

ORDOVICIAN GASTROPODS FROM WESTERN NEWFOUNDLAND

D.M. Rohr, W.D. Boyce¹ and I. Knight¹
Sul Ross State University, Alpine, TX

ABSTRACT

Lower and Middle Ordovician gastropods from the Peabody Museum, Yale University, are described and illustrated to supplement the material previously known from western Newfoundland. Lower Ordovician Lecanospira compacta (Salter, 1859) and Euconia etna (Billings, 1865) are described and placed in their current stratigraphic context. The common but poorly known Lytospira (=Ecculiomphalus) distans (Billings, 1865), from the Cow Head Breccia is redescribed. The genus Subulties Emmons, 1842, is described for the first time from the Upper Ordovician of Newfoundland.

INTRODUCTION

Beginning in 1910, C. Schuchert, W.H. Twenhofel and C.O. Dunbar conducted field work in western Newfoundland. Large collections of Cambrian and Ordovician fossils were brought back to Yale University's Peabody Museum, where they reside today. The results of the stratigraphic research on the areas were summarized in Schuchert and Dunbar (1934). The diverse Ordovician gastropod fauna was being prepared as part of a doctoral dissertation by E.I. Leith (Schuchert and Dunbar, 1934), but it was not completed. Part of the collection is described and illustrated here. This complements our previous work on the gastropods of western Newfoundland (Rohr *et al.*, 2000, 2001, 2002; Rohr and Measures, 2001), part of a continuing study supported by the Geological Survey of Newfoundland and Labrador, National Geographic Society Committee for Research and Exploration and Sul Ross State University.

The Ordovician gastropods in the Peabody collections are from both the autochthonous and allochthonous Ordovician sequences of the outer domain of the Humber (tectonostratigraphic) Zone in western Newfoundland. They include many of the same taxa described and illustrated by Billings (1865), but there are also some other and better preserved taxa.

The Peabody Museum specimens discussed here are from Port au Port Peninsula, the Cow Head area and south of Port au Choix Peninsula (*see* Figure 1 and Appendix).

LITHOSTRATIGRAPHY

AUTOCHTHONOUS ROCKS

The St. George Group is a 500-m-thick succession of subtidal and peritidal limestone and dolostone, widely exposed in western Newfoundland (Figure 1). It is divided into the Watts Bight, Boat Harbour, Catoche and Aguathuna formations (Knight and James, 1987, 1988 - *see* Figure 2). The Barbace Cove Member of the Boat Harbour Formation, the Catoche Formation and the Aguathuna Formation of the St. George Group form an unconformity-bounded, late Canadian to Whiterockian sequence.

The Table Head Formation (Figure 2) was originally established by Schuchert and Dunbar (1934). Klappa *et al.* (1980) elevated the Table Head to group status, and the lower 250 m of predominantly carbonate rocks were named the Table Point Formation. The Table Point Formation consists mostly of thick to massive, bioclastic limestone, but includes lesser algal sponge wackestone to packstone, and algal oncolitic wackestone (Stenzel *et al.*, 1990). The upward-deepening environments of deposition include tidal flat, lagoon, shoal, and sponge bioherms (Klappa *et al.*, 1980). Ross and James (1987) established the Spring Inlet Member for the lower 10 to 40 m of peritidal carbonate rocks of the formation, and they concluded that the formation is within the *Anomalorthis* brachiopod zone. The Spring Inlet Member (in fact, the bulk of the Table Point Formation) lies within the *Histiodellla tableheadensis* conodont

