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PAPER 64-11

ILLUSTRATIONS OF CANADIAN FOSSILS

LOWER CRETACEOUS MARINE INDEX FOSSILS OF THE SEDIMENTARY BASINS OF WESTERN AND ARCTIC CANADA

(Report, 36 plates and 1 table)

J. A. Jeletzky

1964

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By

J.A. Jeletzky

D E P A R T M E N T O F

M I N E S A N D T E C H N I C A L S U R V E Y S

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CONTENTS

Illustrations

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LOWER CRETACEOUS MARINE INDEX FOSSILS OF THE SEDIMENTARY BASINS OF WESTERN AND ARCTIC CANADA

INTRODUCTION

This report illustrates the Lower Cretaceous marine index fossils of the sedimentary basins of the western interior region of Canada - which includes the eastern Cordillera as well as the Interior Plains - and of the Canadian Arctic Archipelago. In Cretaceous time these two regions formed part of the same structural province (Jeletzky, 1961b, pp. 578-582, fig. 23), and their Lower Cretaceous marine faunas are consequently almost identical, and can conveniently be treated together. They are distinct from those of the western Canadian Cordillera, whose index fossils and zones are treated separately (e.g. Jeletzky, 1964).

Thick sequences of the early and/or mid-Lower Cretaceous (i.e., Neocomian or Berriasian to Aptian) marine sedimentary rocks have recently been discovered in the Peace River region, in the Northern Yukon and the northwestern part of the Mackenzie District, and in the Arctic Archipelago. A great many faunas, most of them new to this subcontinent but closely allied to or identical with those of Northern Eurasia, European Arctic, and elsewhere, have been collected from these rocks by the officers of the Geological Survey and others. Only the most diagnostic elements of these Neocomian faunas are illustrated in this interim report compiled in advance of the complete description and illustration of these faunas now being prepared. It is based on a detailed field study of few key sections of the northwestern part of the Mackenzie District and Northern Yukon (Jeletzky, 1958, 1960, 1961a, b) supplemented by the more numerous but often stratigraphically uncertain fossil collections brought in by field geologists. More detailed field work is needed to test and to prove the regional validity of some of the provisional fossil zones proposed for these Neocomian rocks in this report (Table 1). The current interpretation of the taxonomy and morphology of some Neocomian index fossils figured herein may also be subject to later modification.

The late Lower Cretaceous (Albian) part of this report deals, on the contrary, largely with relatively well-known fossils and zones. Much of the pioneer work on the Canadian Albian palaeontology and biochronology was done by McLearn (see list of references in McLearn and Kindle, 1950, pp. 198-199), who first recognized the late Lower Cretaceous age of the faunas concerned and succeeded in unravelling most of the salient features of the Albian geological history

of the western interior region of Canada. McLearn (1944) was, furthermore, the first to publish illustrations and brief descriptions of the most important elements of all then known Albian faunas of this region. His brief summary of the subject is in many respects the prototype of this report.

Further important contributions to the knowledge of Albian palaeontology and biochronology of the western interior region of Canada were made by Warren (1937, 1947), Warren and Stelck (1960, 1961), Stelck (1949, 1952, 1956 (in Mellon and Wall, p. 11), 1958), Stelck et al. (1956), Reeside and Cobban (1960) and others. The recent work of Imlay (1960a, b, 1961) on the closely-allied Albian marine faunas of Alaska proved to be rather useful, particularly for the purpose of dating of some endemic Canadian index fossils and their zones in terms of the international standard stages and zones. The Albian index fossils of the Canadian Arctic Archipelago are illustrated in this report for the first time; most of them are, however, identical with or closely related to those of the Western Interior Region of Canada and the zonal sequence is essentially the same in both regions.

A number of species and at least a few genera (or subgenera) figured in this report are either known or appear to be new. An open nomenclature, such as: "a new genus", "Gastroplites", cf., ex gr., ex aff., n. sp. A., was used for all such species and genera, except for Thorsteinssonoceras ellesmerense n. gen. n. sp. (Pls. VI-VIII, fig. 1). The publication of this manuscript name is justified by the fact that it is erected in a GSC Bulletin which is now in press (Jeletzky, in press). Except where the writer's taxonomic ideas have undergone recent changes, all tentative names used are consistent with those employed for the same fossils in his interdepartmental and external fossil reports and in already-published preliminary reports (Jeletzky, 1958, 1960, 1961a, b).

The empirically-established and/or assumed time ranges (that is the partial or total zones) of the index species figured in this report are summarized in Table 1. These ranges are, generally speaking, compiled on the basis of all reliable Canadian occurrences known to the writer. The Alaskan occurrences of some Canadian species (Imlay, 1960a, b, 1961) have, however, also been taken into account. Broken and queried lines indicate the degree of uncertainty about the age or time range of the fossils concerned. Arrows extending up or down from the zonal compartments of some index fossils indicate that these particular zonal indices are known to range (mostly rarely) somewhat above or below their zones and to mix with the index fossils of adjacent zones. Such associations of index fossils of adjacent zones are valuable biochronological indices in their own right; they do not diminish the zonal value of the fossils concerned as is so often assumed.

Every attempt has been made to give as much detailed information as is known on the stratigraphic and geographic provenance of each specimen figured in this report. The importance of such primary documentation cannot be overstressed. However, because of the need to use all available space for comments on the index fossils themselves, these details have been incorporated in an Appendix.

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Most of the older references have been omitted. They can be found in the bibliographies attached to the preliminary reports of the writer, in the ammonite treatise of Arkell et al. (1957), and the work of McLearn and Kindle (1950), which are included below. Older publications are referred to by author and date in the text and plate descriptions.

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FOSSIL LOCALITIES

Geological Survey of Canada Localities

GSC loc.

5895 Arcthoplites (=Subarcthoplites) aff. belli (McLearn, 1944), and Arcthoplites (Cymahoplites) cf. aburense (Spath, 1933). Early middle Albian. Beudanticeras affine zone, Arcthoplites mcconnelli subzone. Talus at Brûlé Rapids, on Athabasca River, Alberta, probably from the Clearwater Formation. Collected by F.H. McLearn, 1916.

5896 Onestia onestiae McLearn, 1933. Early middle Albian. Beudanticeras affine zone, Arcthoplites mcconnelli subzone. Talus just below Brûlé Rapids, north bank of Athabasca River, Alberta, probably from the Clearwater Formation. Collected by F.H. McLearn, 1916.

5897 Arctica limpidiana McLearn, 1933, and Onestia onestiae McLearn, 1931. Early middle Albian. Beudanticeras affine zone, Arcthoplites mcconnelli subzone. Clearwater Formation; from a 7-foot layer, 9 feet above Athabasca River, Alberta, on the east bank 3 miles below Brûlé Rapids. Collected by F.H. McLearn, 1916.

5903 Inoceramus dowlingi McLearn, 1919. Early middle Albian. Beudanticeras affine zone, Arcthoplites mcconnelli subzone. From greenstone and red-weathering slate talus, 14 miles below Brûlé Rapids, Athabasca River, Alberta, probably from the Clearwater Formation. Collected by F.H. McLearn, 1916.

5995 Posidonia? nahwisi (McLearn, 1931) f. typ. Early to middle upper Albian. Neogastroplites zone, N. selwyni or N. cornutus subzone. Shaftesbury Formation, on north bank of Peace River, east of Cache Creek, Alberta. Collected by F.H. McLearn, 1917.

13122 Buchia volgensis (Lahusen, 1888), Upper Berriasian, Buchia volgensis zone. Northern Richardson Mountains, N.W.T., on Martin Creek, about 1 3/5 miles west of the junction with Donna River, lat. 68°12', long. 135°34'. Collected from the Buff Sandstone Member of the Lower Sandstone Division of Jeletzky (1958, pp. 7, 8) in the writer's opinion. Collected by J.H. Manning of the Mobil Oil Company of Canada Ltd., 1946.

GSC loc.

13125 Various Buchia species. Upper Berriasian to Middle or Upper Valanginian? Buchia volgensis to Buchia n. sp. aff. inflata zones. Northern Richardson Mountains, N.W.T., on Aucella Creek, about 1 6/10 miles southwest from the middle of Lake Anford, lat. 68°29', long. 135°52'. Judging by the known time ranges of the various Buchia species represented, they were collected indiscriminately from the beds of the Buff and White Sandstone Members of the Lower Sandstone Division, as restricted by Jeletzky, (1958, pp. 5, 6). The specimens concerned are figured under Buchia volgensis (Pl. IV, fig. 6) and Buchia n. sp. aff. inflata zones. Collected by J.H. Manning of the Mobil Oil Company of Canada Ltd., 1946.

13781 Neogastroplites cornutus (Whiteaves, 1885) var. D of Reeside and Cobban (1960). Middle upper Albian. Neogastroplites zone, N. cornutus subzone. Fort St. John Group, at confluence of Halfway and Cameron Rivers, British Columbia. Collected by A.J. Goodman, 1947.

13782 Neogastroplites cornutus (Whiteaves, 1885) var. E of Reeside and Cobban (1960). Middle upper Albian. Neogastroplites zone, N. cornutus subzone. Fort St. John shales, one mile above mouth of Cameron River, British Columbia. Collected by A.J. Goodman, 1947.

14006 Neogastroplites cornutus (Whiteaves, 1885) var. E of Reeside and Cobban (1960). Middle upper Albian. Neogastroplites zone, N. cornutus subzone. Nodules in sandy shale of the Fort St. John Group, Wapiti and Murray Rivers area, British Columbia, approximately 2 miles west of long. 120°30'00", and 2 miles north of lat. 54° 35'00". Collected by O.A. Erdman, Gulf Research and Development Company, 1946.

14721 Neogastroplites? sp. indet. Upper Albian. Neogastroplites zone, possibly N. cornutus subzone. Fourth sandstone of Sikanni Formation, on right bank of Sikanni River, three miles east of Alaska Highway bridge; northeastern British Columbia. Collected by L.D. Burling, 1944.

14737 Posidonia? nahwisi (McLearn, 1931) var. goodrichensis (McLearn, 1943). Early to middle upper Albian. Neogastroplites zone, N. selwyni or N. cornutus subzone. Third Sandstone of Sikanni Formation, at Milestone 163 on Alaska Highway, British Columbia. Collected by L.D. Burling, 1944.

GSC loc.

14752 Posidonia? nahwisi (McLearn, 1931) var. goodrichensis (McLearn, 1943). Early to middle upper Albian. Neogastroplites zone, N. selwyni or N. cornutus subzone. First Sandstone of Sikanni Formation, one mile south of confluence of Cypress and Halfway Rivers, British Columbia. Collected by L.D. Burling, 1944.

14757 Neogastroplites selwyni (McLearn, 1933) (N. haasi Reeside and Cobban, 1960). Early upper Albian. Neogastroplites zone, N. selwyni subzone. Basal sandstone (First Sandstone) of Sikanni Formation, where Kobe Creek anticline crosses Halfway River, on left bank a few miles downstream from mouth of Graham River; northeastern British Columbia. Collected by L.D. Burling, 1944.

14764 Aucellina gryphaeoides (J. de C. Sowerby, 1836). Early middle Albian. Beudanticeras affine zone, Arcthoplites irenense or Arcthoplites mcconnelli subzone. 50 feet below seaweed layer of Buckinghorse Formation, Fort St. John Group; just east of Bullhead anticline, 8 1/2 miles north of bridge, on left bank of Sikanni River, British Columbia. Collected by L.D. Burling, 1944.

14805 or 14809 Posidonia? nahwisi (McLearn, 1931) var. goodrichensis (McLearn, 1943). Early to middle upper Albian. Neogastroplites zone, N. selwyni and N. cornutus subzones. Bank of creek entering Sikanni Chief River from the right, 3 miles east of Alaska Highway bridge, northeastern British Columbia. Collected by L.D. Burling, 1944.

14999 Dichotomites cf. giganteus (Imlay, 1960). Middle Valanginian. Polyptychites ex. aff. keyserlingi zone or Buchia n. sp. aff. inflata zone. Northeastern British Columbia, Peace River Foothills, Carbon Creek area, west slope of Mount Monteith, Marine Bullhead Group. Probably from the lower part of the Beattie Peaks Formation.

17300 Neogastroplites maclearni Reeside and Cobban, 1960. Late upper Albian. Neogastroplites zone, N. maclearni subzone. 217 feet above base of shale of Fort St. John Formation, about 30 feet north of the bed of Pearl Creek, and about 1,900 feet from confluence of Pearl Creek and Sulphur River, Grande Cache map-area, Alberta. Collected by R. Thorsteinsson, 1947.

GSC loc.

18306 Cleoniceras cf. tailleuri Imlay, 1960. Early middle Albian. Beudanticeras affine zone, Arcthoplites mcconnelli subzone. Peace River Formation; NW 1/4, sec. 26 or NE 1/4, sec. 27, tp. 87, rge. 20, W.5th mer.; northeast side of Peace River, and near base of Section 8; northwestern Alberta. Collected by R.T.D. Wickenden, 1949.

18318 Beudanticeras? glabrum (Whiteaves, 1889). Late lower or early middle Albian. Beudanticeras affine zone. Peace River Formation; southeast side of Peace River in SW 1/4, sec. 28, tp. 93, rge. 20, W.5th mer., Alberta. Collected by R.T.D. Wickenden, 1949.

21897 Acroteuthis (a new genus?)? n. sp. A. Middle or Upper Valanginian. Polyptychites stubbendorfi zone or Dichotomites quatsinoensis zone. Canadian Arctic Archipelago, Division of Franklin, N.W.T., Ellef Ringnes Island, 4 miles northeast of the Meteorological Station, Deer Bay Formation. Collected by W.W. Heywood, 1952.

21899 Dichotomites quatsinoensis (Whiteaves, 1882). Upper Valanginian, Dichotomites quatsinoensis zone. Canadian Arctic Archipelago, District of Franklin, Ellef Ringnes Island, Deer Bay map-area, 5 miles up Delta River, Deer Bay Formation. Estimated to be from 50 to 100 feet below the top of the formation, according to W.W. Heywood (personal communication). Collected by W.W. Heywood, 1952.

21901 Buchia aff. sublaevis (Keyserling, 1846) s. lato. Upper Valanginian? Dichotomites quatsinoensis zone. Canadian Arctic Archipelago, District of Franklin, Ellef Ringnes Island, Deer Bay map-area, 4 miles northwest of Meteorological Station, Deer Bay Formation, probably near the top of the formation (W.W. Heywood, personal communication). Collected by W.W. Heywood, 1952.

24021 Buchia inflata (Toula, 1874) var. majuscula (Tullberg, 1881). Middle or Upper Valanginian, Polyptychites stubbendorfi zone or Dichotomites quatsinoensis zone? Canadian Arctic Archipelago, District of Franklin, Ellef Ringnes Island, Delta River, locality 101, Deer Bay Formation. Collected by W.W. Heywood, 1953.

GSC loc.

24030 Buchia n. sp. aff. inflata (Toula, 1874). Upper Valanginian, or ? Lower Hauterivian, Dichotomites quatsinoensis zone or ? younger. Canadian Arctic Archipelago, District of Franklin, Ellef Ringnes Island, headwaters of Delta River, Isachsen Formation, 50 to 100 feet above base. Collected by W.W. Heywood, 1953.

24075 Tollia (Temnoptychites) grandiosus Voronets, 1962. Lower Valanginian or ? uppermost Berriasian, Tollia (Temnoptychites) novosemelica zone. Canadian Arctic Archipelago, District of Franklin, Ellesmere Island, Slidre Fiord, Reptile Creek, 2 to 2 1/2 miles northwest of the weather station. Reptile Creek Shale (=Deer Bay Formation). Collected by J.C. Troelson, 1952.

24569 Dichotomites cf. giganteus (Imlay, 1960) and Buchia cf. sublaevis (Keyserling, 1845). Middle Valanginian? Polyptychites ex aff. keyserlingi zone or Buchia n. sp. aff. inflata zone? Peace River Foothills, Alberta, about 2 1/2 miles west of Fischer Creek on Hart Highway. Marine Bullhead Group, assigned to the top beds of the Monteith Formation by the collector. However, the writer considers these beds are more likely to represent the conglomeratic phase of the lower part of the Beattie Peaks Formation. Collected by H. Frebold, 1954.

24693 Neogastroplites americanus (Reeside and Weymouth, 1931) vars. A, D, and C of Reeside and Cobban (1960). Late upper Albian. Neogastroplites zone, N. americanus subzone. Fort St. John Formation, on ridge between head of Ziggy Creek and head of Muskeg River, W1/2 Adams Lookout map-area, Alberta. Collected by E.J.W. Irish, 1954.

25502 Sonneratia (s. lato)? n. sp. A. Early lower Albian. Sonneratia (s. lato)? sp. A zone. Near base of Cretaceous on east side of Jackfish River, N.W.T., at about lat. 60° 58'00". Collected by Shell Oil Company, 1954.

25720 Gastroplites (Paragastroplites) spiekeri McLearn, 1931. Late middle Albian. Gastroplites spp. zone. 400 to 500 feet above base of Hasler Formation; 1 mile east of the gates, on north side of Peace River, Charlie Lake map-area, British Columbia. Collected by E.J.W. Irish, 1955.

GSC loc.

25726 Gastroplites (Paragastroplites) flexicostatus Imlay, 1961. Late middle Albian. Gastroplites spp. zone. Near top of Gates Formation, Lynx Creek, Charlie Lake map-area, British Columbia. Collected by E.J.W. Irish, 1955.

25733 Gastroplites cantianus Spath, 1937 var. Late middle Albian. Gastroplites spp. zone. Drift (?) probably from Hasler Formation; concretion lying in bottom of Dry Creek, on north side of Peace River, Charlie Lake map-area, British Columbia. Collected by E.J.W. Irish, 1955.

25883 "Gastroplites" (a new genus?) n. sp. A. Late middle Albian. Gastroplites spp. zone. Within upper 100 feet of top of Christopher Formation; prominent ridge on east side of Amarok River, south side of Strand Fiord, Axel Heiberg Island, N.W.T. Collected by E.T. Tozer, Operation Franklin, 1955.

26171 Tollia (Subcraspedites) aff. suprasubditus (Bogoslovsky, 1909), and Buchia okensis (Pavlow, 1907). Lower Berriasian, Buchia okensis zone. Canadian Arctic Archipelago, District of Franklin, Axel Heiberg Island, section 4, 4 miles southwest of Buchanan Lake. Deer Bay Formation. Collected by J. Souther, 1955.

26299 Buchia keyserlingi (Lahusen, 1883) f. typ. Lower Valanginian or ? uppermost Berriasian, Tollia (Tollia) tolli zone. Canadian Arctic Archipelago, District of Franklin, Axel Heiberg Island, section 11, 4 miles northeast from head of Strand Fiord. Deer Bay Formation. Collected by J. Souther, 1955.

26853 Buchia okensis (Pavlow, 1907) var. subokensis (Pavlow, 1907). Lower Berriasian, Buchia okensis zone. Northern Richardson Mountains, N.W.T., east slope of Aklavik Range, south bank of the southern branch of Fault Creek, some 600 yards above its confluence with the north fork, from bed 8 of section 2 (Jeletzky, 1958, p. 28). Lower Shale-Siltstone Division, upper part of the Lower Member. Collected by J.A. Jeletzky, 1955.

26885 Aucellina n. sp. aff. aptiensis (d'Orbigny) Pompeckj, 1901. Upper Barremian or ? Aptian, unnamed zone C or D. Northern Richardson Mountains, N.W.T., east slope of Aklavik Range, lower part of the rocky spur extending east of the main slope at a point 2 miles south of Bug Lake.

GSC loc.

26885 (cont.) Upper Sandstone Division, exact position within the Division uncertain. Collected by J.A. Jeletzky, 1955.

26911 Acroteuthis cf. conoides Swinnerton, 1937. Middle Hauterivian, unnamed zone A. Northern Richardson Mountains, N.W.T., east slope of Aklavik Range, north bank of the left fork of the northernmost branch of Bug Creek, about 1 3/4 miles north of the lower end of Bug Creek Canyon, collected from the 60-to-70-foot-thick unit of dark grey shale on the west limb of a syncline that crosses the fork at 2025 feet in altitude (barometric). Coal-bearing Division (Jeletzky, 1960, pp. 7-9), 60-to-70-foot-thick shale unit of its Upper Member. Collected by J.A. Jeletzky, 1955.

26915 Buchia volgensis (Lahusen, 1888) s. str. Upper Berriasian, Buchia volgensis zone. Northern Richardson Mountains, N.W.T., east slope of Aklavik Range, south wall of Fault Creek Canyon, about 3/8 mile up from its lower end, collected in bed 34 of section 3 (Jeletzky, 1958, p. 38) about 17 feet above the assigned base of the Lower Sandstone Division, Buff Sandstone Member. Collected by J.A. Jeletzky, 1955.

26919 Crioceratites (Hoplocrioceras) cf. remondi (Gabb, 1864, emend. Anderson, 1938). Berremian (middle?), Crioceratites (Hoplocrioceras) n. sp. aff. laeviusculum zone. Northern Richardson Mountains, N.W.T., east slope of Aklavik Range, top part of a prominent spur of the east slope of Mount Goodenough massif, almost directly due east of the top of Mount Goodenough proper and about 1 mile north of the adjacent part of Goodenough Creek. Upper Shale-siltstone Division, Upper Member, collected from bed 47, section 5 (Jeletzky, 1958, p. 54). Collected by J.A. Jeletzky, 1955.

26929 Ancyloceras (Acrioceras) aff. starrkingi Anderson, 1938. Barremian (middle?) Crioceratites (Hoplocrioceras) n. sp. aff. laeviusculum zone. Northern Richardson Mountains, N.W.T., the flat crest of Aklavik Range, south bank of the main (left) branch of Bug Creek, some 1,000 yards above the confluence of its branches and about 3 miles west of Bug Lake. Upper Shale-siltstone Division, Upper Member, collected from a distinctive sandstone bed corresponding to bed 17, section 6 (Jeletzky, 1958, p. 71). Collected by J.A. Jeletzky, 1955.

GSC loc.

26934 Ancyloceras (Ancyloceras) cf. durrelli Anderson, 1938. Barremian (middle?), Crioceratites (Hoplocrioceras) n. sp. aff. laeviusculum zone? The same section as for GSC loc. 27004 but 45 to 50 feet stratigraphically lower in the section. Collected by J.A. Jeletzky, 1955.

26952 Acroteuthis n. sp. aff. conoides Swinnerton, 1937. Barremian (middle?) Crioceratites (Hoplocrioceras) n. sp. aff. laeviusculum zone? Northern Richardson Mountains, N.W.T., east slope of Aklavik Range, a nameless rocky spur extending east of the main slope immediately north of the one occurring about 2 miles south of Bug Lake (GSC loc. 26885). Upper Shale-siltstone Division, Upper Member?, fresh, locally-derived float on the crest of the spur about 150 yards east of its steep and high middle part. Collected by J.A. Jeletzky, 1955.

26996 Tollia (Praetollia?) n. sp. A. Upper Berriasian, Buchia volgensis zone. Northern Richardson Mountains, N.W.T., east slope of Aklavik Range, south wall of Fault Creek Canyon, about 3/8 mile up from its lower end, collected in bed 4 of section 3 (Jeletzky, 1958, p. 46) in the basal part of the upper Member (sandy siltstone) of the Lower Shale-siltstone Division. Collected by J.A. Jeletzky, 1955.

26999 Oxyteuthis cf. jasikowi (Lahusen, 1871, emend. Stolley, 1925). Lower Barremian or ? uppermost Hauterivian, unnamed zone B. Northern Richardson Mountains, N.W.T., east slope of Aklavik Range, lower part of a prominent spur of the eastern slope of Mount Goodenough massif, about 1 mile north of the adjacent section of Goodenough Creek. Upper Shale-siltstone Division, Lower Member, collected from bed 12 of section 5 (Jeletzky, 1958, p. 64), 146 to 159 feet above the base of the Division. Collected by J.A. Jeletzky, 1955.

27004 Aucellina n. sp. aff. caucasica (Abich), and Crioceras (Hoplocrioceras) n. sp. aff. laeviusculum zone. Barremian (middle?). Northern Richardson Mountains, N.W.T., east slope of Aklavik Range, a nameless rocky spur extending east from the main slope at a point 2 miles south of Bug Lake, middle part of the spur. Upper Shale-siltstone Division, Upper Member, approximately 90 to 95 feet below its top, in a bed equivalent to bed 22, section 6 (Jeletzky, 1958, p. 70). Collected by J.A. Jeletzky, 1955.

GSC loc.

27884 Polyptychites cf. keyserlingi (Neumayr and Uhlig, 1881) s. lato. Middle Valanginian. Polyptychites ex aff. keyserlingi zone. Northeastern British Columbia, Peace River Foothills, northeast gully of Mount Frank Roy, in the cirque at the head of the stream draining east from the mountain, the second such stream and cirque of easterly drainage north of Moberly Valley. Marine Bullhead Group, 30-40 feet above the base of the Beattie Peaks Formation - probably at the same level as specimen found at GSC loc. 33738. Collected by J.E. Hughes, B.C. Department of Mines, 1954.

28713 Tollia (Temnoptychites) novosemelica (Sokolov, 1913) s. lato. Lower Valanginian or ? uppermost Berriasian, Tollia (Temnoptychites) novosemelica zone. Canadian Arctic Archipelago, District of Franklin, Slidre Fiord, about 1 mile north of the airstrip. Deer Bay Formation. Collected by R. Thorsteinsson, 1956.

28750 Cleoniceras (Anadesmoceras?) aff. subbaylei Spath, 1942 f. typ., and Cleoniceras (Anadesmoceras?) aff. subbaylei Spath, 1942 var. Later lower Albian Cleoniceras aff. subbaylei zone. Christopher Formation, east side of Black Top Mountain, near head of Slidre Fiord, Ellesmere Island, Arctic Archipelago, N.W.T. Collected by R. Thorsteinsson, 1956.

28805 Arcthoplites (=Subarcthoplites) belli (McLearn, 1944). Early middle Albian. Beudanticeras affine zone, Arcthoplites irenense subzone. Loon River Formation; "Lower end of Bullhead Hills", Alberta. Collected by R.D. McConnell, 1889.

32855 Puzosia (s. lato) aff. sigmoidalis Donovan, 1953 (=Puzosia? sp. of Warren, 1947, p. 122, Pl. 29, figs. 6, 7). Middle Lower Albian to lowermost middle Albian. Uppermost Sonneratia (s. lato)? sp. A zone to Beudanticeras affine zone, lower Arcthoplites irenense subzone. Tributary of Kotaneelee River, west flank of Liard Range, N.W.T. Collected by D.F. Stott, 1957.

33737 Neocomites (Neocomites?) aff. indomontanus Uhlig, 1903. Middle Valanginian, probably from the Polyptychites ex aff. keyserlingi zone. Northeastern British Columbia, Peace River Foothills, lat. 55°38'00", long. 122°26'38", a loose block, probably from the level about 1,900 feet

GSC loc.

33737 (cont.) above the top of the Fernie Group. Marine Bullhead Group, basal beds of the Beattie Peaks Formation? Collected by the Triad Oil Co. of Canada Ltd., 1958.

33738 Polyptychites cf. keyserlingi (Neumayr and Uhlig, 1881) s. lato. Middle Valanginian, Polyptychites ex aff. keyserlingi zone. Northeastern British Columbia, Peace River Foothills, lat. 55°38'40", long. 122°26'38". Marine Bullhead Group, basal beds of Beattie Peaks Formation, 1,950 feet above the top of the Fernie Group. Collected by the Triad Oil Co. of Canada Ltd., 1958.

34202 Gastroplites canadensis McLearn, 1931, and Gastroplites (Paragastroplites) spiekeri McLearn, 1931. Late middle Albian. Gastroplites spp. zone. Near base of shales in east bank of Liard River, 10 miles north of mouth of Toad River, British Columbia. Collected by E.D. Kindle, 1943.

35253 Aucellina aptiensis (d'Orbigny) Pompeckj var. nassibianzi Sokolov, 1908. Aptian (early upper?). Tropaeum australe zone. Northern Richardson Mountains, Stony Creek, about 18 1/2 miles upstream from the mouth and within the north-south trending section of the second fork, collected from a low rocky ledge within the creek's bed (near its eastern side) some 200 yards downstream from where the main stream turns abruptly westward (looking upstream). Upper Sandstone Division, 50 to 60 feet below the base of the Grey Siltstone Member (Jeletzky, 1960, p. 15). Collected by J.A. Jeletzky, 1958.

35624 Aucellina n. sp. aff. aptiensis (d'Orbigny) Pompeckj, 1901. Barremian (middle?) Crioceratites (Hoplocrioceras) n. sp. aff. laeviusculum zone. Northern Richardson Mountains, Lower Rat River, northeastern bank about 1/2 mile below the mouth of Longstick Creek and some 500 feet upstream from the Indian campsite, "Destruction City". Upper Shale-siltstone Division, Upper Member, about 27 feet below the massive sandstone unit interpreted as the basal part of the Upper Sandstone Division. Collected by J.A. Jeletzky, 1958.

35667 Acroteuthis cf. kernensis Anderson, 1938, and A. mitchelli Anderson, 1938. Upper Barremian, unnamed zone D. Northern Richardson Mountains, N.W.T., top part of the eastern slope of Mount Goodenough massif; a deep, chimney-like crevice situated about a 1/4 mile north of the top part

GSC loc.

35667 (cont.) of section 5 (Jeletzky, 1958, p. 54). Upper Sandstone Division, Lower massive sandstone unit 95 to 97 feet above the base of the Division. This Acroteuthis-rich bed is an important horizon marker within the Division. A. cf. kernensis and A. cf. mitchelli from GSC loc. 38803 on the Rat River were collected from the same bed. Collected by J.A. Jeletzky, 1958.

35668 Tropaeum cf. undatum Whitehouse, 1926. Aptian (early upper?) Tropaeum australe zone? Northern Richardson Mountains, N.W.T., a 15 to 20 foot high escarpment of the southeastern shore of Treeless Creek, some 500 yards upstream from where the creek abruptly changes its course from northeast to almost due south (looking downstream), entering Mackenzie Delta, some 600 yards downstream from the campsite on the east shore of Emerald Lake. Upper Sandstone Division, upper part? Collected by J.A. Jeletzky, 1958.

35671 Oxyteuthis cf. jasikowi (Lahusen, 1874, emend., Stolley, 1925). Lower Barremian or ? uppermost Hauterivian, unnamed zone B. Northern Richardson Mountains, N.W.T., east slope of Aklavik Range, northeastern side of Treeless Creek, about 1 1/4 miles upstream from its second fork in the mountains (looking upstream), on the lower part of a gentle slope above the wall of the inner canyon. Upper Shale-siltstone Division, Lower Member, collected from fresh debris of locally-derived, rust-weathering, sandy and locally pebbly siltstone 6 to 8 inches thick, 75 to 80 feet above the base of the Division. Collected by J.A. Jeletzky, 1958.

35682 Tropaeum undatum Whitehouse, 1926. Aptian (early upper?) Tropaeum australe zone. Northern Richardson Mountains, N.W.T., northeast shore of Red River, about 4 1/2 miles downstream from the mouth of Barrier River and 1 mile northwest of the southeast corner of the rivers "Big Bend" Upper Sandstone Division, 173 feet above the visible base of the section, which is estimated to be about 120 feet above the base of the Division on Rat River. Collected by J.A. Jeletzky, 1958.

35687 Crioceratites (Crioceratites) emerici (Leveille, 1837) cf. var. journoti Sarkar, 1955. Lower or Middle Barremian. Crioceratites (Crioceratites) emerici zone. Northern Richardson Mountains, N.W.T., east slope of Aklavik Range, first independent creek north of Treeless Creek,

GSC loc.

35687 (cont.) some 200 feet below the top of the southern wall of its canyon, about 1 mile upstream from where Treeless Creek Fault crosses the creek bed, and just west of the axis of an anticline crossing the creek bed. Upper Shale-siltstone Division, top part of the lower member, corresponding to bed 36, section 5 (Jeletzky, 1958, p. 57). Collected by J.A. Jeletzky, 1958.

