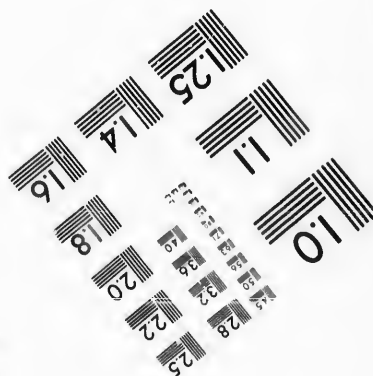
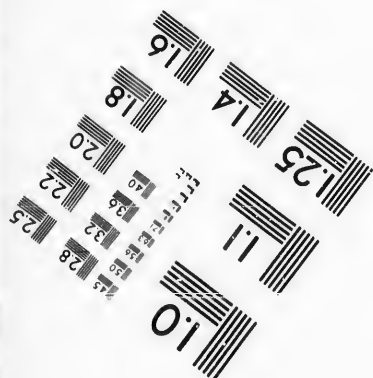
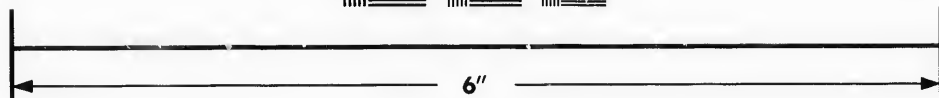
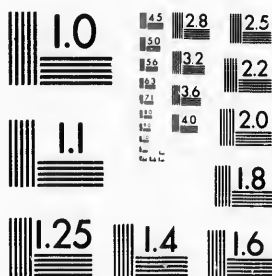


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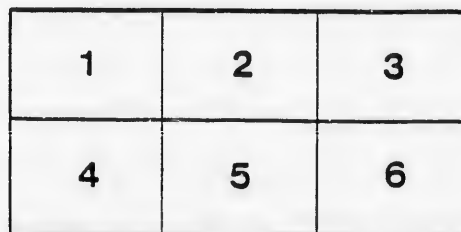
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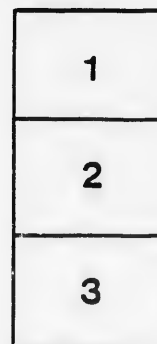
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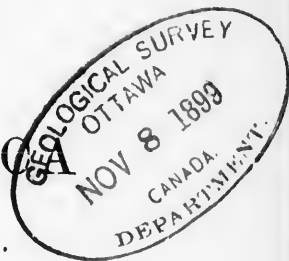
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ON THE
MARINE MOLLUSCA
OF
EASTERN CANADA.



By J. F. WHITEAVES, F.G.S., etc.

Our knowledge of the distribution of the marine mollusca in Lower Canada is still very limited. In 1858 Princepal Dawson published in this Journal (vol. iii., p. 329) a list of shells collected by him in Gaspé Bay; the number of species recorded is thirty-eight. In 1859 Prof. R. Bell gave a list of sixty-nine marine molluscs, collected in various parts of the Gulf of the St. Lawrence (see vol. iv., p. 197); a few of these were procured in New Brunswick. Since that time some additional species have been collected by other observers. In August, 1867, through the kindness of Messrs. John Luce and G. De Carteret, of the firm of W. Frewen & Co., I was enabled to carry on careful dredging operations at Grande Grève, in Gaspé Bay. In this paper it is proposed—1st, to give a list of the species dredged by myself at Grande Grève, and, 2nd, a catalogue of all the marine mollusca known to inhabit Lower Canada at the present date.

Grande Grève is a fishing station on the North-east side of Gaspé Bay, and is sheltered by the narrow strip of land of which Cape Gaspé is the extremity. The rocks of Oriskany sandstone here dip slopingly towards the sea, which deepens very rapidly from the shore, so that but few shells can be collected unless the dredge is used. A fortnight was devoted to a careful examination of this particular spot, and seventy-five species were procured, as follows:—

PALIOBRANCHIATA.

Rhynchonella psittacea Gmelin:—Frequent, alive on stones in from 10 to 20 fathoms.

