

MEDDELELSER OM GRØNLAND

UDGIVNE AF

KOMMISSIONEN FOR VIDENSKABELIGE UNDERSØGELSER I GRØNLAND

Bd. 111 • Nr. 6

DE DANSKE EKSPEDITIONER TIL ØSTGRØNLAND 1947—52

UNDER LEDELSE AF LAUGE KOCH

ON SOME JURASSIC AND
CRETACEOUS BRACHIOPODA FROM
TRAILL Ø, EAST GREENLAND

BY

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WITH 1 PLATE

KØBENHAVN

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BIANCO LUNOS BOGTRYKKERI

1953

The small collection of brachiopods made by Dr. DESMOND DONOVAN from Traill Ø, East Greenland (lat. 72° 45' N.) in 1950 is from five localities. All the brachiopods are preserved as imperfect internal casts and as they are the first Mesozoic specimens to be obtained from Traill Ø they have been described and figured for future reference.

The localities from which the brachiopods were collected are:—

Loc. 120, 137. Lycett Bjerg, S. E. Traill Ø¹⁾. Micaceous irony sandstone of light or dark brown colour.

These two localities are half a mile apart and from a study of the associated ammonites are considered by Dr. DONOVAN to be of Upper Bathonian or possibly Callovian age.

Loc. 14. Bjørnedal, S. E. Traill Ø. Tough dark grey limestone with minute mica flakes.

Loc. 80. Rold Bjerge, northern Traill Ø. Tough dark grey limestone. Localities 14 and 80 are thought to be Infravalangian from the associated belemnites.

Loc. 104. N. of Mountmorris Fjord, Traill Ø. Brown ironstained sandstone with little mica.

No ammonites were obtained here and the precise age is uncertain. It may be top of Portlandian or Lower Cretaceous, Valanginian.

These five localities are marked on the maps included in Dr. DONOVAN's paper which precedes this published in *Meddelelser om Grønland* bd. 111, no. 4.

Description of Species.

?Callovian.

Locality 120.

One poorly preserved Terebratulid and two small imperfect semiplicate Rhynchonellids were obtained from this locality. The Terebratulid which is elongate-oval in outline and incipiently uniplicate with slightly convex valves may be a young form of the species occurring at locality

¹⁾ Ø = Island.

137. Similarly the two Rhynchonellids may be immature forms or varieties of the two larger specimens of locality 137, and the two localities are probably of the same horizon.

Locality 137.

This locality yielded two imperfect unrelated Terebratulids and three Rhynchonellids, two of which are related to the species of locality 120.

Rhynchonella cf. *triplicosa* Quenstedt.

Pl. 1, figs. 1a—d, 2, 3a—c.

cf. *Terebratula triplicosa* Quenstedt, 1851, p. 454, pl. xxxvi, fig. 26.

cf. *Terebratula triplicosa* Quenstedt, 1868, p. 99, pl. xxxix, figs. 1—7, 22, 24.

cf. *Rhynchonella triplicosa* Quenstedt: Eudes-Deslongchamps, 1859, p. 44, pl. v, figs. 12, 20, 23, 24.

cf. *Rhynchonella acutiloba* Eudes-Deslongschamps, 1859, p. 41, pl. v, figs. 5, 6.

Two Rhynchonellids from locality 137 and two from locality 120 are grouped together as probably related species or variants of a single species.

The brachial valve is convex to globose with a low median fold anteriorly and the pedicle valve is posteriorly convex with a broad shallow, median sinus. The linguiform extension is short and slightly tapering. The anterior commissure is uniplicate while the lateral commissure slopes slightly towards the pedicle valve.

The ornament consists of broad rounded simple costae on the anterior half or third of the shell. In the more globose form from locality 137 there are three costae within the sinus and two on each flank. In the flatter form from this locality there are four costae on the median fold, three on each lateral slope and within the sinus. The more complete specimen from locality 120 has three costae on the fold and two on each lateral slope and in the sinus.

All are imperfect internal casts lacking the umbo and showing a septum in the brachial valve extending less than half the length of the valve. The adductor scars, faintly developed, are elongate-oval and set close to the septum. The dental lamellae appear to have been rather short and subparallel, and rather distant umbonally.

