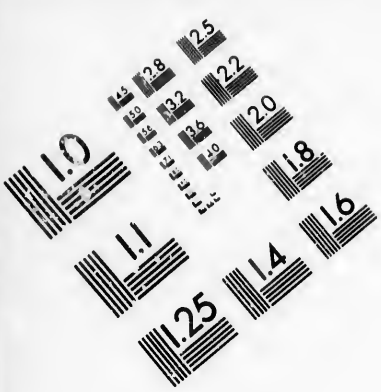

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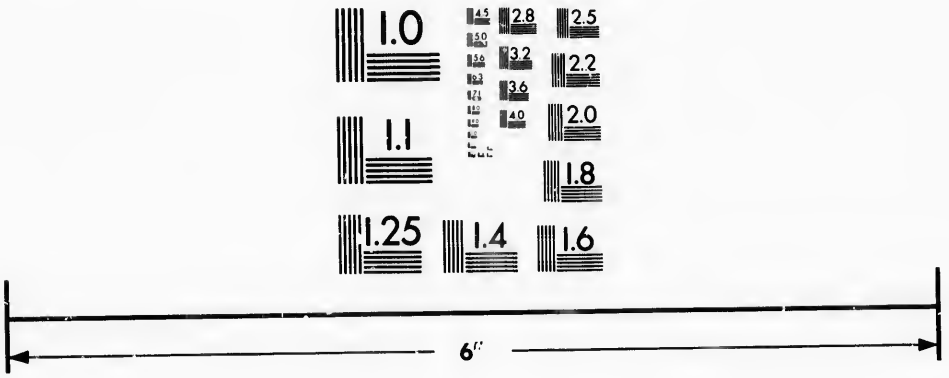

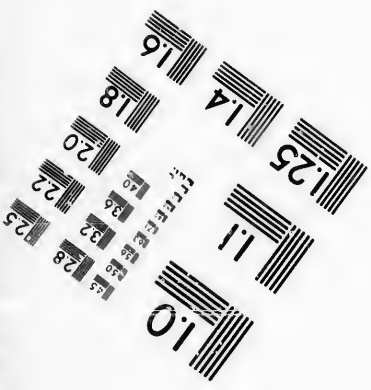

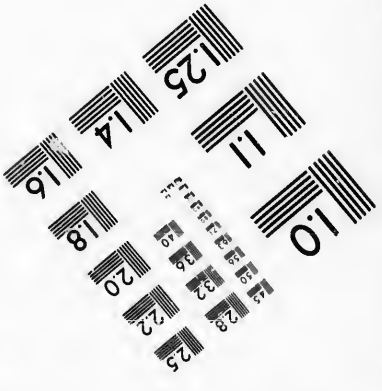

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GEOLOGICAL SURVEY OF CANADA.
ALFRED R. C. SELWYN, F.R.S., F.G.S., DIRECTOR.

NOTES

ON THE

CRETACEOUS FOSSILS

COLLECTED BY

MR. JAMES RICHARDSON,

AT

VANCOUVER AND THE ADJACENT ISLANDS,

BY

J. F. WHITEAVES F.G.S.

Extracted from the Report of Progress for 1873-74.

DAWSON BROS.: MONTREAL.
1874.

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NOTES ON THE CRETACEOUS FOSSILS

COLLECTED BY

MR. JAMES RICHARDSON

AT VANCOUVER AND THE ADJACENT ISLANDS,

BY J. F. WHITEAVES, F.G.S.

To A. R. C. Selwyn, Esq., F.R.S., F.G.S.
DIRECTOR OF THE GEOLOGICAL SURVEY OF CANADA.

Dear Sir,—In compliance with your request to that effect, I have examined with some care the specimens collected by Mr. Richardson last summer, and beg to submit the following provisional report upon them.

Your obedient servant,
J. F. WHITEAVES.

The present collection, though not so large as that made by Mr. Richardson from the same region in 1871, is nevertheless highly interesting. With very few exceptions, the fossils are in a bad state of preservation. They belong entirely to the mollusca proper, and the brachiopoda are altogether unrepresented. The bivalves are usually mere casts, and even when the shell is preserved, the characters of the hinge and of the interior cannot be ascertained. Most of the gasteropods are very imperfect at the aperture, and the few cephalopods are, for the most part, mere fragments. No better clue to the specific and even generic affinities of these fossils is generally attainable than such as their general appearance, surface markings, and relative thickness of test, will supply.