LAMELLIBRANCHIATA.

Anomia ephippium Linn.—On stones and shells with the above; the var. *aculeata* frequent.

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Anusium tenuicostatum Mighels (= *Pecten Magellanicus* Lam.):—Alive in 1 to 10 fathoms.

Pecten Islandicus Chemnitz:—Living in from 5 to 40 fathoms water.

Nucula tenuis Montagu, and var. *expansa* (= *N. expansa* Reeve):—Alive in 40 to 50 fathoms mud. The *Nucula inflata* of Hancock, from Greenland, etc., is apparently only a variety of this species, and is probably the same as *N. expansa* Reeve.

Nucula delphinodonta Migh.:—With the above, but much more abundant. The shell is covered with a ferruginous coat like the British *Lucina ferruginosa*.

Leda perula Müller:—Six fine living specimens in 50 fathoms mud.

Leda minuta Müll.—One, living, with the above.

Yoldia myalis Couthouy:—Rare, with the two preceding; but not infrequent in the stomachs of flat fish caught off Grande Grève.

Crenella glandula Totten:—A few taken living in from 20 to 40 fathoms.

Crenella decussata Mont. (= *C. cicerula* Möll.)—Abundant, living in mud, in from 20 to 60 fathoms. Quite distinct from the preceding, but larger than the average of British specimens.

Modiolaria discors Linn. and var. *levigata* Gray:—Rare, living with the above.

Modiolaria nigra Gray:—One fine living specimen on a stone, in about 20 fathoms.

Modiola modiolus Linn.—Fragments of large specimens in shingle at 20 fathoms.

Mytilus edulis Linn.—Common on the beach and in shallow water.

Cardium Islandicum Linn.—In sandy mud, at 30 to 50 fathoms, and abundantly from fishes' stomachs.

Cardium pinnulatum Conrad:—Alive, with the preceding.

Serripes Groenlandicus Chemn.—Large and fine, in mud, at 20 to 50 fathoms. Found in the English Red-Crag deposits.

Astarte striata Leach, and var. *globosa*:—In 20 to 60 fathoms mud.

Astarte Banksii Leach:—With the preceding, but rarer. This species and the foregoing are barely specifically distinct from the *A. compressa* of English authors. They exactly correspond with the two so-called species from Greenland.

YVAGELI
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ANABAO TO

Astarte undula Gould (= *A. latisulca* Hanley):—Large and fine, in 50 to 60 fathoms mud. Very variable in sculpture. The New England variety, with prominent and distant ribs, which some of the Gaspé examples approach, can hardly be separated from the *Astarte Omalii* var. *undulata* of Searles' Wood's Crag Mollusca.

Astarte semisulcata Leach:—With the preceding a few specimens occurred, which I refer, with doubt, to this species.

Cardita borealis Conrad:—Living, at various depths.

Axinus Gouldii Philippi:—A few living, at 20 to 60 fathoms.

Venus fluctuosa Gould, sp.—Extremely abundant, living in 20 to 50 fathoms.

Macoma sabulosa Spengler (= *Tellina proxima* and *calcarea*, auct.):—Scarce, in 20 to 50 fathoms; also from stomachs of fishes.

Macoma Grænlundica Beek, sp.—Scarce, in shallow water. Probably conspecific with the *Sanguinolaria fusca* of Say from New England, with the West Coast *Macoma inconspicua* of Brod. et Sow, and with the European *Tellina Balthica* of Linnaeus.

Mya arenaria Linn.—Occasional, on the shore.

Mya truncata Linn.—One dead but fresh adult, and living fry taken in 10 to 20 fathoms.

Saxicava (Panopea) Norvegica Spengler:—Six dead but fresh specimens, in 50 fathoms mud.

Saxicava rugosa Linn. and var. *arctica*:—Common, burrowing into stones in from 10 to 20 fathoms.

Anatina papyracea Say:—One alive, in 50 fathoms mud.

Thracia myopsis Möller:—A few taken with the above.