35690 Tropaeum australe (Moore) emend. Whitehouse, 1926. Aptian (early upper?), Tropaeum australe zone. Northern Richardson Mountains, N.W.T., a 200-foot-high bluff on the northeastern bank of Rat River, about 5 1/2 miles downstream from the mouth of Barrier River, and about 100 yards upstream from the southeastern corner of the river's "Big Bend". Upper Sandstone Division, upper part; fresh, locally-derived rubble on the surface of the bed, apparently equivalent to that in which T. undatum was found at locality 35682. Collected by J.A. Jeletzky, 1958.

35693 Tropaeum n. sp. aff. arcticum (Stolley, 1912). Aptian (early upper?). Tropaeum australe zone? Northern Richardson Mountains, N.W.T., northeastern shore of Rat River, about 4 1/2 miles downstream from the mouth of Barrier River, and 1 mile northwest of the southeastern corner of the river's "Big Bend". Upper Sandstone Division, upper part, exact position in the section unknown, as the specimens were collected from fresh blocks fallen down from the cliff's face. Collected by J.A. Jeletzky, 1958.

35697 Tollia (Tollia?) cf. payeri (Toula, 1874) and Buchia volgensis (Lahusen, 1888). Upper Barremian, Buchia volgensis zone. Northern Richardson Mountains, N.W.T., east slope of Aklavik Range, directly beneath (east of) the top of Mount Gifford, and some 500 feet below its eastern rim at that place. Lower Sandstone Division, Buff Sandstone Member. Collected by J.A. Jeletzky, 1958.

35712 Aulacoteuthis cf. ascendens Stolley, 1925. Lower Barremian or ? uppermost Hauterivian. Unnamed zone B. Northern Richardson Mountains, N.W.T., east slope of Aklavik Range, headwaters of the middle (northwest-trending, looking upstream) branch of Jimmy Creek, top of southeastern bank at a point about 3/5 mile above the branch's mouth at the northern end of Mount Goodenough massif. Upper Shale-siltstone Division, Lower Member 150 to 200 feet above the base of the Division. Collected by J.A. Jeletzky, 1958.

GSC loc.

35746 Aucellina aptiensis (d'Orbigny) Pompeckj, 1901. Upper Barremian, unnamed zone C or D? Northern Richardson Mountains, N.W.T., southwestern bank of Rat River, about 1 1/2 miles downstream from the mouth of Longstick Creek; top beds of the Upper Shale-siltstone Division, or basal beds of the Upper Sandstone Division. Collected by J.A. Jeletzky, 1958.

35752 Buchia n. sp. aff. volgensis (Lahusen, 1888). Lower Berriasian, Buchia okensis zone. Northern Richardson Mountains, N.W.T., east slope of Aklavik Range, southeastern promontory of Mount Gifford, northern wall of a nameless tributary of Husky Channel, section 1, bed 92 (Jeletzky, 1958). Lower Shale-siltstone Division. Collected by J.A. Jeletzky, 1958.

35812 Acroteuthis aff. conoides Swinnerton, 1937. Lower Barremian or ? uppermost Hauterivian, unnamed zone B. Northern Richardson Mountains, N.W.T., east slope of Aklavik Range, basal part of the eastern slope of Mount Goodenough massif, about 1/4 mile north of the basal part of section 5 (Jeletzky, 1958, p. 54) and about 1 mile east of the top of Mount Goodenough. Upper Shale-siltstone Division, Lower Member, 25 feet above the visible base of the section and some 120 feet above the base of the Division. Collected by J.A. Jeletzky, 1958.

37183 Arcthoplites (=Subarcthoplites) belli (McLearn, 1944). Early middle Albian. Beudanticeras affine zone, Arcthoplites irenense subzone. Upper part of Christopher Formation, east of Eldridge Bay, Sabine Peninsula, Melville Island, Arctic Archipelago, N.W.T. Collected by E.T. Tozer, 1958.

37199 Buchia n. sp. aff. inflata (Toula, 1874). Middle or Upper Valanginian, Buchia n. sp. aff. inflata zone. Canadian Arctic Archipelago, District of Franklin, N.W.T., Prince Patrick Island, between Intrepid Inlet and Fitzwilliam Strait, 6 miles northwest of the "Redoubt". Mould Bay Formation, Upper Shale Member, 9 feet below the base of the Isachsen Formation. , Collected by E.T. Tozer, 1958.

GSC loc.

37315 Callizoniceras (Wollemaniceras) crassicostata (Imlay, 1961). Late lower Albian. Uppermost Cleoniceras aff. subbaylei zone or Beudanticeras affine zone, "Lemuroceras cf. indicum" subzone. Anderson River, approximately 35 miles from its mouth, N.W.T. Collected by B. Moore, California Standard Oil Company, 1958.

37681 Arcthoplites belli (McLearn, 1944). Early middle Albian. Beudanticeras affine zone, Arcthoplites irenense subzone. Loon River Formation; "lower end of Bullhead (=Buffalo) Hills", Alberta. Collected by R.D. McConnell, 1889.

37683 Gastroplites (Paragastroplites) flexicostatus Imlay, 1961. Late middle Albian. Gastroplites spp. zone. Upper part of steep cliffs at mouth of Deep Creek, south side of Peace River, British Columbia; "St. John shales". Collected by C.M. Sternberg, 1930.

37867 Buchia sublaevis (Keyserling, 1845) var. and Polyptychites stubbendorfi (Schmidt). Upper Middle or lowermost Upper Valanginian, Polyptychites stubbendorfi zone. Canadian Arctic Archipelago, District of Franklin, Ellef Ringnes Island, about 1 7/8 miles east of Isachsen Weather Station on the north bank of the delta of a nameless creek slightly less than 1/2 mile from its mouth and less than 50 feet above sea level. Deer Bay Formation, collected from a concretion lying loose on the surface. The exposure is probably 200 to 250 feet lower stratigraphically than the beds of GSC loc. 21899 carrying Dichotomites quatsinoensis, provided that the beds between these two localities are as horizontal as they appear to be (W.W. Heywood, personal communication). Collected by R. Thorsteinsson, 1958.

38789 Tollia (Subcraspedites) aff. analogus (Bogoslovsky, 1909) and Buchia uncitoides (Pavlow, 1907) s. lato. Early Upper Berriasian, Buchia uncitoides zone. Northwestern Richardson Mountains, Yukon, collected at the crest of an escarpment 200 feet or higher overlooking the first unnamed confluence of Johnston Creek north of Bonnie Lake, about 1 3/4 miles slightly east of north of the north end of Bonnie Lake. Lower part of the Lower Sandstone Division. Collected by J.A. Jeletzky, 1959.

GSC loc.

38803 Acroteuthis cf. kernensis Anderson, 1938, and A. mitchelli Anderson, 1938. Upper Barremian, unnamed zone D. Northern Richardson Mountains, N.W.T., a high cliff on the northeastern shore of Rat River about 4 1/2 miles downstream from the mouth of Barrier River and 1 mile northwest of the southwestern corner of the river's "Big Bend", 200 yards downstream from GSC loc. 35682 and 35693. Upper Sandstone Division, lower part, continuation of the basal bed of the section exposed at GSC loc. 35682, about 3 feet above its visible base. This horizon is estimated to be some 120 feet above the base of the Upper Sandstone Division on Rat River. Collected by J.A. Jeletzky, 1959.

40602 "Gastroplites" (a new genus?) n. sp. A. and Gastroplites? (Paragastroplites?) n. sp. aff. liardense (Whiteaves, 1892). Late middle Albian. Gastroplites spp. zone. Christopher Formation; east side of Thomsen River about 8 miles north of confluence of Thomsen and Muskox Rivers, Banks Island, Arctic Archipelago, N.W.T. Collected by R. Thorsteinsson, 1959.

40606 Gastroplites aff. canadensis (Whiteaves, 1892). Late middle Albian. Gastroplites spp. zone. Christopher Formation; east bank of Thomsen River, about 12 miles north of confluence of Muskox and Thomsen Rivers, Banks Island, Arctic Archipelago, N.W.T. Collected by R. Thorsteinsson, 1959.

41032 Dichotomites cf. giganteus (Imlay, 1960). Middle Valanginian, Buchia n. sp. inflata zone? Northeastern British Columbia, Peace River Foothills, Pine Pass map-area, south side of Pine River valley, east flank of Ridge 3, dip-slope of a creek bearing 138° (true) from Big Boulder Creek Bridge, elevation 3,100 feet (barometric), GSC loc. 225. Marine Bullhead Group, Monach, or less likely, upper Beattie Peaks Formation, about 300 feet below the top of the Lower Marine Bullhead. Collected by J.E. Hughes, 1956.

41419 Buchia inflata (Toula, 1874) var. Middle Valanginian? Polyptychites ex aff. keyserlingi zone? Northwestern Richardson Mountains, Northern Yukon, Bonnie Lake map-area, R.C.A.F. A-14451-11, approximately lat. 68°14', long. 137°28'. Middle part of the bluish grey shale Division (Jeletzky, 1961, pp. 12-14). Collected by A.E.W. Pedder, Triad Oil Co. of Canada Ltd., 1959.

GSC loc.

41421 Tollia (Tollia?) cf. payeri (Toula, 1874). Upper Berriasian, Buchia volgensis zone. Northern Yukon, Barn Mountain map-area, Babbage River, R.C.A.F. A-13383-166, lat. 68°43'50", long. 138°45'30". Judging by the lithology of the matrix, this fauna comes from the Upper (Sandy Siltstone) Member of the Lower Shale-siltstone Division rather than from the Lower Sandstone Division. Collected by A.E.W. Pedder, Triad Oil Co. of Canada Ltd., 1959.

42285 Arcthoplites (Freboldiceras) irenense (McLearn, 1944). Early middle Albian. Beudanticeras affine zone, Arcthoplites irenense subzone. Moosebar Formation(?), within 100 feet of the top of the Commotion Formation; below confluence of Johnson and Burnt Trail Creeks, Pine Pass map-area, British Columbia. Collected by D.F. Stott, 1960.

42447 Buchia n. sp. aff. inflata (Toula, 1874). Middle Valanginian, lower part of Buchia n. sp. aff. inflata zone. Northeastern British Columbia, Peace River Foothills, Pine Pass map-area, ridge at headwaters of Moberly River, lat. 55°39', long. 122°33'. Marine Bullhead Group, probably from the Beattie Peaks Formation. Collected by J.E. Muller, 1960.

42451 Tollia (Subcraspedites) cf. suprasubditus (Bogoslovsky, 1909)? Berriasian (early?), unzoned. Northeastern British Columbia, Peace River Foothills, Pine Pass map-area, Bocock Peak (south), lat. 55°51', long. 122°57'. Marine Bullhead Group, probably from the upper part of the Monteith Formation. Collected by J.E. Muller, 1960.

42455 Buchia sublaevis (Keyserling, 1846) s. lato var. Middle or Upper Valanginian. Buchia n. sp. inflata zone or Dichotomites quatsinoensis zone. Northeastern British Columbia, Peace River Foothills, Pine Pass map-area, ridge between Carbon and Eleven Mile Creeks, lat. 55°49', long. 122°48'. Marine Bullhead Group, Monach Formation, just beneath the contact with the Gething Formation. Collected by J.E. Muller, 1960.

42457 Buchia aff. crassicollis (Keyserling, 1846) var. solida (Lahusen, 1888). Middle or Upper Valanginian, Buchia n. sp. aff. inflata zone or Dichotomites quatsinoensis zone. Northeastern British Columbia, Peace River Foothills, Pine Pass map-area, lat. 55°49', long. 122°57'30", west

GSC loc.

42457 (cont.) of the Monach, Marine Bullhead Group, presumably from the Monach Formation. Collected by J.E. Muller, 1961.

42458 Tollia (Subcraspedites) cf. stenomphala (Pavlow, 1889) emend. Spath, 1925, or T. (S.) pseudotolli Neale, 1962. Berriasian (early?), unzoned. Northeastern British Columbia, Peace River Foothills, Pine Pass map-area, east of Point 6115, lat. 55°42', long. 122°41'. Marine Bullhead Group, Monteith Formation, (upper part). Collected by J.E. Muller, 1961.

42641 Buchia aff. volgensis (Lahusen, 1888) s. str. Upper Berriasian? probably from the upper part of the Buchia volgensis zone. Western Richardson Mountains, Yukon, east of Bell Lake, lat. 67°12'00", long. 136°17'00", 170 to 173 feet above the base of section L17. Probably from the Lower Sandstone Division (Buff Sandstone Member?). Collected by A. Lenz, California Standard Co. of Canada Ltd., 1960.

43618 Gastroplites? (Paragastroplites?) n. sp. aff. liardense (Whiteaves, 1889), and Gastroplites aff. canadensis (Whiteaves, 1892). Late middle Albian. Gastroplites spp. zone. In shale of Christopher Formation, south of Dumbbell Dome, Ellef Ringnes Island, Arctic Archipelago, N.W.T. Collected by A.H. McNair, 1960.

44083 Buchia okensis (Pavlow, 1907) var. and Buchia aff. unschensis (Pavlow, 1907). Upper Berriasian, Buchia volgensis zone. Northern Yukon, Spear map sheet, lat. 68°26', long. 136°30'30". Probably from the equivalent of the Buff Sandstone Member of the Lower Sandstone Division. Collected by the Triad Oil Co. of Canada Ltd., 1959.

44772 Dichotomites cf. giganteus (Imlay, 1960). Mid-Valanginian? Buchia n. sp. aff. inflata zone? Northeastern British Columbia, Pine River Foothills, foot of Mount Bickford Ridge, on valley plain of Pine River. From talus across an interval of 500 feet of upper Monteith Formation, and lower Beattie Peaks Formation. Probably derived from the lower (but not basal) part of the Beattie Peaks Formation. Collected by Mr. J.E. Hughes, B.C. Dept. of Mines, 1960.

GSC loc.

47514 "Gastroplites" (a new genus?) n. sp. A. Late middle Albian. Gastroplites spp. zone. Christopher Formation, Glacier Fiord Section(?), about 7,000 feet southeast of southeast end of Glacier Fiord, South Axel Heiberg Island, Arctic Archipelago, N.W.T. Collected by H.P. Trettin, 1961.

47736 Acroteuthis subquadratus (Roemer) emend. Swinnerton, 1935. Upper Valanginian, Dichotomites quatsinoensis zone. Canadian Arctic Archipelago, District of Franklin, N.W.T., Ellef Ringnes Island, a few miles east of the Isachsen Weather Station. Deer Bay Formation, near the Cannon Ball zone. Collected by R. de Wit, Sproule and Associates, 1961.

47874 Arcthoplites aff. jachromensis (Nikitin, 1888). Early middle Albian? Beudanticeras affine zone. Arcthoplites mcconnelli subzone? Christopher Formation, south side of Bunde Fiord, Axel Heiberg Island, Arctic Archipelago, N.W.T. Collected by R. Thorsteinsson, 1961.

47876 Thorsteinssonoceras ellesmerensis n. gen. n. sp., etc. Middle Valanginian, Thorsteinssonoceras ellesmerensis beds. Canadian Arctic Archipelago, District of Franklin, N.W.T., Ellesmere Island, southeast limb of syncline 2 1/3 miles east of the mouth of a major unnamed river entering a prominent bay which joins Greely Fiord 4 miles east of Hare Fiord. Deer Bay Formation, from fresh, locally-derived talus at 444-foot-level above base of formation. Collected by R. Thorsteinsson, 1961.

47879 Thorsteinssonoceras ellesmerensis n. gen. n. sp. Middle Valanginian, Thorsteinssonoceras ellesmerensis beds. Canadian Arctic Archipelago, District of Franklin, N.W.T., Ellesmere Island, southeast limb of syncline 2 1/3 miles east of the mouth of a major unnamed river entering a prominent bay, which joins Greely Fiord 4 miles east of Hare Fiord. Deer Bay Formation, collected from the measured section adjoining GSC loc. 47876 at the 443- to 444-foot-level above the formation's base. Collected by R. Thorsteinsson, 1961.

48934 Simbirskites (Simbirskites) cf. kleini (Neumayr and Uhlig, 1881). Upper Hauterivian, Simbirskites (Simbirskites) cf. kleini zone. Northern Richardson Mountains, N.W.T., east slope of Aklavik Range, east bank of the east branch of Jimmy Creek at the northern end of Mount Goodenough

GSC loc.

48934 (cont.) massif and 200 yards above its confluence with two other branches of the creek, collected near the axis of a small syncline of the Upper Shale-siltstone Division limited by major faults in the south and in the east. Upper Shale-siltstone Division, basal beds of the Lower Member, 4 to 8 feet above the basal conglomerate of the division. Collected by J.A. Jeletzky, 1958.

University of Alberta Localities

U. of A.

loc. 205 Dichotomites cf. and aff. D. quatsinoensis, (Whiteaves, 1882) and Buchia n. sp. aff. inflata (Toula, 1874)? Middle or Upper Valanginian. Buchia n. sp. aff. inflata zone. Northeastern British Columbia, Upper Peace River area, Marine Bullhead Group, lower Beattie Peaks Formation (valley). Collected by the California Standard Oil Co. of Canada Ltd., locality E-33-58.

loc. 383 Buchia n. sp. aff. inflata (Toula, 1874) Middle Valanginian? Buchia n. sp. aff. inflata zone (lower part?). Northeastern British Columbia, Peace River Foothills, Pine Pass area, Martin Creek. Marine Bullhead Group (Beattie Peaks equivalent?), from a coarse, quartzitic band carrying belemnites and tree-trunk impressions, well above Nikanassin equivalents. Collected by C.R. Stelck.

loc. 40817 Buchia cf. keyserlingi (Lahusen, 1888). Lower or Middle Valanginian? Polyptychites ex aff. keyserlingi zone? Northeastern British Columbia, Peace River Foothills, Pine Pass area, second creek west of Fischer Creek. Marine Bullhead Group. Beattie Peaks Formation? Collected by C.R. Stelck.

loc. 40871 Buchia n. sp. aff. inflata (Toula, 1874). Middle Valanginian? Lower part of Buchia n. sp. aff. inflata zone? Northeastern British Columbia, Peace River Foothills, float on Halfway River, river boulder in the terrace about 3 miles up from the mouth. Derived from the Beattie Peaks Formation of the Marine Bullhead Group. Collected by C.R. Stelck.

EXPLANATIONS OF PLATES I-XXXVI

All figures are natural size unless otherwise indicated.

BERRIASIAN (=INFRAVALANGINIAN) STAGE

Buchia okensis Zone and Unzoned Berriasian Fossils

PLATE I

FIGS. 1A-1C. Buchia okensis (Pavlow, 1907) var. canadiana (Crickmay, 1930). GSC loc. 26171, GSC No. 17127. An almost complete shell of a giant representative of the variant, mostly covered with a well-preserved shell layer. 1A. Lateral view of the exterior of the left valve. The short, broad, subtrapezoidal outline of the valve, the large, angular posterior ear, and the extremely coarse and widely-spaced concentric ornament are diagnostic. 1B. Lateral view of the exterior of the right valve and the projecting part of the beak of the left valve. 1C. Oblique posterior view of both valves.

FIG. 2. Tollia (Subcraspedites) cf. stenomphala (Pavlow, 1889) emend. Spath, 1924, or T. (C.) pseudotolli Neale, 1962. GSC loc. 42458, GSC No. 17184. Photograph of a rubber mould of an apparently-undistorted natural cast. As with the specimen of Tollia (Subcraspedites) cf. suprasubditus (Bogoslovsky, 1909)? shown in fig. 6, the flank does not seem to contract toward the venter, which seems to be obtuse. This indicates reference of this specimen to the subgenus Subcraspedites s. str. rather than to Tollia s. str. These two subgenera of the Berriasian craspeditids cannot be safely differentiated on their ribbing habit alone.

FIGS. 3A-3B. Buchia okensis (Pavlow, 1907) var. subokensis (Pavlow, 1907). GSC loc. 26853, GSC No. 17132. An internal cast (some patches of shell on the anterior part) of a medium-sized left valve. B. okensis var. subokensis is similar to B. fischeriana (d'Orbigny) and B. unschensis (Pavlow) in its smaller size and more closely-spaced, finer concentric ribbing; the concentric ribs are nevertheless wider spaced and the shell larger and thicker than those of B. fischeriana. 3A. Lateral view of the exterior. 3B. Anterior view.

FIGS. 4A-4C. Buchia okensis (Pavlow, 1907) var. GSC loc. 44083, GSC No. 17181. An internal cast of the medium-sized left valve, which differs from the typical Lower Berriasian representatives of the species only in the more pronounced left-handed incurvature of the left beak. It is a rare form associated with numerous specimens of B. volgensis s. str. 4A. Lateral view of the exterior. The posterior wing is large and angular. 4B. Posterior view. 4C. The beak and hinge margin viewed from above.

FIGS. 5A-5C. Buchia aff. unschensis (Pavlow, 1907). GSC loc. 44083, GSC No. 17182. An internal cast of a medium-sized right valve of a peculiar and rare Buchia form morphologically similar to Buchia n. sp. aff. inflata (Toula) from the middle to late Valanginian beds of the region (see Pls. XI-XII). It seems however, to be an unrelated, peculiar end form of the Buchia okensis-unschensis species group because of its different sculpture (see below). 5A. Lateral view of the exterior. The large, angular posterior wing is indistinguishable from that of B. unschensis as well as from that of B. n. sp. aff. inflata. The regular, moderately widely-spaced concentric ribs are, however, quite unlike the fine, closely-spaced concentric ribs of B. n. sp. aff. inflata while being indistinguishable from those of B. unschensis. 5B. Oblique posterior view. The somewhat abrupt truncation of the lower margin is indistinguishable from that of some representatives of B. n. sp. aff. inflata. 5C. The beak, byssus ear and hinge margin viewed from above. The anterior surface of the byssus ear forms an angle of only 45° with the plane of contact of the valves instead of that of 70°-80° characteristic of Buchia n. sp. aff. inflata.

FIGS. 6A-6B. Tollia (Subcraspedites)? cf. suprasubditus (Bogoslovsky, 1909). GSC loc. 42451, GSC No. 17183. An apparently-undistorted fragment (internal cast) of the living chamber. Such fragments of the Berriasian Tollia (Subcraspedites) forms are indistinguishable from the extreme Tollia-like forms of the uppermost Jurassic Craspedites species. The Berriasian age of this fragment and that of the fragments shown in figs. 2, 7, is, however, indicated by the associated Buchia fauna. 6A. Lateral view. The coarse, somewhat bullate, widely-spaced primary ribs and the relatively fine and closely-spaced secondary ribs are closely comparable with those of T. (S.) suprasubditus. 6B. Cross-section of the preserved part of the whorl. The flank does not seem to contract toward the venter and the top of the latter appears to be broad and obtuse. This indicates Subcraspedites s. str. rather than Tollia s. str.

FIG. 7. Tollia (Subcraspedites) cf. suprasubditus (Bogoslovsky, 1909)? GSC loc. 42451, GSC No. 17187. A mostly-flattened fragment of a large specimen otherwise quite similar to that shown in fig. 6.

FIGS. 8A-8B. Buchia okensis (Pavlow, 1907). GSC loc. 35752, GSC No. 17131. Internal cast of the left valve of a juvenile specimen approaching B. okensis (Pavlow) var. subokensis (Pavlow, 1907) in its denser ribbing and shape. 8A. Lateral view of the exterior. 8B. Oblique posterior view.

FIGS. 9A-9C. Buchia aff. volgensis (Lahusen, 1888) s. str. GSC loc. 42641, GSC No. 17180. An internal cast of a medium-sized left valve of a specimen probably belonging to a transitional form between B. volgensis s. str. and B. keyserlingi s. lato. 9A. Lateral view of the exterior. 9B. Anterior view of the same. 9C. The beak and hinge margin viewed from above.

FIGS. 10A-10C. Buchia aff. volgensis (Lahusen, 1888) s. str. GSC loc. 42458, GSC No. 17186. An almost completely shell-covered, somewhat distorted and incomplete left valve of the same peculiar Buchia form as the right valve shown in fig. 11. 10A. Lateral view of the exterior. 10B. Anterior view. 10C. The beak and hinge margin viewed from above.

FIGS. 11A-11C. Buchia aff. volgensis (Lahusen, 1888) s. str. GSC loc. 42458, GSC No. 17185. An internal cast of a medium-sized right valve of a peculiar Buchia probably belonging to the same transitional form as the specimens shown in figs. 9 and 10. 11A. Lateral view of the exterior. 11B. Oblique posterior view. The valve is thicker than most right valves of B. volgensis s. str. and is comparable in this respect to some right valves of B. uncitoides s. lato. It could, therefore, also belong to one of the extreme B. volgensis-like variants of B. uncitoides s. lato. 11C. The beak, byssus ear and hinge margin viewed from above.

PLATE I


1C
1A
2
4A
4B
3A
3B
1B
4C
5B
5A
6B
5C
8A
6A
9B
9A
8B
7
10C
9C
10B
10A
11B
11C
11A

BERRIASIAN STAGE

Buchia okensis Zone

PLATE II

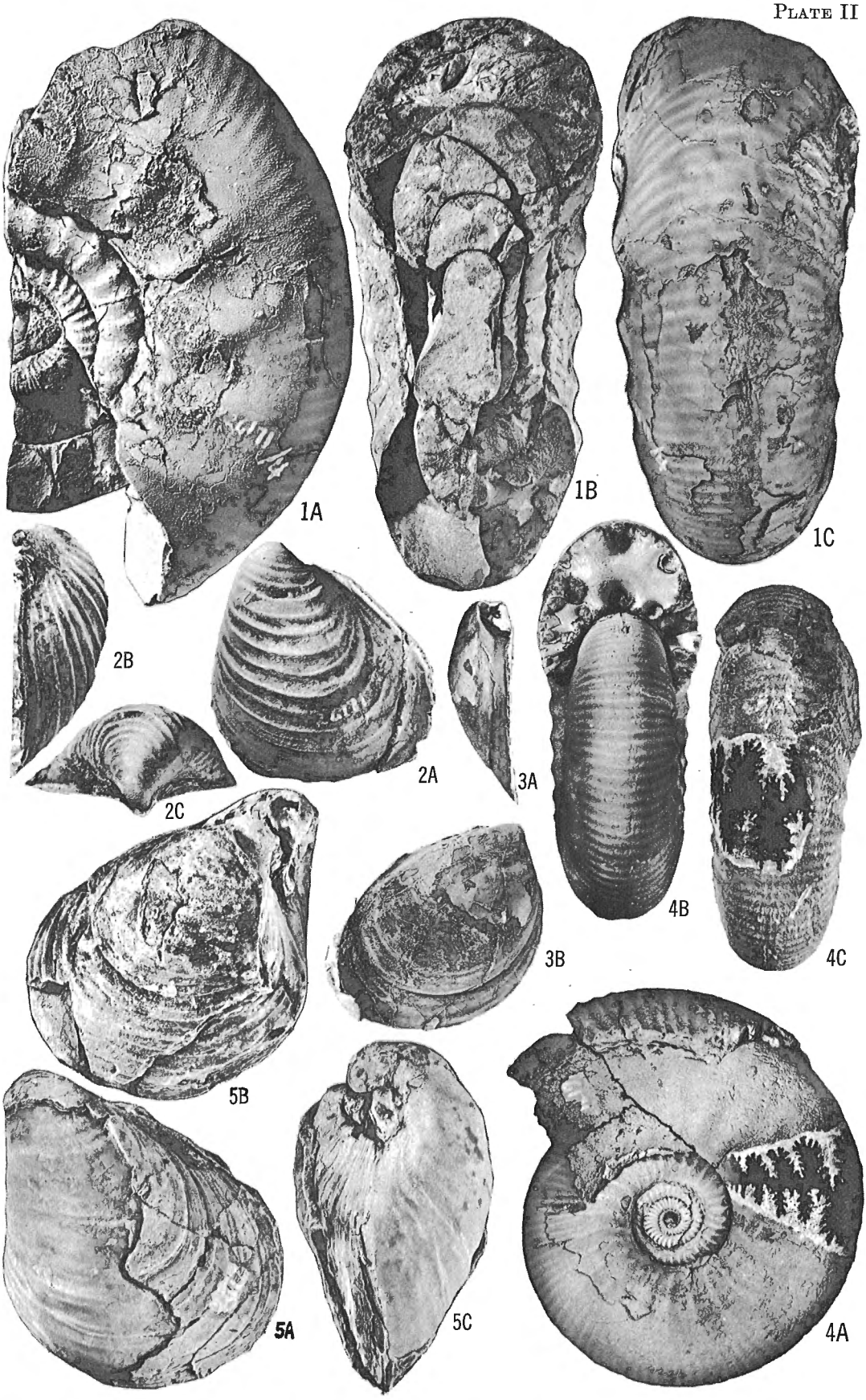
FIGS. 1A-1C. Tollia (Subcraspedites) aff. suprasubditus (Bogoslovsky, 1909). GSC loc. 26171, GSC No. 17121.
Fragment of the penultimate whorl showing the decline of ornament, and three inner whorls, showing the gradual coarsening of the primaries and their progressively wider spacing during the growth until they become the widely-spaced bullae on the penultimate whorl. This ornament matches closely that of T. (S.) suprasubditus. The Canadian species differs, however, from the Russian one in its whorl-shape, the venter being narrower and the flanks gradually sloping down toward the venter. T. (S.) aff. suprasubditus is more nearly similar to Ammonites plicomphalus J. Sowerby (1822, Pl. 359) in this respect. A conclusive comparison of the two is, however, impossible because of the poor preservation of the holotype of the British species, the suture-line of which is unknown.
1A. Lateral view. 1B. Cross-section. 1C. Ventral view.

FIGS. 2A-2C. Buchia okensis (Pavlow, 1907). GSC loc. 26171, GSC No. 17122.
An internal cast of a typical, medium-sized left valve.
2A. Lateral view of the exterior. The coarse, widely-spaced concentric ribs, short, sub-triangular shape and well-developed posterior ear are diagnostic of the species. 2B. Anterior view of the same. The relatively great thickness of the valve is likewise diagnostic of the species. 2C. Beak part and hinge margin viewed from above. The beak is virtually straight.

FIGS. 3A-3B. Buchia n. sp. aff. volgensis (Lahusen, 1858). GSC loc. 35752, GSC No. 17123.
An internal cast of a typical, medium-sized right valve.
3A. Lateral view. Note the almost smooth appearance of the cast. 3B. Anterior view. The relatively thick right valve of this form is unlike that of B. volgensis (Lahusen) s. str. (see Pl. IV, figs. 7, 10).

FIGS. 4A-4C. Tollia (Subcraspedites) aff. spasskensis (Nitikin, 1858). GSC loc. 26171, GSC No. 17124.
A completely septate specimen broken off just before the beginning of the living chamber. It is probably an extreme morphological variant of T. (S.) aff. suprasubditus shown in fig. 1, characterized by much greater density and lesser thickness of primary ribs on the penultimate and ultimate whorls. An internal cast with minor patches of the shell layer.
4A. Lateral view. Note the ascendant suture-line with five auxiliary lobes. 4B. Cross-section and the venter of the earliest part of penultimate whorl. 4C. Ventral view of the later part of the whorl.

FIGS. 5A-5C. Buchia n. sp. aff. volgensis (Lahusen, 1888). GSC loc. 26171, GSC No. 17125.
A complete, large specimen with much of its shell layer in place. The surface of internal cast is only feebly ornamented while that of the shell layer is covered by dense and fine concentric ribs and striae characteristic of this form.
5A. Lateral view of the exterior of the left valve. The beak part is feebly left-handedly incurved. 5B. Lateral view of the exterior of the right valve and the overhanging beak part of the left valve. The left-handed curvature of the beak is clearly visible. 5C. Anterior view of both valves in living position. The shell is shorter and thicker than in most representatives of B. volgensis s. str. (see Pl. IV, figs. 5, 6, 7, 10). Especially its right valve is much thicker than that of B. volgensis s. str. and similar to that of B. uncitoides s. lato (see Pl. IV, fig. 4), B. aff. unschensis s. lato (see Pl. I, fig. 5), and B. keyserlingi s. lato (see Pl. V, fig. 2). Also the byssus ear is more advanced morphologically than that of B. volgensis s. str. and is essentially similar to that of B. unschensis and B. keyserlingi.


