



GEOLOGICAL  
SURVEY  
OF  
CANADA

DEPARTMENT OF MINES  
AND TECHNICAL SURVEYS

PAPER 62-14

ILLUSTRATIONS OF CANADIAN FOSSILS  
CAMBRIAN, ORDOVICIAN AND SILURIAN OF THE  
WESTERN CORDILLERA

B. S. Norford

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Introduction

This report is one of a series presenting illustrations of Canadian fossils, designed to assist the general geologist who may lack knowledge of specialized palaeontology. The series has resulted primarily from requests by field officers of the Geological Survey.

These plates are not intended to be a contribution to palaeontological literature. However, in the legends a special attempt has been made to give as much detailed information as is known on the stratigraphic and geographic provenance of each specimen figured, thereby making a real contribution to the empirical range of the species illustrated. Such information is primary documentation and will remain independent of changes of opinion on specific identification, generic assignment, biostratigraphic correlation, or on local stratigraphic terminology.

A comprehensive analysis of the faunas of the three systems has not been attempted. Instead, some of the more common and easily recognized fossils are illustrated in order to allow the field geologist to gauge the broad stratigraphic horizons of his collections. Detailed chronology can only be later supplied by specialized laboratory study of all the fossils in the field geologist's collections.

The plates are arranged in ascending stratigraphic order, with the fossils grouped according to epoch but not segregated into discrete faunas within the epoch. Thus Plate I is titled 'Early Cambrian fossils' although most of these fossils can be referred to the Olenellus fauna.

Cambrian rocks of the southern Rockies present some of the best exposed but least studied sections in the world and in only a few localities have their fossils been adequately investigated. Lochman-Balk and Wilson (1958) cite the following ascending sequence of North American Cambrian faunas, many of which are represented in Western Canada: Early Cambrian, Olenellus fauna; Middle Cambrian, Plagiura-Poliella, Albertella, Glossopleura, Bathyriscus-Elrathina, and Bolaspidea faunas; Late Cambrian, Cedaria, Crepicephalus, Aphelaspis, Dunderbergia, Elvinia, Conaspis, Ptychaspis-Prosaukia, and Saukia faunas. Hintze (1952) lists eleven Early Ordovician faunas in Utah and Nevada, some of which can be recognized in Western Canada, particularly the earliest or Symphysurina fauna and the rather later Leiostegium-Kainella fauna.

Graptolites provide the standard Ordovician and Silurian chronology, but precise comparison with the sequence of shelly faunas of the carbonate rocks may be difficult to establish. Rare graptolites do occur in carbonate rocks, and a few stratigraphic sections show some interbedding of the graptolitic and carbonate facies. A few

graptolites are illustrated but reference should be made to Bulman's summary account of the global sequence of graptolite faunas, and to the study of the graptolite zones of the Road River Formation by Jackson and Lenz (1962).

In the southern Rockies the latest rocks of Early Ordovician age are beds bearing Palliseria that are locally preserved beneath the Wonah and Mount Wilson Quartzites. These beds have in the past been misinterpreted as Late Ordovician. The next reference fauna is Late Ordovician and is common in the basal part of the Beaverfoot-Brisco Formation that carries Silurian fossils near its top.

The Northwest Territories Sunblood Formation contains an undescribed Middle Ordovician fauna, and is followed by rocks with faunas suggesting correlation with the Red River (Middle Ordovician) and Stony Mountain (Upper Ordovician) units of southern Manitoba. The Early Silurian brachiopod Virgiana has been locally reported from northwest Canada, but most common Silurian shelly fossils are referable to a Clinton fauna of latest Early Silurian or Middle Silurian age. This fauna is widespread in northern British Columbia and the adjacent Northwest Territories and characteristically includes Glassia, Pentamerus, and an abundance of halysitid corals. Late Silurian rocks are locally present in the northern Cordillera but these beds are more fully developed in the Arctic Archipelago.

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This brief bibliography is primarily intended as an acknowledgment of the sources of the illustrations of specimens that are not in the collections of the Geological Survey.

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Types

Unless otherwise indicated all specimens are in the type collections of the Geological Survey of Canada, Ottawa, and locality numbers are those assigned by the Survey. Type specimens from other collections are prefixed as follows:

- ISU           — Iowa State University
- NMBMMR   — New Mexico Bureau of Mines and Mineral Resources
- USGS       — United States Geological Survey
- USNM       — United States National Museum

Illustrations are natural size unless otherwise indicated.

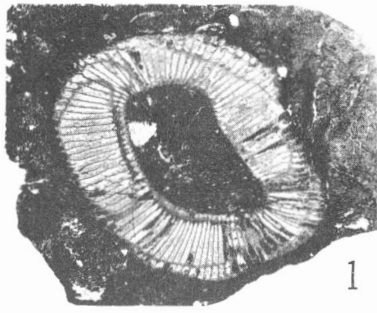
PLATES



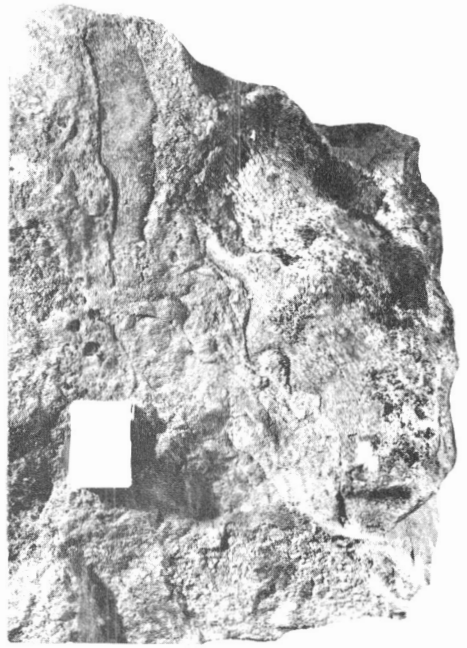
PLATE I

EARLY CAMBRIAN FOSSILS

- Fig. 1. Metacoscinus poolensis Kawase and Okulitch, paratype I3352, from map-unit 1 of Poole (1955), 3 miles southeast of Veronica Lake, Wolf Lake map-area, Yukon Territory, loc. 24040; collected by W.H. Poole, 1953. This is a transverse section of an archaeocyathid similar to those shown in Fig. 2.
- Fig. 2. Limestone with archaeocyathids, hypotype 16857, from about 200 feet below the top of Atan Limestone Unit, 9.6 miles northwest of Terminus Mountain, Kechika map-area, British Columbia, loc. 43853; collected by H. Gabrielse, 1960.
- Fig. 3. Olenellid trilobite, undescribed genus, hypotype 16858, from 25 feet above base of map-unit 3 of Mountjoy (1962), about 2 miles southwest of Mount Simla, Jasper Park, Alberta, loc. 42591; collected by E.W. Mountjoy, 1960. Olenellid trilobites such as those illustrated by Figs. 3, 4, 6, 8 and 9, form the most prominent element of Western Canadian Early Cambrian faunas.
- Figs. 4, 6. Fremontia sp., enlarged X 2, hypotypes 16859 and 16860, from Atan Group, 25 feet below base of limestone unit, 7.4 miles northwest of northeastern end of Denetiah Lake, Kechika map-area, British Columbia, loc. 47441; collected by H. Gabrielse, 1961.
- Figs. 5, 7. cf. Bonnia sp., hypotypes 16920 and 16861, from about 100 feet below conglomerate unit, near headwaters of Gundahoo River, 59° 06'N, 126° 01'W, Rabbit River map-area, British Columbia, loc. 43325; collected by H. Gabrielse, 1960. Note the small spine at the front margin of the pygidium of Fig. 7.
- Fig. 8. Olenellus gilberti Meek, reduced X 1/2, cast type 16862, from same specimen as USNM cast 62619, from Peyto Limestone, east slope of Mount Odaray, Yoho Park, British Columbia; collected by C.D. Walcott, 1909 (his loc. 35n).
- Fig. 9. Olenellus gilberti Meek, hypotype 16863, from unnamed formation, 2.8 miles southwest of Rogers Lake, Rabbit River map-area, British Columbia, loc. 43318; collected by H. Gabrielse, 1960.