Lyonsia (Pandorina) arenosa Möll.—Living in sandy mud, in 30 to 50 fathoms. The shell is covered with particles of sand, as the specific name implies.

Pandora (Kennerlyia) glacialis Leach:—Living with the above. Externally it closely resembles the *Pandora obtusa* of Forbes and Hanley, which is the *Solen pima* of Montague. According to Dr. P. P. Carpenter, *P. glacialis* has an internal ossicle, which is wanting in the British shell.

GASTEROPODA.

Cylichna alba Brown:—Living in 40 to 60 fathoms.

Tonicia marmorata O. Fabr.—Common on stones, in 10 to 20 fathoms.

Leptochiton albus Linn.—With the above; frequent.

Tectura testudinalis Müll.—In very shallow water.

Lepeta cæca Müll.—On stones, in 20 to 50 fathoms, living.

Cemoria Noachina Linn.—Living with the above.

Margarita striata Brod. et Sow. (= *M. cinerea* Gould).

Margarita Grænlandica Chemn. and var. *undulata*.

Margarita obscura Couth.

Margarita varicosa Migh.:—These four species were taken living, in from 30 to 50 fathoms mud, the last being by far the most abundant. The *M. varicosa* is the same as the *M. elegantissima* of Searles' Wood's Crag Mollusca.

Lacuna vineta Fabr.—On sea-weeds in shallow water.

Littorina littoralis Linn. fide Jeffreys (= *L. palliata* Say):
—Common on rocks on the shore.

Littorina rudis Mont.—With the above. The varieties *patula* and *tenebrosa* were common, but I did not meet with the type. *L. Grænlandica* Chemn. appears to be a variety of this species.

Scalaria Grænlandica Perry:—One living specimen on a stone, in 20 fathoms water.

Mesalia (?) *croca* Couth.—Abundant, living in 20 to 50 fathoms mud.

Mesalia (?) *reticulata* Migh.—With the above, but less frequent.

Aporrhais occidentalis Beek.:—Alive, with the two preceding.

Mencstho albula Möll.—Three living; adult specimens were taken on a stone, from about 20 fathoms water.

Velutina (*Morvillia*) *Zonata* Gould:—Three examples taken on stones in deep water.

Velutina haliotoidea Müll.—One taken living, with the above.

Natica affinis Gmelin (= *N. clausa* Brod. et Sow.):—Fine, in about 40 fathoms.

Lunatia Grænlandica Möll.—Very large, living with the above.

Lunatia heros Say:—Frequent in sandy parts of Gaspé Bay, but rare opposite Grande Grève.

Pleurotoma bicarinata Couth:—Rare, in 30 to 50 fathoms.

Bela nobilis Möll.—A few living, at the same depth as the above.

Bela exarata Möll.—One living, in about 40 fathoms.

Bela scalaris Möll.—In mud, at from 30 to 50 fathoms. I regard these three as good species, distinct from the British *B. turricula*, of which I have never seen typical specimens in Canada.

Bela decussata Couth.—Frequent, living in from 30 to 50 fathoms mud.

Bela pyramidalis Strom (= *Fusus pleurotomarius* Couth. *F. rufus* Gould and *B. Vahlü* Möll.) :—With the preceding, but rare.

Nassa trivittata Say :—Living, a little above the village of Gaspé Basin, where the water is brackish.

Buccinum undatum Linn.—Several varieties of this species were dredged in deep water. I regard the *Buccinum undatum* of Möller and the *B. Labradorensis* of Reeve, as varieties of this protean mollusc.

Buccinum tenue Gray (= *B. scalariforme* Möll.) :—Alive, in 60 fathoms mud.

Fusus Kroyeri Möll. sp.—One living specimen, with the preceding; it is the *Buccinum cretaceum* of Reeve and the *Fusus* of Dr. P. P.'s list.

Emmastatus Say :—One dead immature specimen dredged in deep water.

Gymnaeus Gould :—Not rare, living in about 30 fathoms.

Trophon Gunneri Linn.—Living in about 30 fathoms.

Trophon clathratus Linn.—One taken with *T. Gunneri*.

