THE ROSTROCONCH MOLLUSC EUCHASMA BILLINGS, 1865
FROM THE LOWER ORDOVICIAN CATOCHE FORMATION,
WESTERN NEWFOUNDLAND

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ABSTRACT

The distinctive rostroconch Euchasma blumenbachi (Billings, 1859), the type species of Euchasma Billings, 1865, occurs within the Catoche Formation of western Newfoundland. Well-preserved, silicified specimens are illustrated, and the distribution of the species within the Catoche Formation is documented.

INTRODUCTION

Lower Ordovician platform carbonate rocks are widely exposed in western Newfoundland (Figure 1). They are collectively included in the St. George Group (Figure 2) and comprise 500 m of subtidal and peritidal limestone and dolostone divided into the Watts Bight, Boat Harbour, Catoche, and Aguathuna formations (Knight and James, 1987, 1988). The Arenig/late Canadian sequence consists of the Barbace Cove Member of the Boat Harbour Formation, the Catoche Formation and the Aguathuna Formation. Detailed biostratigraphic sampling on the Northern Peninsula enabled Boyce (1989, 1997), Boyce and Stouge (1997) and Boyce et al. (2000) to recognize seven distinct trilobite zones within the interval encompassed by the Barbace Cove Member of the Boat Harbour Formation, the Catoche Formation and the Aguathuna Formation (Figure 2). In descending order, they are:

Llanvirn/Whiterockian Series
Bathyurus perplexus Zone

Arenig/late Canadian Series

Cassinian Stage
Cybelopsis speciosa Zone
Gignopeltis rarus Zone
Benthamaspis gibberula Zone
Strigigenalis caudata Zone

Late Jeffersonian Stage
Strigigenalis brevicaudata Zone
Peltabellia knighti Zone

Graptolites are scattered within the Catoche and Aguathuna formations and allow correlation of much of the upper sequence with the Tetragnostus approximatus, Didymograptus (Expansograptus) nitidus and Didymograptus (Didymograptellus) bifidus zones (James et al., 1988; Williams et al., 1987, 2000).

Molluscs are the most obvious macrofossils in the Catoche Formation, and gastropods are present in most of the beds (Yochelson, 1964, 1990; Rohr et al., 2000, 2001, 2002, 2003). Many of these taxa were first illustrated by Billings (1865), but because fossil collecting during those early years was not pursued in any systematic fashion (Knight and James, 1988), the stratigraphic ranges of many genera are poorly known. Since Billings' (1865) work on what is now the Catoche Formation, many of Billsings' (1865) localities have been recollected with the goal of determining the age ranges of the taxa using established trilobite, conodont and graptolite biostratigraphies (Boyce, 1989, 1997; Boyce and Stouge, 1997; Boyce et al., 2000; Williams and Stevens, 1988; Williams et al., 1987, 2000) within the detailed lithostratigraphic framework established by Knight and others in the Port au Port Peninsula and Port au Choix areas (Knight and James, 1987, 1988; Knight, 1991; Boyce, unpublished data, 2008).

Sections of the Catoche Formation were examined in the Boat Harbour–Cape Norman area (Figure 3), between Hunters Point and Back Arm, St. John Bay (the Catoche Formation Type Section – see Figure 4), between Barbace Cove and Laignet Point on the Port au Choix Peninsula (the Catoche Formation Reference Section – see Figure 4), and

1Regional Geology Section
Figure 1. Simplified geological map of western Newfoundland showing the areas where Euchasma blumenbachi (Billings, 1859) has been collected. TRF: Torrent River Fault.
Figure 2. Chronostratigraphy, biostratigraphy and lithostratigraphy of the upper St. George Group showing the range of Euchasma blumenbachi (Billings, 1859). The Laignet Point member is an informal unit (Knight 1977a and b; Stouge, 1982).

at Garden Hill, east of the Cape St. George–Mainland road (Route 463) on the western Port au Port Peninsula (Figure 5).

SYSTEMATIC PALEONTOLOGY

REPOSITORY OF ILLUSTRATED MATERIAL

The specimens described in this report are housed in the Provincial Museum of Newfoundland and Labrador (NFM) at The Rooms, St. John's.