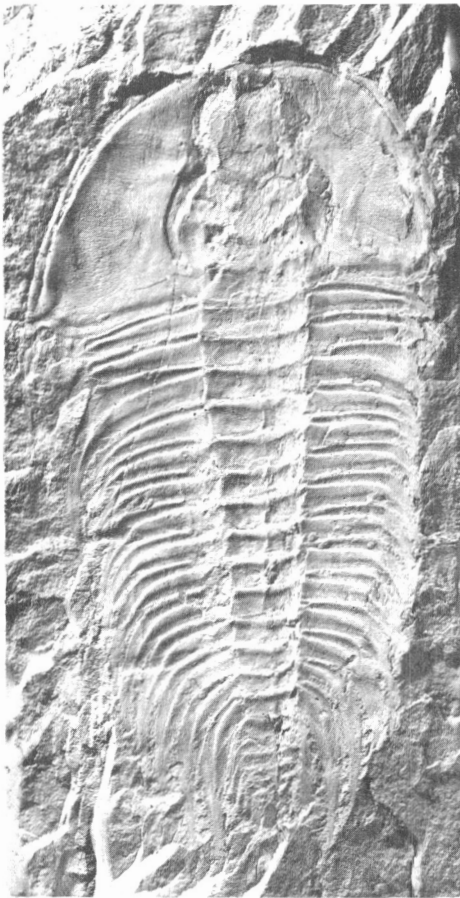
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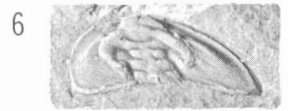
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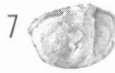
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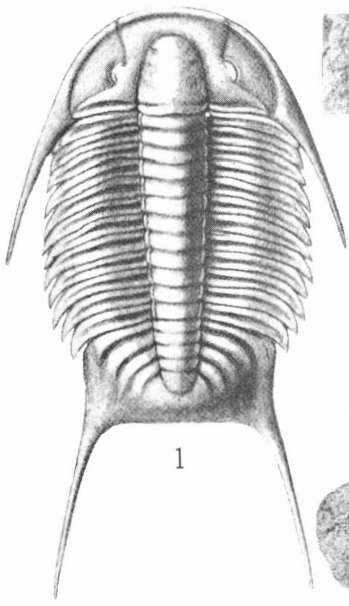
PLATE II

LATE CAMBRIAN FOSSILS

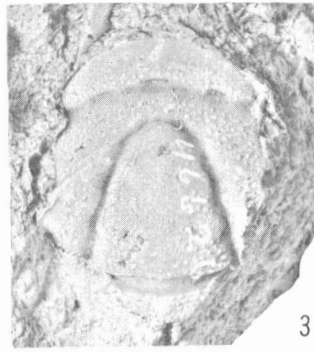
- Figs. 1, 2. Crepicephalus iowensis (Owen), hypotypes USNM 61630 and 61635, from Eau Claire Formation, Eau Claire, Wisconsin, Walcott's loc. 78a. Figures from Walcott (1916).
- Figs. 3, 7. Tricrepicephalus sp., hypotypes 16853 and 16854, from Lynx Formation, about 850 feet above base in stratigraphic section near Snake Indian River, Jasper Park, Alberta, loc. 46626; collected by E.W. Mountjoy, 1961.
- Fig. 4. Araphoia albertensis Resser, enlarged X 3, holotype USNM 108705a, from float, Sullivan Formation, East Lyell Glacier, Banff Park, Alberta, Walcott's loc. 64h. Figure from Resser (1942).
- Fig. 5. Coosia canadensis Resser, enlarged X 1 1/2, holotype USNM 108766a, from Sullivan Formation, Glacier Lake Valley, Banff Park, Alberta, Walcott's loc. 64i. Figure from Resser (1942).
- Fig. 6. Coosia albertensis Resser, enlarged X 2, paratype USNM 108768b, from Sullivan Formation, Glacier Lake Valley, Banff Park, Alberta, Walcott's loc. 65i. Figure from Resser (1942).
- Fig. 8. Araphoia elongata Resser, enlarged X 1 1/2, paratype USNM 108703b or c, from float, Sullivan Formation, Walcott's loc. 64h, as for Fig. 4. Figure from Resser (1942).

MIDDLE CAMBRIAN FOSSILS

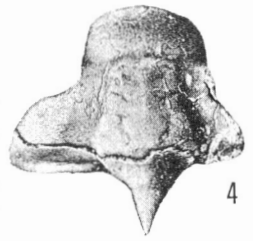
- Fig. 9. Glossopleura cf. G. boccar (Walcott), hypotype 16864, from map-unit 3 of Mountjoy (1962), mountain between forks of south branch of Snake Indian River, Jasper Park, Alberta, loc. 42584; collected by E.W. Mountjoy, 1960.
- Fig. 10. Vanuxemella nortia Walcott, hypotype 16865, from Ross Lake Shale, near Ross Lake, Banff Park, Alberta, loc. 15460; collected by L.D. Burling, 1947.
- Figs. 11, 14. Albertella helena Walcott, USNM 53407 and 53411 (enlarged X 1 1/2), from Gordon Shale, Gordon Creek, Montana; collected by C.D. Walcott, 1904. Figures from Walcott (1908).
- Fig. 12. Hyolithes cecrops Walcott, enlarged X 2, hypotype 16866, from unnamed shale, Windsor Mountain, southwest Alberta, loc. 42784; collected by D.K. Norris, 1951.
- Fig. 13. Olenoides serratus (Rominger), hypotype 15174, probably from Stephen Shale, Mount Stephen, Yoho Park, British Columbia; with agnostid trilobite on same slab.
- Figs. 15-17. Zacanthoides cf. Z. cnopus Walcott, hypotypes 16867, 16868, and 16869, from unnamed shale, Windsor Mountain, southwest Alberta, loc. 42775 (Figs. 15, 17) and loc. 42781 (Fig. 16); collected by D.K. Norris, 1951.



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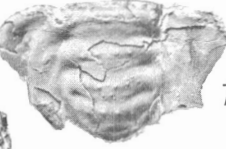
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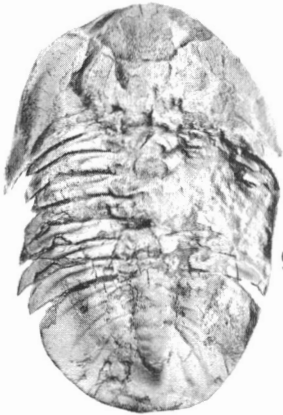


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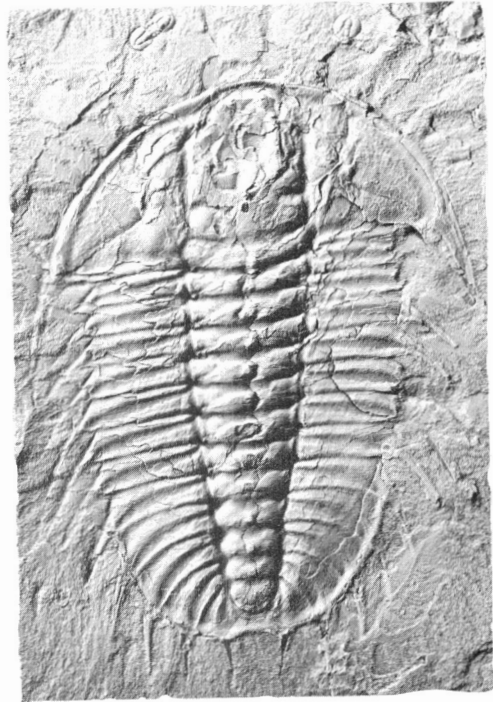
Late Cambrian fossils



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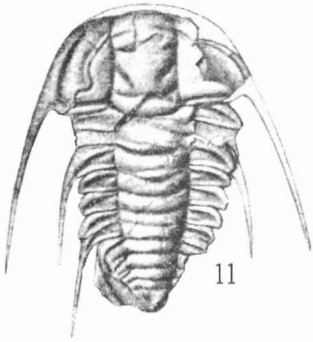
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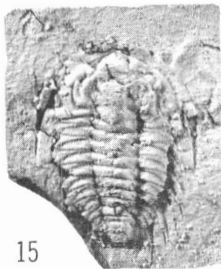
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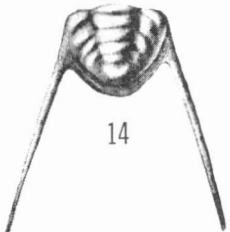
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Middle Cambrian fossils

