A b s t r a c t: The present paper deals with brachiopods occurring in the Dalmanitina Beds (Uppermost Ordovician) of Västergötland, south-central Sweden. The Dalmanitina Beds consist of a relatively thin sequence (0.9 to 4.7 m) of light-coloured siltstone and calcarenite. The fauna consists mainly of brachiopods but there are also trilobites, bryozoans etc.

Brachiopod affinities are mainly with the Hirnantia fauna of Bohemia, Britain, Poland and north Sweden (Jämtland) with at least 9, 6, 5 and 5 species respectively shared. The following species are figured for the first time: Orbulicoidae concentrica (Wahlberg, 1821), Giraldiella bella n. sp., Dalmanella pectinoides n. sp., Horderleyella fragilis n. sp., Drabovia westrogothica n. sp., Aphanomena schmalenseei n. gen. et n. sp., Titanomena grandis n. gen. et n. sp. and Coolinia dalmani n. sp. A new genus, Kinnella, is erected to embrace Hirnantia? kielanae Temple, 1965. A new subfamily, Plectothyrellinae, is erected to embrace rhynchoellaceid genus Plectothyrella Temple, 1965, as type genus.

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Fam. Meekellidae Stehli, 1954,
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Superfam. Rhyonellellaceae Gray, 1848
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Gen. Plectothyrella Temple, 1965,
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Introduction

For some time I have been studying the stratigraphy and the brachiopod fauna of the Dalmanitina Beds (Uppermost Ashgillian) in Sweden in order to increase the knowledge of the brachiopods in those beds. The field work in Västergötland was initiated in 1961 on a small scale and was essentially finished in 1964. Previous to this field work very little was known about the brachiopod fauna of the Dalmanitina Beds in Västergötland. Some of the brachiopods were, often erroneously, referred to certain species, but a great part of the fauna was unknown. The present paper has been much delayed since the manuscript was originally finished in 1965. The main reason for this is that the Ashgillian Hirnantia fauna, which was virtually unknown until 1965, has been studied recently by Temple 1965 in Poland and Britain and by Marek & Havlíček 1967 in Bohemia. When the first manuscript of this paper was finished approximately 15 species of those treated were not named before (some of them do not have a species name in this paper either) and 5 of the rest were only imperfectly known. The above works have caused some changes in this proportion.

Stratigraphy and localities

The stratigraphy of the uppermost Ordovician of Västergötland will be dealt with in a forthcoming paper. As is evident from text-fig. 1 the Dalmanitina Beds in the area investigated include strata above the Nittsjö Formation or the Ulunda Mudstone (cf. Jaanusson, 1963) and below the basal Silurian "Leonaspis Shale". Typically the unit can be divided into three lithologic divisions or members (cf. text-fig. 2). Basically, there is a calcareous siltstone (0-3.4 m thick), which is ridly fossiliferous in some places. Generally only moulds of the fossils are preserved. The middle division (0.1-1.6 m thick) consists of arenitic (or seldom lutitic) limestone with corals and a poor shelly fauna. As a whole the top division (0.1-2.3 m thick) is similar to the basal one but it contains fewer fossils. For convenience these divisions are referred to below as the lower, middle and upper divisions of the Dalmanitina Beds.

The type locality of the Dalmanitina Beds is Allebergånde. The stratigraphy of the Dalmanitina Beds at Allebergånde is shown in fig. 2.

Most of the localities of the Dalmanitina Beds studied by me have been known for a long time. In spite of this very little has been published about these localities. Westergård (1928: 49-50; 54-57) gave detailed accounts of the localities Toran, Ulunda grotta, Ulunda and Dålderna, all on Mt Billingen. Further, Troedsson (1921: 6-10) described the localities Allebergånde on Mt Alleberg, Bestorp on Mt Mössenberg, Stommen on Mt Varvsberget, and Skogastorp on Mt Plantaberget. Henningmoen (1848: 380) and Waern (1948: 435-437) examined the Dalmanitina Beds in the Kulltorp core, the site of which is on Mt Kinnekulle.

The known surface localities and sites from which cores have been taken, are recorded below and in fig. 3, wherein the numbers 1 to 30 (barren localities omitted) correspond to the numbers in the list of localities. Pertinent references to the literature, if any, will be given for each locality. For practical reasons and according to custom the whole district is subdivided into three areas: (a) the Falbygden area, comprising Mts. Mössenberg, Alleberg, Gisseberg, Gerumsberget,
### ALLEBERGSÄNDE SECTION

<table>
<thead>
<tr>
<th>SERIES</th>
<th>FORMATIONS ETC.</th>
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<th>COLUMNAR SECTION</th>
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<td></td>
<td></td>
<td>2.</td>
<td>LOWER DIVISION</td>
</tr>
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<td></td>
<td></td>
<td>3.</td>
<td>UPPER DIVISION</td>
</tr>
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<td></td>
<td></td>
<td>4.</td>
<td>M. D. V.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5.</td>
<td>CONTINUED</td>
</tr>
</tbody>
</table>

**Text-fig. 2:** The type section of the Dalmanitina Beds at Allebergsände (locality no 5). 1. speckled mudstone; 2. light grey shale; 3. light-coloured siltstone; 4. grey calcarenite with crossbedding (lower contact abrupt with smooth surface, upper surface with indication of slight erosion); 5. grey calcilutite; 6. discontinuity surface.

**Varvsberget, and Plantaberget; (b) the Billing area, comprising Mts. Borgundaberget, Billing, Myggberget, and Brunnhemsberget; and (c) the Kinnekulle area, comprising Mt Kinnekulle.** If possible the position in the grid net of the topographical map of Sweden (Topografisk karta över Sverige) on 1:50,000 is given. The Dalmanitina Beds localities occur on the following map sheets: 7D Ulricehamn NV and NO; 8D Skara SV, SO, NV and NO; 9D Mariestad SV, of which only the Skara SO, NV and NO and Mariestad SV have yet been published.

(a) Falbygden area

**Mt Mösséberg (map sheet Skara SV):**
1. Vrågården (VE 103511);
2. Bestorp, two ravines (LINNARSSON, 1869: 52–53; MUNTHE, 1906a: 32; TROEDSSON, 1921: 8–9) (VE 130491 and VE 132492);
3. A locality near Jåttend could not be found by the writer (LINNARSSON, 1869: 53–54; MUNTHE, 1906a: 32) (VE 1335257).

**Mt Alleberg (Ulricehamn NV):**
4. Allebergsände, more exactly the northernmost slope, where the present exposure date from a rock slide in 1928 (ZENZEN 1929: 105–115; HENNINGSMOEN’S section in THORSLUND & JAAANUS-SON, 1960: 13), and three small hills to the south-east of the latter locality (LINNARSSON, 1869: 51–52; MUNTHE, 1906b: 46, 64; TROEDSSON, 1921: 6–8; TROEDSSON, 1923: 425) (VE 178457–181455).
4. Dimmingedalen, boulders on a small hill (VE 286498).
5. An unconspicuous exposure close to the road west of Varv (LINNARSSON, 1869: 50) (VE 294510);
After much confusion regarding these names, whom, however, have only listed genera or species reported for Gotland has been dealt with by several writers, many of whom mentioned five species: Patellites polycentris, A. pleatella, A. rhomboidalis, A. peeten, and Anomites polonicus (or related species), Leptaena rugosa, Leptaenopoma trifidum, Eostropheodonta hirnantesis, and Plectothyrella crassicosta. Moreover, there are on many localities several enteletaceans and thin-shelled, flat and in some instances large strophomenaceans and davidsoniaceans. Artrypaeans and plectambonitaceans are generally absent or few in number. Among fossils others than brachiopods, Dalmanitina mucronata and Bronniartella platynota are especially distinctive.

The Dalmanitina Beds are especially wide-spread and diagnostic: Dalmanella testudinaria, Hirnantesis saigitifera, Kinnella kielanae, Cliftonia psittacina (or related species), Leptaena rugosa, Leptaenopoma trifidum, Eostropheodonta hirnantesis, and Plectothyrella crassicosta. Moreover, there are on many localities several enteletaceans and thin-shelled, flat and in some instances large strophomenaceans and davidsoniaceans. Artrypaeans and plectambonitaceans are generally absent or few in number. Among fossils others than brachiopods, Dalmanitina mucronata and Bronniartella platynota are especially distinctive.

The Hirnantia Fauna

In the last few years it has become evident that the brachiopod faunas in the uppermost Ordovician strata were fairly widely distributed. The fauna presented in this paper is of the general type called Hirnantia Fauna (cf. Temple, 1965: 417). This fauna seems to be restricted to a muddy-silty environment. According to this investigation and to published faunal lists the following brachiopods are especially widespread and diagnostic: Dalmanella testudinaria, Hirnantesis saigitifera, Kinnella kielanae, Cliftonia psittacina (or related species), Leptaena rugosa, Leptaenopoma trifidum, Eostropheodonta hirnantesis, and Plectothyrella crassicosta. Moreover, there are on many localities several enteletaceans and thin-shelled, flat and in some instances large strophomenaceans and davidsoniaceans. Artrypaeans and plectambonitaceans are generally absent or few in number. Among fossils others than brachiopods, Dalmanitina mucronata and Bronniartella platynota are especially distinctive.

The Hirnantesis Fauna has been found in Britain (N. Wales and the Lake District) and Poland (Temple, 1965), southern Estonia and western Latvia (Männil, 1966), Bohemia (Havlíček & Vaněk, 1966; Marek & Havlíček, 1967), Sweden (Västergötland, Dalarna and Jämtland, this paper), and possibly in Burma (Reed, 1915; Temple, 1965) and South Africa (Cocks, 1967, personal communication). A brief survey of the non-endemic brachiopod elements of the Hirnantesis fauna is given below.

Lake District, England: According to Temple (1965) the following brachiopod species occur at Hol Beck (percentage frequency of articulate brachiopods according to Temple; the species are arranged in order of decreasing number): Kinnella kielanae (32.0%, 99 specimens), Hirnantesis saigitifera (29.5%, 76 specimens), Eostropheodonta platystrophioide (P. crassicosta) (15.5%, Dalmanella testudinaria (10.7%), Eostropheodonta hirnantesis (8.1%), Bracteolepata polonica (4.2%), and Phileuda stawheinys (one brachial valve). N. Wales: According to Temple (1965) the faunal composition at Aber Hirnant is as follows: Bacrocystina cf. bouceki (34.2% of the articulate brachiopods; 81 specimens), Eostropheodonta hirnantesis (33.3%), Hirnantesis saigitifera (23.6%), Plectothyrella platystrophioide (P. crassicosta) (4.6%), Kinnella kielanae (3.0%), and Dalmanella testudinaria (1.3%).

Girvan District, Scotland: Lamont (1935) reported Hirnantesis saigitifera from the High Mains Sandstone of the Drummuick Group, the fauna of which is mainly composed of elements not belonging in the Hirnantesis fauna.