Mr. Richardson informs me that they were collected from two zones, those from the first six localities being from his* "Productive Coal Measures, or Division A," while the remainder, those from Gabriola Island, are from his "Lower Shale, or Division B." A few of the fossils from the last mentioned locality appear to have been "loose specimens," while others were obtained *in situ*, but in the absence of Mr. R. it is not possible to separate these.

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* Report of Progress for 1872-73, page 35.

FOSSILS FROM THE PRODUCTIVE COAL MEASURES, OR DIVISION A.

Locality No. 1. *From North West Bay, Vancouver Island.*

(*Cephalopoda.*)

Ammonites, species A.— A large somewhat flattened shell with rounded back, and plain wide ribs, which are often alternately simple and bifurcate. A single large specimen about 7 inches in diameter, very imperfect below, but less so above, and with some of the interior layers of the test preserved.

Ammonites, species B.—Allied to the preceding, of which it may be a variety, but with a more ventricose shell, and with somewhat different sculpture. In this form some of the costæ are continued across the last whorl almost to the sutures, while an alternate and shorter series occupy their interstices. Occasionally, however, the main costæ bifurcate as in the preceding species. Also a large species, measuring about 6 inches across.

Ammonites, species C.—Fragments only of a much flatter shell than either of the preceding, with the ribs closer together and not so prominent.

Note.—From this locality there appear to be three species of Ammonite, of which two are tolerably well preserved. The material, however, is insufficient to enable one to form a very precise notion of their specific relations, as there are only two moderately complete examples and six fragments in the collection.

Nautilus, sp.—One portion of a cast of a large species, shewing the central siphuncle. Also a cast of a single chamber, possibly of the same kind, but with the siphuncle subcentral.

(*Gasterpoda.*)

Cast of a small spiral univalve, apparently with three whorls; genus not recognisable.

(*Lamellibranchiata.*)

Inoceramus, sp.—Shell tuberculated and with V-shaped raised sculpture. Abundant, but not perfect enough for critical comparison with nearly related forms. Judging from larger fragments, most of the specimens are very young shells.

Cucullæa, sp.—A large shell, with prominent umbones, and a thick test ornamented with fine radiating ribs. Probably new, but too fragmentary for accurate description. It may belong to Conrad's sub-genus Trigonoarea.

Axinæa Veatchii, Gabb. var.— Several specimens.

Trigonia, species A.— A narrow, much curved, very convex and strongly ribbed shell, the ribs subnodulous. Perhaps an extreme variety of Trigonia Evansana, Meek.

Trigonia, species B.—A large, subquadrate, depressed form, with distant, rounded tubercles.

Astarte cardinioides, nov. sp.—Two examples of a shell, apparently new to science, and for which the above name is proposed, occur among the specimens from this locality. Descriptions with figures of this and of other species which appear to be new, will be found at the end of this report.

Astarte Vancouverensis, nov. sp.—Occurs sparingly with the above.

Besides these there are burrows of a Teredo-like shell, in fossil wood, and casts of another species of bivalve.

Locality No. 2. Coast a little W. of N. W. Bay, Vancouver Island.

Panopæa Veatchii, Gabb.—The only species.

Locality No. 3. Nanaimo River, Vancouver Island, 10 miles up.

(*Cephalopoda.*)

Ammonites.—Fragment of a small, smooth species, with a sharp and unserrated keel.

(*Gasteropoda.*)

None.

(*Lamellibranchiata.*)

Inoceramus, sp.—A concentrically grooved shell, but very imperfect. Three examples.

Lucina Richardsonii, nov. sp.—One well preserved individual.

Locality No. 4. Nanaimo River, Vancouver Island, 2¼ and 2½ miles up.

(*Cephalopoda.*)

None.