These specimens are comparable in external form and ornament to the forms figured by QUENSTEDT as *T. triplicosa* from the Braun Jura ϵ , or from the Macrocephalus Bed of Württemberg, and to the specimens figured by Eudes-Deslongchamps from the Callovian of North-west France at Montreuil-Bellay in Maine-et-Loire, though the latter are of smaller dimensions. In QUENSTEDT's species the costae extend over the anterior half or third of the shell and there are 2—4 costae on the fold and 2—3 on each lateral slope. The umbo is missing in the Greenland specimen and no comparison can be made with that of *R. triplicosa*. The

internal characters of the German species are unknown and the similarity to the Greenland species may, therefore, be only superficial.

The species described and figured by D'ORBIGNY (1845) as *T. [Rhynchonella] personata* VON BUCH from Jelatma on the R. Oka as well as from the N. Urals at 64° lat., from the Lower Oxfordian [= Callovian] is possibly synonymous with QUENSTEDT's species. D'ORBIGNY also records *R. personata* from the same horizon in central France.

Rhynchonella cf. *atla* Oppel.

Pl. 1, fig. 5a—c.

cf. *Rhynchonella atla* Oppel, 1863, p. 208, pl. vi, figs. 1, 2.

cf. *Rhynchonella penninnica* Uhlig, 1878, p. 655, pl. xvii, fig. 5.

cf. *Rhynchonella penninnica* Uhlig: Uhlig, 1881, p. 418, pl. ix, fig. 11.

One imperfect Rhynchonellid from locality 137 seems to be very similar externally to *R. atla* OPPEL from the upper part of the Alpine Dogger at Mitterwand and in the Klaus-Schichten at the Klaus-Alp near Hallstadt, Austria. OPPEL's species is probably synonymous with *R. penninnica* UHLIG described from the Klaus-Schichten and from a red limestone with *Perisphinctes* cf. *curvicosta* Oppel of Callovian age near Neumarkt, West Galicia.

The dimensions of the Greenland shell, convexity of the valves and the slope of the lateral commissure agree well with those of OPPEL's and UHLIG's species, in which no costae are developed, but there is a broad flattened median fold and shallow sinus.

The Traill Ø specimen consists only of the posterior part of the shell with an imperfect umbo. It is a larger form than the specimens described above as *R. cf. triplicosa* Quenst. and the brachial valve is less convex, while a broad shallow sinus is developed in the pedicle valve. No ornament can be distinguished. A median septum in the brachial valve extends about half the shell length, and the dental lamellae diverge at an angle of 18°. The other internal characters could not be ascertained.

The distribution of OPPEL's species is imperfectly known. It has been recorded from the Callovian of the southern Carpathians in Rumania by SIMONESCU (1899), and it is known also from the Alpes de Vaud, Switzerland, and from La Voulte, Ardèche, France.

'*Terebratula*' sp.

Pl. 1, figs. 8a—c.

The single specimen from locality 137 lacks the anterior margin and is elongate-oval in outline with the pedicle valve considerably more convex than the brachial valve. The lateral commissure is nearly vertical while the anterior commissure was probably plane or uniplicate. The

umbo is massive and erect with a rather large circular foramen which was probably separated from the brachial valve by a well-developed symphytium.

The impression of the adductors in the brachial valve is rather obscure but the two broad, posteriorly tapering scars seem to have been in close contact medianly and to have extended about half the shell length. They do not correspond exactly in size and position with any adductor scars figured by BUCKMAN (1918). In *Goniothyris* which has an erect umbo and well developed symphytium the adductors are strap-shaped and diverge from one another posteriorly at an angle of 10° . In *Cererithyris* which is common in the Lower Cornbrash the adductor scars are more divergent, the umbo is shorter and less erect and the shell is often biplicate (sulcificate).

The adductors are nearer to those occurring in Upper Jurassic, Oxfordian and Corallian species.