Góry Świętokrzyskie, Poland: At Stawy the brachiopod fauna consists of the following elements in order of decreasing number (Temple, 1965): Kinnella kielanae (58.4% of the articulate brachiopods; 676 specimens), Dalmanella testudinaria (17.3%), Phileuda stawhenyys (91 brachial valves), Hirnantesis saigitifera (13.6%), Bracteolepata polonica (4.7%), Eostropheodonta hirnantesis (3.8%), Bacrocystina cf. bouceki (1.6%), and Plectothyrella platystrophioide (P. crassicosta) (0.7%).

According to Marek & Hašek (1967) the following species occur in the Kosov Formation (arranged in approximate order of decreasing numbers): Kinnella kielanae (several hundreds of specimens), Dalmanella testudinaria (several hundreds of specimens), Eostrophoedonta birtannensis (common), Leptaena rugosa, Leptaenopoma trifidum, Hirnantia sagittifera, Cliftonia oxopleioides (C. psitacina?), Plectothyrella platystrophioides (= P. crassicosta), Drabobrithis caelebs, and Bracoeleptaea polonica. Moreover, there are several species that may be endemic.

Västergötland, south-central Sweden: According to this investigation the non-endemic elements of the fauna are Plectothyrella crassicosta (10.7% of the articulate brachiopods; 138 specimens), Eostrophoedonta birtannensis (9.8%), Kinnella kielanae (8.5%), Hirnantia sagittifera (8.1%), Meristina? terebratulina (7.0%), Cliftonia psitacina (6.7%), Dalmanella testudinaria (3.5%), Leptaena rugosa (3.2%), Drabobrithis caelebs (2.6%), Orbiculoidea concentrica (29 specimens), and Leptaenopoma trifidum (2.1%). The most common species, Coolinia dalmani (25.2%), is known only from Västergötland. This is also the case with a few species of Enteletacea and Strophomenacea.

Östergötland, south-central Sweden: In the rich fauna from Borenshult, represented in Dalman's collection, there are a few representatives of the Hirnantia fauna, viz. Dalmanella testudinaria, Leptaena rugosa, Leptaenopoma trifidum, and Meristina? terebratulina. Dalarna, central Sweden: The fauna from Borenshult, represented in Dalman's collection in the Swedish Museum of Natural History, Stockholm, and in a small concretion, Stengärde has yielded a few specimens of Dalmanita mucronata, Brongniartella platynota, and in a small concretion, Tretaspis sp. and a Climacograptus species reminiscent of C. indivisus (but definitely broader than this species). In spite of the presence of Tretaspis sp. it seems probable that the Stengärde strata represent the Dalmanita Beds rather than the Stauropephalus Shale.

From the Upper Ordovician part of the Kyrkås Quartzite at Rännäsen Thorslund has collected a few specimens of Leptaenopoma trifidum together with Dalmanita mucronata and Brongniartella platynota (cf. THORSLUND & JANUSSON, 1960: 49).

No other Shan States, Burma: According to Temple (1965: 417) the "Llandovery" fauna described by Reed (1915) is a Hirnantia fauna. The fauna is still inadequately known. According to Temple Dalmanella testudinaria (D. mansuyi Reed?), Bancroftia cf. bowecki (D. mansuyi, partim?), Kinnella kielanae (Scenidium? medlicotti Reed?), and Bracoeleptaea polonica (Strophodonta macmahoni Reed?) may be represented in the Burmese fauna.

**Material and methods**

**Material:** By far the major part of the material studied comes from Västergötland. In the descriptions, Västergötland localities are generally recorded under "Occurrence" without any remarks as to the stratigraphic horizon; invariably, however, this is the Dalmanita Bed. For one species originally described from Dalarna material from that area has been included.

Most of the available specimens belong to old collections. The most noteworthy of these are G. Wahlenberg's collection, housed in the Palaeontological Institute of the University of Uppsala; J. W. Dalman's collection in the Swedish Museum of Natural History, Stockholm; and S. L. Törnquist's and G. Troedsson's collections in the Palaeontological Institute of the University of Lund.

<table>
<thead>
<tr>
<th>Brachiopod species</th>
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<tr>
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<tr>
<td>Palaeoglossa? sp.</td>
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</tr>
<tr>
<td>Paracancrinos sp.</td>
<td>15 16</td>
</tr>
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<td>Phihedra sp.</td>
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<td>Dalmanella testudinaria</td>
<td>17 3 3</td>
</tr>
<tr>
<td>Dalmanella pectinoides</td>
<td>6 23</td>
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<td>Horderietella fragilis</td>
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<tr>
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<td>1 12 7 1 4</td>
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<td>Hirnantia sagittifera</td>
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<td>Leaneleia cf. scissa</td>
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<td>Aphanomena schmalsensei</td>
<td>4 22 1 1</td>
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<td>Kjellerfjöta sp.</td>
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<td>Leptaenopoma trifidum</td>
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<td>Eostrophoedonta birtannensis</td>
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<td>Coolinia dalmani</td>
<td>2 7 28 6 37 8 15</td>
</tr>
<tr>
<td>Plectothyrella crassicosta</td>
<td>7 3 26 1</td>
</tr>
</tbody>
</table>

Text-fig. 4: Distribution of brachiopods in the Dalmanita Beds in Västergötland. The locality numbers are those used in the text. The figures refer to the number of specimens counted. The letter "R" indicates that the species has been reported in the literature but has not been found in the present investigation.
The specimens recorded in text-fig. 4 are those that at present are at my disposal in Lund and which also are accompanied by information of exact locality. Unfortunately, many specimens are labeled only "Västergötland" or "Vg". In most such instances the locality must be regarded as unknown. Apart from the approximately 1200 specimens included in text-fig. 4 I have investigated at least another 3000 (exact number not counted). The most productive locality has been Allebergsände but the Bestorp and Stommen localities have also yielded large collections.

The material figured or otherwise particularly mentioned belongs to different institutes for which the following abbreviations are used:

- LM Museum of the Palaeontological Institute, University of Lund,
- RM Palaeozoological Department, Swedish Museum of Natural History (Naturhistoriska Riksmuseet), Stockholm,
- UM Museum of the Palaeontological Institute, University of Uppsala.

Material not dealt with: Three distinctive brachiopod species from the Dalmanitina Beds are not dealt with, viz. Meristina? terebratulina (WAHLENBERG, 1821) (? = M? crassa incipiens WILLIAMS; this species is not a Cryptothyrella), Hindella? cassidea (DALMAN, 1828), and an undescribed rhynchoellaceid species from Mt Kinnekulle. These species need serial sectioning and a comparison with pertinent material, coming from outside Västergötland. A special study on this topic will be published separately.

Methods: With few exceptions the fossil specimens are made by the Castolite Company, Manufacturing Chemists, the mould or the cast will be damaged when removed. In some of the more difficult instances the jelly-like "Castoflex", belonging to different institutes for which the following abbreviations are used:

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Methods: With few exceptions the fossil specimens are made by the Castolite Company, Manufacturing Chemists, the mould or the cast will be damaged when removed. In some of the more difficult instances the jelly-like "Castoflex", belonging to different institutes for which the following abbreviations are used:

- LM Museum of the Palaeontological Institute, University of Lund,
- RM Palaeozoological Department, Swedish Museum of Natural History (Naturhistoriska Riksmuseet), Stockholm,
- UM Museum of the Palaeontological Institute, University of Uppsala.

Material not dealt with: Three distinctive brachiopod species from the Dalmanitina Beds are not dealt with, viz. Meristina? terebratulina (WAHLENBERG, 1821) (? = M? crassa incipiens WILLIAMS; this species is not a Cryptothyrella), Hindella? cassidea (DALMAN, 1828), and an undescribed rhynchoellaceid species from Mt Kinnekulle. These species need serial sectioning and a comparison with pertinent material, coming from outside Västergötland. A special study on this topic will be published separately.

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Methods: With few exceptions the fossil specimens are made by the Castolite Company, Manufacturing Chemists, the mould or the cast will be damaged when removed. In some of the more difficult instances the jelly-like "Castoflex", belonging to different institutes for which the following abbreviations are used:

- LM Museum of the Palaeontological Institute, University of Lund,
Superfamily Lingulacea MENKE, 1828
Family Obolidae KING, 1846
Subfamily uncertain
Obolidae gen. et sp. indet.
Pl. 1 fig. 3
A few specimens on a slab of light-coloured siltstone have an
Obolus-like character. The available material is considered
too poor to merit description. The slab is in Wahlenberg's
collection in Uppsala.
Material: 9 specimens.
Occurrence: (2) Bestorp (the lithology makes it certain
that the slab was collected from the lower division).
Genus Palaeoglossa Cockerell, 1911

**Palaeoglossa**? sp.

Pl. 1 fig. 1–2

Description: This species is moderately thin-shelled with
a shell thickness of about 0.05 mm in the middle of a 15 mm
long specimen. When full-grown it is quadrangular in outline
with slightly convex, nearly parallel lateral margins. In the
interior of the brachial valve a median ridge extends for 2/3
of the shell length. The interior surface is nearly smooth. The
exterior ornamentation consists of faint, even growth lines,
about 10 in 1 mm. The umbonal parts are not well
preserved.
Material: 4 specimens.
Occurrence: (27) Korsbäcken (lower division).
Remarks: The posterior portions of the valves are not
sufficiently well preserved to make a generic designation
quite certain. However, the fine ornamentation and the
brachial valve ridge seem to be features typical of *Palaeo-
glossa*.

Family Craniopsideae Williams, 1963
Genus Paracraniops Williams, 1963

**Paracraniops** sp.

Pl. 1 fig. 4–5

Description: A species with a small oval shell and ex-
terior ornamentation consisting of concentric growth lines,
medially numbering about 5 in 1 mm some distance in front
of the umbo. Pedicle valve interior with triangular muscle field, in which
the individual muscle scars are indistinctly separated from
each other. The median septum is low and short.
Brachial valve interior with a rounded triangular and moder-
ately elevated muscle platform. The surface is rather smooth
and no notable details are discernable.
Material: 7 specimens.
Occurrence: This species is only known from (2) Bestorp.

Superfamily Discinacea GRAY, 1840
Family Discinidae Gray, 1840
Subfamily Orbiculoideinae Schuchert & LeVene, 1929
Genus Orbiculoidea D'Orbigny, 1847

**Orbiculoidea concentrica** (Wahlenberg, 1821)

Upsaliensis 8:75.

**Descriptions**

Handl.1826:45.
1921 *Discina concentrica*, — Troedsson, Lunds Univ. Årsskr.,
N. F., Avd. 2, 17, 3:6, 9, 12.

Lectotype: UM Vg 872, selected herein. The specimen is
10.5 mm long, 10.5 mm wide, and is in Wahlenberg's
collection. The specimen is labelled "Mösseberg Bestorps
latar".

Type stratum and type locality: Dalmanitina Beds,
(2) Bestorp.