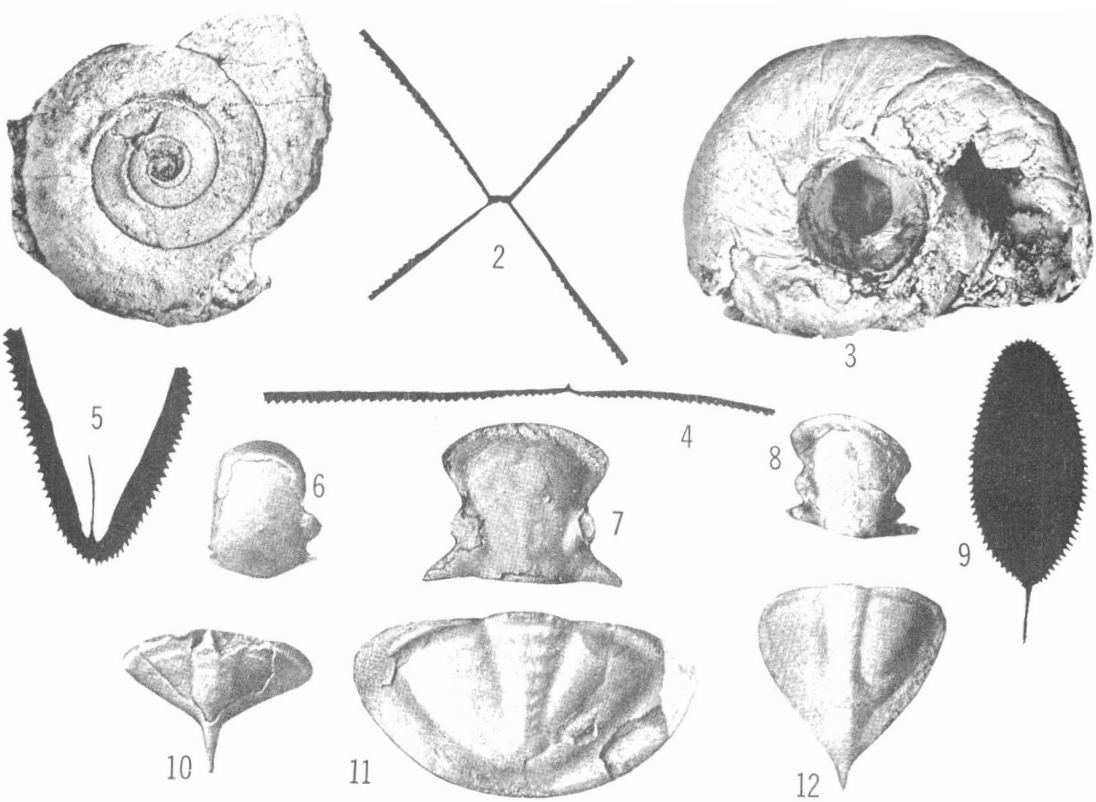
PLATE III

EARLY ORDOVICIAN FOSSILS

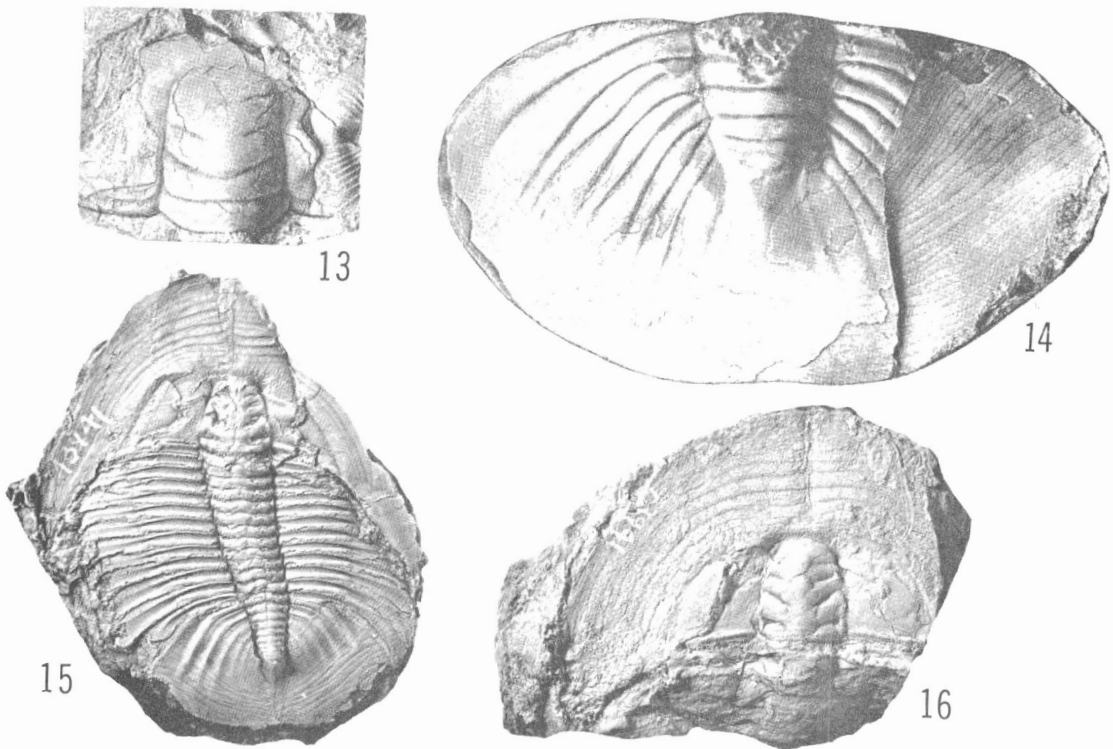
- Figs. 1, 3. Palliseria robusta Wilson, hypotypes 13432 and 13431, from 60-foot-thick dolostone sequence, 760 feet below Mount Wilson Quartzite, west slopes of Nigel Peak, Jasper Park, Alberta, loc. 19741; collected by P. Harker, 1949. The gastropod has a low spire which is viewed from below in Fig. 3.
- Fig. 2. Tetragraptus quadribrachiatus (Hall); figure from Bulman (1955). In this Arenig genus the stipes may be erect or pendant; in the latter case the four stipes lie close together.
- Fig. 4. Didymograptus extensus (Hall); figure from Bulman (1955). This genus is common in Arenig strata; the stipes may also be pendant.
- Fig. 5. Isograptus caduceus var. maximodivergens Harris; figure adapted from Thomas (1960). An Arenig graptolite genus that may be confused with Dicellograptus (Plate VII, Fig. 34) but possesses less complex thecae.
- Figs. 6, 10. Symphysurina spicata Ulrich, hypotypes, enlarged X 2, USNM 70318 and 24647, from Goodwin Formation, Nevada, Walcott's loc. 201a. Figures from Walcott (1925).
- Figs. 7, 11. Bellefontia nonius Walcott, hypotypes USNM 70345 and 70348, from Mons Formation, Clearwater Canyon, southwest Alberta, Walcott's loc. 65y. Figures from Walcott (1925).
- Fig. 8. Xenostegium douglasensis Walcott, syntype USNM 70373, from Mons Formation, Douglas Lake, Banff Park, Alberta, Walcott's loc. 67q. Figure from Walcott (1925).
- Fig. 9. Phyllograptus typus Hall, figure adapted from Bulman (1955). Another graptolite genus common in Arenig rocks, but this genus ranges up into Llanvirn deposits.
- Fig. 12. Xenostegium shepardii (Raymond), hypotype USNM 70367, from Mons Formation, above Mons Glacier, Banff Park, Alberta, Walcott's loc. 66u. Figure from Walcott (1925). Similar characteristic tails of Xenostegium have been collected from the upper part of the Kechika Group of the Muncho Lake region, Tuchodi Lakes map-area, northern British Columbia.

LATE CAMBRIAN FOSSILS

- Figs. 13, 14. Briscoia sinclairensis Walcott, hypotypes USNM 70301 and 70304, from McKay Group, Sinclair Canyon, Kootenay Park, British Columbia, Walcott's loc. 16t. Figure from Walcott (1925).
- Figs. 15, 16. Pterocephalia sp., hypotypes 16870 and 16871, from about 2,500 feet below base of upper (resistant) unit of McKay Group, near head of Tanglefoot Creek, 49°40'N, 115°21'W, British Columbia, loc. 43941; collected by G.B. Leech, 1960.



Early Ordovician fossils

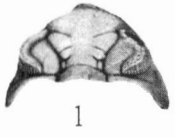


Late Cambrian fossils

PLATE IV

MIDDLE AND LATE ORDOVICIAN FOSSILS

- Figs. 1, 7. Calyptraulax sp., hypotypes 16872 and 16873, from Sunblood Formation, Sunblood Mountain, South Nahanni River, District of Mackenzie, loc. 32936; collected by B.R. Pelletier, 1957.
- Fig. 2. Cybeloides sp., hypotype 16874, from Sunblood Formation, loc. 32936; as for Fig. 1.
- Figs. 3, 9. Öpikina sp., hypotypes 16876 (exterior view) and 16875 (interior view), both brachial valves, from Sunblood Formation, loc. 32936; as for Fig. 1.
- Figs. 4-6. cf. Doléroides sp., hypotypes 16877 (pedicle valve exterior), 16878 (brachial valve interior), and 16879 (pedicle valve interior), from Sunblood Formation, loc. 32936; as for Fig. 1.
- Fig. 8. Climacograptus bicornis (Hall); figure adapted from Bulman (1955). The genus ranges from Early Ordovician to Early Silurian but this species with the proximal horn-like spines seems indicative of late Middle Ordovician time in Western Canada.
- Figs. 10-13. Hesperorthis sp., hypotypes 16880 (brachial valve interior), 16881 (pedicle valve interior), (pedicle valve exterior), and 16882 (pedicle valve and rear view), from Sunblood Formation, loc. 32936; as for Fig. 1.
- Figs. 14, 15. Maclurites cf. M. magnus Lesueur, hypotypes 16883 and 16884, from Sunblood Formation, Virginia Falls, South Nahanni River, District of Mackenzie, loc. 32939; collected by B.R. Pelletier, 1957.
- Figs. 16, 17. Armenoceras saxosum Foerste, siphuncle, holotype 8744, from Stony Mountain Formation, Stony Mountain, Manitoba. This is the only Late Ordovician fossil on Plate IV, all the others are Middle Ordovician.