1A
1B
1C
2B
2A
2C
3A
4B
4C
3B
5B
5A
5C
4A

BERRIASIAN STAGE

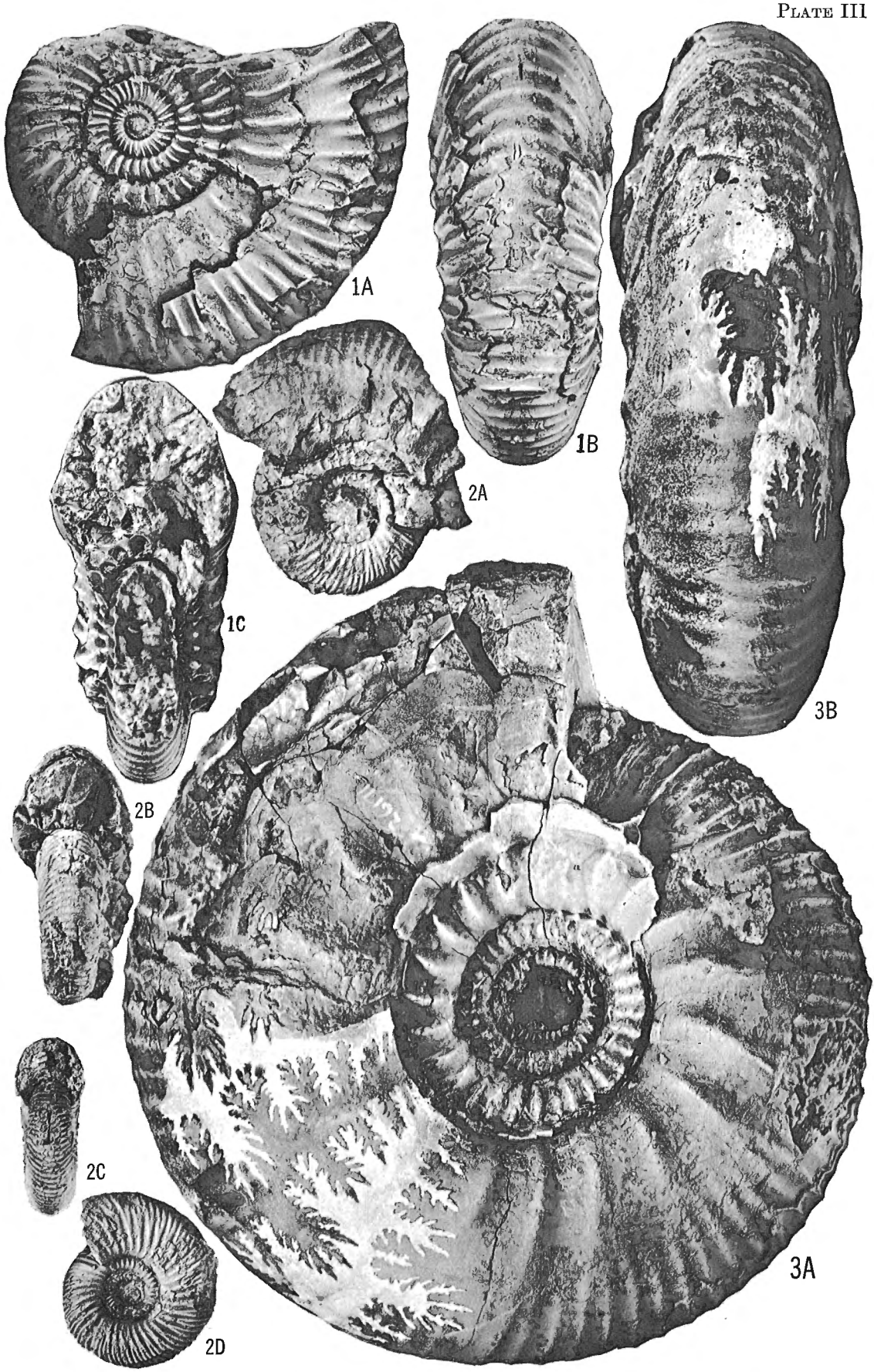
Buchia okensis Zone

PLATE III

FIGS. 1A-1C. Tollia (Subcraspedites) aff. hoeli (Frebold, 1929). GSC loc. 26171, GSC No. 17135.
Intermediate and early whorls of a partly shell-covered typical specimen. Unlike T. (S.) suprasubditus shown in fig. 2 the coarseness and spacing of the primary ribs increases but slightly during the growth of the specimen.
1A. Lateral view. 1B. Ventral view of the last whorl preserved. 1C. Cross-sections of the last two whorls preserved and the venter of the earlier whorl.

FIGS. 2A-2D. Tollia (Subcraspedites) aff. suprasubditus (Bogoslovsky, 1909). GSC loc. 26171, GSC No. 17136.
Fragment of an intermediate whorl and a complete early whorl of a typical specimen. The fragmentary intermediate whorl is mostly shell-covered. Note the contrast between the fine and closely-spaced primary ribs of the inner whorl on the one hand and the coarse, bullae-like and widely-spaced primaries of the intermediate whorl on the other.
2A. Lateral view of the intermediate whorl with part of the inner whorl visible. 2B. Cross-section of the early part of the intermediate whorl and the venter of the early whorl. Note the marked forward swing of the secondaries on the venter, which distinguishes the young representatives of Subcraspedites s. str. from corresponding growth-stages of Craspedites s. str. 2C. Cross-section and venter of the early whorl. 2D. Lateral view of the early whorl. All primary ribs bifurcate at the middle of the flank. The primaries and secondaries are, furthermore, markedly inclined forward but not flexuous. These features permit the differentiation of the early growth-stages of Subcraspedites s. str. and Tollia s. str. (Pl. V, fig. 5) from the corresponding growth-stages of Craspedites s. str.

FIGS. 3A-3B. Tollia (Subcraspedites) aff. hoeli (Frebold, 1929). GSC loc. 26171, GSC No. 17137.
An internal cast of a full-grown specimen with the beginning of the living chamber preserved. Some patches of the shell layer preserved here and there. The ornament gradually declines toward the beginning of the living chamber until it is almost lost (except for the bullae-like primaries) preserved on its early part. All of the swollen and widely-spaced primary ribs are bent like commas. At about the middle of the flanks they bend forward and either bifurcate or trifurcate. In the case of bifurcation, the anterior secondary bifurcates again slightly higher on the flank. Some of the ribs do not subdivide again, but remain dichotomous. Some single ribs are intercalated between the rib bundles on the upper third of the flanks. The basal parts of the secondaries tend to be weakened near the place where they join the top parts of the primaries becoming sometimes completely detached from them (fig. 1A). All secondary ribs are more or less inclined forward. This inclination increases somewhat toward the ventro-lateral shoulder. The ribs cross the venter in a weak forward loop without becoming either weakened or interrupted. The cross-section is hoof-like, slightly wider than high. The maximum width of the whorl is at the umbilical shoulder, from where the sides of the whorl slope gradually but markedly to the rounded umbilical shoulders. From there the convergence increases strongly, resulting in an obtusely-rounded, blunt venter. Like that of all early Lower Cretaceous craspeditids, the visible (external) suture line differs from that of Craspedites s. str. in having much longer and slender lobes, which are more strongly frilled; it is, furthermore, ascendant throughout and has four auxiliary lobes between the 2nd lateral lobe and the umbilical seam. Tollia (Subcraspedites) aff. hoeli is extremely close to "Polyptychites" hoeli Frebold (1929, p. 13-14, Pl. II, fig. 3) and may well be conspecific with it. So far as known, the only differences between the two consist in the slightly greater ratio of secondaries to primaries in the Canadian form (approximately 3 1/2 to 1) and in the apparently greater number of auxiliary lobes in "P." hoeli (judging by the imperfectly-preserved topotype seen in Dr. H. Frebold's private collection). The taxonomic value of these distinctions is uncertain considering the extraordinary individual and infraspecific variability of all craspeditid ammonites. As already mentioned (see under the description of Pl. III, fig. 4), the external suture lines of T. (S.) aff. spasskensis appear to be diagnostic of all early Lower Cretaceous craspeditids (e.g. Subcraspedites s. str., Tollia s. str. and Dichotomites s. lato). The ascendant character, long, slender, closely-spaced lobes, relatively more strongly frilled appearance, and the presence of four or more auxiliary lobes of these suture lines set them sharply apart from those of all known uppermost Jurassic craspeditids. The sutures of all other late Upper Jurassic (Portlandian s. str. and Upper Tithonian) perisphinctids, such as Dorsoplanites, Pavlovia, Laugeites etc., are also quite different. Like the forms described as Subcraspedites and Paracraspedites by Swinnerton (1935), all these genera have fewer auxiliary lobes than the early Lower Cretaceous craspeditids. These auxiliary lobes are, furthermore, arranged in markedly retractive fashion (i.e. the imaginary line connecting their tops is curved sharply away from the shell's mouth) toward the umbilical seam, and are much less individualized than those of the early Lower Cretaceous craspeditids.
3A. Lateral view showing three sutures outlined in white, anterior 1/5 of whorl is living chamber.
3B. Ventral view of the middle part of the whorl. Two suture-lines are outlined in black and white. The secondary ribs cross the venter with a slight forward bend not discernible in the photograph.


1A
1B
2A
1C
3B
2B
2C
2D
3A

BERRIASIAN STAGE

Buchia uncitoides and Buchia volgensis Zones

PLATE IV

FIGS. 1A-1C. Tollia (Subcraspedites) aff. analogus (Bogoslovsky, 1909). GSC loc. 38789, GSC No. 17138
Internal cast of a complete but somewhat deformed specimen. Unlike other Subcraspedites and Tollia s. str. species figured in this report, the ribs of T. (S.) aff. analogus simply bifurcate to the very end of the living chamber.
1A. Lateral view. 1B. Ventral view of the living chamber. 1C. Cross-section of the end of the living chamber and the venter of the earliest part of the last whorl.

FIGS. 2A-2B. Buchia uncitoides (Pavlow, 1907) var. GSC loc. 38789, GSC No. 17140.
Internal cast of an almost complete, medium-sized left valve of a variant transitional to the B. volgensis-like variant of B. okensis s. lato in its heavier and more widely spaced concentric ribbing.
2A. Lateral view of the exterior. The beak is essentially straight, which is typical of the early forms of B. uncitoides s. lato. 2B. Anterior view of the same. The specimen is somewhat tilted toward the camera.

FIGS. 3A-3B. Buchia uncitoides (Pavlow, 1907) f. typ. GSC loc. 38789, GSC No. 17139.
Internal cast of an incomplete, medium-sized left valve.
2A. Lateral view of the exterior. The beak clearly has a left-hand incurvature. 2B. Anterior view of the same.

FIGS. 4A-4B. Buchia uncitoides (Pavlow, 1907) var. spasskensoides (Crickmay, 1930). GSC loc. 38789, GSC No. 17141.
Internal cast of an almost complete, large right valve of a variant transitional to the B. volgensis-like variant of B. okensis s. lato in its heavier and more widely spaced concentric ribbing.
4A. Lateral view of the exterior. The valve is much narrower than that of B. volgensis s. str. and is distinctly subtriangular instead of broadly rounded or subquadrate. 4B. Oblique posterior view. The valve is much higher in cross-section than that of B. volgensis s. str. (see fig. 10B).

FIGS. 5A-5B. Buchia volgensis (Lahusen, 1888) s. str. GSC loc. 35697, GSC No. 17144.
An internal cast of a large left valve of a B. crassicollis-like variant of the species similar to that shown in fig. 6.
5A. Lateral view of the exterior. 5B. Anterior view. The relatively blunt and broad beak is characteristically bent into a hook-shape, unlike that of B. uncitoides s. lato.

FIGS. 6A-6B. Buchia volgensis (Lahusen, 1888) var. GSC loc. 13122, GSC No. 16601.
An internal cast of the left valve of a B. crassicollis-like variant of the species. Concentric ribbing is only feebly developed on the cast's surface. This brings into prominence broad welts and depressions similar to those occurring in B. crassicollis s. str. This form is, however, totally unlike B. crassicollis in its much wider and thinner shell with gradually sloping flanks in cross-section.
6A. Lateral view of the exterior. 6B. Anterior view.

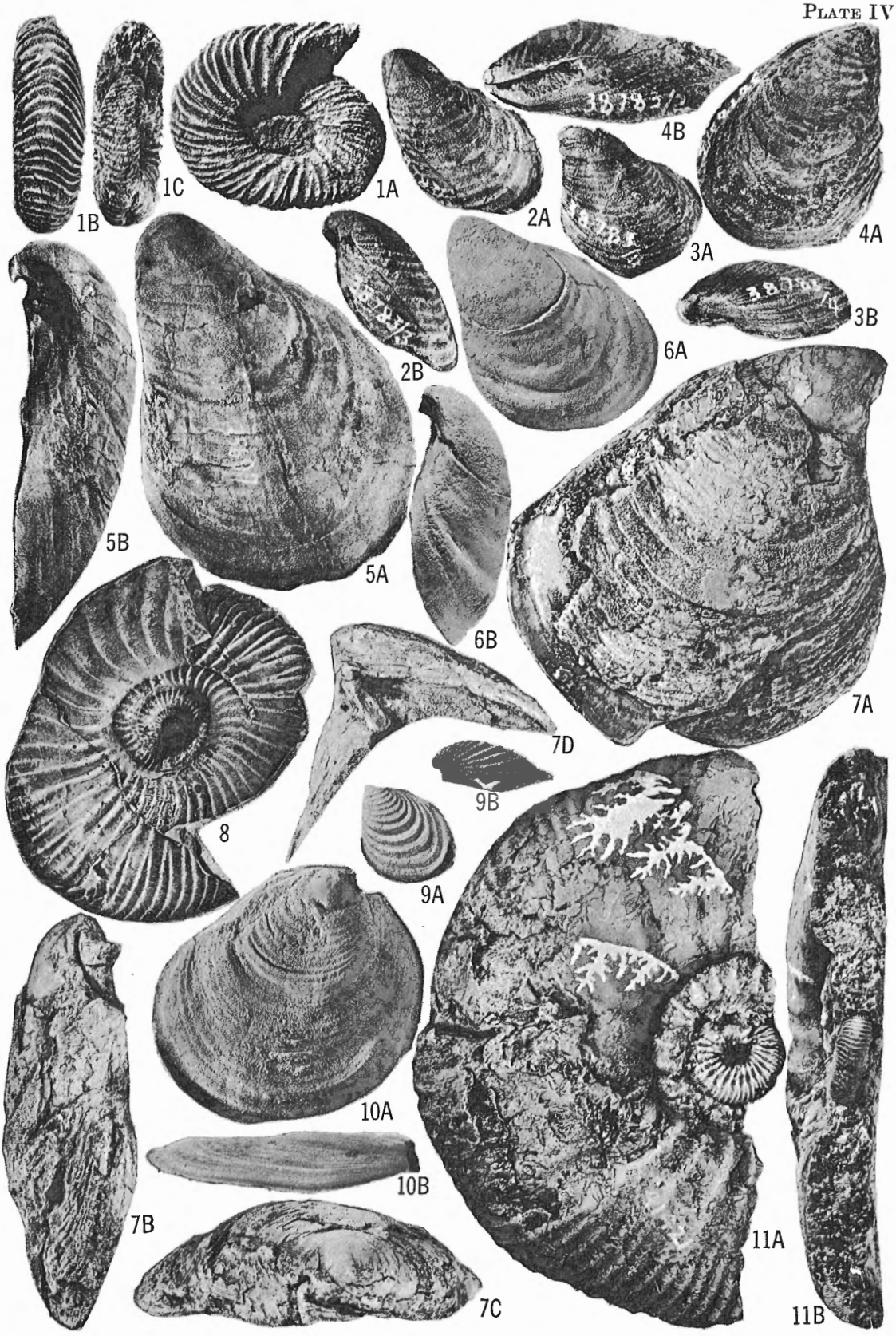
FIGS. 7A-7D. Buchia volgensis (Lahusen, 1888) s. str. GSC loc. 26915, GSC No. 17157.
A typical right valve of a giant representative of the species with the shell-layer well-preserved.
7A. Lateral view of the exterior. The surface of the shell-layer is covered by fine, high, and closely-spaced concentric ribs, typical of the Russian representatives of the species. The surface of the internal cast is, however, virtually smooth. 7B. Anterior view of the exterior. 7C. Beak and hinge margin viewed from above. Part of the anterior surface of the byssus ear is broken off, making it look bent toward the posterior margin. Actually it is inclined steeply toward the anterior margin. 7D. Lateral view of the beak's and hinge margin's interior. The byssus ear is anteriorly closed and spoon-shaped.

FIG. 8. Tollia (Praetollia?) n. sp. A. GSC loc. 26996, GSC No. 17158.
A rubber mould made from the natural impression in the rocks. Lateral view of the fragmentary penultimate and ultimate whorls including the beginning of the living chamber. Unlike the younger T. (P.?) cf. payeri from the upper part of the Buchia volgensis zone, this form is characterized by sharp, fine, simple-dichotomous ribbing throughout. It differs from T. (P.) maynci Spath, 1952 and allied forms in its much wider umbilicus resembling that of T. (S.?) cf. payeri (see fig. 11A).

FIGS. 9A-9B. Buchia aff. okensis (Pavlow, 1907) s. lato. GSC loc. 13125, GSC No. 17143.
An internal cast of the left valve of a small variant? of the species sometimes encountered in the Buchia uncitoides and Buchia okensis zones.
9A. Lateral view of the exterior. 9B. Anterior view.

FIGS. 10A-10B. Buchia volgensis (Lahusen, 1888) f. typ. GSC loc. 13122, GSC No. 16602.
An internal cast of a complete right valve typical of the species.
10A. Lateral view of the exterior. The fine, dense, concentric ribbing is clearly visible on the surface of the cast unlike the specimen shown in fig. 6. 10B. Anterior view. The valve is characteristically flat, unlike those of B. uncitoides (fig. 4B) and B. n. sp. aff. volgensis (Pl. II, figs. 3B, 5C).

FIGS. 11A-11B. Tollia (Subcraspedites?) cf. payeri (Toula, 1874). GSC loc. 41421, GSC No. 17156.
An internal cast of a large but still completely septate specimen showing early whorls. Note the diagnostic changes of the ribbing habit from simple dichotomous ribbing of the innermost whorl to the dominantly trichotomous ribbing of the outer whorl. The ribs are heavy and blunt on the outer whorl; the umbilicus is wide. These features are more diagnostic of the subgenus Subcraspedites, than of true Tollia s. str. The suture line is strongly deformed but retains the characteristic appearance of the lobes and its ascendant character.
11A. Lateral view. 11B. Cross-section of the outer whorls and the venter of the smallest whorl visible. Although somewhat deformed, the outer whorl retains its characteristic shape. The intermediate whorls, however, are completely squashed. The innermost whorl visible is almost perfectly preserved.


1B
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1A
2A
4B
4A
3A
3B
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6A
5B
5A
6B
7A
7D
8
9B
9A
10A
10B
7B
7C
11A
11B

VALANGINIAN STAGE

Tollia (Tollia) tolli and Tollia (Temnoptychites) novosemelica Zones--Undivided

PLATE V

FIGS. 1A-1B. Tollia (Temnoptychites) novosemelica (Sokolov, 1913). GSC loc. 28713, GSC No. 17164. This heavily-built and narrowly umbilicate variant is an adult specimen with most of the living chamber preserved; the inner whorls are somewhat crushed laterally. It is mostly covered by the imperfectly-preserved shell layer. Although this is not clearly visible in fig. 1B, the ribs are just as clearly interrupted in the middle of the venter of the living chamber as in the specimen shown in fig. 4D. This interruption of the ribs is apparently the only distinguishable feature of Tollia (Temnoptychites) novosemelica from Tollia (Tollia) tolli s. lato (inclusive of T. tolmatschowi and T. latelobata). It is generally accepted as diagnostic of the subgenus Temnoptychites Pavlow, 1914, and is absent in all representatives of subgenera Tollia s. str. and Subcraspedites s. str. 1A. Lateral view. The characteristically sharp, fine and closely-spaced ribs gradually weaken on the living chamber until the surface becomes quite smooth approaching the aperture. Lower parts of the primary ribs become swollen before they disappear completely. 1B. Cross-section of the living chamber and the venter, of the earliest-exposed part of the whorl. The whorl cross-section, with its high, narrowly-rounded venter and its maximum width situated at the umbilical shoulder, is equally diagnostic of the subgenus, Tollia s. str. and slender, representatives of Temnoptychites and so is the slender, narrowly-ventered but regularly-rounded discus-like outline of the shell's cross-section.

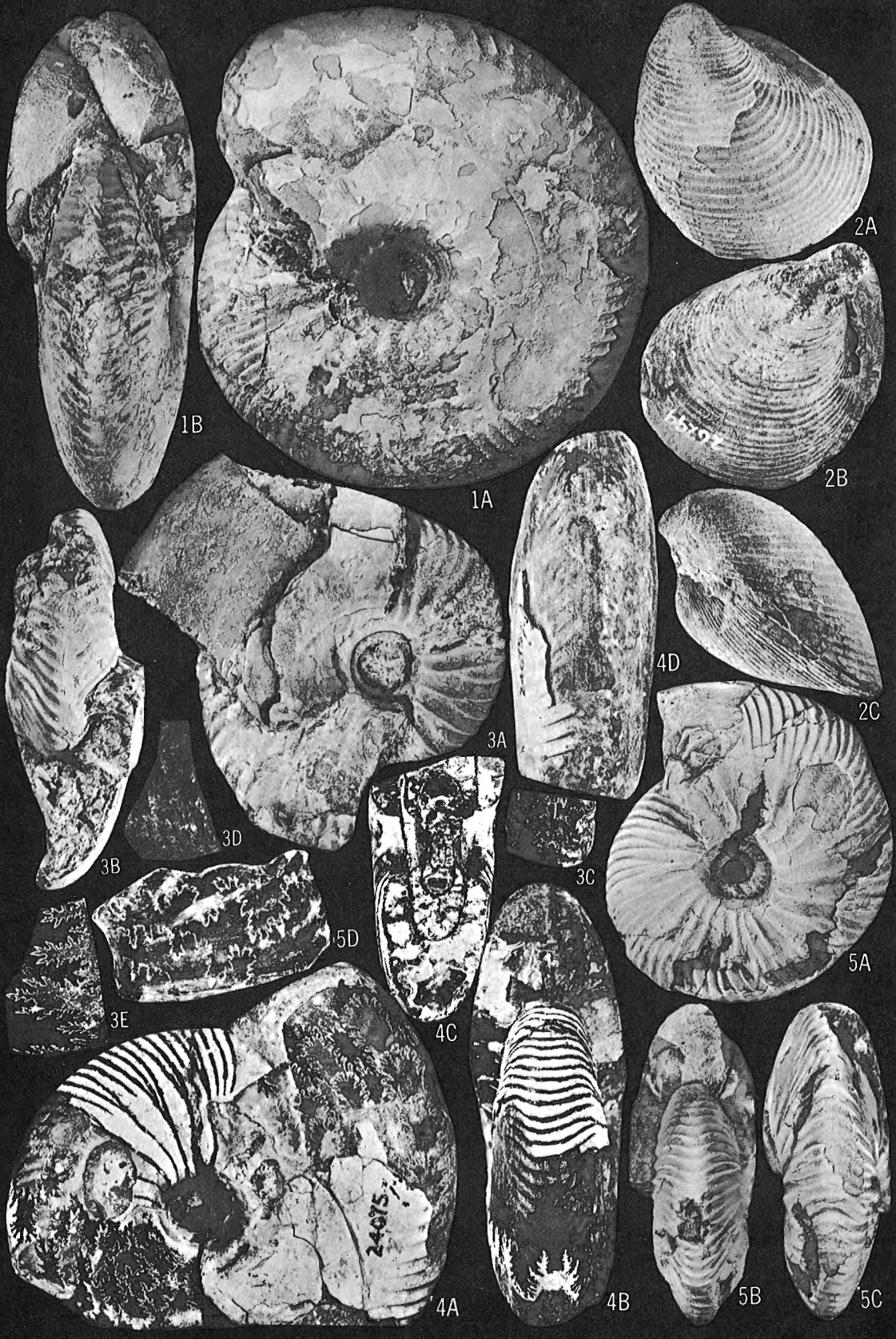
FIGS. 2A-2C. Buchia keyserlingi (Lahusen, 1888) f. typ. GSC loc. 26299, GSC No. 17163. An almost complete, adult, typical representative of the species. Beak parts of both valves are incomplete. The anterior part is covered by the shell-layer; the posterior lower part is an internal cast. B. keyserlingi is very similar to and possibly a descendant of the uppermost Jurassic B. unschensis s. lato; it is, however, more finely and densely ribbed and lacks the large, angular posterior ear of the latter species. From latest Jurassic and early Berriasian B. n. sp. aff. volgensis, B. keyserlingi differs in the constant presence of evenly-spaced, fairly fine and moderately closely-spaced concentric ornament, both on the shell and cast surfaces. From B. volgensis s. str., B. keyserlingi differs in: (1) The shorter and blunter beak of the left valve, which is not hook-shaped and does not markedly overhang the right valve. (2) Shorter and wider, relatively more swollen shells. The greater thickness of the right valve and the almost equal dimensions of both valves are particularly distinctive. (3) The constant presence of much more evenly spaced concentric surface ornament on both the shell and cast. From B. sublaevis (Keyserling, 1846) B. keyserlingi differs in its stronger and more regular concentric ornament, its shorter and blunter beak and more rounded outline. From Buchia inflata (Toula) and all related forms B. keyserlingi differs in its considerably less swollen shell and its broader and regularly-rounded cross-section (viewed from the hinge margin). The flanks of B. keyserlingi slope gradually, while those of B. inflata and its related forms drop down abruptly from the blunt middle part of the shell. 2A. Lateral view of the exterior of the left valve. 2B. Lateral view of the exterior of the right valve and the protruding beak of the left valve. 2C. Anterior view of the exterior of both valves.

FIGS. 3A-3E. Tollia (Temnoptychites) simplex (Bogoslovsky, 1902). GSC loc. 24075, GSC No. 17173. A medium-sized, fragmentary and laterally-deformed specimen, septate throughout; the internal cast has considerable patches of shell-layer. 3A. Lateral view. The complete inner whorl is covered by strong, sharp, widely-spaced, dichotomous ribs throughout, which is diagnostic of the species. The fragment of septate outer whorl which is superimposed on the inner whorl is smooth, except for indistinct and swollen parts of the basal, primary ribs. 3B. Cross-section of the fragmentary outer whorl and the venter of the inner whorl. All secondary ribs are completely interrupted on the venter. A smooth band, diagnostic of the intermediate growth stages of the species, is clearly visible between their ends. The very strong forward projection of the secondary ribs on the venter is another characteristic feature. 3C. Ventral and first lateral lobes of the inner whorl. 3D. The external lateral suture line of the inner whorl typical of the early Lower Cretaceous craspeditids in all respects. 3E. Part of the lateral suture line of the outer whorl. Only the first auxiliary lobe is preserved.

FIGS. 4A-4D. Tollia (Temnoptychites) novosemelica (Sokolov, 1913) var. GSC loc. 24075, GSC No. 17174. A medium-sized, undeformed, wholly septate whorl of an extremely slender and high-whorled variant of the species, apparently transitional to Dichotomites (=Neocraspedites) s. lato in this respect, as well as in the interlocking, slender and strongly-frilled suture lines. This is an internal cast with considerable patches of well-preserved shell-layer. 4A. Lateral view. Although the specimen is septate throughout, the ribbing is completely lost near its end, except for the strongly forwardly inclined top parts of the secondary ribs. The umbilicus is narrower than in any other Tollia species known from the Canadian Arctic. This is also suggestive of Dichotomites (see Pl. XIII, fig. 6). 4B. Cross-section of the whorl-end and the venter of its earlier part. As in all typical Tollia and slender Temnoptychites species the whorl's cross-section is egg-shaped and narrowly ventered, with the maximum width situated at or near the umbilical shoulder (see also fig. 4C). The secondary ribs are not interrupted at the venter at this stage of growth. 4C. Cross-section of the earlier whorls and the venter of the almost smooth innermost whorl. 4D. Venter of the outer whorl near its end; the secondary ribs are interrupted on the venter with a smooth band, diagnostic of the intermediate and late growth stages of Tollia (Temnoptychites) novosemelica, clearly visible between their abrupt ends. This is best seen near the lower end of the picture where the shell layer is preserved. Unlike those of Tollia (Temnoptychites) simplex (see fig. 3B), the secondary ribs are only relatively weakly projected forward here and at the earlier growth stages.

FIGS. 5A-5D. Tollia (Tollia) tolli (Pavlow, 1914) var. latelobata, Pavlow, 1914. GSC loc. 28713, GSC No. 17167. Intermediate whorl (septate throughout) of a somewhat deformed, almost completely shell-covered representative. 5A. Lateral view. Note the alternation of dichotomous and trichotomous ribs on the earlier part of the whorl and the predominance of the trichotomous ribbing on its outer part. The ribs are characteristically sharp and fine throughout. The umbilicus is distinctly wider than in Tollia (Temnoptychites) novosemelica shown in fig. 1. 5B. Cross-section showing end of whorl and part of venter. The secondary ribs cross the venter without any weakening or interruption, which is typical of Tollia (Tollia) tolli and all other representatives of subgenus Tollia; their marked forward swing on the venter is also typical of this subgenus. 5C. Venter of the outer part of the whorl. The ribs are uninterrupted to its very end. 5D. Lateral part of the external suture line X2. It is typical of Cretaceous Craspeditidae (see Pl. II, fig. 4; Pl. III, fig. 3; Pl. IV, fig. 11A), except that the lobes are much wider than in any other Tollia s. lato species. This feature is diagnostic of Tollia (Tollia) tolli var. latelobata, Pavlow, 1914.

PLATE V



VALANGINIAN STAGE

Thorsteinssonoceras ellesmerensis Beds and Unzoned Fossils

PLATE VI

FIGS. 1A-1G. Thorsteinssonoceras ellesmerensis n. gen. n. sp. (a manuscript name ="Polyptychites keyserlingi" of Sokolov and Bodylevsky, 1931 non Neumayr and Uhlig, 1881). GSC loc. 47876, GSC No. 17221. An internal cast with considerable patches of well-preserved shell layer. An intermediate whorl (septate to the end) of the intermediate P. keyserlingi-like variant of the species. This specimen resembles closely the specimen of P. (P.) keyserlingi var. pavlowi Koenen, 1902, shown in fig. 3 in the whorl-shape and ribbing habit. The umbilicus of the Canadian form is, however, deeper and narrower than that of P. keyserlingi var. pavlowi. The suture line of this and other "polyptychitid" ammonites from Ellesmere Island figured in this report is quite different from that of P. keyserlingi (fig. 3B) and all other Eurasian and Canadian representatives of Polyptychites known to the writer, except for "Polyptychites keyserlingi" of Sokolov and Bodylevsky (1931, p. 96, Pl. XI, fig. 1A-1B) from Spitsbergen. The latter form is not a true Polyptychites and is conspecific with Thorsteinssonoceras ellesmerensis n. gen. n. sp. The extra wide saddle subdivided by several lobules, which occurs between the 2nd lateral and auxiliary lobes in P. keyserlingi (fig. 3B) and other Eurasian Polyptychites species, occurs between the 1st and 2nd auxiliary lobes in the Canadian forms concerned (fig. 1B). The external suture line of this and other Ellesmere Island forms is, furthermore, ascendant throughout or almost throughout and has four to five (compare specimens shown in Pl. VII, figs. 1, 3) auxiliary lobes instead of only two to three such lobes occurring in all Eurasian and Canadian Polyptychites species known to the writer (see fig. 1B where the 2nd and 3rd auxiliaries are almost concealed by the steep umbilical wall; Pl. VII, fig. 3; Pl. VIII, fig. 1D). The lobes (see fig. 1B) are longer, more crowded and narrower than those of P. keyserlingi, and some other Eurasian Polyptychites species, such as P. (E.) stubbendorfi (see Pl. X, fig. 5). These distinctions necessitate the erection of a new genus to receive the "polyptychitid" ammonites from the Ellesmere Island figured in this report. The essentially craspeditid nature of their suture line necessitates, furthermore, their transfer to Craspeditidae Spath, 1924. Thorsteinssonoceras ellesmerensis n. gen. n. sp. is formally erected in a paper now in press (Jeletzky, in press). 1A. Lateral view. 1B. Lateral view of the other side. Ribs and suture lines are outlined in black. 1C. Cross-section of the imperfectly-preserved end of the whorl and the venter of its earliest part exposed. 1D. Ventral view of the middle part of the whorl. 1E. Ventral view of the end part of the whorl with two suture lines outlined in white.

