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Early Middle Devonian (Eifelian) Gastropods from the Wadleigh Limestone in the Alexander Terrane of Southeastern Alaska Demonstrate Biogeographic Affinities with Central Alaskan Terranes (Farewell and Livengood) and Eurasia

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Abstract

Silicified Eifelian (early Middle Devonian) gastropods form the dominant component of a mollusk-rich fauna from U.S. Geological Survey fossil locality M1299–SD, on a small islet in the NW¼NE¼ sec. 34, T. 70 S., R. 79 E., of the Craig D–4 quadrangle, southeastern Alaska (Alexander terrane). Six species are recognized from this locality of the Wadleigh Limestone, most of which are conspecific or closely allied with coeval gastropod faunas known from the Nixon Fork subterrane of the Farewell terrane of west-central Alaska and the Livengood terrane of east-central Alaska. None of these species is known from contemporaneous, miogeoclinal strata of western Canada. None of the species discussed herein has been recognized within coeval rocks of nonaccreted western North America, and these close affinities suggest that the Alexander terrane, like the related Farewell and Livengood terranes, is of Eurasian origin, most likely representing rifted marginal parts of the Siberian paleocontinent or, less likely, part of northeastern Baltica. Similarly strong biogeographic linkages are also noted in older (Late Silurian and Early Devonian) faunas of the Alexander terrane.

Introduction

The Wadleigh Limestone, named by Eberlein and Churkin (1970), is a medium- to thick-bedded "relatively pure, fossil-fragmental limestone," with interbedded argillaceous limestone and calcareous shale in the lower part of the unit. The limestone is rich in corals, crinoid columnals, and the stromatoporoid Amphipora and contains less abundant brachiopods, gastropods, bivalves, nautiloids, ammonoids, and ostracodes. The unit is inferred to represent patch reefs, reef breccia, and reef-peripheral deposits (Eberlein and Churkin, 1970). The unit is assigned an Eifelian to Famennian (Middle and Late Devonian) age (Eberlein and others, 1983). The unit concordantly and gradationally overlies red beds of the Lower Devonian Karheen Formation.

Although the Wadleigh Limestone is richly fossiliferous, very few megafossils have been described or illustrated from it. Previous publications addressing various elements of the Wadleigh megafauna include Oliver and others (1975) on Middle Devonian and Frasnian corals, Savage and Baxter (1995) on Frasnian brachiopods, and Blodgett and Cook (2002) with a description of a single gastropod species, *Cheeneetnukia frydai*, noted from the U.S. Geological Survey (USGS) fossil locality (M1299–SD) discussed here. Nautiloids from the same general horizon as USGS fossil locality M1299–SD were also discussed by Zavala and others (1995) and Soja and others (1996).

In this chapter, we discuss a small, but biogeographically important, silicified gastropod fauna from Eifelian strata of the Wadleigh Limestone in the Craig D–4 quadrangle, southeastern Alaska (Alexander terrane). The fauna is represented by a single collection made by J.W. Evans of the USGS in 1968 (his field No. 68AEs596) at a locality that was subsequently designated USGS fossil locality M1299–SD. The fossil locality is on the shoreline of a small islet in the NW¼NE¼ sec. 34, T. 70 S., R. 79 E., of the Craig D–4 quadrangle (fig. 1). This locality is approximately equivalent to fossil locality F–44 of Eberlein and others (1983). The specimens are coarsely silicified, but enough characteristics of the teleoconchs are preserved to allow significant taxonomic and biogeographic conclusions to be drawn. In our experience, Paleozoic gastropod faunas are more provincial than nearly every other faunal group, and so they have important biogeographic implications for terrane accretion in southern Alaska.