Diagnosis: A species of Orbiculoidea with exterior ornamentation
consisting exclusively of concentric ridges that are
more closely spaced centrally than distally; distance 0–0.8
mm in front of apex smooth; 0.8–1.8 mm with about 6 con-
centric ridges; 2.0–3.0 mm with about 3 concentric ridges.

Description: Shell almost circular, biconical with an
ornamentation consisting of concentric ridges outside of a
central, relatively smooth, area, which is about 1.5 mm across.
The distance between two succeeding concentric ridges is
greater towards the margin of the shell. This distance was
measured in a few specimens 1 mm and 2 mm respectively
from the apex (values in mm): 0.20, 0.25, 0.15, 0.30; 0.15, 0.35; 0.23, 0.37. The convexity of the pedicle valve is
greatest around the subcentral apex; distally the valve seems
to be nearly flat. Also the brachial valve is most convex
around the subcentral apex, but on this valve the distal parts
are faintly but clearly convex too. As far as can be seen the
pedicle opening is short and fairly narrow.

Pedicle valve interior: The pedicle tube is not intact in any
specimen but it is obvious that it occupied 2/3 of the distance
between the apex and the posterior margin.

Brachial valve interior: No notable structures are visible.

Material: About 30 specimens.

Occurrence: (2) Bestorp and (5) Allebergsände (upper
division). Specimens in the Lund collections labeled "Kongs-
lena" were probably collected at Allebergsände. I have also
found representatives of this species in the uppermost Ordo-
vician part of the railway section at Stengärde in Jämtland,
northern Sweden (1965).

Remarks: Troedsson (1921: 6) discussed the identity of
Wahlenberg's *Patellites concentricus* and arrived at the con-
clusion that it is identical with the species of *Discina*
(= *Orbiculoidea*) that occurs in the *Dalmanitina* Beds on
Mt Mössberg, the strata and mountain from which Wahlen-
berg's *P. concentricus* originates. In the beds in question there
is no other species that even remotely corresponds to Wahlen-
berg's description. Moreover, there are several specimens of
*Orbiculoidea* in Wahlenberg's collection with the in-
scription "Mösseberg Bestorps latar" (lata = crevice) in Wahlen-
berg's own handwriting. Unfortunately, Wahlen-
berg's own labels are now lost, but it cannot be seriously
doubted that the *Orbiculoidea* species here described is identi-
cal with *Patellites concentricus* Wahlenberg.

Superfamily Craniacea MENKE, 1828
Family Craniidae MENKE, 1828
Genus Philhedra Koken, 1889

**Philhedra** sp.

Pl. 1 fig. 6

Description: Brachial valve very small (juvenile?), about
2.5 mm across, with subcentral umbo and radiating ribs, that
number about 43 around the shell margin.

Material: One brachial valve exterior, from Wahlen-
berg's collection.

Occurrence: (2) Bestorp.
Remarks: This specimen seems to agree closely with *Philbedra athenae* Whittard & Barker (1950: 557–558, Pl. 5, figs. 2–5), but a closer comparison is not possible because of the very poor material.

Genus *PETRORHINA* RAYMOND, 1911

*PETRORHINA* *aperta* (Huene, 1899)


Remarks: The type and only known specimen was collected in the "Brachiopod Shale" on Mt. Alleberg by Linnaeus and is reported to be missing since World War II.

Superfamily Orthacea *WOODWARD*, 1852
Family Plectorthidae Schuchert & LE VENE, 1929
Subfamily Plectorthinae Schuchert & LE VENE, 1929
Genus *Giraldiella* Williams, 1951

*Giraldiella bella* n. sp.

Pl. 2 figs. 1–4

Derivation of the name: From Latin *bellus*, beautiful.

Holotype: RM. Br. 10933. A mould of a brachial valve interior surface. The muscle scar area is broad and slightly elevated above the shell surface anteriorly. The cardinalia (the pedicle valve wide, the exterior costellation is distinctly reflected on the interior surface. The muscle scar area is broad and short (relation about 1.3:1), and the adductor scars do not extend beyond the diductor ones. The adductor scars are relatively broad and slightly elevated above the shell surface anteriorly. The brachial valve interior: The muscles scars are not distinctly set off, especially not anteriorly. The cardinal process shaft extends forward as a delicate median ridge that ends just posterior to the anterior-most extension of the socket ridge supports. The angle between the socket plates is about 90°. The distal part of the socket ridge is not preserved in any specimen.

Material: About 50 specimens.

Occurrence: (2) Bestorp, (5) Ålebergsände (lower division), (8) Ekebacken, (10) Dimmingedalen, (13) Stommen, (14) Skogastorp, (27) Korsbäcken, (28) Kulltorpsbäcken, and (29) core at Kulltorp. This species is also known from *Dalmaninita* Beds at Borenhult, Östergötland (DALMAN, 1828), and from Upper Ashgillian beds in the Lake District, Britain, and Poland (Temple, 1965). Finally, the species has been reported from the Upper Ashgillian Kosov Formation in Bohemia (Havlíček & Vaněk 1966; Marek & Havlíček 1967).

Remarks: It is superfluous to give a description of this species because it is well known from recent studies by Williams & Wright (1963) and by Temple (1965). Temple observed the small average size of the specimens of different species of the *Harrisonia* fauna (p. 421) and the thin shell structures (pp. 388, 391, 399) in the Polish material relative to British and Swedish material. The statistical data probably tell only a little about the genetic relationships between the different *D. testudinaria* populations, but they may be essential for understanding the different habitats. Comparisons may be made with recent mollusk species, some of which are known to vary within wide limits in size and shell thickness as a result of different environmental factors.

*Dalmanella testudinaria* (Dalman, 1828)

Pl. 2 fig. 5


1837 *Orthis testudinaria*,— Hisinger, Lethaea Sveccea seu Petroficateae Sveciae . . . : 71, Pl. 20, figs. 11 a–c.


1965 *Dalmanella testudinaria*,— Temple, Acta Pal. Polonica 10:383–392, Pl. 5, figs. 1–7; Pl. 6, figs. 1–7; text fig. 1a–c.

1965 *Dalmanella testudinaria*,— Wright, Treatise Inv. Paleont. H: H.333, fig. 212, 3a–e.


Material: About 20 specimens.

Occurrence: (2) Bestorp, (5) Ålebergsände (lower, middle and upper divisions) and (22) Storekullen.

Remarks: *Giraldiella protensa* (J. de C. Sowerby, 1839) and *G. protensa filicata* Williams, 1951, from Llandovery strata in Wales are easily distinguished by their multicostellate ribbing pattern. *G. giraldi* Bancroft, 1949, from Lower Llandovery strata in Wales, is distinguished by its mucronate cardinalia, its elongate muscle field in the pedicle valve (longer than wide), and by the small cardinalia (the cardinal process about 1/15 of the shell length as against 1/7 in *G. bella*). *G. subsilurica* Marek & Havlíček, 1967, from Upper Ashgillian strata in Bohemia, is different in having an ovoid muscle field in the pedicle valve and more pronounced ribs.

Superfamily Eneteletacea *WAAGEN*, 1884
Family Dalmanellidae Schuchert, 1913
Genus *Dalmanella* *HALL & CLARKE*, 1892

*Dalmanella* *pectinoides* n. sp.

Pl. 2 figs. 6–9

Derivation of the name: The trivial name is taken from Dalman's museum labels, on which the species is termed "Orthis pectinoides", apparently because of a supposed similarity to "Orthis pecten" (= Coolinia dalmani n. sp.).

Description: The shell is biconvex, with pedicle valve more convex than brachial one. Brachial valve with a shallow median sulcus. The largest specimen measured is 19 mm long and 23 mm wide. The ornamentation is multicoastellate, and in most specimens some ribs (costae) are slightly coarser than average. The ornamentation thus approaches the unequally parvicostellate condition. Ten mm in front of umbo the number of ribs averages 3.5 in one mm.

Pedicle valve interior: The exterior costellation is clearly traced at least distally. The muscle area is bilobed anteriorly and bordered laterally by the nearly parallel prolongations of the dental plates. The adductor ridge is rounded and broad or narrow. The diductor scars are long and narrow, and then extending farther forward than the adductor scars. There is no clear boundary between diductor and adjustor scars. The dental plates are not well preserved in the material available. Brachial valve interior: A median ridge extends beyond the middle of the valve. The ridge may be fairly broad and high. In some specimens a faint indication of a ridge separates the posterior and anterior adductor scars, the anterior ones of which are the largest, especially in large valves. The outline of the anterior scar is more or less rounded, whereas that of the posterior scar is more elongated. The cardinal process is triangular in lateral view, with a thin myophore ridge. The socket ridges and their supports form strong plate-like structures. The angle between the ridges is about 65° and between the bases of the socket-ridge supports about 20° (this figure is not very exact). The fulcrum plates are well developed.

Material: About 20 specimens.

Occurrence: (2) Bestorp, (5) Allebergsände, and (23) Öglunda.

Remarks: The species is most similar to "Mendacella" challinori LAMONT but differs in the uneven costellation.

Family Harknessellidae BANCROFT, 1928
Genus Horderleyella BANCROFT, 1928

Horderleyella fragilis n. sp.
Pl. 2 fig. 10–11; Pl. 3 fig. 1–4

Derivation of the name: From Latin fragilis, brittle.

Holotype: RM. Br. 10267. A mould of a brachial valve interior, 12 mm long and (extrapolated on one side) 16 mm wide.

Type stratum and type locality: Dalmanitina Beds, Mt Alleberg.

Diagnosis: A species of Horderleyella with distinctly angular antero-lateral corners of the pedicle valve muscle field; exterior ornamentation strongly fasciculate; fasciculation combined with soft plication.

Description: The shell is biconvex with the greatest convexity in the pedicle valve. The cardinal extremities are obtuse and the hinge line thus shorter than the greatest width of the valve. The greatest width/hinge length is in four valves: 16, 13; 14, 11; 14, 9; and 11,8 mm. The largest complete (pedicle) valve is 13 mm long and 16 mm wide. The pedicle valve has a median fold corresponding to a sulcus on the brachial valve. The ornamentation consists of rounded ribs, of which there are 2.4 to 2.8 in one mm 10 mm in front of the umbo. In many (but not all) there are five protegular ribs that are much stronger than the rest of the ribs.

Pedicle valve interior: The adductor-scar field is fairly broad and slightly elevated. The diductor scars are relatively narrow, and reach slightly farther forward than the adductor scars. Postero-laterally, the muscle area is bounded by the delicate dental plates, the base-lines of which diverge 50° to 55° from each other. The vascula media are observable in a few specimens. Distally each vasculum forks dichotomously. No other vascula can be discerned.

