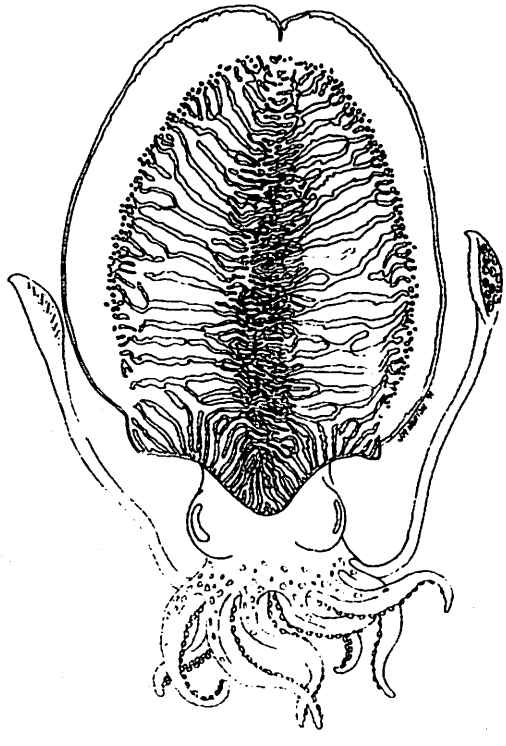
Curatorial Report Number 33

Nova Scotia Museum
1747 Summer Street
Halifax, Nova Scotia, Canada

Cephalopods in the Nova Scotia Museum Collection

By Elizabeth MacAlaster
August 1977



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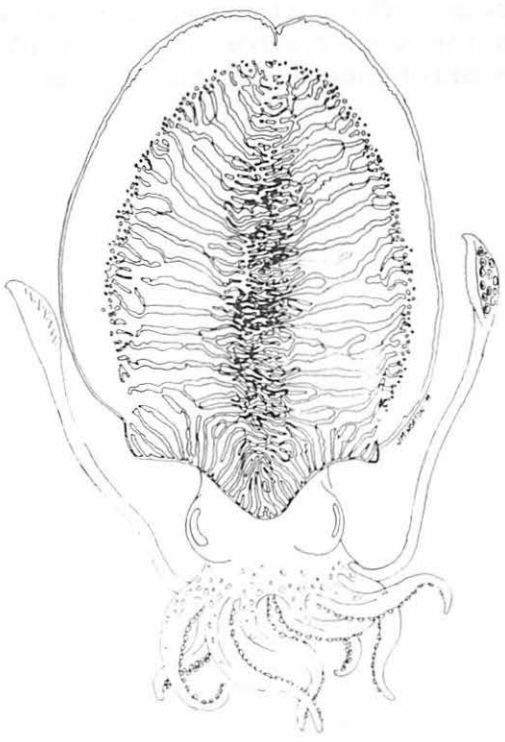

NOVA SCOTIA MUSEUM

Curatorial Reports

The *Curatorial Reports* of the Nova Scotia Museum contain information on the collections and the preliminary results of research projects carried out under the program of the museum. The reports may be cited in publications but their manuscript status should be clearly indicated.

Abstract

This report contains a description and evaluation of the Cephalopod collection in the Nova Scotia Museum. The collection is relatively small, containing 8 of 13 familes found in the American Boreal Region (Cape Cod north to Newfoundland). In addition there is a brief summary of the museum's fossil cephalopod collection.

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INTRODUCTION

Cephalopods are an interesting and diverse group of molluscs. They inhabit the seas of the world from the littoral zone to great depths and have in their group some of the largest invertebrates existing. They are active carnivores, strong, alert and have unusually well-developed senses, qualifying them as the most intelligent of all marine invertebrates.

Several distinguishing characteristics separate them from other molluscs - their ability to undergo rapid and vivid color changes, their reproductive behavior, in which separate sexes mate, the female producing eggs which in some species are carefully brooded and, most obvious, their structure. With the reduction of or even loss of the typical mollusc shell and resultant need for protection during life the cephalopods have developed a structure to suit an active and independent life. They are symmetrical, having their bodies and appendages equally developed on the right and left sides, and pelagic species are usually streamlined for rapid and efficient movement. Although they have developed arms and tentacles to grasp their prey, cephalopods retain some typical molluscan feeding characteristics - a rasping, toothed tongue and the typical alimentary canal. Like other molluscs they also have a siphon, gills and a mantle. However, their highly developed nervous and reproductive systems and their shape places them in a separate position in the molluscan phylum:

Phylum Mollusca
- Class Amphineura - chitons
- Gastropoda - snails
- Scaphopoda - tusk shells
- Pelecypoda - bivalves
- Cephalopoda - squids and octopus
  - Order Teuthoidea - common squids
  - Sepioidea - *Spirula, Sepia*
  - Octopoda - argonauts, octopods

In their classification cephalopods fall into two principal subclasses according to the presence of one or two pairs of gills.