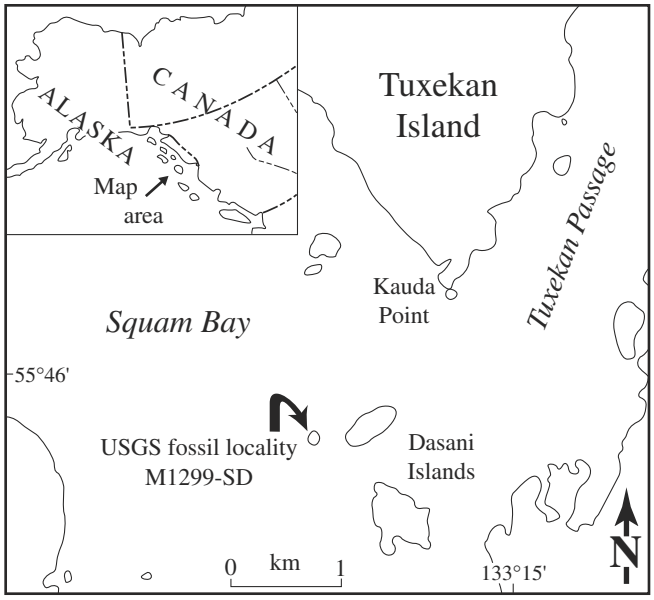

Figure 1. Islet in Tuxekan Narrows-Karheen Strait area, Craig D–4 quadrangle, southeastern Alaska, showing location of U.S. Geological Survey fossil locality M1299–SD (modified from Soja and others, 1996).

Gastropod Fauna

The following species are recognized from U.S. Geological Survey locality M1299–SD:

Cheeneetnukia frydai Blodgett and Cook, 2002—11 specimens

Astralites sp.—14 specimens

Kitakamispira ormistoni (Blodgett, 1992)—3 specimens

Paffrathopsis n.sp.—28 specimens

Euryzone sp.—15 specimens

Subulites (Fusispira) sp.—3 specimens

The most distinctive gastropod in the collection is *Cheeneetnukia frydai* Blodgett and Cook, 2002 (pl. 1, fig. 5), a species whose type area is from the upper part (of middle Eifelian age) of the Cheeneetnuk Limestone (Blodgett and Gilbert, 1983) of the McGrath A–4 and A–5 quadrangles, west-central Alaska. The Cheeneetnuk Limestone represents the uppermost Devonian platform carbonate unit recognized in the Nixon Fork subterrane stratigraphy of the McGrath quadrangle and is equivalent to the uppermost Devonian platform carbonate rocks of the type area of the Nixon Fork subterrane in the Medfra quadrangle, where it represents the upper part of the Whirlwind Creek Formation (Dutro and Patton, 1982). The Whirlwind Creek Formation was described by Dutro and Patton (1982, p. H19) as "an Upper Silurian to Upper Devonian sequence of predominantly shallow-water carbonate rocks, 1,000–1,500 m thick." Blodgett and others (2000) subsequently raised this formation to group status.

Three specimens of *Kitakamispira ormistoni* (Blodgett, 1992) are present in the Wadleigh Limestone collection (pl. 1, fig. 6). This species was originally described from the "Cascaden Ridge unit" of the Livengood quadrangle and was assigned to the closely related genus *Gyronema*; however, reconsideration of its distinctly nodose ornament now favors its placement in the genus *Kitakamispira* Kase and Nishida, 1988. This option was earlier considered by Blodgett (1992) but was rejected at the time it was established. Poorly preserved, silicified specimens of a nearly identical species were also noted in Blodgett (1992, p. 151) to be present in the uppermost part of the Whirlwind Creek Group of the Medfra B–3 quadrangle, west-central Alaska, and these specimens were suggested to probably be conspecific with the Livengood species.

The genus *Paffrathopsis* was recently proposed by Frýda (2000), the type species being *Nerita subcostata* Dechen (1832), which was reillustrated by D'Archiac and DeVerneuil (1842, pl. 34, figs. 5, 5a, 6) under the name *Natica subcostata*. The particular species of *Paffrathopsis* present in the Wadleigh Limestone collection (pl. 1, figs. 7–8) is also the most abundant, represented by 28 specimens. The silicification is quite coarse, but nonetheless, this species appears to represent a new species that differs from the type species, *P. subcostata* (D'Archiac and DeVerneuil, 1842).

The pseudophorid gastropod genus *Astralites* Whiteaves, 1892, was described originally from Givetian beds of the Winnipegosis Formation of Manitoba. The type species is *A. fimbriatus* Whiteaves. A total of 14 specimens are present in USGS collection M1299–SD, which can be ascribed to this genus (pl. 2, figs. 1–3). Heidelberger (2001) ascribed two German species from the Givetian to the genus: *A. sublimbatus* (D'Orbigny, 1850) and *A. muelleri* Heidelberger, 2001. The genus is also present in the upper part (Eifelian) of the Cheeneetnuk Limestone,

