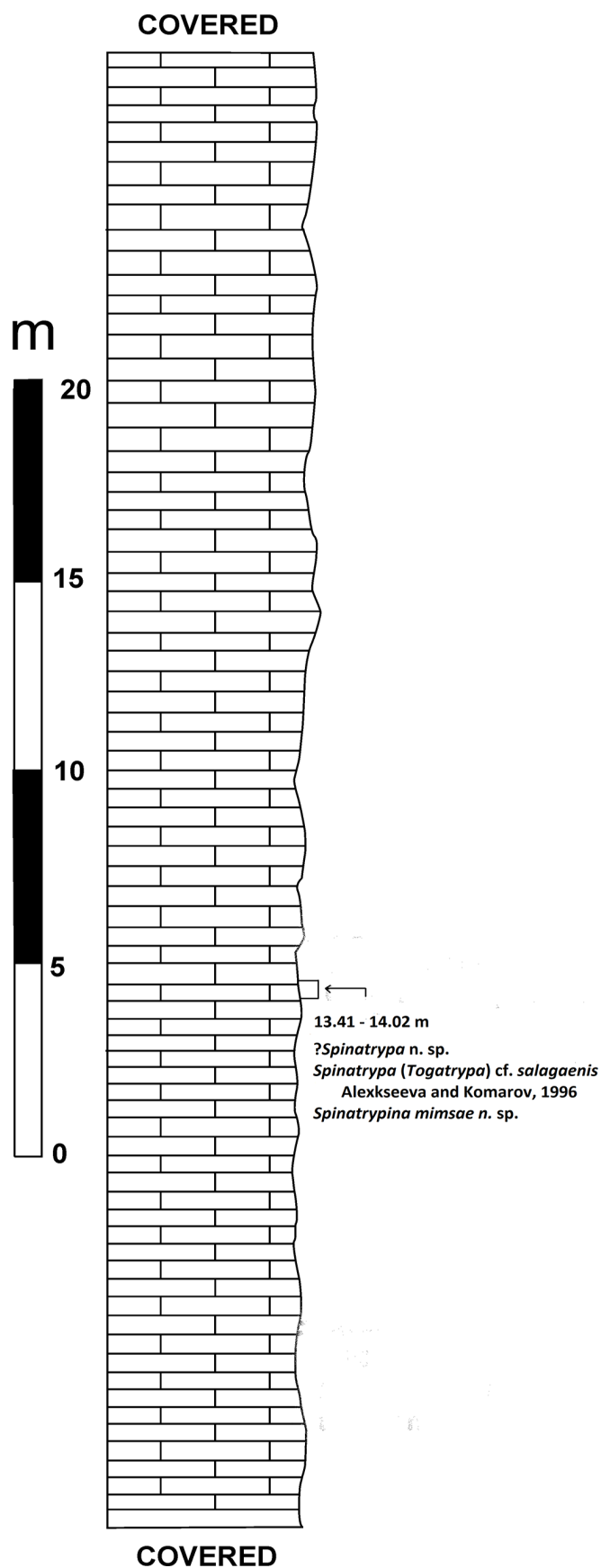




FIGURE 4. View of the outcrop of the type section of the Shellabarger Limestone, view looking east-northeast. View well demonstrates the rugged mountainous terrain surrounding Shellabarger Pass. The geologist on the right in the photo is the late Phil F. Brease (deceased, former NPS geologist, who was an extremely great supporter of paleontology within the park).

seriously attempted there in the mid-1970's and was followed by our 1996 summer field work with financial support from the National Geographic Society to study an unnamed limestone unit that forms the ultimate local base of the Mystic sequence. Two separate limestone packages are separated by a siliciclastic/chert unit. The lower limestone interval is of Emsian (late Early Devonian) age and is known from only one outcrop. The upper limestone interval, representing the vast majority of Devonian limestone outcrops in Shellabarger Pass, is of Frasnian (early Late Devonian) age. The fauna from the Emsian limestone includes sponges (Rigby et al., 2009), rugose and tabulate corals, approximately 20 or more species of brachiopods, and trilobites. Common brachiopod genera observed from the Emsian outcrop include *Carinagypa*, *Ivdelinia*, *Clorinda*, *Myriospirifer*, *Sibirirhynchia*, *Spinatrypa*, *Spinatrypina*, *Variatrypa*, *Carinatina*, *Opsiconidion*, and *Teichertina*. Previous work (Blodgett and Brease, 1997, Blodgett, 1998, Blodgett and Boucot, 1999, Garcia-Alcalde and Blodgett, 2001, and Blodgett et al., 2002) indicates a much stronger Eurasian component to the Farewell terrane, as opposed to the Cordilleran fauna known from east-central Alaska and Yukon Territory of westernmost Laurentia. This overwhelmingly Eurasian aspect suggests that the host terrane, the Farewell terrane, was a continental fragment of Siberian origin.