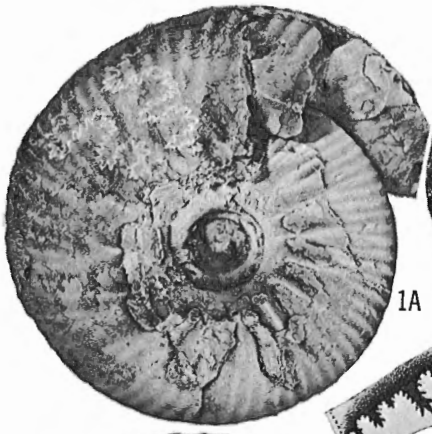
FIGS. 2A-2B. Polyptychites cf. keyserlingi (Neumayr and Uhlig, 1881) s. lato. GSC loc. 27884, GSC No. 17222. A strongly laterally deformed intermediate whorl closely comparable to those of the European representatives of P. keyserlingi s. lato in ribbing habit and other external features. 2A. Lateral view of the side with relatively less distorted ribs and umbilical nodes. 2B. Lateral view of the other side with more strongly distorted ribs and umbilical nodes.

FIGS. 3A-3B. Polyptychites keyserlingi (Neumayr and Uhlig, 1881) var. pavlowi Koenen, 1902. Reproduction of the smaller cotype of the species later separated from its grown-up specimen shown in fig. 4 as P. pavlowi. Osterwald, northwest Germany, mid-Valanginian, Polyptychites keyserlingi zone. From Neumayr and Uhlig (1881, Pl. 27, figs. 2-2a). Intermediate, wholly septate whorl. 3A. Lateral view. 3B. External suture line.

FIGS. 4A-4C. Neocomites (Neocomites?) aff. indomontanus Uhlig, 1903. GSC loc. 33737, GSC No. 17223. 4A. Lateral view showing fine ribbing of the inner whorl. 4B. Lateral view of the outer whorl (a living chamber?) with characteristic coarser sculpture. Unlike those of the outer whorl the secondary ribs begin at the umbilical margin. 4C. Ventral view of the outer whorl, aracteristic chevron-like secondary ribs weakening in the middle of the venter.

FIG. 5. Polyptychites cf. keyserlingi (Neumayr and Uhlig, 1881). GSC loc. 33738, GSC No. 17224. Lateral view of a flattened specimen; ribbing habit closely matches P. keyserlingi s. lato.

FIGS. 6A-6B. Polyptychites (Polyptychites) keyserlingi (Neumayr and Uhlig, 1881) f. typ. Reproduction of the end part of the whorl (the living chamber) of the largest cotype of the species shown by Neumayr and Uhlig (1881, Pl. 27, fig. 1-1a). Süntel, Hannover, mid-Valanginian, Polyptychites keyserlingi zone. 6A. Lateral view of the end part of the living chamber. 6B. Cross-section of the end of the living chamber and the venter of the earliest visible part of the last whorl.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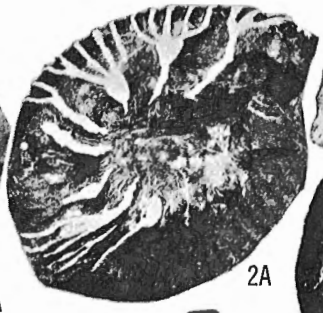
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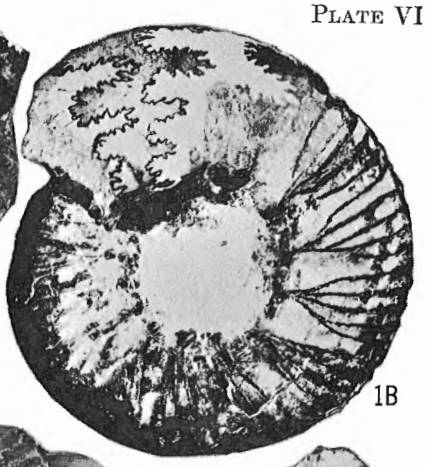
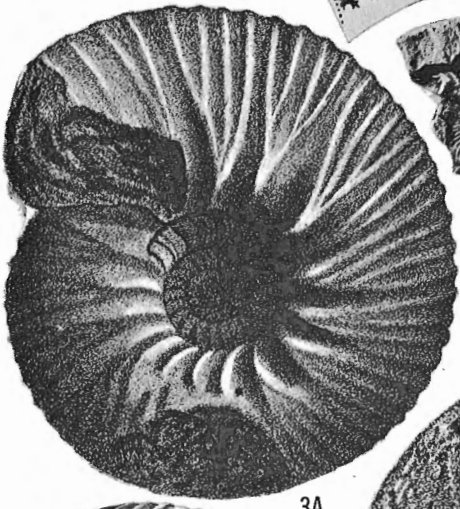

1B

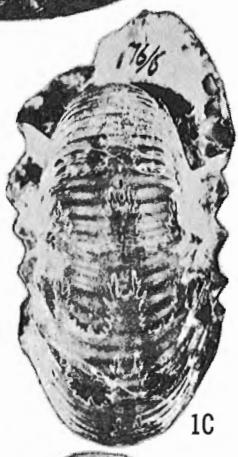

3B


4C


3A


4A


1E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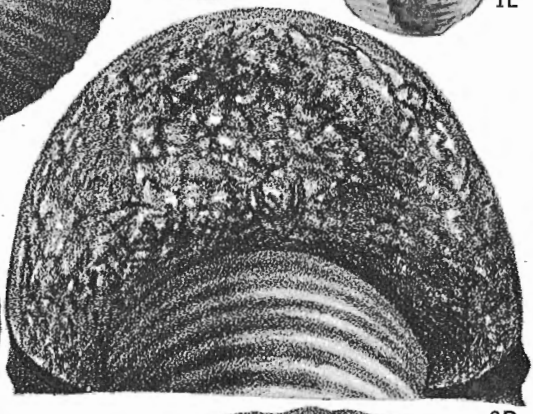
4B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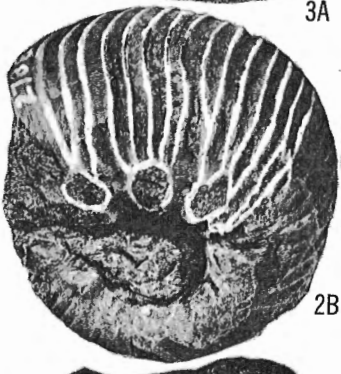
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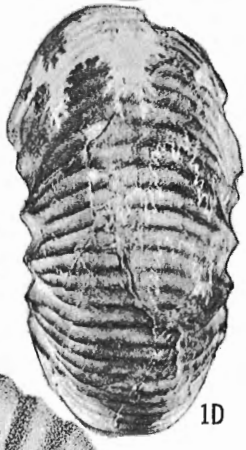
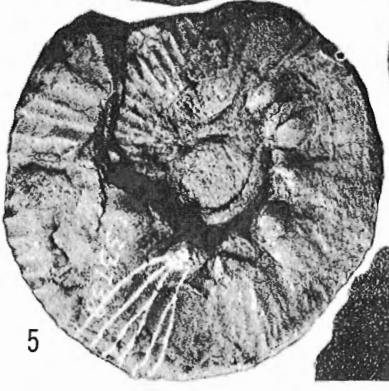

1D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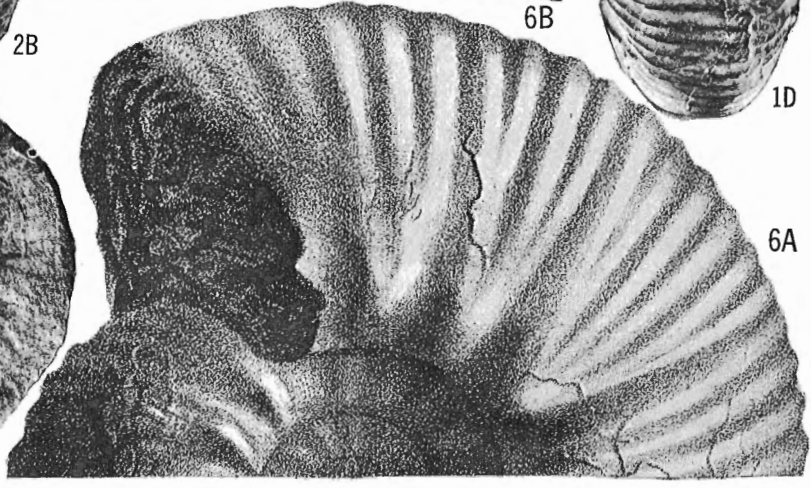

6A

VALANGINIAN STAGE

Thorsteinssonoceras ellesmerensis Beds

PLATE VII

FIGS. 1A-1C. Thorsteinssonoceras ellesmerensis n. gen. n. sp. (a manuscript name). GSC loc. 47876, GSC No. 17228.
An almost completely shell-covered specimen with about 1 inch of the living chamber preserved. This extremely slender variant of T. ellesmerensis is rather similar to Virgatoptychites? pakhsaensis Voronets, 1958 in ribbing habit and whorl shape but differs in possessing well-developed umbilical bullae of polyptychitid type. The suture line of this (not shown) and other representatives (e.g. Pl. VII, fig. 2A) of Thorsteinssonoceras ellesmerensis is rather similar to that of Eurasian Virgatoptychites species and that of other craspeditid ammonites.
1A. Lateral view showing the predominantly virgatitid ribbing habit, which distinguishes this Polyptychites beani-like variant from other variants of Thorsteinssonoceras ellesmerensis n. gen. n. sp. 1B. Ventral view of the middle part of the whorl. Note strong umbilical bullae, which distinguish our form from hitherto-known representatives of Virgatoptychites all of which have raised Tollia-like ribs. 3C. Cross-section of the whorl-end (beginning of the living chamber) and early part of the whorl. Cross-section is more highly arched than the other variants of the species, the venter is relatively narrowly rounded, and the whorl narrower with maximum width at the umbilical shoulder. This results in a distinctly Tollia- and Virgatoptychites-like appearance of the variant concerned.

FIGS. 2A-2D. Thorsteinssonoceras ellesmerensis n. gen. n. sp. (a manuscript name). GSC loc. 47876, GSC No. 18037.
Parts of two mostly shell-covered inner whorls showing a complete and typical external suture line, characteristic ribbing habit, and cross-section.
2A. Lateral view of the outer whorl with the inner whorl sticking out. The umbilical bullae are considerably longer and more nearly straight than those of the grown-up representative (fig. 1A). 2B. Ventral view of the outer whorl with suture line indicated in white. 2C. Cross-sections of both whorls. A small segment of the third whorl is also visible. 2D. Ventral view of the inner whorl. This whorl already has markedly bullate primary ribs (compare fig. 2A).

FIGS. 3A-3D. Thorsteinssonoceras ellesmerensis n. gen. n. sp. (="Polyptychites keyserlingi" Sokolov and Bodylevsky, 1931 non Neumayr and Uhlig, 1881). GSC loc. 47876, GSC No. 17226.
An internal cast with considerable patches of shell. Intermediate whorls (septate to the end) of the intermediate variant which matches closely the specimen of "Polyptychites keyserlingi" of Sokolov and Bodylevsky (1931, Pl. XI, fig. 1B) in all important aspects of its morphology.
3A. Lateral view. 3B. Cross-section of the end of the whorl and the venter of its earlier part. Two constrictions are visible. The whorl of our form is much lower and wider than that of the corresponding growth-stages of the European P. keyserlingi s. lato (see Pl. VI, fig. 6B).
3C. Ventral view of the middle part of the whorl with the suture line outlined in white. 3D. Lateral part of the external suture line clearly showing its craspeditid character.


2C
1B
2B
3C
1C
1A
2A
3D
3A
2D
3B

VALANGINIAN STAGE

Thorsteinssonoceras ellesmerensis Beds

PLATE VIII

FIGS. 1A-1E. Thorsteinssonoceras ellesmerensis n. gen. n. sp. (a manuscript name). GSC loc. 47879, GSC No. 17232. Fragmentary intermediate whorl of a large specimen (septate to the end) and a well-preserved inner whorl showing the typical ribbing habit of the species. The intermediate whorl is smooth except for the sharp, large umbilical nodes and one constriction. This extremely sturdy variant of Thorsteinssonoceras ellesmerensis n. gen. n. sp. is indistinguishable from the Siberian representatives of P. (E.) gravesiformis Pavlow, 1914 in its whorl-shape, funnel-like umbilicus, umbilical nodes, sculpture of the inner whorls, etc. The suture line is, however, rather different (see under Pl. VI, fig. 1), indicating that the two species are only homeomorphically similar.
1A. Cross-sections of both whorls and venter of the early part of the distinctly-ribbed inner whorl showing the ventral part of external suture outlined in white. 1B. Ventral view of the essentially smooth outer (intermediate) whorl. Sharp umbilical nodes and one constriction are clearly visible. 1C. Lateral view of both preserved whorls. The lateral part of the external suture including 1st auxiliary lobe is outlined in white. 1D. The lateral part of the external suture line (same as in fig. 1C) X3. The second and third auxiliary lobes not visible in fig. 1C are sketched in from their indistinct contours on the print. The fourth auxiliary lobe is dimly visible at the umbilical seam (not outlined). The suture line differs from that of the specimen shown in Pl. VII, fig. 3D only in being considerably less frilled. This is obviously because it represents an earlier growth-stage of the new genus. 1E. Ventral part of the external suture line (the same as seen in fig. 1A) X3.


1E
1B
1A
1D
1C

VALANGINIAN STAGE

Polyptychites (Euryptychites) stubbendorfi Zone

PLATE IX

FIGS. 1A-1C. Polyptychites (Euryptychites) stubbendorfi (Schmidt) var. middendorfi Pavlow, 1914. GSC loc. 37867, GSC No. 17244.
A large but fragmentary and somewhat deformed specimen showing the beginning of the living chamber. Although not clearly visible in the photographs, the suture line has essentially the same character as in the specimen shown in Pl. X, fig. 5A.
1A. Lateral view with the primary and secondary ribs outlined in black to show their bidichotomous habit diagnostic of this growth-stage. A constriction is clearly visible near the whorl-end (left side of the picture). 1B. Same view as in 1A but whitened in order to show the contrast between the fine and closely-spaced ribs on the septate part of the whorl and much coarser and distant ribs on the preserved part of body chamber. 1C. The distinctly subangular cross-section of the body chamber and the venter of the earliest preserved part of the whorl.

FIG. 2. Dichotomites cf. giganteus (Imlay, 1960). GSC loc. 14999, GSC No. 17245.
A fragment of the internal whorl with well-preserved, bundled Polyptychites-like flexuous ribbing typical of the species.

FIG. 3. Buchia keyserlingi (Lahusen, 1888) s. lato. University of Alberta loc. 40817. GSC No. 17688 (plaster cast).
An internal cast of the left valve of a medium-sized, apparently typical but rather strongly deformed representative of the species.

FIGS. 4A-4C. Buchia inflata (Toula, 1874) var. GSC loc. 41419, GSC No. 17246.
A large left valve of an extreme variant approaching B. sublaevis in its longer, incurved beak and relatively greater length. The anterior half is covered with well-preserved shell layer while the posterior half is mostly an internal cast.
4A. Lateral view of the exterior. The well-developed, closely-spaced concentric ribbing distinguishes this form from B. sublaevis s. lato. 4B. Posterior view. From this aspect the valve is rather similar to that of B. volgensis s. str.; it is, however, markedly thicker and narrower than the left valve of the latter species. 4C. The beak and hinge margin viewed from above. The thick, high-arched cross-section with steeply-sloping flanks differentiates our form from B. volgensis s. str., B. keyserlingi s. lato and other Berriasian and Lower Valanginian Buchia species. The long, essentially straight beak is similar to that of B. sublaevis s. lato rather than the typical B. inflata (Toula), which has a B. keyserlingi-like short and obtuse beak.

FIGS. 5A-5C. Polyptychites? cf. densicosta Pavlow, 1914. GSC loc. 37867, GSC No. 17247.
Intermediate whorl, septate to the end and mostly shell-covered. Although this specimen is indistinguishable from Polyptychites (Polyptychites) ex gr. ramulicosta Pavlow, 1892, in its whorl shape and ribbing habit, its suture line is essentially similar to that of Thorsteinssonoceras ellesmerensis n. gen., n. sp. (see Pls. VI-VIII) in having four auxiliary lobes. The similarity to P. densicosta Pavlow, 1914 (the suture line of which is unknown), may thus be only due to the convergence.
5A. Lateral view showing the suture line with three auxiliary lobes near the whorl-end. The fourth auxiliary lobe is concealed by the steep umbilical wall. 5B. The laterally-deformed (on the right side only) cross-section of the whorl and the venter of its earliest exposed part. 5C. Ventral view of the middle part of the whorl.


2
1A
1C
5C
3
4B
5A
1B
4C
4A
5B

VALANGINIAN STAGE

Polyptychites (Euryptychites) stubbendorfi Zone

PLATE X

FIGS. 1A-1B. Acroteuthis? (a new genus?) n. sp. A. GSC loc. 21897, GSC No. 17248.
An almost complete and perfectly-preserved specimen of this common and highly distinctive Middle to Upper Valanginian belemnite species. No other late Upper Jurassic and early Lower Cretaceous belemnite form known to the writer has such an attenuated, dagger-like outline reminiscent of Middle and Lower Jurassic Megateuthis. From these latter it differs, however, in lacking any traces of epirostrum, in the lack of the lateral compression of the guard and in the absence of dorso-lateral furrows on its apical part.
1A. Ventral view. 1B. Lateral view. The venter is on the right.

FIGS. 2A-2B. Buchia inflata (Toula, 1874) var. GSC loc. 41419, GSC No. 17249.
A half-grown representative of the same extreme variant (or subspecies?) of the species as that shown in Pl. IX, fig. 4. A left valve mostly covered by poorly-preserved shell layer.
2A. Lateral view of the exterior. 2B. Anterior view of the same. Most of the long and slender beak is broken off.

FIG. 3. Polyptychites (Euryptychites) stubbendorfi (Schmidt) var. middendorfi Pavlow, 1914.
Same specimen shown in Pl. IX, fig. 1. Lateral view of the other side showing the steep, narrow, ladder-like character of the umbilicus and the poorly-preserved suture line, which is essentially similar to that of the specimen shown in fig. 5.

FIGS. 4A-4C. Buchia inflata (Toula, 1874) var. GSC loc. 41419, GSC No. 17250.
A medium-sized, somewhat incomplete left valve of the same variant (or subspecies?) of B. inflata s. lato as the specimens shown in Pl. IX, fig. 4, and Pl. X, fig. 2. Mostly covered by poorly- to well-preserved shell layer.
4A. Lateral view of the exterior. The concentric ribs are more widely spaced in part and the beak has a stronger left-handedly incurvature than most representatives of this variant (or subspecies?) of B. inflata. In these features this specimen somewhat resembles B. pacifica Jeletzky, 1964 of the Canadian Western Cordillera and ? Alaska. 4B. Anterior view of the exterior. The concentric ribs of this part of the valve are all closely-spaced and fine and the beak is long, markedly-coiled and somewhat overhangs the right valve. In these features this specimen seems to be transitional to Buchia crassicollis s. str. of the Canadian Western Cordillera and Alaska (Jeletzky, 1964). 4C. The beak and hinge margin viewed from above. This specimen only differs from other figured representatives of the variant in the stronger left-handed (in this aspect right-handed) incurvature of the beak.

FIGS. 5A-5F. Polyptychites (Euryptychites) stubbendorfi (Schmidt) var. middendorfi Pavlow, 1914.
GSC loc. 37867, GSC No. 17251.
Fragment of an early whorl (figs. 5E-5F) and those of two intermediate whorls (septate to the end) of an undeformed and typically-sculptured specimen transitional between var. incrassata Pavlow, 1914 and var. middendorfi Pavlow, 1914. An internal cast.
5A. Lateral view of the largest preserved whorl showing the alternation of trifurcating and quadrifurcating rib bundles. Bidichotomous ribbing habit characteristic of the later growth-stage of the species (see fig. 3) is almost absent. The overall ribbing habit of this intermediate whorl of P. (E.) stubbendorfi strongly resembles that of the early to intermediate growth-stages of P. (P.) keyserlingi s. lato (see Pl. VI, fig. 3A, Pl. X, fig. 6). The suture line is characterized by its short and broad lateral and auxiliary lobes and by the presence of only three auxiliary lobes. Only two auxiliary lobes are visible in fig. 5A but the 3rd auxiliary lobe is clearly visible near the umbilical seam in fig. 5C. Only the imaginary line uniting the tops of the lateral lobes is ascendant. That uniting the tops of the auxiliary lobes drops away from the living chamber all the way to the umbilical seam (is descendant or suspensive). The suture line of P. (E.) stubbendorfi is, thus, quite unlike that of Thorsteinssonoceras ellesmerensis n. gen. n. sp. (see Pl. VI-VIII) and that of P. (P.)? cf. densicosta (Pl. IX). 5B. Ventral view. 5C. Cross-sections of two intermediate whorls and the impression of the venter of the next inner whorl. 5D. Lateral view of the early whorl shown in fig. 5E. 5E. Ventral view of one of the early whorls of the same specimen. This early whorl is even lower and broader proportionally than are the later whorls of P. (E.) stubbendorfi. 5F. Cross-section of the early whorl shown in figs. 5D-5E.

FIG. 6. Polyptychites keyserlingi (Neumayr and Uhlig, 1881) s. lato. Reproduction of the smallest cotype of the species. From Neumayr and Uhlig (1881, Pl. 27, fig. 3). Lateral view.

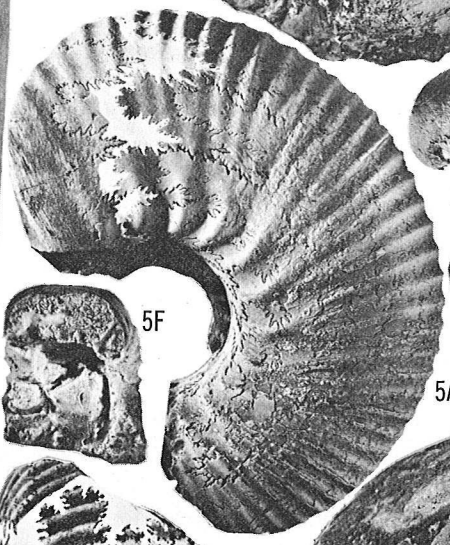

21897
1A
1B

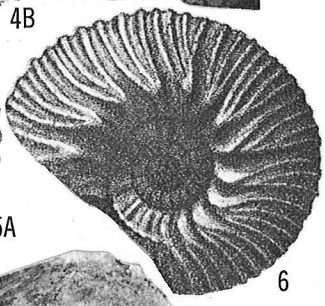

2A
2B


4A

4C


4B


5F
5A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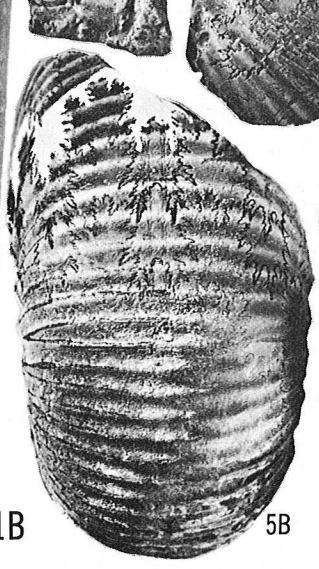
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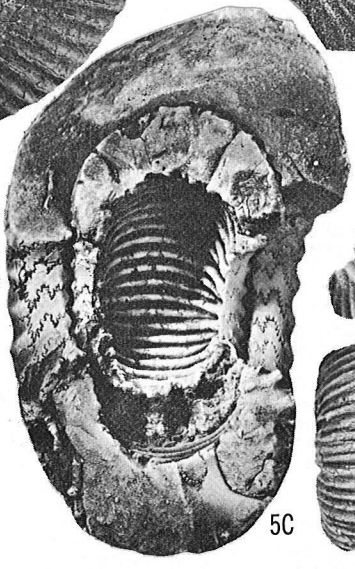
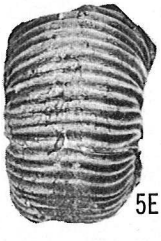

5C


5D


5E

VALANGINIAN STAGE
Dichotomites quatsinoensis Zone

PLATE XI

FIGS. 1A-1D. Buchia aff. keyserlingi (Lahusen, 1888) s. lato. GSC loc. 21901, GSC No. 17252.
An internal cast of an almost complete specimen transitional between B. inflata and B. keyserlingi s. lato. Differs from B. inflata var. shown in Pls. IX-X in its lesser thickness and more gradually sloping flanks.
1A. Lateral view of the exterior of the left valve. 1B. Lateral view of the exterior of the right valve and the protruding part of the left beak. 1C. Anterior view of the exterior of both valves. 1D. Beaks and hinge margins of both valves viewed from above.

FIGS. 2A-2B. Acroteuthis subquadratus (Roemer) emend. Swinnerton, 1935. GSC loc. 47736, GSC No. 17253.
An almost complete and typical adult specimen. The species differs from the Hauterivian Acroteuthis cf. conoides Swinnerton and allied forms (see Pl. XIV, fig. 3; Pl. XV, fig. 3) in the strong displacement of its apex toward the ventral side, much lesser dorso-ventral compression and markedly subquadrate cross-section. The Barremian Acroteuthis pseudopanderi (Sintsov) and allied forms (Pl. XVI, fig. 2; Pl. XVIII, fig. 2; Pl. XIX, fig. 1) all have subcircular to quite circular cross-section and centrally-placed to only feebly ventrally displaced apex; they also lack the marked and broad excavation of the ventral side of the guard. 2A. Ventral view. The broadly-excavated apical part of the venter is diagnostic of the species. 2B. Lateral view. The ventral side is on the right. Note how strong is the displacement of the apex toward this latter.

FIGS. 3A-3B. Buchia cf. sublaevis (Keyserling, 1846) s. lato. GSC loc. 24569, GSC No. 17254.
A juvenile left valve of a form apparently transitional between B. keyserlingi s. lato and B. sublaevis s. lato but morphologically closer to the latter species. An internal cast.
3A. Lateral view of the exterior. 3B. Anterior view of the same.

FIGS. 4A-4C. Buchia n. sp. aff. inflata (Toula, 1874)? University of Alberta loc. 205. GSC No. 18808 (plaster cast).
A half-grown, somewhat deformed left valve with preserved shell layer probably referable to the above-mentioned species.
4A. Lateral view of the exterior. 4B. Anterior view of the same, showing the somewhat abrupt termination of the lower end of the shell diagnostic of B. n. sp. aff. inflata. 4C. The beak and hinge margin viewed from above.

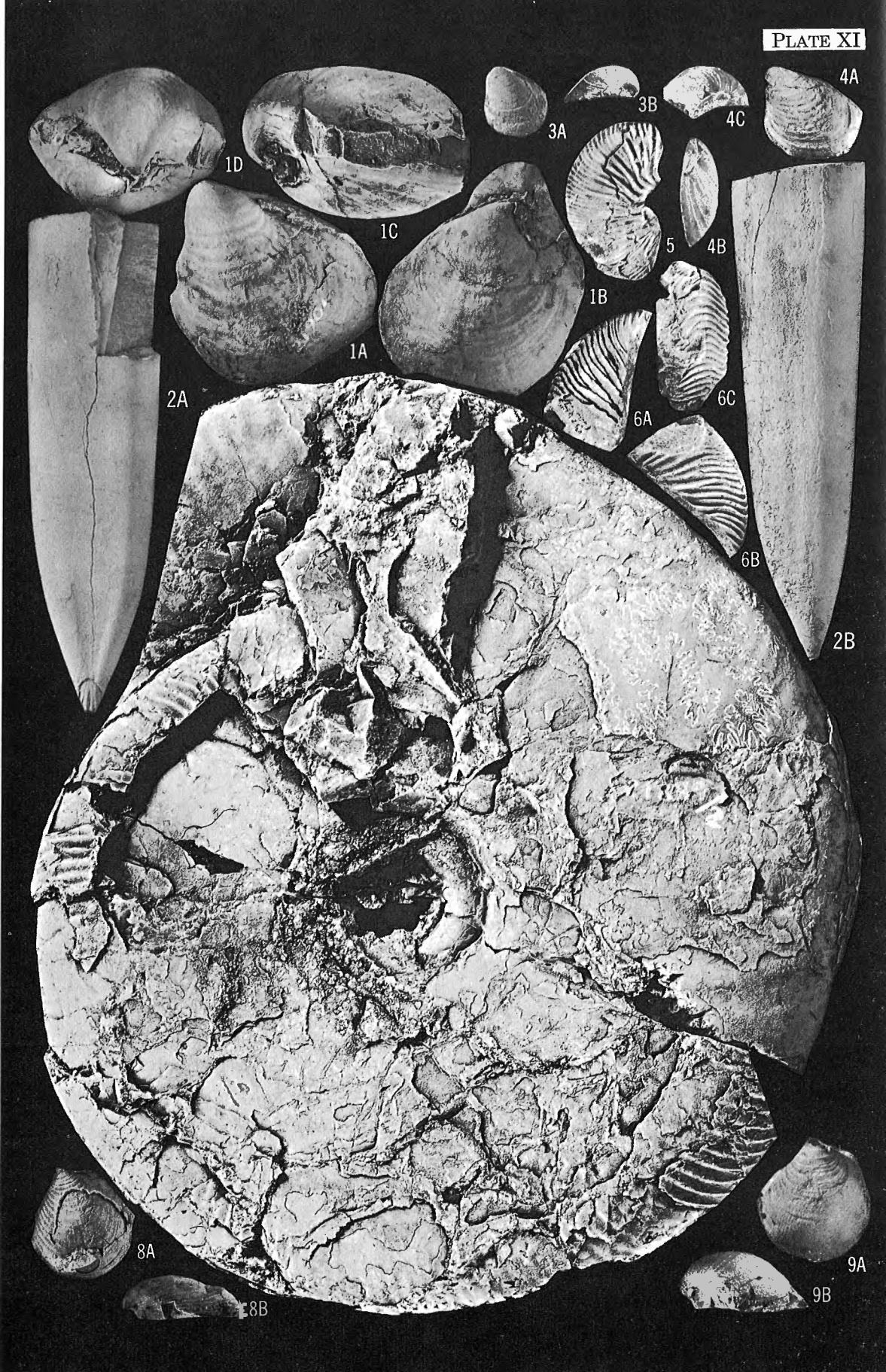
FIG. 5. Dichotomites cf. quatsinoensis (Whiteaves, 1882). University of Alberta loc. 205. GSC No. 18809 (plaster cast).
Lateral view of the flattened fragment of the early whorl showing the dense and fine ribbing habit and the predominantly bidichotomous subdivision of ribs characteristic of early growth stages of the species.

FIGS. 6A-6C. Dichotomites aff. quatsinoensis (Whiteaves, 1882). University of Alberta loc. 205. GSC No. 18810 (plaster cast).
An undistorted fragment showing the characteristic bidichotomous ribbing habit of the early whorls of the species. The ribbing is, however, considerably coarser than that of typical representatives of D. quatsinoensis.
6A. Lateral view of the better-preserved side. 6B. Lateral view of the other side. 6C. Ventral view showing the characteristic forward swing of the ribs across the venter.

FIG. 7. Dichotomites quatsinoensis (Whiteaves, 1882). GSC loc. 21899, GSC No. 17255.
Lateral view of partly-flattened medium-sized wholly septate specimen. The ribbing is characteristically obsolete on this presumably penultimate whorl, except for the top parts of secondary ribs around the venter. These are characteristically coarse and strongly-inclined forward. The suture line (outlined in white) has very long and slender lobes (only 1st and 2nd lateral lobes are visible) with long, slender and very strongly frilled branches. These features are diagnostic of the genus Dichotomites s. lato (=Neocraspedites Spath, 1924 and Homolsomites Crickmay, 1930) and differentiates all its representatives from the apparently ancestral Lower Valanginian Tollia (Tollia) species. The umbilicus seems to be wider than is normal for the species but this is apparently due to strong lateral distortion.

