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Certain Mollusks of the Environs of Halifax, Nova Scotia, Canada

RICHARD W. COLEMAN¹

Abstract. This paper is based upon "A Report on Certain Mollusks of the Environs of Halifax, Nova Scotia, Canada, to the Provincial Department of Health, Province of Nova Scotia, Halifax, Nova Scotia, Canada" sent to the Nova Scotia Department of Health in January, 1968. Twenty-four different mollusks were collected: *Amnicola limosa* Say, *Anodonta cataracta* Say, *Anodonta implicata* Say, *Campeloma decisum* (Say), *Crepidula fornicata* L., *Gyraulus parvus* (Say), *Helisoma trivolvis* (Say), *Lacuna vincta* Montagu, *Littorina littorea* L., *Littorina obtusata* L., *Littorina saxatilis* (Oliv), *Macoma balthica* (L.), *Modiolus demissus plicatulus* Lamarck, *Modiolus modiolus* L., *Mya arenaria* L., *Mytilus edulis* L., *Paludestrina minuta* Totten, *Physa heterostropha* Say, *Physa sayi* Tappan, *Promenetus exacuus* (Say), *Sphaerium partumeium* Say, *Sphaerium securis* Prime, *Thais lapillus* L. and *Viviparus malleatus* Rve. Notes on the biology of these species were given. Acknowledgment for determination of the specimens by members of the staff of the National Museum of Canada, Ottawa, Ontario, Canada, is cited.

This discussion is based upon a paper entitled "A Report on Certain Mollusks of the Environs of Halifax, Nova Scotia, Canada, to the Provincial Department of Public Health, Province of Nova Scotia, Halifax, Nova Scotia, Canada" sent to the Nova Scotia Provincial Health Department in January, 1968. The study was based upon a general invertebrate survey conducted in the summer of 1963 in the environs of Halifax, Province of Nova Scotia, Canada.

This study of certain mollusks of the environs of Halifax, Nova Scotia, Canada, was divided into two parts. Part I states the localities where organisms were collected by hand, by sieve or by white enamelled dipper to provide an idea of the scope of the collecting program for this survey. In addition it is important to indicate in what areas these organisms have not been found so that ecological interpretations may be made. Part II of this report cites the specific mollusks that were collected from certain areas in the environs of Halifax, Nova Scotia, Canada. Other collections in Part I not reported in Part II did not show any mollusks.

DETAILS OF THIS SURVEY

From this survey, 24 different species of mollusks were collected: *Amnicola limosa* Say, *Anodonta cataracta* Say, *Anodonta implicata* Say, *Campeloma decisum* (Say), *Crepidula fornicata* L., *Gyraulus parvus* (Say), *Helisoma trivolvis* (Say), *Lacuna vincta* Montagu, *Littorina littorea* L., *Littorina obtusata* L., *Littorina saxatilis* (Oliv), *Macoma balthica* (L.), *Modiolus demissus plicatulus* Lamarck, *Modiolus modiolus* L., *Mya arenaria* L., *Mytilus edulis* L., *Paludestrina*

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minuta Totten, *Physa heterostropha* Say, *Physa sayi* Tappan, *Prom-enetus exacuus* (Say), *Sphaerium partummeium* Say, *Sphaerium securis* Prime, *Thais lapillus* L. and *Viviparus malleatus* Rve.

From marine areas, *Littorina littorea* L. was the commonest species of mollusk, *Mytilus edulis* L. and *Thais lapillus* L. were, respectively, second and third in importance as marine mollusks. Other mollusks collected from marine areas included *Crepidula fornicata* L., *Lacuna vincta* Montagu, *Littorina obtusata* L., *Littorina saxatilis* (Olivi), *Macoma balthica* (L.), *Modiolus demissus plicatulus* Lamarck, *Modiolus modiolus* L., *Mya arenaria* L. and *Paludestrina minuta* Totten.

From fresh water areas, *Sphaerium securis* Prime was the predominant mollusk. Other mollusks collected from fresh water areas were *Amnicola limosa* Say, *Anodonta cataracta* Say, *Anodonta implicata* Say, *Campeloma decisum* (Say), *Gyraulus parvus* (Say), *Helisoma trivolvis* (Say), *Physa heterostropha* Say, *Physa sayi* Tappan, *Prom-enetus exacuus* (Say), *Sphaerium partummeium* Say and *Viviparus malleatus* Rve.