Until several years ago, most prior interpretations of the gross lithostratigraphy and faunal affinities of the best-studied terrane, the Nixon Fork terrane, had indicated either fragmentation from or lithic continuity with northwestern Canada (Blodgett, 1983; Churkin et al., 1984; Blodgett and Clough, 1985; Rohr and Blodgett, 1985). Newly acquired biogeographic data from Emsian (Late Early Devonian) strata of the Farewell terrane, along with reconsideration of the affinities of the faunas and floras of other time intervals, indicate that this continental margin sequence originated by rifting away from the Siberian continent, rather than northwestern North America (Blodgett and Brease, 1997, Blodgett, 1998, Blodgett et al., 2002).

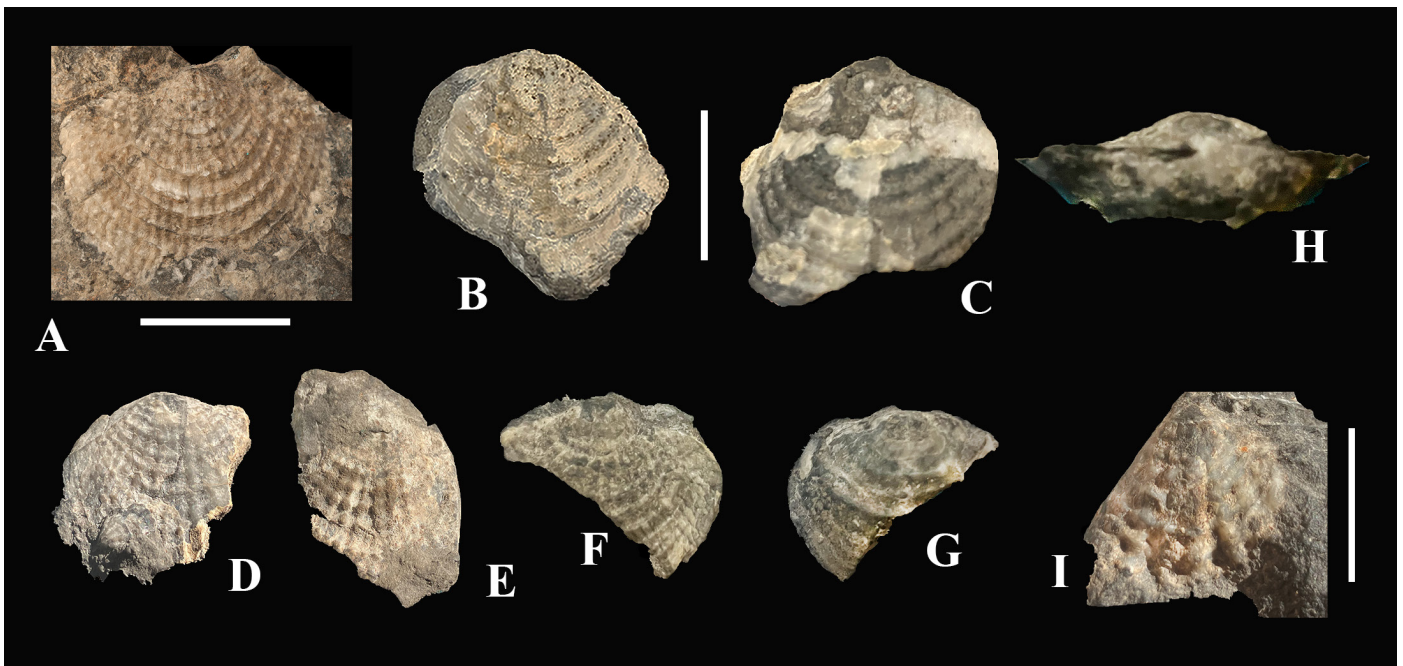


FIGURE 5A–H, ?*Spinatrypa* n. sp. A, ventral valve embedded in matrix (AKGMC 67), collected at 13.41–13.71 m (44–45 feet) above base of section, B–C, articulated shell, ventral and dorsal views of an articulated specimen (AKGMC 68), collected at 13.71–14.02 m (45–46 feet) above base of the unit; D–E, ventral and dorsal views of an articulated shell (AKGMC 69), collected at 13.71–14.02 m (45–46 feet) above the base of the unit; F–H, ventral, dorsal views and posterior views of an articulated specimen (AKGMC 70), collected at 13.71–14.02 m (45–46 feet) above the base of the unit, I, *Spinatrypa* (*Togatrypa*) cf. *salagaensis* Alekseeva and Komarov, 1996, ventral valve (AKGMC 71). Collected at 13.71–14.02 m (45–46 feet) above the base of the unit. Scale bar in all instances = 5 mm.

