SVERIGES GEOLOGISKA UNDERSÖKNING

SER. C. Avhandlingar och uppsatser N:o 316.

ÅRSBOK 16 (1922) N:o 6

CONTRIBUTIONS TO THE FOSSIL FAUNA OF GOTLAND

I

BY

HERMAN HEDSTRÖM

WITH 5 PLATES

Pris 1 kr.

STOCKHOLM 1923
KUNGL. BOKTRYCKERIET. P. A. NORSTEDT & SÖNER
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In course of geological fieldworks being performed these last years, a great number of fossils have been collected in order to gather information on the fauna within the diverse horizons of the Silurian strata of Gotland. In treating these, a great many new species and forms have been found. It is fraught with great difficulties to get a somewhat exact classification of the strata of Gotland without monographs as complete as possible of orders and genera of animals, in connection with simultaneous stratigraphic studies, and any attempt at classifying, on the base of more or less complete palæontological reasoning, will, I think, certainly be attended with failure. For the purpose of elucidating my idea, I will here give some examples of fossils of whose spreading there has hitherto been but limited information.

Pterinea (»*Pteronitella*») *retroflexa* WAHL., observed earlier only in the south of Gotland, has been found as far as the parish of Fleringe in the north of Gotland. While making geological maps, *Ilionia prisca* HIS. has been traced as far as Fårösund, likewise *Orthis Bouchardi* DAV., and the same observation applies to ex. gr. *Spirifer striolatus* LINDSTR., etc.; to me it seems impossible to make separate species of such forms, appearing in the centre or the south of Gotland on the one hand, and in the north of Gotland on the other hand. When, for publishing the geological map of the north of Gotland, I became engaged in treating the collected material, I soon saw that a complete revising was necessary as well in regard to the determination of the different species as to their distribution in horizontal and vertical direction. In order to get an approximately correct notion of the Gotlandian stratigraphy, such a work is unavoidable.

Some years ago, I began a monograph of the genus *Spirifer*, but for lack of time and from other reasons, I could only accomplish *one* illustration of the specimens of *Spirifer* from southern Gotland belonging to the Geol. Survey, the rest of *Spirifer*-species treated here below are either from northern Gotland or borrowed from the Palæozoological Department of State Museum of Natural History, to the Keeper of

which Department, Professor G. HOLM, I am greatly indebted for his obliging kindness.

Now I am going to give some information on a few new species, obtained in the re-examination I have commenced, and on such forms as to which I have been able to get illustrations.

Genus **Proetus** STENIGER.

Proetus delicatus n. sp. (Delicatus = exquisite, delicious).
Plate 1. Fig. 1—15.

Larger *Proetus*-species with characteristic wide, forwards narrowing glabella, and lengthened axis of the pygidium.

The *cranidium* is about as wide as long. The distance between the side corners of the limb is of almost the same length or slightly shorter than the distance between the palpebral lobes, and the latter distance is a trifle shorter than a line drawn between the downwards-backwards projection tips of the fixed cheek. The hight of the cranidium is largest above the hinder part of the neck ring, and nearly as large as half the length from the posterior margin to the anterior margin of the limb (Plate 1, Fig. 1 and 2). The limb is directed forwards and equally wide as the distance between the foremost part of the glabella and the base of the limb. The *sutura facialis* forms a slightly obtuse angle between the posterior suture and the palpebral lobe. The *palpebral lobe* forms a shallow curve on the upper side. From its outer side the facial suture first runs inwards towards the glabella, then, for a short distance, follows the side of the glabella in a nearly parallel line, and runs almost directly to the anterior border of the head. Irrespective of the projecting parts (the genal spines, the palpebral lobe, and the anterior part between the glabella and the limb), the fixed cheek is very narrow. On the side between the glabella and the limb, there is a slightly marked ledge. The *glabella* is separated from the fixed cheek by a furrow round about it. The *neck ring* has two narrower side parts and a broader central part, which, in most cases, is provided with a small tubercle. By marked furrows are the neck ring as well as the neck lobe separated from each other and from the glabella. The neck lobe is rounded, triangular, its hight, however, being greater than the base, that rests on the fixed cheek and has its genal spines directed inwards.

The glabella is broadest behind, tapering slowly forwards, more rapidly just before the central lateral furrow, and is not evenly rounded forwards, but very slightly pointed. It is provided with *3 pairs of lateral furrows* and *one*, sometimes *2 pairs of lateral pits*. The

hindmost pair affects the shape of a sickle. They are broadest at the centre and more pointed towards the sides, they go obliquely forwards, and, in most cases, they reach down to the margin of the glabella. At the central or broadest part there rises a boss more or less well marked. About half the distance between the inner tips of the hinder and middle pair of side grooves, and very little within these, there lie on the glabella a couple of round cavities, which almost always are distinctly marked. — The middle pair of side furrows are not quite so obliquely turned forwards as the preceding pair and these, too, go to the margin of the glabella. Usually they have the form of an even narrow furrow, sometimes with the suggestion of a little swelling in the inmost (seldom also in its outermost) part. — The front pair lie about the centre of the side slopes of the glabella, and, in most cases, have a somewhat oval form, are short, and do not reach as far as to the glabellar margin. To the front inwards from the interior part of these furrows and nearer to the median line of the glabella, there appear at times a couple of minor hollows. — *The sculpture* of the glabella as well as of the whole rest of the shell consists of pin-prick-like impressions equally distributed over the entire surface, and among these a great many still finer such ones (Fig. 4).