¹ Regional Geology Section

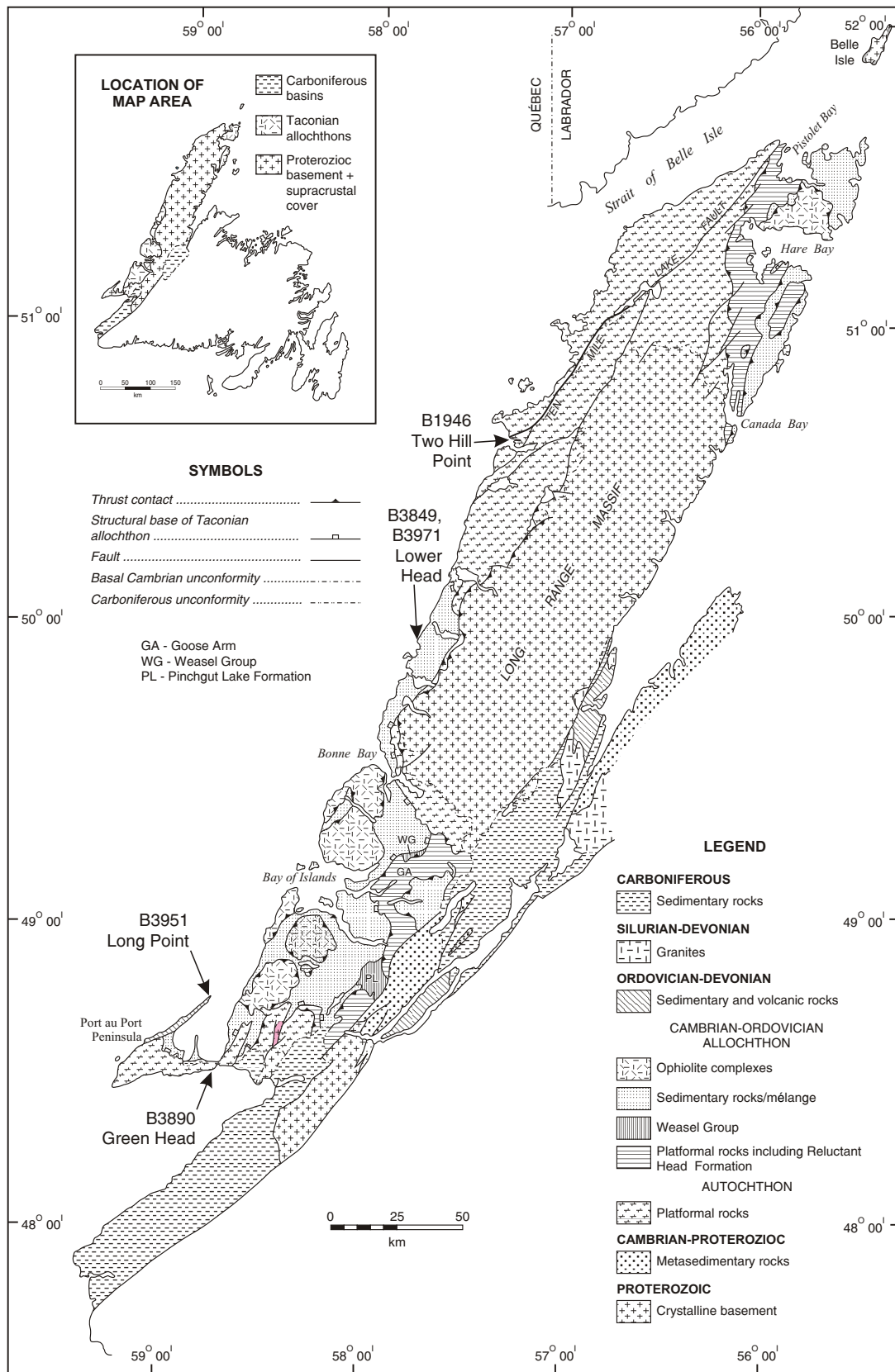


Figure 1. Geological terranes in western Newfoundland. Arrows indicate areas sampled for gastropod fossils.