The outline of the shell and the vertical lateral commissure and plane anterior commissure are similar to those of '*Terebratula strogonofi* d'Orbigny (1845) described from the north of the Ural Mountains from a reddish grit, of Oxfordian and probably Callovian age. The brachial valve in the Greenland specimen is less convex. The internal characters are not described by D'ORBIGNY.

The second Terebratulid from locality 137 is still more imperfect and is a smaller more convex form without median fold and sinus and with a plane anterior commissure. The beak and internal characters are unknown.

? Upper Portlandian.

Locality 104.

Antinomia cf. *sima* (Zeuschner).

Pl. 1, figs. 7a—e.

cf. *Terebratula sima* Zeuschner, 1846, p. 20, pl. 1, figs. 16—19, pl. ii, figs. 1—3.

cf. *Terebratula sima* Zeuschner: Pictet, 1867, p. 176, pl. xxxiii, figs. 4—7.

cf. *Terebratula sima* Zeuschner: Zittel, 1870, p. 130, pl. xxxvii, figs. 11, 12 only.

cf. *Antinomia sima* Zeuschner: S. S. Buckman, 1906, p. 441, pl. xli, fig. 2.

The single imperfect Terebratulid from this locality consists only of the posterior part of the pedicle valve and about half of the brachial valve.

The median part of the brachial valve is deeply sulcate, the sulcus commencing about 4 mm. below the umbo. The lateral slopes are slightly convex but are imperfectly preserved and appear to have extended laterally and anteriorly beyond the median sulcate lobe. The latter projects towards the pedicle valve, and at right angles to the posterior part of the brachial valve, as a long parallel-sided U-shaped tongue. The lateral

commissure is imperfectly preserved but seems to have been curved and not vertical.

The pedicle valve has a massive, slightly incurved umbo which is truncated by a circular foramen. The deltidial plates are not preserved but must have been small, since the foramen is almost in contact with the brachial valve. The remaining part of the valve is convex with a low flattened median fold.

This specimen resembles in general form the specimen figured by ZITTEL (1870, p. 134, pl. xiv, figs. 1, 2) as *Terebratula* [*Pygope*] *rupicola*, from the red Tithonian limestone of Puchow, Waagtal, Galicia, and from the Tithonian of the Tyrol. This species has a similar sulcate brachial valve and a long U-shaped linguiform extension of this valve. The lateral slopes are, however, shorter than those apparently indicated in the Greenland shell and there is no median fold in the pedicle valve. The same applies to the shell figured as *T.* [*Antinomia*] *planulata* Zeuschner (Zittel, 1870, pl. 38, figs. 3—5) also from the Tithonian of Galicia.

It seems probable from the convexity of the two valves that the Greenland specimen was originally nearer to *T. sima* Zeuschner as figured by ZITTEL (1870, pl. 37, figs. 11, 12) and by PICTET (1867, pl. 33, figs. 4—7) from Galicia. ZITTEL (op. cit. p. 192) in an addendum re-identified pl. 37, figs. 13, 14 as a new species, *T. discissa*, and suggested also that his fig. 11 probably represented another new species and not *T. sima* Zeuschner. In *Antinomia sima* the two lateral flanks are extended as lobes beyond the median tongue-like part of the shell, a growth-stage which occurs in the development of the medianly perforate homoeomorphous genera, *Antinomia*, *Pygope* and *Pygites*. These genera are characteristic of the Upper Portlandian and Neocomian of Southern and Central Europe, though they have been recorded from the Moscow Basin and the Crimea —(EICHWALD 1868). *Antinomia sima* is said by PICTET to occur only in the Klippenkalk [Upper Portlandian] of the Carpathians, and he figured it from Rogoznik and Czorstyn near Neumarkt, Galicia. It also occurs in the Upper Tithonian at Dohnau near Puchow, further west in Galicia.

It is of interest that *A. planulata* (Zeuschner) and *Pygope rupicola* (Zittel) both occur with *A. sima* at Rogoznik near Sandec, W. Galicia.