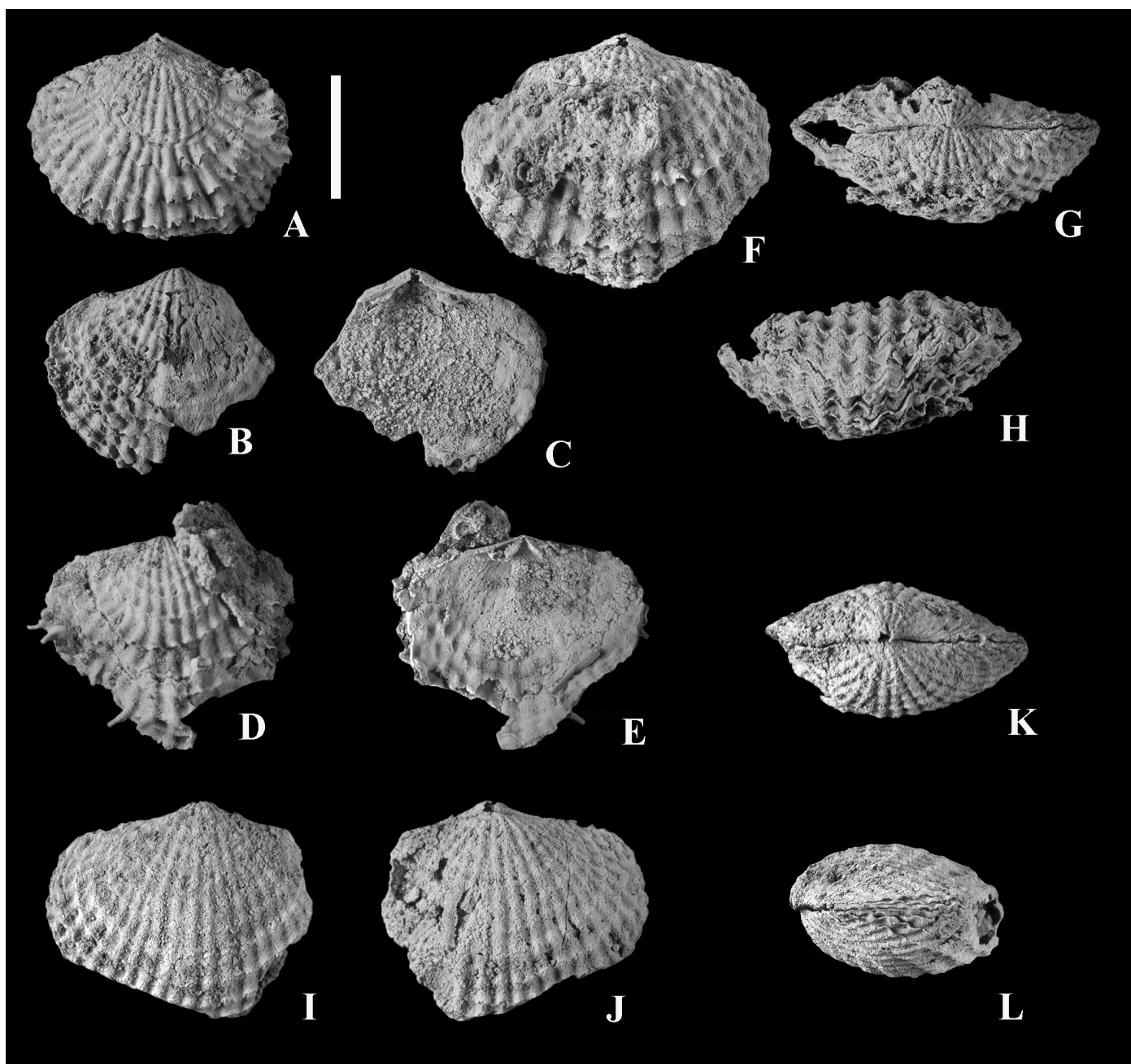


FIGURE 6. Undescribed species of *Spinatrypa* from early Eifelian strata of the upper part of the Cheeneetnuk Limestone (Blodgett and Gilbert, 1983) of the McGrath A-5 quadrangle of west-central Alaska (part of the Farewell terrane). **A**, dorsal valve of an articulated specimen; **B-C**, exterior and interior view of a free ventral valve; **D-E**, exterior and interior view of a free dorsal valve; **F-H**, dorsal, posterior, and anterior views of an articulated specimen; **I-L**, ventral, dorsal, posterior, and anterior views of an articulated specimen. Scale bar = 10 mm.

SYSTEMATIC PALEONTOLOGY

Repository: – The brachiopod specimens described in this paper are deposited at the Alaska Geological Materials Center (prefix GMC AK), Anchorage, Alaska.

Order Atrypida Rzhonsnitskaya, 1960
 Suborder Atrypidina Moore, 1952
 Superfamily Atrypoidea Gill, 1871
 Family Atrypidae Gill, 1871
 Subfamily Spinatrypinae Copper, 1978
 Genus *Spinatrypa* Stainbrook, 1951

Type species: *Atrypa hystrix* var. *occidentalis* Hall, 1858

?*Spinatrypa* n. sp.

Description. Medium-sized, oval, biconvex, with the greatest width and thickness near the middle. The ventral valve is widest in the middle. The umbo is low, curved. The anterior part of the valve is convex and it flattens out towards the anterior edge. The lateral slopes are gentle. The dorsal valve is flattened with steeper lateral slopes than those of the ventral valve. The ribs are rounded, dichotomizing towards the anterior edge. The intercostal spaces are approximately equal to the width of the ribs. Frills are observed on the continuation of the growth plates. At 5 mm of length in the middle of the ventral valve there are 5-6 ribs. The total number of ribs cannot be counted due to the