Brachial valve interior: A strong median fold is a prominent feature in the interior morphology of the brachial valve. The fold corresponds to the exterior sulcus and extends to the anterior margin of the valve where it is less distinct than posteriorly. The cardinal process is a narrow ridge-like structure with a posterior edge separating two muscle attachment areas. In one well-preserved specimen the angle between the weak socket-ridges is about 58°. The socket-ridge supports are approximately parallel. The muscle scars are generally indistinct. In the only specimen where they can be observed the posterior adductor scar is small, rounded and placed far to the side. The anterior adductor scar is triangular, 1.5 times as long and twice as broad as the posterior scar. The anterior border is nearly half-way between the apex and the anterior margin of the shell. The proximal parts of the vascula media can be discerned in one specimen.

Material: About 30 specimens.

Occurrence: (2) Bestorp, (5) Allebergsände (lower and upper divisions), (13) Stommen and probably (22) Storekullen (the identification of the single specimen from this locality is not quite positive).

Remarks: Except for the present species the genus Horderleyella does not seem to be known elsewhere except in the Middle Ordovician of England and Wales. H. fragilis is different from the British species in having a muscle field in the pedicle valve with angular antero-lateral corners. The muscle field in the British species is always more or less rounded.

Family Enteletidae WAAGEN, 1884
Subfamily Draboviinae HAVLICEK, 1950
Genus Drabovia HAVLICEK, 1950

Drabovia westrogothica n. sp.
Pl. 3 fig. 8–12

Derivation of name: Latinitized from Västergötland, a province of Sweden.


Type stratum and type locality: Dalmanitina Beds, Stommen.

Diagnosis: Shell biconvex or plano-convex and small, largest specimen measured being 13 mm long and 15 mm wide; ribs fairly coarse, 3.0–3.5 in one mm; hinge short, with length/maximum length being 0.6–0.7;1; dental plates thin and low; muscle scars with very faint delimitations.

Description: The shell is biconvex or plano-convex, the brachial valve varying from almost flat to slightly convex. The outline is rounded with the hinge-line shorter than the greatest width. The ornamentation is ramicostellate.
relatively coarse, and there are 2.0–2.3 ribs in one mm at any distance from the apex. The largest specimen is 13 mm long and 15 mm wide. The angle between the brachial interarea and the plane of commissure is apparently about 45°.

| Pedicle valve interior: | The exterior ornamentation is reflected in the interior of the valve. Traces of punctuation have not been identified on the moulds. The teeth are badly preserved in all specimens. The dental plates are long, but low and weak, and in two specimens they diverge from each other at 68° and 79°. Immediately in front of the dental plates the border of the muscle-sear area bends antero-medially, so that the adductor-adjustor field has a triangular outline. This anterior border is, however, seldom visible. The adductor scar area is elongated, has straight borders, and does not extend as far distally as the adductors in the anterior part of the valve. |
| Brachial valve interior: | The socket plate with ridge forms a high, thin, plate-like structure. The angle between the socket plates varies considerably as is indicated by figures from three valves: 52°, 23°, 31°, 22°, and 37°. The myophore area of the cardinal process is divided into two lobes by a median furrow. The anterior and posterior adductor scars are separated by a very faint, oblique ridge. The anterior scar is larger (about twice as long) than the posterior one and elongate in outline; the posterior scar is drop-shaped. A low median ridge separates left and right scar areas. |

Material: | About 20 specimens. |

Occurrence: | (2) Bestorp, (5) Allebergsände (lower and upper divisions), (8) Ekebacken, (13) Stommen, (14) Skogastorp and (23) Öglunda. |

Remarks: | Drabovia westrogothica differs from the contemporary D. agnata Marek & Havliček, 1967, especially in having more delicately shaped interior structures and relatively shorter hinge-line. |

Subfamily Schizophroriniace SCHUCHERT & LEVENE, 1929

Genus Hirnantia LAMONT, 1935

Hirnantia sagittifera (M'Coy, 1851)

Pl. 3 fig. 13; Pl. 4 fig. 1–2


1852 Orthis sagittifera, — M'Coy, Description of the British Palæozoic fossils... 227, Pl. 1 H, figs. 15–19.

1871 Orthis sagittifera, — DAVIDSON, Palæontogr. Soc. 3, 7: 260–261, Pl. 36, figs. 18–21 (non figs. 22–23).


1965 Hirnantia sagittifera, — TEMPLE, Acta Palaeont. Polon. 10: 394–401, Pl. 11, fig. 8; Pl. 12, figs. 1–10; Pl. 13, figs. 1–10; Pl. 14, figs. 1–8; text figs. 2 a–b, 3 c–d.


1967 Hirnantia sagittifera, — Havliček & VáňEK, Věstník Úst. geol. 42: 279, Pl. 2, figs. 20, 22, 23.

Pedicle valve interior: The exterior surface ornamentation is distinctly reflected in the distal parts of the interior. The muscle scars occupy a short and broad (relation about 0.75:1) area defined laterally by the slightly diverging dental plates. The adductor scars seem to be quite broad (the width of the adductor field is apparently ½ of the width of the whole muscle scar) and anteriorly they reach as far as the adductor scars. In most specimens it is impossible to identify the individual scars.

Brachial valve interior: In adult specimens (shell length at least 9 mm) the central disc is more or less smooth outside the muscle fields. In a large specimen indistinct traces of pallial markings can be distinguished laterally. In small specimens there is a narrow ridge reaching half-way to the anterior margin of the valve. The ridge passes over into the myophore without a distinct limit. The anterior adductors, which are the largest ones, are rounded in outline, whereas the posterior adductors are triangular. Width:length is 1:1 for both adductors, and the size relation is about 1.24:1. The scars are clearly distinguishable only in the largest specimens. The brachiophores diverge from each other at about 90° or slightly less. A fulcrum plate is developed.

Material: | About 35 specimens. |

Occurrence: | (1) Vrągdården (?), (2) Bestorp, (5) Allebergsände (lower and upper divisions), (6) Mt Gisseberg, (8) Ekebacken, (12) St Virvan, (13) Stommen (lower division), (18) Skultorp, (24) Toran, and (28) Kullatorpsbäcken. The species was first reported from the Upper Ashgillian Kosov Formation in Bohemia (MAREK & HAVLÍČEK, 1967). |

Subfamily Schizophroriniace SCHUCHERT & LEVENE, 1929

Genus Hirnantia LAMONT, 1935

Hirnantia sagittifera (M'Coy, 1851)

Pl. 3 fig. 13; Pl. 4 fig. 1–2


1852 Orthis sagittifera, — M'Coy, Description of the British Palæozoic fossils... 227, Pl. 1 H, figs. 15–19.

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1965 Hirnantia sagittifera, — TEMPLE, Acta Palaeont. Polon. 10: 394–401, Pl. 11, fig. 8; Pl. 12, figs. 1–10; Pl. 13, figs. 1–10; Pl. 14, figs. 1–8; text figs. 2 a–b, 3 c–d.


1967 Hirnantia sagittifera, — Havliček & VáňEK, Věstník Úst. geol. 42: 279, Pl. 2, figs. 20, 22, 23.
Description: A species with a large, biconvex shell that has obtuse cardinal angles and its greatest width (max. about 50 mm) about half-way between hinge-line and anterior margin. The ornamentation is multicoxostellate.

Pedicle valve interior: The muscle-scarn area is lanceolate, being widest near the anterior end, with markedly raised borders. The width is about twice that of the distance between the tooth apaxes, and the length about 1/2 of the shell length. The exterior rib pattern is visible everywhere outside the muscle area and no pallial markings have been observed.

Brachial valve interior: The length of the muscle-scarn area (measured from the umbo) is about 1/2.5 of the shell length. The cardinal process seems to be simple rather than bilobed. Anteriorly it tapers abruptly when running over into the narrow shaft, which is quite low and not raised into a sep­

Occurrence: This species is known from (1) Vrågården, (2) Bestorp (lower division), (3) Åsstorp, (5) Allesbergå, (lower and upper divisions), (7) Mt Gissberg, (8) Ekebacken, (10) Dimmingedalen, (13) Stomen, (14) Skagastorp, possibly (28) Kullatorpsbäcken, and (29) the Kullatorp boring. Anteriorly it tapers abruptly when running over into the narrow shaft, which is quite low and not raised into a septum. There are no fularul plates. The socket-ridge supports the tooth apexes, and the length about

Material: About 95 specimens.

Occurrence: This species is known from (1) Vrågården, (2) Bestorp (lower division), (3) Åsstorp, (5) Allesbergå, (lower and upper divisions), (7) Mt Gissberg, (8) Ekebacken, (10) Dimmingedalen, (13) Stomen, (14) Skagastorp, possibly (28) Kullatorpsbäcken, and (29) the Kullatorp boring. Anteriorly it tapers abruptly when running over into the narrow shaft, which is quite low and not raised into a septum. There are no fularul plates. The socket-ridge supports the tooth apexes, and the length about

Material: About 95 specimens.

Genus Kinnella n. gen.

Derivation of name: From Swedish Kinne which is used as component in geographical names in the Kinnekulle area.


Diagnosis: Biconvex enteletids with high, catadine pedicle valve interarea and relatively low brachial valve interarea; ornamentation multicoxostellate, possibly with some ribs slightly coarser than the others; some ribs apparently hollow (cf. Temple, 1965: 403, 405); delthyrium and notothyrium open; muscle field of pedicle valve rounded and marginally elevated, with lateral margins subparallel; width of muscle field about equal to distance between tooth apaxes; cardinal process with bilobate myophore; process anteriorly continuing into thick and elevated, septum-like shaft.


Kinnella kielanae (Temple, 1965)  
PL 4 fig. 3–6


1965 Hirnantia kielanae Temple, Acta Palaeont. Polon. 10:401–407, PL 8, figs. 1–7; PL 9, figs. 1–8; PL 10, figs. 1–8; PL 11, figs. 1–7; text figs. 2 c–f, 3 a–b.


Description: Relatively small shells, attaining a maximum width of about 12 mm. It is unequally biconvex with the pedicle valve most vaulted. The length is about 3/4 of the width. Punctae have been observed in the specimen figured by Henningmoen (1948). The length of the pedicle valve interarea is half the valve length or slightly less. The pedicle and brachial interareas are catacline and anacline respectively. The greatest width is somewhat in front of the hinge-line, and the cardinal angles are thus obtuse. The brachial valve is slightly sulcate. The margin is rounded, and may or may not bear a very slight indentation anteriorly. The surface is multicoxostellate: the ribs are of subequal size and 3 to 4 of them occur in one mm at a point 5 mm in front of the umbo.

Pedicle valve interior: The muscle-scarn area is elevated above the shell surface. The anterior border of the scar area is rounded. The separate muscle scars are long and very narrow.

Brachial valve interior: The cardinalia are of the type described in the generic diagnosis. Fularul plates are present. The anterior and posterior adductor scars are separated by a faint transverse ridge. The anterior scar has a rounded triangular outline whereas the posterior scar is more elongated. The median ridge is fairly inconspicuous in small specimens. In larger ones it is more or less rounded, very massive, and occupies only about the posterior 3/4 of the valve length.

Material: 110 specimens.