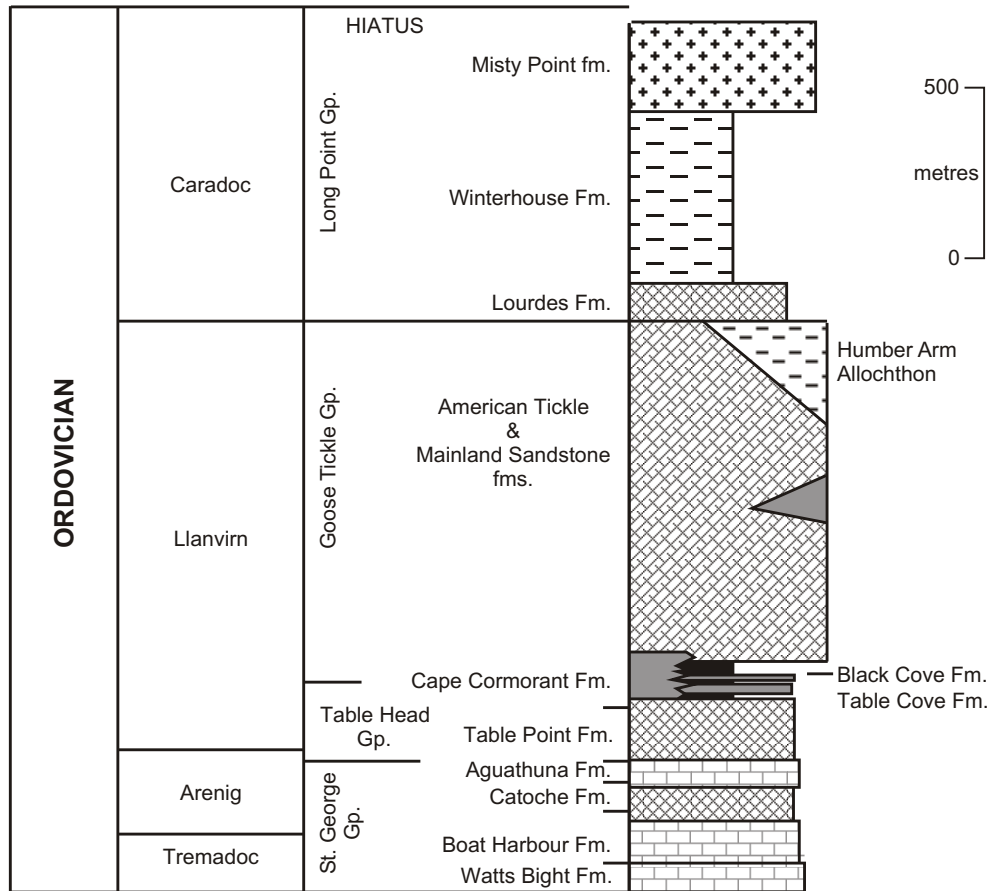


Figure 2. Stratigraphic column of Ordovician formations in western Newfoundland (modified from Williams et al., 2001).

zone of Stouge (1984). The uppermost 16 m of the Table Point Formation and the lower 70 m of the Table Cove Formation lie within the *Histiodella kristinae* conodont zone (Stouge, 1984, page 19, Figure 18).

Schuchert and Dunbar (1934) established the Long Point series, which is now the Long Point Group. Most recently it has been subdivided into three formations by Quinn *et al.* (1999) – in ascending order, the Lourdes, Winterhouse and Misty Point formations (Figure 2). Schuchert and Dunbar (1934, page 70) collected *Subulites* and *Maclurites* from bed 3 of their Long Point series. Locality B3951 (see Figure 1 and Appendix) is located north of Long Point lighthouse at the north tip of Long Point. This bed is probably part of what is now the Winterhouse Formation of Bergström *et al.*, (1974), which is middle to late Caradoc in age (Quinn *et al.*, 1999).

ALLOCHTHONOUS ROCKS

The tectonically allochthonous Cow Head Group (Middle Cambrian to Whiterockian) is a succession of periplat-

form, shelf-slope carbonates. It consists of massive limestone conglomerate and breccia intercalated with ribbon limestone, grainstone and shale, transported into deep water by a variety of gravity processes. At Lower Head (Figure 1), in Gros Morne National Park, spectacular conglomerates are exposed; these are correlative with bed 14 of the Factory Cove Member of the Shallow Bay Formation on the Cow Head Peninsula (James and Stevens, 1986). The Lower Head conglomerates contain several large fossiliferous blocks of Middle Ordovician light-coloured limestone. These blocks, which are of shallow-water origin and contain gastropods, are assigned to the Whiterockian-age *Orthidiel-la* brachiopod zone (Ross and James, 1987).