The genus *Euryzone* is represented by 15 specimens in USGS collection M1299–SD, most of which are coarsely silicified (pl. 1, figs. 1–4), although 1 specimen (pl. 1, fig. 4) is preserved well enough to show the typical placement of the selenizone on the upper whorl face that is associated with the genus. The type species of the genus is *E. delphinuloides* (Schlotheim) from the Givetian of Germany. The genus is widespread in many Givetian localities worldwide. The Wadleigh species illustrated here closely approaches the type species, but the preservation of the Alaskan material is too coarse to confirm species level identity with the type species. Another *Euryzone* species, *Euryzone* n.sp. Blodgett, 1992, has been previously described from the Eifelian strata of the "Cascaden Ridge unit," Livengood B–3 quadrangle, east-central Alaska (Livengood terrane). However, the Livengood terrane species differs in having a more angular whorl profile, in contrast to the smooth, evenly rounded whorls found in the Wadleigh Limestone specimens.

Subulites (*Fusispira*) sp. (pl. 1, fig. 9; pl. 2, fig. 4) is represented in USGS collection M1299–SD by three specimens that appear to be conspecific, or closely allied with *Subulites* (*Fusispira*) sp. Blodgett, 1992, described from Eifelian beds of the "Cascaden Ridge unit" in exposures of the Livengood terrane of the Livengood B–3 quadrangle, east-central Alaska. As noted by Blodgett (1992, p. 160), the Livengood terrane species is also present in Eifelian beds of the uppermost part of the Cheeneetnuk Limestone, McGrath A–5 quadrangle, west-central Alaska (part of the Nixon Fork subterrane of the Farewell terrane).

Biogeographic Implications

The Eifelian gastropod fauna known from the Wadleigh Limestone (USGS fossil loc. M1299–SD) is essentially identical at the species level with coeval faunas known from the Nixon Fork subterrane of the Farewell terrane of west-central Alaska and the Livengood terrane east-central Alaska (see fig. 2). None of these gastropod species is recognized in nonaccreted rocks of western North America. Their extremely close similarities suggest a similar Eurasian origin, mostly