FIGS. 8A-8B. Buchia n. sp. aff. inflata (Toula, 1874). GSC loc. 37199, GSC No. 17256.
A medium-sized left valve; preserved as an internal cast in the middle and covered by well-preserved shell layer around the margins; somewhat distorted laterally.
8A. Lateral view of the exterior. Fine but distinct radial ornament similar to that of Buchia ex gr. concentrica-mosquensis crosses the fine and closely-spaced concentric ornament. Posterior ear is well developed. This combination of features appears to be diagnostic of this species. 8B. Anterior view of the same. The profile appears to be lower than it actually is because of lateral distortion (flattening). The valve bends abruptly toward the right valve near its lower margin and results in the characteristic truncation diagnostic of the species (see Pl. XII, figs. 3, 9). Similar truncation also occurs in Buchia pacifica (Jeletzky, 1964) of the Canadian Western Cordillera and ? Alaska. The two species are, however, quite unlike in all other diagnostic features and are believed to be unrelated.

FIGS. 9A-9B. Buchia n. sp. aff. inflata (Toula, 1874). GSC loc. 37199, GSC No. 17257.
A medium-sized left valve mostly shell-covered. This specimen is transitional to B. bulloides (Lahusen) in its generally-rounded shape, the abrupt truncation of the valve near the lower margin is all but absent.
9A. Lateral view of the exterior. 9B. Anterior view of the same.


1D
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9A
9B

VALANGINIAN STAGE

Dichotomites quatsinoensis and Buchia n. sp. aff. inflata Zones

PLATE XII

FIGS. 1A-1C. Buchia inflata (Toula, 1874) var. majuscula (Tullberg, 1881). GSC loc. 24021, GSC No. 16647. A large and almost complete internal cast of a fairly typical representative with some patches of shell layer. This specimen is transitional to B. sublaevis (Keyserling) in its locally obsolete concentric ornament. 1A. Lateral view of the exterior of the left valve. Prominent and fairly closely spaced concentric ribbing occupies the central part of the valve. 1B. Lateral view of the exterior of the right valve and the protruding beak part of the left valve. 1C. Anterior view of the exterior of both valves. The anterior surface is mostly covered only by fine, closely-spaced concentric ribs or striae. The beaks are short, blunt, and nearly equal in size, which is diagnostic of the B. keyserlingi-inflata species group.

FIGS. 2A-2C. Buchia sublaevis (Keyserling, 1846) s. lato var. GSC loc. 37867, GSC No. 17234. An internal cast of a somewhat fragmentary left valve of a flat variant of the species. 2A. Lateral view of the exterior. The beak is essentially straight. 2B. Anterior view. Unlike that of Buchia bulloides and Buchia keyserlingi, the beak is feebly coiled and overhangs the right valve. 2C. The beak and hinge margin viewed from above. The broad and low cross-section with gently-sloping flanks distinguish this variant of B. sublaevis from B. crassicollis s. str. The beak has only a slight left-hand incurvature.

FIGS. 3A-3B. Buchia n. sp. aff. inflata (Toula, 1874). University of Alberta, loc. 383. GSC loc. 17690 (plaster cast). An internal cast of a large, typical left valve. The marked left-hand curvature of the beak is stronger than that of most other representatives of the species. 3A. Lateral view of the exterior. 3B. Anterior view.

FIG. 4. Dichotomites quatsinoensis (Whiteaves, 1882). Ventral view of the specimen shown in Pl. XI, fig. 7.

FIGS. 5A-5B. Buchia n. sp. aff. inflata (Toula, 1874). University of Alberta No. 40871. GSC No. 17691 (plaster cast). An internal cast, with some patches of shell layer, of a well-preserved left valve of a medium-sized, typical representative of the species. The characteristically fine, closely-spaced concentric ribs and striae are clearly visible on the surface of the shell layer and less distinctly on the surface of the internal cast. This diagnostic sculpture is quite unlike that of the B. keyserlingi inflata species group. The beak is essentially straight. 5A. Lateral view of the exterior. 5B. Anterior view. The beak is short and blunt.

FIGS. 6A-6D. Buchia n. sp. aff. inflata (Toula, 1874). GSC loc. 42447, GSC No. 17276. An internal cast of the medium-sized right valve of a very strongly swollen and truncated variant. The posterior ear is very large and angular. 6A. Lateral view of the exterior. 6B. Oblique posterior view of the exterior. 6C. Beak and hinge margin viewed from above. 6D. Anterior view of the exterior.

FIGS. 7A-7D. Buchia n. sp. aff. inflata (Toula, 1874). GSC loc. 42447, GSC No. 17264. Internal cast of a medium-sized, typical right valve. This valve is extremely swollen and truncated, which is diagnostic of the species. 7A. Lateral view of the exterior showing fine, closely-spaced, concentric ribbing. 7B. Oblique posterior view of the same. 7C. Anterior view of the same. The characteristic byssus notch and byssus ear are visible at the right side of the picture. 7D. Beak and hinge margin viewed from above.

FIGS. 8A-8C. Buchia sublaevis (Keyserling, 1846) s. lato. GSC loc. 42455, GSC No. 17235. Internal cast of a complete, small, left valve with considerable patches of shell-layer preserved near the anterior margin. Fairly-pronounced and moderately closely spaced concentric ribbing show it to be transitional to B. keyserlingi s. lato. 8A. Lateral view of the exterior. The beak has slight left-hand incurvature and clearly visible concentric ribbing. 8B. Anterior view of the same. The beak has about the same appearance as in the specimen shown in fig. 2B. 8C. Beak and hinge margin viewed from above. The cross-section is considerably higher and narrower than that of the specimen shown in fig. 2C. Furthermore, the flanks slope much more abruptly, diagnostic of the thick (late?) variant of B. sublaevis.

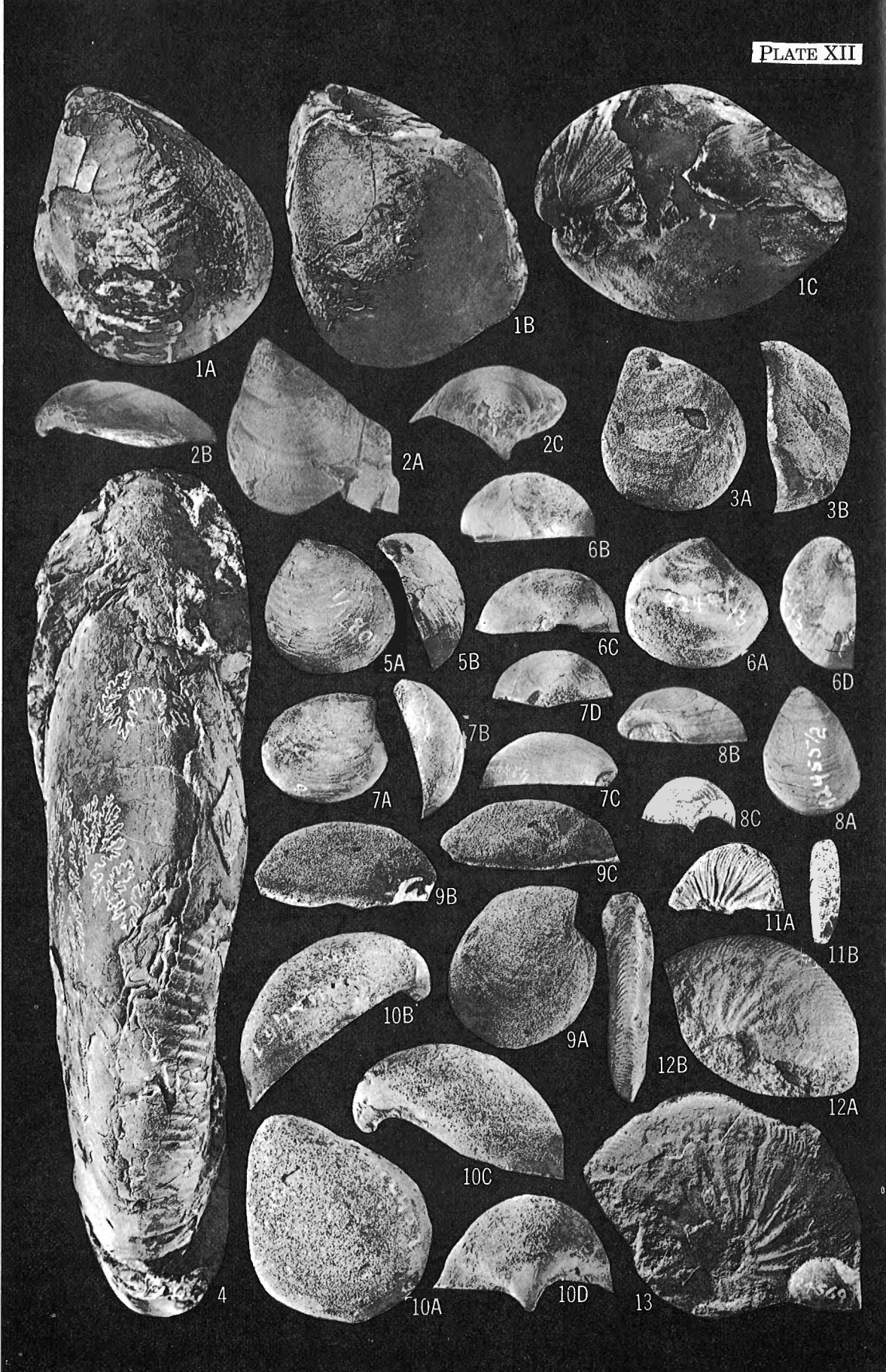
FIGS. 9A-9C. Buchia n. sp. aff. inflata (Toula, 1874). University of Alberta loc. 383. GSC No. 17692 (plaster cast). An internal cast of a large but typical right valve. The typical concentric ornament is preserved on the cast's surface. 9A. Lateral view of the exterior. 9B. Oblique posterior view of the same. 9C. Anterior view of the same. The byssus notch and incompletely-preserved (as internal cast) byssus ear are outlined in white.

FIGS. 10A-10D. Buchia aff. sublaevis (Keyserling, 1846). GSC loc. 42457, GSC No. 17230. An internal cast of a complete left valve apparently transitional between B. sublaevis s. lato and B. crassicollis var. solida (Lahusen, 1888). 10A. Lateral view of the exterior. 10B. Posterior view of the same. 10C. Anterior view of the same. 10D. Beak and hinge margin viewed from above. The beak does not show any left-hand curvature characteristic of B. n. sp. aff. inflata.

FIGS. 11A-11B. Dichotomites cf. giganteus (Imlay, 1960). GSC loc. 41032, GSC No. 17259. Internal cast of the early whorl of the specimen showing the characteristic ribbing habit of D. giganteus (Imlay). The polyptychoid bundling of secondary ribs low on the flanks, and the marked flexuosity of the ribs are diagnostic for the species. 11A. Lateral view. 11B. Ventral view.

FIGS. 12A-12B. Dichotomites cf. giganteus (Imlay, 1960). GSC loc. 44772, GSC No. 18038. An internal cast of the fragmentary intermediate whorl of the specimen showing the same characteristic ribbing habit as the specimen shown in fig. 13. Strongly deformed laterally. 12A. Lateral view. 12B. Ventral view. Note the strong forward projection of secondary ribs on the venter.

FIG. 13. Dichotomites cf. giganteus (Imlay, 1960). GSC loc. 24569, GSC No. 17258. Rubber mould of a natural impression in the rock. Lateral view showing the bundled but not dichotomous ribbing habit and the strong forward flexure of the top parts of the secondary ribs, diagnostic of D. giganteus (Imlay). This specimen had been previously identified as Subcraspedites cf. greenlandicus Spath, 1936, by the writer, and was then believed to be Berriasian in age.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9C
9B
11A
11B
10B
9A
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12A
10C
10A
10D
13
4

VALANGINIAN STAGE
Dichotomites quatsinoensis and Buchia n. sp. aff. inflata Zones

PLATE XIII

FIGS. 1A-1C. Buchia n. sp. aff. inflata (Toula, 1874). GSC loc. 37199, GSC No. 17277. Medium-sized right valve of the variant transitional to B. bulloides (Lahusen). Completely covered by the shell layer. Only a slight truncation of the valve is noticeable at its lower margin (fig. 1C). 1A. Lateral view of the exterior. 1B. Anterior view of the same. 1C. Oblique posterior view of the same.

FIGS. 2A-2B. Buchia n. sp. aff. inflata (Toula, 1874). GSC loc. 37199, GSC No. 17278. Internal cast of a small but fairly typical left valve. The surface of the cast is covered by well-developed dense and fine radial striae in addition to the fine and closely-spaced concentric ornament. The lower margin of the valve is markedly truncated (fig. 2B). 2A. Lateral view of the exterior. The hinge margin is on the upper left side of the photograph instead of being on its upper side as in all other Buchia specimens figured. 2B. Anterior view of the same.

FIGS. 3A-3B. Buchia cf. bulloides (Lahusen, 1888). GSC loc. 37199, GSC No. 17279. Medium-sized left valve apparently indistinguishable from B. bulloides (Lahusen) in its regularly-rounded outline (fig. 3A) and cross-section (fig. 3B). An internal cast with poorly-preserved ornament. 3A. Lateral view of the exterior. 3B. Anterior view of the same.

FIGS. 4A-4C. Buchia n. sp. aff. inflata (Toula, 1874). GSC loc. 37199, GSC No. 17280. Internal cast of a medium-sized, right valve of the same variant as that shown in fig. 1. 4A. Lateral view of the exterior. An imprint of another smaller Buchia valve covers the middle part of the valve. 4B. Anterior view of the same. The middle part of the valve is flattened. 4C. Oblique posterior view of the same.

FIGS. 5A-5B. Buchia n. sp. aff. inflata (Toula, 1874). GSC loc. 24030, GSC No. 17281. An internal cast of a medium-sized right valve belonging to the same variant as the specimen shown in fig. 1. 5A. Lateral view of the exterior. 5B. Anterior view of the same. Well-preserved byssus notch and byssus ear are visible near the upper margin of the photograph.

FIGS. 6A-6D. Dichotomites quatsinoensis (Whiteaves, 1882). GSC loc. 21899, GSC No. 17282. Fragment of an intermediate whorl (septate throughout) and a complete earlier whorl partly covered by shell. Gradual coarsening of fine and closely-spaced upper parts of the secondary ribs during the growth is clearly visible. Middle parts of the flanks are more or less smooth throughout but the swollen lower parts of the primary ribs are always present near the umbilical rim (figs. 6A-6B). The suture line is strongly ascendant and clearly Tollia-like (see on the inner whorl in fig. 6B); the lateral lobes are, however, very long and have very long and thin stems and branches unlike those of any representative of Tollia s. lato. These lobes are more strongly frilled than those of Tollia. This suture is diagnostic of Dichotomites s. lato (including Neocraspedites, Homolsomites and Wellsia). 6A. Lateral view, mostly shell-covered. 6B. The other side with several suture lines outlined in white; note bullae-like basal parts of primary ribs. 6C. Cross-sections of two whorls and the venter of the early part of the inner whorl. The fine, closely-spaced and forward bent secondary ribs cover the venter and upper flanks of the latter. 6D. Cross-section. The inner whorls are outlined in white. The innermost whorl visible has a wider cross-section with broader and lower venter than the subsequent whorls, which is diagnostic of the species.

FIGS. 7A-7C. Buchia sublaevis (Keyserling, 1846) s. lato. GSC loc. 21899, GSC No. 17283. Complete and typical, half-grown specimen cut in two by a calcitic veinlet. Mostly shell-covered. Concentric ornament of fine and indistinct striae, ribs and furrows barely perceptible in the photographs. 7A. Lateral view of the exterior of the left valve. 7B. Lateral view of the exterior of the right valve and protruding beak part of the left valve. 7C. Oblique posterior view of both valves.

FIGS. 8A-8C. Buchia cf. bulloides (Lahusen, 1888). GSC loc. 37199, GSC No. 17284. Internal cast of a small, somewhat laterally compressed left valve, which could belong either to B. bulloides (Lahusen) or to the B. bulloides-like variant of B. n. sp. aff. inflata (Toula). 8A. Lateral view of the exterior. 8B. The beak and hinge margin viewed from above. 8C. Anterior view of the same. The middle part of the valve is strongly abraded. This and the lateral deformation of the valve produce its B. subbulloides-like appearance.

FIGS. 9A-9C. Buchia sublaevis (Keyserling, 1846) s. lato. GSC loc. 21899, GSC No. 17285. A completely shell-covered, typical and complete juvenile specimen. Except for its small size and almost smooth surface this specimen does not differ materially from the adult specimens of B. sublaevis s. lato. 9A. Lateral view of the exterior of the left valve. 9B. Anterior view of both valves. 9C. Lateral view of the exterior of the right valve and the protruding beak part of the left valve.

FIGS. 10A-10B. Buchia sublaevis (Keyserling, 1846) var. GSC loc. 21899, GSC No. 17286. Internal cast of a juvenile left valve of an unusually broad and short variant possibly transitional to B. bulloides (Lahusen). 10A. Lateral view of the exterior. The shell seems to have a well-developed posterior ear, which is simulated by a protruding piece of rock. It actually is much more posteriorly oblique than the orientation would suggest. 10B. Posterior view of the same.

FIGS. 11A-11B. Buchia keyserlingi (Lahusen, 1888) s. lato. GSC loc. 21899, GSC No 17287. An internal cast of a fragmentary, juvenile right valve partly imbedded in the rock. The concentric ribbing is unusually coarse and widely spaced for this growth-stage and simulates B. okensis (Pavlow). 11A. Lateral view of the exterior. 11B. Oblique posterior view.


1B
1A
1C
2B
2A
3B
3A
4A
4B
5B
4C
5A
6D
7C
7B
7A
6A
10B
10A
11A
6C
11B
8C
8B
8A
9A
9B
6B
9C

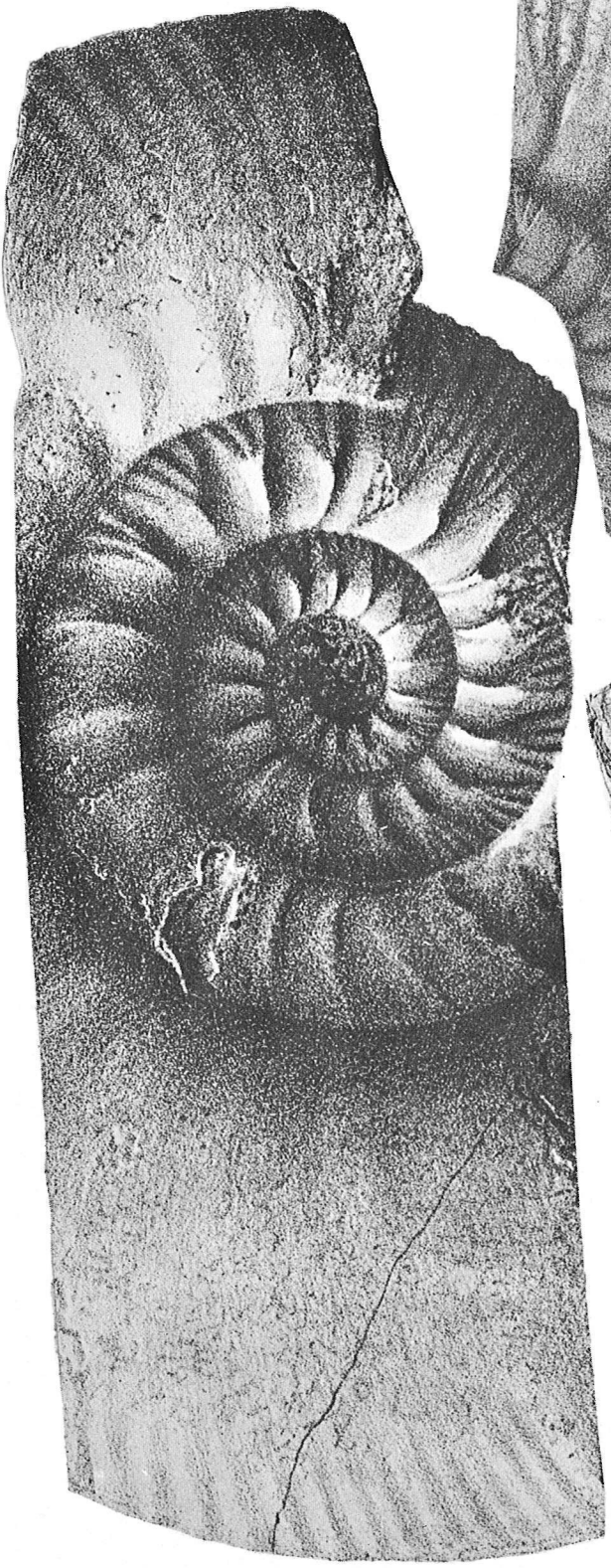
HAUTERIVIAN STAGE
Simbirskites (Simbirskites) kleini Zone

PLATE XIV

FIG. 1. Simbirskites (Simbirskites) kleini (Neumayr and Uhlig, 1881). Reproduction of the completely septate cotype of the species figured by Neumayr and Uhlig (1881, Pl. XXXII, fig. 1). Northwest Germany, marl pit "Hannoverische Treue bei Kniestedt (Salzgitter)", brown iron ore of Hils Formation. Upper Hauterivian. Preserved in Denkmann's collection. Shown for comparison with the Canadian representative of the species shown in Pl. XV, fig. 2. Lateral view.

FIG. 2. Simbirskites (Simbirskites) kleini (Neumayr and Uhlig, 1881). Reproduction of the fragmentary internal cast of the inner whorls (a cotype) of the species figured by Neumayr and Uhlig (1881, Pl. XXXI, fig. 2). Northwest Germany, exact locality unknown, from brown iron ore of Hils Formation, Upper Hauterivian? Preserved in Ottmer's collection. Shown for comparison with the Canadian representative of the species shown in Pl. XV, fig. 2.

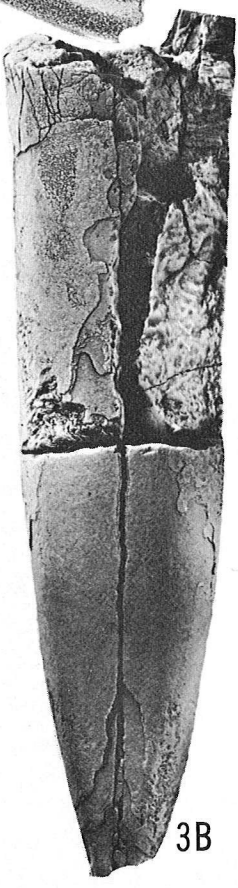
FIGS. 3A-3B. Acroteuthis cf. conoides Swinnerton, 1937. GSC loc. 26911, GSC No. 17288. A somewhat fragmentary and exfoliated guard showing the diagnostic strong dorso-ventral flattening and compression combined with gradual tapering of the apical part. 3A. Lateral view. The alveolar part is widened by crushing (top) and about 1/2 inch at the end of the apical part (bottom) is broken off. Ventral side is on the right. 3B. Ventral view. Right side of the alveolar part is broken off exposing the inside of the characteristically deep alveolus.



1

2

3A



3B

HAUTERIVIAN AND BARREMIAN STAGES
Various Zones

PLATE XV

FIG. 1. Crioceratites (Crioceratites) emerici (Leveillé, 1837) cf. var. journoti Sarkar, 1955. GSC loc. 35687, GSC No. 17289. Lateral view of spire fragment mostly preserved as an internal cast. A plaster cast made from a natural impression in the rock. The coarse sculpture and the regular alternation of the coarser, protruding ribs with two to five finer, single or rarely bifurcating ribs are clearly visible. These features are diagnostic of the species. Three rows of nodes occur only on the coarser, protruding ribs but not on the intercalated finer ribs. All three rows of nodes are covered by long, pointed spines, which are, however, only preserved locally on the upper (ventro-lateral) row, wherever the fragment is shell-covered. The presence of these three rows of spines confined to the coarser ribs and the regular alternation of coarser and finer ribs are diagnostic of the subgenus Crioceratites s. str. (including Emericiceras Sarkar, 1955).

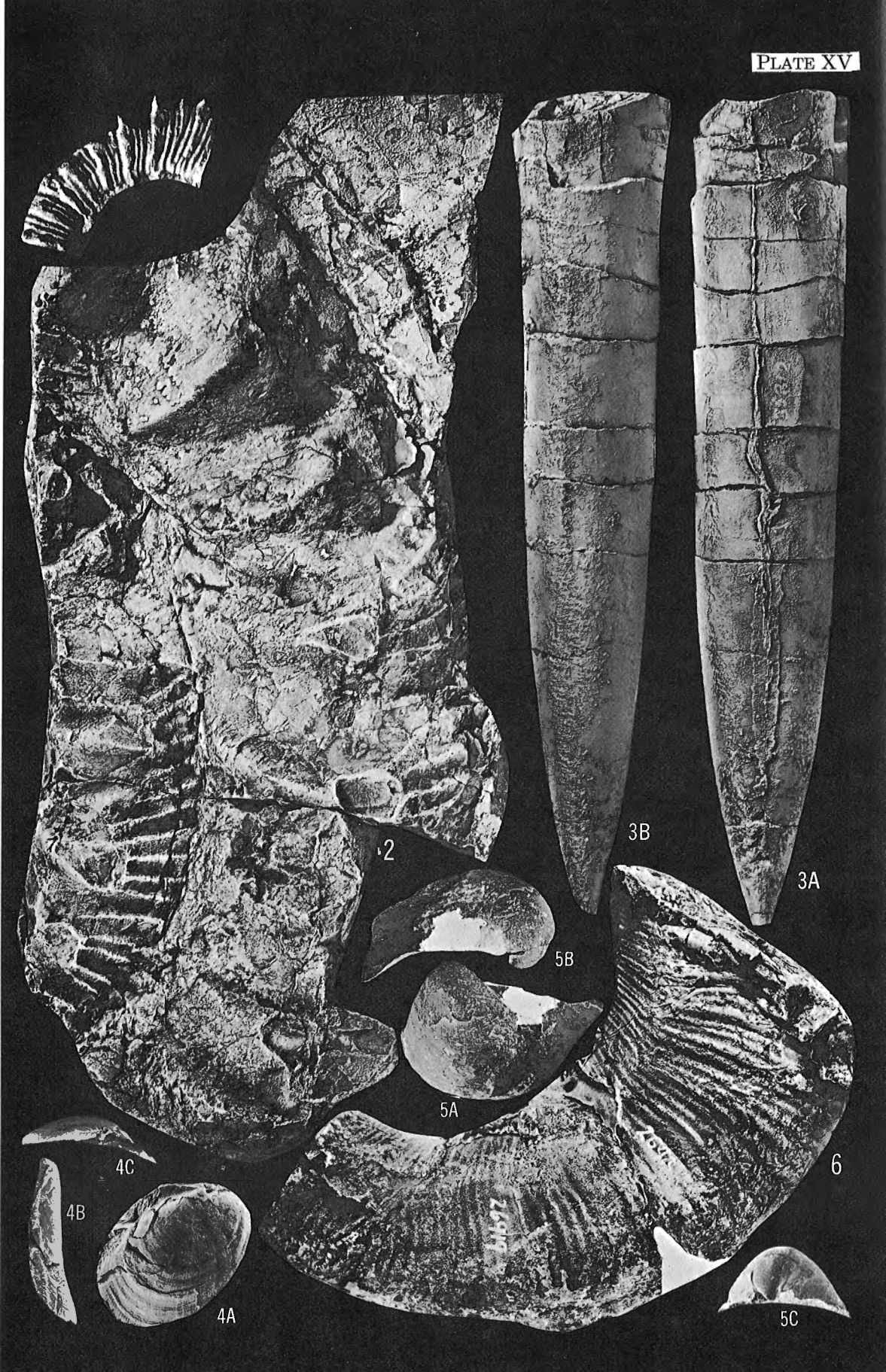
FIG. 2. Simbirskites (Simbirskites) cf. kleini (Neumayr and Uhlig, 1881). GSC loc. 48934, GSC No. 17290. Lateral view of the flattened fragments of three whorls including the living chamber. The two inner whorls show the typical sculpture of the genus and subgenus Simbirskites consisting of strong, bullae-like primary ribs ending in the pronounced nodes. Three to four secondary ribs spring up from these nodes. Trifurcate ribs mostly alternate with the quadrifurcate ribs. Details of sculpture are quite similar to those observed on the European cotypes of S. (S.) kleini (see Pl. XIV, figs. 1-2) and so is the degree of involution of the Canadian specimen. The small fragment of the living chamber (top of the photograph) is essentially smooth, just as is the last whorl of S. (S.) kleini (see Pl. XIV, fig. 1). Suture line not preserved. Suture line of Simbirskites is essentially similar to that of the early Lower Cretaceous Polyptychitidae, which suggests that this genus is a direct descendant of Polyptychites s. lato. Ribbing habit of Simbirskites is almost identical with the unrelated Middle Jurassic Stephanoceras s. lato but the sutures are quite distinct.

FIGS. 3A-3B. Acroteuthis aff. conoides Swinnerton, 1937. GSC loc. 35812, GSC No. 17291. An almost complete and essentially-undeformed (although jointed and somewhat sheared) guard of a form that differs from the more typical A. cf. conoides (see Pl. XIV, fig. 3) in the relatively longer and slenderer and also more strongly dorso-ventrally flattened and compressed guard. 3A. Ventral view. 3B. Lateral view, ventral side on the right.

FIGS. 4A-4C. Aucellina aff. caucasica (Abich, 1851). GSC loc. 27004, GSC No. 17292. Internal cast of a well-preserved, medium-sized right valve. Considerable patches of well-preserved shell occur at posterior and lower margins. In the outline and flatness of the right valve, as well as in the appearance of its beak, A. aff. caucasica and allied Aucellina forms are indistinguishable from mid- to late Upper Jurassic Buchia ex gr. concentrica-mosquensis. The ornament of these two unrelated species groups is also similar. This similarity is, however, only superficial and permits of the generic differentiation of the two. In Aucellina ex gr. caucasica-aptiensis the radial ornament dominates the concentric ornament in Meleagrinella-like fashion. The concentric ribs tend, at the same time, to overlap the radial ornament in a somewhat shingle-like manner. The radial ornament shows, furthermore, a characteristic wavering at every pronounced concentric rib (growth-line). The somewhat raised edges of the concentric ornament tend, finally, to become feebly to strongly tuberculate or spinose, giving a reticulate appearance to the shell surface. All these diagnostic features tend to be better expressed on the shell surface than on the internal cast (see figs. 4A-4B, 5). These diagnostic features may even be completely indiscernible on the internal casts of Aucellina, which may in this case become indistinguishable from Buchia ex gr. concentrica-mosquensis. 4A. Lateral view of exterior. Note the ornament of the shell-covered part of the valve as compared with the ornament of the part preserved as an internal cast. The surface of the ligamental plate (top of the photograph) is tilted outward toward the camera at about 45°. This is another diagnostic feature of Aucellina (compare Pompeckj, 1901, Pl. XVI, figs. 1A, 8A) as the ligamental plate of the homoeomorphically similar Buchia species is directed either upward or slightly inward and that of other Buchia species is tilted strongly inward (Jeletzky, 1964). The posterior ear is much longer and better defined than that of Buchia. 4B. Posterior view. The valve is partly flat and partly concave, which is diagnostic of the species. 4C. Oblique anterior view showing the byssus ear and the beak.

FIGS. 5A-5C. Aucellina aff. caucasica (Abich, 1851). GSC loc. 27004, GSC No. 17293. An internal cast of a fragmentary but otherwise typical left valve with considerable patches of poorly-preserved inner shell layer. 5A. Lateral view of the exterior showing a fragment of the long posterior ear diagnostic of Aucellina. The beak has marked right-handed incurvature but the valve is strongly posteriorly oblique, which makes it superficially similar to that of Buchia mosquensis (Buch). 5B. Posterior view showing the strongly-coiled valve and beak. 5C. The beak and hinge margin viewed from above. The beak is relatively short and stout. This is generally speaking diagnostic of the predominantly Barremian-Aptian Aucellina ex gr. caucasica-aptiensis and distinguishes them from the essentially Albian-Cenomanian Aucellina ex gr. gryphaeoides, which tend to have considerably longer and more pinched beaks.