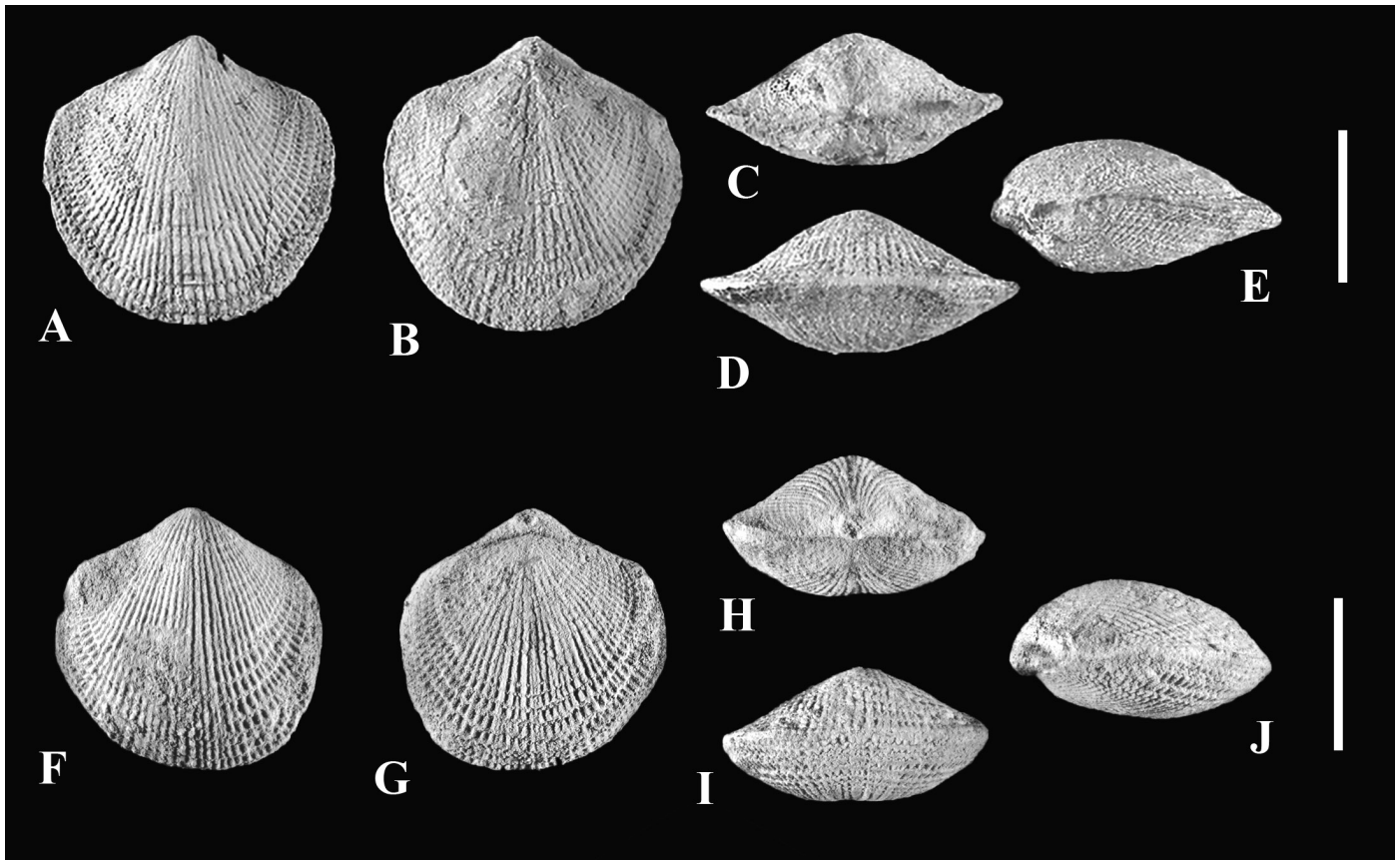


FIGURE 7. *Spinatrypina mimsae* n. sp. from the late Emsian age Shellabarger Limestone. A-E, Holotype, ventral, dorsal, posterior, anterior, and lateral views of an articulated specimen. AKGMC-71. F-J, ventral, dorsal, posterior, anterior, and lateral views of another articulated specimen. AKGMC-72. Scale bar = 5 mm. Both illustrated specimens recovered from talus at 13.41 m (44 feet) above base of measured section.

incomplete preservation of the shell layer. The internal structure is unknown.

Remarks. ?*Spinatrypa* sp. is similar in the external structure of the shell to *Spinatrypa margarita* (Barrande), described by R.E. Alekseeva (1962) from the Krekov Horizon (Pragian) of the Kuznetsk basin (Western Siberia), differing only in slightly larger sizes. The peculiar external structure and incomplete external structure of the shell, as well as its unknown internal structure, do not allow us to classify it with complete confidence as belonging to the genus *Spinatrypa*. The new species illustrated here does not closely approach any species described from the Emsian and Eifelian of northwestern Laurentia (east-central Alaska, Yukon Territory, of the Canadian Arctic Islands).

Comparison. Three unillustrated and unnamed species of *Spinatrypa* (*S. sp. A*, *S. sp. B*, and *S. sp. C*) were noted in Blodgett's (1978) MS thesis from Emsian strata of the McCann Hill Chert of east-central Alaska. These specimens are deposited in the University