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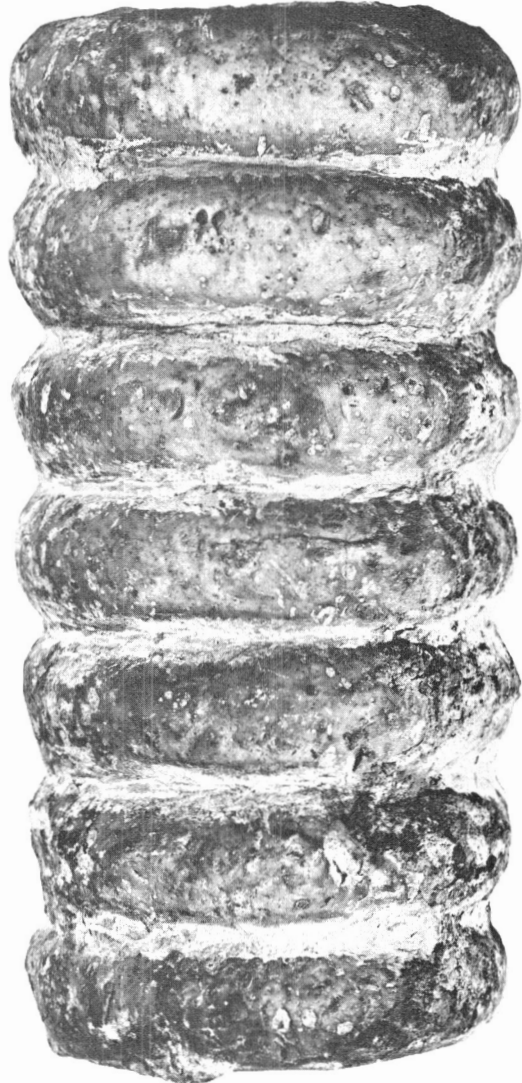
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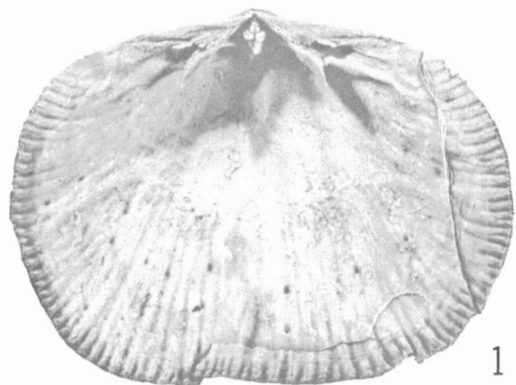
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PLATE V

MIDDLE AND LATE ORDOVICIAN FOSSILS

- Fig. 1. Dinorthis rockymontana Wilson, brachial valve interior, enlarged X 2, hypotype 16885, from Beaverfoot-Brisco Formation, 17-40 feet above base, Cirrus Mountain, Banff Park, Alberta, loc. 42026; collected by B.S. Norford, 1960.
- Fig. 2. Favistina alveolata stellaris (Wilson), hypotype 16886, from Beaverfoot-Brisco Formation, 49°48.5'N, 115°10.1'W, ridge 2 1/2 miles north of mouth of Quinn Creek, loc. 43940; collected by G.B. Leech, 1960.
- Figs. 3-5. Strophomena planumbona (Hall), hypotypes SUI 1846, pedicle valve interior, enlarged X 2, SUI 1845, lateral and pedicle views, from Brainard Member of Maquoketa Formation, Auburn, Iowa. Figures from Wang (1949).
- Fig. 6. Lambeoceras armstrongi Flower, longitudinal section of unnumbered holotype NMBMMR, from Second Value Formation, Cooks Range, New Mexico. Figure from Flower (1957).
- Fig. 7. Lambeoceras lambei (Whiteaves), holotype 1872, reduced X 1/2 and in part longitudinally sectioned, from Red River Formation, East Selkirk, Manitoba; collected by L.M. Lambe, 1880.
- Fig. 8. Fusispira angusta Ulrich and Scofield, hypotype 13247, from Ottawa Formation, Hull, Quebec; collected by G.W. Sinclair, 1927. Similar species are present in western Middle Ordovician rocks.
- Fig. 9. Lambeoceras rotundum Flower, longitudinal section through apical part of unnumbered holotype NMBMMR, from Second Value Formation, southern end of Franklin Mountains, Texas. Figure from Flower (1957).



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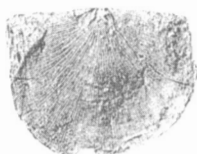
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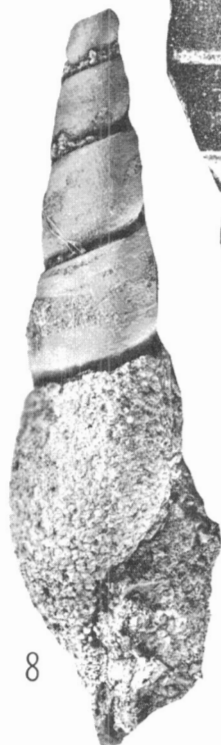
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PLATE VI

LATE ORDOVICIAN CORALS

- Fig. 1. Catenipora rubra Sinclair and Bolton, hypotype 16905a, transverse section, from unnamed formation, Carcajou River Canyon, District of Mackenzie, loc. 7244; collected by G.S. Hume, 1922. A common species in the northern cordillera and closely related to C. robustus which is found in beds of a similar age in the south.
- Figs. 2, 3. Catenipora robustus (Wilson), hypotypes 16906 and 16907, transverse sections by transmitted and reflected light, from Beaverfoot-Brisco Formation, 17-40 feet above base, Cirrus Mountain, Banff Park, Alberta, loc. 42018; collected by B.S. Norford, 1960.
- Figs. 4, 10. Catenipora sp., hypotypes 16908 and 16909, longitudinal and transverse sections, from unnamed formation, ridge north of lower part of Point Creek, 55°27'N, 123°18'W, Pine Pass map-area, British Columbia, loc. 42163; collected by J.E. Muller, 1960. The genus is abundant in Late Ordovician rocks but also occurs in the Middle Ordovician and Silurian.
- Figs. 5, 9. Palaeophyllum sp., hypotypes 16910 and 16911, transverse and longitudinal sections, from Mount Kindle Formation, 745-950 feet above assumed base, Mount Kindle, District of Mackenzie, loc. 32960; collected by B.R. Pelletier, 1957.
- Figs. 6, 7. Sarcinula sp., hypotypes 16912 and 16913, transverse and longitudinal sections, from Mount Kindle Formation, loc. 32960; as for Fig. 5.
- Figs. 8, 15. Manipora sp., hypotypes 16914 and 16915, longitudinal and transverse sections, from basal part of middle member of Whittaker Formation, 10 miles west of Iverson Lake, District of Mackenzie, loc. 32632; collected by W.B. Brady, 1957.
- Fig. 11. Manipora sp., hypotype 16916, transverse section, from Mount Kindle Formation, loc. 32960; as for Fig. 5. This genus differs from Catenipora by doubling of some ranks of corallites and by the presence of favositid patches in parts of the corallum.
- Figs. 12, 16. Bighornia parva Duncan, side view of paratype USNM 124801 and enlarged X 3 view of calyx of holotype USNM 127574, from shaly beds at top of Bighorn Dolomite, Rock Creek, Wyoming. Figures from Duncan (1957). The genus is widespread in the cordillera and has been collected from Alberta, British Columbia, and the Yukon Territory.
- Figs. 13, 14. Streptelasma prolongatum Wilson, hypotype 16917, calyx and side views, from Beaverfoot-Brisco Formation, 17-40 feet above base, Cirrus Mountain, Banff Park, Alberta, loc. 42026; collected by B.S. Norford, 1960.

