

A LOWER ORDOVICIAN FAUNA FROM THE SMØLA ISLAND, NORWAY

BY

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WITH ONE FIGURE IN THE TEXT AND ONE PLATE

The material described in this paper came from Skilberg in the Smøla Island at the western coast of Norway, situated at about 63° N lat. SW of the mouth of the Trondheim Fjord (see text-fig 1). The fossils are silicified and occur in a massive limestone with bands of chert, which is much disturbed and folded and surrounded at present by Caledonian igneous rocks. J. SCHETELIG (1913) and H. REUSCH (1914), who described the geology of Smøla, mentioned the occurrence of poor fossils. A more copious material from the limestone was first collected by O. HOLTEDAHL, and in his paper of 1915 he was able to describe *Lophospira*? *norvegica*, *Eunema smoeleni* and a *Maclurea* sp. This fauna was then considered to be of young Ordovician age, as being compared to the sequence in the Oslo District, where *Maclurites* occurs in the Upper Ordovician only. Later HOLTEDAHL emphasized that the fauna might be much older than originally assumed, and perhaps an equivalent to the Durness limestone of Scotland (1918 p. 256). He was strengthened in this view when finding in the Younger dolomite series of Bear Island a fauna consisting of the same types as that in the Smøla limestone. This Bear Island fauna includes *Piloceras* together with *Maclurites* and other forms, and is thus fixed as Lower Ordovician (Canadian), (HOLTEDAHL 1919). In 1922 Prof. HOLTEDAHL revisited Smøla and collected more material, and a great number of mostly small specimens were worked out by dissolving the limestone in hydrochloric acid. This additional material was briefly reported upon in the Novaya Zemlya paper of 1924 (pp. 110-112). The forms mentioned are *Lophospira* sp., a high *Maclurites* near to *M. sylpha* BILLINGS, a *Camarella* and a *Piloceras*? CARSTENS

in his paper of 1924 deals with the geology and petrology of the Smøla limestone and associated effusive rocks. Following HOLTEDAHL he refers the limestone to the Lower Ordovician.

Professor HOLTEDAHL has been kind enough to offer me this interesting material for description, on which he himself has done a good deal of work¹. I therefore wish to offer my sincerest thanks.

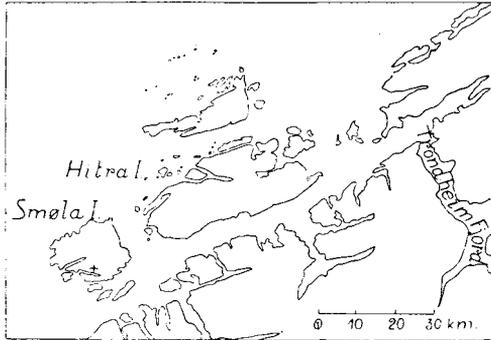


Fig. 1. Sketch map of the Smøla Island and environs.
The + marks the occurrence of the fossiliferous limestone.

I am also under obligations to the authorities of the Natural History Museum and the Museum of the Geological Survey in London for the allowance to see collections from the Durness limestone.

Brachiopoda.

Genus *Camarella* BILLINGS.

Camarella sp.

Pl. fig. 11 12.

Camarella HOLTEDAHL 1924 p. 111.

A number of small specimens present, the largest of which is 5 mm long, 6 mm wide and 4.5 mm thick. Outline rounded triangular. There is no area and a sinus in the dorsal and a fold in

¹ Most of the illustrations were made under his supervision.

the ventral valve. The shell is smooth, if this may not be due to imperfect preservation. The specimens show clearly the characters of the genus. This form might come nearest to *C. panderi* (BILLINGS 1863 fig. 78), which is an almost smooth form.

Gastropoda.

Genus *Straparollina* BILLINGS

Straparollina holtedahli n. sp.

Pl. fig. 1-4.

Material present: 5 somewhat well preserved larger shells and a number of very small ones.

Description of the holotype, the specimen figured in pl. fig. 1 a b: Apical angle 95° , height 14 mm, width at the base 16 mm, the specimen consisting of 5 volutions. Volutions rapidly increasing, the cross-section rounded with the base less convex, flattened within the umbillicus. On the edge of the umbillicus there is a distinctly elevated carina, but else the shell is wholly smooth, no finer sculpture could appear in the specimens in cause of the imperfect preservation. Umbillicus occupying about one fourth of the whole width at the base and perforating the shell to the apex. In a smaller specimen the apical angle is only about 80° .