BUCKMAN (1906, p. 441) discussed these forms and described the species *Antinomia planulata* (Zeuschner) and *Pygope rupicola* (Zittel) as being in the 'glossothyridoid stage', from their resemblance to the Terebratulid genus *Glossothyris* (= *Nucleata*). In the next stage, called by BUCKMAN the 'bifidate stage', the two lobes have grown anteriorly but remain separate and have not converged. Finally the lobes converge and fuse and leaving a median perforation, that of *Antinomia* being of smaller size and more posterior than that of *Pygope* and *Pygites*. In the latter genus which is usually found in the Lower Cretaceous, Neocomian, the

median fold in the pedicle valve is medianly sulcate and a median fold is developed within the sulcus in the brachial valve. The two valves in the only species assigned to the genus by BUCKMAN—*Pygites diphyoides* (d'Orbigny) from the Upper Neocomian, Basses Alpes, S. France, and as figured by PICTET (1867, pl. 23) from the Berriasian (Infra-Valanginian) of Ardèche, S. France, are moderately convex and have a vertical or slightly waved lateral commissure.

The affinities of the Greenland shell from the apparent convexity of the two valves and the curvature of the lateral commissure, appear to be with the pre-perforate stage of *Antinomia* rather than with *Pygites* or *Pygope*, but more and better preserved specimens are necessary to confirm this.

Antinomia, according to BUCKMAN (1906, p. 440), is mainly found in the Klippenkalk and Upper and Lower *Diphya*-Limestone of Upper Portlandian age. *Pygope* occurs in the same beds, in the Stramberg Beds and in the Neocomian, while *Pygites* is probably limited to the Infra-Valanginian and Valanginian.

The present indication is, therefore, that locality 104 is probably of Upper Portlandian age.

Cretaceous (Infravalanginian).

Locality 14.

This locality yielded a single indeterminate pedicle valve of a Terebratulid, poorly preserved and lacking the foramen.

Locality 80. '*Rhynchonella*' cf. *decipiens* d'Orbigny.

Pl. 1, figs. 4a—c.

cf. *Rhynchonella decipiens* d'Orbigny, 1850, p. 25, pl. 494, figs. 13—16.

cf. *Rhynchonella decipiens* d'Orbigny: Jacob and Fallot, 1913, p. 14, pl. 1, figs. 5—8.

The single Rhynchonellid from this locality is imperfect and lacks the umbo of the pedicle valve. It is largely decorticated but the shell appears to be entirely smooth. The brachial valve is convex and sub-acuminate with a low median fold anteriorly not projecting above the level of the lateral slopes. The anterior commissure is uniplicate, and the broad linguiform extension of the pedicle valve is 10.7 mm in length and tapers gently forward with a rounded termination. The lateral commissure slopes towards the pedicle valve at an angle of 15° to the vertical.

The imperfect pedicle valve develops a broad shallow median sinus a short distance below the umbo, but this flattens slightly on the linguiform extension. The shell is geniculated almost at a right angle so that the posterior portion is well demarcated from the linguiform extension.

This specimen agrees in shell outline and absence of ornament with *R. decipiens* d'Orbigny (1848, p. 25, pl. 494, figs. 13—16) figured from the Neocomian [Aptian according to d'Orbigny] of Barrême, Basses Alpes, and recorded also from the Crimea.

D'Orbigny's specimen is said to be 24 mm. wide with the length $\frac{73}{100}$ [or 17.5 mm] and thickness $\frac{33}{100}$ [7.9 mm] of the width. In the Greenland specimen the width is 24 mm, the length as preserved 17.5 mm and the thickness 14 mm. The dimensions of the Greenland specimen are, therefore, comparable, but the valves are more convex.

JACOB and FALLOT (1913, p. 14, pl. i, figs. 5—8) also figure d'Orbigny's species from the Barremian of Castellane, Basses Alpes, but the specimens are considerably smaller and less acuminate.

The Greenland specimen also resembles in size, contour and lack of ornament specimens figured by JACOB and FALLOT (1913, pl. iv, figs. 17—21, and pl. xi) as *Rhynchonella* cf. *cherennensis* var. *moutoniiformis* from the Portlandian or Lower Valanginian of Tours d'Ai, Préalpes Vaudoises, but the linguiform extension in the Swiss form is usually more angular.