1. two pairs of gills, arms numerous and without suckers, shell external- Tetrabranchia (*Nautilus)*

2. one pair of gills, arms eight or ten with rows of suckers and hooks, shell internal or absent - Dibranchia (all cephalopods except *Nautilus)*.

Because most of the species are large and have distinguishing features, classifying them into their families and genera is relatively simple. Although a good key to North Western Atlantic cephalopods is lacking, useful references are Abbott (1974) and Gosner (1971).

NOVA SCOTIA MUSEUM COLLECTION

Due to several factors the cephalopod collection is relatively small in size. In the Atlantic Boreal region the cephalopods inhabit sublittoral to deep-water zones or they are free oceanic swimmers. Thus, other than the common squid, *Illex,* which is caught in abundance in fish nets, catching cephalopods is limited to a chance occurrence

in a trawl. Also cephalopods (again with the exception of *Illex)* are of no commercial value at the present so that little effort is made to develop specific and efficient fishing techniques.

The development of the collection, therefore, has been a consequence of donations from people who have found cephalopods in nets aboard fishing and research vessels or washed ashore. Many of the early contributors to the collection are unknown. J. M. Jones found the giant squid in 1870, H. Piers was another early collector. Most of the recent material has been collected by D. S. Davis and P. Odense. (FRB cruises, "E. E. Prince").

The specimens of a deep-water octopus, *Bathypolypus arcticus,* in the collection were used to initiate a major study of this elusive species (see Macalaster, 1976).

Of the thirteen families found in the American Atlantic Boreal Region, the museum collection has representatives from eight - 60% of the total number. In addition the collection contains several British and European species, and in the fossil collection are some good specimens of early cephalopods. The following report is designed to familarize the reader with the collection and to stress its value as a small, interesting and diverse group of both preserved animals and shells readily available for display and for interpretative purposes.

LIST OF AMERICAN ATLANTIC BOREAL CEPHALOPODS
(species followed by an asterisk are represented in the museum collection)

Class Cephalopoda
Order Sepioidea

Family Spirulidae
Spirula spirula (Linné) 1758*
Family Sepiolidae
Rossia tenera (Verrill) 1880*
Rossia glaucopsis Loven 1845 *
Rossia megaptera Verrill 1881
Rossia palpebrosa Owen 1835 *
Rossia leucoptera Verrill 1878

Subfamily Stoloteuthinae
Stoloteuthis leucoptera (Verrill) 1878

Order Teuthoidea
Family Loliginidae
Loligo pealeii Lesueur 1821 *
Family Histioteuthidae
Histioteuthis collinsii Verrill 1879
Histioteuthis reversa (Verrill) 1880 *
Family Cranchiidae
Taonius pavo (Lesueur) 1821
Megalocranchia megalops (Prosch) 1849
Pyrgopsis lemur Berry 1920
Family Chiroteuthidae
Chiroteuthis lacertosa Verrill 1881
Family Mastigoteuthidae
Mastigoteuthis agassizii Verrill 1881
Mastigoteuthis grimaldi (Joubin) 1895
Mastigoteuthis cordiformis Chun 1908
Family Enoploteuthidae
Pterygioteuthis gemmata Chun 1908 *
Abraliopsis pfefferi (Joubin) 1896*
Family Architeuthidae
Architeuthis dux Steenstrup 1857

Family Ommastrephidae
Subfamily Ommastrephinae
Ommastrephes megaptera (Verrill) 1878
Ommastrephes bartrami (Lesueur) 1821
Ommastrephes pteropus (Steenstrup) 1855

Subfamily Illicinae
Illex illecebrosus (Lesueur) 1821*
Family Gonatidae
Gonatus fabricii (Lichtenstein) 1818*
Family Brachioteuthidae
Brachioteuthis beanii Verrill 1881
Brachioteuthis riisei (Steenstrup) 1882
Family Onychoteuthidae
Onychoteuthis banksii (Leach) 1817*
Tetronychoteuthis dussumieri (Orbigny) 1839

Order Octopoda
Family Stauroteuthidae
Stauroteuthis syrtensis Verrill 1879
Chunioteuthis eversbachii Grimpe 1916
Family Alloposidae
Alloposus mollis Verrill 1880 *
Family Octopodidae
Octopus equivocus Robson 1929
Subfamily Bathypolypodinae
Bathypolypus arcticus Prosch 1849 *
Benthoctopus piscatorum (Verrill) 1879
Graneledone verrucosa Verrill 1881
Family Ocythoidae
Ocythoe tuberculata Rafinesque 1814
Family Argonautidae
Argonauta argo Linné 1758

The following are species in the museum collection but not normally found live in these waters. They have been obtained through donations.