(*Gasteropoda.*)

Sycodes (?) cypræoides? Gabb.—A single imperfect specimen of a shell, from this locality, is doubtfully referred to this species. The much better examples, from Protection Island, have exactly the shape and surface markings of S. cypræoides, but there are indications of plaits on the columella in the shells brought home by Mr. Richardson.

Actæonina (?) sp.—Very imperfect, but with much the shape of A. pupoides, Gabb.

Cinulia inflata (?) *Gabb.*—A few specimens.

Natica, sp.—Only a fragment, shewing, however, the characters of nearly the whole of the body whorl. Umbilicus none; shell with a strong keel running from the bottom of the aperture round the base of the whorls. As the upper part of the volutions appears to be angulated also, the shell should probably be referred to the sub-genus Euspira.

Fasciolaria ? nodulosa, nov. sp.—Two individuals, but not very perfect examples.

Aporrhais, sp.—One specimen, in very bad condition, and quite unrecognisable. It seems to have one central digitation, and in that respect resembles A. angulata, Gabb.

There are also two or three other species of Gasteropoda, but these are too imperfect for even the generic name to be ascertained. In one only a portion of the pillar is visible, but that has strong folds, as in the Volutidæ, or Fasciolariadæ.

Lamellibranchiata.)

Inoceramus,—Two species.

Axinœa —— ?—Resembles A. Vcatchii, Gabb.,in outline and thickness of test, but has much finer ribs.

Mactra, sp.—Several. The outline of this shell is very like that of Mactra Warrenana, Meek and Hayden, and it closely resembles also the Mactra albaria of Conrad.

Lucina ? sp.—(Cast.)

Anatina ? sp.—(Do.)

Pholadomya, sp.—A bad, distorted cast.

Nucula, sp.—(Cast.)

Locality No. 5. From Protection Island.

(Cephalopoda.)

None.

(Gasteropoda.)

Sycodes (?) *cypræoides* (?) *Gabb.*—Three specimens. See the previous remarks on this species.

Cinulia obliqua ? Gabb.—Badly preserved.

Gyrodes expansa ? Gabb.—One or two specimens, which are doubtfully referred to this form.

Fasciolaria nodulosa, nov. sp.—A single badly preserved example.

Also three unrecognisable species, in a fragmentary condition.

(*Lamellibranchiata.*)

Inoceramus, sp.—With flattened, distant, concentric ribs, somewhat as in I. Whitneyi, Gabb.

Dosinia, perhaps *D. tenuis, Meek.*—A single individual, of which a figure is given.

Mactra (*?*) *sp.*—A species with strong concentric ribs, perhaps an extreme form of Cymbophora Ashburnerii, Gabb. The only specimen is very different from any of the other Mactridæ in the collection.

Two or three other forms, of which the genera cannot be ascertained.

Locality No. 6. *Below Dodd Narrows.*

(*Cephalopoda.*)

Baculites, sp.—Fragments only.

Ammonites, sp.—Portion of a single chamber.

(*Gasteropoda.*)

None.

(*Lamellibranchiata.*)

Conchocele cretacea, nov. sp.—A few specimens, tolerably well preserved. The most abundant shell from this locality.

Also a few unrecognisable fragments, one evidently of a species of Inoceramus.

FOSSILS FROM THE LOWER SHALE, OR DIVISION B.

From Gabriola Island. (*The only locality examined.*)

(*Cephalopoda.*)

None.

(*Gasteropoda.*)

Natica, sp.—A solitary example of an imperforate, but not angulated shell, of which only the body whorl is present.

Cinulia, sp., perhaps *C. obliqua, Gabb.*—A single cast.

Also a small imperfect spiral species, of which the genus is not recognisable.

(*Lamellibranchiata.*)

Nucula (*Acila*) *truncata, Gabb.*—One good example of this interesting shell is among the Gabriola Island fossils. Several specimens of the same species were collected by Mr. Richardson, in 1872, from the W. side of

Hornby Island in beds which he refers to in his "Middle Shale, or Division D."

Axinœa, sp.—One very imperfect shell, obviously belonging to this genus, but different from the two other species previously catalogued from other localities.

Mactra, sp.—Possibly the same as those from Division A., Locality No. 4.

Tellina Meekiana, nov. sp.—A single well preserved example.