This form is closely related to *S. pelagica* (BILLINGS 1865 p. 223 fig. 205). Both forms have a quite similar umbillicus, which is keeled at the margin. Our form differs from *pelagica* in having a lower spire with fewer volutions and in lacking the obscure angularity and faint concave band at the side of the volutions. This does not seem to be due to imperfect preservation. Another species of *Straparollina* is *minima* (WHITFIELD 1897 p. 179 pl. 4 fig. 10-12) from the Canadian of Vermont, a very small shell with three volutions, the last of which is angular. A small specimen of *S. holtedahli* with 3 volutions is very similar to *S. minima*. The Black River species *asperostriata*, *circe* and *eurydice* (BILLINGS 1863 figs. 84-86), which were referred to *Straparollina*, differ from the genotype in lacking the keel at the edge of the umbillicus, the same is true to *daphne* (BILLINGS 1865 p. 160 fig. 145).

Genus *Trochonema* SALTER
Subgenus *Eunema* SALTER
Trochonema (Eunema) smoeleni HOLTEDAHL

Pl. fig. 5.

1915. *Eunema smoeleni* HOLTEDAHL p. 6 pl. fig. 2.

Only one specimen present, which was described by HOLTEDAHL as follows (translated):

"One almost complete specimen is present of a small regularly conical gastropod with apical angle 40° consisting of 4 volutions. The peripheral band is broad its plane being strongly oblique in a direction coinciding with the main outline of the gastropod. On the lower volutions below this band a distinct spiral list is seen, situated (as it best can be seen on the second volution from below) just above the suture line. No umbilical canal is developed. The margin of the aperture not being preserved, its accurate outline is unknown. By its comparatively slender shape and wanting umbilicus the present form belongs to the cited subgenus of *Trochonema*, if yet it is not especially near to other known species, of *Eunema*. The common *E. rupestre* EICHW. from the Upper Ordovician of Western Russia and Scandinavia is of a wholly different type by its coarser form and strong spiral lists. Our form is nearer to several North American Ordovician species of *Eunema* and *Trochonema*."

To this it might only be added that the original specimen is 10.5 mm high and 6.5 mm wide at the base.

Genus *Lophospira* WHITFIELD
Lophospira sp.

Pl. fig. 9—10.

1924. *Lophospira* HOLTEDAHL p. 111.

Material present: A great number of specimens, but mostly very small ones.

Description of the best specimen (pl. fig. 9): Height 17 mm of a spire with 5 volutions, apical angle about 45° . Volutions angular with two carinae, the upper one rather prominent and situated close below the suture, and a very strong one on the periphery. On the lower volution there is still seen a much fainter third carina; on the upper ones this is not seen, as being covered by the volution next below. The spaces both above and below the peripheral carina are flat or slightly concave, bases of volutions slightly convex. The outline of the aperture is not seen; inner lip thickened and umbilicus if present very narrow. The prominent upper carina situated close

to the suture may be said to distinguish this form. Among the forms described by ULRICH and SCOFIELD it seems to be similar to *L. pulchella* (p. 892 pl. 73 figs. 46–48) and *L. spironema* (p. 983 pl. 72 figs. 44–47), but the upper carina in these forms seems to be less strong. The present form has also some resemblance to *L. borealis* DONALD (1902 p. 333 pl. 9 fig. 5) from the Durness limestone which has a less strong upper carina; the specimen described is, however, an internal mould, while our specimens have the test preserved.

Genus *Pagodispira* GRABAU

This genus was erected by GRABAU (1922 p. 30) to receive forms before included in *Lophospira* but differing in having a small apical angle and subrectangular volutions, which embrace only to a very small degree. GRABAU described three new forms, including *P. derwiduii*, the genotype, from the Machiakou limestone of North China and also included *P. bowdeni* (SAFFORD) from the Upper Ordovician of North America. All these have a greater apical angle than the forms described and referred to below.

Pagodispira norvegica (HOLTEDAHL).

Pl. fig. 6–8.

1915. *Lophospira*? *norvegica* HOLTEDAHL p. 6 pl. fig. 3.

About six specimens present, none of which is complete.