A review of the previous literature on some of these species seems appropriate.

Littorina littorea L. was the commonest species of marine mollusk found in this survey. *Littorina*, as reported by Keen with the assistance of Coan (1963), was found as an intertidal mollusk on rocks near the high tide line. *Littorina littorea* were commonly found in this area in this survey. Bousfield (1960) reports *L. littorea*, the common or edible periwinkle, as being found from Southern Labrador in Canada to New Jersey and from Western Europe. It is very common on rocks, but is also on sand and mud flats. Rogers (1931) also reports that *L. littorea* is abundant on all the shores of northern Europe. It is found on the coasts of New England. On the rocky coasts of Maine it is found in greatest abundance, covering the sides of huge boulders and wharf piers exposed by the outgoing tide, clinging to seaweeds and stems of marsh grasses or crawling in ditches and tide pools. The periwinkle is a vegetarian. The eggs are laid in masses on seaweeds or rocks. Fritter and Graham (1962) report that *Littorina littorea* has been found at 35 fathoms in dredgings. Abbott (1953) reports that *L. littorea* is a favorite food in Europe.

Bousfield (1960) reports that *Littorina obtusata* L., the smooth or yellow periwinkle, has been reported from Labrador, Canada, to New Jersey and from northwestern Europe. It is very common throughout the region on outer rocky shores under rockweeds in the lower part of the tidal zone.

Littorina saxatilis (Olivi) has been reported by Bousfield (1960) as the Northern Rough Periwinkle from Baffin Island, Canada, to New Jersey as well as from Europe. It is extremely common throughout the whole region on rock, mud or sand mainly in the upper part of

the tidal zone and in estuaries, often in quite brackish water. Abbott (1953) has also reported *L. saxatilis* from Arctic Seas to Puget Sound. Females have given birth to live, shelled young. Morris (1952) also reports *L. saxatilis* from northern New England on our east coast as well as from other areas. Fritter and Graham (1962) report *L. saxatilis* on rocks near high water from three feet above high water of equinoctial spring tides to mid-tide level. It occurs on the shores of Britain and Ireland, being abundant in the North Atlantic, and breeding throughout the year.

Mytilus edulis L. was considered to be the second most common marine mollusk from this survey. Henderson (1935) reported that some *Mytilus* individuals live out in the open coasts and are therefore marine while other individuals of the same species may live near the mouths of large streams in brackish waters. Bousfield (1960) reports that *M. edulis*, commonly called the blue or edible mussel, has been reported from Baffin Island in Canada to South Carolina. It has been reported from intertidal areas to several fathoms in depth. It attaches by byssus threads to rocks, pilings and wharves and forms beds on mud flats in estuaries. Abbott (1953) reports *M. edulis* from Alaska to California as well as being very common in New England. It is sometimes found in more southerly waters attached to floating wood. Rogers (1931) further reports *M. edulis* from the temperate shores of Europe. Acres of *M. edulis* are exposed to low tide on mud flats extending far up the estuaries of rivers that flow into the ocean. Tebble (1966) reports that *M. edulis* is very common around the coast of the British Isles from high in the intertidal zone to depths of a few fathoms within sheltered harbors and estuaries. *M. edulis* was further reported as widely distributed in the boreal regions of the northern hemisphere from the western border of the Kara Sea south to the Mediterranean, North Carolina, California and Japan. Hirase (1951) gives data on *M. edulis* from Japanese islands.

Bousfield (1960) reports that *Thais lapillus* L. is commonly called the American dogwinkle and has been found from southern Labrador in Canada to New York and from northwestern Europe. It is common below the mud from the tide level to two fathoms under rockweed. The egg case is found to be one to three inches in height, spindle-shaped and laid in clusters on the underside of rocks near the low water level. Abbott (1953) also reports that *T. lapillus* has been reported from Norway to Portugal.