The form of *the free cheek* appears from Fig. 5 (Plate 1). The genal spine is comparatively short. The front part of the limb protrudes into a tip situated before and below the limb of the cranidium. It is provided with elevated lines running parallel to the outer border, and on the limb, the pin-prick-sculpture seems to be more accentuated. *The eye* is comparatively small, of somewhat lengthened form, although approaching to a semi-circle. Round the ring encircling the eye outside, there appear (at least behind) minor nodules and radiating grooves. The fixed cheek field slopes outwards to the sides, and has a marginal furrow next to the outward limb. There has not been found any complete *hypostoma;* the most integral part is figured (Fig. 6 and 7, Plate 1). It is of the common form characteristic of the Genus *Proetus*, has a strongly convex centre and lateral margins bent in. The anterior margin is evenly bent in a moderate curve, on the sides extended into an anterior pair of wings or slightly obtuse corners. Some terrace lines more marked in form run obliquely forwards from the sides of the convex part and converge along the median line towards the anterior margin, where they form an acute angle augmenting on the following lines. On the hinder part of the convex median centre, the terrace lines are not so much marked, but form slightly suggested shorter curves and striæ. As for any triangular formation at the front

border, which is mentioned by LINDSTRÖM[1] and figured by him under *Proetus concinnus* DALM. and a few other species, it has not been found in this species. On the inner side of the posterior wing there is an oval, lighter coloured *macula*, which at the hinder border is covered with about 5 little dotted elevations. The hypostoma has the same sculpture as the rest of the shell.

Only a few segments of the *thorax* have been found, the aspect and transverse profile of which are represented in Fig. 8—10. The distance between the axis and the fulcrum is shorter than that from the border of the pleuræ and the bend. The pleural furrow is strongly pronounced, but ceases or is less apparent a little below the fulcrum.

The *Pygidium* is well developed, has a long axis and several segments. Its profile at the front border is figured in Fig. 15. The length of the *axis* is proportionate to the breadth, in round numbers, as 3 to 2. The axis is evenly tapered backwards and ceases in a small rounded segment. In a great number of specimens, yet not in all, and, as its seems, most apparent in slightly decayed shells of pygidia, each segment is covered on the axis by 2 spots on either side or 2 pairs of spots (Cfr Plate 1, Fig. 12—14). The pair next to the median line affects the form of triangles with their bases resting on the furrow or the suture on the next preceding segment or annulus, and the point directed backwards. They diminish in size backwards, and disappear finally on the hindmost portion of the axis. About half-way between these spots and the exterior border of the axis lies the other pair, usually a little behind the median line of each segment or annulus. They have the form of spots rounded at the front, more from pear-like to oval behind, which are largest in the middle of the pygidium, diminishing in size forwards and backwards, where at last they cease. Also on specimens (Fig. 11) where the pair of spots cannot be detected with the naked eye, they can be perceived by means of a pocket lens, in that the pin-prick-like sculpture there seems to be wanting. — The furrow of the pleural lobes is more distinctly marked than that between the pleural segments, and the ridge lying behind this furrow is lower and less distinctly pricked than the anterior one, which outwards towards the even border ends in a nodule-like swelling. If, on the side of the pygidium, you count these nodules, to get a notion of the number of pleuræ being parts of it, you will get the number of 9 or 10, but if, on the specimens a little decayed, you count the number of segments of the axis, you will get the number of 13, the hindmost of which seems to send a feeble keel back-

[1] LINDSTRÖM, G.: Researches on the visual organs of the Trilobites. Kongl. Sv. Vet. Akademiens Handlingar, Vol. 34, 191, Page 67.

wards corresponding to the named nodule of the exterior part of the pleural lobes. In decayed specimens, the sutures between the different segments or annuli of the axis actually appear more distinctly as darker curves.

Locality. This species has as yet only been found in the canal of Hörsne in the eastern part of the cut near the church, where, however, it is common and has shown its presence by a great many cranidia, free cheeks, and pygidia. The rock is a reef limestone, close to which, on the western side, there is a stratification of bituminous, dark slate. The total number of specimens belong to the collections of the Geological Survey of Sweden. Most of the material has been collected by the artist G. LILJEVALL.

Genus **Spirifer** (SOWERBY 1815, SCUPIN 1900).

As for this great and comprehensive genus HALL[1] has tried to make a grouping founded principally on American species.

Without further entering upon his division I will only say that it is difficult to understand why e. g. he refers *Spirifer nobilis* BARR. and *S. Schmidti* LINDSTR. to the section of Radiati and not to the section Aperturati, which last named group according to him is plicated on the jugum and sinus just as the said species are. Moreover it may often be rather difficult to decide what should be determined as folds, plicæ, or larger striæ. For my part I think that e. g. *Spirifer Logani* HALL. should be classed under the section of Radiati and not to Aperturati, etc. — In what follows, I agree with SCUPIN's[2] definition of the genus *Spirifer*, as a consequence of which this genus will also embrace the genus *Cyrtia*.

Spirifer deltidialis n. sp.

Plate 2. Fig. 1—4.

According to an old view of the matter, this species should be classed with the genus *Cyrtia* on account of the covered deltyrium, = pseudodeltidium. Once I even believed that the present species was a *Cyrtina*, but since, by preparing the interior of the fossil, it was shown that the ventral shell is devoid of a median septum, this species must be classed under the genus *Spirifer*.

Small, nearly symmetric, or at least little unsymmetric shells of half-pyramidal form and with few but pronounced plicæ. The *ventral or*

[1] HALL, JAMES, assisted by CLARK, JOHN M.: An introduction to the study of the Brachiopoda, intended as a hand-book for the use of students. Part. II. Thirteenth Annual Report of the State Geologist. 1894.

[2] SCUPIN, HANS: Die Spiriferen Deutschlands. — Palaeontol. Abh., Bd. 8, H. 3 — Jena 1900.

foot shell with two plicæ on either side of the median sinus and the dorsal shell with three, if the jugum is included. The ventral shell has the form of a triangle having two sides equal and with an altitude half as great as the base, that is coincident with the hinge line. The *area* is provided with an oblong, convex *pseudo-deltidium* of about one millimeter in breadth; the pseudo-deltidium is perforated with a *foramen* lying under the apex and of a round or oblique pearlike shape. The elongated pseudo-deltidium seems to be composed of two deltidial plates, which have grown together, for at the middle of it there is a feeble keel. The pseudo-deltidium is very strongly arched and excreted from the area, which, for the rest, shows a fine lineation, parallel to the hinge line.