The Greenland specimen also resembles in shell outline and dimensions *Rhynchonella spoliata* Suess (1852, p. 51, pl. vi, figs. 1 a—c) figured from the red limestone of Nesselndorf, Upper Portlandian, of Koniakau, near Stramberg, only the anterior part of the shell in this form is finely capillate, and the anterior commissure is less rounded. JACOB and FALLOT (1913, p. 14, pl. i, figs. 2—4) figured SUESS' species from the Upper Tithonian of Chomerac, Ardèche, S. France. The specimens are very comparable in size and folding to the Greenland form but are anteriorly capillate.

This also applies to *R. boissieri* Pictet from the Infra-Valanginian of Berrias, Ardèche. The shell outline and dimensions are very close to those of the Greenland shell but it is finely capillate with irregular costae anteriorly.

The internal characters of these Upper Jurassic and Neocomian species are at present entirely unknown. *R. spoliata* Suess, *R. decipiens* d'Orbigny, and the capillate forms—*R. boissieri* Pictet, and *R. capillata* Zittel and similar species from the Upper Jurassic or Neocomian should probably be grouped together in a new genus.

Previous Record of Jurassic and Cretaceous Brachiopoda from East Greenland.

Although much has been written about Palaeozoic Brachiopods of Greenland the Mesozoic forms which are less abundant and poorly preserved are as a rule mentioned in stratigraphical reports without descrip-

tion or figures. The literature dealing with these forms is extremely scattered, and reference is, therefore, given here to some of the previous papers in which Jurassic or Cretaceous species are described or mentioned. Others are listed in the References.

No Jurassic or Cretaceous brachiopods have previously been described from Traill Ø. An Upper Palaeozoic fauna, including brachiopods, was described by FREBOLD and NOE-NYGAARD (1938), and these two authors and also STAUBER (1938) record the occurrence of Bathonian—Callovian, Portlandian and Valanginian beds in either the northern or southern part of Traill Ø.

KOCH (1929 A) listed the various Jurassic and Cretaceous formations occurring in Greenland and the fauna found in them without giving genera or species, while the sequence of beds and some of the fossils are listed by ROSENKRANTZ (1929 A) in the same publication.

One of the earliest descriptions of Jurassic brachiopods from East Greenland was by LUNDGREN (1896) who figured five specimens. Three species of *Rhynchonella* and two of *Waldheimia* were said to be poorly preserved but fairly common in a grey sandstone of Callovian age at Kap Stewart, Jameson Land, at lat. $70^{\circ} 25' N$. *Lingula* sp. was figured from a tough micaceous limestone, presumably from the same locality.

MADSEN (1904, p. 173, 174) recorded the occurrence of fragments of two species of *Rhynchonella* in dark coloured calcareous sandstone of Vardekloft, S. W. of Fame Øer, Hurry Inlet, and *Waldheimia* sp. from the Ostrea Beds of Nathorst Fjeld in Jameson Land, which RAVN (1912, p. 450) in his sequence of strata listed as Callovian, and Upper Bajocian or Lower Bathonian respectively. In this same paper RAVN recorded *Rhynchonella* sp. and *Terebratula* sp. from "Kloft I", Koldewey Ø, N. E. Greenland, from grey micaceous sandstone, said to be of Sequanian—Kimmeridgian age. Portlandian and Neocomian beds are also said to occur here but no brachiopods were reported.

HAUG (1926), PEDERSEN (1929) and ROSENKRANTZ (1929 and 1934) pointed out that some of the beds thought by earlier authors to be Upper Bajocian or Lower Bathonian, or even Callovian, were in reality of Liassic age. The beds at Kap Stewart, Jameson Land, were found to be Lower Lias, Jamesoni zone, and the Ostrea Beds of Nathorst Fjeld Upper Lias. Some of the Vardekloft fossils were reidentified as Lias, others associated with *Macrocephalites* were Callovian. LUNDGREN's specimens from Kap Stewart, including the brachiopods, were reidentified by ROSENKRANTZ (1934, p. 11) and a considerable number of species listed. In 1942 ROSENKRANTZ recorded Liassic brachiopods from the Southern part of Liverpool Land which lies to the east of Jameson Land. *Grandirhynchia* sp., *Tetrarhynchia* sp., *Lobothyris* aff. *punctata* and *Spiriferina münsteri* were listed from the Lower Lias, Jamesoni zone, and *Lingula beani* Phillips from the Upper Lias, Toarcian.