SYSTEMATIC PALEONTOLOGY

REPOSITORY OF ILLUSTRATED MATERIAL

The specimens illustrated in this report are housed in the Invertebrate Paleontology Division, Peabody Museum of Natural History, Yale University, New Haven, Connecticut, USA.

Systematic Descriptions

Superfamily EUOMPHALOIDEA de Koninck, 1881

Family EUOMPHALIDAE de Koninck, 1881

Genus *Lytospira* Koken, 1896

Type species. *Euomphalus angelini* Lindström, 1884, from the *Orthoceras* Limestone (Middle Ordovician) of Sweden.

Lytospira distans (Billings, 1865)

Plate 1-1, 1-2; Plate 2-1, 2-2

1865 *Ecculiomphalus distans* (n. sp.) Billings, pages 249-250, Figure 235.

2001 *Lytospira angelini* (Lindström, 1884); Rohr and Measures, page 291, figures 7, 8.9-8.19.

Description. Large (up to 13 cm in diameter), discoidal shell having whorls widely out of contact, coiled in a regular spiral curve; spacing between whorls about twice the width of the previous whorl; round cross section with a slightly flattened base and inner whorl and angular crest located at middle or slightly outward of top surface; whorl width increases about four times with each volution. Coarse lamella indicate a broad, deep sinus at crest of whorl. Growth lines concave-forward on base and sweeping back convexly on both sides of whorl to crest. No indication of foreign objects cemented to shell; shell exhibits rugose surface in later whorls. Cross-sections of whorls show thick shell and lack of any channels or ridges on interior of whorl. Earliest whorls in contact with each other.

Discussion. Rohr and Measures (2001) assigned these large, uncoiled specimens in the Cow Head Breccia at Lower Cove to *Lytospira angelini* but noted that they might actually be the shell named *Ecculiomphalus distans* by Billings (1865) from Cow Head. One specimen in the Peabody Museum collections (Plate 1.1) is very similar to the base of the single specimen illustrated by Billings (1865) and includes the earliest whorls. *Lytospira angelini* (Lindström, 1884) from the lower Middle Ordovician strata of Sweden, has a rounded profile like the Newfoundland shells, but the earliest whorls of *L. angelini* are unknown, and the bases of the whorls do not coil along a plane. *Lytospira distans* appears to be very similar to *L. angelini*, but the Newfoundland specimens are more complete.

Occurrence. Locality B3849. The locality is probably the same as locality 1996R14 of Rohr and Measures (2001), part of block theta of James and Stevens (1986) in the Shallow Bay Formation of the Cow Head Group at Lower Head. The Peabody Museum specimens appear to consist of the same milky-coloured grainstone as those of Rohr and Measures (2001).

Figured specimens. YPM 3450, 35912.

Genus *Lecanospira* Butts, 1926

Type species. *Ophileta compacta* Salter, 1859, from the Beauharnois Formation (Beekmantown Group) of Beauharnois, Québec.

Lecanospira compacta (Salter, 1859)

Plate 3

For complete synonymy see Desbiens *et al.*, 1996.

Description. Discoidal shell with slightly concave base, concave top. Internal mold with some shell material remaining. Whorl crest on internal mold sharp; growth lines curving sharply back from suture; base of whorl rounded

Discussion. *Lecanospira* Butts, 1926, is a common genus in the Lower Ordovician rocks of eastern North America, being found in Texas, Missouri, Alabama, Virginia, Maryland, Pennsylvania, New York, Québec and Newfoundland. It has been used as a biostratigraphic zone within the Canadian Series (Yochelson and Copeland, 1974). The oldest occurrences of the genus are from the early Tremadoc (Early Canadian Series, Gasconadian Stage) (Salter, 1859; Ulrich and Bridge in Ulrich *et al.*, 1931; Butts, 1940, 1941; Sando, 1957).