Family Sepiolidae
Sepiola atlantica (Orbigny) 1839
Family Nautilidae
Nautilus pompilius Linné 1758
Family Sepiidae
Sepia officinalis Linné 1758
Family Loliginidae
Alloteuthis subulata (Lamarck) 1798

CEPHALOPODS IN THE NOVA SCOTIA MUSEUM COLLECTION

Spirula spirula Linnaeus 1758. Little cuttlefish.

Distribution: tropical and subtropical regions in the Atlantic, Indian and Pacific Oceans, from about 100 to 750 fathoms.

Habitat: marine pelagic

This primitive oceanic sepioid is characterized by the presence of an internal chambered shell, which is at the posterior end. It tends to lift this portion so that the animal appears to hang vertically in the water. There is also a light organ on this end of the body, but unlike the on-off effect of other luminescent organisms, this light shines continuously, facing upwards because of the vertical position of the animal.

Museum Collection

The museum collection contains dried specimens of the shells only.

Accession #	Location	Date	Collector
1969-Z-10.21	Brazos, I., Texas, U. S. A.	28 June 1969	B. Wright
1974-Z-213	unknown	unknown	old collection
1973-Z-406.1	St. Catherine Pt., Bermuda	1 Feb. 1973	P. Doleman

References:

Abbott, 1974
Clarke, 1966
Dall, 1896
Johnson, 1934
Voss, 1956

Rossia palpebrosa Owen 1835

Distribution: North Atlantic Ocean to Baffin Bay, Greenland, Iceland, Spitzbergen, Barents and Kard Seas.

Habitat: marine benthic, continental shelf and slope, 50 to 300 fathoms.

According to Mercer (1968) in his unpublished MSc. thesis *Rossia palpebrosa* is the type species and synonymous with *R. sublevis*, *R. hyatti*, *R. glaucopsis* and *R. papillifera*. Abbott (1974), however, separates *R. glaucopsis* from the group and recognizes 3 other species: *R. molleri*, *R. tenera*, and *R. megaptera*.

Museum Collection

The museum collection contains 3 specimens preserved in 70% isopropanol.

Accession #	Location	Date	Collector
1973-Z-515.13	N. Sable I., N. S.	17 April 1973	D. S. Davis
1973-Z-528.9	Halifax, S. E. Buoy.	19 April 1973	D. S. Davis
1977-Z-201.10	Emerald Bank	10 March 1977	D. S. Davis

References:

Hyatt, 1871
Mercer, 1968
Owen, 1835

References for *R. glaucopsis* Lovén, 1845

Abbott, 1974
Johnson, 1934
LaRocque, 1953
Mercer, 1968 MSc. thesis
Voss, 1957
Whiteaves, 1901

Sepiola atlantica Orbigny, 1839

Distribution: Färöes, Norway to W. Africa, absent from the Mediterranean 12 to 84 fathoms.

Habitat: marine benthic

Absent from the Atlantic Boreal Region, this small squid was donated to the collection. It was collected from the Blackwater Estuary, Essex, England with a beam trawl during a study of marine fauna in that area.

Museum Collection

The museum collection contains 2 preserved specimens.

Accession #	Location	Date	Collector
1977-Z-200.1	Essex, England	18 May 1961	D. S. Davis

References:

Davis, D. S., 1967
Hoyle, W. E., 1886
Massy, A. L., 1967

Sepia officinalis (Linné, 1758) Common cuttlefish

Distribution: shallow warmer waters of Europe.

Habitat: marine benthic

This colorfully marked squid is not represented in the Western Atlantic Ocean, though the internal shell, the cuttlebone, has been found washed up on shores from Florida to Texas. It was once caught commercially for its durable black ink, and its cuttlebone is still sold in pet stores as a source of lime for caged birds.