Crepidula fornicata L. is a mollusk associated with seashores according to Fischer (1887). Bousfield (1960) reports that *C. fornicata*, commonly called the boat shell or quarter-deck, has been reported from southwestern Newfoundland in Canada south to Florida and Texas. It is very common in warm shallow bays and estuaries attached to shells, stones or each other or washed ashore. Abbott (1953) reports

that *C. fornicata* is a common littoral species that has been introduced to the west coast of the United States as well as from previously mentioned areas. They either live on muddy bottoms where there are no solid objects to which they can attach themselves or frequently pile up in groups of 6 to 12 or more. Rogers (1931) reports that *C. fornicata* has been reported from Maine to Brazil. Although they have been reported to feed on seaweeds for the most part, they have been known to eat other mollusks. The horseshoe crab (*Limulus*) often carries a load of upward of 100 slippers. Fritter and Graham (1962) report *C. fornicata* as being found in England on stony beaches at low water level and on hard and soft bottoms to five fathoms. Perry and Schwengel (1955) reported *C. fornicata* from one to six fathoms in their paper on the marine shells of the western coast of Florida. Morton (1958) discusses the life cycle of *C. fornicata* in detail while Sowerby (1842) reports on the world-wide distribution of *Crepidula*.

Bousfield (1960) reports that the common Atlantic chink shell, *Lacuna vincta* Montagu, has been noted from Labrador in Canada to New Jersey. It is common on algae at and below the low water level of rocky shores in cold water areas. Webb (1959) reports that *L. vincta* is common over a wide territory of the northland. Abbott (1953) states that *L. vincta* has been reported from the Arctic Ocean to Rhode Island and from Alaska to California. It is common from low water to 25 fathoms. Rogers (1931) states that *L. vincta* lives in sheltered coves upon seaweeds. It is found from Arctic seas to New Jersey. Fritter and Graham (1962) report that *L. vincta* has been found on rocks covered especially with *Fucus*, *Ceramium*, *Poly-siphonia*, *Chordaria* and *Zostera* from low water to 21 fathoms on all coasts of Britain and from Ireland, being found in the boreal North Atlantic.

Bousfield (1960) reports that *Macoma balthica* (L.), the Little Macoma, has been found from the Arctic seas to Georgia. It is very common throughout the region, ranging from mid-tide level to deep water and tolerating warm or cold temperatures and low or high salinities. Abbott (1953) reports *M. balthica* as also occurring from the Bering Sea to off Monterey, California. It is a common intertidal and deep water species. Rogers (1931) also reported *M. balthica* from the whole Atlantic coast, Scotland and Norway. It was found to be abundant in muddy and sandy bays, even following the banks of the Hudson River above the city of New York. Tebble (1966) reports that *M. balthica* has been found in thick mud, muddy sand and muddy gravel. In British waters it occurs primarily from the upper regions of the intertidal zone to low water. It is tolerant of low salinities and is particularly common in estuaries. This species has been reported from the White Sea and the western edge of the Kara Sea, along the Norwegian coast and from the Baltic, south to the Iberian Peninsula.

Modiolus demissus plicatulus Lamarck (*Volsella demissa* Dillwyn), the Atlantic ribbed mussel, was reported by Bousfield (1960) from the southwestern gulf of the St. Lawrence in Canada to Georgia. It has been reported in shallow brackish bays and estuaries in mud or attached to shells, stones and stakes. Abbott (1953) also reports it as introduced to California.

Modiolus modiolus L. (*Volsella modiolus* L.), commonly called the Northern Horse Mussel, has been reported by Bousfield (1960) as occurring from the Arctic to North Carolina on rocks or in sand and gravel at and below low water level in cold water areas. Abbott (1953) reports *M. modiolus* (*V. modiolus*) from Arctic seas to northeast Florida and from Arctic seas to San Pedro, California. It is one of the largest and commonest mussels found in cooler water below low water level. Rogers (1931) reports *M. modiolus*, the common horse mussel, as being found in muddy gravel from low water to 80 fathoms or hiding in rock crevices. It has been cited from California to Alaska, Cape Hatteras (North Carolina) to the north and from northern Europe. Tebble (1966) reports that *M. modiolus* has been reported from the lower shore in holdfasts of *Laminaria* or in rock pools and off shore down to 80 fathoms off the British Isles, having been reported off the Isle of Man. It has also been reported in the Atlantic Ocean from the Gulf of Onega in the White Sea, the Faroes and Iceland, to the Bay of Biscay and along the eastern coast of North America from Labrador to North Carolina and in the Pacific Ocean from the Bering Sea south to Japan and California.