Class ROSTROCONCHIA Pojeta and Runnegar, 1976

Discussion. Rostroconchs are bilaterally symmetrical molluscs, which differ from bivalves in having a fused instead of hinged margin. They range from the Cambrian through the Permian (Pojeta and Runnegar, 1976).

Order CONOCARDIIDAE Neumayr 1891
Family EOPTERIIDAE Miller 1889
Genus EUCHASMA Billings, 1865

Type species. Conocardium blumenbachium Billings, 1859, from the Romaine Formation, Mingan Islands, Québec (Twenhofel, 1938, pages 55-56; Plate 11, figures 1, 2).

Type specimen. GSC 445 by designation of Pojeta and Runnegar (1976, page 67; Plate 27, figures 1-4), from the Romaine Formation, Mingan Islands, Québec (see Figure 6).

Euchasma blumenbachi (Billings, 1859)
Plate 1, plate figures 1-13

1859 Conocardium blumenbachium Billings, page 350.
1865 Euchasma blumenbachia Billings, page 361; figure 348 (see Figure 6).
1938 Euchasma blumenbachi Billings; Twenhofel, pages 55-56; Plate 11, figures 1, 2.

See Pojeta and Runnegar (1976) for complete synonymy.
Description. Strongly inflated, moderate sized (up to 33 mm long, 34 mm high, 18 mm wide), about 20 radial ribs that do not increase in number during growth; fine co-marginal ornament intersects ribs at acute angle; prominent anterior lobe, dorsal part of gape elliptical, radial ribs form zigzag commissure. Anterior gape narrow, marginal denticles visible immediately inside commissure. Interior unknown, protoconch not preserved.

Occurrence and stratigraphic distribution. Billings (1859, 1865) reported Euchasma blumenbachi from "Divisions G and H, at Port au Choix, Table Head and Cape Norman", i.e., the Boat Harbour Formation (Barbace Cove Member) and Catoche Formation of modern stratigraphic usage (see Figure 2). At Cape Norman (Pistolet Bay), the species ranges from 4.88 to 8.64 m above the base of Unit 3 of Boyce (1989, page 88), 15.14 to 18.90 m above the base of Section 1989CNS-001 (Boyce, 1989, page 93), and entirely within the Catoche Formation. In the Catoche Formation Stratotype Section of the Eddies Cove West area (Figure 4), Euchasma blumenbachi (Billings, 1859) ranges from 2.31 to 86.80 m above the base of the Catoche Formation, whereas on the Port au Choix Peninsula, the species ranges from 1.47 to 97.03 m above the base of the formation in the Reference Section (also Figure 4). On the Port au Port Peninsula (Figure 5), the species so far is known only from the Garden Hill locality (1996R017).

Discussion. Although Euchasma occurs throughout the Catoche Formation, the well-silicified specimens illustrated here were found only at locality 1996R017 on the Port au Port Peninsula. Pojeta and Runnegar (1976) placed all known species of North American Euchasma in E. blumenbachi. Besides Newfoundland, the species is reported from Québec, Virginia, and central Texas (Pojeta and Runnegar, 1976), as well as west Texas (Flower, 1964). Boyce (unpublished data, 2001) has also identified the taxon from the Cape Weber Formation of Ella Ø, Northeast Greenland. Euchasma blumenbachi (Billings, 1859) ranges from the late Jeffersonian Strigigenalis brevicaudata Zone to the Cassinian Benthamaspis gibberula Zone.
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**Figure 5.** Geological map of the Port au Port Peninsula (after Stockmal and Waldron, 1993) showing the location of Garden Hill.

**Figure 6.** Euchasma blumenbachi (Billings, 1859). Billings’ (1865, page 361; Figure 348) illustration of GSC 445, from the Romaine Formation, Mingan Islands, Québec. Scale bar is 1 cm.


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Plate 1. Euchasma blumenbachi (Billings, 1859) from the Catoche Formation. Plate figures 1-6. A complete but partially abraded specimen showing dorsal, anterior, posterior, ventral, left lateral, and right lateral views, ×1.5, specimen number NFM F-740. Plate figures 7-12. Dorsal view with rostrum; anterior views with radial ribs forming zigzag commissure; posterior view with rostrum and gape of commissure; ventral view with both radial ribs and fine comarginal ornament, denticles visible immediately inside commissure; two views of the same right lateral side to emphasize two types of ornament; ×1.5, specimen number NFM F-741. Plate figure 13. Ventral view of fragmentary specimen, ×1.5, specimen number NFM F-742.