Anatina Tryoniana? Gabb.—The only specimen is too imperfect to enable a confident opinion to be formed as to the accuracy of this determination.

Pholadomya, sp.—Near P. Breweri.

As was stated at the commencement of this report, with the exception of the fossil plants, which have been described by Principal Dawson on a previous occasion, Mr. Richardson's 1873 collection consists exclusively of shells. Of these, Baculites among the Cephalopods, Cinulia among the Gasteropods, and Inoceramus among the Lamellibranchiate bivalves, are each strikingly characteristic Cretaceous genera.

On the other hand, in a small collection made by Mr. Richardson at Quatsino Sound, Vancouver Island, in 1871, there occur two species, at least, which have been regarded as Tertiary fossils. Mr. F. B. Meek, to whom some of these fossils were sent, refers one to the Conchocele disjuncta of Gabb, a Miocene species of California, and another to the Dolium petrosum of Conrad, which occurs also in the Eocene and Miocene deposits of Oregon. From this locality there are five species, all of which are badly preserved casts. One of these is a Natica, and the rest are spiral gasteropods whose generic positions are very uncertain.

In Mr. Richardson's 1873 collection the fossils are altogether Cretaceous. The Conchocele, for which a new specific name is proposed, is associated with fragments of Baculites and Ammonites; and the Nucula truncata, although belonging to the same sub-genus (Acila of H. and A. Adams) as the Tertiary Nucula Conradi of Meek, is not only very distinct from it, but is still more closely allied to the N. bivirgata of Fitton a fossil characteristic of the Gault of Europe.

The coal-bearing rocks of Vancouver and the adjacent islands, with their associated shales, &c., have been referred to the "Chico group" of American geologists, a formation which is considered to be synchronous with the Upper Cretaceous of Europe, as recently defined. There is little room to doubt that these views are essentially correct. The lithological characters of the Upper Cretaceous strata of the Pacific Coast and of those of Europe are widely different, and it is reasonable to suppose that the physical conditions under which they were respectively accumulated were as diverse. In the Cretaceous rocks of Vancouver or California it is difficult

to find exact parallels for the five divisions which are usually characteristic of the Upper Chalk Formation of Europe.

In the Vancouver region it is not unlikely that the beds referred by Mr. Richardson to his "division A," may form the base of the Chico group. The specific relations of the larger portion of the most characteristic fossils in the present collection have not yet been ascertained with sufficient certainty to throw any light on this point. So far, not even a single species from the Vancouver region can be proved to be actually conspecific with an European fossil. Several shells, however, are common to the Chico group of California and to that of Vancouver and the adjacent islands. The series from the "Lower Shales" of Gabriola Island is too small and the individuals too imperfect to afford much help in the elucidation of the relations existing between the deposits above and below them. Cinulia obliqua of Gabb ranges from Mr. Richardson's Division A, up to his Division D, and Nucula truncata, Gabb, occurs both in the "Lower Shales" of Gabriola Island and in the "Middle Shales" of Hornby Island.

DESCRIPTIONS OF NEW SPECIES.

The following descriptions are, to a certain extent, provisional. As, in certain cases, the essential characters of the genera cannot be definitely ascertained, owing to the unfavorable state of preservation of the fossils, some of the names may have to be modified or changed. At the same time as the species appear to be new, it has been thought better to describe and figure them, in the hope that better specimens may soon be obtained, which will enable more accurate and complete descriptions to be given.

Lucina Richardsonii, *nov. sp.*—Shell obliquely semi-orbicular, somewhat inflated, very inequilateral, nearly smooth, with faint concentric striations. Umbones prominent, nearly marginal, dorsal slope almost straight, and making a rounded angle with the posterior part of the shell, which is slightly subquadrate. Anterior portion of the test, beneath the beaks, obliquely rounded off towards the ventral margin and almost truncate.

The outline is somewhat like that of Loripes dubia, Gabb., but our shell is destitute of the concentric ribs of that species, its umbones are nearly terminal, and the test is much shorter anteriorly.

Locality.—Nanaimo River, Vancouver Island, ten miles up.

Collector.—Mr. James Richardson, to whom the species is dedicated.