Occurrence: (1) Vrågården, (2) Bestorp (lower division), (6–7) Mt Gissberg, (8) Ekebacken, (10) Dimmingedalen, (12) St Virvan, (27) Korsbäcken, (28) Kullatorpsbäcken, and (29) the Kullatorp boring. The species occurs in Upper Ashgillian strata in Wales and Scotland (Lamont, 1935) and possibly in Llandovery beds in Wales (Williams, 1951); it may be a related species. Moreover, Temple (1965) reported it from the Lake District of North England and from the uppermost Ordovician in Poland. It has also been collected from the Ashgillian Kosov Formation in Bohemia (Marek & Havliček, 1967).

Superfamily Triplesiaceae Schuchert, 1913
Family Triplesiidae Schuchert, 1913
Genus Cliftonia Foerste, 1909

Cliftonia psittacina (Wahlenberg, 1821)  
PL 4 fig. 7–8; PL 5 fig. 1–2


1828 Atrypa reticularis, — Dalman, Kongl. Vet. Acad. Handl. 1827:43 (127) (partim); non PL 4, fig. 2.

1837 Atrypa reticularis, — Lhisinger, Lethaea Svecica :75 (partim); non PL 21, figs. 11 a–c.


1921 Atrypa reticularis, — Troedsson, Lunds Univ. Årsskr., N. F., Avd. 2, 17, 3:7, 12.

1921 Atrypa imbricata, — Troedsson, Lunds Univ. Årsskr., N. F., Avd. 2, 17, 3:7, 12.


**Lectotype**: UM D. 1175, a complete specimen. Coll. G. Wahlénberg. Height 12 mm, width 18 mm, length 14 mm.

**Type stratum and type locality**: Boda Limestone, Osmundsberget, Dalarna.

**Description of the Dalarna material**: (The description is based on the Osmundsberget population.) Shell biconvex, uniplicate and moderately large. Pedicle valve with apsacline interarea; brachial interarea rudimentary. The cardinal angles are obtuse and the maximum width is along or in front of the transverse mid-line. The surface ornamentation consists of strong concentric growth lamellae (1.0 to 1.7 in one mm) and radial ribs in a multicoxostellate pattern. The number of ribs is about 5 (4-6) in the sulcus and 6-7 (4-8) along a growth lamella on the fold at a point 10 mm in front of the apex (measured along the shell surface). The number of ribs along the same growth lamella on the lateral flank is between 6 and 16, the variation depending in part upon how near the hinge-line the ribs are discernible. The height (perpendicular to the main commissure plane), width, and length (in the main commissure plane) of Osmundsberget specimens (Br. 7444—72, 102299—302) are given below:

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Material from Dalarna is treated herein only for comparative purposes.

**Description of the Västergötland material**: Much of the Västergötland material is flattened and destroyed, hence a direct comparison with Cliftonia psittacina material from Dalarna is difficult. One of two measurable individuals (Br. 10525, from Alleberg) is 11 mm high, 20 mm wide and about 11 mm long. However, it is somewhat irregularly compressed. The other specimen (from Korsbäcken, lower division) is 12 mm high, 18 mm wide and 17 mm long. Especially the height is probably slightly diminished by exfoliation. The average number of ribs is about 5 (4 to 5) in the sulcus and about 10 on the lateral flank at a point 10 mm in front of the umbo (measured along the shell surface). The size of the specimens is generally comparable with that of the Osmundsberget population. However, some of the specimens, especially those from silty and less calcareous sediment, are considerably larger than the largest specimens from Dalarna. One of them is about 30 mm wide. At least to some degree this difference is the result of flattening of the Västergötland specimens.

Pedicle valve interior: There seems to have been a short pedicle tube (cf. WRIGHT, 1963: 744—745). The dental plates are strong and united with the shell floor by callus matter. The muscle scars are diffuse.

Brachial valve interior: The cardinal structures are delicate. Only the basal part of the cardinal process has been observed.

**Material**: 32 specimens from Osmundsberget, Dalarna, and about 80 specimens from localities in Västergötland. **Occurrence**: Dalmaniina Beds at (1) Vråkården, (2) Bestorp, (3) Alleberggården (lower and upper divisions), (6—7) Mt Gisseberg, (8) Ekebadken, (10) Dimmingedalen, (11) Varv (according to LINNARSSON, 1869: 50), (12) St Virvan, (13) Stommen (lower division), (14) Skogastorp, (27) Korsbäcken, (28) Kullatorpsbäcken (lower division), and (29) Kullatorp core (lower division: 35.40—35.68 m). Cliftonia psittacina also occurs in the Boda Limestone in Dalarna (cf. the above treatment), and in the uppermost Ordovician siltstone at Stengärde in Jämtland (collected in 1965). The same species may be represented in Wales in the lowermost Llandovery (WILLIAMS 1951; cf. the synonymy list).

Superfamily Plectambonitacea KOZLOWSKI, 1929
Family Leptelliinidae ULRICH & COOPER, 1936
Subfamily Leptaeninae HAVLÍČEK, 1961
Genus Leangella HAVLÍČEK, 1933

**Leangella cf. scissa** (DAVIDSON, 1871)

**Text-fig. 5**


cf. 1965 *Leangella scissa*, — WILLIAMS, Treatise Inv. Paleont., H376, fig. 242: 2a—c.

Material from Dalarna is treated herein only for comparative purposes.

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Pedicle valve interior: There seems to have been a short pedicle tube (cf. WRIGHT, 1963: 744—745). The dental plates are strong and united with the shell floor by callus matter. The muscle scars are diffuse.

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**Description:** The pedicle valve is strongly vaulted in the central part, whereas the cardinal angles are flattened. The exterior ornamentation consists exclusively of five distinct ribs, one of which is median. There are faint growth lines. The width is 6 mm, the length 4.5 mm, and the height about 1.2 mm.

**Material:** 1 specimen. Coll. J. Bergström, 1962.

**Occurrence:** The single Västergötland specimen was found at (22) Storekullen. In collections there occur similar specimens from the Ashgillian Boda Limestone in Dalarna.

**Remarks:** The genus seems to be related to Kjaerina-like type with flat or slightly concave brachial valve; without geniculation; ornamentation unequally parvicostellate with undulating ribs; no median thickened ribs; rugae either missing or very fine; chilidium with median sulcus; cardinal process myophore knobs not thinly blade-shaped, and with myophore groove; socket ridges with denticles; muscle scars indistinct, ventral muscle scars not bounded by subparallel ridges; pseudopunctae small.

**Species assigned to the new genus:** Aphanomena schmalenseei n. sp., Orthis luna G. Lindström, 1880, and Rafinesquina ultrix Marek & Havelicér, 1967.

**Remarks:** The genus seems to be related to Kjaerina (Kjaerina) and K. (Hedstroemina) but differs in the development of the cardinal process knobs, which are much stouter (not blade-formed) and have a myophore groove on the posterior surface. On the postero-lateral side of the socket ridge there is a series of denticles, which possibly are also developed in some (undetermined) K. (Hedstroemina) species. A smooth interior is also shared with the two subgenera mentioned. K. (Kjaerina) differs especially from Aphanomena in having long, subparallel ridges bounding the ventral muscle scar area and in having a thickened median rib. K. (Hedstroemina) is often distinguished by having rugae and geniculation. The chilidium has a median sulcus and is, in this respect, similar to the chilidium in K. (Kjaerina), K. (Hedstroemina), Leptaenopoma, Titanomena and other genera and subgenera but differs from the evenly rounded chilidium found in Maccoelia, Oepikina and Strophomena.

**Aphanomena schmalenseei** n. sp.

Pl. 5 fig. 3-6; Text-fig. 6

**Description:** A large, flat and thin-shelled Aphanomena species with a brachial valve that is slightly concave immediately anterior to the umbo. Maximal observed length and width 39 and 55 mm respectively. The greatest width is along the hinge-line. The ornamentation is unequally parvicostellate; however, in some specimens the difference between ribs of different coarseness is very small. Twenty mm in front of the umbo, 3.4 to 4.2 ribs have been counted in one mm. The variation depends partly on the variable number (1 to 7) of fine ribs between two coarser ones. A very fine concentric striation crosses the radiating ribs. The interarea is low. The chilidium is high, with a median sulcus. The delthyrium is open.

**Brachial valve interior:** The interior surface of both valves is a mirror image of the exterior surface; in large specimens it may be quite smooth. Each tooth has on its anterior surface a series of small pits (6 in one well-preserved specimen) which interlock with denticles on the socket ridge. The dental plates are fairly short. Other structures are not easily discernable. The muscle-scar area seems to have been fairly large; the length was possibly nearly half that of the entire valve, and the width was probably considerable, too.

**Material:** About 45 specimens.

**Occurrence:** (2) Bestorp, (5) Allebergsände (lower and upper divisions), (6-7) Mt Gisseberg, (8) Ekebacken, (12) St Virvan, (13) Stommen, (27) Korsbäcken, and (28) Kulatsorpsbäcken.

**Remarks:** Aphanomena luna (G. Lindström, 1880), which seems to be closely related to A. schmalenseei, is a large species with a maximal width of more than 50 mm. It is distinguished from A. schmalenseei by its ornamentation, which is more even with only slightly irregular ribs and many relatively fine ribs (4 to 8) between the distinct coarse ribs. This species seems to be confined to bioherm habitats; it is
found in the Upper Ordovician Boda Limestone in Dalarna. As in *A. schmalenseei* there is no distinct concentric striation or rugation.

Another species which seems to be related to *A. luna* was described by Williams (1951: 123–124, Pl. 8, figs. 1–4) as *Strophodonta* (*Eostropheodonta*) cf. *mullochiensis* (not *S. mullochiensis* Reed, 1917). This species is from Lower Llandovery strata in Wales. It is fairly similar to *A. luna* but is probably distinguished by having a faint and uneven rugation and a fine but distinct concentric striation.

Still another related form was described from Upper Ordovician and Lower Silurian strata by Sokolskaja (1954: 39–40, Pl. I, figs. 4–13); there may be more than one species in these figures as *Rafinesquina* (*R.* *expansa* (not *Orthis expansa* J. de C. Sowerby, 1839). It differs from *A. schmalenseei* in that it has a slight rugation along the hinge and a distinct concentric striation.

To this group of brachiopods also belongs *Rafinesquina ultrix* Marek & Haviček, 1967, from the Upper Ordovician Kosov Formation in Bohemia. In this species the concentric ornamentation is quite marked, giving the surface a reticulat- ed appearance. The myophore "shaft" is elevated, and there is no distinct concentric striation. The interior of both valves seems to be devoid of all kinds of structures except pseudopunctae. It is impossible to see any trace of cardinalia or muscle scars. The exfoliation was brought about by the splitting of the core.

**Genus Kjerulfina Bancroft, 1929**

*Kjerulfina*? sp.  
Pl. 5 fig. 7

**Description:** Small, planoconvex shells with a relatively high pedicle-valve interarea. The largest specimen measured is 6.5 mm long and 10 mm wide. The exterior ornamentation is unequally parvicostellate. It is quite delicate, and in many specimens it is impossible to discern any ribs at all. The whole surface is covered by concentric growth lines, of which there are about 20 in one mm. There is also a vague rugation.