of Alaska Museum of Paleontology, Fairbanks, Alaska. None of these species closely resembles our species described here. An undescribed and previously unillustrated species of *Spinatrypa* is present in early Eifelian strata of the Cheeneentuk Limestone of the McGrath A-5 quadrangle (Farewell terrane). It is illustrated here on Figure 6. This unnamed species differs from ?*Spinatrypa* n. sp. in being coarse ribbed and in having a much deeper dorsal valve.

Subgenus *Togatrypa* Havlíček, 1987

Spinatrypa (*Togatrypa*) cf. *salagaensis* Alekseeva and Komarov, 1996

Figure 5I

Remarks. The species is represented by one incomplete shell found in the Shellabarger Limestone of south-central Alaska at 13.71-14.02 m (45-46 feet) above the base of the unit. The ventral valve is of medium size, slightly convex, isometric. The ribs are very coarse, and have very coarse nodular thickenings formed at their intersection with the growth plates. The intercostal spaces are equal in width to the thickness of the ribs. In terms of the nature of the ribbing, the Alaskan species from Shellabarger Limestone is close to *Spinatrypa* (*Togatrypa*) *salagaensis* Alekseeva and Komarov, 1996 (p. 142-143, Pl. XV, figs. 9, 10) from the Vecherninskaya Suite (Emsian) of North-East Russia, but differs in its smaller size.

Subfamily Spinatrypininae Copper, 1978

Genus *Spinatrypina* Rzhonsnitskaya, 1964

Type species: *Spinatrypina margaritoides* Rzhonsnitskaya, 1964

Spinatrypina (*Spinatrypina*) *mimsae* n. sp.