Museum Collection

A whole cuttlefish preserved in 70% isopropanol as well as whole cuttlebones and fragments are in the museum collection.

Accession #	Location	Date	Collector
1973-Z-420.11	Rosas, Spain, Mediterranean	11 Aug. 1973	B. Wright
1973-Z-436.1	Marina da Pisa, Italy	14 Aug. 1973	B. Wright
1975-Z-259.1	Naples, Italy	Aug. 1975	J. O'Dor
1970-Z-22	Cape Sable Light, Shelburne Co., N. S.	May 1970	B. J. & S. Smith

References:

Abbott, 1974
Davis, 1974
Harry and Snider, 1969
Verrill, 1882a
Voss, 1974

Loligo pealeii Lesueur, 1821

Distribution: along the Northeast coast of North America from S. Carolina to Cape Cod, from the low water mark to about 50 fathoms.

Habitat: pelagic

Loligo pealeii is one of the larger squids found in this area, sometimes reaching a length of 60 cm. It is very abundant in areas further south where it is caught commercially for fish bait.

Museum Collection

There are 4 preserved specimens in the museum collection.

Accession #	Location	Date	Collector
1974-Z-211	Herring Cove, Halifax Co., N. S.	9 July 1974	F. Green
1974-Z-212	off Halifax, N.S.	15 July 1974	S. Purdy
1977-Z-201.4	unknown		old collection
1977-Z-201.6	unknown		old collection

References:

Abbott, 1974
Johnson, 1934
Mercer, 1968
Verrill, 1882a

Alloteuthis subulata (Lamarck, 1798)

Distribution: Eastern Atlantic Ocean, North Sea from 3-60 fathoms.

Habitat: pelagic

Alloteuthis subulata is not common to this area and was collected from the Blackwater Estuary, Essex, England and also from Cornwall, England.

Museum Collection

Both preserved specimens were donated to the collection.

Accession #	Location	Date	Collector
1977-Z-200.2	Essex, England	25 July 1954	D. S. Davis
1977-Z-200.3	Cornwall, England	24 April 1964	D. S. Davis

References:

Davis, 1967
Turk, 1973

Histioteuthis reversa (Verrill) 1880

Distribution: major part of the Atlantic, south of approximately 55°N. latitude, including the Mediterranean and the South Atlantic.

Habitat: pelagic from surface waters to about 500 fathoms, found in greatest abundance near land masses and oceanic ridges.

This medium-sized squid is covered with large and small photophores on the ventral mantle, giving it a warty appearance. The left eye is about twice the size of the right.

Museum Collection

There are 2 preserved specimens in the museum collection.

Accession #	Location	Date	Collector
1974-Z-255.4	South of Sable I. Bank	25 June 1974	D. S. Davis
1975-Z-297.1	edge of LaHave Bank	15 Aug. 1974	P. Odense

References:

Abbott, 1974
Mercer, 1968
Verrill, 1882a
Voss, 1970

Pterygioteuthis gemmata Chun, 1908

Distribution: worldwide, primarily in warmer waters.

Habitat: pelagic

Museum Collection

The museum collection contains 1 preserved specimen of this small species.

Accession #	Location	Date	Collector
1975-Z-298.4	LaHave Bank	15 Aug. 1974	P. Odense

References:

Abbott, 1974
Roper, 1972

Abraliopsis pfefferi (Joubin) 1896

Distribution: Widely distributed throughout much of the Atlantic and Indian Oceans.

Habitat: pelagic

Museum Collection

The museum collection contains 6 preserved specimens.

Accession #	Location	Date	Collector
1975-Z-198.1	off Brown's Bank	14 Aug. 1974	D. S. Davis
1975-Z-299.8	off LaHave Bank	15 Aug. 1974	P. Odense
1975-Z-398.1	Brown's Bank	14 Aug. 1974	P. Odense
1975-Z-400.12	LaHave Bank	15 Aug. 1974	P. Odense
1975-Z-400.13	LaHave Bank	15 Aug. 1974	P. Odense
1975-Z-402.13	LaHave Bank	15 Aug. 1974	P. Odense

References:

Roper, 1972

Architeuthis megaptera Verrill 1878

Distribution: Nearly all records of *Architeuthis*, the giant squid, are from Newfoundland, northern Europe and New Zealand, though it has been found off the western and lower eastern U. S. and in the Mediterranean. Most of the specimens have been stranded.