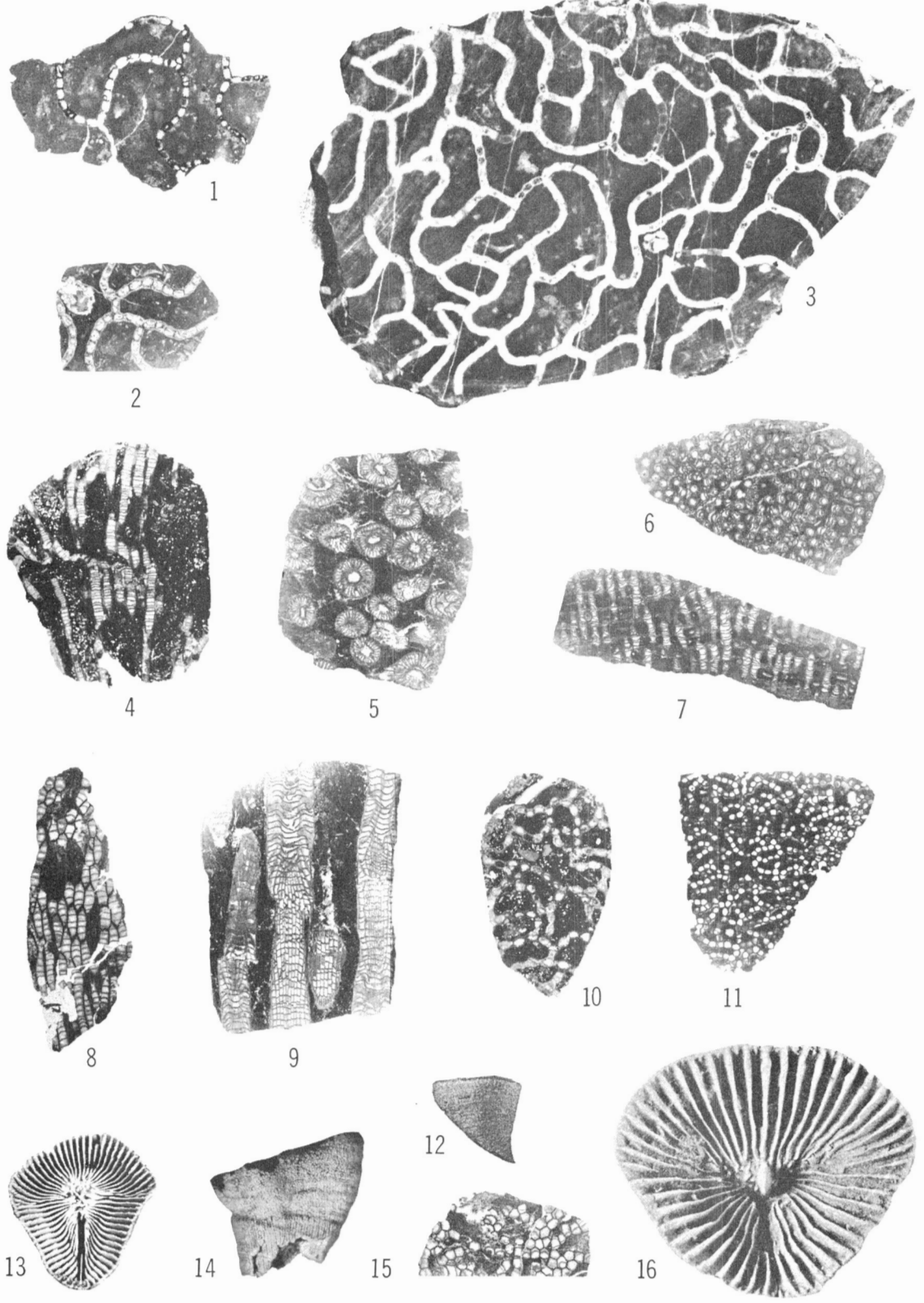


PLATE VII

LATE ORDOVICIAN FOSSILS

- Figs. 1-7. Thaerodonta sp. aff. T. saxea (Sardeson), hypotypes 16887, Figs. 1, 2, 3, 6, 7, brachial, pedicle, side, rear, and front views; 16888, Fig. 4, brachial valve interior; and 16889, Fig. 5, pedicle valve interior, from Beaverfoot-Brisco Formation, 17-40 feet above base, Cirrus Mountain, Banff Park, Alberta, loc. 42017; collected by B.S. Norford, 1960.
- Fig. 8. Dinorthis columbia Wilson, hypotype 16890, brachial valve interior, from lower beds of Beaverfoot-Brisco Formation, Palliser Pass, southeast British Columbia, loc. 7561; collected by J.R. Marshall, 1923.
- Fig. 9. Dinorthis cf. D. rockymontana Wilson, hypotype 16891, brachial valve interior, from lower beds of Beaverfoot-Brisco Formation, 49°49'N, 115°26'W, southeast British Columbia, loc. 32302; collected by G.B. Leech, 1957.
- Figs. 10-15. Dinorthis columbia Wilson, hypotype 16892, brachial, pedicle, rear, front, and side views, from Beaverfoot-Brisco Formation, 17-40 feet above base, Cirrus Mountain, Banff Park, Alberta, loc. 42026; collected by B.S. Norford, 1960.
- Fig. 12. Dinorthis columbia Wilson, hypotype 16893a, pedicle valve interior, from lower beds of Beaverfoot Formation, Palliser Pass, southeast British Columbia, loc. 7563; collected by J.R. Marshall, 1923.
- Figs. 16-20. Rhynchotrema kananaskia Wilson, holotype 6749, brachial front, rear, side, and pedicle views, from lower beds of Beaverfoot-Brisco Formation, Palliser Pass, southeast British Columbia, loc. 7628; collected by J.R. Marshall, 1923.
- Fig. 21. Dinorthis rockymontana Wilson, hypotype 16894, side view, Beaverfoot-Brisco Formation, 59 feet above base, Hatch Creek section, 3 miles northeast of Harrogate, southeast British Columbia, loc. 8045; collected by C.S. Evans, 1932.
- Figs. 22-25, 35. Rhynchotrema windermeris Wilson, hypotype 16895, Figs. 22, 24, brachial and rear views; hypotype 16896, Figs. 23, 25, 35, front and side views, and showing internal view of hinge, from lower beds of Beaverfoot-Brisco Formation, Mount Coleman, Banff Park, Alberta, loc. 20014; collected by P. Harker, 1951.
- Fig. 26. Petroria rugosa Wilson, hypotype 16897, interior of pedicle valve enlarged X 2, from Beaverfoot-Brisco Formation, 17-40 feet above base, loc. 42017; as for Fig. 1.
- Figs. 27-29. Lepidocyclus laddi Wang, holotype SUI 1828, brachial, front, and side views, from upper part of Elgin Member, Maquoketa Formation, Winneshiek County, Iowa. Figures from Wang (1949).
- Fig. 31. Dinorthis columbia Wilson, hypotype 16898, enlarged X 2 view of front of brachial valve, from Beaverfoot-Brisco Formation, 260 feet above base, Hatch Creek section, 3 miles northeast of Harrogate, southeast British Columbia, loc. 8050; collected by C.S. Evans, 1932.
- Figs. 30, 32, 33. Platystrophia equiconvexa Wang, holotype SUI 1823, side, pedicle, and front views, from upper part of Elgin Member, Maquoketa Formation, Winneshiek County, Iowa. Figures from Wang (1949).
- Fig. 34. Dicellograptus morrissi Hopkinson, figure enlarged X 2, adapted from Bulman (1955). The genus ranges from Middle to Late Ordovician but is more common in the Late Ordovician. Confusion is possible with Isograptus (Plate III, Fig. 5) but the thecae are more complex in Dicellograptus.
- Fig. 36. Palaeophyllum sp., hypotype 16899, from Beaverfoot-Brisco Formation, 17-40 feet above base, Cirrus Mountain, Banff Park, Alberta, loc. 42018; collected by B.S. Norford, 1960. This shows a typical weathered corallum; orientated sections of the genus are shown by Plate VI, Figs. 5 and 9.
- Fig. 37. Dicranograptus nicholsoni Hopkinson, figure enlarged X 2, adapted from Bulman (1955); a Middle and Late Ordovician genus.