The plicæ of *the ventral shell* running on either side of the sinus begin at the top of the apex, whereas the two plicæ on the sides of it seem to have their lowest part a little higher up on the shell. The apex is bent down towards the foramen of the pseudo-deltidium. The hinge line is straight in its interior part less apparent, because it is surmounted by the base of the dorsal shell.

The area of *the dorsal shell* is almost imperceptible. All the three plicæ seem to begin at the tip of the shell.

The shell sculpture is characterized by lamellar lines of growth running at regular distances from each other and by very fine radially arranged knots.

The shells have a breadth of about 6—7 millimeters, their length being by 1—2 millimeters shorter and the hight being further about 1 millimeter less. The interior of the shell here is not accessible to studies.

Locality: The parish of Dalhem at the flour and saw mill of Gandarve, where for the sake of the waterfall some blasting operations have been brought about in a nearly oolitic rock. A few entire and several half shells have been brought home. The material belongs to the Geological Survey of Sweden (collected by HEDSTRÖM and LILJEVALL).

From reasons I have mentioned above I cannot now give a report of all the Gotland forms of »*Spirifer plicatellus*». Moreover it would have been desirable to have an occasion of comparing Gotland specimens with English and American, and among the last named preferably with the American *Spirifer niagarensis* CONRAD. It seems to me that it would certainly be possible to distinguish *Spirifer globosus* SALTER, *Spirifer radiatus* SOW., and *Sp. interlineatus* SOW. as different species, particularly as they, judging from all I have been able

to see, do not occur together, but belong to different localities and horizons.

In conformity with the exposć of synonymy made, and accounted for by DAVIDSON in his »A monograph of British Brachiopoda, Part VII, pag. 84—85» (where there is also a complete list of literature) LINNÉ's *Anomia plicata* (at least one of the two specimens in the Linnean cabinet) would be of the same kind as DALMAN's (& HISINGER's) *Delthyris cyrtæna* and as SOWERBY's *Sp. interlineatus*. HISINGER states as places of occurrence of this species Djupvik and Klinteberg, but from the former of these places there has not been found any individuum corresponding to the figures of DALMAN and HISINGER, and LINDSTRÖM too associates the Djupvik form with its chief species *Spirifer plicatellus* L.; so it is possible that DALMAN and HISINGER have associated two forms in one denomination or not separated them. This view is, it seems to me, corroborated by DALMAN's statement of the variations of the species.

From the uncertainty thus prevailing in the older denominations of the species, it appears to me most opportune, like SOWERBY to strike out the species *Spirifer plicatellus* L. and make use of his name of *Sp. radiatus* SOW. and *Sp. interlineatus* SOW. — *Spirifer globosus* SALTER is already before, by its form, a well characterized species.

Spirifer radiatus SOW.

Plate 2. Fig. 10—12.

1825. SOWERBY, J. DE C.: Min. Con., vol. V, p. 493, fig. 1, 2.

1839. SOWERBY, J. DE C.: Silurian System, pl. XII, fig. 6.

1860. LINDSTRÖM, G. (Spirifera plicatella L.) Bidrag till kännedomen om Gotlands Brachiopoder, Öfvers. Sv. Vet. Akad. Handl. 1860, pag. 358.

1866. DAVIDSON, TH.: A monograph of the British Fossil Brachiopoda. Part. VII, Pag. 87, Pl. IX, fig. 1—6.

Gotland specimens from Djupvik of Eksta, the Fröjel brick kiln, and Visby agree with the illustrations given by DAVIDSON on Pl. IX, fig. 2 of the work quoted. Occasionally the plicæ or folds are wanting in them, sometimes such are to be found apparent at the shell borders and extending from there backwards, seldom, however, over the middle of the shell, but they do not reach *so far backwards as to the hinge line*. There plicæ are evenly curved undulately and do not show so distinctive folds as in *S. interlineatus* SOW. The shell sculpture represented by DAVIDSON in fig. 26 is peculiarly characteristic of this species. *In the intervals of the previous longitudinal, radiating striæ there arise new, secondary*, and

all of them are crossed over by *pronounced transverse sculpture* in form of minute, elevated, thread-like, concentric lines. You will but seldom be likely to see a primary striæ dividing itself into two, and if this takes place, the two generated striæ will only by exception be equally broad; one as a rule, is at first much narrower than the other. The breadth of the shells is usually largest just above the extreme borders of the cardinal area. The relation of the shell sizes appears from the following measurements of specimens from Djupvik:

	Length.	Breadth.	Thickness.
a.	21 mm.	30 mm.	15 mm.
b.	20 »	30 »	15 »
c.	27 »	34 »	17 »
d.	27 »	34 »	18 »

The teeth cavities augment in breadth towards the interior cavity, i. e. they form a greater angle and not such narrow grooves of almost uniform breadth as in *Sp. interlineatus* SOW. Hence it follows that also the angle between the crural plates is less obtuse than in the last mentioned species. They both have the crural plates with one convex side opposite to the other, but *Sp. radiatus* SOW. has the extreme tip of either plate furnished with a boss directed inwards nearly at right angles to the median line, (see Fig. 12, Plate 2) and this boss is wanting in *Sp. interlineatus* SOW. In consequence the borders of the ventral shell are in form and quality adapted to this arrangement.

SOWERBY's figured form of *Sp. radiatus*, somewhat differing and less broad, is also to be found in Gotland.