Desbiens *et al.* (1996) reported *Lecanospira* (*Lecanospira*) *compacta* (Salter, 1859) from loose blocks at GSC Location O-106298 within the Beauharnois Formation on Ile d'Aloigny, Québec; they correlated the blocks with the early Arenig, (Late Canadian Series, Cassinian Stage) *Strigigenalis caudata* Zone of Boyce (1989). However, one of us (W.D.B.) has concluded that there is "mixing" of at least two discernable faunal components of different ages in the Beauharnois Formation. The first component of the "faunal mix" is a probable Middle Canadian (Demingian Stage) *Randaynia saundersi* Zone (Ross-Hintze Zone E and/or F equivalent) fauna. Besides *Lecanospira compacta* (Salter, 1859), it also includes the following trilobites:

"*Hystricurus conicus* (Billings, 1859)"

Hystricurus sp. cf. *H. deflectus* Heller, 1954

Lecanospira is probably confined to the Gasconadian and Demingian. However, if *Barnesella* Bridge and Cloud, 1947, is placed in *Lecanospira*, the upper range of the genus *Lecanospira* would extend into the Middle Ordovician (Whiterockian).

Billings (1865, pages 245-246) described *Lecanospira nerine*, from what is now known as the Boat Harbour Formation, in St. John Bay. He also discussed *L. compacta* – the

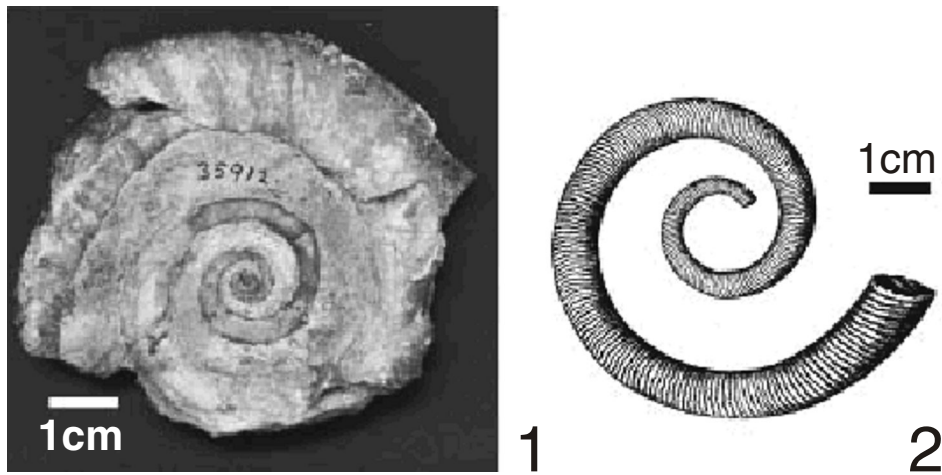


Plate 1. *Lytospira distans* (Billings, 1865). 1, Basal view, YPM 35912; 2, Basal view of Billings (1865, Figure 235) only illustrated specimen.



Plate 2. *Lytospira distans* (Billings, 1865). 1, Top view of YPM 7394. 2, Basal view of a fragment of YPM 7394.

type species – but did not provide a separate description. Distinguishing between the two species is not easy. Billings (1865, page 246) observed that *L. nerine*, “is closely allied to [*L.*] *compacta*, and it is not without much hesitation that a new name is proposed for it.” He distinguished them in part on size and on the shape of the base; *L. compacta* “is always flat” and *L. nerine* “is always gently concave”. Knight (1941) pointed out the poor quality of the types of *L. compacta*, and concluded that Salter (1859) actually had illustrated two species under the one name; Desbiens *et al.* (1996) illustrated additional specimens of *L. compacta* from the Beauharnois Formation, but their poor preservation does not contribute to a solution. *Lecanospira* from other areas of North America commonly have been put in *L. compacta*

(Butts, 1926, 1941; Sando, 1957; Yochelson, 1984), but the basis for their species-level assignment is questionable given the low quality of the original *L. compacta* material. *L. nerine* is always smaller at the type locality near Eddies Cove West, where it is only found associated with thrombolitic mounds (Rohr *et al.*, 2000). It is therefore possible that *L. nerine* is a micromorphic species derived from *L. compacta*.