Keen (1958) reports that Lamarck's name *Modiolus* was conserved by the International Commission on Zoological Nomenclature (1958) mainly because of its wide usage in the nineteenth century literature although *Volsella* has priority and has been used by modern workers. This is the case of *Modiolus* Lamarck, 1799, vs. *Volsella* Scopoli, 1777.

Bousfield (1960) reports that *Mya arenaria* L., the common soft-shell clam or long-neck clam, has been reported from Labrador, Canada, to off North Carolina. It has been reported as a very common mollusk on sandy and muddy bottoms from intertidal areas to depths of several fathoms, primarily in estuaries and bays. Abbott (1953) reports that this clam has been introduced to the western United States. This delectable clam is harvested from the New England coasts. While 100 pounds of oysters is equivalent to only 13 pounds of meat, 100 pounds of clams furnishes 35 pounds of meat. Rogers (1931) reports that *M. arenaria* is found on gravelly mud flats of river mouths from South Carolina to Greenland and Great Britain, and has become established in the San Francisco Bay. It normally occurs between high and low tide marks, and even in rocky shores burrows in the sediment deposited in crevices. Morris (1952) reports that *M. arenaria* is seen with just the tip of its siphon at the surface. Quayle

(1960) has reported *M. arenaria* from British Columbia, Canada, from sand and mud mainly in estuaries at rather high tidal level.

Paludestrina minuta Totten has been reported by Rogers (1931), as *Rissoa minuta* Totten, attached to seaweed from New England to New Jersey. Bousfield (1960), reporting on this mollusk as the Salt Marsh Spire Shell, states that it has been found from Labrador, Canada, to New Jersey. It has also been collected in James Bay in Canada. This mollusk is reported to be very common on mud flats and in shallows of salt marshes, estuaries and bays throughout the area.

Sphaerium clams have been found in various parts of the world. Morton (1958) reports that *Sphaerium* in Britain are small, colorless, orbicular bivalves, usually less than one-half an inch long, found burrowing in nearly all kinds of freshwater areas.

Sterki (1907), Baker (1928) and Rogers (1931) report *Ammicola limosa* Say as a mollusk in various areas of the U. S. A. or from Canada. Baker (1928) reports that *A. limosa* has been found in rivers, streams and various quiet bodies of water, such as swamps, lakes and related areas. Baker commented that Say reported that this species at its type locality was "extremely numerous on the muddy shores of the rivers Delaware and Schuylkill between high and low water marks."

Gyraulus parvus (Say) has been reported by Baker (1928) from the U. S. A. and from Canada. Jones (1931) reported *G. parvus* from Iowa. Leonard, with the technical assistance of Roscoe, Fairbanks, Miles and Tong-Yun Ho (1959), report that *G. parvus* in Kansas is associated with artificial and natural lakes and also with quiet pools in stream beds often on or among aquatic plants. On larger lakes it is seen on floating pieces of driftwood. Bransom (1961) states that algal-covered rocks are associated with *G. parvus* in Oklahoma, especially in temporary bodies of water. These algae protect the substrate as a cover. When these bodies of water dry up in Oklahoma, algae protect the bottom of the pond where aestivation of the snails is seen.

Campeloma decisum (Say) was reported by Baker (1928) as occurring in various parts of the U. S. A. as well as in Canada, having also been reported by Sterki (1907) from Ohio, Jones (1931) from Iowa and Bransom (1961) from Oklahoma. Although *C. decisum* has been reported from lakes, it is primarily a snail associated with rivers. Baker (1928) found it usually associated with sand bars in the middle of a river about a foot deep in summer, being also found in rapid current buried in sand or in sandy or rocky-sandy bottoms of creeks in Wisconsin.