Another early brachiopod misidentification, *Rhynchonella fissicostata* Suess, from the Rhaetic of Falskebugt, Wollaston Forland, N. E. Greenland, by TOULA (1874) and quoted by FEILDEN and DE RANCE (1878) in the N. Polar Expedition report, and by Nathorst (1901), was mentioned by MAYNC (1940) who suggested that the Rhynchonellid was probably obtained from the Middle Valanginian.

A Bathonian—Callovian fauna from Jameson Land was described by SPATH (1932) who figured *Orbiculoidea reflexa* (Sow.) from Hjørnefjeldet from the Upper Cornbrash, *Arctocephalites* Beds, and *Lingula beani* Phillips from the Lower Callovian, *Arcticoceras* Beds of Norden-skjöld Bjerg. These same species were described by POMPECKJ (1900) from the ?Bajocian Beds of Cape Flora, Franz Josef Land, at 80° N. lat., whence specimens were obtained by the Norwegian N. Polar Expedition. Later SPATH (1936) described and figured several species of brachiopods from the Upper Jurassic of Kap Leslie, Milne Land, to the west of Jameson Land. *Lingula zeta* Quenst., *Rhynchonella* aff. *grossesulcata* Eichwald, *Rugithyris rosenkrantzi* Spath and *R.* sp. were figured from the Portlandian, and *Orbiculoidea* aff. *latissima* (Sow.) from the Kimmeridgian and Portlandian. No brachiopods were described from the Oxfordian and Lower Kimmeridgian of the same area (SPATH 1935). *Orbiculoidea* sp. ind. figured by SPATH in 1947 from the Infra-Valanginian of S. W. Jameson Land was said to be probably the same species as that described earlier from the Portlandian of Milne Land and from Aucella River in Jameson Land. No reference was made to brachiopods in SPATH's later report (1952) on Wollaston Forland and the base of the Cretaceous.

STAUBER (1940) gave the sequence above the Lias in N. Jameson Land as Bathonian—Callovian, Vardekløft formation; Kimmeridgian—Portlandian, and Infra-Valanginian, but did not list any brachiopods.

In 1932—33 FREBOLD in a description of the Upper Jurassic of Kuhn Ø, N. E. Greenland, gave the sequence as Callovian—Oxfordian, Upper Oxfordian—Lower Kimmeridgian, Lower Volgian, Upper Volgian, Middle Valanginian, Hauterivian, Barremian and Aptian. *Terebratula* sp. was figured from ?Sequanian—Kimmeridgian of the west coast of Fligelys Fjord. This form cannot be matched up in the present collection and is more massive with fine radial capillation. It is said to be probably the same species as that occurring in beds of the same age on Koldewey Ø, N. E. Greenland, and recorded by RAVN in 1912 from Kløft I.

Cretaceous Brachiopods have been described from East Greenland by FREBOLD (1935). *Terebratulina* aff. *striata*, *Terebratula biplicata* Sowerby, and *Kingena groenlandica* Frebold were all figured from the Aptian of Koldewey I.

MAYNC (1947) listed a number of brachiopods from the Cretaceous of Kuhn Ø [lat. 75° N.], and from Gauss Peninsula further south in N. E.

Greenland. Rhynchonellids and Terebratulids were said to occur in the Valanginian of Wollaston Forland, south of Kuhn Ø. *Terebratula biplacata* Sow. was described (MAYNC 1947, 1949) from the Aptian or Albian, and *Rhynchonella antidichotoma* Buv. was recorded from the Aptian of eastern Kuhn Ø. *Rhynchonella* nov. sp. and *Terebratulina* aff. *striata* were listed in MAYNC's later paper from East Greenland. No brachiopods were found by DONOVAN (1949) in the Albian of Geographical Society Ø to the North of Traill Ø.

