

SVERIGES GEOLOGISKA UNDERSÖKNING

SER. C.

Avhandlingar och uppsatser.

N:o 489.

ÅRSBOK 41 (1947) N:o 8.

SUPPLEMENTARY NOTES ON THE
UPPER CAMBRIAN TRILOBITES
OF SWEDEN

BY

A. H. WESTERGÅRD

WITH THREE PLATES

Pris 2 kronor

STOCKHOLM 1947

KUNGL. BOKTRYCKERIET. P. A. NORSTEDT & SÖNER

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Abstract. — The following new species and subspecies are described and illustrated: *Agnostus* (*Homagn.*) *obesus laevis*, *Glyptagnostus reticulatus nodulosus*, *Ciceragnostus? fаланensis*, *Proceratopyge similis*, *Drepaura eremita*, *Parabolina lapponica*, *Parabolinella leptoplastorum*, *Irvingella suecica*, and *I. suecica marginata*. A diagram of the Upper Cambrian sequence in the various areas and a tabular review of the range and geographical distribution of the trilobites so far known in this series in Sweden will be found on pp. 20—27.

The writer's memoir of 1922, »Sveriges Olenidskiffer» (The Olenidian of Sweden), gives an account of the stratigraphy and trilobite fauna of the Upper Cambrian of the various areas in Sweden and minor additional notes on this subject have subsequently been published by the writer in some papers cited on p. 28. The present report is based on material discovered over a period of years and adds materially to our knowledge of some earlier described species or is referable to hitherto unknown forms. A great deal of it belongs to the Paleozoological Department of the Swedish Museum of Natural History and one of the new species to the Geological-Mineralogical Institution of the University of Lund. The writer tenders his sincere thanks to the Directors of these museums for their courtesy in placing the collections at his disposal.

Description of Fossils.

Agnostidae (McCOY, 1849).

Agnostinae (JAEKEL, 1909).

Genus *Agnostus* BRONGNIART, 1822.

Subgenus *Homagnostus* (HOWELL, 1935).

Subgenotype: *Agnostus pisiiformis* (LIN.) var. *obesus* BELT, 1867.

Agnostus (*Homagnostus*) *obesus* BELT, 1867. — Pl. 1, figs. 10, 11.

Westergård, 1922, pp. 116, 193; pl. 1, figs. 4 a, b (not figs. 5, 6).

R e m a r k s. — Both shields, more particularly the pygidium, are greatly convex. The preglabellar longitudinal furrow sometimes extends to the marginal furrow and sometimes fades out before reaching the latter. The pygidium is characterized by its distinctly annulated, broad, and high axis extending almost to the marginal furrow; it is parallel-sided or widens backwards due to the rear lobe tending to become more or less semiglobular. It is a small form, the cephalon not exceeding 3.5 mm in length.

As regards the cephalon the marginal furrow is usually less broad in *obesus* than in the genotype of *Agnostus*, *A. pisiiformis*; otherwise the forms agree. In the pygidium *obesus* is distinct from *pisiiformis* by the above-mentioned characteristics. These criteria are variable in both species, however. The annulation of the axis is not so well defined — sometimes it is even obsolete — in *pisiiformis* as it is in *obesus*, and in the predominant form of the former the axis is narrower and shorter than in the latter. Other specimens of *pisiiformis* (or a variety) from the *pisiiformis* zone agree with *obesus* as to the breadth and length of the axis (cf. Westergård, 1946, pl. 13, fig. 14), and it is but in the fainter annulation of the axis, somewhat lower convexity, and larger size that this form differs from *obesus*. *A. pater* from the *Paradoxides forchhammeri* beds displays still closer resemblance to the latter, the dissimilarities being confined to the pygidial axis being inconsiderably narrower and shorter. Another late Middle Cambrian form, *A. neglectus* (described in the memoir just mentioned), also compares fairly well with *obesus* as regards the pygidium, whose rear axial lobe is somewhat widened, but differs slightly in the cephalon.

Howell and other authors regard *Homagnostus* as an independent genus. According to the present writer's experience of the Agnostidae, however, the characteristics claimed to distinguish this group from *Agnostus* are too insignificant and too variable to indicate generic distinction. The groups merge into each other and overlap. Thus *Homagnostus* is awarded but subgeneric rank.

Horizon and Localities. — *A. (H.) obesus* ranges through the *Olenus* zone except the uppermost subzone. An earlier statement that the form occurs also in the basal layer of the *Orusia lenticularis* zone does not seem to be correct. Widely distributed in Scandinavia. Infrequent to common.

Great Britain.

Agnostus (Homagnostus) obesus laevis subsp. n. — Pl. 1, fig. 12.

Agnostus pisiiformis obesus BELT(?), Westergård, 1922, pp. 116, 193; pl. 1, figs. 5, 6.

D i a g n o s i s. — Distinct from *obesus* by lacking any trace of a preglabellar longitudinal furrow and having broader marginal furrow.

In the cephalon this form is not distinguishable from *Agn. pisiiformis subsulcatus* WESTERGÅRD (1946) and in the pygidium it agrees with *obesus*.

About twenty specimens, not very well preserved in shale, have been collected from the subzone of *Protopeltura aciculata* at Andrarum, Scania. The holotype is the complete specimen, fig. 5, illustrated in 1922.

Agnostus (Homagnostus) rudis SALTER(?). — Pl. 1, figs. 13 a, b.

Westergård, 1922, pp. 118, 193; pl. 1, fig. 17.

R e m a r k s. — As this form is known but from three pygidia, which, moreover, vary as to the length and breadth of the axis, its specific reference is uncertain. It is tentatively identified as *rudis*. A closely related form from slightly younger strata was described in the above-mentioned memoir under

the name of *A. rudis holmi*. These forms were by Kobayashi (1939) included in *Geragnostus* HOWELL, 1935 (type *A. sidenbladhi* LINNARSSON from the Ceratopyge limestone) probably because of their wanting a preglabellar longitudinal furrow. They display closer resemblance to *A. (H.) obesus laevis*, however, and may be referable to *Homagnostus*.

Horizon and Localities. — Subzone of *Peltura acutidens*. Andrarum, Scania — Storeklev, Hunneberg, and Sättra, Kinnekulle, Västergötland. — Very rare.

Wales.

Genus *Glyptagnostus* WHITEHOUSE, 1936.

Genotype: *Glyptagnostus toreuma* WHITEHOUSE, 1936 (= *Agnostus reticulatus* ANGELIN, 1851).

Glyptagnostus reticulatus (ANGELIN, 1851). — Pl. I, figs. 1–6.

- 1851. *Agnostus reticulatus* ANGELIN (partim), Pal. Suec., Fasc. I, p. 8, pl. 6, fig. 10. (Brief diagnosis and a poor fig. of a restored complete specimen. A few of the syntypes are referable to *G. reticulatus nodulosus* to be described. Zone of *Olenus*. Andrarum, Scania.)
- 1867. *Agnostus nodosus* BELT, Geol. Mag., vol. 4, p. 295, pl. 12, figs. 3 a, b. (Description and figs. of two entire specimens. Associated with *Olenus gibbosus*. North Wales.)
- 1880. *Agnostus reticulatus* ANGELIN, Tullberg, S. G. U., Ser. C, No. 42, p. 23, pl. 1, figs. 12 a, b. (Description and figs. of cephalon and pygidium. Zone of *Olenus*. Andrarum, Scania.)
- 1882. *Agnostus reticulatus* ANGELIN, Brögger, Die silur. Etage 2 und 3, p. 57, pl. 1, figs. 11 a, b. (Remarks on species; figs. of cephalon and pygidium. Zone of *Olenus*. Mjösen district, Norway.)
- 1906. *Agnostus reticulatus* ANGELIN, Lake, Pal. Soc., Brit. Cambr. Trilob., p. 8, pl. 1, fig. 11. (Description and fig. of entire specimen. Lower Lingula Flags. Wales.)
- 1909. *Ptychagnostus reticulatus* ANGELIN, Jaekel, Zeitschr. Deutsch. Geol. Ges., Vol. 61, p. 400, text-fig. 19. (Sketch of the dorsal shield after Tullberg.)
- 1923. *Agnostus reticulatus* ANGELIN, Poulsen, D. G. U., II. Række, No. 40, p. 23, pl. 1, fig. 3. (Description of cephalon and pygidium; fig. of the latter. Zone of *Olenus*. Bornholm.)
- 1926. *Pseudagnostus reticulatus*, Butts, Alabama Geol. Surv., Spec. Rept. 14, p. 76, pl. 9, fig. 5. (Fig. of entire specimen. Early Upper Cambrian, «near top of Conasauga formation». Alabama, U. S. A.)
- 1936. *Glyptagnostus toreuma* WHITEHOUSE, Mem. Queensland Mus., Vol. 11, pt. 1, p. 102, pl. 9, figs. 17–20. (Description and figs. of cephalon and pygidium. Early Upper Cambrian. Queensland, Australia.)
- 1938. *Glyptagnostus angelini* RESSER, Geol. Soc. America, Spec. Pap. No. 15, p. 49, pl. 10, fig. 23. (Distinguished from Angelin's species as illustrated by Westergård in 1922. Fig. of complete specimen. Nolichucky formation, early Upper Cambrian. Alabama.)
- 1938. *Glyptagnostus reticulatus* (ANGELIN), Kobayashi, Jap. Journ. Geol. Geogr., Vol. 15, No. 15, p. 170, pl. 16, fig. 34. (Description and fig. of cephalon. Upper Cambrian. British Columbia, Canada.)