Spirifer grandis n. sp. (Grandis = great).
Plate 2. Fig. 5—9.

The large Fårö form of »*Spirifer plicatella* L.», mentioned by LINDSTRÖM (in »Bidrag till kännedomen om Gottlands Brachiopoder, Öfvers. af K. Vet. Akad. Förh. 1860, n:o 8, p. 358) has, in course of the geological fieldworks, proved to bound to a certain defined horizon and in all places of so uniform a quality and without transition to other *Spirifer* species that I do not hesitate in recording it as a separate species, although classifying it as a variety might be in question.

From *S. radiatus* it differs at first by its size. 2 specimens from Lansa exhibit the following measures:

	Length.	Breadth.	Thickness.
a.	33.5 mm.	45.8 mm.	26 mm.
b.	32 »	42.5 »	23.6 »

The greatest breadth of the shells lies farther from the extreme borders of the cardinal area than in the preceding species, and towards the sides they are almost roundly alated. Plicæ are wanting. The striæ are broad, flattened, and dichotomous outwards to the borders in such a way that each stria is divided into two new equally large (Cfr. Fig. 9, Plate 2). The arising of new striæ as in the preceding species between the previous striæ has only been observed as one occurrence. A very indistinct transverse sculpture has only been observed on the outermost parts in form of faintly marked, minute lines (Fig. 9). — The interior of the shell is not in any specimen accessible to studies.

Localities: Fårö, Lansa sea-shore sheds, and in blocks on the shore at Ekeviken NNE of Austers, and in a ditch by the road 500 m. east of Lansa; Visby in digging foundations at Endreväg 1,250 m. from Österport; the parish of Tofta, Lixarve, and the parish of Stenkumla at the farm of Martille situated fartherst to the north near the parochial border.

Horizon: Limestone with small reefs and marly shale above the bottom layer with *Spongiostroma Holmi* ROTHPL. of the Visby district. (Layer IV b[1]).

Spirifer interlineatus SOW.

Plate 2. Fig. 13—19.
Plate 3. Fig. 1—19.

1839 SOWERBY J. DE C.: Silurian System. Pl. VI Fig. 6 p. 614.

The species from the Visby district is in very good agreement with SOWERBY'S illustration (Plate VI, Fig. 6) and description of this species. It has 5 or 6 plicæ or folds on either side of the sinus and corresponding depressions on the opposite shells. These folds are sharply marked and distinct as far down as the cardinal area and the umbonal region. In the specimens figured by SOWERBY, the umbo of the ventral shell curves farther in over the hinge line and is situated nearer to that of the dorsal shell than in the Visby form. The shells are minutely striated, fresh striæ arise, as a rule, in the intervals between those existing before, but the whole of the striæ are not so pronounced as in *Sp. radiatus* SOW., and the distance between them is proportionately greater than in this species. The transverse sculpture is usually indistinct, and when it is to be found, more blurred and not so sharply marked as in *Sp. radiatus* SOW.

As to the disposition of the hinge of the shells, the differences

[1] HEDSTRÖM, HERMAN: The stratigraphy of the silurian strata of the Visby district. — G. F. F. 1910. Vol. 32, p. 1462 and 1488 (»Hedströms guide»).

from that of the *Sp. radiatus* SOW. has been previously mentioned. (Cfr. for the rest Fig. 18 and 19 Plate 3). The tooth plates of the ventral shell are comparatively broad (Fig. 16, 17, Plate 3), and the tooth cavities form narrow pits tapering towards the apex. The angle between the crural plates more obtuse than in *Sp. radiatus*.

Localities: Fårö, Lansa sea-shore sheds, Norsholmen and other places; Fleringe, east of Vialms T.; Lärbro, ditch south-east of Nyhamn, Visby, digging of foundations at Endreväg 1,250 m from Österport and in the quarry of the city of Visby above the Cement works; Stenkumla, the nothern farm of Martille, in a well near the house west of Tomtemyr, and in making stone drains south of Källgården; parish of Tofta, Lixarve, the parochial border contiguous to Stenkumla and Västerhejde, Östergårda.

Horizon: Limestone with small reefs and marly shale above the bottom layer with *Spongiostroma Holmi* ROTHPL. (Layer IV b in the author's Visby-guide, see note above).

Spirifer sinuosus n. sp. (Sinuosus = undulating).
Plate 4. Fig. 1—9.

Since SOWERBY'S *Spirifer sinuatus* (= *Terebratula sinuata*), a specific name given by him to *Orthis* (*Bilobites*) *biloba* L. is no more in use for any *Spirifer* species, this name has become free, and the specific name here put forward must not, therefore, cause any confusion. The name has been chosen relatively to the few and broad grooves that are seen between the equally few plicæ. In relation to its length the median sinus has a larger breadth than in the preceding species, and the plicæ of the sides of it are on the ventral shell only 3 in number. Relatively to the preceding species, the shell has a greater breadth than length, and is widest near the line that makes a distinction between the front parts and the hinder parts of the shell, (the foregoing species is widest close to the cardinal area). The shells are evenly striated. The transverse sculpture distinct, often with knots on the striæ.

Size relations:	Length	Breadth	Thickness
a	38 mm.	18 mm.	— mm.
b	34 »	17 »	16 »
c	26.5 »	12 »	11 »

Localities: Fårö, canal close east of Båta in layers containing *Pent. tenuistriatus* WAHL.; Slite, Lännaberget; parish of Vesterhejde, Allehage in limestone layer 4 or 5 m above »*Leperditia* shale, layer VI» within the »*Megalomus*-horizon layer VII» (Cfr. the author's guide,

see preceding note, p. 1483). This *Spirifer* species belongs, therefore, to a more recent layer than the preceding.

Spirifer insignis n. sp. (Insignis = characteristic).
Plate 5. Fig. 1—24.