Habitat: pelagic

Although many different species have been reported - *A. harveyi, A. princeps, A. clarkei, A. dux* - Aldrich (1967) states that in the North Atlantic there is but 1 species, *A. dux* Steenstrup, 1857. According to Verrill, *A. megaptera* is too small (19") to be considered a synonym of this type species.

Museum Collection

One preserved specimen was transferred to the National Museum, Ottawa, in 1967.

Accession #	Location	Date	Collector
1870-Z-2	Cape Sable, Nova Scotia	Feb. 1870	J. M. Jones

References:

Aldrich, 1967
Verrill, 1882a

Other references for the genus:

Abbott, 1974
Clarke, 1966
Johnson, 1934
LaRocque, 1953
Mercer, 1968
Verrill, 1882a

Illex illecebrosus (Lesueur) 1821

Distribution: Newfoundland to N. E. Florida

Habitat: pelagic

Illex is the common squid of the Gulf of St. Lawrence and the Maritime Provinces. It is an active animal, swimming freely in schools like mackerel and herring. Illex is an important food source for cod, mackerel and whales and provides the principal bait for the cod fishery. It is edible for humans, but not yet considered a delicacy in Nova Scotia as it is by the Japanese.

Museum Collection

The museum collection contains 23 preserved specimens, several beaks and jaw parts and 3 pens.

Accession #	Location	Date	Collector
1972-Z-790.1	S. of Emerald Bank, N. S.	31 July 1972	P. Odense
1974-Z-229.17	Shelburne, N. S.	summer 1973	P. MacLeod
1973-Z-525.1	Emerald Gully, N. S. shelf	18 April 1973	D. S. Davis
1974-Z-281.1	Emerald Bank, N. S. shelf	24 June 1974	D. S. Davis
1974-Z-233.1	Emerald Bank, N. S. shelf	24 June 1974	D. S. Davis
1977-Z-201.1	unknown	unknown	old collection
1977-Z-201.2	Hubbard's Bay, Halifax Co., N. S.	24 July 1917	E. Piers
1977-Z-291.3	Hubbard's Bay, Halifax Co., N. S.	4 Aug. 1918	E. Piers
1977-Z-201.5	Nova Scotia	unknown	old collection
1977-Z-201.7	Nova Scotia	unknown	old collection

References:

Abbott, 1974
Clarke, 1966
Johnson, 1934
LaRocque, 1953
Mercer, 1968
Verrill, 1882a
Whiteaves, 1901a

Gonatus fabricii (Lichtenstein) 1818

Distribution: Widely distributed in colder regions of the N. Atlantic and N. Pacific.

Habitat: pelagic

Gonatus fabricii is an important food source for the bottlenose whale, northern fur seal, tuna, cod and some sea birds. The Greenland Eskimos also use it for bait in the cod and shellfish industry and for food.

This species may not be *fabricii*, as the genus is presently undergoing revision, and the species are confused.

Museum Collection

In the museum collection there are 4 preserved specimens.

Accession #	Location	Date	Collector
1975-Z-299.8	off LaHave Bank	15 Aug. 1974	P. Odense
1973-Z-513.8	South of Sable Island	16 April 1973	D. S. Davis
1973-Z-513.9	South of Sable Island	16 April 1973	D. S. Davis
1975-Z-296.6	off LaHave Bank	15 Aug. 1974	P. Odense

References:

Abbott, 1974 p.578
Clarke, 1966 p.152
Johnson, 1934 p.161
LaRocque, 1953 p.342
Mercer, 1968
Verrill, 1882a
Whiteaves, 1901a p.210

Onychoteuthis banksi (Leach) 1817

Distribution: worldwide in warm and temperate waters.

Habitat: pelagic, surface to about 50 fathoms.

O. banksi is regarded as one of the flying squids as it often jumps aboard vessels. Its principal characteristic is the development of hooks on the arms, replacing to a large extent the suckers of many other squids. It is a strong swimmer, designed for speed in hunting down and hooking its prey.

Museum Collection

The museum's 1 specimen was taken off the coast of Nova Scotia, but the date of capture and its present whereabouts is unknown. The illustration is a copy of an original drawing by J. M. Jones or R. Morrow. (see Figure 1. page 23)

References:

Abbott, 1974
Clarke, 1966
Mercer, 1968
Voss, 1956

Alloposus mollis Verrill, 1880

Distribution: East & West N. Atlantic, Azores, W. Africa, Gulf of Mexico

Habitat: pelagic, more abundant near coasts

The body of *Alloposus mollis* is characteristically gelatinous, ovate with very stout arms webbed nearly to their ends. While swimming about it would give the appearance of an umbrella opening and closing.