Illustrated specimen. YPM 201808.

Occurrence. Locality B3890, Boat Harbour Formation (St. George Group), Port au Port Peninsula.

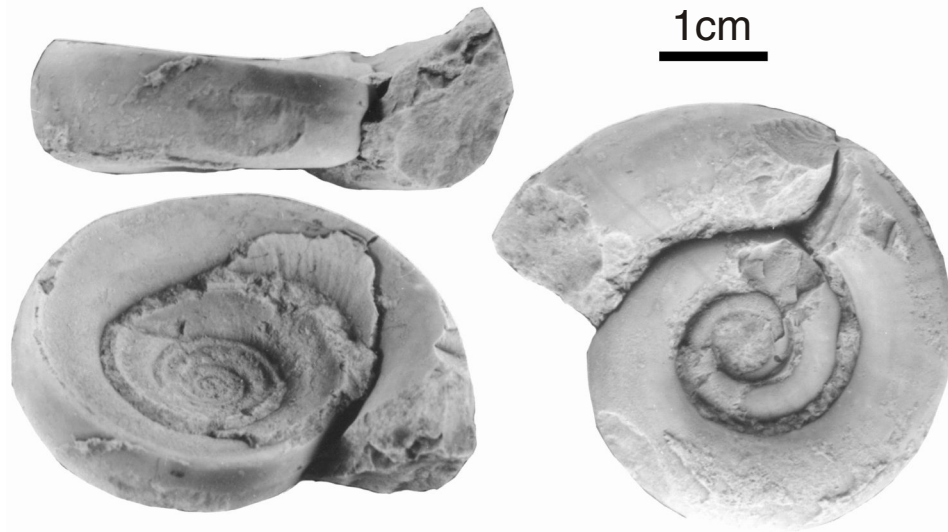


Plate 3. *Lecanospira compacta* (Salter, 1859). Lateral, top and basal views of YPM 201808.

Superfamily PLEUROTOMAROIDEA Swainson, 1840
 Family RAPHISTOMATIDAE Koken, 1896
 Genus *Euconia* Ulrich in Ulrich and Scofield, 1897

Type species. *Pleurotomaria etna* Billings, 1865 from the *Strigigenalis caudata* Zone, Catoche Formation (St. George Group) at Cape Norman, western Newfoundland.

Euconia etna (Billings, 1865)
 Plate 4

- 1865 *Pleurotomaria etna* (n. sp.) Billings, pages 226-227, Figures 210a, b.
- 1946 *Euconia etna* Cloud and Barnes, 1946, Plate 41, Figures 25-27.

Description. Conical phaneromphalous internal mold, apical angle about 85 degrees, with flush whorls and nearly flat base. Cross-section of shell illustrates subquadrate whorls, concave at top, convex on umbilical edge then flattening across base.

Discussion. *Euconia* is reported from Lower and Middle Ordovician rocks from eastern and southern North America. In western Newfoundland, the genus ranges from the Barbace Cove Member of the Boat Harbour Formation (Jeffersonian) through the Catoche Formation (Cassinian). An undescribed species of *Euconia* occurs in a Whiterockian-age block in the Cow Head Breccia (D. Rohr, personal communication).

Illustrated specimen. YPM 201825.

Occurrence. Locality B3890, Boat Harbour Formation (St. George Group), Port au Port Peninsula.

Superfamily SUBULITOIDEA Lindström, 1884
 Family SUBULITIDAE Lindström, 1884
 Genus *Subulites* Emmons, 1842

Type species. *Subulites elongatus* d'Orbigny, 1850, from the Trenton Limestone (Middle Ordovician) of New York.

Subulites spp. indet.
 Plate 5-1 to 5-3

Description. Smooth, high-spined shells (15 degrees) up to 6 cm in height, sutures shallow, very broadly convex between sutures; whorl profile greatly elongated vertically. Aperture and surface of shell unknown.