The interior of both valves seems to be devoid of all kinds of structures except pseudopunctae. It is impossible to see any trace of cardinalia or muscle scars. The exfoliation was brought about by the splitting of the core.

**Material:** About 35 specimens, all with shell preserved.  
**Occurrence:** All specimens have been found in the Kulłatorp core (locality 29) between 33.20 and 35.12 m, i.e. in the limestone (middle) division of the *Dalmantina* Beds.

**Remarks:** It is difficult to place this species taxonomically because of the lack of interior structures. In size the present species is comparable to *Bracteoleptaena polonica* (Temple, 1965), in which the ribbing is, however, parvicostellate.

"Leptaena* costata* Teichert, 1937, from the Wright Bay Formation, Greenland, recalls *Kjerulfina*? sp. in general appearance and may be related. There is some similarity between *Kjerulfina*? sp. and *K. broggeri* (Holtedahl, 1916) in shell ornamentation (rugae and growth lines), and this may be taxonomically significant.

Family Leptaeniidae Hall & Clarke, 1894  
Genus *Leptaena* Dalman, 1828

*Leptaena rugosa* Dalman, 1828  
Pl. 5 fig. 8–9; Text-fig. 7


1921 *Leptaena rhomboidalis*, — Troedsson, Lunds Univ. Arskr., N. F., Avd. 2, 17, 3:7, 10, and 12 (pars; his material also includes *L. trifidum*).


**Lectotype:** RM Br. 10435, selected and figured by Spjeldnaes, 1957.

**Description:** *L. rugosa* is a large *Leptaena* species with central disc 16–22 mm long (measured from umbo to antero- median part of diaphragm) and 25–32 mm wide (measured 5 mm in front of the hinge-line because the diaphragm is less distinct close the hinge). In most specimens the rugation is very even and the number of distinguishable rugae varies between 7 and 12, depending partly on how well developed and well preserved they are in the umbonal region. The rib ornamentation is multiconcortellate, and 2.8 to 3.2 fine, rounded ribs, occur in one mm on distal parts of the central disc and on the trail. In some specimens a few ribs around the longitu­dinal mid-line are slightly coarser than average. The chilidium is fairly low and has a well-developed median sulcus. The pedicle valve interior is well known from Spjeldnaes’s studies of this species.


Brachial valve interior: The rugae are clearly visible in the interior, commonly even within the muscle-scar area. The pseudopunctae are relatively small. The myophore knobs of the cardinal process are high, plate-like, and diverge from each
other at 70° to 90°. The articulating surface of the socket ridge seems to have had a few denticles in at least one specimen; in other specimens denticles have not been seen. Laterally each cardinal-process myophore merges into a callus that fills the region between the cardinal process and the socket ridge and bends anteriorly to form the lateral border of the posterior adductor scar. This scar is clearly elongated, whereas the anterior-adductor scar is rounded. In some specimens there is a posterior median ridge (as is the case in *Leptaenopoma trifidum*); in others the ridge is not clearly marked. Between the anterior-adductor scars the ridge, if present, seems to divide into a pair of straight (not crescent-shaped) ridges, in front of which there is a fine antero-median ridge. 

**Material:** About 40 specimens counted.

**Occurrence:** This species is known from (2) Bestorp, (3) Äxtorp, (5) Allebergshäde (lower division; very scarce in the upper division), (11) Varv (lower division; according to Linnarsson, 1869: 50), (13) Stommen (lower division), (18) Skultorp, and (27) Korsbäcken. Outside Västergötland it occurs in the Dalmatinina Beds at Boreshult in Östergötland (Dalmán's collections) and in the uppermost Ordovician part of the railway section at Stengärde in Jämtland (observation in 1965). *L. rugosa* has also been reported from the Ashgillian Kosov Formation in Bohemia (Havlíček & Vaněk, 1966; Marek & Havlíček, 1967).

**Remarks:** *Producta rugosa* Hisinger, 1827, is a nomen nudum. The species intended was observed on Gotland. It is thus of Silurian age and is certainly not identical to *Leptaena rugosa* Dalman.

*Leptaena rugosa* has been reported by Sokolskaja from Ordovician strata in the Baltic region (Sokolskaja, 1954: 56–57, Pl. 3, figs. 3–9). This form has since been described as *Leptaena rugosoides* Oraspoonld, 1956, and is well separated from *Leptaena rugosa*.

Close relatives of *Leptaena rugosa* seem to be found in *L. ventricosa* Williams, 1963, and especially *L. salapiensis* Williams, 1963, which occur in Caradocian strata in the Bala District in Wales (cf. Williams, 1963: 464). *Leptaena salapiensis* also occurs in the Caradocian of Belgium (Malaise, 1873, Pl. 4, figs. 13–14). Specimens in Törnquist's collection in Lund from the Assise de Gembloux in Grand Manil, Brabant, have been valuable in proving the identity. The fauna at the Belgium locality indicates the zone of *Pleurograptus linearis* (cf. Michot, 1954: 50).

**Genus Leptaenopoma** Marek & Havlíček, 1967

*Leptaenopoma trifidum* Marek & Havlíček, 1967

Pl. 5 figs. 10–11; Pl. 6 figs. 1–2; Text-fig. 8


1906b *Strophomena rhomboidalis*, — Munteh, Sver. Geol. Unders., Ser. Aa 120: 46, line 16 (in all probability at least most of the specimens) (non line 5: *L. rugosa*).

1921 *Leptaena rhomboidalis*, — Troedsson, Lunds Univ. Årsnskr., N. F., Avd. 2, 17, 3, 7, 12 (partim: Troedsson's material also includes *L. rugosa*).


**Description:** *L. trifidum* is a fairly small or medium-sized leptaenoid species with a central disc that is about 10–12 mm long and 14–18 mm wide. The rugae are very even in most specimens and their spacing varies so that the total number may be as small as 4 or 5 or as large as 10. The ornamentation is multicostellate on the central disc, and the ribs are fine and rounded. In most specimens the marginal trail is somewhat unequally parvicostellate. The rib number is 3.3 in one mm on the trail and on distal parts of the central disc. The geniculation is abrupt and there may be an elevated marginal diaphragm around the central disc. The angle between the central disc and the trail is slightly obtuse, 90°–120°. In most specimens the middle part of the trail is nearly flat, and the valve has a trapeziform outline. However, certain specimens are well rounded. The chilidium is of “leptaenoid” type with a deep median sulcus (Poulsen, 1943, text-fig. 6).

**Pedicle valve interior:** As in the brachival valve the rugae are nearly as distinct in the interior as on the exterior surface. Some of the pseudopunctae are irregularly arranged; others follow the rugation pattern. Most pseudopunctae are apparently subparallel with the shell surface. Thus they can be traced for a short distance proximal to the summit.

The muscle area is probably oval, and is surrounded by a thin elevated ridge except in the anterior end on either side of a fairly strong median ridge. The adductor scars are relatively large and broad, situated around the posterior end of the median ridge. Surrounding the adductor scars are the diductor scars, the major parts of which are situated on the elevated marginal ridge. Posterior to the diductor scars is a small pit that seems to correspond to the dorsal foramen described by Spjeldnaes (1957: 51). The umbonal region is not well known. In most specimens the pallial disc is separated from the marginal trail by a shallow, concentric sulcus, which corresponds to the diaphragm.

**Genus Leptaenopoma** Marek & Havlíček, 1967

*Leptaenopoma trifidum* Marek & Havlíček, 1967

Pl. 5 figs. 10–11; Pl. 6 figs. 1–2; Text-fig. 8


1906b *Strophomena rhomboidalis*, — Munteh, Sver. Geol. Unders., Ser. Aa 120: 46, line 16 (in all probability at least most of the specimens) (non line 5: *L. rugosa*).

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are separated by a postero-median ridge, which tapers anteri- orly and extends partly into a pair of very short, crescent- shaped ridges of a type that is typical of several leptaenoid species. Between, or just in front of, the paired ridges there is a low, narrow anterior ridge. The anterior and posterior median ridges are morphologically different from each other and, ontogenetically, they become distinctly separated. Lateral to the anterior median ridge there is a pair of sub- parallel, low, narrow ridges. In old specimens the myophore knobs of the cardinal process are fairly thick, plate-like structures that diverge from one another at about 90°. The articulating surface of the socket ridge bears 2 to 3 denticles. The pallial disc is surrounded by an elevated diaphragm.

Material: About 40 specimens from Västergötland; a parallel, low, narrow ridges. In old specimens the myophore knobs of the cardinal process are fairly thick, plate-like structures that diverge from one another at about 90°. The articulating surface of the socket ridge bears 2 to 3 denticles. The pallial disc is surrounded by an elevated diaphragm.

M a t e r i a l : About 40 specimens from Västergötland; a few specimens from Dalarna. Between, or just in front of, the paired ridges there is a few specimens from Borenshult in Östergötland; and some specimens from Dalarna. O c c u r r e n c e : (2) Bestorp (upper division), (5) Al-lebergändë (middle and upper divisions), (23) Oglunda, and (24) Toran. Outside Västergötland this species is known from the Dalmanitina Beds at Borenshult in Östergötland (from specimens in Dalman's collections), from the Boda Lime- stone at Boda in Dalarna (specimens in Törnquist's collections), from the Kyrkås Quartzite at Rannåsen in Jämtland (collected by Thorklund), and from the Kosov Formation in Bohemia (Marek & Havlíček, 1967).

R e m a r k s : Leptaenopoma trifidum is readily distinguish- able from contemporary leptaenoid species despite its great variability. It is in several respects similar to Leptaena rhomboidalis (Wahlenberg) (as understood by Poulsen, 1943: 18–21, text-figs. 5 C, 6 B, and 7 A–E, and by Kelly, 1967: 594–595 partim, Pl. 98, figs. 1–2; non fig. 3) of late Llando- overian age. However, the latter species is characterized by coarser rugae and by the absence of structures corresponding to the crescent-shaped ridges in the brachial interior of L. trifidum.

Genus Titanomena n. gen.

D e r i v a t i o n o f t h e n a m e : From Greek τιτάνος wide, extending, and μυη crescent.

T y p e s p e c i e s : Titanomena grandis n. sp.

D i a g n o s i s : Large or medium-sized leptaenids with con- convex or plano-convex profile and without abrupt geniculation; surface ornamentation multicostellate; deltidium massive and teeth stout; muscle-area of pedide valve broadly oval and fairly small; cardinal process small; socket plates not denticulated; chilidium large, with a median sulcus.

S p e c i e s a s s i g n e d t o t h e n e w g e n u s : Titanomena grandis n. sp.