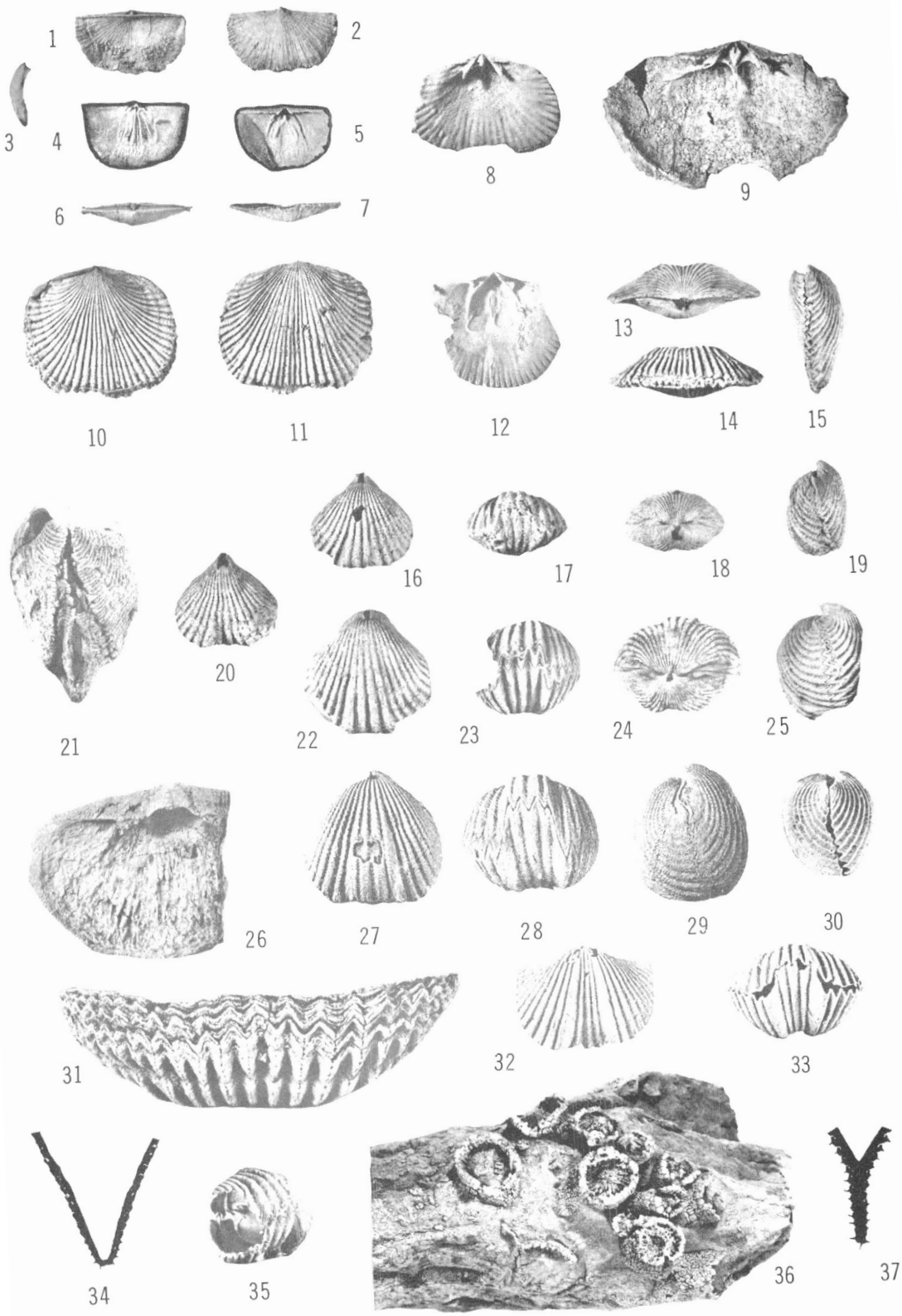
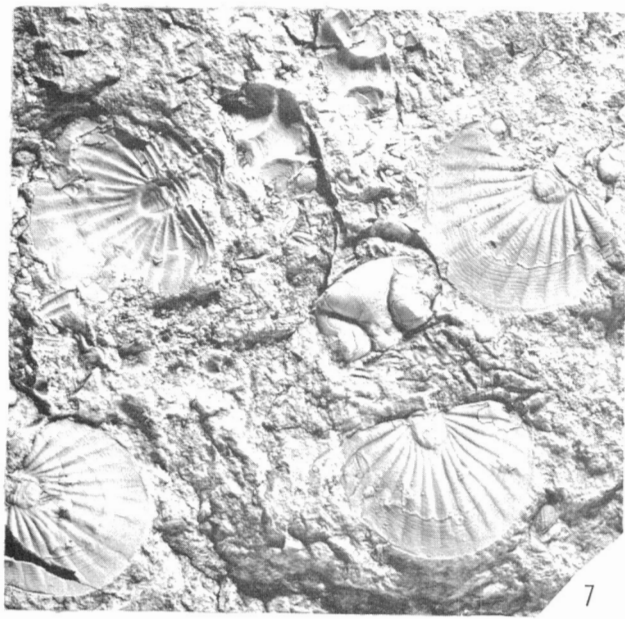


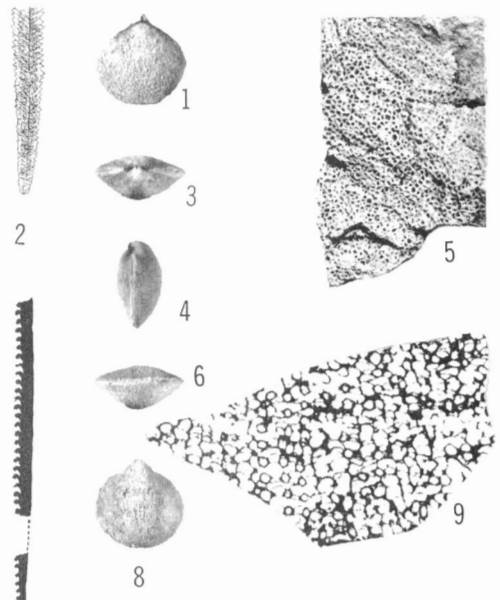
PLATE VIII

EARLY AND MIDDLE SILURIAN FOSSILS

- Figs. 1, 3, 4, 6, 8. Glassia variabilis Whiteaves, hypotype 16900, brachial rear, lateral, front, and pedicle views, enlarged X 2, from unnamed formation, 55° 27'N, 123° 23'W, Pine Pass map-area, British Columbia, loc. 42157; collected by J.E. Muller, 1960. The species is associated with Early Silurian graptolites at Prong Creek in the Yukon Territory but may range up into the Middle Silurian.
- Fig. 2. Retiolites (Stomatograptus) grandis grandis Suess, figure adapted from Bouček and Münch (1943). This graptolite and the others of Figs. 10, 13, and 15 are widespread in the Lower Silurian graptolitic facies.
- Fig. 5. Multisolenia confluens Stearn, holotype 10412, from Fisher Branch Dolomite (Lower Silurian), Seven Mile Point, Atikameg Lake, Manitoba; collected by C.W. Stearn, 1951.
- Fig. 7. Scutellum borealis (Poulsen), hypotype 15411, from Lower Silurian beds of Road River Formation, Prong Creek, 65° 17'N, 135° 45'W, Yukon Territory; collected by P.A. Ziegler, 1960.
- Fig. 9. Multisolenia tortuosa Fritz, longitudinal section, enlarged X 3, hypotype 10485, from Cross Lake Member, Cedar Lake Dolomite (Middle Silurian), Cross Lake, Manitoba; collected by C.W. Stearn, 1951.
- Fig. 10. Monograptus spiralis spiralis (Geinitz), figure adapted from Pribyl (1944).
- Fig. 11. Pentamerus sp., hypotype 16901, interior of broken pedicle valve, from lower 15 feet of coralline member of Sandpile Group, elevation 4,800 feet, 59° 02' 1/2'N, 128° 07' 1/2'W, McDame map-area, British Columbia, loc. 35168; collected by B.S. Norford, 1957.
- Fig. 12. Murchisonia sp., hypotype 16902, from unnamed formation, 55° 27'N, 123° 23'W, Pine Pass map-area, British Columbia, loc. 42158; collected by J.E. Muller, 1960.
- Fig. 13. Monograptus priodon (Bronn), figure adapted from Bulman (1955). This species is present in upper Lower and lower Middle Silurian graptolitic facies.
- Fig. 14. Encrinurus cf. E. princeps Poulsen, hypotype 16903, pygidium, from 64° 47'N, 135° 07'W, Yukon Territory, loc. 47061; collected by L.H. Green, 1961.
- Fig. 15. Monograptus turriculatus (Barrande), figure adapted from Bulman (1955).
- Figs. 16, 19, 20. Virgiana decussata (Whiteaves), Figs. 16, 19, pedicle, and brachial views from Fisher Branch Dolomite (Lower Silurian) Fisher Branch, Manitoba; Fig. 20 from upper part of Mayville Dolomite, Mayville, Wisconsin. Figures from Ehlers and Kesling (1957).
- Fig. 17. Lyellia affinis (Billings), hypotype 10413, from Fisher Branch Dolomite (Lower Silurian), Grand Rapids, Manitoba; collected by J.B. Tyrrell.
- Fig. 18. Pentamerus sp., from Schoolcraft Dolomite (Middle Silurian), Mackinac County, Michigan. Figure from Ehlers and Kesling (1957). The figure shows the lower surface of a bed and gives a sea-floor view of a cluster of brachiopods.