FIG. 6. Crioceratites (Hoplocrioceras) cf. remondi (Gabb, 1864) emend. Anderson, 1938. GSC loc. 26919, GSC No. 17294. Lateral view of the late part of the spire and the beginning of the shaft (living chamber). This part of the shell is already devoid of the umbilical or dorso-lateral nodes but still shows the diagnostic bifurcation and trifurcation of ribs low on the flanks in places. Ribs are pronouncedly flexuous throughout and several tend to become slightly elevated at the ventro-lateral shoulder. These ill-defined and rounded elevations may be the remnants of the ventro-lateral nodes so well developed at the corresponding growth stage of Crioceratites (Hoplocrioceras) n. sp. aff. laeviusculum (see Pl. XVIII, fig. 1).


2
3B
3A
5B
5A
4C
4B
4A
6
5C

BARREMIAN STAGE
Crioceras (Hoplocrioceras) n. sp. aff. laeviusculum Zone

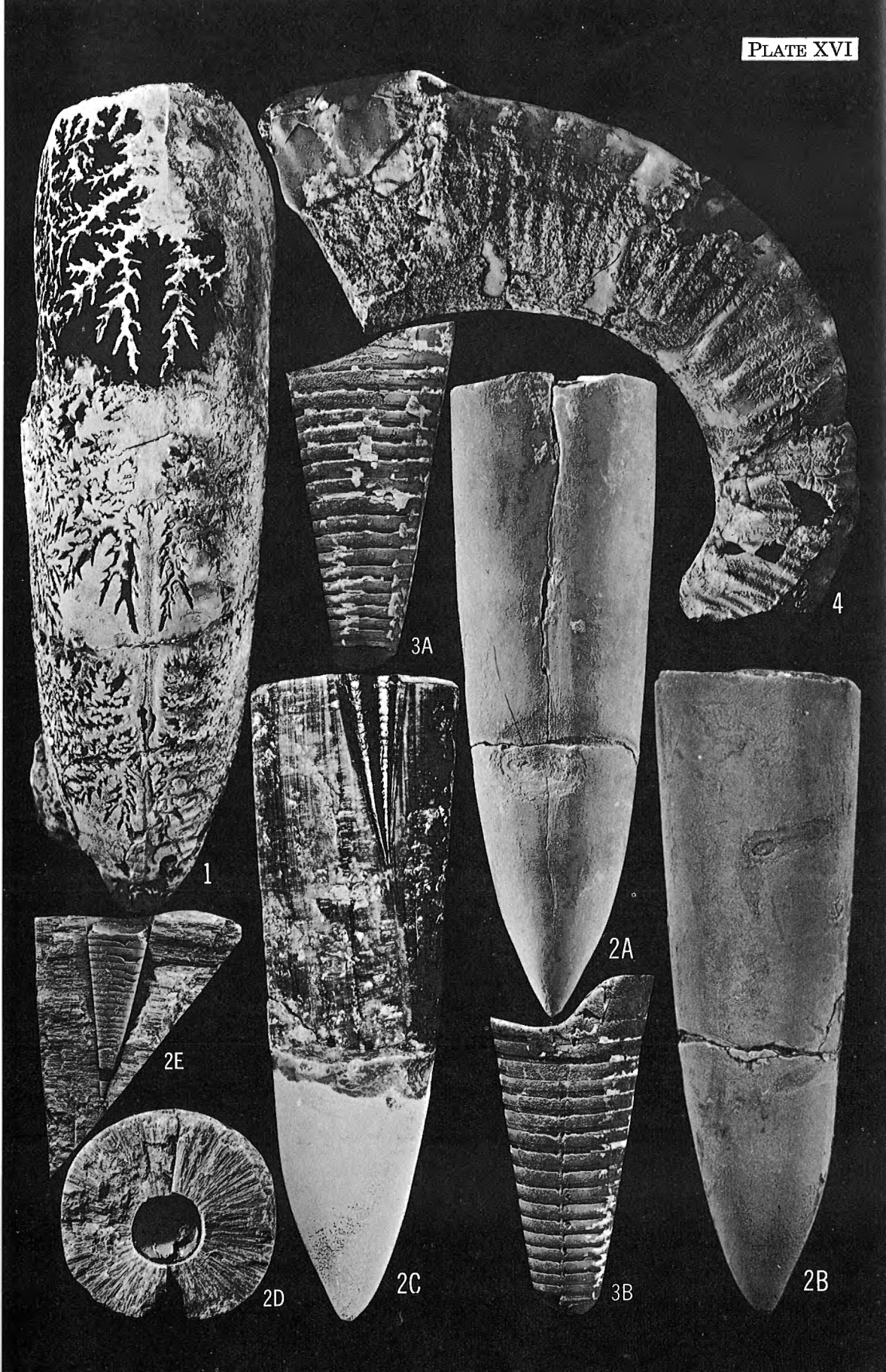
PLATE XVI

FIG. 1. Crioceratites (Hoplocrioceras) n. sp. aff. laeviusculum (Koenen, 1902). GSC loc. 27004, GSC No. 17295. Ventral view of a wholly septate fragment of the spire shown in Pl. XVIII, figs. 1A-1B (see explanation of these figures for further comments). Large and rounded ventro-lateral nodes are superimposed on one or more ribs and separated from each other by one to three nodeless ribs. The extremely slender and strongly-frilled ventral lobe of the suture line is outlined in white.

FIGS. 2A-2E. Acroteuthis pseudopanderi (Sintsov, 1877 emend. Pavlow, 1901). GSC loc. 27004, GSC No. 17296. A well-preserved but fragmentary, stout variant with only the lower part of the alveolar region preserved. The cross-section of the guard (fig. 2D) is almost perfectly circular and almost equidimensional; it shows but feeble dorso-ventral compression and is only slightly flattened on the dorso-ventral and lateral sides. The apical part of the ventral side is not depressed or furrowed (fig. 2A) in contrast with the higher parts of the venter, which are distinctly depressed in the middle (furrow-like). All these features are diagnostic of A. pseudopanderi and distinguish it from all allied species. 2A. Ventral view. 2B. Lateral view. The ventral side is on the left side of the photograph. The apex is markedly displaced toward the ventral side. This feature varies strongly within the species. 2C. Lateral view of the other side. The upper two-thirds of that half of the guard closer to the camera are removed to show the depth of the somewhat oblique alveolar cavity, the early growth lines of the guard, and the position of the apical line (i.e. the succession of the apical ends of the juvenile guards connecting the apex of the alveolus with the last preserved apex of the guard. 2D. Cross-section of the upper end of the guard. The phragmocone is visible inside of the alveolus. 2E. Inside view of the alveolar part of the guard removed in fig. 2C with the lower part of the phragmocone left in place. The venter is on the left side of the photograph.

FIGS. 3A-3B. Acroteuthis pseudopanderi (Sintsov, 1877 emend. Pavlow, 1901). GSC loc. 27004, GSC No. 17297. Middle part of phragmocone with most of the conotheca absent and the septa exposed. Probably forms the continuation of the phragmocone shown in fig. 2E. 3A. Lateral view. The ventral side is to the left. 3B. Ventral view showing weathered-out siphuncle.

FIG. 4. Crioceratites (Hoplocrioceras) n. sp. aff. laeviusculum (Koenen, 1902) var. GSC loc. 27004, GSC No. 17298. Lateral view of the specimen shown in Pl. XVII, fig. 1. This completely septate and largely shell-covered fragment of the spire is peculiar in retaining the rounded umbilical or ventro-lateral nodes and distinct bundling of the ribs springing from them (in twos and threes) to much larger diameter than any of the other specimens known to the writer (compare specimen figured in Pl. XIX, fig. 3). The umbilical nodes become lost in the middle part of the fragment while the ventro-lateral nodes persist throughout. The bundling of the flexuous ribs springing from the umbilical nodes and the presence of only two rows of nodes is diagnostic of the subgenus Hoplocrioceras Spath, 1924.


1
4
3A
2A
2E
2C
2B
2D
3B

BARREMIAN STAGE
Crioceras (Hoplocrioceras) n. sp. laeviusculum Zone

PLATE XVII

FIGS. 1A-1B. Crioceratites (Hoplocrioceras) n. sp. aff. laeviusculum Koenen, 1902, var. GSC loc. 27004, GSC No. 17298. The same specimen as in Pl. XVI, fig. 4. 1A. Ventral view showing the typically-developed ventro-lateral nodes and the ventral part of the external suture line. 1B. Dorsal (=umbilical) view showing the simple, fairly closely spaced and markedly forwardly projected ribs. The dorsal or internal lobe of the suture line and the cross-sections of both ends of the fragment are clearly visible. The change from the more nearly equidimensional and more rounded cross-section of the intermediate growth-stage to the considerably higher than wide, trapeze-like cross-section of the late growth-stage is characteristic of the species. The maximum lateral diameter of the later cross-section is always situated at the dorso-lateral (=umbilical) shoulder and its dorsal and ventral sides are both strongly flattened.

FIG. 2. Ancyloceras (Ancyloceras) cf. durrelli Anderson, 1938. GSC loc. 26934, GSC No. 17299. Lateral view of fragmentary shaft (living chamber) showing lateral and dorso-lateral rows of nodes superimposed on strong widely-spaced ribs. The adjacent septate part of the shaft, and that of the spire (not shown) are much more finely and closely ribbed than the living chamber. Like the Californian A. (A.) durrelli Anderson, 1938, the European A. (A.) costellatum Koenen, 1902, and some other Barremian representatives of the genus, the Canadian A. (A.) cf. durrelli lacks the third (ventro-lateral or ventral) row of nodes on the living chamber. This is in contrast with A. (A.) urbani Koenen, 1902 and some other Aptian representatives of the genus, which have three rows of nodes on the spire as well as on the living chamber.

PLATE XVII

BARREMIAN STAGE
Crioceras (Hoplocrioceras) n. sp. aff. laeviusculum Zone

PLATE XVIII

FIGS. 1A-1B. Crioceratites (Hoplocrioceras) n. sp. aff. laeviusculum Koenen, 1902. GSC loc. 27004, GSC No. 17300, X 1/2. End part of the spire and complete shaft of the largest specimen known. The mouth border of the laterally-flattened living chamber is clearly visible in fig. 1B near its top. Ventro-lateral nodes occur at every second to fourth rib and extend at least on to the early part of the living chamber; they possibly were originally present throughout its length. The shaft is straight to the end of the living chamber, which appears to be a diagnostic feature of the subgenus Hoplocrioceras. The subgenus Crioceratites s. str. does not normally possess a distinct straight shaft while the genus Ancyloceras s. lato is characterized by a recurved shaft (see Pl. XIX, fig. 2A). The subgenus Shasticrioceras differs from Hoplocrioceras in possessing ventro-lateral tubercles on all ribs. Its ribs are, furthermore, characteristically single and coarser than those of Hoplocrioceras. H. n. sp. aff. laeviusculum is, however, more similar to Shasticrioceras than any other representative of Hoplocrioceras in that it retains pronounced and closely-spaced ventro-lateral nodes at least well into its latest growth stage; consistently lacks lateral nodes at any growth-stage; is more coarsely ribbed; and has somewhat angular ventro-lateral shoulders and flattened venter. The n. sp. could conceivably be a transitional form between Hoplocrioceras and Shasticrioceras. The subgenus Pedioceras Gerhardt is likewise, closely similar;it differs from H. n. sp. aff. laeviusculum and other representatives of Hoplocrioceras largely in its much lower, subquadrate cross-section. The large bump on the flank of the specimen where the spire merges into the shaft is not a node but a pathological growth. 1A. Ventral view showing the superposition of ventro-lateral nodes on two or three ribs and the intercalation of two to four ribs between the nodes. 1B. Lateral view showing closely-spaced but moderately coarse, essentially straight ribbing habit persisting all over the shaft. The typical crioceratid (actually lytoceratid) suture is visible on the spire, which is mostly preserved as an internal mould.

FIGS. 2A-2C. Acroteuthis pseudopanderi (Sintsov, 1877 emend. Pavlow, 1901). GSC loc. 27004, GSC No. 17301. A medium-sized, fairly typical representative of the species matching closely the Russian guard figured by Pavlow (1901, Pl. VIII, fig. 2). Only the lower half of the alveolar region is preserved. The apex is only slightly displaced toward the ventral side unlike that shown in Pl. XVI, fig. 2B. The ventral furrow appears more pronounced than it actually is and to extend further down, because of weathering. 2A. Ventral view showing the furrow-like depressed venter of the alveolar and stem regions and the lack of the corresponding depression on the apical part of the guard. 2B. Lateral view. The ventral side is on the left of the photograph. 2C. Cross-section of the lower part of the alveolar region. The almost perfectly round and nearly equidimensional (slightly wider than high and a little flattened on the dorso-ventral and lateral sides) cross-section is diagnostic for the species. The ventral side is down in the picture.

FIGS. 3A-3D. Aucellina n. sp. A. (aff. aptiensis (d'Orbigny) Pompeckj, 1901). GSC loc. 35624, GSC No. 17304. A large, well-preserved and almost complete left valve with a perfectly-preserved shell layer and hinge. It differs from A. aptiensis f. typ. in its much greater elongation and larger dimensions, and from A. aptiensis var. nassibianzi and A. caucasica in the lack of pronounced right-hand curvature of the left beak and in the lesser posterior obliquity of the left valve. Displays all the morphological features diagnostic of the genus Aucellina Pompeckj, 1901, such as the long and well-defined posterior ear, the short and rounded, but well-defined anterior ear, the tooth-like bulge of the ligamental plate flanked posteriorly by a transverse furrow, the wavering appearance of the radial ornament, and other features listed in the description of Pl. XV, fig. 4. The strong constriction of the valve is apparently an individual feature, perhaps caused by injury. 3A. Lateral view of exterior. 3B. Anterior view. The short, rounded, anterior ear is clearly visible. 3C. Lateral view of the interior of the beak and the hinge margin, X2. The well-preserved ligamental plate with the ligamental pit, tooth-like bulge and transverse furrow flanking the latter are clearly visible. 3D. Lateral view of the interior of the complete valve, showing the posterior and anterior ears.

FIGS. 4A-4C. Aucellina aptiensis (d'Orbigny) Pompeckj, 1901, var. nassibianzi Sokolov, 1908. GSC loc. 35746, GSC No. 16598. A small, well-preserved, typical but somewhat incomplete left valve with much well-preserved shell layer. Part of the posterior ear is broken off. The valve exhibits all of the characters peculiar to Aucellina (see Pl. XV, fig. 4). The reticulate appearance of the ornament is unusually well displayed. The perfectly-preserved ligamental plate is even more Meleagrinella-like than that of Aucellina n. sp. A. (aff. aptiensis) shown in fig. 3. Its tooth-like bulge is, indeed, situated in the middle part of the plate rather than near its anterior end. This results in the increase of the prominence and length of the anterior ear which forms part of the ligamental plate itself instead of being separated from it by the downward directed section of the valve margin as in Aucellina n. sp. A. (aff. aptiensis) (fig. 3). A. aptiensis var. nassibianzi is connected to typical A. aptiensis (Pl. XX, fig. 6), by all possible transitional forms (Pl. XX, fig. 3). It has been claimed to be distinguishable from Aucellina caucasica (Abich, 1851) by its more markedly posteriorly oblique left valve and more strongly developed posterior ear (Sokolov, 1908, p. 75) but these distinctions may be only varietal. The material of A. caucasica available to the writer is inconclusive. 4A. Lateral view of exterior. 4B. Oblique posterior view. 4C. Beak and hinge margin viewed obliquely from the lower margin of the valve to show the structural detail of the ligamental plate and both ears. The ligamental plate occupies all of the underside of the characteristically short and blunt left beak, as in Meleagrinella and other related genera of the subfamily Oxytominae Ichikawa, 1958. The underside of the beak of Buchia (subfamily Buchinae Cox, 1953) is, on the contrary, clearly separated from the ligamental plate, and protrudes over it.

FIGS. 5A-5B. Aucellina aff. caucasica (Abich, 1851). GSC loc. 27004, GSC No. 17310. Internal cast of a large left valve with some patches of poorly-preserved shell layer near the lower margin. This specimen is only tentatively referred to the more coarsely ribbed variant of the more nearly straight-beaked, more swollen, coiled form (a new species?) shown in Pl. XV, figs. 4-5. It could almost belong to Aucellina caucasica (Abich, 1851) var. stuckenbergi Pavlow, 1907, if its older (mid-Barremian) age were disregarded (Jeletzky, 1958, pp. 12-14). Radial ornament strongly dominates the concentric ornament; radial ribs waver noticeably at each pronounced concentric rib and locally bear small tubercles. This ornament is quite unlike that of early Buchia species (see under the explanation of Pl. XV, fig. 4), and permits the generic identification of the Barremian-Aptian Aucellina forms lacking the hinge and anterior ear. The long but incompletely-preserved beak is strongly right-handedly incurved and the valve itself is strongly posteriorly oblique. This makes it superficially similar to the left valve of B. mosquensis s. lato. 5A. Lateral view of the exterior. 5B. Oblique view of the anterior and hinge margins with the beak visible near the left side of the photograph.

FIGS. 6A-6C. Aucellina n. sp. B. (aff. aptiensis (d'Orbigny) Pompeokj, 1901). GSC loc. 26885, GSC No. 17308. This peculiar Aucellina form differs from A. aptiensis in its coarser radial ornament and shallow, longitudinal (oblique) furrow in the middle of the left valve. From Aucellina n. sp. A. (aff. aptiensis), it differs in the same features and in being a much shorter, thicker shell. From A. caucasica (and A. aptiensis var. nassibianzi) it differs in having the oblique furrow and an essentially straight left beak. The specimen is an internal cast of a medium-sized left valve and lacks parts of the anterior and posterior ears. 6A. Lateral view of the exterior. 6B. Beak and hinge margin viewed from above. 6C. Anterior view.

PLATE XVIII

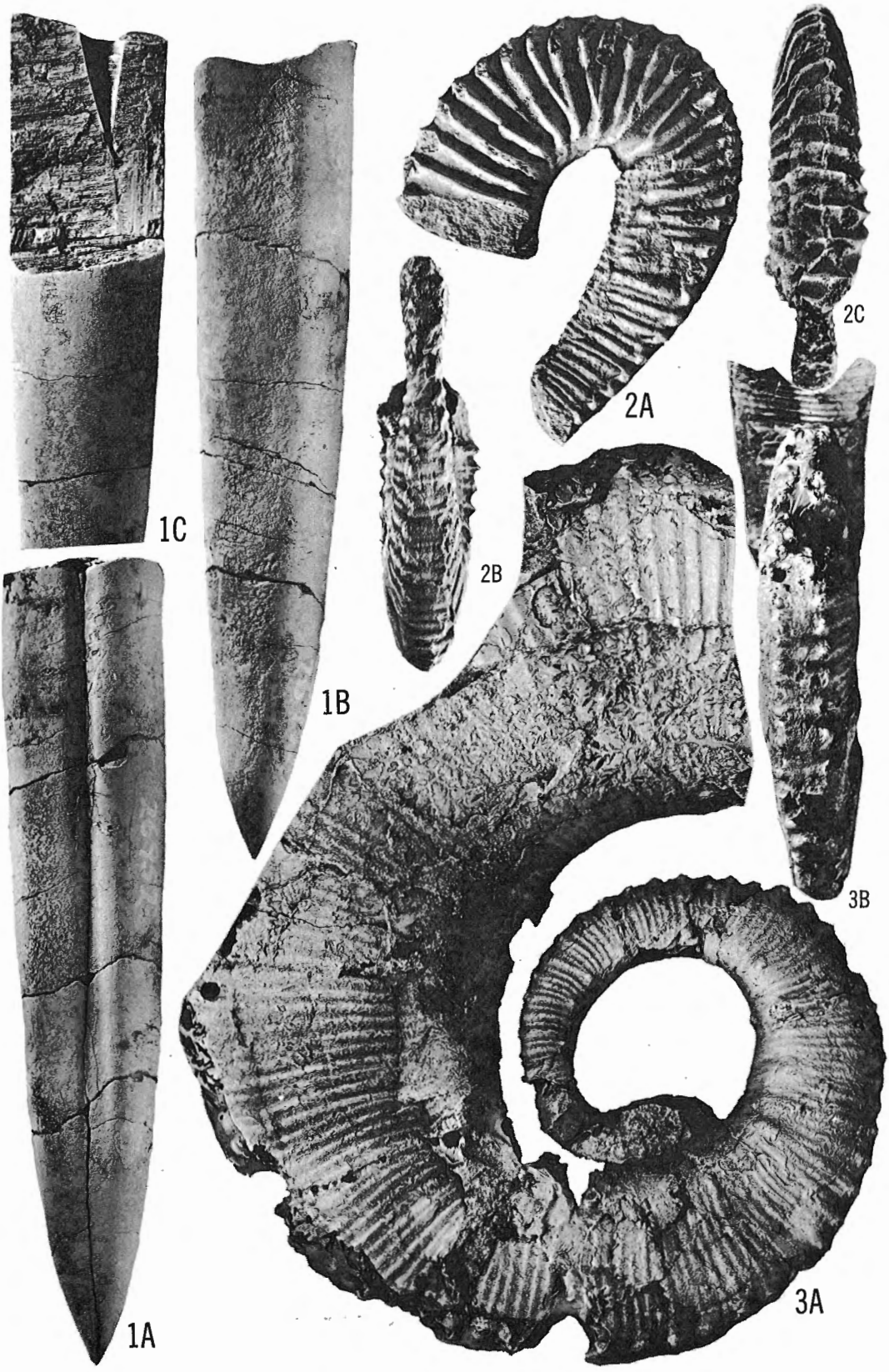
BARREMIAN STAGE
Crioceras (Hoplocrioceras) n. sp. aff. laeviusculum Zone

PLATE XIX

FIGS. 1A-1C. Acroteuthis n. sp. aff. conoides Swinnerton, 1937? GSC loc. 26952, GSC No. 17305. Well-preserved guard, fragmentary in its alveolar region, of which only the lowermost part is preserved (fig. 1C). This apparently new species differs from A. pseudopanderi in its markedly flattened as well as clearly and deeply furrowed venter (except in the apical region), much longer and proportionally slenderer guard and shallower alveolus. From Acroteuthis cf. A. kernensis and A. mitchelli (Pl. XXXI, figs. 4, 8) A. n. sp. aff. conoides? differs in the shallower alveolus, less rapid apical tapering of the stem region of the guard and more rapid apical tapering of its apical region giving in a shorter and blunter appearance to the posterior part of the guard. From Acroteuthis conoides Swinnerton A. n. sp. aff. conoides? differs in its more rounded and more nearly equidimensional cross-section (less compressed dorso-ventrally) and in its shallower alveolus. 1A. Ventral view. 1B. Lateral view. The ventral side is on the left. 1C. Other lateral view to show the very shallow alveolus.

FIGS. 2A-2C. Ancyloceras (Acrioceras) aff. starrkingi Anderson, 1938. GSC loc. 26929, GSC No. 17306. Strongly laterally deformed (flattened) but otherwise well-preserved shaft showing the characteristically recurved end part diagnostic of the genus Ancyloceras s. lato. The ventro-lateral and dorso-lateral (umbilical) nodes gradually weaken and then are replaced by weak bullae (or disappear) on the recurved end part of the shaft. The latter is covered by high and strong, flexuous, more or less widely spaced ribs, which often bifurcate at the dorso-lateral (umbilical) shoulder. These ribs cross the venter without any weakening but become replaced by much finer forward projected ribs on the dorsum. The lateral nodes are absent throughout. The straight part of the shaft is covered by much denser, essentially-straight ribs, which appear to cross the venter and dorsum without any forward or backward swing. Most of the closely-spaced, strong, claviform ventro-lateral nodes of this part of the shaft are superimposed on two adjacent ribs. The ventro-lateral shoulders are very sharp and almost rectangular on the straight part of the shaft but gradually become rounded on its recurved part. The narrow venter between the nodes is perfectly flat on the straight part of the shaft but gradually becomes narrowly rounded on its recurved part. 2A. Lateral view of the better preserved side. 2B. Ventral view of the straight (early) part of the shaft. 2C. Ventral view of the recurved (late) part of the shaft with the dorsum of its straight part visible in the lower part of the photograph.

FIGS. 3A-3B. Crioceratites (Hoplocrioceras) n. sp. aff. laeviusculum Koenen, 1902. GSC loc. 27004, GSC No. 17307. One and a half whorls of the middle and end parts of the spire possibly including the very beginning of the living chamber; well preserved and mostly shell-covered, but partly laterally flattened towards the end. This specimen supplements that shown in Pl. XVIII, fig. 1. On the inner whorl, which is already subtrapezoidal and considerably higher than wide in cross-section, the ribs on the flanks mostly spring up in bundles consisting of two to four ribs out of the rounded dorso-lateral (umbilical) nodes. Other single ribs are intercalated in twos and threes between the bundles. These ribs continue uninterrupted from the dorsum. Most ribs are somewhat flexuous low on the flanks. Higher up they straighten up and run essentially in the radial direction. There is no subdivision in the more and less prominent ribs, such as is characteristic of subgenus Crioceratites s. str. (see explanation of Pl. XV, fig. 1), at this or later growth-stages. The dorso-lateral (umbilical) tubercles and bundled ribs disappear completely on the outer half whorl of the specimen. There the flanks are covered throughout by the somewhat flexuous, moderately thin, closely-spaced, single ribs. A few of these seem to subdivide low on the flanks but this is by no means certain. The ribs on the flanks become gradually coarser and more widely spaced all the way toward the outer end of the specimen. The closely-spaced, rounded ventro-lateral nodes persist throughout. Two or three of the lateral ribs end blindly against each node with one or two more ribs being often intercalated between the adjacent nodes. The nodes are superimposed on the sharp, almost rectangular ventro-lateral shoulders, which contrast with the broadly-rounded dorso-lateral (umbilical) shoulders. The narrow, flat venter between the nodes (fig. 3B) is either unsculptured or carries indistinct and broad single ribs connecting the opposite ventro-lateral nodes. These ribs are separated from each other by considerably broader, transversal depressions apparently lacking any distinct supplementary sculpture. The intercalated ribs of the flanks seem to end blindly at the ventral shoulder between the nodes. The strongly-flattened dorsum is ornamented with single, thin and closely-spaced ribs, which cross it with a distinct forward bend. These ribs, too, become gradually coarser and more widely spaced all the way toward the end of the specimen. The extremely complex suture line with its very slender, moss-like frilled lobes and saddles has only two lateral lobes and no individualized auxiliary lobes. This essentially lytoceratid suture has, however, distinctively trifid lateral lobes. Such suture lines are characteristic of all Lower Cretaceous heteromorph ammonites except for the most primitive types. In the sedimentary basins of Western and Arctic Canada these heteromorph ammonites are so far only known in the mid-Lower Cretaceous (Hauterivian to Aptian) rocks and the lytoceratids proper are all but absent. In this region the occurrence of any fragment with this specialized (i.e. trifid lateral lobes) lytoceratid suture line is suggestive of mid-Lower Cretaceous age. 3A. Lateral view of the better-preserved side. 3B. Ventral view of the middle part of the inner whorl of the specimen and the dorsum of the end part of its outer half whorl.


1C
1B
1A
2A
2C
2B
3B
3A

APTIAN STAGE
Tropaeum australe Zone and Unnamed Zone E

PLATE XX

FIGS. 1A-1B. Tropaeum n. sp. aff. arcticum (Stolley, 1912). GSC loc. 35693, GSC No. 17311. A dorso-ventrally deformed fragment of the living chamber partly covered by the shell layer. The relatively closely spaced and not too coarse and prominent ribs of the living chamber are diagnostic of T. arcticum (Stolley) and related forms. The European Tropaeum ex gr. bowerbanki-hillsi are, on the contrary, characterized by very coarse and distantly-spaced ribs on the living chamber, contrasting greatly with the much finer and more closely spaced ribs on the septate whorls. The undeformed cross-section of Tropaeum n. sp. aff. arcticum is almost perfectly circular. The ribs become obsolete or completely lost in the middle of the venter, which is the best distinguishing feature of the species. 1A. Dorsal view, showing the deformed cross-section of the whorl. 1B. Lateral view.

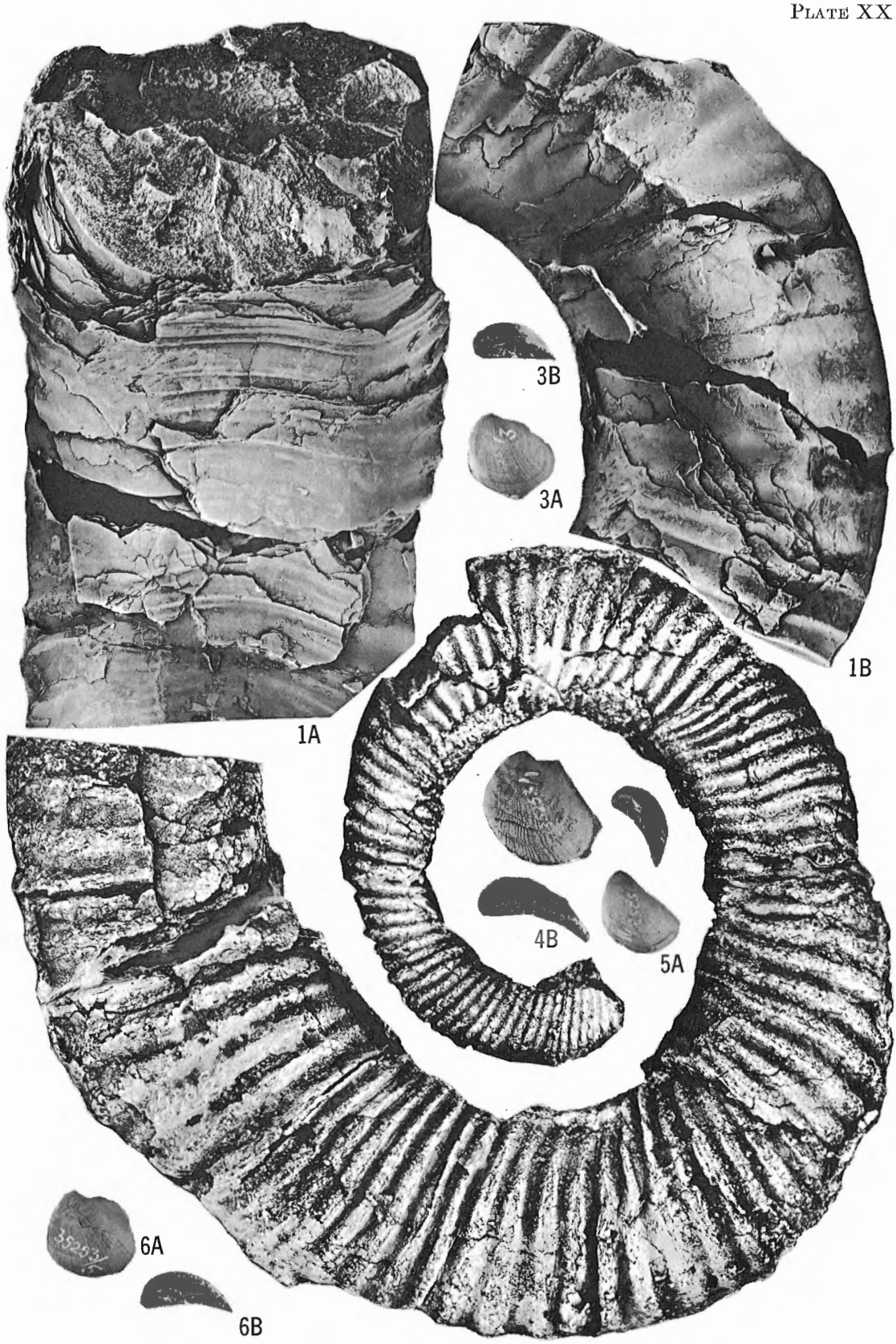
FIG. 2. Tropaeum undatum Whitehouse, 1926. GSC loc. 35682, GSC No. 17313. Shell-covered parts of the penultimate and ultimate whorls, somewhat deformed laterally, and with the beginning of the living chamber preserved. As in all the representatives of the Tropaeum arcticum species group, the ribs on the living chamber are only slightly coarser and not much wider spaced than those on the septate whorls. The density (about 76 ribs per whorl) and the flexuous, blunt appearance of the ribs matches exactly that of the Australian species. Unlike those of T. n. sp. aff. arcticum, the ribs of T. undatum do not become either markedly weakened or interrupted in the middle of the venter at later stages of growth. The somewhat flexuous, predominantly single (ribs only rarely bifurcate on the flanks) ribbing habit, combined with the complete absence of nodes on all but the early growth-stages, distinguish the genus Tropaeum from all related crioceratid and ancyloceratid genera. This genus is restricted to late Lower and early Upper Aptian rocks all over the world. Except for the complete absence of nodes during most of its growth, Tropaeum is similar to Shasticrioceras.