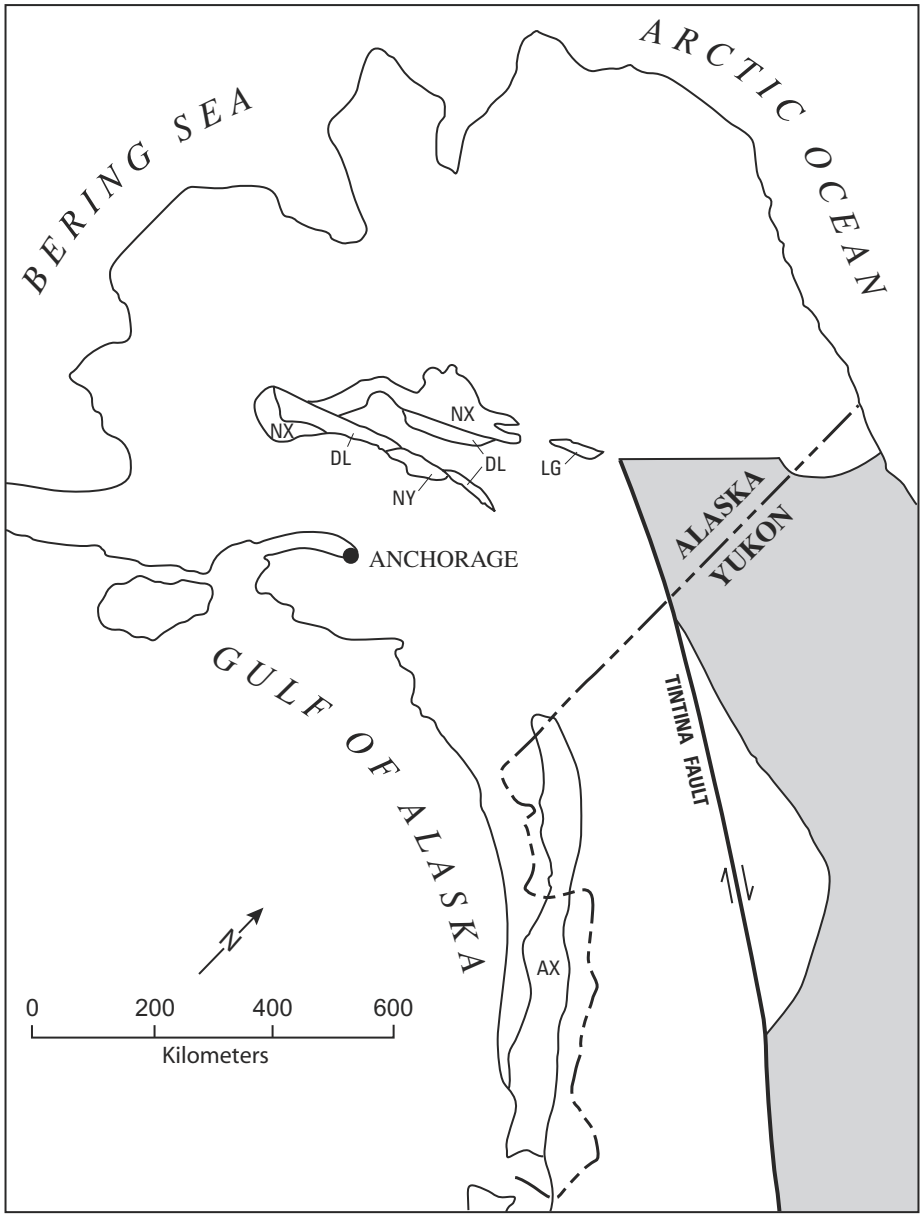

Figure 2. Tectonostratigraphic terranes and component subterranes in Alaska (modified from Blodgett and others, 2002). AX, Alexander terrane; LG, Livengood terrane. Subterranes of the Farewell terrane: DL, Dillinger; MY, Mystic; NX, Nixon Fork. Shaded area, North American autochthonous basement.

likely from a marginal part of the Siberian paleocontinent, as indicated by biogeographic affinities (primarily based on brachiopods) of the Farewell terrane (Blodgett and Brease, 1997; Blodgett, 1998; Blodgett and Boucot, 1999; Garcia-Alcalde and Blodgett, 2001; Blodgett and others, 2002).

Close alliance of the Alexander terrane Eifelian gastropod fauna with that of the Farewell and Livengood terranes is also supported by another Eifelian age collection recovered in 1958 by Donald J. Miller of the USGS from the Chilkat Mountains of the Juneau D–6 quadrangle, part of the Alexander terrane in southeastern Alaska. This small collection contained several brachiopod species, as well as several gastropod species and the dasyclad alga genus *Coelotrochium*. Many of these species were conspecific with species in the Cheeneetnuk Limestone of the Farewell terrane (Blodgett and others, 2002). As noted elsewhere, the alga genus *Coelotrochium* is almost a hallmark for the shallow-water, inner-carbonate-platform facies of Eifelian rocks of the Farewell terrane and is also known from northern Europe (Baltica), but it has never been reported from cratonic or miogeoclinal rocks of North America.

Rugose corals from Middle Devonian strata of the Alexander terrane also have non-North American affinity. Oliver and others (1975, p. 19) noted that the Middle Devonian coral fauna from the Wadleigh Limestone of southeastern Alaska was distinct from that of western North America, stating that "none of these corals from southeastern Alaska seems conspecific or very closely related to Hume [Shale of Northwest Territories] or Great Basin species."

An unusually rich, biogeographically distinctive fossil fauna of Emsian (late Early Devonian) age is known from Kasaan Island on the east side of Prince of Wales Island, southeastern Alaska. The earliest mention of this fauna is by Kindle (1907), who provided a faunal list from these beds and noted that the entire fauna was more strongly allied with Asiatic and European faunas than with contemporaneous North American faunas outside of Alaska. The foreign affinities were particularly emphasized by the presence of the bivalve *Hercynella* in a single horizon in the lower part of the Devonian section on Kasaan Island. Forney and others (1981, p. 131) noted the presence of typical "Bohemian" molluscan elements in the Emsian strata of Kasaan Island, including the distinctive bivalve *Hercynella* cf. *H. bohemica* Barrande, the oriostomatid gastropod *Oriostoma* sp. aff. *O. princeps* Oehlert, and the tremanotid gastropod *Boiotremus* cf. *B. fortis* Frech. We note that Lower Devonian Bohemian (or Barrandian) faunas have close biogeographic affinities with Uralian faunas of Russia. Blodgett and others (1988) illustrated two gastropod species from the Kasaan beds: Oriostoma sp. (their figs. 6.7, 6.8) and *Tubina* sp. (their figs. 6.5, 6.6). The oriostomatid genus Tubina is foreign to North America, and no previous reports of the taxon are known from the Western Hemisphere. In a broad survey of all known Emsian gastropod collections from western or Arctic North America, not one species of the richly diverse Kasaan Island fauna is shared with faunas of undoubted North American origin. The closest related fauna from western North America is that from the Nixon Fork subterrane of the Farewell terrane exposed on the south flank of Limestone Mountain, Medfra B–4 quadrangle, west-central Alaska (Blodgett and others, 1988, 2002; Blodgett and Rohr, 1989; Frýda and Blodgett, 1998 and in press). Emsian brachiopods from Kasaan Island also are characterized by close affinities with contemporaneous Uralian and (or) Siberian faunas (Soja, 1988; Blodgett and others, 2002). Early Devonian corals from Noyes Island, off the west side of Prince of Wales Island, were also noted by Churkin and others (1969, 1970) as showing their closest affinities with those of the former USSR, notably the Asiatic part (Siberia and Kolyma).