Museum Collection

There is one specimen in the collection. This was on display in the travelling exhibit "One Hundred Years of Oceanography" from 1973 until 1977.

Accession #	Location	Date	Collector
1972-Z-780-3(1)	S. of Emerald Bank, N. S. Cont. Shelf.	31 July 1972	P. Odense

References:

Abbott, 1974
Johnson, 1934
Mercer, 1968
Verrill, 1882a
Verrill, 1880 Am. J. Sci. 20:393

Bathypolypus arcticus (Prosch, 1849)

Distribution: abundant in the deep water of the North Atlantic Ocean.

Habitat: benthic, mostly along the continental slope

This small octopus though abundant, is rarely caught, perhaps because of the depth at which it lives. Unlike other, shallow water species, *B. arcticus* has no ink sack, nor does it change color dramatically. It has been found in the stomachs of groundfish such as cod and hake, but is not yet of any commercial value.

The genus is presently undergoing revision; in this area there may be more than 1 species. For more information on *B. arcticus* see Macalaster (1976).

Museum Collection

There are 9 preserved specimens in the museum collection.

Accession #	Location	Date	Collector
1973-Z-523.1	Emerald Bank, N. S. shelf	18 April 1973	D. S. Davis
1974-Z-230.1	Nova Scotia	unknown	unknown
1974-Z-252.2	Western Bank, N. S. shelf	25 June 1974	D. S. Davis
1973-Z-528.10	Halifax S. E. Buoy, N. S. shelf	19 April 1973	D. S. Davis
1973-Z-375.2	Emerald Bank, N.S. shelf	18 Oct. 1973	P. Odense
1973-Z-525.2	Emerald Gully, N. S.shelf	18 April 1973	D. S. Davis
1977-Z-201.9	Nova Scotia	unknown	H. Piers
1977-Z-201.8	Bay of Fundy, 10' N. of Digby, N. S.	6 Aug. 1958	B. Reid & L. Duncanson
1977-Z-371.20	Emerald Basin, N. S. shelf	9 Mar. 1977	D. S. Davis

References:

Abbott, 1974
Johnson, 1934
LaRocque, 1953
Macalaster, 1976
Mercer, 1968
Robson, 1932
Verrill, 1882a

Argonauta argo (Linné) 1758

Distribution: worldwide in warmer waters

Habitat: pelagic

Argonauta argo is a small pelagic octopod, the female many times larger than the male. During maturation one pair of arms in the female becomes expanded at its extremities into broad paddle-like membranes which secrete lime to build a delicate shell cradle in which the eggs are held during incubation. Since the octopus is normally found in warm waters it is an important record for this area.

Museum Collection

The museum collection contains preserved and dried specimens.

Accession #	Location	Date	Collector
1974-Z-229.18	Shelburne Harbour, Shelburne Co., N. S.	summer, 1973	P. MacLeod
1975-Z-282.2	Prospect Bay, N. S.	summer, 1973	V. Kiley
1974-Z-227.1	unknown		S. Sharpe

References:

Abbott, 1974
Verrill, 1882a
Voss, 1956

Nautilus pompilius Linné, 1758 Chambered or Pearly Nautilus

Distribution: warm seas, common around Indo Pacific Islands

Habitat: pelagic-benthic

Nautilus pompilius is the only cephalopod to possess a large, completely external shell, which is chambered with a siphonal tube running through the center of each chamber septum. As the animal grows it moves forward, cutting off the chamber which it last occupied by a pearly septum until it comes to rest in the large outer one. The compartments can be filled with gas to regulate the bouyancy of the Nautilus, which is able to float, swim or carry the shell as it walks on the sea bottom. It has been used for cameos, ornament, and as drinking cups.

Museum Collection

Nautilus pompilius does not occur in the North Atlantic, but the museum collection contains several of the beautiful shells.

Accession #	Location	Date	Collector
1975Z.213. .	Indo-Pacific	unknown	R. Rateau
1967-Z-5.14(2)	W. Pacific Ocean bottom	unknown	unknown
1967-Z-5.15(2)	W. Pacific Ocean bottom	unknown	unknown
1972-Z-556.10	Phillipine Islands	1971	W. san Luis

Cephalopods in the Museum Fossil Collection

Cephalopods have been an important element of marine fauna since Ordovician time and are unsurpassed as guide fossils in Paleozoic rocks. The geological distribution of the main divisions of Cephalopods are shown in Figure 2. The Nautiloidea include the root stock of all cephalopods, the Ammonoids and Dibranchiates being particularly successful offshoots. The only present day Nautilioid is the comparatively primitive Nautilus. The Ammonoids, a very abundant and diverse group during the Jurassic and Cretaceous periods, are now extinct, while the Dibranchiata have branched into 4 groups - the first, the Belemnoids, are extinct, but the other 3 have modern representatives - the Sepioids, the Teuthoids and the Octopoids.