Remarks. — Examination of Angelin's syntypes of *reticulatus*, which were inaccessible to the present writer when treating the species in his memoir of 1922, has corroborated the statement that the species varies fairly considerably as regards the sculpture of the test. In view of this variability it seems expedient to distinguish, in addition to the predominant form, a subspecies described below. Unfortunately, in the memoir mentioned the present writer illustrated but the latter form, which has caused some confusion in the identification of some foreign forms referable to Angelin's species.

In *reticulatus* sensu str. the dorsal furrows are moderately impressed and as a rule slightly deeper in the cephalon than in the pygidium, sometimes being very weak in the latter. Of the furrows on the cheeks and pleural lobes those

running about perpendicularly to the outline are deeper than the remainder. The nodose prominences due to the reticulation of the surface decrease in size from the dorsal furrows to the border in both shields. The frontal glabellar lobe has sometimes a longitudinal furrow or a depression in its anterior portion and, sometimes, there is no trace of such a depression; the anterior outline of the lobe is usually slightly angulate, not so evenly rounded as in Tullberg's figure. The posterior main lobe of the pygidial axis is divided by one transverse and two longitudinal furrows into two larger convex median and two narrower depressed lateral portions which vary in relative length and breadth; the lateral portions are subdivided into a row of small knobs (usually five pairs), which are never so well defined as in Tullberg's figure and sometimes are practically imperceptible.

Thanks to the courtesy of Professor Leif Störmer of Oslo, the present writer has had the opportunity of examining Brögger's specimens of *reticulatus*. The pygidium (fig. 11 b), preserved in stinkstone but somewhat damaged, has the convex anterior portion of the third axial lobe narrower and the lateral depressed portions broader than in Brögger's figure; thus, it compares much better with our figs. 4 and 6 than can be concluded from the figure, and it differs from our fig. 6 only by somewhat higher convexity. An associated cephalon, about half as long as that illustrated by Brögger, agrees with our figs. 1 and 2. The original of fig. 11a has not been found.

Professor Chr. Poulsen of Copenhagen, who at the request of the writer has kindly compared the specimens from Bornholm with the photographs of this paper, stated in a personal communication that *reticulatus* and *reticulatus nodulosus* occur associated with *Olenus wahlenbergi* at one locality (Öleaa 17) and that the latter form appears also at the base of the *Olenus* zone at another locality (Laesaa 2) where it is associated with *Polyphyma* sp.

The Australian form *G. toreuma* WHITEHOUSE¹ has been distinguished as an independent species for the following reasons: — — — »all the Queensland specimens have in common certain features of the ornament that show slight differences from the Swedish form as figured by Westergaard [= *reticulatus nodulosus* subsp. n.]. For instance the reticuli near the cephalon [glabella] are coarser and the lateral lobes of the pygidial axis are not so minutely subdivided» (Whitehouse, 1936, p. 103). However, the difference in the cephalon is just that distinguishing *reticulatus* from its subspecies and the dissimilarity in the pygidium adduced by Whitehouse is of no value for reasons stated above and shown by the illustrations in this paper. As far as can be concluded from Whitehouse's description and photographs there does not seem to exist any specific difference between *toreuma* and *reticulatus* sensu str., and, thus, the former may be a synonym of the latter. In this connection it is worthy of remark that,

¹ It should be noted that in the description of *G. toreuma* Whitehouse uses a terminology differing from that generally accepted. The axis of the pygidium is stated to have three primary lobes; the anterior of these corresponds to the first and second lobes and the median and posterior to the third lobe in the usual sense. The posterior lobe by Whitehouse is homologous with the constricted and depressed terminal portion of the third lobe in e.g. *Goniagnostus nathorsti* and *Doryagnostus incertus*.

according to Whitehouse, a few Scandinavian Middle Cambrian agnostids do occur in Australia, and in the present writer's opinion this is also true of *Doryagnostus incertus* (Westergård, 1946, p. 83).

As regards *G. angelini* from Alabama Resser states that there are minor differences between this form and that illustrated by the present writer in 1922, which doubtlessly is correct. On the other hand Butt's and Resser's figures of the Alabama form compare so closely with *reticulatus* sensu str. that it seems reasonable to include it in Angelin's species. Also the form from British Columbia illustrated by Kobayashi may be referable to the latter.

H o r i z o n a n d L o c a l i t i e s. — Zone of *Olenus*; in Scania hitherto found only in the subzones of *O. gibbosus* and *O. truncatus*. — Scania: Andrarum; Tosterup; Gislövshammar (boring). — Öland: Degerhamn. — Östergötland: Knivinge. — Västergötland: Kinnekulle. — Närke: Latorpsbruk; Ullavi and Skruke, parish of Sköllersta; Tångsätter, parish of Asker (boring). — Jämtland: Klövsjö; Brunflo. — Infrequent in Scania, otherwise very rare.

Bornholm: — Mjösen district of Norway. — Wales. — Alabama, U. S. A. — British Columbia, Canada. — Queensland, Australia.

Glyptagnostus reticulatus nodulosus subsp. n. — Pl. 1, figs. 7—9.

Agnostus reticulatus ANGELIN (partim), Westergård, 1922, pp. 117, 193, pl. 1, figs. 11, 12. (Only the form illustrated. Subzone of *Olenus wahlenbergi*. Andrarum, Scania).

D i a g n o s i s. — Reticulation of the cheeks markedly finer than in *reticulatus*. Prominences close to the dorsal furrows in the middle and posterior portions of the pleural lobes of the pygidium large and practically not divided by furrows subparallel to the axis.

R e m a r k s. — The cephalon, fig. 7, differs from *reticulatus* also in the basal lobes being divided by a transverse furrow. This criterion is often met with in *Ptychagnostus* and some authors have considered it a characteristic distinctive of that genus; it was proved by the present writer (1946, p. 68) not to have even specific validity, however.

S i z e. — The holotype cephalon, fig. 7, the largest specimen found, is 6.5 mm long.

H o r i z o n a n d L o c a l i t i e s. — Subzones of *Olenus truncatus* and *O. wahlenbergi*. Andrarum, Scania. Infrequent.

Occurs on Bornholm at two different horizons: at the base of the *Olenus* zone and associated with *O. wahlenbergi* (personal communication by Professor Poulsen; see p. 6).

Phalacrominae (CORDA, 1847).

Genus *Ciceragnostus* KOBAYASHI, 1937.

Genotype: *Agnostus barlowii* BEL1, 1868.

Ciceragnostus? jalaensis sp.n. — Pl. 1, fig. 14.

A single imperfect pygidium is present. It is of high convexity, has a long, narrow, and very weak median ridge and a flattened border slightly widened

posteriorly. It cannot be decided whether the axis is or is not outlined anteriorly. The specimen displays fairly close resemblance to *C. cicer*, in particular a form from the Andrarum limestone (Westergård, 1946, pl. 14, fig. 9); thus it seems more likely that it belongs in *Ciceragnostus* than in *Phoidagnostus*.

The specimen was collected from the zone of *Agnostus pisiformis* at Djupadalen, 6 km E of Falköping, Västergötland.

Ceratopygidae RAYMOND, 1913.

Linnarsson (1869) seems to have been the first to assign *Ceratopyge* as the type of an independent family which was not defined, however. In recent years the family has been discussed by Kobayashi (1935), Troedsson (1937), and Whitehouse (1939).

Kobayashi included in it the following genera: *Proceratopyge* WALLERIUS from the late Middle and early Upper Cambrian, *Hysterolenus* MOBERG and *Ceratopyge* CORDA from the early Lower Ordovician, and, tentatively, the imperfectly known *Kogenium* KOBAYASHI from the Middle Cambrian of Eastern Asia.