The Upper Lower to Upper Silurian Heceta Limestone of southeastern Alaska contains a diverse brachiopod fauna of Uralian-Cordilleran affinities (Blodgett and others, 2002). At the species level, however, as noted by Kirk and Amsden (1952, p. 54), the Heceta brachiopod faunas most closely resemble Late Silurian faunas described by Khodalevich (1939) from the east slope of the Urals.

Late Silurian gastropods from the Glacier Bay region of southeastern Alaska (part of the Alexander terrane) likewise are biogeographically most closely allied to Late Silurian faunas known from the Ural Mountains of Russia and the Farewell terrane of southwestern and west-central Alaska (Rohr and others, in press; Rohr and Blodgett, this volume). Like contemporaneous rocks of the Farewell terrane of southwestern and west-central Alaska, the Heceta Limestone of the Alexander terrane contains extensive Late Silurian algal-reef-mound complexes with an algal flora and associated aphrosalpingid sphinctozoan sponges that are also known in the Urals (Riding and Soja, 1993; Rigby and others, 1994; Soja, 1994; Soja and Antoshkina, 1997; Blodgett and others, 2002). Similar complexes are unknown from rocks of equivalent age in the North America craton.

In summary, Silurian and Devonian megafossils from the Alexander terrane lack affinities with North America faunas from the western Cordillera of the United States or western or Arctic Canada but are closely allied with faunas described from the Urals, Central Asia, and the Kuznetsk Basin of Siberia. Their closest consistent biotic ties, however, are with the Farewell terrane of southwestern Alaska, suggesting that although they are dominated by differing sedimentologic regimes, these terranes were close enough to one another during Silurian and Devonian time to produce commonality among a large proportion of their fossil biota.

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References Cited

Blodgett, R.B., 1992, Taxonomy and paleobiogeographic affinities of an early Middle Devonian (Eifelian) gastropod faunule from the Livengood quadrangle, east-central Alaska: Palaeontographica, Abteilung A, v. 221, p. 125–168.

———1998, Emsian (Late Early Devonian) fossils indicate a Siberian origin for the Farewell terrane, *in* Clough, J.G., and Larson, Frank, eds., Short notes on Alaskan geology, 1997: Alaska Division of Geological & Geophysical Surveys Professional Report 118, p. 27–34.

Blodgett, R.B., and Boucot, A.J., 1999, Late Early Devonian (late Emsian) eospiriferinid brachiopods from Shellabarger Pass, Talkeetna C–6 quadrangle, south-central Alaska and their biogeographic importance; further evidence for a Siberian origin of the Farewell and allied Alaskan accreted terranes: Senckenbergiana Lethaea, v. 72, no. 1, p. 209–221.

Blodgett, R.B., and Brease, P.F., 1997, Emsian (late Early Devonian) brachiopods from Shellabarger Pass, Talkeetna C–6 quadrangle, Denali National Park, Alaska indicate Siberian origin for Farewell terrane [abs.]: Geological Society of America Abstracts with Programs, v. 29, no. 5, p. 5.

Blodgett, R.B., and Cook, A.G., 2002, Cheeneetnukiidae, a new Middle Devonian murchisonioid gastropod family, including the new genera *Cheeneetnukia* and *Ulungaratoconcha* based on representatives from Alaska and Australia: Memoirs of the Queensland Museum, v. 48, no. 1, p. 17–28.

Blodgett, R.B., and Gilbert, W.G., 1983, The Cheeneetnuk Limestone, a new Early(?)–Middle Devonian formation in the McGrath A–4 and A–5 quadrangles, west-central Alaska: Alaska Division Geological & Geophysical Surveys Professional Report 85, 6 p.