Helisoma trivolvis (Say) has been reported by Baker (1928) as occurring in various parts of the U. S. A. as well as in Canada. Baker

(1928) has reported *H. trivolvis* from muddy or sandy habitats, usually from swamps and lakes; however, occasionally from rivers and streams. Bransom (1961) reports that *H. trivolvis* in Oklahoma is generally found in stagnant or semi-stagnant waters, rarely in rapid flowing waters. The diet usually consists of living, dead and decaying plant material; however, animal material is also used as a source of food. Egg capsules may be seen on the side of plants and rocks at the edge of the water.

Leonard, with the technical assistance of Roscoe, Fairbanks, Miles and Tong-Yun Ho (1959), report that *Promenetus exacuous* (Say) has been reported by Baker in a general distributional pattern from the United States east of the Rocky Mountains north to Alaska and the Mackenzie River, south to New Mexico. It was reported by Leonard and his co-workers in Kansas in association with *Gyraulus parvus* (Say) among such vegetation as *Potamogeton*, *Spirodela*, *Riccia*, *Mimulus*, *Eleocharis* and *Scirpus* in cool water of a brooder pond of a fish hatchery. Baker reported this species in Wisconsin on logs in sloughs with muddy bottoms in 0.3 to 0.6 meter deep water. It has also been found on mud flats at the edge of a small stream. Bransom (1961) also reported *P. exacuous* from Oklahoma.

A series of molluscan collecting areas illustrated by Kodachrome slides were presented as follows:

- Collection No. 4: North West Arm beach near North West Arm Rowing Club, at foot of South Street, Halifax, Halifax County, Nova Scotia, Canada. June 7, 1963. coll. R. W. Coleman:
- a. *Littorina littorea* L.
 - b. *Thais lapillus* L.
 - c. *Mytilus edulis* L.
- Collection No. 6: From shore of Bedford Basin, on Rockingham Men's Club property, Birch Cove, Halifax County, Nova Scotia, Canada. June 7, 1963. coll. R. W. Coleman:
- a. *Littorina littorea* L.
 - b. *Thais lapillus* L.
 - c. *Mytilus edulis* L.
- Collection No. 11: Barrett Lake, collecting area near Irving Oil Station Grocery Store and near Kinsac Lake Road, Halifax County, Nova Scotia, Canada. June 7, 1963. coll. R. W. Coleman (Figure 6):
- a. *Anodonta implicata* Say
 - b. *Anodonta cateracta* Say
 - c. *Gyraulus parvus* (Say)
 - d. *Sphaerium partumeium* Say
- Collection No. 13: From pond near junction of Riverside Drive to highway no. 1, Lower Sackville, Halifax County, Nova Scotia, Canada. June 7, 1963. coll. R. W. Coleman (Figure 5):
- a. *Viviparus malleatus* Rve.
- Collection No. 15: From swamp with *Typha* reeds near corner where railroad tracks cross highway no. 2 and near Nova Scotia Building Supplies Ltd., Waverley, Halifax County, Nova Scotia, Canada. June 8, 1963. coll. R. W. Coleman (Figure 4):
- a. *Physa heterostropha* Say
 - b. *Sphaerium securis* Prime
 - c. *Ammicola limosa* Say



Figure 1. Breeding area for collection no. 60.

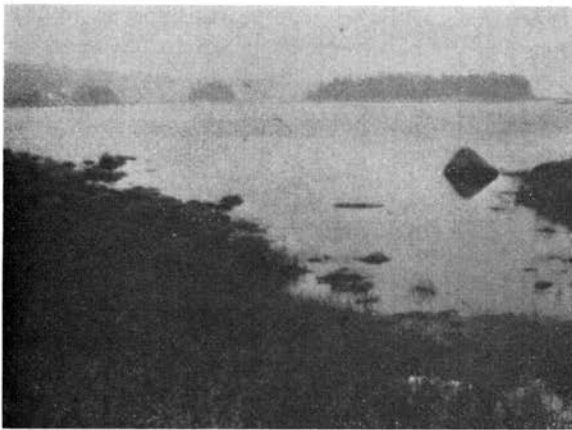


Figure 2. Breeding area for collection no. 55.

