

A CAMBRIAN FAUNA FROM FINNMARK, NORTHERN NORWAY

BY

TRYGVE STRAND

WITH ONE PLATE

The small Cambrian fauna here described was discovered last summer by Mr. SVEN FØYN, cand. mag., and collected by him at three localities on the north-western side of the Digermul peninsula in the Tana fjord, Finnmark. The localities are Boksjokka, Hånsvikelv and Kistedal, small river valleys, the geographical position being about $70^{\circ} 35' N$ and $17^{\circ} 10' E$ of Oslo.

The greater part of the material collected was taken from loose pieces of rock carried by the rivers, but some specimens were also taken from solid rock, and there is thus no doubt as to the beds from which the fossils were derived. Mr. FØYN also made a preliminary mapping of the Digermul peninsula, which brought out the main features of stratigraphy and structure. An account of the stratigraphy and geology of the fossiliferous beds will be included in a future publication by FØYN; in the present paper only the fossils are described and their stratigraphical significance discussed. When FØYN comes to publish his observations, the fauna newly discovered will prove to be of great value for clearing up some of the problems in the geology of Finnmark.

However, the discovery of Cambrian fossils in this part of Norway is also in itself a welcome contribution to our knowledge of the Cambrian faunas and their distribution.

To Mr. FØYN, and also to Professor O. HOLTEDAHL, the writer wishes to express his indebtedness for the opportunity to work out this interesting material.

Lingulella (Lingulepis) cf. roberti (MATTHEW).

Pl. figs. 1—3, 8—9.

Description. Specimen No. 57374 (pl. fig. 8) is a nearly exfoliated interior mould a ventral valve. Outline ovate and acuminate towards the apex with the maximum width nearer to the anterior end than to the apex. Dimensions: length 17 mm, width 14 mm (index width to length 82). The most interesting feature shown by the specimen are markings of the pedicle groove and visceral cavity and main vascular sinuses. The visceral cavity extends for a distance of 7—8 mm anteriorly from the apex. Together with the pedicle groove it makes a club-shaped area, about 2 mm wide at the rounded anterior end. The vascular sinuses can be traced to take their origin at the posterior part of the visceral cavity, anteriorly from here they curve more strongly inwards in relation to the outline of the valve, and disappear slightly anterior of the middle.

Sp. No. 57382 (pl. fig. 1) is a ventral valve with a subtriangular acuminate posterior part. Length 13.5 mm, width 9 mm (67). Besides the usual sculpture of concentric growth-lines there are also fine radial lines. A similarly preserved dorsal valve on the same slab is 11 mm long and 11 mm wide.

Sp. No. 57358 (pl. fig. 2) is an elongate ventral valve with acuminate apex. Length 13 mm, width 9 mm (69).

Sp. No. 57369 (pl. fig. 9) is a large, comparatively broad ventral valve. Length 16 mm, width 13 mm (81).

Remarks. The present form is characterized by the pointed apical part of the ventral valve with slightly concave postero-lateral outline. By this form of the valve, it places itself in the subgenus *Lingulepis* of *Lingulella*. The great amount of individual variation shown by our form is also common with other species of this subgenus.

From a comparison of the material here described with the figures and descriptions of WALCOTT (1912) it appears that our form comes very near to *Lingulella (Lingulepis) roberti* (MATTHEW) (l. c., p. 557, pl. 37, figs. 4, 4 a—d), certainly nearer than to any other species of the subgenus there described. This comparison is based on form and outline as well as on sculpture and interior markings. From the species *gregwa* and *exigua*, which are stated by WALCOTT to be related to *roberti*, our form differs by its sculpture, which agrees with that of *roberti*.

Billingsella cf. retroflexa (MATTHEW).

Pl. figs. 4—7.

Description. All the specimens here described occur on a single small slab of sandstone (sp. No. 57510), on one side of the slab three internal moulds, on the other side almost exclusively casts of the exterior.

The ventral valve in pl. fig. 7 is an internal mould with the interarea badly preserved and evidently compressed. It is moderately convex with a median depression. Outline with anteriorly converging sides and thus widest at the hinge-margin, rounded anteriorly and broadly triangular at the posterior margin. The anterior margins of the interarea appear as very distinct, somewhat oblique grooves.

Dimensions: length 12 mm, width 11 mm.

The specimen in pl. fig. 6 is an internal mould of the postero-lateral part of a ventral valve. The valve is narrower at the hinge-line than in the anterior part. The mould shows distinctly the one side of the apsacline, almost horizontal interarea with tooth and triangular delthyrium. Nothing is seen of a deltidium, but the parts where it should occur are concealed in the matrix. — Half the width of the hinge-margin is about 5 mm.