Troedsson added two new genera, *Lopnorites* and *Diceratopyge*, from the Upper Cambrian of Central Asia. He distinguished two subfamilies which were claimed to constitute defined parallel lineages. They were characterized thus:

»*Hysteroleninae* n. subfam. Genera: *Kogenium*(?), *Lopnorites* and *Hysterolenus*. Eye-lines present. Pygidium well segmented . . .

Ceratopyginae n. subfam. Genera: *Proceratopyge*, *Diceratopyge* and *Ceratopyge*. No eye-lines. Pygidium with few pleurae. The pygidium of the earliest genus *Proceratopyge* is also well segmented in some species» (Troedsson, 1937, p. 34).

Thus, the principal difference between the subfamilies was stated to be the ocular ridges which were claimed to be present in *Hysteroleninae* but absent in *Ceratopyginae*. This feature as well as the segmentation of the pleural lobes of the pygidium is a poor criterion, however, whose taxonomic value was overestimated by Troedsson.

Whitehouse has called attention to the fact that even though the ocular ridges are absent in *Ceratopyge forficula* (genotype), they are quite definite in *C. latelimbata* MOBERG & SEGERBERG, beyond doubt congeneric with the former and occurring in the same layer. As regards *Proceratopyge* it is true that the ocular ridges are usually almost or quite imperceptible in *P. conifrons* (genotype), but topotypes exist in which they are distinct. Moreover, two new species of this genus, *P. magnicauda* and *P. similis* illustrated in the present paper, have defined ocular ridges, nine thoracic segments as in *Lopnorites*, and a well segmented pygidium. These species in particular display so close similarities to *Lopnorites rectispinatus* (genotype) and *L. fragilis* that it would be unnatural to consider them generically distinct from the latter. Consequently, there will be no doubt but that *Lopnorites* is a synonym for *Proceratopyge*, and the present writer agrees with Whitehouse that the subfamilies proposed by Troedsson and endorsed by Kobayashi (1938) do not imply a natural grouping of the genera under consideration.

Whitehouse described four new species of *Proceratopyge* from the early Upper

Cambrian of Australia, unfortunately known but from detached cranidia and pygidia. Of these forms *P. lata* is very similar to the genotype in the cranidium, the fixed cheeks being relatively wide and the brim comparatively short; also the pygidium tentatively combined with the cranidium agrees with the genotype except that it has five instead of four axial rings and, accordingly, is somewhat longer. In *P. rutellum* the fixed cheeks are so reduced that the palpebral lobes practically impinge upon the glabella, and the brim is longer. The remainder are intermediate in their characters. *P. rutellum* was stated to be very similar to the American late Upper Cambrian genus *Housia* WALCOTT (1916), and as *rutellum* is connected to *lata* by intermediate forms, Whitehouse concluded that *Housia* is synonymous with *Proceratopyge*. However, the genotype of *Housia*, *Dolichometopus* (*Housia*) *varro* WALCOTT (1916; 1925), is in some features, which may have generic value, sharply distinct from that of *Proceratopyge* and, furthermore, all the species of which entire specimens are known have ten thoracic segments in *Housia* whereas they have nine in *Proceratopyge* (including *Lophnorites*). The present writer therefore considers *Housia* generically distinct from *Proceratopyge*, and it seems to him questionable whether the former should be regarded as a member of Ceratopygidae.

Genus *Proceratopyge* WALLERIUS, 1895.

Genotype: *P. conifrons* WALLERIUS, 1895.

In addition to the genotype two more Swedish species, *nathorsti* and *tullbergi*, have hitherto been known. The latter, which were described by the present writer in 1922, were based only on the pygidium and thus their generic reference was not quite ascertained. Additional material of these and two new species now make it possible to give a fuller characterization of the genus of which the following Swedish species exist:

- P. conifrons*, zone of *Lejopyge laevigata*
- » *magnicauda* sp.n., zone of *L. laevigata*¹
- » *nathorsti*, zone of *Agnostus pisiiformis*
- » *similis* sp.n., zone of *A. pisiiformis*(?)
- » *tullbergi*, zone of *Orusia lenticularis*, lower part.

Generic diagnosis. — Carapace ovate, gently arched; test smooth.

Cephalon with the posterior corners prolonged in a pair of strong spines. Glabella conical to almost parallel-sided, not extending to the border; lateral furrows well defined to almost imperceptible. Eyes situated about at the middle of the cheeks. Anterior branches of the facial suture diverging forwards or almost parallel.

Thorax of nine segments; axis slightly conical; pleura furrowed, with fulcrum remote from the axis, terminating in spines.

Pygidium fairly large, semicircular to sub-triangular; axis conical, annulated, extending to the border; pleural lobes furrowed; anterior segment terminating in a pair of strong spines.

¹ For comparison the holotype of *P. magnicauda* is illustrated on pl. 2, fig. 11.

†—472687. *S. G. U., Ser. C, No 489. Westergård.*

Members of the genus are known from the late Middle and early Upper Cambrian of Sweden, the Upper Cambrian of Central and Eastern Asia (= *Lopnorites*), the early Upper Cambrian of Australia, and probably from the Lower Tremadocian of Argentina (HARRINGTON, 1938).

Proceratopyge nathorsti WESTERGÅRD, 1922. — Pl. 2, figs. 2—7.

Proceratopyge nathorsti WESTERGÅRD, 1922, pp. 120, 194, pl. 2, figs. 3—5. (Description and figs. of the pygidium; fig. 3 is the holotype. Zone of *Agnostus pisiformis*. Degerhamn, at S. Möckleby, Öland, and Andrarum, Scania).

Description. — Glabella gently conical, rounded in front, with two pairs of very faint lateral furrows and a very small median tubercle far back. Occipital furrow shallow; occipital ring smooth. Brim slightly concave, border upturned, marginal furrow fairly indistinct. Ocular ridges imperceptible. Doublure of the free cheek truncated at the axial line.

Thorax of nine segments (in fig. 2 the fifth(?) segment is displaced and almost concealed by the second segment). Axial rings smooth. Fulcrum situated in the anterior segments two-thirds and in the posterior segments somewhat more than half the total length of the pleuron from the dorsal furrow. Pleura terminating in short spines that do not markedly increase in length in the posterior segments.

Pygidium about twice as broad as long. Axis prominent, conical, with four well-defined rings, extending to the broad and slightly concave border. Marginal furrow practically effaced. Pleural lobes with two pairs of distinct and a third pair of weak pleural furrows.

Size. — The carapace in fig. 2, which is the largest specimen found, preserved in alum shale, retaining the test and somewhat flattened, is about 28 mm long (cephalon 11.5, thorax about 10, and pygidium 6.5 mm).

Remarks. — *P. nathorsti* is readily distinguished from the genotype by fainter glabellar furrows, lacking the projection of the border that in the latter species extends to the glabella, and narrower pygidium.

The truncation of the doublure of the free cheek in this species as well as in *tullbergi* simulates the existence of a suture like that in the Asaphidae but may be due to a rupture.

Horizon and Localities. — Zone of *Agnostus pisiformis* (and according to Nathorst subzone of *Olenus gibbosus*?). — Andrarum, Scania. — Degerhamn, Öland. — Hjortsberga, Närke (a free cheek). — Rare.

Proceratopyge similis sp.n. — Pl. 2, fig. 1.

Diagnosis. — Distinct from the genotype by strongly tapering glabella and proportionally longer pygidium with well defined pleural furrows.

Description. — Glabella about half as broad in front as at the rear, with three pairs of faint lateral furrows, and a very small median tubercle far back. Occipital furrow shallow; occipital ring smooth. Anterior border projecting backwards to the glabella. Ocular ridges faint, oblique. Anterior branches of the facial suture apparently parallel.

Thorax of nine segments. Axis occupying anteriorly somewhat less than one-third and posteriorly one-fifth of the total breadth; axial rings smooth. Fulcrum in the middle segments at a distance from the glabella subequal to two-thirds of the width of the pleuron. Pleural spines short also in the posterior segments.

Pygidium slightly more than twice as broad as long. Axis occupying about one-fifth of the total breadth, extending to the broad and flat border, with five rings. Pleural lobes distinctly furrowed. Marginal spines of the first segment not preserved.

Size. — Holotype 25.5 mm long (cranium 9, thorax 10.5, pygidium 6 mm) and about 15 mm broad across the thorax.