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APPENDIX – *Euchasma blumenbachi* (Billings, 1859) Localities in the Catoche Formation (St. George Group), western Newfoundland


NTS 02M/12 (Raleigh)

Section 1989CNS-001 of Boyce (1989) – Cape Norman, Pistolet Bay

**CN-033 of Boyce (1989) = 1985F162**
– 8.29 to 8.64 m above the base of Unit 3 of Boyce (1989, page 88), 18.55 to 18.90 m above the base of the section (Boyce, 1989, page 93) – lime mudstone and wackestone: dark blue-grey weathering, thin rubbly bedded, bioturbated; top of bed contains thin lenses of skeletal lime packstone and grainstone and spectacular patches of diagenetic dolostone-pseudobreccia, white weathering. 574800E, 5720200. Canadian Series, earliest Cassinian Stage, *Strigigenalis caudata* Zone.

**CN-027 of Boyce (1989) = 1985F156**
– 4.88 to 5.13 m above the base of Unit 3 of Boyce (1989, page 88), 15.14 to 15.39 m above the base of the section (Boyce, 1989, page 93) – lime mudstone and wackestone: dark blue-grey weathering, thin rubbly bedded, bioturbated; top of bed contains thin lenses of skeletal lime packstone and grainstone and spectacular patches of diagenetic dolostone-pseudobreccia, white weathering. 574800E, 5720200. Canadian Series, earliest Cassinian Stage, *Strigigenalis caudata* Zone.

Mollusca–Rostroconchia

*Euchasma blumenbachi* (Billings, 1859)

NTS 012B/06 (Cape St. George)

**1996R017 = 1996F011**
– Garden Hill, western Port au Port Peninsula, east of Hunt Oil–Pan Canadian Petroleum #1 Well Head (Prog. #94 106 01 01). Beds east of well, dipping about 10° W. Lower part of the Catoche Formation. 335490E, 5372856N. Canadian Series, earliest Cassinian Stage, *Strigigenalis caudata* Zone.

1 at top of horizon only.
Mollusca–Cephalopoda
   *Protocycloceras lamarcki* (Billings, 1859)
Mollusca–Gastropoda
   *Ceratopea billingsi* Yochelson, 1964
   *Euomphalopsis magnum* Rohr, 2002
   *Maclurites* sp. undet.
   Billings' second operculum – see Billings (1865, page 243; Figure 229)
Mollusca–Rostroconchia
   *Euchasma blumenbachi* (Billings, 1859)

1996F012
   – Garden Hill, western Port au Port Peninsula, closest up-dip beds to Hunt Oil–Pan Canadian Petroleum #1 Well Head (Prog. #94 106 01 01). Lower part of the Catoche Formation.

Arthropoda–Trilobita
   *Jeffersonia timon* (Billings, 1865)
Mollusca–Cephalopoda
   *Protocycloceras wortheni* (Billings, 1865)
Mollusca–Gastropoda
   *Ceratopea numeria* (Billings, 1865)
   *Euonia normani* (Billings, 1865)
   *Maclurites oceanus* (Billings, 1865)
Mollusca–Rostroconchia
   *Euchasma blumenbachi* (Billings, 1859)
Porifera
   *Calathium?* sp. undet.

NTS 012I/11 (Port Saunders)

Section 9 of Knight (1991) – Catoche Point, Port au Choix Peninsula to Blanche Point Section, Pointe Riche Peninsula (Catoche Formation Reference Section)

2000R015 = 2000F026 = G of Williams *et al.* (1987, page 458, Figure 2) = 1984F121
   – Laignet Point, above uppermost mound bed. 97.03 m above the base of the Catoche Formation. 473615E, 5618600N. Canadian Series, Cassinian Stage, *Benthamaspis gibberula* Zone.