LINDSTRÖM (e. g. in List of the fossil fauna of Sweden II. Upper Silurian. Stockholm 1888 p. 13) under the name of *Spirifera Schmidti* var *elongata* LM. has distinguished a *Spirifer*, which, if in the Palæozoological collections of State Museum of Natural History, we investigate what his idea may be of this variety, must be stated as not belonging to a variety of *S. Schmidti* LM. Certainly both have »a large, wide sinus» in common (at the bottom of which there are, as a rule, 2 plicæ), which projects over the ventral border in a broad nearly tongue-shaped flap, but, besides, this variety has quite other characteristics, and is far different from *Sp. Schmidti* LM. (In the plate 4 there are in the figures 10—14 some new illustrations of LINDSTRÖMS original specimen of *S. Schmidti.*)

Description. The shells are about twice as wide as long. The length is equal to or a little greater than the thickness. The species is characterized by its very elongated cardinal borders often forming tips; hence the origin of LINDSTRÖM'S name of *elongata*. Moreover the shells are distinguished by their plicæ or folds of the sinus and jugum, and also by their (on the largest specimen distinctly marked) sharp-edged lateral plicæ and by their transverse zigzagging sculpture.

The largest specimens from the eastern side of Lindeklint (Fig. 1—4, Plate 5) and from Lye (Fig. 5—8, Plate 5) exhibit some minor differences from the specimens of Lauberg (Fig. 9—24, Plate 5), which differences may, presumably, depend upon their sizes. The latter may, therefore, be distinguished as *forma minor* n.

The ventral shell has a wide and high area (in the largest specimens 34—38 mm. wide and 9—10 mm. high), and a triangular delthyrium. The area forms a feeble convex arch up towards the apex, which is a little bent inwards over the tip of the delthyrium, and often has a faint transverse lineation (Fig. 6 and 9, 13, 17, and 21). The shell has got a deep sinus, at the bottom of which there are two plicæ, separated by a groove, which following the vertical axis of the shell continues over the dorsal shell, separating its jugal plicæ. These sinus folds are like the jugal folds of the dorsal shell rounded on their surface; by that means they are distinguished from the sharp-edged lateral plicæ. They project tongue-shaped over the shell edge, meeting the two jugal plicæ of the dorsal shell, which are

broader than the former, and embrace together the whole sinus at the shell margin.

On the sides of the jugum and sinus (between these and the cardinal area) the plicæ of the large specimens are sharp-edged, but of varying number from 6 (Fig. 5—8) to 12 (Fig. 1—4). On account of the sharp edges of the lateral plicæ, the coarse lamellated transverse sculpture gets a zigzag-shaped appearance, whereas, over the evenly curved folds lying at the sinus and on the jugum, the sculpture is getting more rounded.

The total number of the plicæ begin at the bases of the shells, but every fold is, almost immediately close to or only a little bit from the cardinal area, divided into two plicæ of equal size and quality, which afterwards, e. g. in specimens from the hill of Sandarve, may again dichotomize. The intervals of the plicæ are also somewhat larger between each such pair than between each special fold of the pair. This is particularly distinct in specimens from the hill of Sandarve and in one specimen which according to the label in the State Museum of Natural History originates from the parish of Vestkinde.

The shells have a minute, radiate, longitudinal striation, that is less dominating in well preserved, not chafed specimens, where it is conspicuous as well at the bases of the lamellæ of the transverse sculpture as above all at the sinus and on the jugum of their plicæ. On worn specimens, however, where the plicæ are not so sharp-edged, but more rounded, there the zigzag-shaped, transverse sculpture may be more or less erased, and there the radiate striæ are very conspicuous until finally, in specimens quite worn out, these also disappear.

Forma minor n., the Lauberg form, has precisely the last mentioned disposition of the sculpture. The radiate striæ are equally or more conspicuous than the transverse sculpture, and this again is not so zigzag-shaped as in the principal form, because the surfaces of the lateral folds are not of so sharp-edged triangular shape, but more rounded. Plicæ are less numerous, and they do not seem to dichotomize directly in front of the area, which, as a rule, they seem to do in the principal form, whence it follows that the grooves between them are of the same order of size, and not, like the specimens from the hill of Sandarve, wider on the sides of each pair of grooves. The area of the ventral shell is lower in proportion, and the shell apex is somewhat more curved inwards over the delthyrium than in the principal form. As the name indicates it is less large than the latter.

Approximate dimensions:

Principal form up to about 37 mm. broad, 17 mm. long and 17 mm thick.

Forma minor up to about 26 mm. broad, 12 mm. long and 11 mm thick.

The interior character of the species has not been susceptible of studies, because convenient specimens have not been available.

Localities:

Principal form: Hill of Sandarve in the parish of Fardhem; Lindeklint; Rotarve (from here only one specimen belonging to the Geological Survey of Sweden) and Mannagårda in the parish of Lye. Besides one specimen taken in the parish of Vestkinde?

Forma minor: Lauberg (a great many specimens).

All of the specimens belong to the Palæozoological Department of the State Museum of Natural History, except the afore said specimen from Rotarve in the parish of Lye (Fig. 5—8, Plate 5).

Explanation of Plate 1.

Proetus delicatus n. sp.

From Hörsne canal at the eastern part of the cut near the church, Gotland.

Fig. 1. Cranidium, seen from above. — 2/1.
» 2. Same specimen, seen from side. — 2/1.
» 3. Another, not complete cranidium from above. — 3/1.
» 4. Shell sculpture at the foremost side groove of preceding sp. — 10/1.
» 5. Free cheek. — 2/1.
» 6. Hypostoma, seen from the front. — 4/1.
» 7. Same Hypostoma, seen from side. — 4/1.
» 8. Thoracic segment. — 2/1.
» 9. Transverse profile of preceding thoracic part. — 1/1.
» 10. Part of thoracic axis. — 2/1.
» 11. Pygidium, seen from above. — 2/1.
» 12. Another pygidium, seen from above. — 2/1.
» 13. Another pygidium, seen from side. — 3/1.
» 14. Same pygidium as preceding, seen from side. — 2/1.
» 15. Transverse profile at the base of preceding pygidium. — 1/1.