Blodgett, R.B., and Rohr, D.M., 1989, Two new Devonian spine-bearing pleurotomariacean gastropod genera from Alaska: Journal of Paleontology, v. 63, no. 1, p. 47–53.

Blodgett, R.B., Rohr, D.M., and Boucot, A.J., 1988, Lower Devonian gastropod biogeography of the Western Hemisphere, *in* McMillan, N.J., Embry, A.F., and Glass, D.J., eds., Devonian of the World: Canadian Society of Petroleum Geologists Memoir 14, v. 3, p. 285–305.

———1990, Early and Middle Devonian gastropod biogeography, *in* McKerrow, W.S., and Scotese, C.R., eds., Palaeozoic paleogeography and biogeography: Geological Society (London) Memoir 12, p. 277–284.

———2002, Paleozoic links among some Alaskan accreted terranes and Siberia based on megafossils, *in* Miller, E.L., Grantz, Art, and Klemperer, S.L., eds., Tectonic evolution of the Bering Shelf-Chukchi Sea-Arctic margin and adjacent landmasses: Geological Society of America Special Paper 360, p. 273–291.

Blodgett, R.B., Rohr, D.M., Measures, E.A., Savage, N.M., Pedder, A.E.H., and Chalmers, R.W., 2000, The Soda Creek Limestone, a new upper Lower Devonian formation in the Medfra quadrangle, west-central Alaska, *in* Pinney, D.S., and Kauth, P.K., eds., Short notes on Alaska geology, 1999: Alaska Division of Geological & Geophysical Surveys Professional Report 119, p. 1–9.

Churkin, Michael, Jr., Eberlein, G.D., Hueber, F.M., and Mamay, S.H., 1969, Lower Devonian land plants from graptolitic shale in southeastern Alaska: Palaeontology, v. 12, no. 4, p. 559–573.

Churkin, Michael, Jr., Jaeger, Hermann, and Eberlein, G.D., 1970, Lower Devonian graptolites from southeastern Alaska: Lethaia, v. 3, no. 2, p. 183–202.

D'Archiac, E.J.A., and DeVerneuil, E.P., 1842, On the fossils of the older deposits in the Rhenish provinces, preceded by a general survey of the fauna of Palaeozoic rocks, and followed by a tabular list of the organic remains of the Devonian System in Europe: Geological Society of London Transactions, v. 6, p. 303–410.

von Dechen, E.H.C., *in* De la Beche, H.T., Handbuch der Geognosie: Berlin, p. 533–534

D'Orbigny, Alcide, 1850, Prodrome de paléontologie stratigraphique universelle des animaux mollusques et rayonnés faisant suite au cours élémentaire de paléontologie et de géologie stratigraphiques: Paris, 392 p.

Dutro, J.T., Jr., and Patton, W.W., Jr., 1982, New Paleozoic platform formations in the northern Kuskokwim Mountains, west-central Alaska, *in* Stratigraphic notes, 1980–1982: U.S. Geological Survey Bulletin 1529–H, p. H13–H22.

Eberlein, G.D., and Churkin, Michael, Jr., 1970, Paleozoic stratigraphy in the northwest coastal area of Prince of Wales Island, southeastern Alaska: U.S. Geological Survey Bulletin 1284, 67 p.

Eberlein, G.D., Churkin, Michael, Jr., Carter, Claire, Berg, H.C., and Ovenshine, A.T., 1983, Geology of the Craig quadrangle, Alaska: U.S. Geological Survey Open-File Report 83–91, 53 p., 4 sheets, scale 1:250,000.

Forney, G.G., Boucot, A.J., and Rohr, D.M., 1981, Silurian and Lower Devonian zoogeography of selected molluscan genera, *in* Gray, Jane, Boucot, A.J., and Berry, W.B.N., eds., Communities of the past: Stroudsberg, Penn., Hutchinson Ross, p. 119–164.

Frýda, Jiří, 2000, Some new Givetian (late Middle Devonian) gastropods from the Paffrath area (Bergisches Land, Germany): Queensland Museum Memoirs, v. 45, no. 2, p. 359–374.

Frýda, Jiří, and Blodgett, R.B., 1998, Two new cirroidean genera (Vetigastropoda, Archaeogastropoda) from the Emsian (Late Early Devonian) of Alaska with notes on the early phylogeny of Cirroidea: Journal of Paleontology, v. 72, no. 2, p. 265–273.