Original description (translated), based on the holotype (pl. fig. 6):

“A high slender form with 7 volutions preserved. The single specimen is not quite complete, the lower volutions being broken away on one side, thus the aperture can not be studied. The shell shows a serrate outline in longitudinal section with a peripheral keel on the volutions. The suture line can not be seen in cause of imperfect preservation, but a distinct rib is seen a trifle above the strongest constriction of the shell. The interior being filled with a quartzose mass, it can not be decided if an umbilicus was present or not. — In all probability we here have a representative of the genus *Lophospira* WHITFIELD (as defined by ULRICH and SCOFIELD in Pal. of Minnesota), however, as neither the aperture nor the umbilicus is known, the question can not be decided with full certainty. The form shows similarity to some North American ones, thus to *Murchisonia* (*Loph.*?) *catharina* BILLINGS from (probably) the Middle Ordovician of Newfoundland.”

The holotype is 15 mm high and 6 mm wide on the next lowest volution preserved, which is 9 mm distant from the apex, apical angle 20–25°, seems to be larger in the upper volutions.

Also the other specimens have apical angles of 20–25°. In one specimen the central axis of the shell is shown, but no umbilicus is seen, it was certainly very narrow. The largest specimen is a fragment with a 8 mm wide volution.

The small specimen figured as *Lophospira*? sp. by HOLTEDAHL (1919 pl. 1 fig. 1) from the Younger dolomite series of Bear Island is very similar to *P. norvegica* and may be identical. Our form is also similar in its slender shape to *P. angulocincta* (SALTER) (DONALD 1902 p. 332 pl. 9 fig. 4) from the Durness limestone, which, however, differs in having the peripheral angulations less prominent and in having the upper slope of the volutions wider and steeper than the lower, there is also a carina below the suture in this species. *Murchisonia catharina* and *M. cicelia* of BILLINGS (1865 p. 231 figs. 215 & 219) from the Chazy of Newfoundland also seem to be similar.

Genus *Hormotoma* SALTER

Hormotoma sp.

Pl. fig. 16.

One specimen present with 5 rounded volutions preserved, height 45 mm, width of the lowest part 20 mm on one side and 14 mm on the other, the specimen being much compressed and badly preserved.

Genus *Maclurites* LESEUR

Maclurites sp.

Pl. fig. 18–19.

1915. *Maclurea* HOLTEDAHL p. 7 pl. fig. 4–6.

1924. *Maclurites* near to *M. sylpha* HOLTEDAHL p. 111.

The material present is a number of fragments. On a fragment of the base half the diameter can be measured to 30 mm, of which 17 mm is the width of the exterior volution and 8 mm that of the preceding. The volutions are convex at the base with almost vertical sides. The shell is thick. Other specimens show that we have to do with a very high form with the height almost equal to the width at the base. In this respect our form is similar to *M. sylpha* BILLINGS (1865 p. 244) from the Canadian of Newfoundland, which form has also been cited from the Durness limestone.

Opercula of *Maclurites*.

Pl. fig. 14—15.

Two specimens present. The one is 26 mm high and 18 mm wide. At the right and lower side the outline coincides with the growth-lines, while at the left and upper side the specimen is broken. In the lower left part there is an elevation from which the surface slopes down to each side. At the inner side of the shell a strong elongate projection is found inside of this elevation. A similar specimen, also with a strong muscular attachment, is 24 mm high and 18 mm wide. It is more worn, but in its upper part the outline seems to coincide with the growth-lines.

Genus *Ophileta* VANUXEM*Ophileta* sp.

Pl. fig. 13 a—c.

One specimen present with 3 volutions. Its greatest width is 26 mm, it is distorted so as to be drawn out in that direction, in the opposite direction half the diameter is 11 mm, height of the largest preserved part 12 mm. The base seems to have been gently concave and the spire still more so. Volutions rapidly increasing, somewhat square in cross-section with the under side wider than the upper. The under side of the volutions somewhat convex, outer side steep, upper side seems to have been flat and sloping down towards the centre. There is a distinct elevation at its outer edge.

In spite of the bad preservation there may be little doubt that this specimen is an *Ophileta*. Our form is characterized by rapidly increasing volutions, in this as in other respects it may be compared to *O. compacta* (SALTER 1859 p. 17 pl. 3 fig. 3).

Cephalopoda.Genus *Piloceras* SALTER*Piloceras*? sp.

Pl. fig. 17.

Finally it may be noted that our collection contains a much worn fragment consisting of granular quartz, 35 mm long and 15 mm wide at the broader end, tapering to the other. At the outer side of the specimen near the broader end there is found a small conical sheath, about 3 mm wide at the upper end and 4 mm high.

At the narrower end the specimen is split at a longitudinal plane.

HOLTEDAHL (1924 pl. 111) mentions the similarity to *Piloceras*, the conical sheath being considered as an endosiphosheath. However, in cause of the imperfect preservation of the specimen, some doubt may remain as to the identification.