Conchocele cretacea, *nov. sp.*—Shell elliptical, somewhat quadrangular, inflated, beaks terminal, anterior; front end shallowly concave, making an acute angle with the ventral margin; base broadly rounded; posterior extremity slightly convex, forming an angle at its junction with the dorsal

margin. Two keels extend, on each valve, from the beaks to the posterior end, each of which incloses an excavated space of which the interior is the smallest; the outer area thus circumscribed is broadly lenticular, while the inner one is rather shorter and much narrower. The outer dorsal ridges are somewhat convex, and the area inclosed is only slightly higher when the shell is viewed laterally. Surface ornamented with fine sub-equal concentric striæ. Conchocele disjuncta, Gabb, the only previously known species in this genus, is a larger, less oblique, and more trigonal shell, straightly truncated anteriorly, whereas C. cretacea is distinctly concave in that region. In our species the prominent keels are entirely dorsal, and are separated from the ventral margin by a considerable space, indeed by the whole siphonal end of the shell, whereas in C. disjuncta the ridges make a bold curve from the beads to the posterior dorsal margin.

The outline of this remarkable shell is so different from its nearest ally, that a new specific name has been proposed for it. It is possible that when larger series of specimens can be compared, our shell may prove to be only an immature state of the type species.

The marked differences between the two shells, however, as well as the circumstance that the C. disjuncta is described as a Miocene fossil, while the Vancouver Island shell is almost unquestionably Cretaceous, seem to justify their separation.

Astarte Cardinoides, *nov. sp.*—Shell ovately-elliptical or sub-quadrangular, very unequilateral, bluntly truncate both in front and behind, but much narrower behind; flattened or only very moderately convex. Umbones depressed, placed at about seven-eighths of the length from the anterior end; hinge line sloping gradually downwards; an obtuse and barely perceptible angle runs from the beaks to the posterior ventral margin; posterior end sub-truncate; ventral margin very slightly convex; anterior extremity wider than the posterior, also subtruncate, but more produced towards the ventral margin. Test thick, with a crenulated inner margin: the surface ornamented with tolerably strong concentric costæ. Named from its close resemblance to some of the Liassic Cardiniæ.

Locality.—North West Bay, Vancouver Island.

Collector.—Mr. James Richardson.

Astarte Vancouverensis, *nov. sp.*—Shell oblong, very inequilateral, beaks almost terminal: very short in front, produced and somewhat pointedly rounded behind; test thick, margin crenulated. Surface with concentric costæ, much as in the preceding species.

Locality.—North West Bay, Vancouver Island. Also coast a little W. of North West Bay.

Collector.—Mr. James Richardson.

The interior characters of the two species just described cannot be

ascertained, but from the thickness of the test, the crenulated border, and surface markings, it is evident that they both belong to the Astartidæ. Their outline is not unlike some forms of Cypricardia, but the grooved ribs seem to place them in the typical genus Astarte. Only two or three specimens of each were obtained, and these appear to be water worn and are otherwise badly preserved. At first they were thought to be extreme forms of one variable species, but a more careful study of the specimens has led to a different conclusion.

Locality.—Below Dodd Narrows.

Collector.—Mr. James Richardson.

Tellina Meekiana, nov. sp.—Shell ovate, compressed, very inequilateral; beaks one-third of the length from the anterior end, not very prominent, pointing slightly forwards; hinge margin sloping down somewhat rapidly to the posterior end, which is narrowly rounded, much more so than is the opposite termination; base, elliptically convex. Test thin, ornamented with close, fine concentric striæ.

As none of the characters of the interior can be made out in the only specimen collected, it is by no means certain whether this shell belongs to the Tellinidæ or Veneridæ. Its outline is singularly like that of Meretrix lens, but the thinness of the test, the characters of the beaks, the sculpture, and flatness of the Gabriola Island shell, seem in favor of the view taken.

Locality.—Gabriola Island. From the Lower Shale, or Division B.

Collector.—Mr. James Richardson.