The Cephalopod fossil collection in the museum has representives from all 3 major groups explained above and contains exceptionally fine examples from the Ammonoids. Although most of the collection needs further taxonomic study it could readily supply an exhibit or interpretative program with substantial material in good condition.

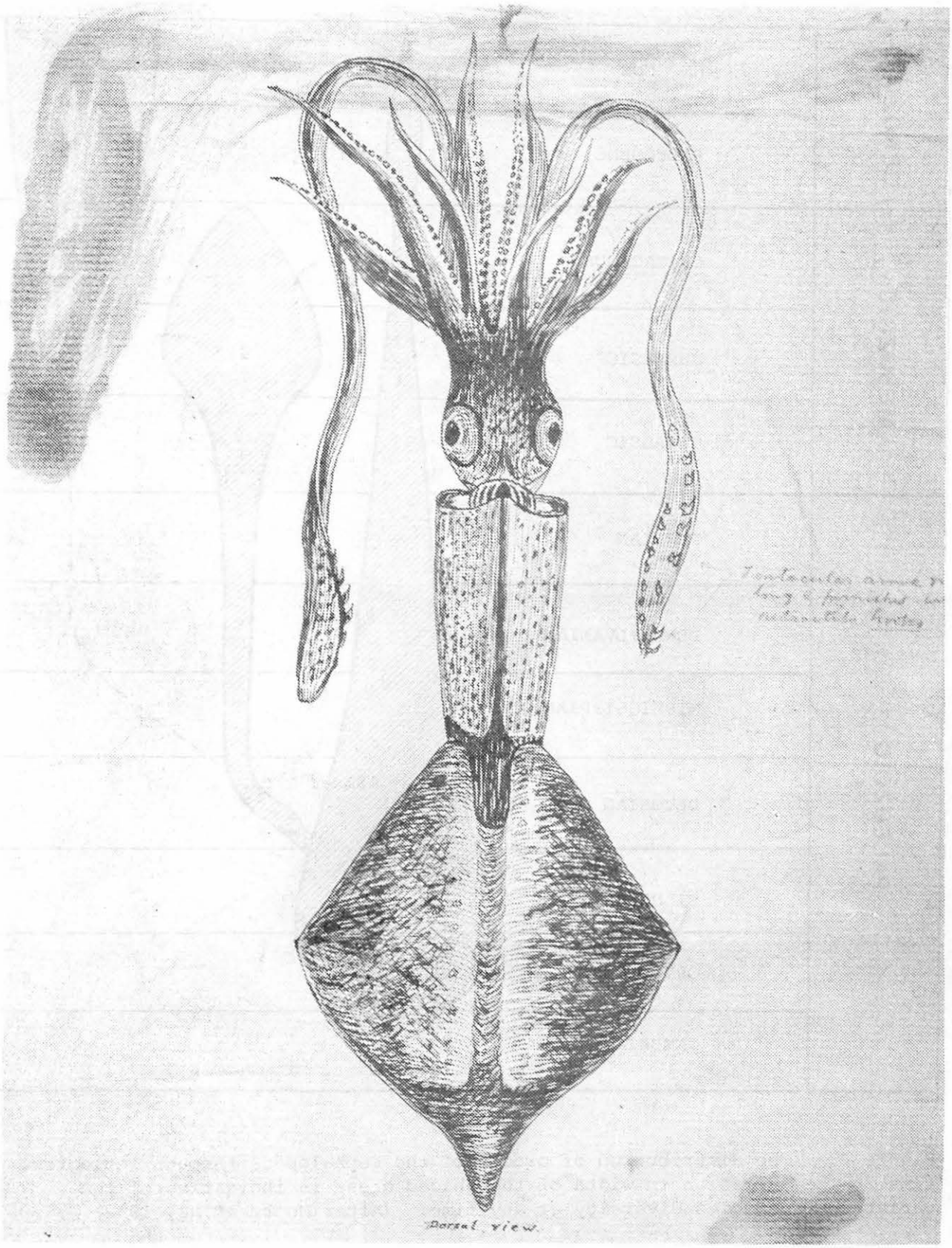

Figure 1. A drawing of *Onychoteuthis banksi* (Leach) 1817 from the files of the the Nova Scotia Museum. The drawing has been attributed to J. M. Jones or R. Morrow. The annotations are by H. Piers. Slightly reduced.