- Collection No. 16: Lake Thomas, collecting area near highway no. 2 and in back of Wilf's Diner Truck Stop, Waverley, Halifax County, Nova Scotia, Canada. June 8, 1963. coll. R. W. Coleman:
a. *Sphaerium securis* Prime
b. *Physa sayi* Tappan
- Collection No. 19: Grand Lake, collecting area in littoral zone near edge of Laurie Provincial Park picnic grounds, Halifax County, Nova Scotia, Canada. June 8, 1963. coll. R. W. Coleman:
a. *Sphaerium securis* Prime
- Collection No. 21: From littoral zone of Lake Egmont, near Jodrey Farm and road to Jodrey Farm, Halifax County, Nova Scotia, Canada. June 8, 1963. coll. R. W. Coleman:
a. *Promentus exacuus* (Say)
b. *Physa heterostropha* Say
c. *Campeloma decisum* (Say)

Collection No. 22: Musquodoboit River, collecting area near where river crosses
Sheet Harbour and near Decker's



Figure 3. Breeding area for collection no. 33.



Figure 4. Breeding area for collection no. 15.

(Garage), Upper Musquodoboit, Halifax County, Nova Scotia, Canada. June 8, 1963. coll. R. W. Coleman:

- a. *Physa sayi* Tappan
- b. *Helisoma trivolvis* (Say)

Collection No. 23: In swamp alongside Elderbank Station Road and near site of former Elderbank Railroad Station and near railroad tracks, Elderbank, Halifax County, Nova Scotia, Canada. June 8, 1963. coll. R. W. Coleman:

- a. *Physa heterostropha* Say
- b. *Sphaerium securis* Prime

Collection No. 26: Pond of Bruce Boutilier residence, near alongside highway no. 3, French Village, Halifax County, Nova Scotia, Canada. June 9, 1963. coll. R. W. Coleman:

- a. *Sphaerium securis* Prime

Collection No. 28: From and under rocky edge and littoral zone of St. Margaret's Bay, near and behind telephone office on highway no. 102, St. Margaret's Bay township area, Halifax County, Nova Scotia, Canada. June 10, 1963. coll. R. W. Coleman:

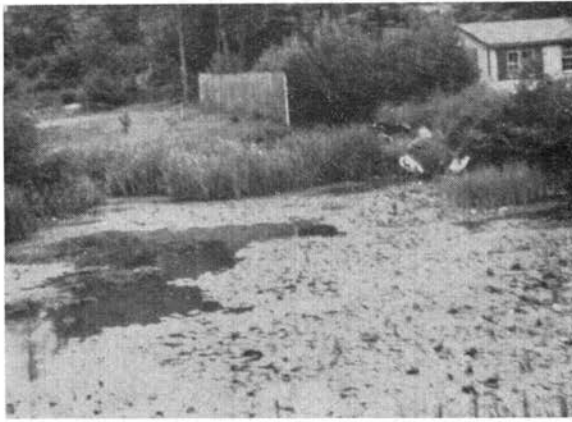


Figure 5. Breeding area for collection no. 13.

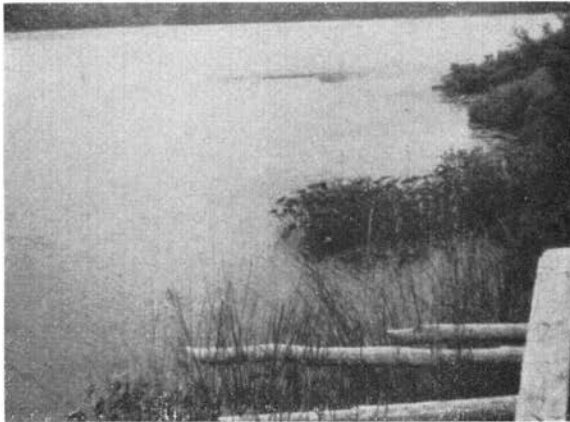


Figure 6. Breeding area for collection no. 11.

Scotia, Canada. June 9, 1963. coll. R. W. Coleman:

a. *Mytilus edulis* L.

Collection No. 30: Hubbards Beach, organisms under rocks at foot of Shore Club Road, St. Margaret's Bay, Hubbards area, Halifax County, Nova Scotia, Canada. June 9, 1963. coll. R. W. Coleman:

a. *Littorina saxatilis* (Oliv)

b. *Littorina littorea* L.