FIGS. 3A-3B. Aucellina aptiensis (d'Orbigny) Pompeckj, 1901, GSC loc. 35253, GSC No. 17318. Internal cast of a fairly small left valve of an oblique, thick variant, transitional between the typical form of the species (fig. 6) and var. nassibianzi (fig. 4). The radial ribs are very strongly developed and are often covered by oblique tubercles producing a "thread-like" effect. This ornament exhibits all of the diagnostic features discussed under the explanation of Pl. XV, fig. 4. 3A. Lateral view of the exterior. 3B. Anterior view of the same.

FIGS. 4A-4B. Aucellina aptiensis (d'Orbigny) Pompeckj, 1901, var. nassibianzi Sokolov, 1908. GSC loc. 35253, GSC No. 17319. An internal cast of a more coarsely sculptured left valve, otherwise typical of the variant. Note the large, angular posterior ear, which distinguishes this variant from A. caucasica (Abich). 4A. Lateral view of exterior. 4B. Anterior view.

FIGS. 5A-5B. Aucellina aff. gryphaeoides (J. deC. Sowerby, 1836, emend. Sokolov, 1908). GSC loc. 35253, GSC No. 17317. Internal cast of a narrow and high left valve, with a long, pinched, and noticeably-coiled beak. This specimen differs markedly from the associated broad and low left valves of Aucellina ex gr. aptiensis-caucasica, which are furthermore characterized by coarser sculpture as well as by obtuse and short beaks. This specimen may be an unrelated forerunner of the Albian Aucellina ex gr. gryphaeoides. 5A. Lateral view of the exterior. The posterior ear is completely broken off. 5B. Anterior view. The long beak is noticeably coiled, tip broken.

FIGS. 6A-6B. Aucellina aptiensis (d'Orbigny) Pompeckj, 1901, f. typ. GSC loc. 35253, GSC No. 17316. Internal cast of a somewhat fragmentary, medium-sized left valve of a typical (morphologically extreme) variant. Posterior ear is well developed and sharply separated from body of valve. Anterior ear and part of anterior margin of the valve are broken off. This simulates the somewhat posteriorly oblique shape of the valve, which was originally almost perfectly symmetrical. The short, blunt beak has only slight right-hand incurvature. Some patches of shell layer are preserved. 6A. Lateral view of exterior. 6B. Anterior view.


1A
1B
3A
3B
4B
5A
6A
6B

HAUTERIVIAN?, BARREMIAN, AND APTIAN STAGES
Various Zones

PLATE XXI

FIGS. 1A-1B. Tropaeum australe (Moore) emend. Whitehouse, 1926. GSC loc. 35690, GSC No. 17381. Plaster cast of a natural external mold of the fragmentary intermediate whorl. This very finely and closely ribbed species is indistinguishable from the more finely ribbed variant of T. australe. Unlike Tropaeum n. sp. aff. arcticum shown in Pl. XXII, figs. 2B, 3C, the ribs of T. australe do not show any weakening or interruption on the venter at corresponding diameters (fig. 1B). T. australe has, furthermore, over 100 ribs per whorl as against some 63 to 64 in T. n. sp. aff. arcticum and some 76 in T. undatum. 1A. Lateral view. 1B. Ventral view.

FIGS. 2A-2C. Tropaeum cf. undatum Whitehouse, 1926. GSC loc. 35668, GSC No. 17382. Fragment of septate early whorl differs from comparable whorls of T. australe and T. n. sp. aff. arcticum in its coarser ribbing comparable to the early whorls of T. undatum (Pl. XX, fig. 2). Ribs are somewhat elevated and swollen on the ventro-lateral shoulders and do not show any weakening on the venter. 2A. Lateral view. 2B. Ventral view. 2C. Cross-section.

FIGS. 3A-3D. Oxyteuthis cf. jasikowi (Lahusen, 1874). GSC loc. 26999, GSC No. 17383. Almost complete, medium-sized guard showing characteristic spindle-like shape in ventral and lateral aspects, absence of the alveolar furrow on the venter, the tendency of the venter to become slightly grooved in the apical region and the increasing separation of the lateral grooves in the direction of the alveolus by a gradually widening longitudinal swelling. The latter feature is diagnostic of the genus Oxyteuthis Stolley. The cross-section (fig. 3D) of the middle part of the guard lacks the dorso-ventral compression characteristic of the species. It is not clear, however, whether the subcircular, equidimensional shape of the Canadian specimen is an individual deviation or a taxonomically important distinction. 3A. Lateral view. 3B. Lateral view of the other side showing the Oxyteuthis-like separation of lateral grooves in the alveolar and stem parts of the flanks. 3C. Ventral view showing the slightly-furrowed apical region. 3D. Cross-section of the middle part of the guard (at the middle of three cracks visible in fig. 3C).

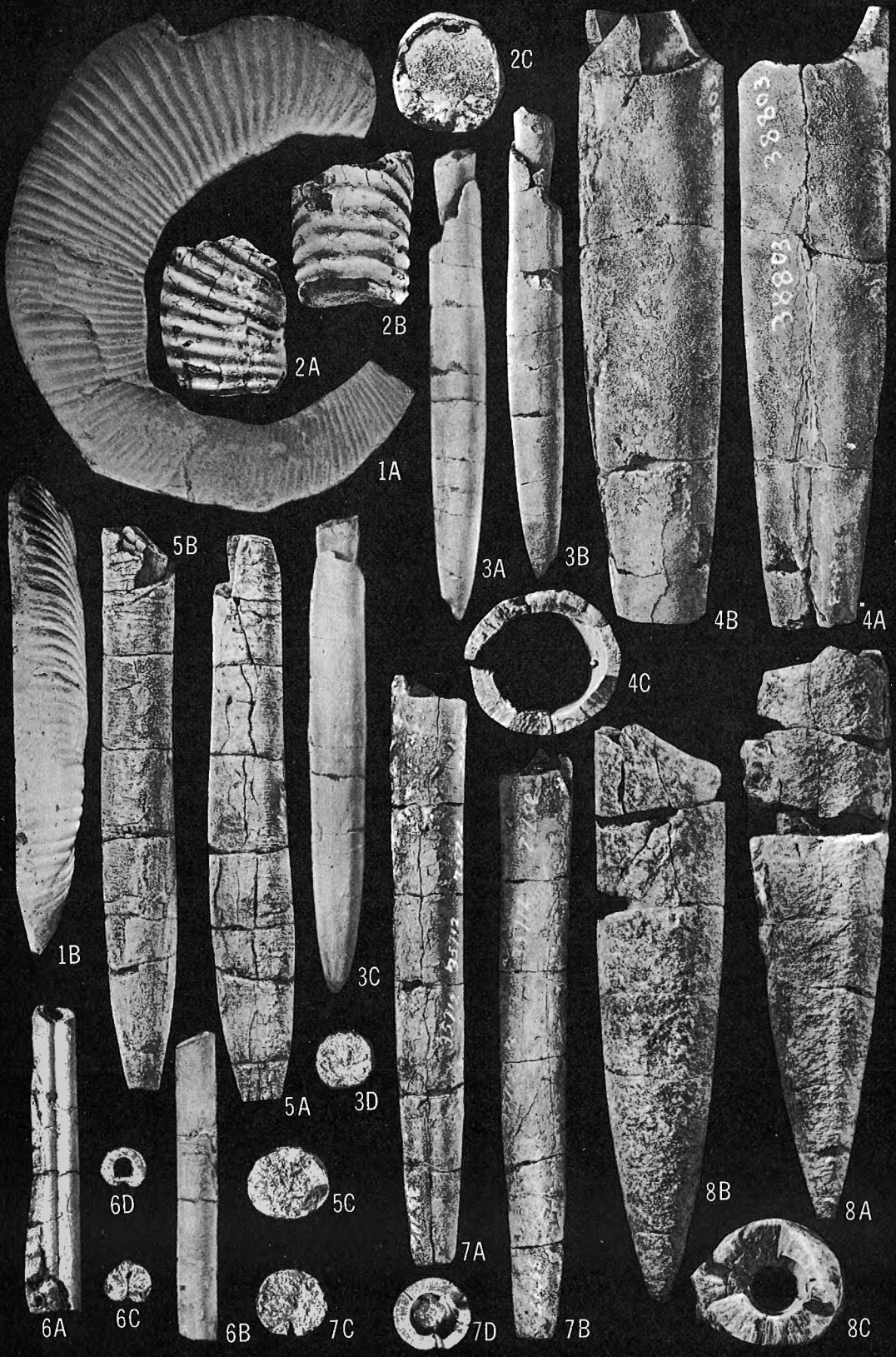
FIGS. 4A-4C. Acroteuthis cf. A. kernensis Anderson, 1938 and A. mitchelli Anderson, 1938. GSC loc. 38803. GSC No. 17384. Fragmentary medium-sized guard almost complete in the alveolar part but lacking the apical end (see fig. 8A-8B for apical end). The species differs from A. pseudopanderi and A. conoides in its generally high conical shape in ventral and lateral aspects and in much longer and gradually-tapering apical part. This results in the dagger-like appearance of the apical region of the guard. The ventral surface of A. cf. A. kernensis and A. mitchelli is distinctly depressed or/and grooved almost throughout similar to A. n. sp. aff. conoides Swinnerton shown in Pl. XIX, fig. 1A. The essentially circular to laterally oval, well-rounded, cross-section distinguishes our species from all its Valanginian-Berriasian predecessors. 4A. Ventral view. 4B. Lateral view. The venter is on the right side of the photograph. 4C. Cross-section of the top part of the alveolus.

FIGS. 5A-5C. Oxyteuthis cf. jasikowi (Lahusen, 1874). GSC loc. 35671, GSC No. 17385. A large, fragmentary and strongly-weathered guard similar to the smaller and better-preserved guard shown in fig. 3 except for the strong dorso-ventral flattening and compression of its cross-section (fig. 5C), and somewhat more pronouncedly lanceolate outline in ventral aspect (fig. 5A). 5A. Ventral aspect. 5B. Lateral aspect. The venter is on the left. 5C. Cross-section at about the middle of the stem region. The ventral side is at the bottom.

FIGS. 6A-6D. Hibolithes n. sp. A? GSC loc. 35624, GSC No. 17386. An imperfectly-preserved upper part of the guard showing the diagnostic ventral groove extending from the alveolar rim all the way down to the lower end of the fragment. Only Hibolithes s. str. and Belemnopsis have such long ventral groove on their alveolar and stem regions. Their descendants, such as Mesohibolites Stolley, Neohibolites Stolley and Parahibolites Stolley, all have shorter furrows restricted to the alveolar region of the guard (see Stolley, 1911-25, Swinnerton, 1935-55). The strongly dorso-ventrally compressed cross-section (fig. 6C) of the stem region and the cylindrical (Belemnopsis-like) outline of the guard are not matched in any of the Cretaceous Hibolithes species the writer is familiar with. 6A. Ventral view. 6B. Lateral view. The venter is on the left side of the photograph. 6C. Cross-section at the upper (alveolar) end of the fragment. 6D. Cross-section of the lower (stem) end of the fragment. This peculiar form may be only a homoeomorph of Hibolithes.

FIGS. 7A-7D. Aulacoteuthis cf. ascendens Stolley, 1925. GSC loc. 35712, GSC No. 17387. A large, indifferently-preserved and fragmentary (apical part broken off) guard probably belonging to the extremely slender and long variant of A. ascendens. The ventral furrow that distinguishes Aulacoteuthis from Oxyteuthis is visible on the remainder of the apical part and adjacent part of the stem region. The characteristical lateral grooves are not preserved but the dorso-ventrally compressed cross-section of the stem region (fig. 7C) and alveolar end (7D) rule out its reference to Cylindroteuthis Bayle, 1874. 7A. Ventral view. 7B. Lateral view. The venter is on the left side of the photograph. 7C. Cross-section at about the middle of the guard (at the 3rd crack from the bottom in fig. 7B). The venter is at the bottom of the photograph. 7D. Cross-section at the alveolar end. The venter is at the top of the photograph.

FIGS. 8A-8C. Acroteuthis cf. A. kernensis Anderson, 1938 and A. mitchelli Anderson, 1938. GSC loc. 35667, GSC No. 17388. An indifferently-preserved (surface mostly covered by a crust of fine-grained sand), fragmentary guard with complete and typically-shaped apical region. The cross-section in the lower part of the alveolus (fig. 8C) and farther down is markedly dorso-ventrally compressed and the ventral side of the guard is flat or somewhat depressed in the middle with a shallow, longitudinal ventral groove (fig. 8A). 8A. Ventral view. 8B. Lateral view. The venter is on the left. 8C. Cross-section of the alveolar end. The venter is at the bottom.


1A
2A
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2C
3A
3B
4A
4B
4C
5A
5B
1B
3C
3D
6A
6D
6C
6B
5C
7C
7A
7D
7B
8B
8A
8C

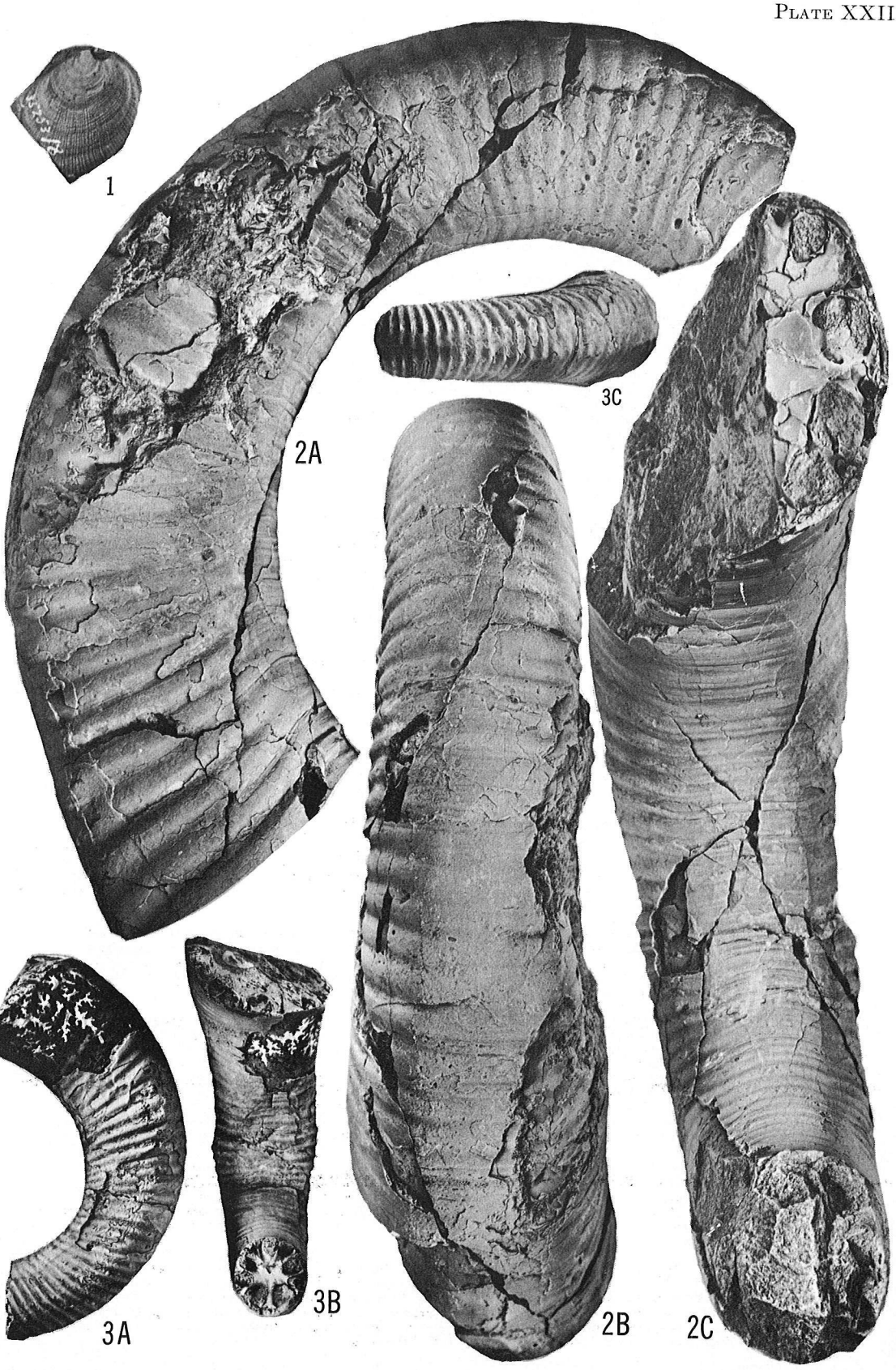
APTIAN STAGE
Zone of Tropaeum australe and Unnamed Zone E

PLATE XXII

FIG. 1. Aucellina aptiensis (d'Orbigny) Pompeckj, 1901 var. nassibianzi Sokolov, 1908. GSC loc. 35253, GSC No. 17320. Lateral view of the exterior of a typical, large right valve. The lower-posterior part is broken off.

FIGS. 2A-2C. Tropaeum n. sp. aff. arcticum (Stolley, 1912). GSC loc. 35693, GSC No. 17321. Fragment of an essentially-undeformed intermediate (septate to the end) whorl, mostly shell-covered T. n. sp. aff. arcticum differs from T. arcticum (Stolley) in its somewhat broader and heavier ribs and, even more characteristically, in their pronounced weakening and then interruption on the middle part of the venter in the middle and late growth-stages. The gradual decline of the ribs on the venter takes place within the whorl fragment shown (fig. 2B). All ribs are single, they cross the dorsum with a gentle forward swing. On the broadly-rounded dorsal (umbilical) shoulder the ribs swing gently backward, swing gently forward just above the shoulder and maintain an essentially straight course over the remainder of the flanks; they are gently inclined forward from the radii throughout this interval and then cross the broadly-rounded ventral shoulder and the venter without any noticeable forward or backward swing. Fine secondary ribs and striae cover the rounded surfaces of the ribs and intervening depressions. Parts of the suture line are visible at the beginning and in the middle part of the fragment (fig. 2A); they show that the suture line of Tropaeum is much simpler than that of Hoplocrioceras. The two sutures belong, however, to the same specialized (i.e. with the trifid lateral lobes) lytoceratid type (see under Pl. XIX, fig. 3). Cross-section is almost perfectly round (with only slightly-flattened flanks, venter and dorsum) and nearly equidimensional throughout the fragment. 2A. Lateral view. 2B. Ventral view of the middle part of the fragment. 2C. Dorsal view showing the cross-sections at the beginning and the end of the fragment.

FIGS. 3A-3C. Tropaeum n. sp. aff. arcticum (Stolley, 1912). Locality unknown but this specimen is probably that collected by McConnell (1891, p. 116D) loose in the bed of Longstick Creek on the eastern slope of Northern Richardson Mountains. Not only was it found in the drawer containing the fossil collections of McConnell but its preservation is right for the area and its surface is strongly waterworn in places. Tropaeum n. sp. aff. arcticum is, finally, not known anywhere outside of the Northern Richardson Mountains. If so, then the specimen was probably derived from outcrops of the Upper Sandstone Division. This division is apparently the only rock unit outcropping for several miles up from the mouth of Longstick Creek (Jeletzky, 1960, geol. map). Upper Sandstone Division?, Aptian (early upper?). Tropaeum australe zone? GSC No. 17322. Well-preserved fragment of an early whorl showing the characteristic weakening of the ribs on the venter at its end (fig. 3C). Ribs are much finer and denser at this growth-stage than on the later whorls (fig. 2A); they are, furthermore, more nearly straight throughout the flanks and are somewhat more inclined forward in relation to the radius of whorl. On the early part of the fragment the ribs are somewhat elevated and have feebly nodose appearance at the umbilical shoulders (fig. 3C). This phenomenon disappears as soon as the ribs begin to weaken in the middle part of the venter. A slight backward swing of the ribs occurs between their node-like elevated portions. This phenomenon also disappears as soon as the ribs begin to weaken in the middle of the venter. The suture-line is of the already-described, specialized lytoceratid type with the pronouncedly trifid first lateral lobe (fig. 3A); however, unlike Crioceratites (Hoplocrioceras) n. sp. aff. laeviusculum it is but little ramified and not at all moss-like frilled. The cross-section of whorl is almost perfectly round and equidimensional at this (fig. 3B) and later growth-stages (fig. 2C). 3A. Lateral view showing the suture line (outlined in black and white). 3B. Dorsal view showing cross-section at the beginning of the fragment. 3C. Ventral view of the middle part of the fragment.


1
2A
3C
2B
2C
3B
3A

ALBIAN STAGE
Sonneratia? sp. A., Cleoniceras aff. subbaylei and Beudanticeras affine Zones

PLATE XXIII

FIGS. 1A-1C. Sonneratia (s. lato)? n. sp. A. GSC loc. 25502, GSC No. 17389. A large, mostly shell-covered representative, most of the living chamber preserved but strongly crushed laterally. The narrow, funnel-like umbilicus with essentially smooth walls and crowded, swollen, rounded ribs are diagnostic of this little understood hoplitid which is apparently restricted to the basal beds of the Albian (Lower Albian?) sequence of Mackenzie basin and Northern Yukon. 1A. Lateral view. 1B. Anterior end (cross-section of strongly laterally crushed living chamber) and venter of early part of penultimate whorl. 1C. Cross-section of the early part of penultimate whorl and the next inner whorl. Venter of feebly sculptured, still earlier whorl is also visible.

FIGS. 2A-2B. Arcthoplites (=Subarcthoplites) aff. belli (McLearn, 1944). GSC loc. 5895e, GSC No. 17390. A mostly shell-covered, laterally deformed, intermediate? whorl with part of the living chamber preserved. This form combines the ribbing habit and the density of ribs (15 primaries per whorl) of A. belli with an apparently greater forward swing of secondaries on the venter and more planulate shape of the whorl; it could be transitional between Arcthoplites s. str. and Cymahoplites. 2A. Lateral view. 2B. Anterior view of the whorl's end and the ventral view of its earlier part.

FIGS. 3A-3B. Cleoniceras(Anadesmoceras?) aff. subbaylei Spath, 1942, f. typ. GSC loc. 28750, GSC No. 17391. Medium-sized representative of the species with part of the living chamber preserved, somewhat laterally deformed, shell-covered. It differs from Cleoniceras (Grycia) sablei Imlay, 1961 in that its primary ribs do not weaken toward the middle of the flanks, and its secondaries maintain their strength all the way to the ventro-lateral shoulder. The strong, forward projection of the secondaries at the ventro-lateral shoulder and the lesser number of primaries (13-14) per whorl are even more obvious distinctions of the form from C. (G.) sablei. From C. (A.?) subbaylei Spath, 1942 (p. 700-1, text-fig. 246) the Canadian form differs apparently only in its somewhat more slender whorl shape and predominantly stronger sculpture; it could, thus, well be conspecific with this English form. 3A. Lateral view. 3B. Ventral view of the middle part of the whorl.

FIG. 4. Cleoniceras (Anadesmoceras?) aff. subbaylei Spath, 1942, var. GSC loc. 28750, GSC No. 17392. Lateral view of a somewhat laterally deformed, completely shell-covered, large representative of the extremely feebly sculptured and slender variant of the form concerned. Last quarter whorl is the early part of the living chamber. This variant is even more similar to C. (A.?) subbaylei than the typical form of the species shown in figs. 3, 6 in its sculpture; it appears, however, to be much more slender than and to lack the flattening and broadening of the venter of the living chamber so characteristic of C. (A.?) subbaylei.

FIGS. 5A-5C. Colvillia crassicostata Imlay, 1961. GSC loc. 37315, GSC No. 17393. Fragment of the body chamber (last septum visible at top of fig. 5A and at the base of fig. 5C) of a sturdier, more coarsely ribbed variant of the species. Internal cast with some patches of shell layer. 5A. Lateral view. 5B. Ventral view. 5C. Cross-section of the anterior end of the living chamber and that of a fragmentary inner whorl.

FIGS. 6A-6C. Cleoniceras (Anadesmoceras?) aff. subbaylei Spath, 1942. f. typ. GSC loc. 28750, GSC No. 17394. The ultimate whorl of a fairly large, typical representative of the species with the almost completely preserved living chamber; the specimen is essentially undeformed and mostly shell-covered. Last two sutures are dimly visible in the lower left part of fig. 6A (near the broken-off early part of the whorl). Note the marked change in the whorl's cross-section from narrowly rounded, almost sharpened on the early, septate part of the whorl to much broader, distinctly flattened and subangular near the end of the living chamber. The sculpture is typically developed (see under fig. 3). 6A. Lateral view. 6B. Cross-section of the anterior end of the living chamber and the venter of the fragmentary, early part of the ultimate whorl. 6C. Ventral view of the living chamber.

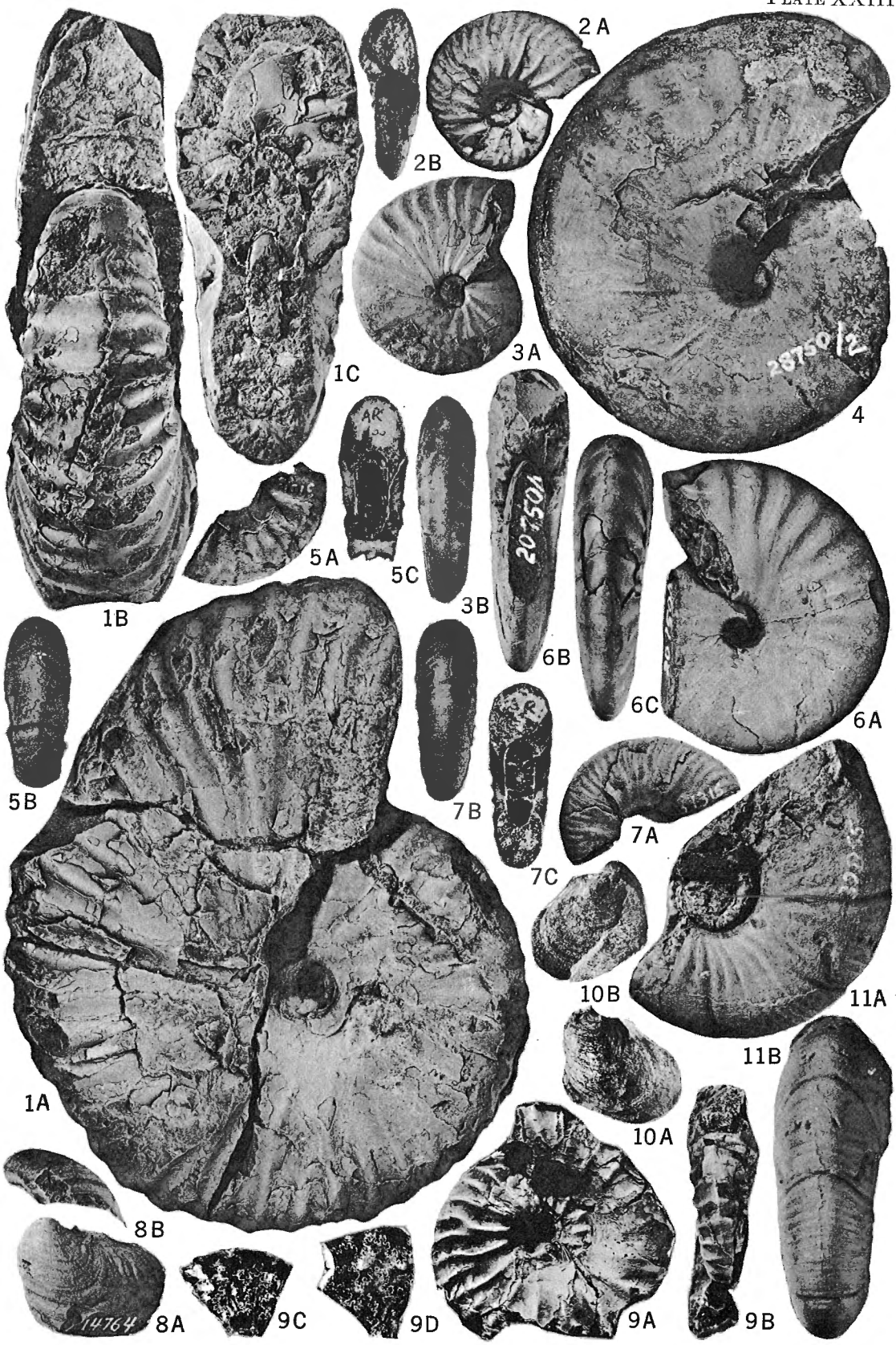
FIGS. 7A-7C. Colvillia crassicostata Imlay, 1961. GSC loc. 37315, GSC No. 17395. Fragment of the ultimate whorl (including last three septa) and the early half of the living chamber of a typical representative of the species. This partly shell-covered, medium-sized representative of C. crassicostata shows all its diagnostic features such as: (a) Weakening or interruption of the secondaries along the mid-ventral line (fig. 7B); (b) Bifurcation or trifurcation of flexuous and forwardly-incurved primaries at or slightly above the middle of the flanks (fig. 7A); and (c) Constrictions, which are most conspicuous on the venter (figs. 7A, 7B). 7A. Lateral view. 7B. Ventral view. 7C. Cross-sections of the ultimate and penultimate whorls.

FIGS. 8A-8B. Aucellina gryphaeoides (J. deC. Sowerby, 1836). GSC loc. 14764, GSC No. 17396. Internal cast of a medium-sized, typical left valve with some patches of the imperfectly-preserved shell layer. Aucellina gryphaeoides is an Albian-Cenomanian species; it differs from the Barremian-Aptian Aucellina ex gr. aptiensis-caucasica (see Pls. XV, XVIII, XX) in much finer radial ornament and considerably longer, pinched beak of the left valve. 8A. Lateral view of the exterior. 8B. Anterior view of the same.

FIGS. 9A-9D. Arcthoplites (=Subarcthoplites) talkeetnanum (Imlay, 1960). GSC No. 7429. Arcthoplites mcconnelli zone, early Middle Albian, Clearwater Formation, Brule Rapids, Athabasca River, Alberta. Collected by Dr. R. Bell, Geological Survey of Canada, 1882. For the most part strongly laterally deformed, fragmentary, intermediate (wholly septate) whorl of a typical representative of the species. This species differs from Arcthoplites aff. jachromensis (Nikitin, 1888) (see Pl. XXV, fig. 1) apparently only in the smaller size, almost smooth living chamber, relatively higher and more planulate whorl-shape, and more convex venter. 9A. Lateral view. 9B. Ventral view of the earliest visible part of the whorl. 9C. Two almost complete lateral parts of external suture lines of the earliest visible part of the whorl. 9D. Three almost complete lateral parts of external suture lines of the anterior part of the whorl. The first lateral (extreme right) lobe is almost symmetrically trifid.

FIGS. 10A-10B. Aucellina gryphaeoides (J. deC. Sowerby, 1936) (=Aucellina? dowlingi McLearn, 1944). GSC No. 9556. Holotype of A. ?dowlingi McLearn, 1944. Beudanticeras affine and Arcthoplites zone, Lower to early Middle Albian. Buckinghorse Formation, 8 1/2 miles west of highway bridge, Sikanni River, northeastern British Columbia. Collected by H.H. Beach, Geological Survey of Canada, 1944. A fairly small but almost complete, partly shell-covered example. End of left beak broken off (fig. 10B). 10A. Lateral exterior, left valve. 10B. Lateral exterior, right valve.

FIGS. 11A-11B. Puzosia (s. lato) aff. sigmoidalis Donovan, 1953 (=?Puzosia? sp. of Warren, 1947, p. 122, Pl. 29, figs. 6, 7). GSC loc. 32855, GSC No. 17397. A shell-covered, undistorted but fragmentary intermediate (septate to the end) whorl and fragments of inner whorls. The diagnostic sigmoidal, closely-spaced constrictions (eight or nine per whorl) are separated by only four to five primary ribs. Unlike the specimens of Warren (1947) and Donovan (1953), the ribs weaken and then mostly disappear in the upper part of the flanks and on the venter. Taxonomic value of this feature is uncertain. 11A. Lateral view. 11B. Ventral view.