——— in press, New Emsian (Late Early Devonian) gastropods from Limestone Mountain, Medfra B–4 quadrangle, west-central Alaska (Farewell terrane), and their paleobiogeographic affinities and evolutionary significance: Journal of Paleontology, v. 78, no. 1, p. 111–132.

Garcia-Alcalde, J.L., and Blodgett, R.B., 2001, New Lower Devonian (Upper Emsian) *Myriospirifer* (Brachiopoda, Eospiriferinae) species from Alaska and northern Spain and the paleogeographic distribution of the genus *Myriospirifer*: Czech Geological Society Journal, v. 46, no. 3–4, p. 59–68.

Heidelberger, Doris, 2001, Mitteldevonische (Givetische) Gastropoden (Mollusca) aus der Lahnmulde (südliches Rheinisches Schiefergebirge): Geologische Abhandlungen Hessen, v. 106, 291 p.

Kase, Tomoki, and Nishida, Tamio, 1988, Two new Middle Devonian gastropods from the Nakazato Formation of Kitakami, Northeast Japan, in Professor Tamio Kotaka commemorative volume on molluscan paleontology (Studies on Japanese Trilobites and Associated Fossils, no. 41): Saito Ho-on Kai Museum Special Publication 2, p. 257–261.

Khodalevich, A.N., 1939, Verkhnesiluriiskie brakhiopody vostochnogo sklona urala: Trudy Uralskogo Geologicheskogo Upraveleniya, Izdanie Uralgeoupravleniya, Sverdlovsk, 135 p.

Kindle, E.M., 1907, Notes on the Paleozoic faunas and stratigraphy of southeastern Alaska: Journal of Geology, v. 15, no. 4, p. 314–337.

Kirk, Edwin, and Amsden, T.W., 1952, Upper Silurian brachiopods from southeastern Alaska: U.S. Geological Survey Professional Paper 233–C, p. 53–66.

Oliver, W.A., Jr., Merriam, C.W., and Churkin, Michael, Jr., 1975, Ordovician, Silurian, and Devonian corals of Alaska: U.S. Geological Survey Professional Paper 823–B, p. B13–B43.

Riding, Robert, and Soja, C.M., 1993, Silurian calcareous algae, cyanobacteria, and microproblematica from the Alexander terrane: Journal of Paleontology, v. 67, no. 5, p. 710–728.

Rigby, J.K., Nitecki, M.H., Soja, C.M., and Blodgett, R.B., 1994, Silurian aphrosalpingid sphinctozoans from Alaska and Russia: Acta Palaeontologica Polonica, v. 39, no. 4, p. 341–391.

Rohr, D.M., Blodgett, R.B., and Frýda, Jiří, 2003, New Silurian murchisoniid gastropods from Alaska and a review of the genus *Coelocaulus*, *in* Clautice, K.H., and Davis, P.K., eds., Short notes on Alaska geology, 2003: Alaska Division of Geological & Geophysical Surveys Professional Report 120, p. 87–93.

Savage, N.M., and Baxter, M.E., 1995, Late Devonian (Frasnian) brachiopods from the Wadleigh Limestone, southeastern Alaska: Journal of Paleontology, v. 69, no. 6, p. 1029–1046.

Soja, C.M., 1988, Lower Devonian (Emsian) brachiopods from southeastern Alaska: Palaeontographica, Abteilung A, v. 201, p. 129–193.

———1994, Significance of Silurian stromatolite-sphinctozoan reefs: Geology, v. 22, no. 4, p. 355–358.

Soja, C.M., and Antoshkina, A.I., 1997, Coeval development of Silurian stromatolite reefs in Alaska and the Urals Mountains; implications for paleogeography of the Alexander terrane: Geology, v. 25, no. 6, p. 539–542.

Soja, C.M., Gobetz, K.E., Thibeau, Jennifer, Zavala, Erika, and White, Brian, 1996, Taphonomy and paleobiological implications of Middle Devonian (Eifelian) nautiloid concentrates, Alaska: Palaios, v. 11, no. 5, p. 422–436.

Whiteaves, J.F., 1892, The fossils of the Devonian rocks of the islands, shores or immediate vicinity of Lakes Manitoba and Winnipegosis: Geological Survey of Canada Contributions to Canadian Palaeontology, v. 1, no. 4, p. 255–359.

