THE SOLITARY RUGOSE CORAL *ACANTHOPHYLLUM* IN THE SHELLABARGER LIMESTONE (LATE EMSIAN, LATE EARLY DEVONIAN) AT DENALI NATIONAL PARK AND PRESERVE, SOUTH-CENTRAL ALASKA

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Abstract—In this short note we provide documentation of the first rugose coral (*Acanthophyllum* sp.) to be formally illustrated from the Shellabarger Limestone of late Early Devonian (Emsian) age in Shellabarger Pass, Talkeetna C-6 quadrangle, south-central Alaska. This also comprises the first rugose coral to ever be illustrated from Denali National Park and Preserve. In addition, we provide information on its stratigraphic occurrence as well as of other reported occurrences of *Acanthophyllum* noted in Alaska.

INTRODUCTION

In this note we provide the first illustrations of Devonian rugose corals from Shellabarger Pass (see Fig. 1 for general location), Denali National Park, Alaska. Devonian brachiopods are now prominently known from this richly fossiliferous area. We are currently trying to document most of the Devonian megafauna, and hope soon to finish research on our richly diverse Emsian brachiopod megafauna. In the near future we will emphasize the Frasnian age fauna of the region. Detailed studies of the megafauna did not begin here until the later part of the 1990s, and these and subsequent studies indicate a strong Eurasian alliance, especially with Northeast Russia, rather with adjacent cratonic North American Devonian rocks of east-central Alaska, suggesting the host Farewell terrane originated as a rift block derived from NE Russia.

The Emsian fauna is from the Shellabarger Limestone, which was established by Blodgett et al. (2022). See Figure 2 for its outcrop belt in the Shellabarger Pass region in south-central Alaska where it primarily crops out in the Talkeetna C-6 quadrangle of south-central Alaska. The type section of the Shellabarger Limestone has a maximum measured thickness of 38.7 m (127 ft) (see Fig. 3).

GEOLOGIC SETTING

Blodgett et al. (2022, p. 73-75) provided the following discussion of the geologic setting of the Devonian of the Shellabarger Pass. The specimens described here are from the base of the Mystic sequence of the Farewell terrane of southwestern and west-central Alaska. The Mystic terrane was originally named by Jones and Silberling (1979) and described further by Jones et al. (1981) as a separate tectonostratigraphic entity of full terrane rank. More recently, Decker et al. (1994) recognized that the Mystic terrane, as well as the Nixon Fork and Dillinger terranes, were genetically related, and all were reduced in rank to subterranes of a larger terrane, termed the Farewell terrane. Gilbert and Bundtzen (1984) considered the Dillinger and Mystic terranes, each of whose type sections are close to one another, to represent a single stratigraphic succession of Paleozoic to Triassic age, assigning the term "sequence" to each. They considered the underlying Dillinger sequence to be a Cambrian to Lower Devonian deep-water succession overlain by the Mystic sequence, consisting of laterally variable 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 sequences has been studied by Blodgett and Gilbert (1992) to the southwest in the Lime Hills D-4 and D-5, 1:63,360 scale quadrangles.

The Nixon Fork subterrane, defined originally as a full-rank terrane by Patton (1978), represents a predominately shallow-water carbonate platform whose lower part is 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). Until the late 1990s, most interpretations of the gross lithostratigraphy and faunal affinities of the best-studied subterrane of the Farewell terrane, the Nixon Fork subterrane, 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; Abbott, 1995). Newly acquired biogeographic data from Lower Devonian strata of the Farewell terrane, together 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 an origin from northwestern North America (Blodgett and Brease, 1997; Blodgett, 1998; Blodgett et al., 2002). Much of this rifting appears to have occurred during Late Devonian to early Carboniferous time (Blodgett et al., 2010).