Figure 7

Description: The shell is small, biconvex, oval, finely ribbed, with the greatest width and thickness in the middle. The

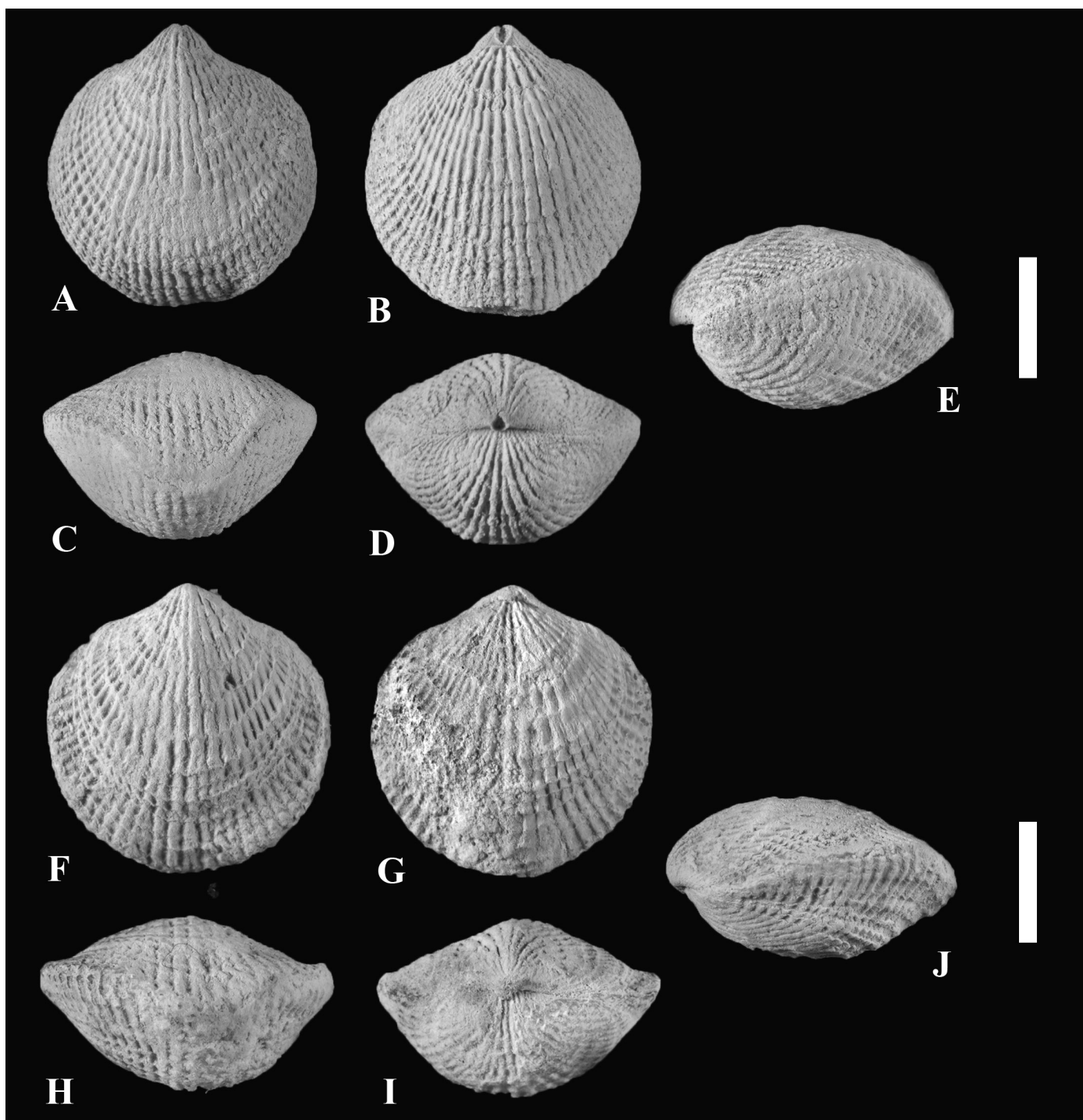


FIGURE 8. *Spinatrypina tichiensis* Rzhonsnitskaya, 1967 from early Pragian strata of the Soda Creek Limestone, Medfra B-3 quadrangle, west-central Alaska (belonging to the Nixon Fork subterrane of the Farewell terrane). A-E, ventral, dorsal, anterior, posterior and lateral views of an articulated specimen. F-J, ventral, dorsal, anterior, posterior, and lateral views of another articulated specimen. Scale bar = 5 mm.