Remarks. — Only the holotype is present; it is preserved in alum shale, somewhat flattened, and wants the test. The differences in the cranium distinguishing this form from the genotype may to some extent be ostensible due to the mode of preservation; in the pygidium there seem to be true dissimilarities, however. Thus, in *similis* there are five well-defined axial rings whereas in *conifrons* the number is four (rarely a fifth ring is faintly indicated), ratio of length and breadth in the former being 1 : 2.17 and in the latter about 1 : 2.5 (2.4—2.7); furthermore the segmentation of the lateral lobes is better defined in the former than in the latter. Therefore *similis* is tentatively counted as an independent species. — In the pygidium this form agrees with *tullbergi*.

Horizon and Locality. — The specimen was labelled Scania; probably it was collected at Andrarum. The slab does not contain any other fossil and but on account of some insignificant lithological features it is tentatively referred to the zone of *Agnostus pisiiformis*.

Proceratopyge tullbergi WESTERGÅRD, 1922. — Pl. 2, figs. 8—10.

Proceratopyge tullbergi WESTERGÅRD, 1922, pp. 121, 194, pl. 2, figs. 6, 7. (Description and figs. of the pygidium. Subzone of *Protopeltura aciculata*. Andrarum, Scania).

Description. — Glabella parallel-sided, rounded in front, apparently lacking lateral furrows, with a very small median tubercle fairly far back. Occipital ring smooth. Border at the middle line projecting backwards (not extending all the way to the glabella?). Anterior branches of the facial suture diverging forwards, posterior branches running from the eyes straight outwards and then curving backwards. Doublure of the free cheek truncated at the axial line as in *P. nathorsti*, q.v.

An associated imperfect thoracic segment has somewhat longer pleural spines than have other congeneric forms and in the last segment the pleural spines are greatly prolonged and subequal in length to the pygidial spines (cf. Westergård, 1922, pl. 2, fig. 7).

Pygidium about twice as broad as long. Axis of five or six rings. Lateral lobes distinctly furrowed.

Size. — The holotype pygidium, largest specimen found (Westergård, 1922, pl. 2, fig. 6), is 9.5 mm long and 21 mm broad.

Remarks. — No larger cranium than that of a young individual in fig.

8 is present. *P. tullbergi* is sharply distinct from the genotype and other congeneric forms so far known by the course of the posterior branch of the facial suture and the very long pleural spines of the last thoracic segment.

Horizon and Locality. — The holotype was found according to Tullberg in the subzone of *Protopeltura aciculata*. The specimens illustrated in this paper are associated with *Agnostus* (*Homagn.*) *obesus* and probably originate from the upper portion of the subzone of *Olenus dentatus*. Andrarum, Scania. — Rare.

Damesellidae KOBAYASHI, 1935.

Genus *Drepanura* BERGERON, 1899.

Genotype: *D. premesnili* BERGERON, 1899.

Drepanura eremita sp.n. — Pl. 3, figs. 9—II.

Diagnosis. — Distinct from the genotype by having the border of the cranidium developed at the sides, subquadrangular glabella, the eyes situated farther back and more remote from the dorsal furrows, the posterior limb narrow (in sagittal direction) and tapering inconsiderably, subcylindrical and longer axis of the pygidium, four pairs of pronounced pleural furrows, well-defined flat border, and the first pair of marginal spines relatively narrow.

Description. — Glabella prominent, subquadrangular, slightly tapering forwards, length equal to the breadth anteriorly, sloping in front almost vertically to the margin. Lateral furrows two pairs, well impressed; posterior pair at some distance from the dorsal furrows bifurcate, one branch extending backwards-inwards and a fainter branch running forwards and almost separating the second pair of glabellar lobes from the middle portion of the glabella. Occipital furrow straight, fairly deep at the sides, shallow at the axial line; posterior margin of the occipital ring convex. Dorsal furrows deep, curving slightly outwards at the second pair of glabellar lobes. Border narrow and well-defined at the sides, decreasing inwards, not developed in front of the middle portion of the glabella; marginal furrow distinct as far as the border is developed. Brim extero-anteriorly slanting strongly to the border. Ocular ridges faint, oblique. Fixed cheeks about one-third as broad as the glabella, at the palpebral lobes almost as high as the latter, sloping strongly to the dorsal furrows. Palpebral lobes at subequal distance from the anterior and posterior margins. Anterior branch of the facial suture running from the eye forwards, then curving inwards and cutting the border at a very acute angle; posterior branch directed almost straight outwards, cutting the posterior margin at a distance from the dorsal furrow equal to the breadth of the occipital ring. Surface of cranidium under a lens finely shagreened; on the exterior part of the posterior limb finely granulate.

Pleuron of an associated imperfect thoracic segment furrowed, with a fairly stout spine curving backwards; anterior straight margin terminating in a small projection at the limit of the doublure, as described by Monke in the genotype

and *D. ketteleri*. Test on the spine finely granulate (proximal part of the pleuron lacking the test).

Pygidium (the long spines excluded) subtriangular in outline; ratio of length and breadth 1 : 1.7. Axis occupying about one-fifth of the maximum breadth, almost parallel-sided, strongly arched, somewhat higher anteriorly and posteriorly than in the middle portion and, accordingly, slightly concave on a side-view, at the rear sloping abruptly to the border, with six segments in addition to the articulating half ring; ring furrows shallow but distinct, the last one very faint. Pleural platform gently arched, with four pairs of fairly deep pleural furrows extending to the flat and well-defined border; anterior margin with a small projection corresponding to that on the anterior margin of the thoracic pleuron described above. Anterior pair of half ribs prolonged into a pair of strong and very long spines directed backwards-outwards and curving slightly inwards, in transverse section ovate proximally and circular distally. Between these, eight pairs of relatively short marginal spines, broad at the base, then abruptly narrowing due to a constriction at their exterior margin; last pair very small. Surface of the test unknown, the pygidium being exfoliated.

Size. — Cranidium 7 mm long and 17 mm broad at the posterior margin; holotype pygidium 11 mm long (exclusive of the long spines) and 19 mm broad.

Remarks. — But the illustrated specimens are present. The cranidium and thoracic segment were found on a bedding surface of a slab of stinkstone (orsten) otherwise yielding *Agnostus pisiiformis* in great abundance and some specimens of *Proceratopyge nathorsti* (the latter illustrated on pl. 2, figs. 4—7); unfortunately the locality of the slab is unknown. The pygidium was collected by the writer from a stinkstone slab at Djupadalen, Västergötland, rich in *A. pisiiformis* but yielding no more species. It may be noted that the slabs display so close similarities that they may originate from one stratum. It can be added that Djupadalen, where natural sections through great parts of the Cambrian System are to be found, is a classical locality often visited by students of this system and collectors of fossils.

As the cranidium and thoracic segment as well as the pygidium show criteria characteristic of *Drepanura* and do not display any essential features that are not found in this genus it can hardly be doubted that the fragments are conspecific and that the form is referable to *Drepanura* in the sense hitherto used. Even the small projection at the anterior margin of the thoracic pleura and the lateral lobes of the pygidium found in Monke's illustrations of *D. premesnili* and *D. ketteleri* are developed in *eremita* too. As stated above the Swedish form is readily distinguished from the genotype. On the other hand it displays close resemblance to *D. ketteleri*, which seems to agree with our form better than any other so far made known. As regards the border of the cranidium *eremita* is intermediate between *premesnili* and *ketteleri*, the border being absent in *premesnili*, well defined throughout in *ketteleri*, and developed only at the sides in *eremita*. The eyes are situated somewhat farther back in *eremita* than in *ketteleri*, and the posterior branch of the facial suture is transverse in the former

but oblique in the latter. The pygidium of *eremita* compared with that of *ketteleri* has a greater number of segments and, accordingly, is relatively larger, has subtriangular instead of semicircular outline and a well defined border with peculiarly pointed spines.

As far as the present writer is aware *eremita* is the only form referable to *Drepanura* hitherto found outside Eastern Asia. It is of great paleogeographical interest and for correlation of the formations at the boundary between the Middle and Upper Cambrian in the West Pacific and Acado-Baltic Provinces.¹

Horizon and Locality. — Zone of *Agnostus pisiiformis*. Djupadalen, 6 km E of Falköping, Västergötland. — As the Upper and Middle Cambrian sections at this as well as many other localities in different areas of Sweden have been carefully examined and as the illustrated specimens are the only ones of this species that have been found, it must be extremely rare.

Olenidae (BURMEISTER, [1843] 1844).²

Genus *Parabolina* SALTER, 1849.

Genotype: *Entomostracites spinulosus* WAHLENBERG, 1821.

Parabolina lapponica sp.n. — Pl. 3, fig. 8.

Diagnosis. — Distinct from *P. spinulosa* by shorter glabella and the eyes situated farther back.