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

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

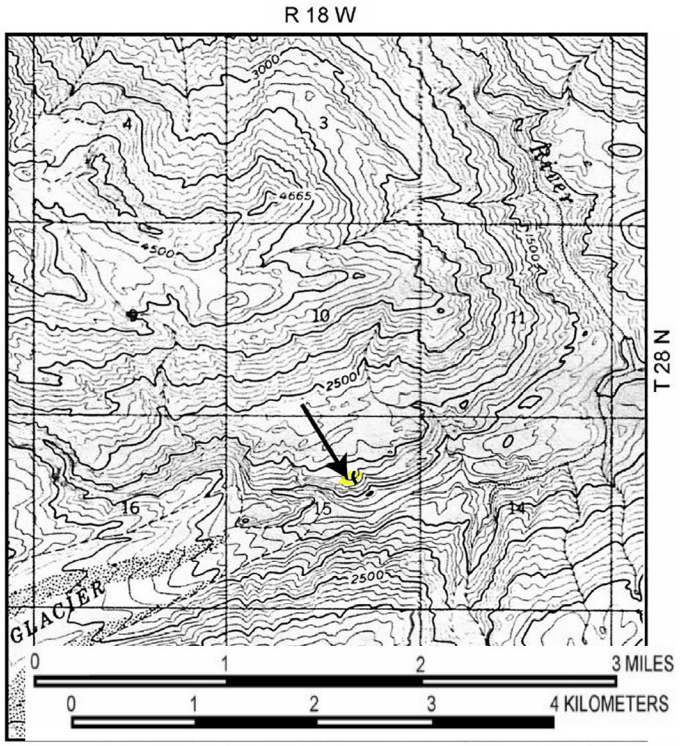

FIGURE 2. Map showing location of Late Early Devonian (Emsian) limestone outcrop in Shellabarger Pass, Denali National Park and Preserve, Talkeetna C-6 quadrangle, south-central Alaska. Outcrop shown in yellow color surrounding the measured type section. Line indicates measured section. Base of section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

pass is situated in the remote western part of the Preserve portion of Denali National Park & Preserve (Fig. 4). Field work was first 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.

The Frasnian limestone fauna has not yet been thoroughly reinvestigated taxonomically, but it is a proposed target for our future study. Preliminary identifications indicated the presence of the brachiopod genera *Schizophoria*, *Productella*, *Atrypa*, *Spinatrypa*, *Allanaria*?, *Tenticospirifer*, *Cyrtospirifer*, *Crurithyris*, *Eleutherokomma*, *Gypidula*, "*Camarotoechia*,"

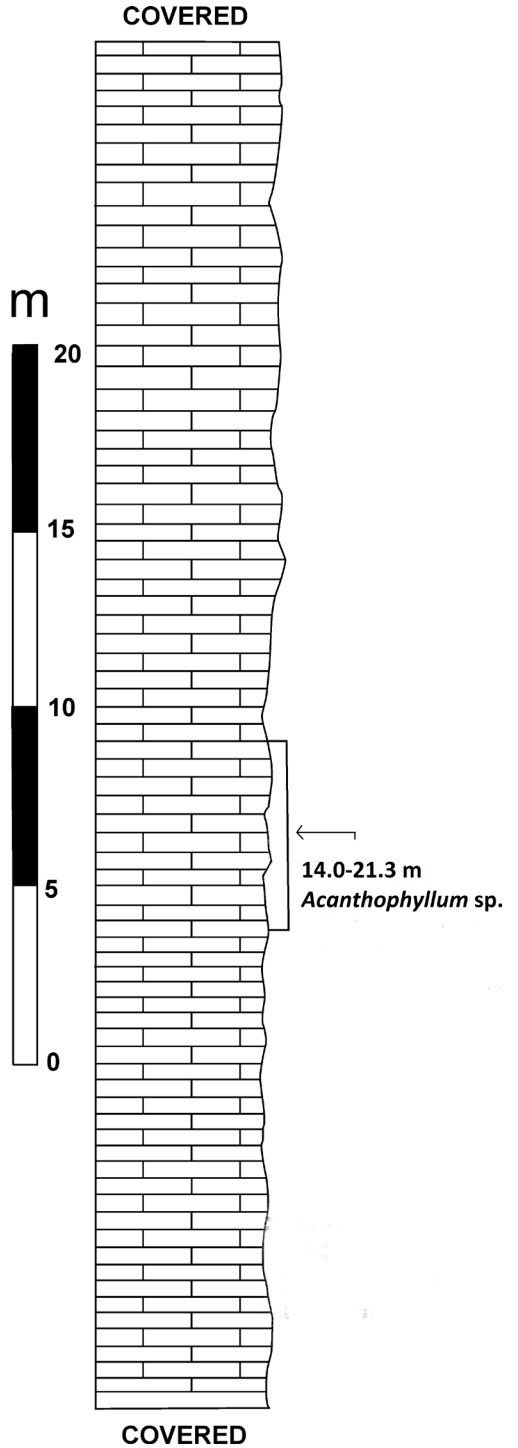

FIGURE 3. Measured type section of the Shellabarger Limestone. This section forms a single isolated limestone outcrop and constitutes the oldest Devonian interval within the Dl unit of Reed and Nelson (1977, 1980) and forms the oldest stratigraphic interval within the Mystic sequence of Gilbert and Bundtzen (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 discussed corals here were found in talus rubble derived from 14.0-21.3 m (46-70 ft.) above the base of the section.