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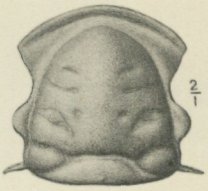

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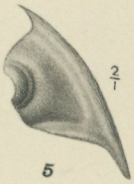

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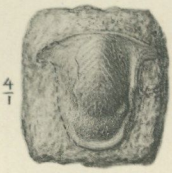

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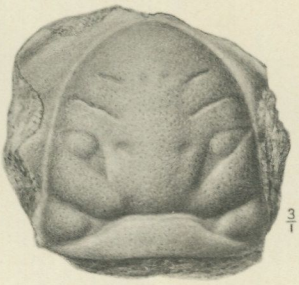

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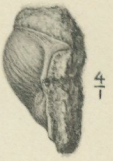

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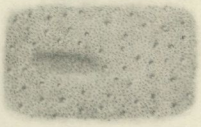

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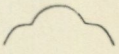

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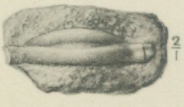

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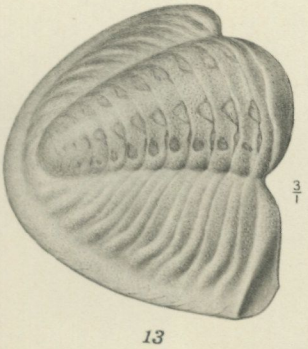

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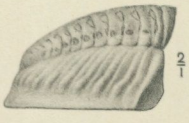

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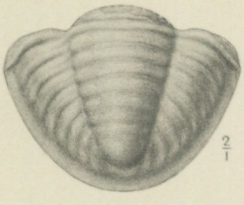

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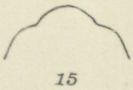

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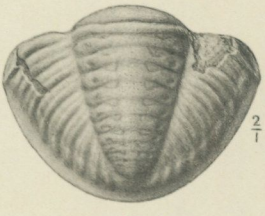

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Explanation of Plate 2.

Fig. 1—4. *Spirifer deltidialis* n. sp. — 4/1. Gotland. Parish of Dalhem, flour and saw mill of Gandarve. Specimen, taken by H. HEDSTRÖM, belongs to the Geological Survey of Sweden.

Fig. 1. Dorsal side. — Fig. 2. Ventral side. — Fig. 3. Shell seen towards area. — Fig. 4. Shell, seen from side.

Fig. 5—9. *Spirifer grandis* n. sp. 1/1. — Fig. 9. — 3/1. Gotland, Fårö, Lansa sea-shore sheds. — Specimen belongs to the Palæozoological Department of the State Museum of Natural History.

Fig. 5. Dorsal side. — Fig. 6. — Ventral side. — Fig. 7. Shell, seen towards area. — Fig. 8. Shell, seen from side. — Fig. 9. Shell sculpture at the border of the shell. — 3/1.

Fig. 10—12. *Spirifer radiatus* SOW. Gotland, parish of Eksta, Djupvik. Specimens, brought home by LINNARSSON 1875, belong to the Geological Survey of Sweden.

Fig. 10. Dorsal side. 1/1. — Fig. 11. Transverse section of an entire shell, showing deltidial plates in the interior of the shells. 1/1. Fig. 12. Figure shows the interior of the dorsal shell with the hinge line and the inward bent projections, situated on the crural plates. 2/1.

Fig. 13—17. *Spirifer interlineatus* SOW. — 1/1. Gotland. Lansa sea-shore sheds of Fårö. Specimen, brought home by G. HOLM, belongs to the Geological Survey of Sweden.

Fig. 13. Dorsal side. — Fig. 14. Ventral side. — Fig. 15. Shell, seen towards area. — Fig. 16. Shell, seen from side. — Fig. 17. Shell, seen towards anterior border.

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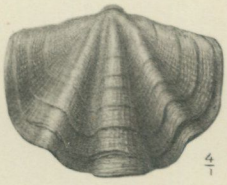
Plate 2 fig. 16 is Shell, seen towards anterior border
» 17 is Shell, seen from side.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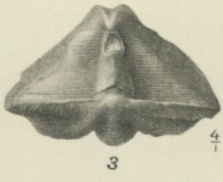
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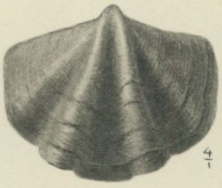
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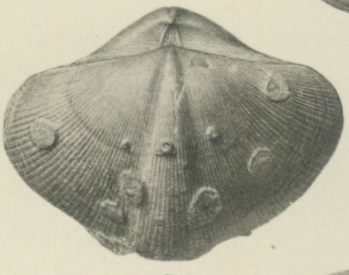
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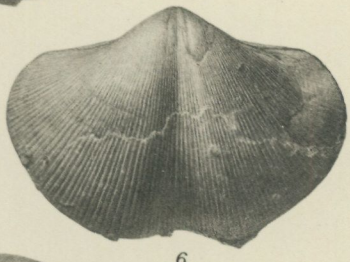
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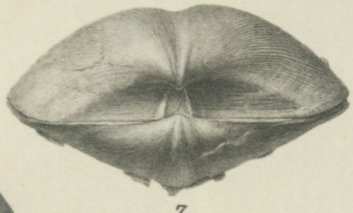
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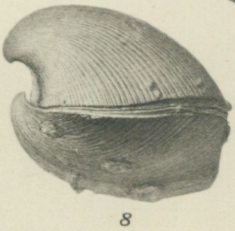
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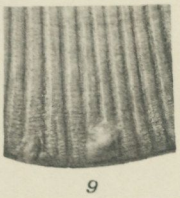
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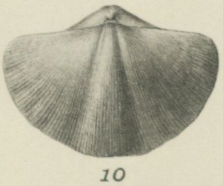
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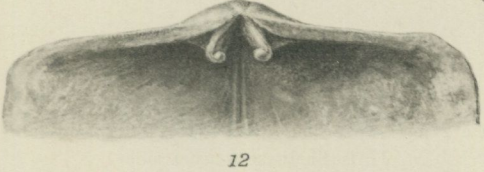
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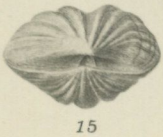
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Explanation of Plate 3.