No brachiopods have been described from the marine Upper Cretaceous of West Greenland with the exception of an indeterminate capillate specimen recorded by de LORIO (1883) from the Nugsuaq peninsula, N. of Disko Ø.

From this survey of Jurassic and Cretaceous literature it is evident that the Traill Ø specimens are distinct from those that have previously been figured from Greenland. The Lingula Beds recorded by SPATH (1932) from the Callovian, and from the Portlandian or Infra-Valanginian of East Greenland have not so far been found on Traill Ø.

Conclusions.

It is almost impossible from the study of these extremely imperfect specimens to draw many conclusions about the age and relationship of the species.

The affinities of the fauna generally seem to be with Central and South-Eastern Europe and especially with Galicia and Northern Carpathians.

The occurrence of an *Antinomia*, a genus characteristic of southern and central Europe, in the Arctic is of special interest, and it is hoped that additional material will be obtained so that this form can be described and its affinities more precisely determined.

No species in common with the Spilsby Sandstone, Lincolnshire (Infra-Valanginian) or with the Speeton Beds of Yorkshire (Valanginian, etc.) have been obtained.

From a study of these fragmentary brachiopods from Traill Ø it is thought that

Locs. 120 and 137 are probably of Callovian age.

Loc. 104 is probably Upper Tithonian, Upper Portlandian.

Loc. 80 is probably Infra-Valanginian.

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Explanation of Plate I.

All specimens are natural size unless otherwise stated.

The specimens will be preserved in Copenhagen, at the Mineralogical Museum.

Figs. 1a-d. '*Rhynchonella*' cf. *triplicosa* (Quenstedt).

?Callovian. Loc. 120. 1a. Anterior view showing commissure and broad costae. 1b. Left-hand lateral view of same. 1c. Right-hand half lateral view of same. 1d. Internal cast of brachial valve of same specimen with short median septum and traces of dental lamellae in pedicle valve.

Fig. 2. '*Rhynchonella*' cf. *triplicosa* (Quenstedt).

?Callovian. Loc. 137. Internal cast of brachial valve showing anterior costation.

Figs. 3a-c. '*Rhynchonella*' cf. *triplicosa* (Quenstedt).

?Callovian. Loc. 137. 3a. Internal cast of brachial valve showing median septum. 3b. Anterior view of pedicle valve of same specimen showing broad costae. 3c. Lateral view of same showing lateral commissure and relative convexity of valves, brachial valve on the left.

Figs. 4a-c. '*Rhynchonella*' cf. *decipiens* d'Orbigny.

?Infravalangianian. Loc. 80. 4a. Internal cast showing brachial valve with concentric growth-lines but no radial ornament. 4b. Anterior view showing U-shaped commissure. 4c. Lateral view showing acuminate outline.

Figs. 5a-c. '*Rhynchonella*' cf. *atla* Oppel.

?Callovian. Loc. 137. 5a. Internal cast showing brachial valve with median septum and dental lamellae in pedicle valve. 5b. Lateral view of same showing curving commissure. 5c. Pedicle valve of same showing dental lamellae, and smooth shell surface.

Fig. 6. '*Rhynchonella*' cf. *triplicosa* (Quenstedt).