FIGURE 4. Outcrop of the upper part of the type section of the Shellabarger Limestone (Emsian, Late Early Devonian) in Shellabarger Pass (view looking east-northeast). The two people in the photo are Pam Sousanes (NPS) (left) and one of the authors, Robert B. Blodgett (on right).

Ladogioides?, *Theodossia*, *Emanuella*?, and *Tylothyris*, as well as rugose and tabulate corals, the ammonoid *Manticoceras*, and the trilobite *Scutellum*.

CORALS FROM THE DEVONIAN OF SHELLABARGER PASS

The report of *Acanthophyllum* here is from richly fossiliferous Devonian rocks of the basal part of the Mystic sequence well exposed in the Shellabarger Pass area, Talkeetna C-6 quadrangle of south-central Alaska. These basal Emsian age beds were named the Shellabarger Limestone by Blodgett et al. (2022) and recognized to be minimally 38.7 m thick (see Fig. 3). The pass is situated in the remote western part of the Preserve portion of Denali National Park & Preserve. Fossils from this unit (megafossils and conodonts) indicate a late Emsian age.

Corals were listed previously in Reed and Nelson (1977, 1978) from this then unnamed stratigraphic unit, but no detailed taxonomic information was provided. J.T. Dutro, Jr. in an unpublished USGS E&R report dated February 2, 1976 (Shipment number A-75-18) on collection 75AR67 collection from the unit noted the rugose coral *Dohmophyllum* sp. and horn coral, indet. Unfortunately no illustrations of either form are available, but a concerted effort should be able to relocate them in the former USGS collections, which have been turned over to the National Museum of Natural History (Smithsonian Institution).

Overlying Devonian strata in Shellabarger Pass appear to belong to an unnamed carbonate unit of Frasnian (Early Late Devonian) age. William A. Oliver, Jr. of the USGS provided