Discussion. The shells are easily recognized as *Subulites* because of the very high-spined, smooth, fusiform shell. Without the original shell, assignment to species is impossible. The specimens are from two localities of different ages, and likely represent different species. The Middle Ordovician specimen (YPM 201813; Plates 5-2, 5-3) is small and preserves only the early whorls, and the Late Ordovician specimen (YPM 201811; Plate 5-1) only preserves the later whorls.

Subulites ranges from the Middle Ordovician (Whiterockian) through the Silurian. It is a common genus in the Ordovician of North America, Scandinavia and the Baltic. Until now, it has not been illustrated from the Upper Ordovi-

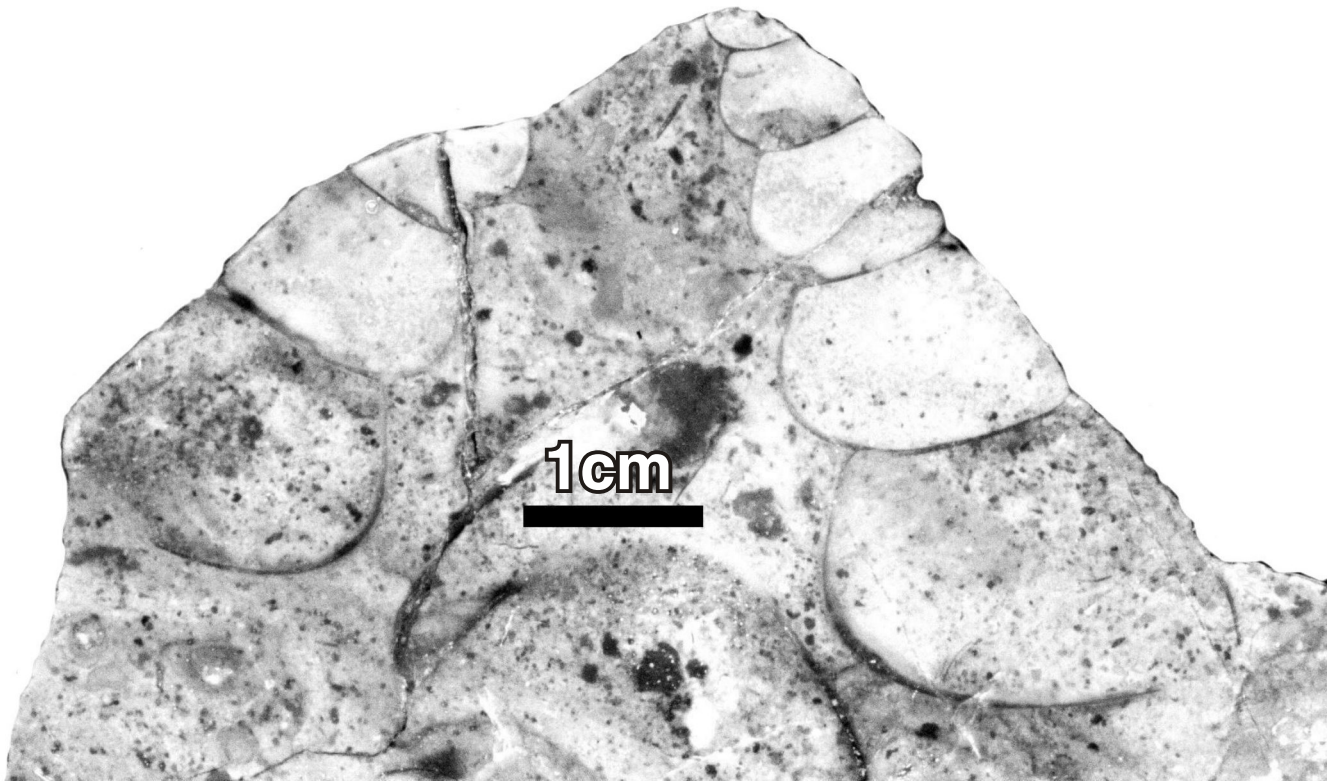


Plate 4. Cross-section through *Euconia etna* (Billings, 1865). YPM 201825.

cian of Newfoundland. Billings (1865, page 223-224, Figure 206) illustrated *Subulites daphne* from Division L (i.e., the Table Point Formation) at Point Riche.