Fig. 1—5 *Spirifer interlineatus* Sow. — 1/1. Gotland. Lansa seashore sheds of Fårö. — Specimen, brought home by G. HOLM, belongs to the Geological Survey of Sweden.

Fig. 1. Dorsal side. — Fig. 2. Ventral side. — Fig. 3 shell, seen towards area. — Fig. 4. Front side of shell. — Fig. 5. Shell from side.

Fig. 6—10 *Spirifer interlineatus* Sow. — 1/1. Gotland. Lansa seashore sheds of Fårö. — Specimen, brought home by v. SCHMALENSÉE, belongs to the Geological Survey of Sweden.

Fig. 6. Dorsal side. — Fig. 7. Ventral side. Fig. 8. Shell, seen towards area. — Fig. 9. Front side of shell. — Fig. 10. Shell from side.

Fig. 11—15. *Spirifer interlineatus* Sow. — 1/1. Gotland. Quarry of the city of Visby above Sjukhemmet (nursing-home) and Cement works. Specimen, taken by G. LILJEVALL, belongs to the Geological Survey of Sweden. Fig. 11. Dorsal side. — Fig. 12. Ventral side. — Fig. 13. Hinge line side. — Fig. 14. Front side of shell. — Fig. 15. Shell from side.

Fig. 16—17 *Spirifer interlineatus* Sow. — 2/1. Gotland. Visby. Endreväg, 1,250 m from Österport. — Specimen, brought home by H. HEDSTRÖM, belongs to the Geological Survey of Sweden. — Fig. 16. Area and hinge line of a ventral shell. — Fig. 17. Half part of same shell, seen from side.

Fig. 18 *Spirifer interlineatus* Sow. — 2/1. Gotland. Quarry of the city of Visby above Cement works and Sjukhemmet. — Specimen, taken by H. HEDSTRÖM, belongs to the Geological Survey of Sweden. — Hinge line of a dorsal shell, showing the narrow dental cavities and crural region.

Fig. 19. *Spirifer interlineatus* Sow. — 2/1. Gotland. Parish of Tofta, north-west of Lixarve. — Specimen, taken by H. HEDSTRÖM, belongs to the Geological Survey of Sweden. Half a dorsal shell, seen from side towards crural plate.

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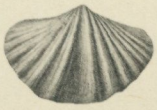

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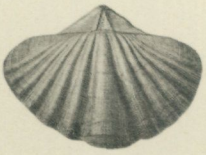

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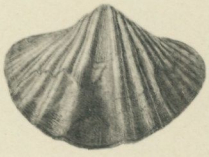

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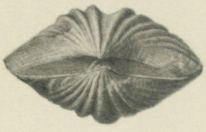

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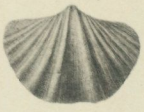

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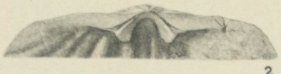

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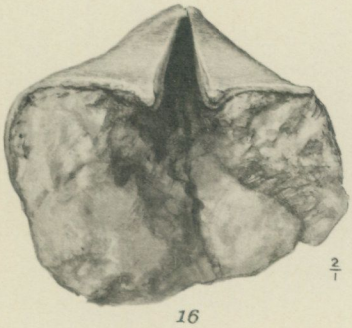

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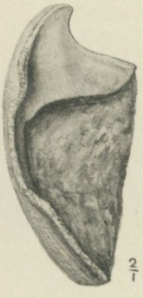

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Explanation of Plate 4.

Fig. 1—4. *Spirifer sinuosus* n. sp. 1/1. Gotland. Slite. Lännaberget. Specimen belonging to the Palæozoological Department of the State Museum of Natural History. — Fig. 1. Ventral side. — Fig. 2. Shell, seen to area. — Fig. 3. Front side of shell. — Fig. 4. Shell from side. — (The dorsal side of this shell is damaged.)

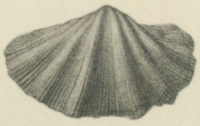
Fig. 5 and 6. *Spirifer sinuosus* n. sp. — 1/1. Gotland. Fårö, canal close to the east of Båta. Layer with *Pentamerus tenuistriatus*. — Specimen, taken by G. LILJEVALL, belongs to the Geological Survey of Sweden. — Fig. 5. Ventral side of half a shell. — Fig. 6. Same specimen, seen to area.

Fig. 7 and 8. *Spirifer sinuosus* n. sp. — 1/1. Gotland. Parish of Vesterhejde. Allehage. WSW. of »Hallbro's slott,» about $4.25-5.25$ m above »The Leperditia shale». Specimen, taken by G. LILJEVALL, belongs to the Geological Survey of Sweden, and is a dorsal shell. In Fig. 8 seen from the front side.

Fig. 9. *Spirifer sinuosus* n. sp. — 1/1. Ventral shell from the same locality as the foregoing. — Specimen, taken by H. HEDSTRÖM, belongs to the Geological Survey of Sweden.