Description. — Glabella subrectangular; first (posterior) pair of lateral furrows meeting across the glabella, second pair discontinuous, third pair faint or indiscernible. Occipital ring with a very small median tubercle. Sagittal length of the brim slightly exceeding that of the border. Palpebral lobes but a little more remote from the posterior than from the anterior margin of the cranium and at a distance from the glabella subequal to one-third of the breadth of the latter. Ocular ridges oblique. Anterior branch of the facial suture running forwards and then slightly inwards.

Size. — Largest cranium, holotype, 14 mm long and 23 mm broad.

Remarks. — Only a few crania are present.

Following Holm (1890, p. 264) the present writer (1922, p. 96) recorded this form as *P. spinulosa*. Examination of the original material has proved, however, that it differs from the latter species in several features as stated above. It seems to display closer resemblance to *P. heres* BRÖGGER but is distinct by having oblique instead of transverse ocular ridges and the eyes situated farther back. The species can hardly be confounded with *P. longicornis*, which occurs at the same horizon as does *lapponica* and is known also from S. Lapland.

Horizon and Locality. — Associated with *Peltura scarabaeodis* (abundant) in a slab of gray stinkstone from Storberget, on the north-eastern shore of Lake Wojmsjön, Southern Lapland (Västerbotten).

¹ The *Drepanura-Blackwelderia* fauna (Kushan formation) of Eastern Asia is late Middle Cambrian in age according to most students. Endo (Proc. Sixth Pacific Sci. Congress, 1939) regards it as having originated in Eastern Asia which may be true; in such a case it is not surprising that *Drepanura* appears in Scandinavia only in the early Upper Cambrian.

² Burmeister's memoir, *Die Organisation der Trilobiten*, has the year 1843 on the title-page but 1844 on the back of the cover.

Genus *Parabolinella* BRÖGGER, 1882.

Genotype: *P. limitis* BRÖGGER, 1882.

Parabolinella leptoplastorum sp.n. — Pl. 3, fig. 7.

D i a g n o s i s. — Distinct from *P. laticauda* WESTERGÅRD (1922) by shorter and narrower glabella, longer brim, and the posterior branch of the facial suture running more straight outwards.

D e s c r i p t i o n. — Glabella tapers inconsiderably, rounded in front, occupying but a little more than half the cranidial length, slightly narrower than the posterior limb. First (posterior) and second pairs of lateral furrows well defined, discontinuous; third pair almost imperceptible. Occipital furrow deep at the sides and shallow at the axial line. Brim almost half as long as the glabella, with very faint radiating ridges. Marginal furrow pronounced; border upturned. Palpebral lobes of moderate size; at about the same distance from the anterior and posterior margins of the cranidium and at a distance from the glabella subequal to half the breadth of the latter. Ocular ridges well-defined, slightly oblique. Anterior branch of the facial suture running forwards and slightly outwards and then curving slightly inwards; posterior branch directed outwards and backwards.

S i z e. — Length of cranidium 5.2 mm and breadth 9.2 mm at the rear.

R e m a r k s. — Only the holotype is present and probably it is a young specimen. It should be compared with *P. laticauda* from the subzone of *Peltura minor*, in particular with the younger specimen illustrated by the writer in 1922, which is about equal in size. *P. leptoplastorum* is distinct from this specimen as stated above. Considering the differences in *laticauda* due to different stages of growth we may conclude that the full-grown *leptoplastorum* will prove to display closer resemblance to the full-grown *laticauda* than does the young specimen found.

P. leptoplastorum is the earliest form referable to this genus so far known from Scandinavia.

H o r i z o n a n d L o c a l i t y. — Subzone of *Leptoplastus ovatus*. Röstångå (0.7 km W of the church), Scania.

Komaspididae KOBAYASHI, 1935.

The family was discussed by Kobayashi in 1935 and 1938 and by Resser in 1942.

Genus *Irvingella* ULRICH & RESSER (in Walcott, 1924).

Genotype; *I. major* ULRICH & RESSER, 1924.

Diagnosis according to Resser (1942, p. 3):

»Glabella quadrate to subconical; eyes always large; anterior fixigenes present; brim simple or slightly rimmed; librigenes very narrow; pygidium like *Chariocephalus*.

Upper Cambrian (lower and middle Franconia zones), North America.»

Irvingella suecica sp.n. — Pl. 3, figs. 1—3, (4?).

D i a g n o s i s. — Distinct from the genotype by having proportionally broader fixed cheeks and slightly shorter palpebral lobes not touching the posterior marginal furrow.

D e s c r i p t i o n. — Cranium more than one and a half as broad as long, moderately arched. Glabella long, broad, somewhat constricted towards the front. First (posterior) pair of glabellar furrows wide and deep and meeting across the glabella; second pair faint and short to imperceptible. Occipital furrow well impressed throughout; occipital ring smooth. A very faint border followed by a very weak marginal furrow discernible in the holotype but imperceptible in some specimens; brim narrow at the axial line. Palpebral lobes slightly shorter than the glabella and not extending all the way to the occipital segment. Breadth of the fixed cheek about half of that of the glabella.

Associated pygidium (a poorly preserved young specimen) subtriangular in outline. Axis prominent, extending to the border, with one ring and a relatively long end-lobe. Pleural lobes with two pairs of well-defined pleural furrows; border faint, with a pair of short spines.

S i z e. — Holotype cranium, one of the largest specimens found, 9 mm long and 15.5 mm broad.

R e m a r k s. — About twenty cranidia and a single pygidium are present, all collected from a small limestone (orsten) lens which did not yield any other form. The state of preservation is not very good and most specimens are imperfect and more or less disfigured by pressure.

It is questionable whether all these specimens belong to one species. It can hardly be doubted that the specimens figs. 1 and 2 are conspecific with the holotype fig. 3 in spite of the latter having a very faint anterior border of which there are no traces in the two former. In figs. 5 and 6 the border is distinct, however. Forms of the latter type were placed by Kobayashi (1938) in the subgenus *Parairvingella*, which Resser (1942) raised to the rank of independent genus. It was stated to differ from *Irvingella* in having the »brim concave, with rim and preglabellar area» and slightly shorter palpebral lobes. The line of separation seems to be fairly arbitrary, however. Thus, one of Resser's *Irvingella* forms, *I. media*, which displays particularly close resemblance to the holotype of *suecica* except that it is of higher convexity, appears to have the border even slightly better defined than the latter and inconsiderably longer palpebral lobes than have some forms included in *Parairvingella*.

To the present writer it does not seem very likely that the Swedish forms under consideration should be generically distinct. Fig. 3 links figs. 1 and 2 together with 5 and 6. Except the dissimilarities as regards the border there cannot be pointed out any differences that can be proved not to be of adventitious nature. Thus, with our present imperfect knowledge of these forms it seems advisable to consider them congeneric, and the writer is not even convinced that they are specifically distinct. Additional and more complete material is required to answer this question definitively. Provisionally the form with a defined border is considered a subspecies of *suecica*.

Probably the associated pygidium belongs to either the species or subspecies. According to Resser the pygidium of *Irvingella* is like that of *Chariocephalus*, but he does not illustrate any pygidium of the former, and the pygidium of *Parairvingella* seems to be unknown. The pygidium in our fig. 4 differs from *Chariocephalus* in its triangular instead of ovate outline, narrower and less distinctly segmented axis, and in having a pair of small marginal spines.

No trilobite of this type has hitherto been known from Scandinavia. It belongs to a group which is widely distributed in the Upper Cambrian of North America and is also recorded from England,¹ Novaya Zemlya, and from the Middle and Upper Cambrian of Eastern and Central Asia.

Horizon and Locality. — The zone is not known for certain. The species was collected from a folded shale series whose fossiliferous limestone lenses nevertheless occur in about normal order. It was found about 2 m below the top of the shale which was covered by a thick bed of gray *Orthoceras* (and *Ceratopyge*?) limestone, and as a lens immediately below this bed yielded *Ctenopyge angusta* (personal communication by Dr. Thorslund) and another lens next in order below the former contained *Eurycare* of *latum*-type, the species may belong either to the upper portion of the *Leptoplastus-Eurycare* zone or to the basal layer of the *Peltura-Ctenopyge* zone. — KARBÄCKEN, 13 km NNW of Tåsjö church, Ångermanland.

Irvingella suecica marginata subsp.n. — Pl. 3, figs. 5, 6.

D i a g n o s i s. — Distinct from *suecica* by having a pronounced border and a faint marginal furrow.

Associated with *I. suecica*, q. v.

In addition to the forms treated above the most complete specimens so far collected of *Peltura minor* (BRÖGGER) and *Ctenopyge pecten* (SALTER) are illustrated on pl. 2, fig. 12, and pl. 3, fig. 12. Unfortunately, the latter is poorly preserved in shale.