Illustrated specimens. YPM 201811 (Long Point Group); YPM 201813 (Table Head Group).

Occurrence. Locality B1946, Table Point Formation (Table Head Group), Port Saunders; Locality B3951, Long Point Group, Port au Port Peninsula.

ACKNOWLEDGMENTS

We are grateful to T. White, Senior Curator at the Peabody Museum, Yale University for facilitating the loan of the specimens. D. Rohr's work was supported in part by the Sul Ross Faculty Research Fund. Dave Leonard, Tony Paltanavage and Terry Sears drafted the figures.

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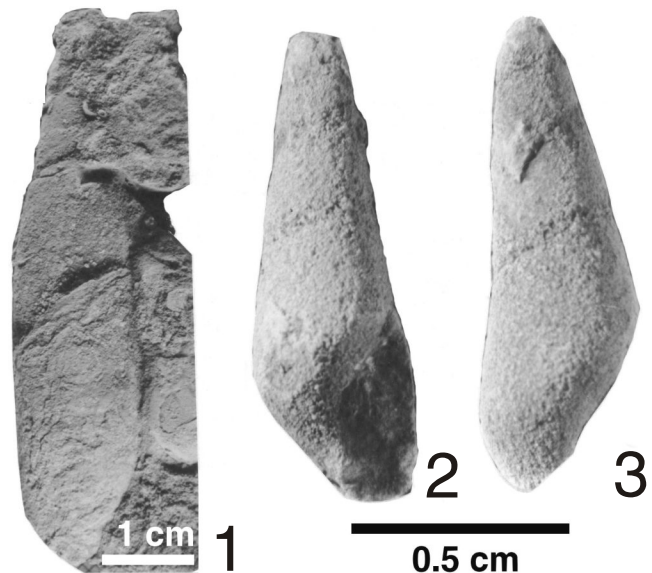


Plate 5. *Subulites* spp. *indet.*, side view of YPM 201811; 2-3, side views of smaller specimen YPM 201813.

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APPENDIX 1

Ordovician gastropod localities. Text in quotations is from Peabody Museum labels; text not in quotations is interpretation from this study.

B1946

“Middle Ordovician, Two Hill Point ledges, Port Saunders. Collector C.O. Dunbar, 1920”. Table Point Formation. NAD27, Zone 21, 478000 E, 5609060 N.

B3849

Middle Ordovician, “East side of Shallow Bay, north of Cow Head. Collector W.H. Twenhofel, 1910”. Probably the same as locality 1996R14 of Rohr and Measures (2001), part of block theta of James and Stevens (1986) in the Shallow Bay Formation of the Cow Head Group at Lower Head, Gros Morne National Park. Longitude 57°46.22' W, latitude 49°57.71' N.

B3890

Lower Ordovician, uppermost Watts Bight Formation or lowest Boat Harbour Formation. “*Diphragmoceras*’ Zone (lower part), 200 ft northeast of Green Head, 1-1.5 miles southwest of the Gravels, Port au Port. Collectors C.O. Dunbar, E.I. Leith, and P.A. Morris, 1933”. Longitude 58°44' W, latitude 48°33' N.

B3951

Upper Ordovician (Caradoc). “Just above limestone series in the bluish nodular shaly limestone, Richmondian, north of Long Point lighthouse on reefs at north tip of Long Point. Collectors C. Schuchert and C.O. Dunbar”. Long Point Group. Longitude 58°46 W, latitude 48°47 N.

B3971

Middle Ordovician. “Lower Table Head fossils from great limestone blocks, Lower Head, which is 3.5 miles north of Cow Head. Collectors C. Schuchert and C.O. Dunbar, 1918”. Probably part of block theta of James and Stevens (1986) in the Shallow Bay Formation of the Cow Head Group at Lower Head, Gros Morne National Park. Longitude 57°46.22' W, latitude 49°57.71' N.