Zavala, Erika, Thibeau, Jennifer, Gobetz, K.E., and Soja, C.M., 1995, Origin of Middle Devonian nautiloid deposits, southeastern Alaska [abs.]: Geological Society of America Abstracts with Programs, v. 27, no. 1, p. 94.

PLATES 1, 2

Plate 1. Eifelian (early Middle Devonian) gastropods from USGS fossil locality M1299–SD.

Figures 1–4. *Euryzone* sp.

1, 2, 3. Apertural, apical, and basal views of coarsely silicified specimen. Magnification, ×1.5.

4. Oblique apical view of partial shell fragment, showing preserved trace of selenizone on final whorl. Magnification, ×2.

5. *Cheeneetnukia frydai* Blodgett and Cook, 2002. Side view. Magnification, ×1.5.

6. *Kitakamispira ormistoni* (Blodgett, 1992). Side view. Magnification, ×1.

7, 8. *Paffrathopsis* sp., abapertural and apical views. Magnification, ×2.0.

9. *Subulites* (*Fusispira*) sp. Blodgett, 1992. Side view of medium-size shell. Magnification, ×2.0.

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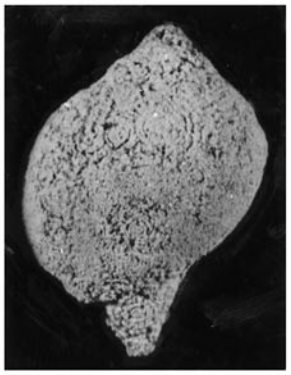

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Plate 2. Eifelian (early Middle Devonian) gastropods from USGS fossil locality M1299–SD.

Figures 1–3. *Astralites* sp.
1, 2, 3. Side, oblique side, and apical views of relatively large shell. Magnification, ×1.5.
4. *Subulites* (*Fusispira*) sp. Blodgett, 1992. Apertural view of large shell. Magnification, ×1.5.

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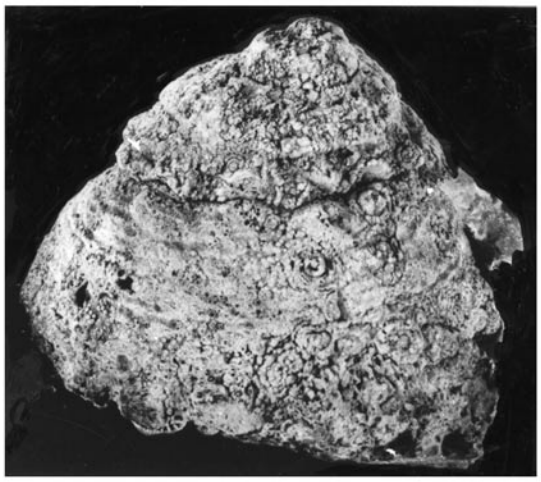

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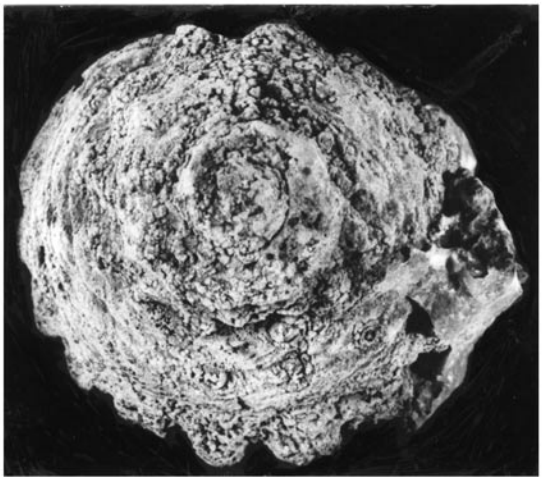

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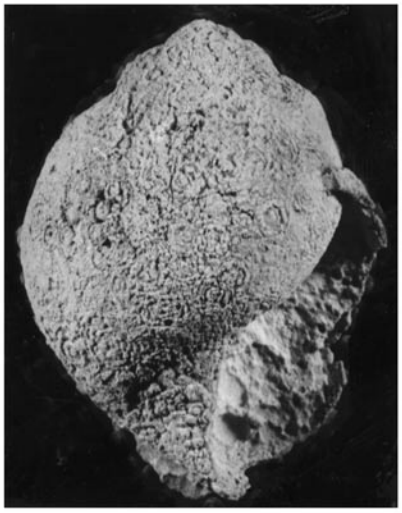

4