hinge edge is short and slightly curved. The anterior commissure is rectimarginate. The ventral valve is swollen in the posterior half and flattens out to the front and sides. The beak is slightly curved with a rounded foramen. The dorsal valve is equal in convexity to the ventral one. In its posterior half, a longitudinal depression is observed. The ribs are rounded, with intercostal spaces equal to the width of the ribs. In total, there are up to 50 ribs on the surface of the valves. In the direction of the anterior edge, they dichotomize and intercalate. In the middle part of the valves, 1 mm contains 3-3.5 ribs. Concentric sculpture is

represented by raised growth plates, at the intersection of which with the ribs, hollow needles are observed. The internal structure is unknown.

Remarks: *Spinatrypina mimsae* n. sp. differs from the Siberian species *S. (S.) asperoides* (Biernat, 1964) and *S. (S.) praebodini* Rzhonsnitskaya, 1964 (see Alekseeva and Komarov, 1996) in its thin ribs and their large number and the presence of hollow needles at the intersection of the raised growth plates and ribs. We know of two other undescribed species of *Spinatrypina* in Alaska, both occurring in the Nixon Fork

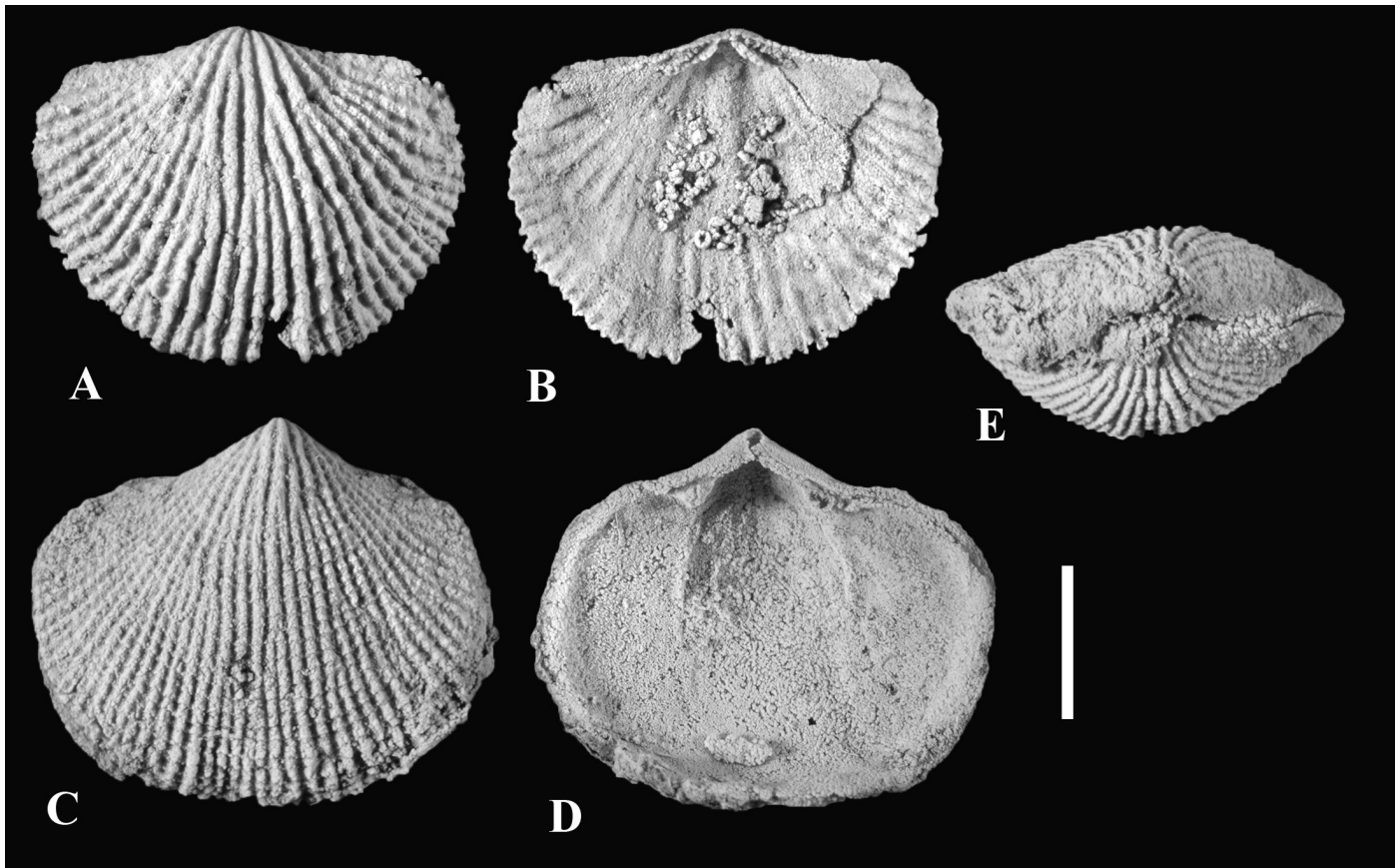


FIGURE 9. Undescribed species of *Spinatrypina* from early Eifelian strata of the upper part of the Cheeneetnuk Limestone, McGrath A-5 quadrangle, west-central Alaska. **A-B**, exterior and interior views of an isolated free dorsal valve. **C-D**, exterior and interior views of a free ventral valve. (ribbing seems finer than in dorsal valve) **E**, posterior view of an articulated specimen. Scale bar = 5 mm.

subterranean of the Farewell terrane. One is from early Pragian strata of the Soda Creek Limestone of Blodgett et al. (2000) and is here identified as *Spinatrypina tichiensis* Rzhonsnitskaya, 1967 (Fig. 8). It differs from *Spinatrypina mimsae* n. sp. in its much larger size, much coarser ribbing and being much more strongly biconvex. *Spinatrypina tichiensis* Rzhonsnitskaya has previously been reported from the early Pragian of North-East Russian and Taimyr. The other species is an unnamed species of *Spinatrypina* from early Eifelian age strata of the upper part of the Cheeneetnuk Limestone of Blodgett and Gilbert (1983). It is distinguished from *Spinatrypina mimsae* n. sp. in its much larger size and coarser ribbing.