In the discussion of *Ctenopyge laticornis* WESTERGÅRD, 1944a, the writer omitted to mention that this form should be compared with *Sphaerophthalmus fletcheri* MATTHEW, 1903, a member of the *Peltura* fauna from Cape Breton, Nova Scotia. The free cheek is of the same characteristic shape in both, only the aperture of the eye seems to be situated slightly farther forward in the Swedish than in the Canadian form. The cranidium and pygidium with which Matthew combined the free cheek are very like those of *S. alatus*.

¹ According to C. J. Stubblefield. Summary of Progress of the Geological Survey of Great Britain . . . for the Year 1931, Pt. 1, p. 65.

Stratigraphy.



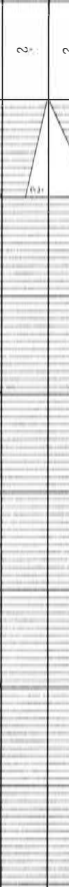



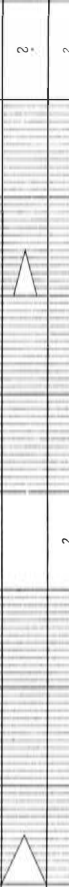



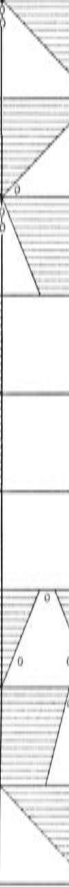



A diagram of the Upper Cambrian sequence in various areas in Sweden according to our present knowledge is seen on pp. 20—21.

Only in Scania does the series seem to be completely developed; there it is also much thicker — maximum about 56 m — than in any other area. It should be noted, however, that several of the zones and subzones are very sharply delimited, implying remarkably abrupt changes of the fauna, which may indicate the existence of concealed breaks. At any rate neither stratigraphic nor lithologic data indicating the presence of any gaps have been observed, and thus we may presume that the sedimentation in Scania has proceeded continuously during the whole of the Upper Cambrian epoch. On the other hand, in all Swedish areas outside Scania there are minor or greater breaks, often manifested by interstratified calcareous and phosphoritic conglomerates or by the rocks lacking stratification and the fossil fragments — usually belonging to forms from different subzones or zones — being quite irregularly orientated, but often the breaks do not appear lithologically and reveal themselves only as faunal gaps. It is possible, however, that in some cases the sequence is more complete than seen from the diagram since safely determinable fossils in the shale are rare in Middle Sweden and always lacking in Northern Sweden.

Thanks to numerous recent borings we have now complete profiles through the Upper Cambrian in all Cambro-Silurian areas in Southern and Central Sweden except Hunneberg in Västergötland and a few small outliers in Småland, Östergötland, and Västergötland, the deposits of which are inaccessible and indicated only by boulders and cobbles of disintegration at the locality. At Hunneberg the upper portion of the *Agnostus pisiiformis* zone and the lower and middle portions of the *Olenus* zone are concealed. Our knowledge of the Upper Cambrian in Northern Sweden, particularly Lapland and Ångermanland, is still very imperfect owing to exposures of the series being rare and poor in this extensive area. Under Gothland and in the Northern Baltic area (the Southern part of the Gulf of Bothnia inclusive of the Bay of Gävle) the Upper Cambrian is lacking.

The writer has selected *Polyphyma angelini* (BARRANDE, 1872) as one of the index fossils of the uppermost subzone of the *Olenus* zone, since this form has a wider geographical distribution than the associated species of *Olenus*, *scanicus*

being found but in Scania and *rotundatus* on Southern Öland and at Hunneberg. The name *Beyrichia angelini* was given by Barrande to a form illustrated on Angelin's »Plate A», one of the plates with crustaceans which were printed for a contemplated fasciculus III of *Palaeontologia Scandinavica* but were never published. Angelin's original has been sought in vain in the collections of the Paleozool. Dept. of the Swedish Museum of Natural History and is probably lost. Our knowledge of the form is thus confined to Barrande's information (based on a personal communication by Angelin) that it was found in Regio Olenorum at Andrarum. However, in Scania and other Swedish areas different forms of *Polyphyma* and allied genera of Conchostraca occur mainly at two levels of the Upper Cambrian: at the base of, and immediately below, the *Olenus* zone and at the top of the same zone, and as Angelin's figure is far from good, it is not possible to decide for certain which of these forms was depicted. Thus, the form from the *Olenus* zone at Tomta, Närke, described and illustrated by Linnarsson (1875) as *Beyrichia angelini* has been regarded as the type to be valid until Angelin's specimen may be found. A new figure of Linnarsson's specimen is seen on pl. 1, fig. 15, of this paper. It agrees with the form associated with *Olenus scanicus* at Andrarum.

4.	<i>Leptoplastus</i> and <i>Eurycare</i>	e. <i>Leptoplastus stenotus</i>		2.
		d. <i>Eurycare angustatum</i>		2.
		c. <i>Lept. ovatus, Eur. latum</i>		2.
		b. <i>Leptoplastus raphidophorus</i>		2.
		a. <i>Leptoplastus paucisegmentatus</i>		2.
5	<i>Parabolina</i> <i>spinulosa</i> and <i>Orusia</i> <i>lenticularis</i>	b. <i>Parabolina spinulosa</i>		2.
		a. <i>Protapeltura aciculata,</i> <i>Parabolina brevispina</i>		
		f. <i>Polyptyma angelini, Olscanicus</i>		2.
2.	<i>Olenus</i>	e. <i>Olenus dentatus</i>		2.
		d. <i>Olenus attenuatus</i>		2.
		c. <i>Olenus wahlenbergi</i>		2.
		b. <i>Olenus truncatus</i>		2.
		a. <i>Ol. transversus, Ol. gibbosus</i>		2.
1.	<i>Agnostus pisiformis</i>			

Range and geographical distribution of the Upper

	Zones														
	1	2					3		4						
		a	b	c	d	e	f	a	b	a	b	c	d	e	
<i>Agnostus</i> (<i>Agn.</i>) <i>pisiformis</i> (LIN.)	+
» » » <i>spiniger</i> (DALM.)	+
» (<i>Homagn.</i>) <i>obesus</i> (BELT)	+	+	+	+	+
» » » <i>laevis</i> subsp.n.	+
» » » <i>rudis</i> (SALT.)?
» » » <i>holmi</i> WGÅRD
<i>Pseudagnostus cyclopyge</i> (TULLB.)	+
» <i>leptoplastorum</i> WGÅRD	+
<i>Glyptagnostus reticulatus</i> (ANG.)	+	+
» » <i>nodulosus</i> subsp.n.	+	+
<i>Lotagnostus trisectus</i> (SALT.)
» <i>subtrisectus</i> WGÅRD
<i>Ciceragnostus</i> ? <i>falanensis</i> sp.n.	+
Undet. agnostid No. 1 (Westergård, 1944a, pl. 1, fig. 3)	+
Undet. agnostid No. 2 (Westergård, 1922, pl. 1, fig. 18)
<i>Schmalenseeia amphionura</i> MOB.	+
<i>Proceratopyge similis</i> sp.n.	?
» <i>nathorsti</i> WGÅRD	+	?
» <i>tullbergi</i> WGÅRD	+	.	+
<i>Acrocephalites stenometopus</i> (ANG.)	+	+
» ? <i>rarus</i> WGÅRD ¹	+
<i>Conocephalina olenorum</i> WGÅRD	+
» <i>Liostracus</i> » <i>pusillus</i> WGÅRD	+
<i>Drepanura eremita</i> sp.n.	+
<i>Olenus gibbosus</i> (WAHL.)	+
» <i>transversus</i> (LINRS.) WGÅRD	+
» <i>truncatus</i> (BRÜNN.)	+
» <i>wahlenbergi</i> WGÅRD	+
» <i>attenuatus</i> (BOECK)	+
» <i>dentatus</i> WGÅRD	+
» <i>rotundatus</i> WGÅRD	+
» <i>scanicus</i> WGÅRD	+
<i>Beltella solitaria</i> WGÅRD	+
<i>Parabolina brevispina</i> WGÅRD	+

¹ Probably from Lugnås, Västergötland.

Cambrian trilobites so far known from Sweden.

[illegible]

[illegible]

[illegible]

[illegible]

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in addition to those cited in the present writer's memoir of 1922.

Abbreviations: S. G. U. = Sveriges Geologiska Undersökning.

G. F. F. = Geologiska Föreningens i Stockholm Förhandlingar.

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Explanations of Plates.

If nothing is mentioned as regards the rock, the specimen is preserved in limestone.

If no other statement is made, the specimen belongs to the Geological Survey of Sweden.