Arthropoda–Trilobita
   *Bathyurellus abruptus* Billings, 1865
   *Bathyurellus platypus* Fortey, 1979
   *Benthamaspis gibberula* (Billings, 1865)
   *Grinnellaspis flabelliformis* (Fortey, 1979)
   *Ischyrotoma anataphra* Fortey, 1979
   *Isoteloides canalis* (Whitfield, 1886)
   *Jeffersonia angustimarginata* Boyce, 1989
   *Jeffersonia timon* (Billings, 1865)
   *Petigurus nero* (Billings, 1865)
   *Stroutactinus insularis* (Billings, 1865)
   *Uromystrum marginiatus* (Billings, 1865)

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Brachiopoda–Articulata
Gen. et sp. undet.
Hemichordata–Graptolithina
Pseudophyllograptus sp. A of Williams in Williams et al. (1987, pages 462-464; Figure 6, I to O)
Mollusca–Gastropoda
Maclurites sp. undet.
Mollusca–Rostroconchia
Euchasma blumenbachi (Billings, 1859) – seen, not collected

Section 6 of Knight (1991) – Barbace Point to Barbace Cove Section, Port au Choix Peninsula

– K-1982-307-11 of Knight. 1.47 to 2.05 m above the base of the Catoche Formation, within Unit 3 of Knight (1991, page 1)
– boundstone: rubbly-weathering, skeletal-rich mounds, obscure structure rich in large gastropods, straight cephalopods, eocrinoids. 474750E, 5619475N. Canadian Series, latest Jeffersonian Stage, Strigigenalis brevicaudata Zone.

Arthropoda–Trilobita
Benthamaspis hintzei Boyce, 1989
Bolbocephalus convexus (Billings, 1865)
Grinnellaspis newfoundlandensis Boyce, 1989
Ischyrotoma parallela Boyce, 1989 – seen, but not collected
Jeffersonia angustimarginata Boyce, 1989
Petigurus sp. nov. A of Boyce (1989, pages 53-54; Plate 29, figure 7) – seen, but not collected
Petigurus groenlandicus Poulsen, 1937
Peltabellia willistoni Lochman, 1966
Uromystrum affine (Poulsen, 1937)

Brachiopoda–Articulata
Tritoechia sp. undet.

Echinodermata–Crinoidea
eocrinoid gen. et sp(p). undet – fragmentary material

Mollusca–Cephalopoda
Gen. et sp(p). – curved forms
Gen. et sp(p). – straight forms

Mollusca–Gastropoda
Gen. et sp(p). undet. – high-spired forms?
Gen. et sp(p). undet. – low-spired forms

Mollusca–Rostroconchia
Euchasma blumenbachi (Billings, 1859)

Porifera
Calathium or Receptaculites sp. undet.

Section 8 of Knight (1991) – Bustard Cove to Back Arm, St. John Bay (Catoche Formation Stratotype Section)

– K-1982-304-33 of Knight, 1982. Top 0.15 m of Unit 12a of Knight (1991, page 122), 86.65 to 86.80 m above the base of the formation – wackestone with packstone layers and lenses: 4- to 6-cm grainy packstone bed at top; well-bedded, dolomitic, intensely bioturbated in lower beds, scattered gastropods, some flaser of lime mudstone; ripple-marked lenses of skeletal packstone; fossils include large trilobites, gastropods, some brachiopods. 478775E, 5619375N. Canadian Series, Cassinian Stage, Benthamaspis gibberula Zone.

1 1982F037 only sampled 0.00 to 0.10 m below the top of Unit 12a.
Arthropoda–Trilobita
  *Bathyurellus abruptus* Billings, 1865
  *Bathyurellus platypus* Fortey, 1979
  *Benthamaspis gibberula* (Billings, 1865)
  *Bolbocephalus convexus* (Billings, 1865)
  *Ischyrotoma anataphra* Fortey, 1979
  *Jeffersonia timon* (Billings, 1865)
  *Petigurus nero* (Billings, 1865)

Brachiopoda–Articulata
  *Tritoechia* sp. undet.

Mollusca–Gastropoda
  Gen. et spp. undet. – sampled by D.M. Rohr

Mollusca–Rostroconchia
  *Euchasma blumenbachi* (Billings, 1859) – seen, but not collected
  Gen. et sp(p). undet.

2000F030 = ECW-049A

– top 0.15 m of 0.80-m-thick limestone bed within Unit 6f (a covered interval) of Knight (1991, page 125), 30.33 to 30.48 m above the base of the formation. Canadian Series, earliest Cassinian Stage, *Strigigenalis caudata* Zone.