R e m a r k s : Contrary to Cooper's (1956: 820) familial diagnosis, the size of the apical foramen seems to be fairly small. However, the apical foramen seems to have been smaller in many Upper Ordovician and later leptaenids than in most Middle Ordovician representatives of the family. Other characteristics, e.g. the shape of the pedicle valve muscle area and the shape of the chilidium are quite typical of the Leptaeniidae and places Titanomena close to genera such as Cyphomena and Dactylogonia. The latter differs from Titanomena in being unequally parvicostellate and in its abrupt geniculation. Cyphomena is rather similar to Ti- tamen in the shape of the brachial valve interior, but in Cyphomena this structure commonly has a more distinct bor- der between the distal trail and the central disc, a more marked convexity, and a smaller size. Even so, the differences are relatively small and it seems possible that Titanomena was a derivative of Cyphomena.

Titanomena grandis n. sp.

P l. 6 fig. 3–6; Text-fig. 9

D e r i v a t i o n o f t h e n a m e : From Latin grandis, large.

H o l o t y p e : LM LO 4257. A mould of a brachial valve interior, somewhat fragmentary and with signs of damage when still alive. Coll. S.L. Törnquist.

T y p e s t r a t u m a n d t y p e l o c a l i t y : Upper divi- sion of the Dalmanitina Beds, Alleebergändë.

D i a g n o s i s : A Titanomena species, the shell of which has a gentle geniculation 25–30 mm in front of the apex.

D e s c r i p t i o n : The adult shell of Titanomena grandis attains a width of more than 50 mm and a length of at least 45 mm. It is plano- to concavo-convex. A great part of the bra- chial valve seems to be rather flat and the very gentle geniculation does not occur until 25–30 mm in front of the umbo. The cardinal angles are slightly obtuse. The ornamentation is multicostellate with rounded ribs, about 2.5 of which occur in one mm at a point 20 mm in front of the umbo. Concentric growth lines occur at uneven intervals. The brachial valve interarea is much lower than that of the pedicle valve. The deltidium is low but very thick, and obviously formed partly as a pedicle callist. The chilidium is rather high. Pedicle valve interior: Traces of the costellation and the con- centric structures of the exterior surface can be seen inside both valves. In the pedicle valve the muscle-scar area is rounded or elongated in outline and, except medially, the distal parts are raised above the shell floor by means of secondary shell matter. The adductor scars are situated on a broad median ridge, which does not extend as far forward as the diductor scars.

Text-fig. 9: Titanomena grandis n. gen. et n. sp. Holotype, LM LO 4257.

Brachial valve interior: With the exception of the cardinalia and the muscle-scar area, the entire surface is finely pseudo- punctate. This feature is not so obvious in the pedicle valves studied.

There is a notothyrial platform, which is fairly thick in the posterior part. The length of this platform (including the
muscle scars) relative to the length of the valve is 0.2–0.3/1, and the width relative to the width of the valve is 0.2/1. The cardinal process ascends through the platform as two fine myophore ridges, separated from each other by a median chilidial fold and a very low and short ridge that extends forward from the anterior extremity of the fold. The real posterior median ridge does not appear until further forward, where the platform is relatively low. This ridge divides in front into two branches in a typical leptaenoid manner. These paired ridges form the raised antero-medial border of the anterior muscle scars. An anterior-median ridge begins in front of the bifurcations. In its posterior part between the paired ridge branches it is fairly inconspicuous. A pair of lateral ridges originates from the angle between the posterior and the anterior muscle scars or, perhaps, from the lateral part of the anterior scars.

M a t e r i a l : 3 brachial, 2 pedicle interiors, several exteriors, most of them fragmentary.

O c c u r r e n c e : (2) Bestorp and (5) Allebergösände.

Family Stropheodontidae CASTER, 1939
Genus Leptostrophia HALL & CLARKE, 1892
Subgenus Eostropheodonta WILLIAMTS, 1951

Leptostrophia (Eostropheodonta) hirnantensis
(M'Coy, 1851)

Pl. 6 fig. 7–9; Text-fig. 10


1855 Orthis hirnantensis, — M'COY, in SEDEWICK & M'COY, British Palaeozoic rocks and fossils. 1: 219, 2: Pl. 1H, figs. 11–11c.

1871 Orthis Hirnantensis, — DAVIDSON, Palaeontogr. Soc. 3, pt. 7: 261–262, Pl. 32, figs. 5–7 (non figs. 8–9).

1965 Eostropheodonta (Eostropheodonta) hirnantensis, — TEMPLE, Acta Palaeont. Polonica 10: 410–412, Pl. 17, figs. 1–6; Pl. 18, figs. 1–7; Pl. 19, figs. 1–5.


1967 Eostropheodonta hirnantensis, — MAREK & HAVLÍČEK, Věstník Úst. Úst. geol. 42: 262, Pl. 4, figs. 10–12.

D e s c r i p t i o n : A species with a plano-convex or slightly concavo-convex shell that has acute cardinal angles and thus attains its greatest width along the hinge-line. The ornamentation is distinctive: the pattern is intermediate between multicostratellate and unequally parvicostratellate and the ribs are narrow, unusually high, and at first glance give the impression of being sharp-edged, even though they are, actually, well rounded. The pedicle-valve interarea is about 1/10 as high as the valve is long. The delthyrium is open. The brachial-valve interarea is very low. There is a fairly well-developed chilidium without a median sulcus.

Pedicle valve interior: The rib pattern of the exterior is clearly visible on the interior surface. In both valves the entire surface outside the muscle-scar area is coarsely pseudo-punctate. The pseudopunctae are concentrated on the radiating ridges and thus appear to be arranged in more or less straight rows. In most specimens the muscle-scar area is indistinct, but in a few large specimens it can be seen that it was large, flabellate and nearly 1/3 as long as the valve. Each tooth has on its antero-medial surface a longitudinal groove.

In one specimen, this groove (it has been observed in one specimen only) has pits corresponding to the denticles on the socket plates.

Brachial valve interior: The muscle scars are poorly defined. The articulating surface of the socket plate bears a row of about four small denticles. The notothyrial platform is rather inconspicuous. Anteriorly it is continuous with a short, low median ridge. In young specimens the cardinal-process knobs are short and plate-like, and diverge at about 80°. In adult specimens the knobs are relatively longer and the divergence is about 65°.

M a t e r i a l : About 125 specimens.

O c c u r r e n c e : (1) Vrågården, (2) Bestorp, (3) Asstorp, (5) Allebergösände (lower division), (6–7) Mt Gissegberg, (8) Ekebäcken, (10) Dimmingedalen, (12) St Virvan, (13) Stommen (lower division), (14) Skogastorp, and (28) Kullatorpsbäcken. In Wales the species is represented in the Upper Ashgillian Hirnant Beds (M'Coy, 1851), and it has recently been reported from Upper Ashgillian beds in the Lake District, England, in Poland (TEMPLE, 1965) and in Bohemia (MAREK & HAVLÍČEK, 1967).

R e m a r k s : The genus Eostropheodonta was erected by BANCROFT (1949), who considered it a distinct genus. Later WILLIAMS (1951, 1965) included Eostropheodonta as a subgenus in Strophodontidae, 1850. In a recent revision of the Llandovery stropheodontids from the Welsh Borderland, COCKS (1967) criticized the current subfamilial arrangement within Stropheodontidae. He found the arrangement inconsistent with present knowledge about the interrelationships between early stropheodontid genera. However, he did not give any alternative arrangement. Strophodontida was considered a strictly Devonian genus, and Eostropheodonta was included as a subgenus within Leptostrophia.

Superfamily Davidsoniacea KING, 1850
Family Meekelliidae STEHILL, 1954
Subfamily Chilidiopsinae BOUCOT, 1959
[nom. transl. ex Chilidiopsinae BOUCOT, 1959]
Genus Coolinia BANCROFT, 1949

Coolinia dalmanni n. sp.
Pl. 6 fig. 10; Pl. 7 fig. 1–4

1828 *Orthis Pecten* — DALMAN, Kongl. Vet. Acad. Handl. 1827: 110–111 (partim: the Västergötland specimens exclusive of a few specimens in D a l m a n’ s collection of *Eostroeheo donta hirnantsis*), PI. 1, figs. 6 a–d.

1837 *Orthis Pecten* — HISINGER, Kongl. Vet. Acad. Handl. 1826: 70 (partim: only specimens from Västergötland localities), PI. 20, figs. 6 a–d.

1921 *Schubertella pecten* — TROEDSDEN, Lunds Univ. Årskr. N. F., Avd. 2, 17: 7, 12.

**Derivation of name:** After J. W. Dalman, one of the early students of Swedish fossil brachiopods.

**Holotype:** LM LO 4261. Coli.

**Type stratum and type locality:** Lower division of the Dalmantina Beds at Stommen.

**Diagnosis:** A thin-shelled and large (maximal width exceeds 40 mm) species of *Coolinia* with a flat brachial and a nearly flat pedicle valve. Rib density exceptionally high for such a large *Coolinia* species with about 3 ribs in every mm five mm in front of umbo.

**Description:** The shell is plano-convex with very low convexity of the pedicle valve. The greatest width is along the hinge-line. The ornamentation is unequally parvicostellate with every second rib stronger than the rib between. There are 13 to 15 protargal ribs. The ribs grow coarser with distance away from the umbo. Five mm in front of the umbo there are 3 ribs in one mm; 15 mm in front of the umbo there are only 2. Fine, closely-spaced growth lines are discernible especially between the ribs. The chilidium is large and rounded. There is no deltidium. It has not been possible to discern any pseudopunctae either on flaked shell fragments or on sections perpendicular to the shell surface. However, only one specimen has been studied: specimens with preserved shell are extremely scarce.

**Pedicle valve interior:** The exterior sculpture is to some degree reflected on the interior surface of both valves. The muscle area is poorly defined anteriorly, but the diductor-muscle scars seem to be separated in front of the adductor scars. Postero-laterally, the diductor scars are bordered by the well-developed dental plates. The adductor scars are broadly lanceolate. In the delthyrial cavity there is a concave, triangular pedicle callist.

**Brachial valve interior:** The muscle scars are obscure. Between and behind them is a broad, low platform. Fulcal plates may be well developed or many be totally missing, and the socket ridges diverge from each other at angles between 40° and 90°. The angle apparently diminishes during ontogeny. In small valves the cardinal process knobs run together without doubt is *Coolinia dalmani*. For this reason a new proposal has been sent to the ICZN in order to settle the identification problem ultimately (BERGSTRÖM 1968). It now seems safe to regard *Coolinia* a distinct genus separated from *Fardenia* Lamont, 1935. In erecting *Chilidiopsis*, Boucot (1959: 27) remarked that it might be a junior synonym to the poorly known genus *Coolinia* Bancroft, 1949. New material has now made this synonymy clear (BRUNTON, COCKS & DANCE, 1967: 167).