RM. = Paleozoological Department of the Swedish Museum of Natural History, Stockholm.

Plate 1.

Glyptagnostus reticulatus (ANGELIN).

Figs. 1—4. Two cephalon and two pygidia of Angelin's syntypes. Fig. 2 is the lectotype. Andrarum, Scania. — RM. No. Ar. 9793—9796.

Figs. 5a, b. Cephalon. Ullavi, parish of Sköllersta, Närke.

Figs. 6a, b. Pygidium. Tängsätter (boring), parish of Asker, Närke.
Figs. 1—6 zone of *Olenus*.

Glyptagnostus reticulatus nodulosus subsp.n.

Figs. 7, 8. Cephalon — holotype — and pygidium. Subzone of *Olenus wahlenbergi*. Andrarum (Westergård, 1922, profile 1, level 2 m), Scania.

Fig. 9. Pygidium. One of Angelin's syntypes of *G. reticulatus*. Andrarum, Scania. — RM. No. Ar. 9797.

Agnostus (*Homagnostus*) *obesus* (BELT).

Figs. 10, 11. Cephalon and pygidium. Subzone of *Olenus wahlenbergi*. Andrarum, Scania.

Agnostus (*Homagnostus*) *obesus laevis* subsp.n.

Fig. 12. Cephalon wanting the test, in shale; the posterior glabellar lobe is damaged. Subzone of *Protopeltura aciculata*. Andrarum, Scania.

Agnostus (*Homagnostus*) *rudis* SALTER(?).

Figs. 13a, b. Pygidium. Subzone of *Peltura acutidens*. Sätra, eastern slope of Kinnekulle, Västergötland.

Ciceragnostus? *faianensis* sp.n.

Fig. 14. Pygidium, Zone of *Agnostus pisiformis*. Djupadalen, 6 km E of Falköping, Västergötland.

Polyphyma angelini (BARRANDE).

Fig. 15. New figure of the specimen illustrated by Linnarsson in 1875. Zone of *Olenus*. Tomta, 3 km SW of Hallsberg junction, Närke.

Figs. 1—13 photographed by C. Larsson.

Figs. 14, 15 photographed and retouched by J. W. Englund.

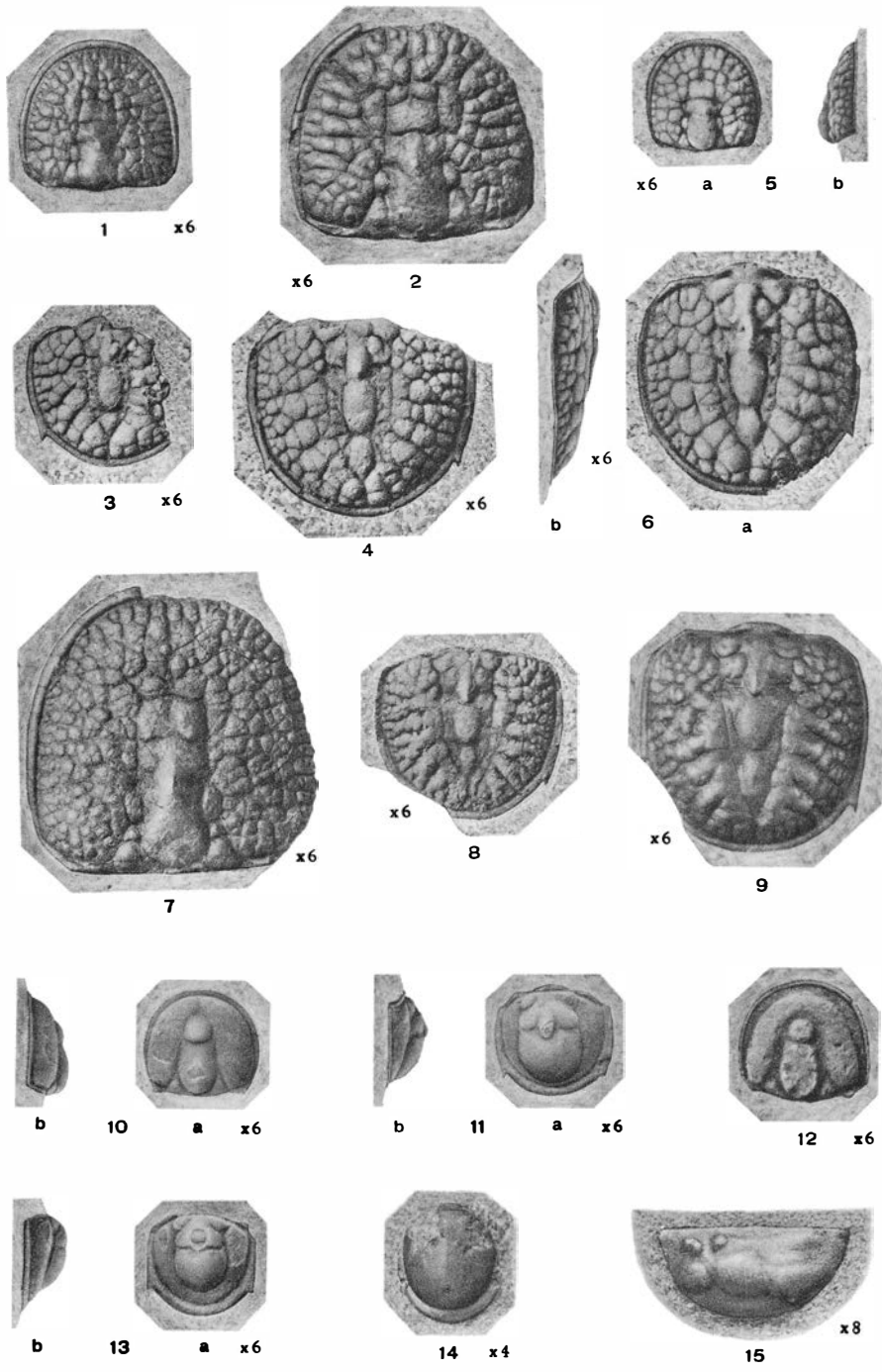


Plate 2.*Proceratopyge similis* sp.n.

- Fig. 1. Carapace wanting the free cheeks, in shale; test absent. Zone of *Agnostus pisiformis*(?). (Andrarum?), Scania. — RM. No. Ar. 1942.

Proceratopyge nathorsti WESTERGÅRD.

- Figs. 2, 3. Carapace wanting the free cheeks, and an associated detached free cheek, in shale; test preserved. Zone of *Agnostus pisiformis*. Andrarum, Scania. — RM. No. Ar. 1945a.

- Figs. 4—7. Cephalon, free cheek, pygidium, and a small pygidium with two attached thoracic segments. Zone of *Agnostus pisiformis*. Locality unknown. — RM. No. Ar. 9799.

Proceratopyge tullbergi WESTERGÅRD.

- Figs. 8—10. Cephalon, free cheek, and pygidium, in shale. Associated with *Agnostus* (*Homagnostus*) *obesus*. (Andrarum?), Scania. — RM. No. Ar. 1941a, b.

Proceratopyge magnicauda sp.n.

- Fig. 11. Carapace wanting the free cheeks (with a detached free cheek probably of this specimen). Holotype. Zone of *Lejopyge laevigata*. Andrarum, Scania. — RM. No. Ar. 9798.

Peltura minor (BRÖGGER).

- Fig. 12. Carapace wanting the free cheeks; the most complete specimen of this form so far found. Subzone of *Peltura acutidens*, upper part. Råbäck, north-western slope of Kinnekulle, Västergötland.

Figs. 1—12 photographed and retouched by J. W. Englund.