Discussion: Copper (1967, p. 514-515) gave a stratigraphic range of Lower to Upper Devonian (Gedinnian-Frasnian) for this genus, with wide-wide distribution and acme of Givetian-Frasnian. In the same paper (based largely on the study of German material) he notes: “nearly all *Spinatrypina* of Eifelian age are small; large size in this genus is not reached until much later in Givetian time. This factor may be useful in broad faunal comparisons, but it is not axiomatic that small size is indicative of Eifelian age.” Copper (2002) in volume 4 of the Revised Brachiopod Treatise gave a stratigraphic range of Silurian (?Ludlow, Pridoli)-Upper Devonian (Frasnian) with worldwide geographic distribution. However, it should be noted that all Devonian occurrences are restricted to the tropical Old World Realm.

Etymology: The species is named in honor of Alison (Koch) Mims who contributed to the documentation, study, management, protection, and stewardship of National Park Service paleontology for more than 20 years.

ACKNOWLEDGMENTS

The research of Valeryi V. Baranov was carried out under the state order of the Institute of Geology of Diamond and Precious Metals of the Siberian Branch of the Russian Academy Sciences, project FUGG-2024-0005. Blodgett thanks the Committee for Research and Exploration of the National Geographic Society for providing funds in 1996 which permitted five days of fieldwork in the Shellabarger Pass area of south-central Alaska in late July of the same year. He also thanks Phil F. Brease (deceased) and Pam Sousanes of the U.S. National Park Service, Denali National Park, for able assistance in the field. Norman M. Savage, University of Oregon, Eugene, kindly identified the conodonts. Carl Bentley, helicopter pilot for Era Helicopters, capably got us into and out of the remote and beautiful area of the central Alaska Range.

We are grateful to Howard R. Feldman, Biology Department, Touro University, New York, New York and Dirk A. Bodnar (Murrieta, California) for their thoughtful reviews of this manuscript. Finally, we are indebted to Christopher L. Hodges (Sacramento State University, Sacramento) for his help in the formal drafting of several figures.

This work also greatly benefited from the recent (post-1995) collaborative efforts on the part of other paleontologists who have studied or made observations of our fossil collections from the Shellabarger Pass area. These include the following individuals: Jenaro L. Garcia-Alcalde (Oviedo, Spain, Devonian brachiopods), Alan E.H. Pedder (Sidney, British Columbia, Canada, deceased Devonian corals), Norman M. Savage (University of Oregon, Eugene, Devonian conodonts), and J. Keith Rigby, Sr. (Provo, Utah, deceased, Devonian sponges).

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