Trichotropis borealis Brod. et Sow.

Admete viridula O. Fabr.—The two last species were fine, and frequent in 30 to 40 fathoms.

CEPHALOPODA.

? *Loligo illecebrosa* Lesuer :—Abundant; is used by the fishermen largely as a bait for cod.

Among other invertebrates dredged here were *Metridium marginatum* Edw. et Haime, *Alcyonium rubiforme* Ehrenb., *Echinarachnius parva* Linn., *Ophiopholis aculeata* Lutk., *Ophioglypha robusta*, and *O. Sarsii*, with other commoner forms, and some fine sponges.

It is thought desirable to place on record a list of the sea shells known to inhabit the River and Gulf of the St. Lawrence, north of New Brunswick, and south of north-eastern Labrador. The species enumerated in the preceding list are included, and only unrecorded localities are given for rare species. My thanks are due to Principal Dawson, to Drs. Stimpson, and P. P.

Carpenter, and to Messrs. S. Hanley and J. G. Jeffreys, for their kind critical assistance in the identification of difficult species. At the same time, having carefully compared the Canadian shells with Möller's types in the British Museum, and in the cabinets of Messrs. Hanley and Jeffreys, this and the preceding list must be regarded as the expression of my own individual judgment on the several species.

LIST OF THE MARINE MOLLUSCA OF EASTERN CANADA.

PALLIOBRANCHIATA.

Rhynchonella psittacea, Gmel.

LAMELLIBRANCHIATA.

- | | |
|--|--|
| <i>Anomia ephippium</i> , Linn.
and var. <i>aculeata</i> . | <i>Cardita borealis</i> , Conr. |
| <i>Limea subauriculata</i> , Mont. | <i>Gemuna Tottenii</i> , Stimp. |
| <i>Amusium tenuicostatum</i> , Migh. | (= <i>Venus gemma</i> , Totten). |
| <i>Pecten Islandicus</i> , Chemn. | <i>Venus fluctuosa</i> , Gould. |
| <i>Nucula tenuis</i> Mont.
and var. <i>expansa</i> . | <i>Maetra polynema</i> , Stimp. |
| <i>Nucula delphinodonta</i> , Migh. | (= <i>M. ovalis</i> , Gould—name pre-occupied). |
| <i>Leda pernula</i> , Müll. | <i>Ceronia deaurata</i> , Turton, |
| — <i>minuta</i> , Müll. | (= <i>Mesodesma Jauresii</i> , De Joan-
nis); Little Metis, J. F. W. |
| <i>Yoldia myalis</i> , Couthouy,
(is the <i>Leda limatula</i> of Principal
Dawson's list). | <i>Ceronia areolata</i> , Conrad;
(This species I believe to be the
young of the preceding). |
| <i>Crenella pectinula</i> , Gould;
(Mingan, J. Richardson, Jr). | <i>Macoma Groenlandica</i> , Beck. |
| — <i>glandula</i> , Totteu. | — <i>sabulosa</i> , Spengl. |
| — <i>decussata</i> , Mont. | <i>Tellina (Angulus) tenera</i> , Say;
(collected in Gaspé Bay by Prin-
cipal Dawson). |
| <i>Modiolaria discors</i> , Gray,
and var. <i>loevigata</i> . | <i>Solen ensis</i> , Linn. |
| — <i>nigra</i> , Gray. | <i>Machæra costata</i> ? Say. |
| <i>Modiola modiolus</i> , Linn. | <i>Mya arenaria</i> , Linn. |
| — <i>plicatula</i> , Lamarek. | — <i>truncata</i> , Linn. |
| <i>Mytilus edulis</i> , Linn. | <i>Cryptodaria siliqua</i> , Spengl. |
| <i>Cardium Islandicum</i> , Linn. | (Tadoussac, Principal Dawson;
Little Metis, J. F. Whith-
eaves). |
| — <i>pinnulatum</i> , Conr. | <i>Panopæa Norvegica</i> , Spengl. |
| <i>Serripes Groenlandicus</i> , Chemnitz; | <i>Saxicava rugosa</i> , and var. <i>arctica</i> . |
| <i>Axinus Gouldii</i> , Phil. | <i>Anatina papyracea</i> , Say. |
| <i>Astarte borealis</i> ? Chemn.
(Marsouin, Prof. R. Bell). | <i>Thracia myopsis</i> , Möll. |
| — <i>undata</i> , Gould. | <i>Lyonsia (Pandorina) arenosa</i> , Möll.
(is the <i>Ostcodesma hyalina</i> of Prof.
Bell's list, but not of Conrad). |
| — <i>semisulcata</i> ? Leach. | <i>Pandora glacialis</i> , Leach. |
| — <i>striata</i> , Leach. | <i>Zirphæa crispata</i> , Linn. |
| — <i>Banksii</i> , Leach. | |
| — <i>quadrans</i> , Gould;
(Mingan, J. Richardson, Jr). | |