Arthropoda–Trilobita
  *Bathyurellus abruptus* Billings, 1865
  *Benthamaspis conica* Fortey, 1979
  *Bolbocephalus convexus* (Billings, 1865) – pygidium (-) seen, but not collected
  *Grinnellaspis flabelliformis* (Fortey, 1979)
  *Jeffersonia timon* (Billings, 1865)
  *Petigurus nero* (Billings, 1865)

Brachiopoda–Articulata
  *Tritoechia* gen. et sp. undet.

Mollusca–Cephalopoda
  Gen. et sp(p). undet.

Mollusca–Gastropoda
  Gen. et sp(p). undet.

Mollusca–Rostroconchia
  *Euchasma blumenbachi* (Billings, 1859) – seen, but not collected


– top 0.10 m of Unit 6e of Knight (1991, page 125)' i.e., 29.92 to 30.02 m above the base of the formation – wackestone – packstone: well-bedded, gastropods, dolomitic burrow mottling; packstone, intraclastic and rich in gastropods; upper 72 cm poorly exposed. 484340E, 5620550N. Canadian Series, earliest Cassinian Stage, *Strigigenalis caudata* Zone.

Arthropoda–Trilobita
  *Bathyurellus abruptus* Billings, 1865
  *Catochia ornata* Fortey, 1979
  *Grinnellaspis flabelliformis* (Fortey, 1979)
  *Ischyrotoma anataphra* Fortey, 1979
  *Jeffersonia timon* (Billings, 1865)
  *Petigurus nero* (Billings, 1865)
  *Strotactinus insularis* (Billings, 1865)

Brachiopoda–Articulata
  Gen. et sp(p). undet.

Designated February 13, 2002.

i.e., 1.80 to 1.90 m above the base of Unit 6e.
Mollusca–Cephalopoda
   Gen. et spp. undet. – curved, straight
Mollusca–Gastropoda
   
   *Euonia*
   Gen. et sp(p). undet.
   *Maclurites* sp. undet.
   *Murchisonia*
Mollusca–Rostroconchia
   *Euchasma blumenbachi* (Billings, 1859)

**NTS 012I/14 (St. John Island)**


– K-1982-304-009 of Knight. Upper 0.80 m of Unit 2 of Knight (1991, page 126), 2.31 to 3.11 m above the base of the formation – boundstone: mounds, obscure internal structure, rich in skeletal remains, trilobites, sponges, eocrinoids, large gastropods and cephalopods; mounds end to south side of Hunters Point and pass into wackestone rich in gastropods. 484250E, 5622600N. Canadian Series, latest Jeffersonian Stage, *Strigigenalis brevicaudata* Zone.

Arthropoda–Trilobita
   *Benthamaspis hintzei* Boyce, 1989
   *Bolbocephalus convexus* (Billings, 1865)
   *Catochia ornata* Fortey, 1979
   *Ischyrotoma anataphra* Fortey, 1979
   *Ischyrotoma parallela* Boyce, 1989
   *Isoteloides peri* Fortey, 1979
   *Jeffersonia angustimarginata* Boyce, 1989
   *Petigurus* sp. nov. A of Boyce (1989, pages 53-54; Plate 29, figure 7)
   *Petigurus groenlandicus* Poulsen, 1937
   *Petigurus nero* (Billings, 1865)
   *Uromystrum affine* (Poulsen, 1937)

Brachiopoda–Articulata
   *Tritoechia* sp. undet.

Echinodermata–Crinoidea
   Gen. et sp(p). undet.

Mollusca–Cephalopoda
   *Cassinoceras wortheni* (Billings, 1865)

Mollusca–Gastropoda
   *Ceratopea canadensis* (Billings, 1865)*
   *Euonia*
   Gen. et sp(p). undet. – high-spired forms
   Gen. et sp(p). undet. – planispiral forms
   *Maclurites*
   Second operculum of Billings (1865, page 243; Figure 229)*

Mollusca–Rostroconchia
   *Euchasma blumenbachi* (Billings, 1859)

Porifera
   *Archaeoscyphia* sp. undet.
   Gen. et sp. undet.

* Reported by Rohr et al. (2000, page 250).
* Reported by Rohr et al. (2000, page 250).