Pl. fig. 5 shows an external cast of a somewhat distorted ventral valve with a median depression and sculpture of fine costae, of which there are 2—3 in one millimeter. — Dimensions: length 14 mm, maximum width 14 mm, width at the hinge margin 11 mm.

The dorsal valve in pl. fig. 4 is an internal mould. Outline with straight hinge-margin, lateral and posterior parts rounded, maximum width in the midst of the shell. Convexity rather strong, stronger than in ventral valve. There is no sinus or fold. The cardinalia are well displayed, there is a strong cardinal process and distinct divergent brachiophores. As is best shown in an artificial cast, the nothothyrial platform is elevated above the bottom of the valve.

The following diagnosis contains what essentially is known of this form from the specimens described above:

Outline rounded, subtrapezoidal, hinge-line straight, usually narrower than the maximum width of the shell, cardinal angles obtuse. Sculpture of fine costae. Ventral interarea apsacline, delthyrium broadly triangular; whether a deltidium is present is unknown. Of interior characters, the presence of teeth at the margins of the

delthyrium is known. The dorsal interior with nothothyrial platform elevated above the bottom of the valve, with strong cardinal process and divergent brachiophores.

Remarks. What is known of the interior characters of this form is enough to place it in the scheme of classification, as recently revised by SCHUCHERT & COOPER (1932). With the presence or absence of a deltidium our form will have to be classed as a *Billingsella*, or an *Eoorthis*, respectively.

The following species of *Billingsella* resemble in external characters the form here described: *Billingsella lindströmi* (LNRS.) from the Paradoxides forchhammeri zone of Öland has a similar outline and also has the dorsal valve more convex than the ventral. It differs from our form in having a sinus in the dorsal valve, but none in the ventral.

Forms closely related to *B. lindströmi* have been described from the upper part of the Middle Cambrian of Great Britain (MATLEY 1911).

Billingsella retroflexa (MATTHEW) from the Middle Cambrian of Nova Scotia (WALCOTT 1912, p. 761, pl. 90, fig. 1, 1 a—h) is very similar to *B. lindströmi*, but is perhaps still more suggestive of the form here described than the latter. *B. retroflexa* has thus a sinus in the ventral valve.

All the species mentioned above have been classed under *Billingsella*, but so far as I have been able to find out, it is unknown whether or not they had a deltidium.

There are also a number of other forms, which from exterior characters might perhaps equally well be compared to our form. This is thus the case with *Billingsella holtedahli* (WALCOTT 1924, pl. 1, figs. 6—16) from the Ozarkian of Novaya Zemlya. This and other forms belong, however, to faunal provinces outside the Atlantic one, and a closer relation to such forms may seem less probable. In this connection it is especially suggestive that *Billingsella retroflexa* occurs together with *Lingulella (Lingulepis) roberti* in the Middle Cambrian of Nova Scotia. Provided we are correct in comparing the *Lingulepis* here described with *L. roberti*, it ought to be no mere incidence that the orthoid brachiopod here described has a striking similarity with *Billingsella retroflexa*.

Hyalolithus sp.

A fragment of a hyolithid (No. 57386) is too incomplete and badly preserved to be more accurately determined. Length of the fragment, being the adapical part of a shell, about 15 mm, angle of divergence about 15° .

Trail of *Cruziana* type.

Pl. fig. 10.

Description. Sp. No. 57468 is a small slab of greyish sandstone, also containing very thin layers of clayey substance which appear as dark patches. It is this dark substance which makes the trail discernible; this can best be described by allusion to its resemblance to a small twig of a spruce. Width of the trail 15 mm.

The trail is of the same type as those figured by WALCOTT (1918) and regarded as trilobite trails (*Cruziana*). Especially the trail figured on pl. 38, figs. 3—4, from the Upper Cambrian of Newfoundland is similar to the one here described.

The fauna from Finnmark here described consists of the following forms:

Lingulella (*Lingulepis*) cf. *roberti* (MATTHEW).

Billingsella cf. *retroflexa* (MATTHEW).

Hyalolithus sp.

Trail of *Cruziana* type.