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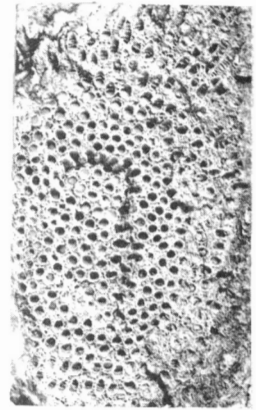
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PLATE IX

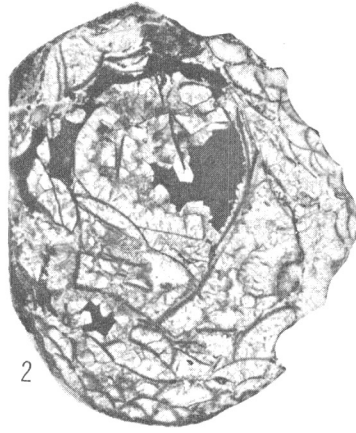
EARLY TO MIDDLE SILURIAN CORALS

These fossils are all from the upper part of the Sandpile Group and are either early Middle or late Early Silurian in age.

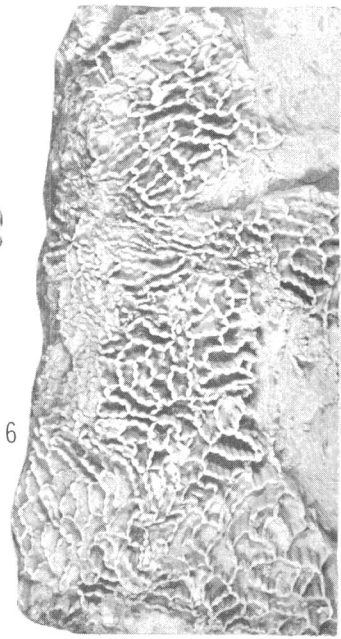
- Fig. 1. Halysites sp. 1, hypotype 14484, from coralline member of Sandpile Group, elevation 5,100 feet, 59° 03'N, 128° 11'W, McDame map-area, British Columbia, loc. 35170; collected by B.S. Norford, 1958.
- Fig. 2. Cystiphyllum sp., hypotype 15770a, transverse section, from lower 10 feet of coralline member of Sandpile Group, elevation 6,100 feet, 59° 04'N, 128° 11'W, McDame map-area, British Columbia, loc. 38278; collected by B.S. Norford, 1957.
- Fig. 3. Cystihalysites cf. C. magnitubus (Buehler), hypotype 15757c, longitudinal section, from lower 20 feet of coralline member of Sandpile Group, elevation 6,300 feet, 59° 04'N, 128° 11'W, McDame map-area, British Columbia, loc. 35166; collected by B.S. Norford, 1958.
- Fig. 4. Heliolites cf. H. megastoma (M'Coy), hypotype 15816, from lower 15 feet of coralline member of Sandpile Group, elevation 4,800 feet, 59° 02 1/2'N, 128° 07 1/2'W, McDame map-area, British Columbia, loc. 35168; collected by B.S. Norford, 1957.
- Figs. 5, 9. Fletcheria sp. 1, hypotypes 14489a and 14489b, longitudinal and transverse sections from the same corallum, from coralline member of Sandpile Group, loc. 35170; as for Fig. 1.
- Fig. 6. Halysites sp. 2, hypotype 14485, from lower 40 feet of coralline member of Sandpile Group, elevation 6,200 feet, 58° 59'N, 128° 00'W, Cry Lake map-area, British Columbia, loc. 35164; collected by B.S. Norford, 1958.
- Figs. 7, 12. Halysites nitida Lambe, hypotypes 15825a and 15825. Fig. 7 shows a longitudinal section enlarged X 4 from the corallum shown by Fig. 12, from about 1,000 feet above base of Sandpile Group, elevation 5,800 feet, 58° 48'N, 127° 57'W, Kechika map-area, British Columbia, loc. 35167; collected by B.S. Norford, 1958.
- Fig. 8. Fletcheria sp. 2, hypotype 16904, from lower 40 feet of coralline member of Sandpile Group, loc. 35164; as for Fig. 6. The cross at bottom-centre of the illustration is a site of the quadripartite increase characteristic of the genus.
- Fig. 10. Coenites rectilineatus (Simpson), hypotype 15821, from lower 15 feet of coralline member of Sandpile Group, loc. 35168; as for Fig. 4.
- Fig. 11. Favosites discoideus (Roemer), hypotype 15822, from upper 20 feet of coralline member of Sandpile Group, elevation 5,400 feet, 59° 03 1/2'N, 128° 10'W, McDame map-area, British Columbia, loc. 35169; collected by B.S. Norford, 1957.
- Fig. 13. Favosites favosus (Goldfuss), hypotype 15850, from coralline member of Sandpile Group, loc. 35170; as for Fig. 1.



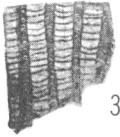
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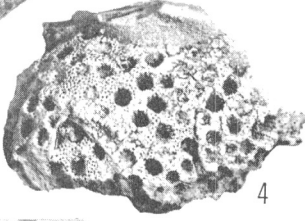
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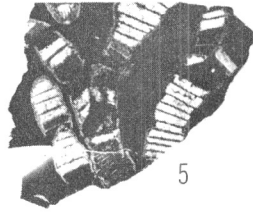
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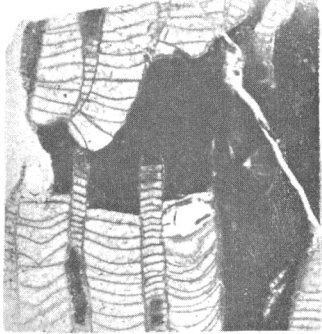
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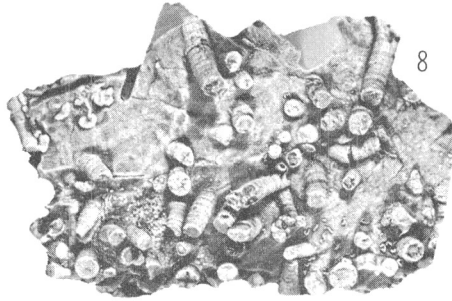
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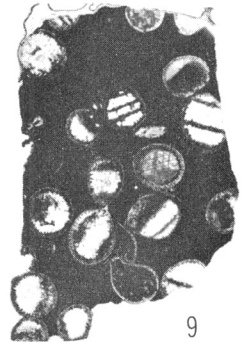
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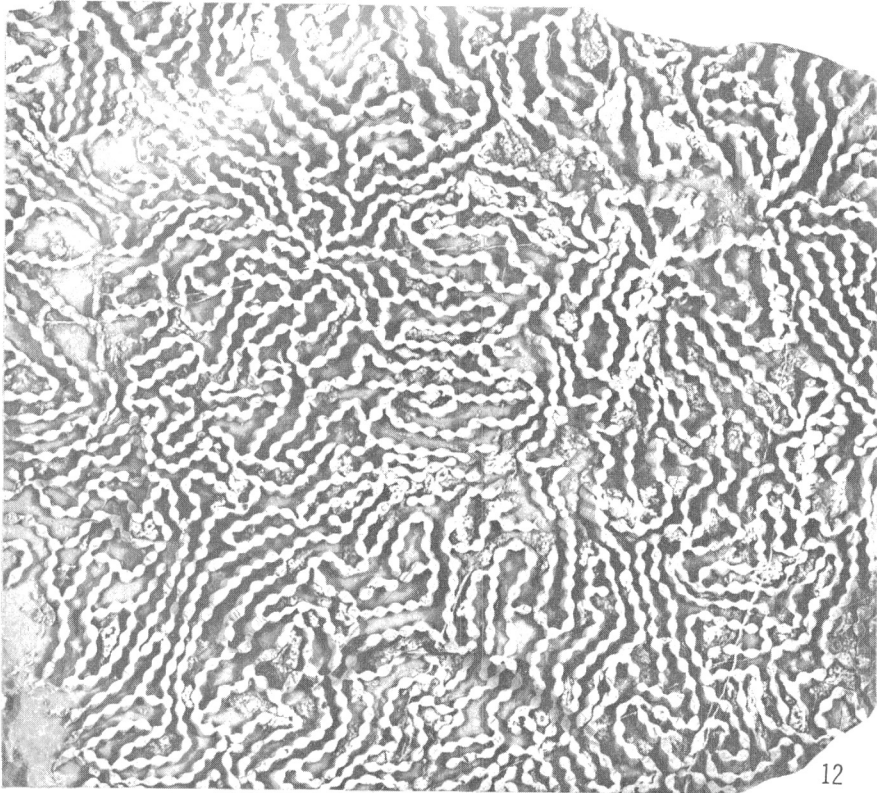
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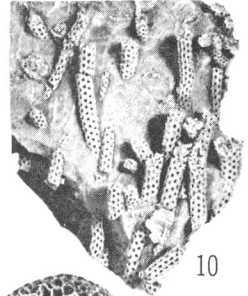
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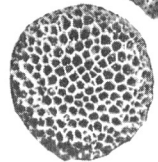
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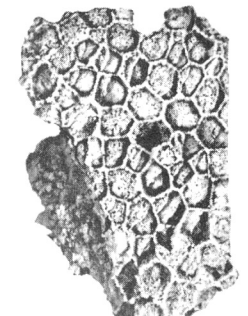
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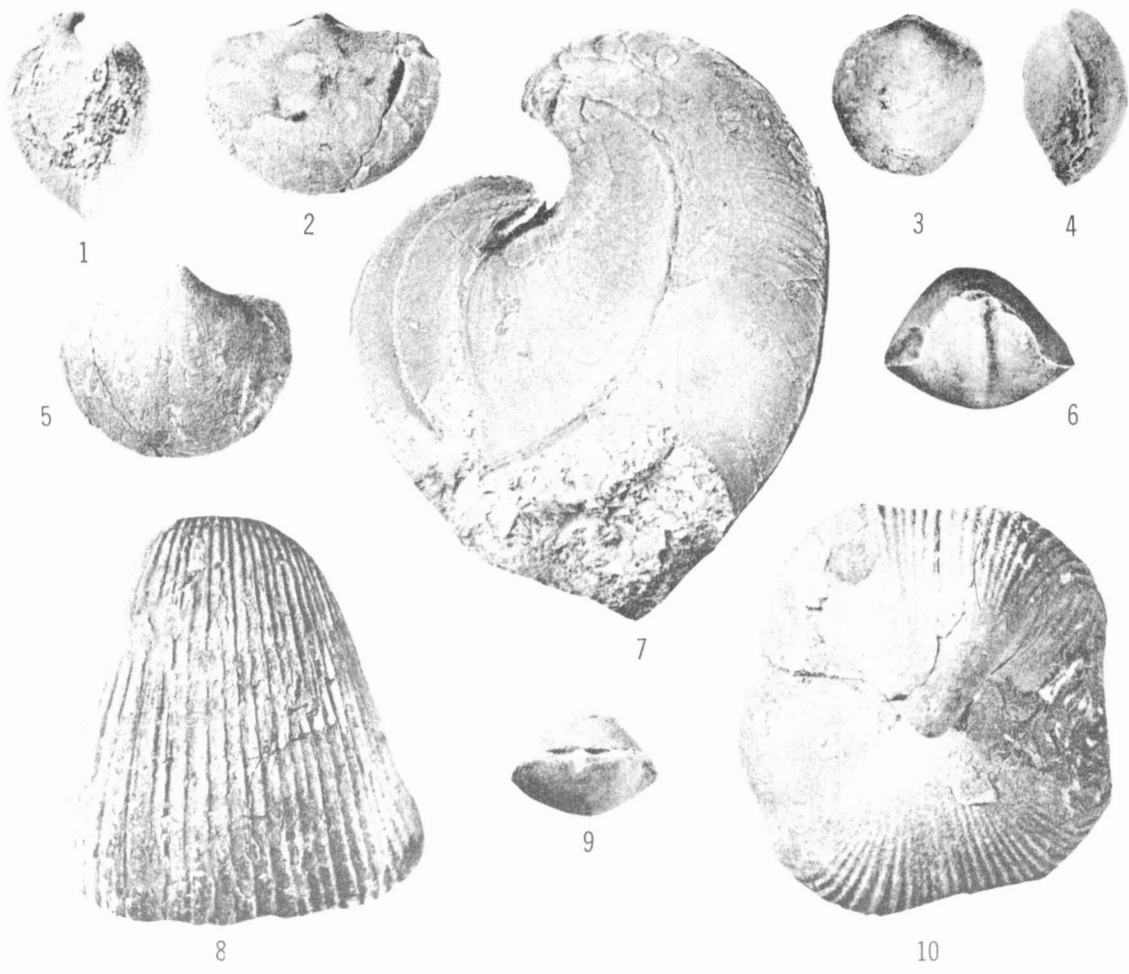
PLATE X