Fig. 10—14. *Spirifer Schmidti* LINDSTR. — 1/1. Gotland. Hemse. Specimen belongs to the State Museum of Natural History, and is LINDSTRÖM's original specimen of Fig. 1, Plate XII of his paper: Bidrag till kännedomen om Gotlands Brachiopoder. — Öfvers. af K. Vet. Akad. Förh. 1860, n:o 8, p. 358.

Fig. 10. Dorsal side. — Fig. 11. Ventral side. — Fig. 12. Shell, seen to area. — Fig. 13. Shell from front side. — Fig. 14. Shell from side.



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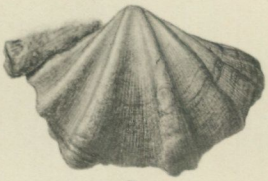

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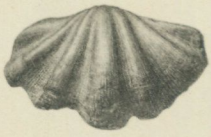

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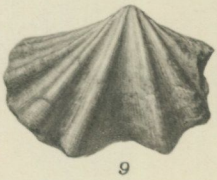

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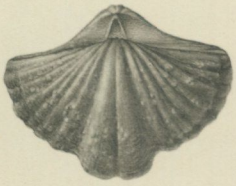

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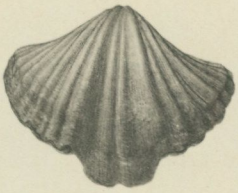

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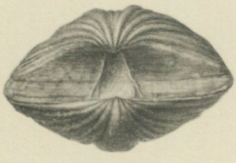

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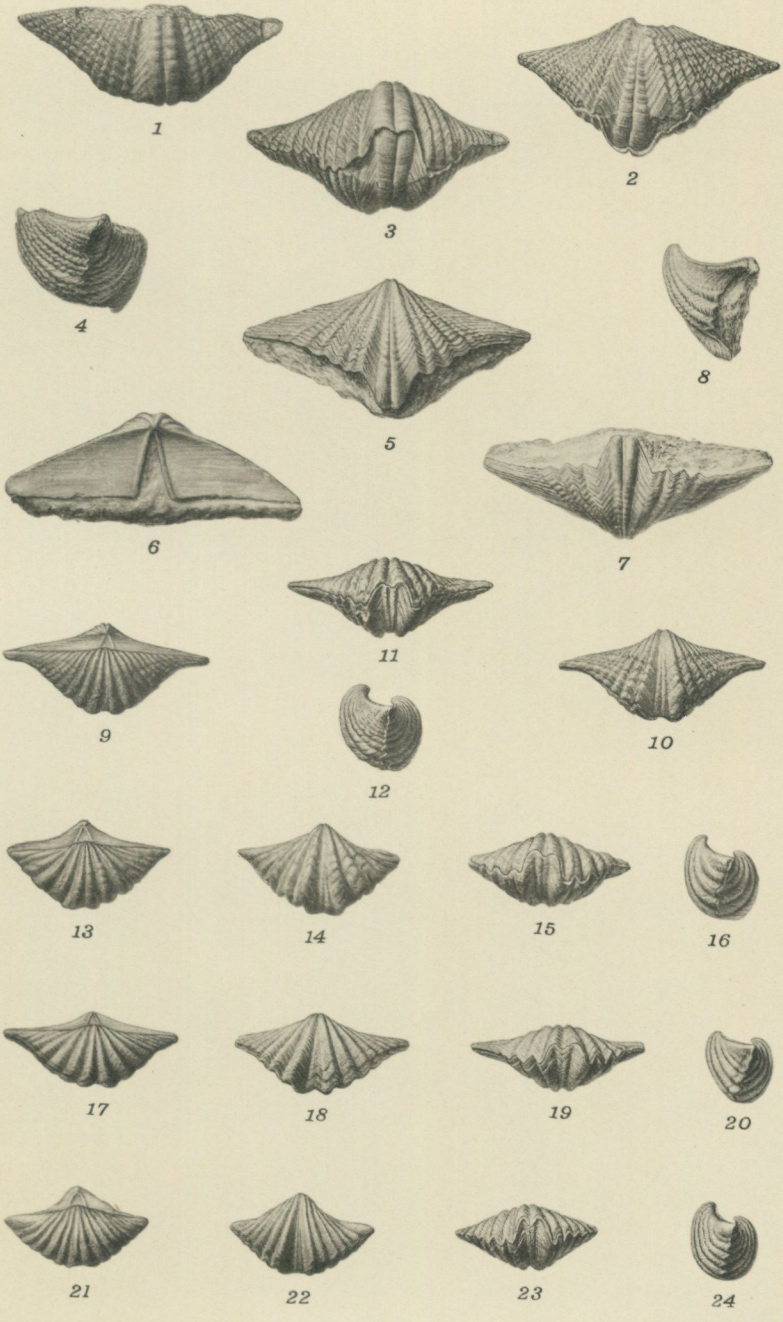
Explanation of Plate 5.

Spirifer insignis n. sp.

Fig. 1—4. Illustrations of a specimen from Lindeklint, belonging to the Palæozoological Department of the State Museum of Natural History. — Fig. 1. Dorsal side. — Fig. 2. Ventral side. — Fig. 3. Shell from front margin. — Fig. 4. Shell seen from lateral margin.

Fig. 5—8. Ventral shell from Rotarve in the parish of Lye, brought home by H. MUNTHE, belongs to the collections of the Geological Survey of Sweden. — Fig. 5. Shell, seen from above. — Fig. 6. Shell, seen to area. — Fig. 7. Same, from front side. — Fig. 8. Same, from lateral border.

Fig. 9—24. Illustrations of 4 different specimens from Lauberg belonging to the Palæozoological Department of the State Museum of Natural History. Figures 9, 13, 17, 21. Dorsal sides. — Figures 10, 14, 18, 22. Ventral sides. Figures 11, 15, 19, 23. Shells, seen to front borders. — Figures 12, 16, 20, 24. Shells, seen from side margins.



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