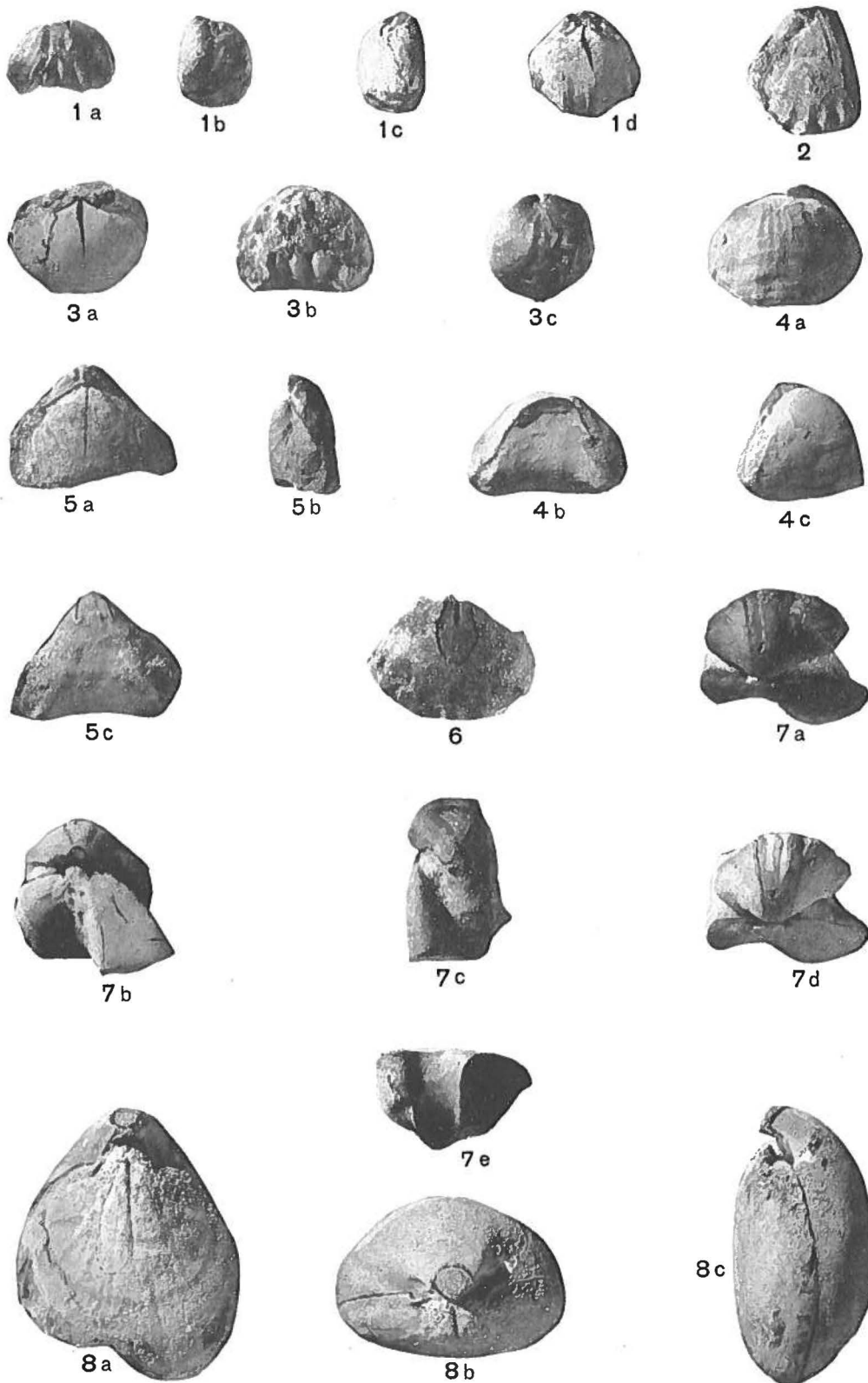
?Callovian. Loc. 120. Internal cast of brachial valve showing traces of elongate adductor scars and median septum. $\times 2$.

Figs. 7a-e. *Antinomia* cf. *sima* (Zeuschner).

?Upper Tithonian, Upper Portlandian. Loc. 104. 7a. Internal cast, posterior view. 7b. Same showing umbo and foramen of pedicle valve and sulcate brachial valve with extended and broken lateral slopes. 7c. Same, lateral view. 7d. Posterior view to show median ridge in pedicle valve. 7e. Anterior view showing strongly sulcate linguiform extension of brachial valve and broken off lateral slopes.

Figs. 8a-c. *Terebratula* sp.

?Callovian. Loc. 137. 8a. Internal cast showing brachial valve with broad almost parallel adductor muscle scars, and pedicle valve with sub-erect umbo and rounded foramen. 8b. Posterior view showing convexity of the two valves. 8c. Lateral view showing vertical lateral commissure and prominent umbo of pedicle valve.



Mesozoic Brachiopoda from Traill Ö