It may also be mentioned that HOLTEDAHL in 1915 described concentric structures from the Smøla limestone similar to stromatolites.

It now remains to discuss the stratigraphical significance of this fauna, which is listed below:

Camarella sp.

Straparollina holtedahli n. sp.

Trochonema (Eunema) smoeleni HOLTEDAHL.

Lophospira sp.

Pagodispira norvegica (HOLTEDAHL).

Hormotoma sp.

Ophileta sp.

Maclurites sp.

Piloceras? sp.

Ophileta and *Piloceras* are genera typical of the Canadian (Lower Ordovician) in the Arctic or Boreal Province, being found in Europe as well as in North America and Asia in the northern parts of the continents bordering the Arctic Ocean. The best known occurrences of this fauna are in Newfoundland, Northwestern Scotland (Durness) and Bear Island (Younger dolomite series of HOLTEDAHL), more recently it has also been found in Manchuria and North China. The occurrence of the genus *Straparollina* in Smøla also points in the same direction, the two known typical species of this genus occur in the Canadian of Newfoundland and Vermont respectively. Concerning *Pagodispira norvegica* we know at least that similar very slender forms are known only from the Canadian and the Chazyan. The *Maclurites* may be near to *M. sylpha*, a form described from Newfoundland and also cited from Durness. The remaining forms give at least no contradictory evidence, as congeneric and similar forms are known in the Canadian. The forms considered just above (*Trochonema (Eunema)*, *Lophospira* and *Hormotoma*) are wide-spread Ordovician genera, and the few specimens here described permit no conclusions as to the relations to other areas.

It may be worth mentioning that HEDSTRÖM has recently described a fauna consisting mainly of gastropods from the Otta Valley in Central Southern Norway (situated 170 km SSE of Smøla). This fauna is of a decidedly Baltic character of the age of the expansus shale and vaginate limestone (3c β and 3c γ of the Oslo District section), and is thus probably somewhat younger than the fauna here described. The two faunas show no nearer relations and have certainly been of quite different origin.

The present study of the Smøla limestone fauna must be said to affirm the conclusions reached by HOLTEDAHL as to the age and geological position. This formation is of Lower Ordovician (Canadian) age and belongs to the Arctic faunal province. The corresponding formations have been mentioned just above. As emphasized by HOLTEDAHL this correspondance is also born out by the lithology of the beds. I have also myself seen specimens of rocks and fossils from Newfoundland, Durness, Bear Island and Smøla. It is at once apparent that the rocks from all these areas are similar to confusion, and the fossils occur in exactly the same preservation.

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Explanation of the plate.

All the figures except figs. 11—12 are in natural size.
The originals are in the Paleontological Museum in Oslo.
Locality Skilberg, Smøla, collector O. HOLTEDAHL.

- Fig. 1 4. *Straparollina holtedahli* n. sp.
1a. holotype. 1b. same specimen seen from above. 4. a specimen seen from below to show the umbillicus.
- .. 5. *Trochonema (Eunema) smoeleni* HOLTEDAHL, holotype only specimen present.
- .. 6 8. *Pagodispira norvegica* (HOLTEDAHL). 6. holotype.
- .. 9 10. *Lophospira* sp.
- .. 11 12. *Camarella* sp. Two specimens one showing the ventral and the other the dorsal valve. Magnification 2 diameters.
- .. 13 a c. *Ophileta* sp. a. from above b. from the side c. from below.
- .. 14 15. Opercula of *Maclurites*, one specimen in front view, the other seen from the side to show the muscular attachment.
- .. 16. *Hormotoma* sp.
- .. 17. *Piloceras?* sp. The specimen seen from the broad end. In the upper part in the figure the supposed endosiphosheath is seen,
- .. 18—19. *Maclurites* sp. 18. The base of a specimen seen from the side showing the axis and two volutions on the right side. The thick shell is hollow, being silicified only at the outer and inner surfaces. 19. a specimen shown in section.



1a



1b



2



3



4



5



6



7



8



9



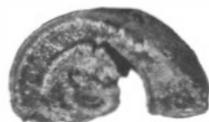
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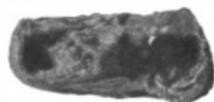
11



12



13a



13b



14



15



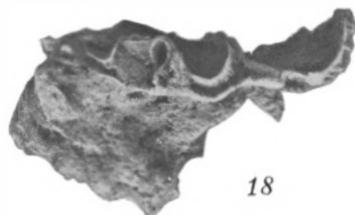
16



13c



17



18



19