LATE SILURIAN FOSSILS

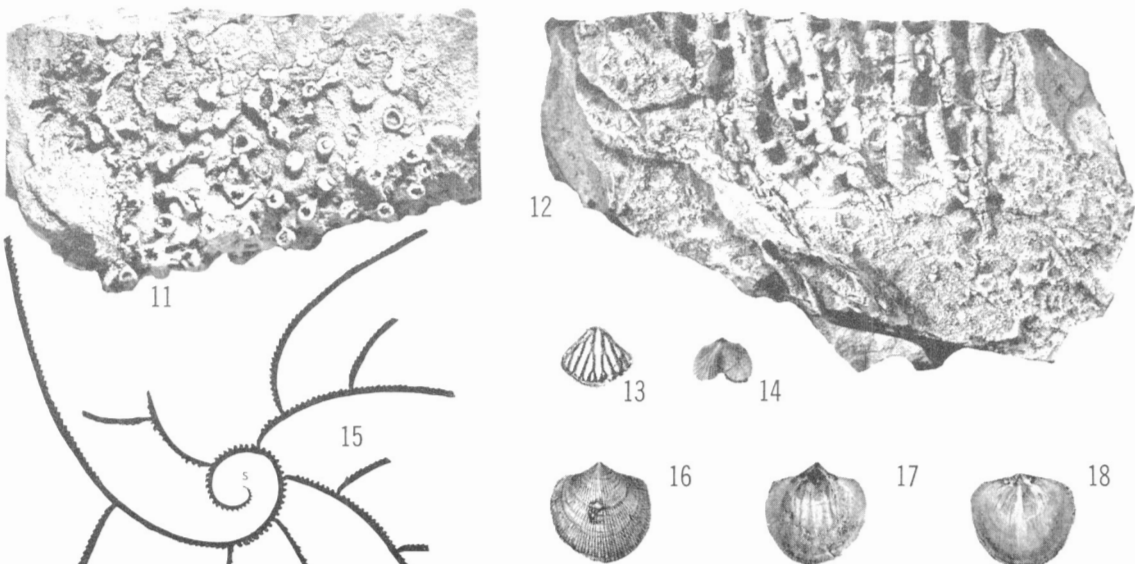
- Figs. 1, 2, 5. Alaskospira dunbari Kirk and Amsden, enlarged views X 2 of paratype USNM 116590, and brachial and pedicle aspects of holotype USNM 116589, from south shore of Kosciusko Island, southeast Alaska, USGS loc. 1005; collected by Edwin Kirk, 1917. Figures from Kirk and Amsden (1952).
- Figs. 3, 4, 6, 9. Atrypella scheii (Holtedahl)?, brachial, lateral, front, and rear views of hypotypes USNM 116578, 116573, 116575, and 116573, from east end of Heceta Island, southeast Alaska, USGS loc. 1019; collected by Edwin Kirk, 1917. Figures from Kirk and Amsden (1952).
- Figs. 7, 8, 10. Conchidium alaskense Kirk and Amsden, natural longitudinal section of paratype USNM 116566, pedicle view (reduced X 1/2) of holotype USNM 116567, rear view of paratype USNM 116563, from north shore of Heceta Island, southeast Alaska, USGS loc. 983; collected by Edwin Kirk, 1917. Figures from Kirk and Amsden (1952).

MIDDLE AND LATE EARLY SILURIAN FOSSILS

- Figs. 11, 12. Syringopora verticillata Goldfuss, hypotype 15827, from lower 40 feet of coralline member of Sandpile Group, elevation 6,200 feet, 58°59'N, 128°00'W, Cry Lake map-area, British Columbia, loc. 35164; collected by B.S. Norford, 1958.
- Fig. 13. Petalocrinus mirabilis Weller and Davidson, hypotype 16919, from coralline member of Sandpile Group, elevation 5,100 feet, 59°03'N, 128°11'W, McDame map-area, British Columbia, loc. 35170; collected by B.S. Norford, 1958. The arms are fused in this genus to form five arm-fans that surround the calyx; the illustration shows a single discrete arm-fan with the ambulacral grooves visible on the ventral surface.
- Fig. 14. Dicoelosia cf. D. biloba (Linnaeus), hypotype 15788, brachial view, enlarged X 2, from coralline member of Sandpile Group, loc. 35170; as for Fig. 13.
- Fig. 15. Cyrtograptus purchisoni Carruthers; figures adapted from Bulman (1955). This genus is restricted to the Middle Silurian. Figs. 11-14 and 16-18 are of fossils from the coralline member of the Sandpile Group that is either early Middle or late Early Silurian.
- Figs. 16-18. Atrypa sp., hypotypes 16918a and 16918b, pedicle valve exterior, pedicle valve interior, brachial valve interior, from the same individual, from coralline member of Sandpile Group, loc. 35170; as for Fig. 13.



Late Silurian fossils



Middle and late Early Silurian fossils

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