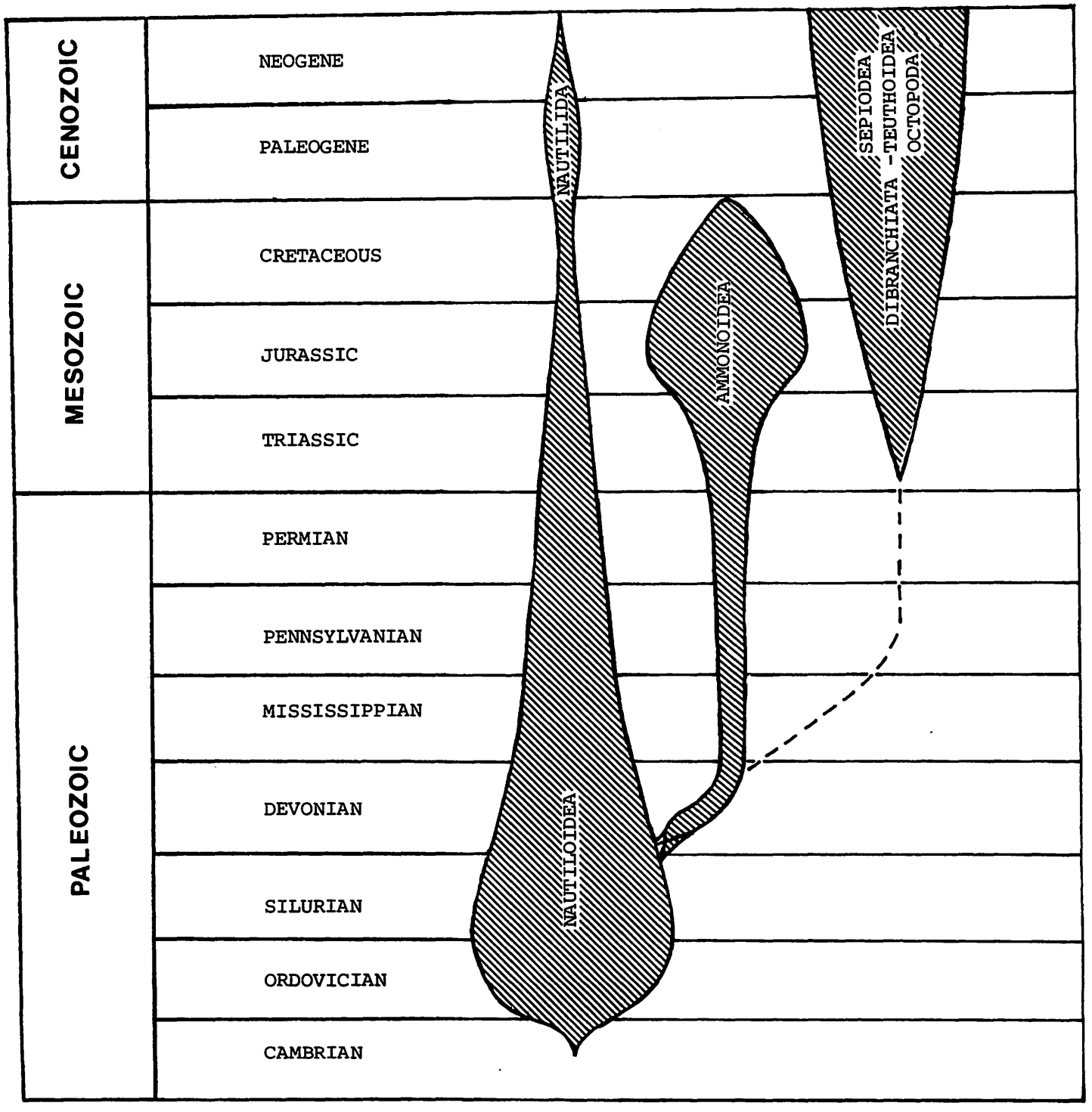

Figure 2. The distribution of orders of the cephalopoda through geological time. The variation in width of the shaded areas is indicative of the variation in species diversity at any time. (After Moore *et al*, 1952).

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