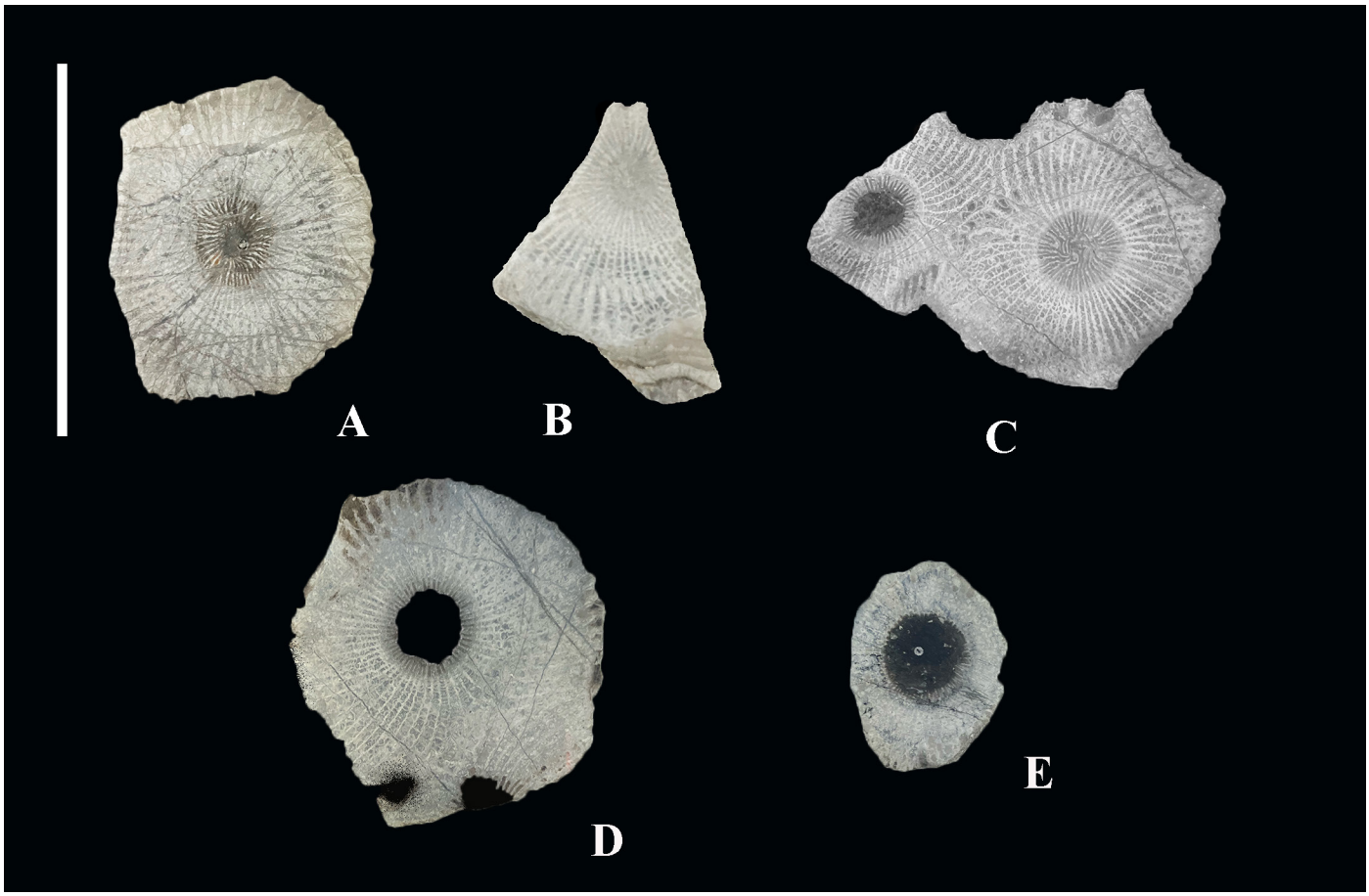

FIGURE 5. Five specimens of the solitary rugose coral *Acanthophyllum* sp. found in talus adjacent to 14.0-21.3 m (46-70 ft.) above the base of the section. All are transverse sections and are deposited in the Alaska Geologic Materials Center (prefix AKGMC) in Anchorage, Alaska. Specimen numbers are AKGMC 62-66. **A** – AKGMC-62, **B** – AKGMC-63, **C** – AKGMC-64, **D** – AKGMC-65, and **E** – AKGMC-66.

identifications on fossils in a series of USGS E&R reports (available online through the Alaska Paleontological Database (www.alaskafossil.org). Both rugose and tabulate corals were listed, including rugosans: *Tabulophyllum* sp., *Phillipsastraea sp.* (2 or 3 spp)., *Phillipsastrea*? sp., *Macgeea* sp., *Disphyllum sp., Disphyllum? sp., Syringaxon sp., Smithophyllum* sp., *Peneckiella? sp., Thamnophyllum sp., Paracanthus? sp.* and tabulates: *Alveolites* sp., *Thamnopora* sp., *Cladopora* sp., *Hexagonaria* sp., and *Syringopora* sp. None of these forms have previously been illustrated. In light of the relatively high diversity of the Frasnian coral collections, they would be an excellent target for future taxonomic study.

SYSTEMATIC PALEONTOLOGY

Repository: The rugose corals specimens illustrated in this paper are deposited at the Alaska Geologic Materials Center (prefix AKGMC), Anchorage, Alaska. These consist of about 9 coralla, the best of which are illustrated in Figure 5.

Order Rugosa Milne-Edward & Haime, 1850
Suborder Columnariina Rominger, 1876
Family Ptenophyllidae Wedekind, 1923
Genus *Acanthophyllum* Dybowski, 1873

Type species: *Cyathophyllum heterophyllum* Milne-Edwards & Haime, 1851

Acanthophyllum sp.
Fig. 5

Discussion: The genus *Acanthophyllum* is a well known and widely distributed solitary rugose coral genus. It is known from the Devonian (Pragian-Frasnian, see Bayer et al., 1956), but is most common in Emsian-Middle Devonian strata. Occurrences are widespread throughout the tropical Old World Realm. Reported occurrences of *Acanthophyllum* in Alaska can be found in Oliver et al. (1975) as well as The Alaska Paleontological Database website (www.alaskafossil.org). The genus is notably common in slightly younger strata (early Eifelian) of the Cheeneetnuk Limestone, McGrath A-5 quadrangle, west-central Alaska.

Material: About 9 coralla are present in the talus collection gathered at 46-70 feet (14.0-21.3 m) above the base of the Shellabarger Limestone. The five best coralla, represented by transverse thin sections, are illustrated here. The associated specimen numbers are: AKGMC-62, AKGMC-63, AKGMC-64, AKGMC-65, and AKGMC-66. These are deposited at the Alaska Geologic Materials Center (prefix AKGMC) in Anchorage, Alaska.