GASTEROPODA.

*Opisthobranchiata.**Cylichna alba*, Brown.*Prosobranchiata.*

- Toniceia marmorea*, O. Fabr.
Leptochiton albus, Linn.
Amicula Emersonii, Couthouy;
 (Gaspé Bay, Principal Dawson).
Lepeta cœca, Möll.
Cemoria noachina, Linn.
Margarita striata, Brod. et Sow.
 — *obscura*, Couth.
 — *variegata*, Migh.
 — *Grœnlandica*, Chemn.
 and var. *undulata*.
 — *helicina*, O. Fabr.
Adeorbis (Molleria) *costulata*, Möll.;
 (Mingan, J. Richardson, Jr).
Rissoa minuta, Totten;
 (Little Metis, J. F. W.)
 — *castanea*, Möller;
 (Mingan, J. Richardson, Jr).
Lacuna vineta, Fabr.
 — *littoralis*, Linn.
Littorina rudis, Montagu;
 vars. *patula* and *tenebrosa*.
Scalaria Grœnlandica, Perry.
Mosalia erosa, Couthouy,
 (= *Turritella polaris*, Möller).
 — *reticulata*, Mighels,
 (= *Turritella lactea*, Möller).
Aporrhais occidentalis, Beek;
 (Mingan, J. Richardson, Jr).
Menestho albula, Möll.
Velutina haliotoidea, Müll.
 — (Morvillia) *Zonata*, Gould.
Lamellaria perspicua, Linn.
Natiea affinis, Gmelin.
Lunatia heros, Say.
 — *Grœnlandica*, Möll.
- Lunatia triseriata*, Say.
Bulbus flavus, Gould.
Amauropsis Islandica, Gmelin,
 (= *Natiea heliceoides*, Johnstone).
Pleurotoma bicarinata, Couth.
Bela nebilis, Möll.
 — *sealaris*, Möll.
 — *exarata*, Möll.
 — *decussata*, Couth.
 — *pyramidulis*, Strom.
Astyris Holbolli, Beek; smooth var.
 (= *Columbella rosea*, Gould);
 Mingan, J. Richardson, Jr.
Purpura lapillus, Linn.
Nassa trivittata, Say.
Buccinum undatum, Linn.
 (varieties = *B. undulatum* Möll.
 and *B. Labradorensis*, Reeve).
 — *tenue*, Gray.
Buccinofusus Kroyeri, Möll.
Chrysodomus tornatus, Gould.
 — *decemeostatus*, Say,
 (varieties occur with characters
 intermediate between this
 and the preceding species).
 — *Islandicus*? Chemn.
 (?= *Fusus Spitzbergensis*, Reeve).
 — *pygmaeus*, Gould.
Trophen clathratus, Linn.
 — *sealariforme*, Gould.
 — *Gunneri*, Lovén.
 — *eraticulatus*, O. Fabr.
 (= *T. Fabricii*, Beek);
 Mingan, J. Richardson, Jr.
Trichotropis borealis, Brod. et Sow.
Admete viridula, O. Fabr.

CEPHALOPODA.

Loligo illecebresa? Lesuer.