Fasciolaria nodulosa, nov. sp.—Shell angularly fusiform; spire pointed, rather short, about one-fourth of the entire length of the shell, or less; body whorl conspicuously angulated below the suture, somewhat ventricose; canal long and tapering, almost straight. The upper volutions are undulately ribbed, and the body whorl is ornamented with raised nodulous, distant tubercles, or elevations, at the angle below the suture; their interstices are widely excavated longitudinally. The whole surface is covered with sub-equal, somewhat flattened, strong, transverse revolving ribs, and the shell is also faintly striated longitudinally.

As the interior of the shell is not visible in any of the specimens collected, it is impossible to say whether there are any plaits on the pillar or not. It is provisionally placed in the genus Fasciolaria, on account of its close agreement in external characters with some recent species of this group, such as the F. fusiformis Lamarck, from Port Philip. It may prove to be a Fusus, and indeed it bears no very remote resemblance to F. Mexicanus of Gabb.; still, it differs from that shell in several important particulars.

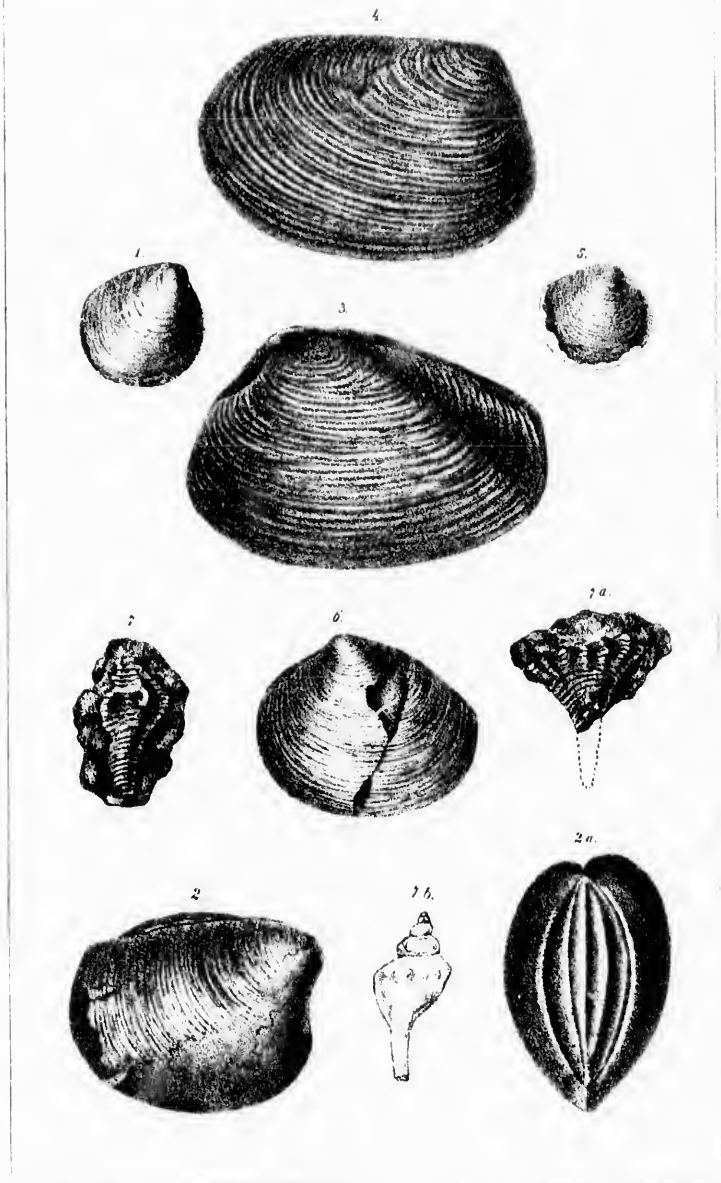
Locality.—Nanaimo River, Vancouver Island, two and a quarter miles up; also Protection Island.

Collector.—Mr. James Richardson.

EXPLANATION OF PLATE.

Fig.

1. Lucina Richardsonii.
2. Conchocele cretacea.
3. Astarte cardinioides.
4. " Vancouverensis.
5. Dosinia tenuis ? Meek.
6. and 7. *a*. Fasciolaria nodulosa, view of two different individuals with the test preserved shewing sculpture.
7. *b*. Outline of another specimen of the same species.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