Collection No. 31: Beach of St. Margaret's Bay, Queensland, near edge of highway no. 3 across from Dorey's Restaurant, Halifax County, Nova Scotia, Canada. June 9, 1963. coll. R. W. Coleman:

a. *Mytilus edulis* L.

Collection No. 33: Beach of St. Margaret's Bay near Beach Coffee Shop and near highway no. 3, Black Point area, Halifax County, Nova Scotia, Canada. June 9, 1963. coll. R. W. Coleman (Figure

- a. *Littorina littorea* L.
 - b. *Mytilus edulis* L.
 - c. *Mya arenaria* L.
 - d. *Littorina obtusata* L.
- Collection No. 34: Frost Fish Cove, near French Village, off highway no. 33, Halifax County, Nova Scotia, Canada. June 9, 1963. coll. R. W. Coleman:
- a. *Modiolus demissus plicatulus* Lamarck
- Collection No. 35: Peggy's Cove, near S. W. Manuel's Confectionery, Halifax County, Nova Scotia, Canada. June 9, 1963. coll. R. W. Coleman:
- a. *Littorina littorea* L.
 - b. *Thais lapillus* L.
- Collection No. 36: North West Arm beach, Fleming Park (City of Halifax), Halifax, Halifax County, Nova Scotia, Canada. June 9, 1963. coll. R. W. Coleman:
- a. *Littorina littorea* L.
 - b. *Mytilus edulis* L.
 - c. *Thais lapillus* L.
- Collection No. 37: Near edge of highway, near Lloyd's Supermarket, Eastern Passage, from littoral zone of bay, Halifax County, Nova Scotia, Canada. June 10, 1963. coll. R. W. Coleman:
- a. *Littorina littorea* L.
 - b. *Mytilus edulis* L.
- Collection No. 38: From littoral zone of bay behind Perry's Groceries (Store), Lawrencetown, Halifax County, Nova Scotia, Canada. June 10, 1963. coll. R. W. Coleman:
- a. *Mytilus edulis* L.
- Collection No. 39: Three Fathom Harbour, at foot of Causeway Road, Halifax County, Nova Scotia, Canada. June 10, 1963. coll. R. W. Coleman:
- a. *Littorina littorea* L.
- Collection No. 40: Cheezetcook Inlet, collecting area behind L&M Grocery, Grand Desert, Halifax County, Nova Scotia, Canada. June 10, 1963. coll. R. W. Coleman:
- a. *Paludestrina minuta* Totten
- Collection No. 41: Shores of bay, LR Ship Harbour, Halifax County, Nova Scotia, Canada. June 10, 1963. coll. R. W. Coleman:
- a. *Littorina littorea* L.
 - b. *Mytilus edulis* L.
 - c. *Thais lapillus* L.
- Collection No. 42: Atlantic Ocean, Murphy Cove, Mr. Murphy's Boat Landing, Halifax County, Nova Scotia, Canada. June 10, 1963. coll. R. W. Coleman:
- a. *Littorina littorea* L.
 - b. *Littorina saxatilis* (Olivi)
- Collection No. 43: From littoral zone of bay, Spry Bay, Taylors Head area, Halifax County, Nova Scotia, Canada. June 10, 1963. coll. R. W. Coleman:
- a. *Littorina littorea* L.
 - b. *Thais lapillus* L.
- Collection No. 44: Along littoral zone of bay, Sober Island, Halifax County, Nova Scotia, Canada. June 10, 1963. coll. R. W. Coleman:
- a. *Littorina littorea* L.
 - b. *Thais lapillus* L.
 - c. *Mya arenaria* L.
- Collection No. 45: From littoral zone of bay, near highway no. 7 and opposite Sheet Harbour Motel, Sheet Harbour, Halifax County, Nova Scotia, Canada. June 10, 1963. coll. R. W. Coleman:
- a. *Mytilus edulis* L.