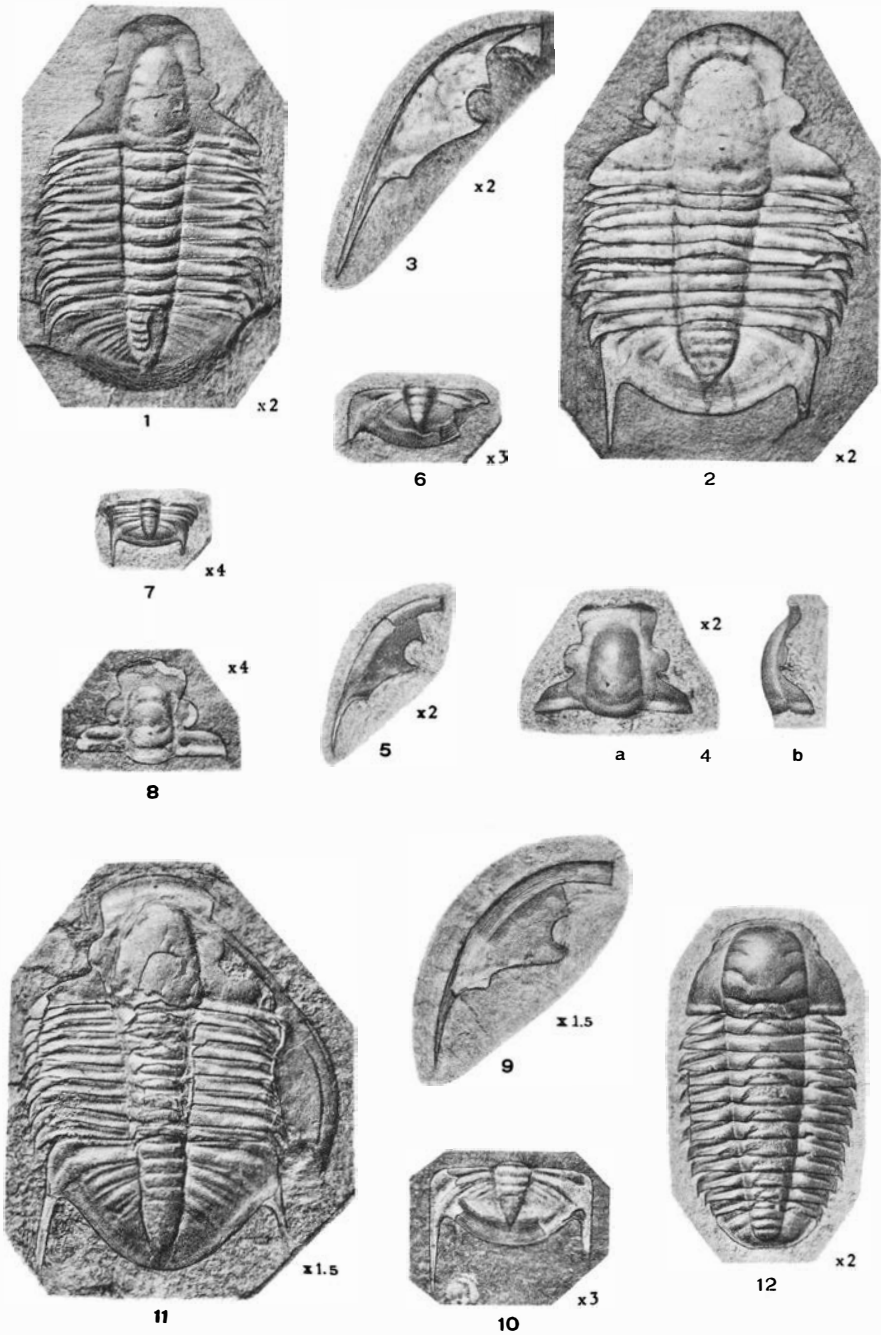


Plate 3.

Irvingella suecica sp.n.

- Figs. 1, 2. Two cranidia of different sizes without any trace of an anterior border.
 Fig. 3. Cranidium with the border very faintly indicated; holotype.
 Fig. 4. Associated pygidium, tentatively included in this species.
 Figs. 1—4 from a layer between the subzones of *Leptoplastus ovatus* and *Ctenopyge angusta*. Karbäcken, 13 km NNW of Tåsjö church, Ångermanland.

Irvingella suecica marginata subsp.n.

- Figs. 5, 6. Two cranidia, the smaller with a faint border and the larger with a well defined border. Associated with the preceding specimens. Fig. 6 is the holotype.

Parabolinella leptoplastorum sp.n.

- Fig. 7. Cranidium. Subzone of *Leptoplastus ovatus*. Röstånga, Scania. — Geol.-Min. Instit., Lund.

Parabolina lapponica sp.n.

- Fig. 8. Cranidium. Subzone of *Peltura scarabaeoides*. Boulder at Storberget, on the north-eastern shore of Lake Vojmsjön, Southern Lapland. — RM. No. Ar. 106.

Drepanura eremita sp.n.

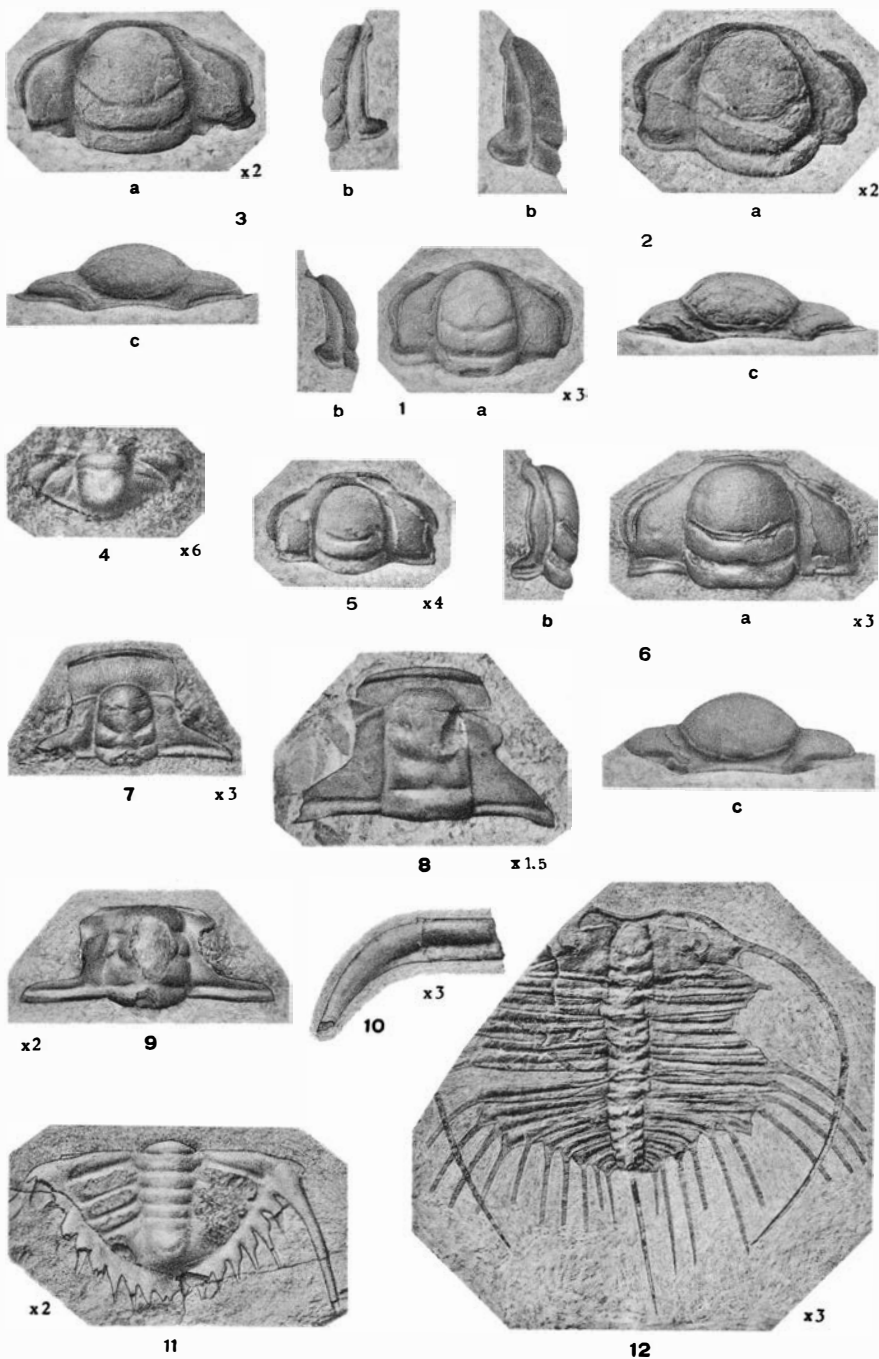
- Figs. 9, 10. Cranidium and an associated pleuron of a thoracic segment. Zone of *Agnostus pisiformis*. Locality unknown. — RM. No. Ar. 9799.
 Fig. 11. Pygidium, holotype. Zone of *Agnostus pisiformis*. Djupadalen, 6 km E of Falköping, Västergötland.

Ctenopyge pecten (SALTER).

- Fig. 12. The most complete specimen of this species so far found in Sweden; not very well preserved in shale. Subzone of *Peltura scarabaeoides*. Gislövshammar (boring: Westergård, 1944a, level 52.2 m), Scania.

Figs. 1—3, 5, 6c, 10, 12 photographed by C. Larsson.

Figs. 4, 6a, b, 7—9, 11 photographed and retouched by J. W. England.



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