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This work 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), Norman M. Savage (University of Oregon, Eugene, Devonian conodonts), and J. Keith Rigby, Sr. (Provo, Utah, deceased, Devonian sponges). Reviews of a preliminary draft of this paper were graciously provided by Howard R. Feldman, Biology Department, Touro University, New York, New York and Tim Connors, U.S. National Park Service, Lakewood, Colorado.

Finally, we wish to honor one of our co-authors, Alan E.H. Pedder (1932-2023), prominent Devonian coral worker (recently deceased) of Sidney, British Columbia (Fig. 6). He was formerly with the Canadian Geological Survey in Calgary, Alberta, Canada, and was the leading student of Devonian corals from western North America. He was truly a great colleague and friend. We will miss you!

FIGURE 6. Alan Pedder at work in his office at the Geological Survey of Canada in Calgary studying Devonian corals.

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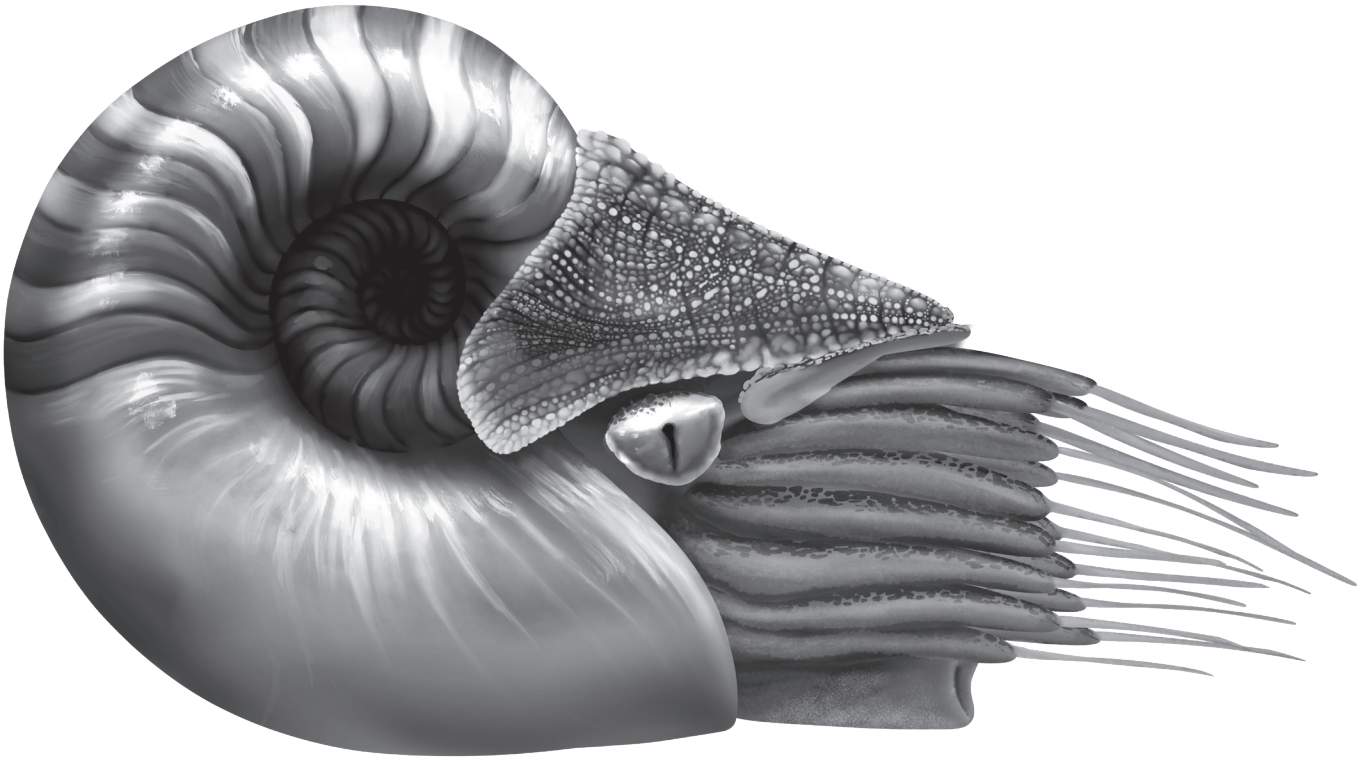
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