- Collection No. 46: From littoral zone of bay, Port Dufferin, near and behind Whitman's Grocery (Store), Port Dufferin, Halifax County, Nova Scotia, Canada. June 11, 1963. coll. R. W. Coleman:
- a. *Littorina littorea* L.
 - b. *Thais lapillus* L.
 - c. *Mya arenaria* L.
 - d. *Modiolus modiolus* L.
- Collection No. 47: From littoral zone of bay, Ecum Secum, near and behind R. N. Salter Grocery, Guysborough County, Nova Scotia, Canada. June 11, 1963. coll. R. W. Coleman:
- a. *Littorina littorea* L.
 - b. *Littorina obtusata* L.
 - c. *Littorina saxatilis* (Olivi)
 - d. *Thais lapillus* L.
 - e. *Mya arenaria* L.
 - f. *Crepidula fornicata* L.
 - g. *Macoma balthica* (L.)
- Collection No. 50: From littoral zone of bay, Pope's Harbour, collecting area near where highway no. 7 joins road to Mooseland, Halifax County, Nova Scotia, Canada. June 11, 1963. coll. R. W. Coleman:
- a. *Littorina littorea* L.
- Collection No. 51: From littoral zone of bay, East Jeddore, in back of post office, Halifax County, Nova Scotia, Canada. June 11, 1963. coll. R. W. Coleman:
- a. *Littorina littorea* L.
 - b. *Littorina saxatilis* (Olivi)
 - c. *Mytilus edulis* L.
 - d. *Thais lapillus* L.
- Collection No. 52: From littoral zone of bay, collecting area near edge of highway no. 7 and near where Salmon River meets highway no. 7, Salmon River Bridge, Halifax County, Nova Scotia, Canada. June 11, 1963. coll. R. W. Coleman:
- a. *Littorina saxatilis* (Olivi)
 - b. *Mya arenaria* L.
 - c. *Thais lapillus* L.
- Collection No. 54: From littoral zone of bay, near Island View Inn, West Jeddore, Halifax County, Nova Scotia, Canada. June 11, 1963. coll. R. W. Coleman:
- a. *Littorina littorea* L.
 - b. *Mytilus edulis* L.
 - c. *Thais lapillus* L.
- Collection No. 55: From littoral zone of bay near Lazy-Tide Hall, East Petpeswick area, Halifax County, Nova Scotia, Canada. June 11, 1963. coll. R. W. Coleman (Figure 2):
- a. *Modiolus demissus plicatulus* Lamarck
 - b. *Mya arenaria* L.
 - c. *Mytilus edulis* L.
- Collection No. 56: From littoral zone of Petpeswick Inlet near J. F. M. Young property, West Petpeswick, Halifax County, Nova Scotia, Canada. June 11, 1963. coll. R. W. Coleman:
- a. *Littorina littorea* L.
 - b. *Modiolus demissus plicatulus* Lamarck
 - c. *Mytilus edulis* L.
- Collection No. 57: Halifax Bay, wharf at foot of George Street, Halifax, Halifax County, Nova Scotia, Canada. June 12, 1963. coll. R. W. Coleman:
- a. *Littorina littorea* L.
 - b. *Mytilus edulis* L.
- Collection No. 59: From littoral zone of bay, Sambro, near and behind Gray's Canteen, Halifax County, Nova Scotia, Canada. June 12,

1963. coll. R. W. Coleman:
- a. *Littorina littorea* L.
 - b. *Littorina saxatilis* (Olivi)
- Collection No. 60: From littoral zone of bay, near Fina Gasoline Service Station and Grocery, Ketch Harbour, Halifax County, Nova Scotia, Canada. June 12, 1963. coll. R. W. Coleman (Figure 1):
- a. *Littorina littorea* L.
 - b. *Lacuna vincta* Mont.
 - c. *Macoma balthica* (L.)
 - d. *Mya arenaria* L.
 - e. *Thais lapillus* L.
- Collection No. 61: From littoral zone of bay near edge of highway and near Fire Hall and Walsh's Canteen, Purcell's Cove, Halifax County, Nova Scotia, Canada. June 12, 1963. coll. R. W. Coleman:
- a. *Littorina littorea* L.
 - b. *Mya arenaria* L.
 - c. *Mytilus edulis* L.
 - d. *Thais lapillus* L.

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