The following species have been found in Labrador, but have not yet been taken living in the area in question:—

- Terebratella Labradorensis*, Sow. *Maetra solidissima*,
Yoldia sapotilla, Gould. *Thracia Conradi*, Couth.
Leda buccata, Möll. *Cione limacina*, Phipps.

Limacina helicina, Phipps.
Bulla vertenius, Migh.
 — *occulta*, Migh.
Philina lineolata, Couth.
Pilidium rubellum, Fabr.
Scissurella crispata, Flem.

Tritella acicula, Stimps.
Bella violacea, Migh.
 — *cancellata*, Migh.
Buccinum Groenlandicum, Hancock.
Ommastrephes todarus?

All of these, with the exception of the first species, are given on the authority of Dr. A. S. Packard, Jr. (this Journal, vol. viii., page 401. Throughout Dr. Packard's article, wherever the depth of water is given as "feet," read "fathoms").

Ostrea Virginiana? Lam., *Venus mercenaria* Say, *Crepidula fornicata*, *C. plana*, and *Nassa obsoleta* live in the Bay of Chaleur, but barely within the limits we have prescribed.

Mochera squama Blainv., *Fasciolaria ligata* Mighels, and *Fusus ventricosus* Gray, occur both north and south of Lower Canada, but they have not as yet been taken in its waters.

Lastly, a few shells are found in the postpliocene beds of Lower Canada, which, as yet, have not been detected as members of its recent fauna. These are:—

Terebratella Spitzbergensis? Dav.
Leda truncata, Brown.
Cardium Dawsoni, Stimp.
Astarte Laurentiana, Lyell.
Macoma inflata, Stimp.

Cylichna nucleola, Reeve.
Buccinum glaciale, Linn.
Buccinum Groenlandicum, Hanc.
 — *cyaneum*, Brug.
 — *Tottenii*, Stimp.

The three last named species of *Buccinum* are quoted on the authority of Dr. Stimpson. The *Terebratella* has been referred to the *T. Labradorensis* of Sowerby. Having seen recent specimens of this shell from Halifax, N. S., and fossil examples from Rivière-du-Loup, it seems to me to come nearer to Davidson's *Terebratella Spitzbergensis*.

At depths as great as fifty fathoms and upwards in Gaspé Bay, the mud or sand brought up by the dredge, even in July and August, is icy cold. It is not improbable that in this bay one of the branches of the cold northerly arctic current may flow. An experiment made by Dr. Fortin of trying to naturalize oysters in Gaspé Bay seems to have failed. Oysters are very sensitive to cold, and not only does extreme cold exist at the bottom in deep water all the year round, but the surface is frozen over along the shore during the winter.

The marine mollusca of the River and Gulf of the St. Lawrence are remarkable, first, for the extreme antiquity of many of the species, and secondly, for their wide geographical range. The

majority of them belong to an arctic or sub-arctic fauna, which is to a large extent circumpolar. In time, some date back to a period as old as that in which the European coralline crag was deposited, and during the formation of the European tertiaries and post-pliocene beds, many species lived in the seas of Great Britain, etc., which are now extinct there but which still live on the western side of the Atlantic. There may be perhaps, in addition to this, a small local assemblage consisting of species apparently of a more recent date of creation and confined to a comparatively limited area. Nearly all of the Greenland shells will probably be yet detected in the River and Gulf of the St. Lawrence. When we possess more definite information as to the geographical distribution of the living marine invertebrates of the Dominion, we shall be better able to understand the conditions under which the Canadian post-pliocene beds were deposited. And further, a careful comparison is still required between the recent invertebrates of the northern seas, and the fossils of the tertiary and post tertiary beds of Europe and North America. Not only would the results of such investigations add to our knowledge of physical geology, and help to form a key towards the solution of the problem of the rationale of the geographical distribution of plants and animals, but it might also throw some light on that vexed question the origin of species. These arctic or sub-arctic molluscs are not only in many cases of high antiquity, but from their wide spread distribution we get an opportunity of studying the modifications of species caused by altered physical conditions.