Together with *Coolinia alterniradiata* (SHALER), *C. pecten* (Linnaeus) and *C. subplana* (CONRAD), *C. dalmani* is one of the large *Coolinia* species, attaining a width of more than 40 mm. In this respect it differs from the smaller species *C. applanata* (SALTER), *C. applanata inaequalis* (Bancroft), *C. roemeri* (FOERSTE) (maximal width 30 mm), *C. reedsi* (AMS- DEN) (max. width 18–19 mm) and *C. comei* (MAREK & HAVLIČEK) (largest specimen known 17 mm wide). The rib density is a fairly good aid in the identification of the different species. The approximate number of ribs in one mm, 5 mm and 15 mm respectively in front of the umbo are: *C. comei* 3.2; *C. dalmani* 3.2; *C. applanata* 3; *C. alterniradiata* 2.2, 2.2; *C. reedsi* 2.1; *C. subplana* 2.1, 1.3; *C. applanata inaequalis* 2.0, 1.2; *C. pecten* 1.6, 1.1. *C. alterniradiata* seems to differ from all the others in having a constant rib density over the shell surface.

**Remarks:** Together with other species *Coolinia dalmani* has long been known as *Anomites pecten*, *Orthis pecten* etc. and assigned to LINNAEUS. However, LINNAEUS (1758: 702) in his description referred to Lister: "List. angl. 243, s.9 f.49." Lister (1678: 243) wrote about the locality as follows: "Ex fodinis carbonum Fossilium juxta Hallifax". Lister’s species is thus of Carboniferous age.

**Wahlenberg** (1821: 66) was probably the first to record *A. pecten* from Swedish deposits. He reported it from Gotland (Silurian), Västergötland (Upper Ordovician) and as a variety from Fägelsång in Skåne (probably Middle Ordovician). DALMAN (1828: 110) added Borenhult in Östergötland as an Upper Ordovician locality. On the basis of present knowledge about the faunas in the actual beds it is evident that we are dealing with at least three different species (excluding *Eostropheo donta hirnantsis*, which is also included in Dalman’s Västergötland collection of "Orthis pecten").

**Remarks:** Together with another writer to discuss *A. pecten*, but he did not add anything substantial to the concept of the species.

**Lindström** (1861: 373), writing on brachiopods from Gotland, seems to be the first to restrict the species stratigraphically and geographically.

The fact that Lister’s figure, to which LINNAEUS refers, is of a Carboniferous lamellibranch known as Dunbella paryacea (J. de C. Sowerby, 1822), was observed by Wood in 1947. Wood made a proposal to the International Commission on Zoological Nomenclature (ICZN) that the species name *pecten Linnaeus, 1758*, should be applied to the Silurian brachiopod generally identified as *Schubertella pecten* and not to the species figured by Lister.

In the directions following on this proposal the ICZN (1950) stated that the species name *pecten Linnaeus, 1758*, should apply to the species "commonly known as Strophomena pecten (Linnaeus, 1758), i.e. the species determined as Schel­wienella pecten (Linnaeus, 1758) by Dalman (J. W.), 1828, K. Svenska Vetensk. Akad. Handl., 1827: 110 pl. 1, figs. 6 a–d (as Orthis pecten)".

In 1967 BRUNTON, COCKS & DANCE figured the only specimen of *Anomia pecten* in the Linnaean Collection. It seems quite probable that this specimen has belonged to *Linnaeus* and that it has been collected in Lower or Middle Silurian strata on Gotland. As has been pointed out by me (BERGSTRÖM & HAGELTORN, 1968) this Gotland species represented by the specimen in the Linnean Collection is not conspecific with the species figured by DALMAN (1828, Pl. I, figs. 6 a–d), as the latter without doubt is *Coolinia dalmani*. For this reason a new proposal has been sent to the ICZN in order to settle the identification problem ultimately (BERGSTRÖM 1968). It now seems safe to regard *Coolinia* a distinct genus separated from *Fardenia* Lamont, 1935. In erecting *Chilidiopsis*, Boucot (1959: 27) remarked that it might be a junior synonym to the poorly known genus *Coolinia* Bancroft, 1949. New material has now made this synonymy clear (BRUNTON, COCKS & DANCE, 1967: 167).

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Superfamily Rhythonellaceae Gray, 1848
Family Ancistrotrychidae Cooper, 1956

**Emended diagnosis**: The family diagnosis should be changed to include forms with a median septum in the brachial valve.

Subfamily Plectothyrellinae n. subfam.

**Diagnosis**: Ancistrotrychids with median septum.

Genus *Plectothyrella* Temple, 1965

**Emended diagnosis**: Shell biconvex and uniplicate; shell surface imbricate; costae coarse and angular; new ribs may be intercalated on the fold and in the sulcus; pedicle valve with very strong tooth plate supports; brachial valve with massive crural bases; cardinal process missing.

*Plectothyrella crassicosta* (Dalman, 1828) PL. 7 fig. 5–8


1837 *Atrypa crassicosta*, — Hisinger, Lethaea Svecica : 76, PL. 22, fig. 3.


1921 *Platystrophia biforata*, — Troedsson, Lunds Univ. Årskr., N. F., Avd. 2, 17, 9–10, 12.


**Description**: *P. crassicosta* is a relatively large, globose species with a median fold on the brachial valve and a corresponding sulcus on the pedicle valve. The greatest width and length observed are 30 and 30 mm respectively. The maximum width is mid-way between the apex and the anterior commissure. The shell surface is provided with strong ribs that are triangular in cross section. There are about 4 of these in the sulcus and 10 on the lateral flank at a point 20 mm from the apex.

Pedicle valve interior: The teeth are strong and provided with tooth plates that are largely hidden by secondary shell-matter. Muscle attachment was apparently confined to the pedicle valve interior: A distinct, narrow, median ridge.

Brachial valve interior: A distinct, narrow, median ridge extends anteriorly from the crural bases for about a third the length of the valve. In large valves two short ridges diverge from the median ridge in an antero-lateral direction. The outer socket-ridge is elongated and narrow, whereas the inner socket-ridge is short and massive. The crura emerge abruptly from the shell floor, and the crural plates are feebly developed or nonexistent.

**Material**: About 145 specimens.


**Remarks**: *Plectothyrella crassicosta* seems to occupy a fairly isolated systematic position. *Atrypa canaliculata* Dalman, 1828, and *Aratanea monodi* Schmidt, 1967, are probably the most closely related species known. *P. crassicosta* differs from these species in the common presence of imbrication and in the more angular ribs.

**References**


LINNÆUS, Carolus [Linné, Carl von]: Systema naturae per regna tria naturae, secundum classes, ordines, genera, species, cum characteribus, differentiis, synonymis, locis. IO, 1: 1–823, Holmiae (Stockholm) 1758.


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The photos were made by Mr. Gustav Andersson at the Institute of Palaeontology, Uppsala, with the kind permission of Dr. V. Jaanusson. If not otherwise stated they were made from Plastiform casts of the specimens.

Plate 1


Fig. 3: Obolidae gen. et sp. indet. Exterior view of a crushed valve. (2) "Mössenberg/Bestorps lat.", Coll. G. Wahlénberg. UM Vg 870. 6/1.

Fig. 4-5: Paracraniops sp. 4: Interior of valve. (2) Bestorp. Coll. G. Troedsson. LM LO 4237. 6/1. 5: Interior of valve. (2) Bestorp. Coll. G. Troedsson. LM LO 4238. 6/1.

Fig. 6: Philhedra sp. A small, brachial valve. (2) "Mössenberg/Bestorps lat.", Coll. G. Wahlénberg. UM Vg 871 6/1.

Plate 2


Fig. 5: *Dalmanella testudinaria* (DALMAN, 1828). A brachial valve interior. (8) Ekebacken. Coll. J. B e r g s t r ö m, 1964. LM LO 4241. 4/1.

Fig. 6–9: *Dalmanella pectinoides* n. sp. 6: A brachial valve interior. (5) Ällebergsände. Coll. S. L. T ö r n q u i s t. LM LO 4242. 3/1. 7: A brachial valve exterior. (2) Bestorp, Coll. J. W. D a l m a n, 1827. RM Br. 10216. 3/1. 8: Holotype, a pedicle valve interior. (2) Mössesberg. UM Vg 873. 3/1. 9: A pedicle valve exterior. (2) "Mössesberg/Bestorp". Coll. J. D a l m a n, 1827. RM Br. 10215 (counterpart to RM Br. 10213). 3/1.

Fig. 10–11: *Horderleyella fragilis* n. sp. 10: A brachial valve interior. (5) Ällebergsände. Coll. J. W. D a l m a n, RM Br. 102329. 3/1. 11: A pedicle valve interior. Västergötland, exact locality unknown. RM Br. 10995 (counterpart to RM Br. 10996). 3/1.
Plate 3

Fig. 1-4: *Horderleyella fragilis* n. sp. 1: A brachial valve exterior. (5) Ållebergsände. UM Vg 874. 3/1. 2: Holotype, a brachial valve interior. (5) Ållebergsände. RM Br. 10267. 3/1. 3: A pedicle valve interior. Västergötland, exact locality unknown. RM Br. 10996 counterpart to RM Br 10995). 3/1. 4: A pedicle valve exterior. Exact locality unknown, probably Ållebergsände, upper division. RM Br. 10944. 3/1.

Fig. 5-7: *Draborthis caelebs* Marek & Havlíček, 1967. 5: A pedicle valve interior. Locality probably (5) Ållebergsände. RM Br. 10989. 3/1. 6: A brachial valve exterior. (2) "Möösberg/Bestorp, Dalman 1827". RM Br. 10201. 3/1. 7: A brachial valve interior. (2) "Möösberg/Bestorp, Dalman 1827". RM Br. 10203 (counterpart to RM Br. 10201). 3/1.


Plate 4


Fig. 7–8: Cliftonia psittacina (Wahlenberg, 1821). Lectotype, posterior and anterior views of conjoined valves. Dalarna, Osmundsberget, Boda Limestone. Coll. G. Wahlenberg. UM D. 1175. 3/1.
Plate 5


Fig. 7: *Kjerulfina?* sp. Plastiform not used. A pedicle valve exterior. (29) Kullatorp boring core at 35.04 m UM Vg 881. 4/1.


Plate 6


Fig. 3–6: *Titanomena grandis* n. gen. et n. sp. 3: A pedicle valve exterior. (5) Ållebergsände. Coll. J. Bergström, 1962. LM LO 4256. 1/1. 4: Holotype, a brachial valve interior. The specimen has been severely damaged when still in life. (5) Ållebergsände. Coll. S. L. Törnquist. LM LO 4257. 1.5/1. 5: A pedicle valve interior. Västergötland, exact locality unknown (probably Ållebergsände, upper division). RM Br. 10944. 1/1. 6: A brachial valve exterior. (5) Ållebergsände, probably upper division. RM Br. 10929. 1.5/1.


Fig. 10: *Coolinia dalmani* n. sp. A brachial valve exterior and a fragment of a pedicle valve exterior. (5) Ållebergsände. Coll. P. T. Cleve, 1865. UM Vg 883. 1.5/1.
Plate 7