Already in a more general way, from its generic types, this fauna must be determined as of Middle or Upper Cambrian age. As is evident from the discussion above, it seems also justified to make a more accurate correlation of this fauna. The two species, with which the brachiopods from Finnmark have been especially compared, occur together in the Middle Cambrian of south-eastern Canada, at George River, Cape Breton, Nova Scotia. According to YOUNG (1913) the age of these beds has been determined by the find of *Paradoxides forchhammeri*, and belongs thus in the upper part of the Middle Cambrian. *Billingsella lindströmi*, which is closely related both to *B. retroflexa* and to the orthoid brachiopod here described, occurs in the *Paradoxides forchhammeri* zone of Öland. Also the related British forms mentioned above occur at a corre-

sponding horizon. There are thus strong reasons for placing the fauna from Finnmark at a corresponding stratigraphical level.

The fossils described occur in a greyish rather fine-grained sandstone, alternating, according to FØYN, with dark shale. This is a type of facies different from that with alum shale and stinkstone, which prevails in other parts of Scandinavia, where Middle (and Upper) Cambrian faunas are known.

Of the two forms constituting or fauna, the *Billingsella* species is rare and occurs only in a few specimens, while the *Lingulepis* species is very common and occurs in great masses throughout the rock. This type of occurrence is reminiscent of the Lower Ordovician *Obolus* conglomerate or *Obolus* sand of Sweden and the Baltic. In both cases we certainly have to do with shells which have been washed together in shallow water. As I have had the opportunity of seeing from some specimens from George River, Nova Scotia, collected by Professor HOLTEDAHL, the rock at that locality is a slightly calcareous reddish sandstone, where *Lingulepis roberti* occurs in great numbers. The similarity of fauna between this area and Finnmark is thus combined with a similarity in the facies of rock. The fauna newly discovered by FØYN gives a further proof of the close connection existing between the Cambrian of Scandinavia and that of the Atlantic provinces of North America.

References.

- LINNARSSON, G. 1876. On the brachiopoda of the Paradoxides beds of Sweden. Bihang til Kgl. Svenska Vet.-Akad. Handl. 3. No. 12. Stockholm.
- MATLEY, C. A. 1911. Note on some brachiopoda from the Paradoxides beds of Comley. Q. J. G. S. 67. p. 300. London.
- SCHUCHERT, CH., and G. A. COOPER. 1932. Brachiopod genera of the suborders Orthoidea and Pentameroidea. Mem. of the Peabody Mus. of Nat. Hist. 4, part 1. New Haven, Conn.
- WALCOTT, CH. D. 1912. Cambrian Brachiopoda. U. S. Geol. Surv. Monograph 51. Washington.
- 1918. Appendages of trilobites. Smithsonian Misc. Coll. 67, No. 4 (Cambrian Geol. and Pal. IV, No. 4). Washington.
- 1924. Ozarkian brachiopoda from Novaya Zemlya. Rep. Sci. Results of the Norw. Exp. to Novaya Zemlya 1921, No. 25. Oslo (Kristiania).
- YOUNG, G. A. 1913. George River. 12th Geol. Congress. Excursions in Canada. Guide book No. 1, p. 266. Ottawa.

PLATE

Explanation of the plate.

All the originals are in the Paleontological Museum in Oslo.

Figs. 1—9 $\times 2$, fig. 10 $\times 1$.

- Fig. 1. *Lingulella (Lingulepis) cf. roberti* (MATTHEW). Ventral valve, imprint of the exterior. No. 57382.
- „ 2. Same species. Elongate acuminate ventral valve. No. 57358.
- „ 3. Same species. Ventral valve. No. 57369.
- „ 4. *Billingsella cf. retroflexa* (MATTHEW). Dorsal valve, internal mould. 4 a. Same in profile from side. This specimen and those in figs. 5—7 from the same slab of sandstone, No. 57510.
- „ 5. Same species. Ventral valve, imprint of the exterior, somewhat distorted.
- „ 6. Same species. Ventral valve, internal mould of postero-lateral part.
- „ 7. Same species. Ventral valve, internal mould.
- „ 8. *Lingulella (Lingulepis) cf. roberti* (MATTHEW). Ventral mould. No. 57374.
- „ 9. Same species. Broad ventral valve. No. 57369.
- „ 10. Trail of *Cruziana* type. No. 57468.

Trygve Strand: A Cambrian Fauna from Finnmark.



1



2



3



4



4 a



5



6



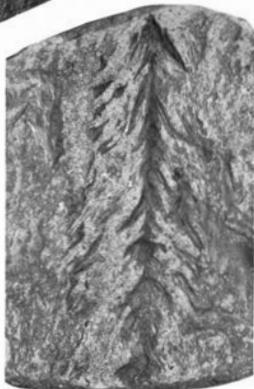
7



8



9



10