2A
2B
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4
1B
5A
5C
3B
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7B
7C
7A
1A
10B
11A
11B
10A
8B
14764
8A
9C
9D
9A
9B

ALBIAN STAGE
Beudanticeras affine Zone

PLATE XXIV

FIGS. 1A-1D. Arcthoplites sp. indet. A. GSC No. 9706. Reproduction of the figured specimen of "Lemuroceras cf. indicum" (McLearn, 1944, Pl. V, fig. 4). "Lemuroceras cf. indicum" zone, late Lower Albian? Buckinghorse Formation, Sikanni River, 1 1/2 mile below Locks, about 10 miles west of Alaska Highway bridge, northeastern British Columbia. Collected by L.D. Burling, Geological Survey of Canada, 1944. Internal cast of a strongly laterally deformed, early(?) whorl. This possibly new species differs from A. talkeetnanum in its wider umbilicus, lower whorl section, and coarser, more distantly spaced ribbing habit. The last mentioned feature distinguishes it also from the extremely coarsely ribbed and low-whorled variant of A. belli (Pl. XXVI, fig. 11). 1A. Lateral view. 1B. Other lateral view. 1C. Dorsal view. 1D. Ventral view.

FIGS. 2A-2B. Arcthoplites (Freboldiceras) irenense (McLearn, 1944). GSC loc. 42285, GSC No. 17415. Internal cast of a strongly laterally deformed intermediate whorl (wholly septate?) retaining the Y-shaped ribbing habit of an Arcthoplites at least on its early part. Several incomplete suture lines are somewhat indistinctly visible on the early part of the whorl. Two characteristically wide, essentially trifid first lateral lobes are outlined in white. This suture line is more complex than that of A.(F.) singulare Imlay, 1960 (see also expl. of Pl. XXVI, fig. 13). 2A. Lateral view. 2B. First and second lateral lobes outlined in black and white and oriented as in fig. 2A.

FIGS. 3A-3B. Beudanticeras cf. affine (Whiteaves, 1892). GSC No. 5030. Reproduction of B. cf. glabrum of McLearn (1944, Pl. IV, figs. 2-3), X 1/2. Beudanticeras affine and Arcthoplites zone, early middle Albian?. Clearwater Formation, Peace River, 25 miles below Cadotte River, Alberta. Collected by R.G. McConnell, Geological Survey of Canada, 1878. Internal cast (with some patches of the shell layer) of a large, essentially undeformed intermediate whorl which combines the relatively low, more regularly rounded and broad-ventered cross-section of B. affine with the absence of constrictions characteristic of Beudanticeras? glabrum. The extremely complex, partly interlocking suture line is essentially similar to that of B. affine. 3A. Lateral view. 3B. Cross-section of the anterior end and the venter of the early part of the whorl.

FIGS. 4A-4B. Beudanticeras affine (Whiteaves, 1892). GSC loc. 7426, GSC No. 17400. An internal cast (with some patches of shell layer) of a small but otherwise typical specimen. A juvenile? representative with part of the living chamber preserved. The sharp ventered appearance of the anterior end (fig. 4B) is simulated by the lateral crushing; the more rounded cross-section of the early part of the whorl is a natural one. Constrictions are well developed on the cast's surface but almost concealed by the shell layer. The complex suture line with markedly asymetrically trifid first lateral lobe is typical of the species (fig. 4A). The surface is smooth at all growth-stages, except for constrictions and fine, dense striation. 4A. Lateral view. 4B. Ventral view of the end part of the whorl.

FIGS. 5A-5B. Beudanticeras glabrum (Whiteaves, 1889). Holotype. GSC No. 5028. Beudanticeras affine and Arcthoplites zone, early Middle Albian?. Peace River, a few miles below Fort Vermilion, Alta. Collected by W. Ogilvie, Geological Survey of Canada, 1885. A partly shell-covered, medium-sized, essentially undeformed, intermediate (wholly septate) whorl. The narrow-ventered, discus-like shape of the whorl combined with the complete absence of ribbing at any growth-stage and less complex suture line separate B.? glabrum from B. affine and other Beudanticeras-like ammonites of our region. 5A. Lateral view. 5B. Cross-section of the anterior end and the venter of the early part of the whorl.

FIGS. 6A-6G. Beudanticeras glabrum (Whiteaves, 1889). GSC loc. 18318, GSC No. 17401. Undeformed inner whorls, mostly shell-covered, note characteristic whorl shape, and complete absence of sculpture, except for fine striation. Inner whorls of B.? glabrum carry several constrictions, which are only visible on the surface of internal casts (figs. 6A, 6B). 6A. Lateral view of the intermediate whorl of the four represented in fig. 6. 6B. Early part of the whorl shown in fig. 6A and a segment of the next inner whorl. 6C. Lateral view of the outer of the four whorls represented in fig. 6. 6D. Cross-section of anterior end and venter of the early part of the whorl shown in fig. 6C. 6E. Cross-section of outer whorl and venter of the inner whorl shown in fig. 6B. 6F. Cross-section of anterior end and venter of the early part of the whorl shown in fig. 6A. 6G. Lateral part of the external suture line of the anterior part of the whorl shown in fig. 6C.

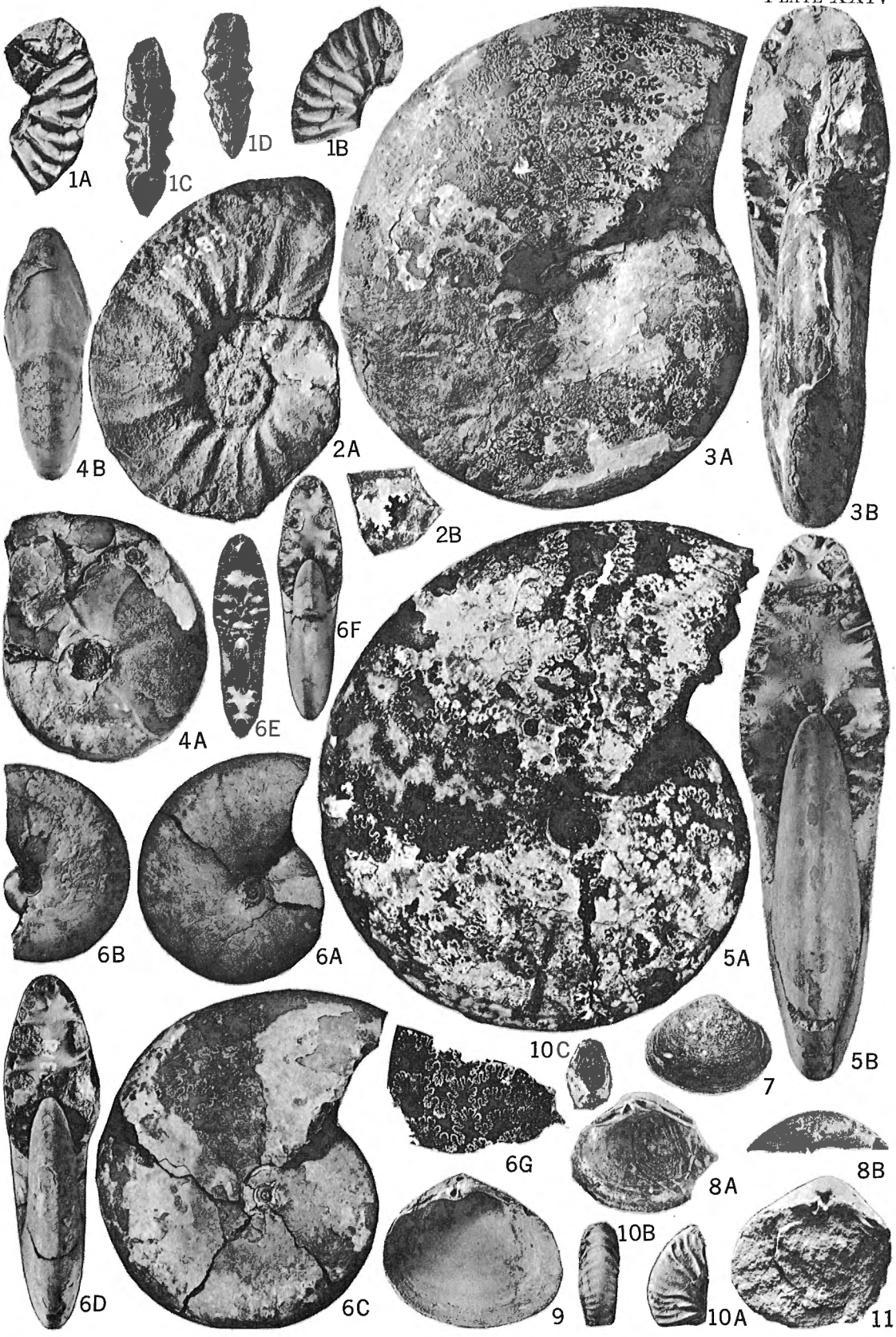
FIG. 7. Arctica limpidiana McLearn, 1933. GSC loc. 5897, GSC No. 7421. Lateral view of the exterior of a completely shell-covered right valve. The shape and sculpture of the valves of A. limpidiana are virtually indistinguishable from those of Onestia onestiae shown in figs. 9 and 11.

FIGS. 8A-8B. Arctica limpidiana McLearn, 1933. Holotype. GSC loc. 5897, GSC No. 7420. A well-preserved, somewhat fragmentary right valve showing a typical Arctica hinge, which permits its generic differentiation from the superficially similar shell of Onestia onestiae at a glance. 8A. Lateral view of interior showing hinge structure. 8B. View of beak and hinge margin from above.

FIG. 9. Onestia onestiae McLearn, 1931. GSC loc. 5897, GSC No. 8004. Lateral view of the interior of a well-preserved shell showing typical cardiid-like hinge structure, which is quite different from that of superficially similar Arctica limpidiana.

FIGS. 10A-10C. Arcthoplites (Cymahoplites) cf. aburense (Spath, 1933). GSC loc. 5895, GSC No. 17409. A partly shell-covered, undeformed fragment of an inner whorl. The strongly-flattened flanks, narrowly-rounded venter with markedly forward bent secondary ribs, and the close spacing of ribs are all diagnostic of subgenus Cymahoplites Spath, 1922 (= Lemuroceras Spath, 1942) and differentiate our species from Arcthoplites ex gr. belli. As it is clearly visible in fig. 10A, the primary ribs issue almost tangentially from the semi-smooth umbilical wall. This shows that the only morphological difference alleged to exist between Cymahoplites and Lemuroceras cannot be maintained. These two "genera" are considered to be synonymous both on the generic and subgeneric level. The fragment illustrated appears to be indistinguishable from Cymahoplites aburense (Spath, 1933) in all its observable morphological features.

FIG. 11. Onestia onestiae McLearn, 1933. GSC loc. 5896, GSC No. 8003. Lateral view of interior showing the typical cardiid-like hinge structure.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ALBIAN STAGE
Beudanticeras affine Zone

PLATE XXV

FIGS. 1A-1D. Arcthoplites aff. jachromensis (Nikitin, 1888). GSC loc. 47874, GSC No. 17402. Anterior part of the living chamber of a large, presumably adult representative enclosing fragments of two inner whorls. This undeformed, partly shell-covered specimen differs from the lectotype of A. jachromensis (Arkell et al., 1957, p. L400, fig. 518) only in the larger size and slenderer whorl-section. The taxonomic value of these distinctions is uncertain, they may reflect infraspecific variability of A. jachromensis. Unlike all other Canadian representatives of the genus, A. aff. jachromensis retains its sculpture on the living chamber. 1A. Lateral view showing the typical ribbing habit of the living chamber matching that of the enclosed intermediate whorl. 1B. Lateral view of the other side. 1C. Ventral view of the living chamber. 1D. Cross-section of the imperfectly-preserved posterior end of fragmentary living chamber and that of the enclosed intermediate whorl.

FIGS. 2A-2D. Arcthoplites (=Subarcthoplites) belli (McLearn, 1944). GSC loc. 37183, GSC No. 17463. Intermediate(?) whorl with complete living chamber; mostly shell-covered, strongly deformed laterally. 2A. Lateral view. Mouth border is almost completely preserved. 2B. Lateral view of the other side. 2C. Ventral view of the anterior part of the living chamber with the completely-preserved mouth border (outlined in white). Note the pronounced constriction just before the mouth border. 2D. Lateral parts of several more or less strongly weathered external suture lines (the same as those visible in fig. 2A), X 3.

PLATE XXV

ALBIAN STAGE
Beudanticeras affine Zone

PLATE XXVI

FIGS. 1A-1E. Arcthoplites (=Subarcthoplites) mcconnelli (Whiteaves, 1892) Holotype. GSC No. 4800. Arcthoplites mcconnelli zone, early Middle Albian. Clearwater Formation, Athabasca River at Burnt Rapids, Alta. Collected by R.G. McConnell, Geological Survey of Canada, 1889. A mostly shell-covered, wholly septate, intermediate(?) whorl characterized by strong reduction of ornament and almost complete loss of clear bifurcation of primary ribs. The narrow-stemmed, almost perfectly trifid first lateral lobe (fig. 1E) differentiates this species from otherwise similar representatives of Freboldiceras Imlay, 1960. 1A. Lateral view of the less sculptured side. 1B. Lateral view of the stronger sculptured side. 1C. Ventral view of the middle part of the whorl. 1D. Cross-section of the anterior end and the venter of the early part of the whorl. 1E. Lateral parts of three incomplete, external suture lines (same as those visible in fig. 1A), X 3.

FIG. 2. Arcthoplites (=Subarcthoplites) belli (McLearn, 1944). GSC loc. 28805, GSC No. 17407. Lateral view of mostly shell-covered, partly flattened specimen showing ribs pronouncedly bent like a cupid's bow, the primary stems of which often start obliquely from the umbilicus.

FIGS. 3A-3E. Arcthoplites belli (McLearn, 1944). Holotype. GSC loc. 28805, GSC No. 9570. A partly shell-covered, intermediate (probably wholly septate) whorl of a somewhat laterally deformed specimen. The suture line is essentially similar to that of A. mcconnelli (fig. 3A). The ribbing habit is extremely variable, some ribs bifurcate above middle of flank, others at or well below the middle. Some ribs issue almost tangentially from the umbilicus, others start almost radially. Other topotypes of A. belli shown in this plate (figs. 4, 7, 8, 11, 12) provide even better illustration of extreme variability of its ribbing habit. Other variables include width of umbilicus, shape of flanks, venter, and strength of ribs. A. belli thus can only be differentiated from A. aff. jachromensis (Pl. XXV, fig. 1) and allied forms by its smooth adult living chamber and generally more convex, well-rounded cross-section. Consequently Subarcthoplites Casey, 1954 is untenable even as a subgenus, being based on infraspecific or even individual characters. 3A. Lateral view of unwhitened specimen to show suture line and ribs (outlined in black). 3B. The same (whitened). 3C. Lateral view of the other side (whitened). 3D. Cross-section of imperfectly-preserved anterior end and venter of the early part of the whorl. Unwhitened to show the suture line. 3E. The same view as last. Whitened to show the essentially straight ribs on the venter.

FIGS. 4A-4C. Arcthoplites belli (McLearn, 1944). GSC loc. 28805, GSC No. 17412. An undeformed early half-whorl of a typical form; in internal cast with some patches of shell layer. 4A. Lateral view. 4B. Cross-section. 4C. Same as 4B, X 3.

FIG. 5. Arcthoplites belli (McLearn, 1944). GSC loc. 37681, GSC No. 17411. Lateral view of an almost-flattened adult specimen including typically-ribbed penultimate whorl and a fragment of virtually smooth (except for striation) living chamber.

FIGS. 6A-6B. Arcthoplites (Cymahoplites) cf. aburense (Spath, 1933). GSC loc. 5895, GSC No. 17406. Intermediate whorl, strongly deformed laterally, and mostly covered by shell. The flattened flanks, oblique and almost rimless umbilical wall, and the paucity of definitely-bifurcating ribs characterise both Cymahoplites and Lemuroceras, as also does the almost tangential direction of the basal parts of primaries. The writer accordingly suppresses Lemuroceras as a junior synonym of Cymahoplites. The Canadian form concerned does not seem to differ from Cymahoplites aburense (Spath, 1933) in its ribbing habit, whorl shape, etc.; it differs from Arcthoplites belli in much denser ribbing, greater number of primaries (20-22 per whorl as compared with 14-17 for A. belli), and much more planulate cross-section. 6A. Lateral view. 6B. Lateral view of the other side, X 3 to show the lateral part of external suture line with its asymmetrically trifid first lateral lobe.

FIGS. 7A-7B. Arcthoplites belli (McLearn, 1944). GSC loc. 28805, GSC No. 17409. Typical inner whorl, essentially similar to that shown in fig. 4 except for smaller size, partly shell-covered. 7A. Lateral view. 7B. Cross-section of the anterior end and the venter of the early part of the whorl. 7C. Ventral view.

FIGS. 8A-8D. Arcthoplites belli (McLearn, 1944). GSC loc. 28805, GSC No. 17417. Internal cast (some patches of shell layer) of an almost complete, typical undeformed inner whorl.. 8A. Lateral view. 8B. Lateral view of the other side. 8C. Ventral view. 8D. Cross-section of anterior part and venter of the early part of whorl.

FIGS. 9A-9B. Arcthoplites aff. belli (McLearn, 1944). GSC loc. 5895, GSC No. 17408. A shell-covered, partly laterally deformed intermediate form combining the ribbing habit and density of ribs (16 primaries per whorl) of A. belli with an apparently more and marked forward swing of the secondaries on the venter planulate whorl's shape; the poorly visible suture line agrees with that of A. belli in all essential detail. 9A. Lateral view. 9B. Ventral view of the least-deformed anterior end.

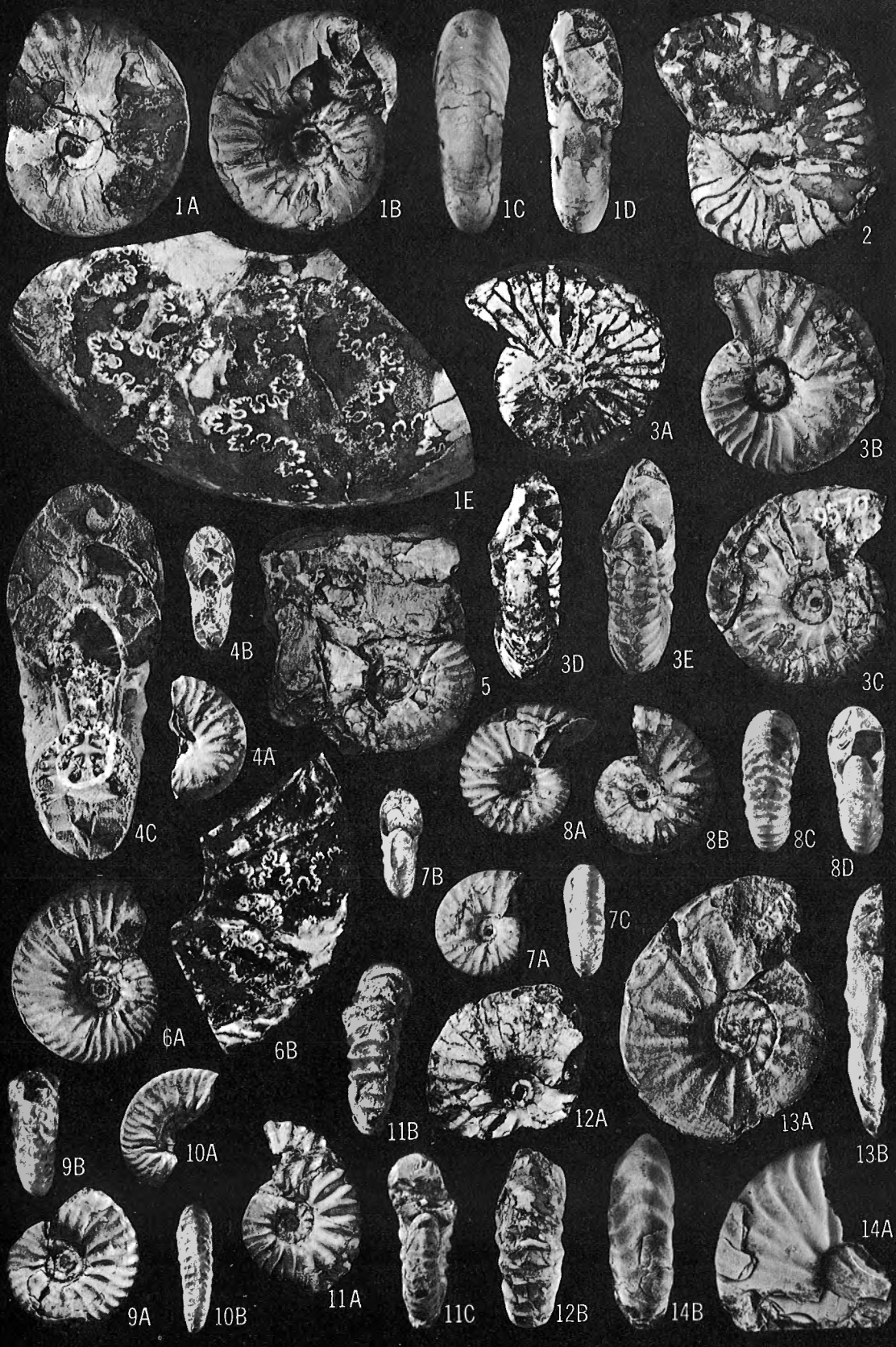
FIGS. 10A-10B. Arcthoplites (Cymahoplites) cf. aburense (Spath, 1933). GSC loc. 5895, GSC No. 17413. A shell-covered, fragment of an inner whorl (part of the living chamber preserved); anterior part almost undeformed. Strongly-flattened flanks, narrow venter with forward bent ribs, and close spacing of ribs are diagnostic of the subgenus Cymahoplites and differentiate our form from A. ex gr. belli. 10A. Lateral view. 10B. Ventral view.

FIGS. 11A-11C. Arcthoplites belli (McLearn, 1944) var. A partly shell-covered, undeformed, intermediate whorl (with most of the living chamber preserved) of an extremely low-whorled and coarsely-sculptured variant of A. belli closely approaching A. jachromensis in all diagnostic features, except for the lower point of bifurcation. 11A. Lateral view. 11B. Ventral view. 11C. Venter of the early part and the cross-section of the anterior end of the whorl.

FIGS. 12A-12B. Arcthoplites (=Subarcthoplites) belli (McLearn, 1944). GSC loc. 28805, GSC No. 17416. A mostly shell-covered, penultimate(?), largely-undeformed but fragmentary whorl of a variant transitional between the typical form (figs. 3, 4, 7, 8) and the extreme A. jachromensis-like variant shown in fig. 11. Whorl is much higher than in the A. jachromensis-like variant, venter is wider and lower-arched than the typical form and the flanks are more flattened; some ribs trifurcate instead of bifurcating. 12A. Lateral view. 12B. Ventral view.

FIGS. 13A-13B. Arcthoplites (Freboldiceras) irenense (McLearn, 1944). Holotype. GSC loc. 42285, GSC No. 17415. A strongly laterally deformed internal cast of an intermediate whorl (septate to the end). The broad stems of the first lateral lobe diagnostic of the subgenus are dimly visible in fig. 13A. Other diagnostic features are: (a) early loss of secondary ribs; (b) swollen appearance of the distantly-spaced and more or less straight primaries; and (c) planulate whorl and narrow venter. 13A. Lateral view. 13B. Ventral view, anterior end is below.

FIGS. 14A-14B. Cleoniceras cf. tailleuri Imlay, 1960. GSC loc. 18306, GSC No. 17418. Internal cast (small patch of shell layer near venter) of undeformed fragment showing early part of living chamber with parts of last suture line preserved, the typical bullate appearance of the basal parts of the primaries, abrupt and near vertical umbilical wall, and the marked forward swing of primaries on the venter. 14A. Lateral view. 14B. Ventral view.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ALBIAN STAGE
Gastroplites spp. Zone

PLATE XXVII

FIG. 1. Inoceramus dowlingi McLearn, 1919. GSC loc. 5903, GSC No. 5399. Lateral view of the exterior of an almost complete, shell-covered specimen. This small, closely and regularly concentrically ribbed, subcircular form may well be a young growth-stage of I. anglicus Woods or some other large Inoceramus form.

FIGS. 2A-2C. Gastroplites stantoni McLearn, 1931. GSC No. 6336. Holotype. Gastroplites zone, late Middle Albian. Peace River sandstone, west bank of Peace River, about 15 miles below mouth of Cadotte River, Alta. Collected by Dr. F.H. McLearn, Geological Survey of Canada, 1917. Internal cast of an undeformed, intermediate (wholly septate) whorl; differs from the equivalent growth-stages of G. canadensis and G. kingi only in the narrow, slightly convex appearance of the venter and could well be an extreme morphological variant of one of these two species. 2A. Lateral view. 2B. Cross-section of the anterior end and the venter of the early part of the whorl. 2C. Ventral view of the anterior part of the whorl.

FIG. 3. Inoceramus cadottensis McLearn, 1931 var. altifluminis McLearn, 1943. Holotype. GSC No. 8935. Gastroplites zone, late Middle Albian. Lower part of Fort St. John Group, talus at the mouth of Deep Creek, Peace River Canyon, northeastern British Columbia. Collected by C.M. Sternberg, National Museum of Canada, 1930, X 1/2. Exterior lateral view of an internal cast of a large representative of the variant, which differs from the typical form in the strongly reduced and irregular concentric ornament as well as in the better developed posterior wing and more swollen umbones.

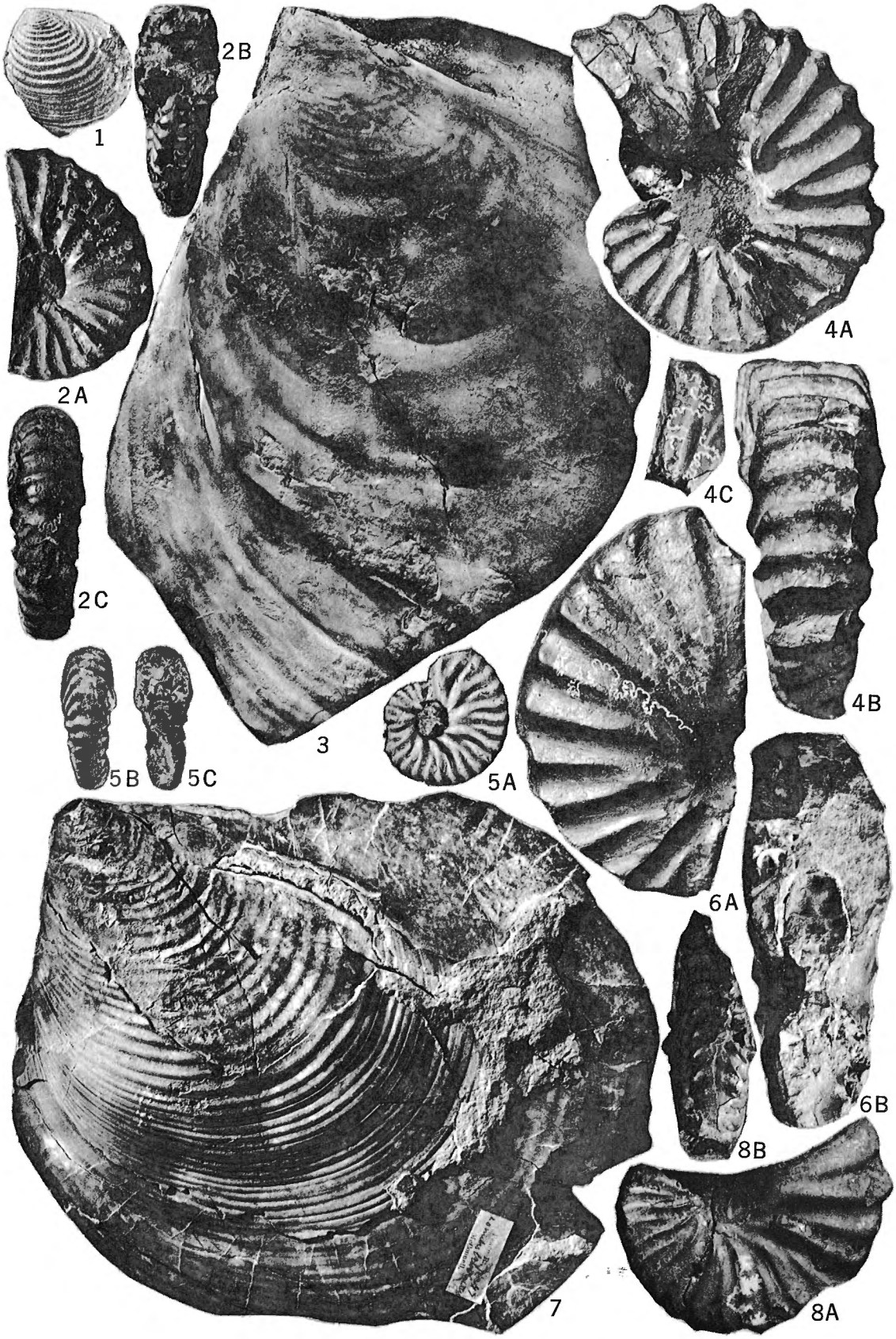
FIGS. 4A-4C. Gastroplites canadensis (Whiteaves, 1893). Holotype. GSC No. 7430. Gastroplites zone, late Middle Albian. Peace River, 20 miles below Cadotte River, presumably from the upper member of the Peace River sandstone, northeastern British Columbia. Collected by R.G. McConnell, Geological Survey of Canada, 1889. Internal cast of a half-grown representative with almost half of the living chamber preserved (see Pl. XXVIII, figs 2-3) for adult specimen. The stoutly-whorled, coarsely-ribbed appearance, broad and flat venter, and the only slightly convex ribs on the venter are diagnostic of this growth-stage of the species. 4A. Lateral view. The last suture is somewhat indistinctly visible near middle of whorl. 4B. Ventral view. 4C. Lateral parts of two last external suture lines.

FIGS. 5A-5C. Gastroplites (Paragastroplites) spiekeri McLearn, 1931. GSC loc. 25720, GSC No. 17426. One of the earliest whorls of the species distinguishable from the corresponding growth-stages of G. canadensis, by its already clearly sloping flanks, feebly-rounded venter and markedly flexuous ribs. 5A. Lateral view. 5B. Ventral view of the anterior part. 5C. Cross-section of the anterior end and the venter of the early part.

FIGS. 6A-6B. Gastroplites (Paragastroplites) spiekeri McLearn, 1931. Holotype. GSC No. 6339. Gastroplites zone, late Middle Albian. Upper member of Peace River sandstone, Peace River, 8 miles below Cadotte River, northeastern British Columbia. Collected by C.M. Sternberg, National Museum of Canada, 1930. Internal cast of wholly septate, essentially-undeformed intermediate whorl (see expl. of Pl. XXIX, fig. 2). 6A. Lateral view. One of the suture lines is outlined in white; it is the most pseudoceratitic-like of all Gastroplites suture lines known. 6B. Cross-section of the whorl and those of two inner whorls.

FIG. 7. Inoceramus cadottensis McLearn, 1931. Holotype. GSC No. 6343, X 1/2. Gastroplites zone, late Middle Albian. Presumably from the upper member of Peace River sandstone, Peace River, 20 miles below Cadotte River, Alberta. Collected by R.G. McConnell, Geological Survey of Canada, 1889. The closely and evenly spaced ribs cover the middle and dorsal part of the shell but decline anteriorly and postero-dorsally unlike I. anglicus Woods, 1912. Lateral view of the exterior of a large partly shell-covered left valve.

FIGS. 8A-8B. Gastroplites (Paragastroplites?) allani McLearn, 1931. Holotype. GSC No. 6337. Same locality, age and collector as for the specimen shown in fig. 7. An internal cast of a fragmentary, wholly septate intermediate whorl. The species combines the smooth to semi-smooth appearance of the venter, clavate, forwardly-bent appearance of the ribs at the ventral shoulder and other diagnostic features of G. (P.) spiekeri with the broader and essentially flat venter; it may be but a morphological variant of this species. 8A. Lateral view. 8B. Ventral view of the early part of the whorl.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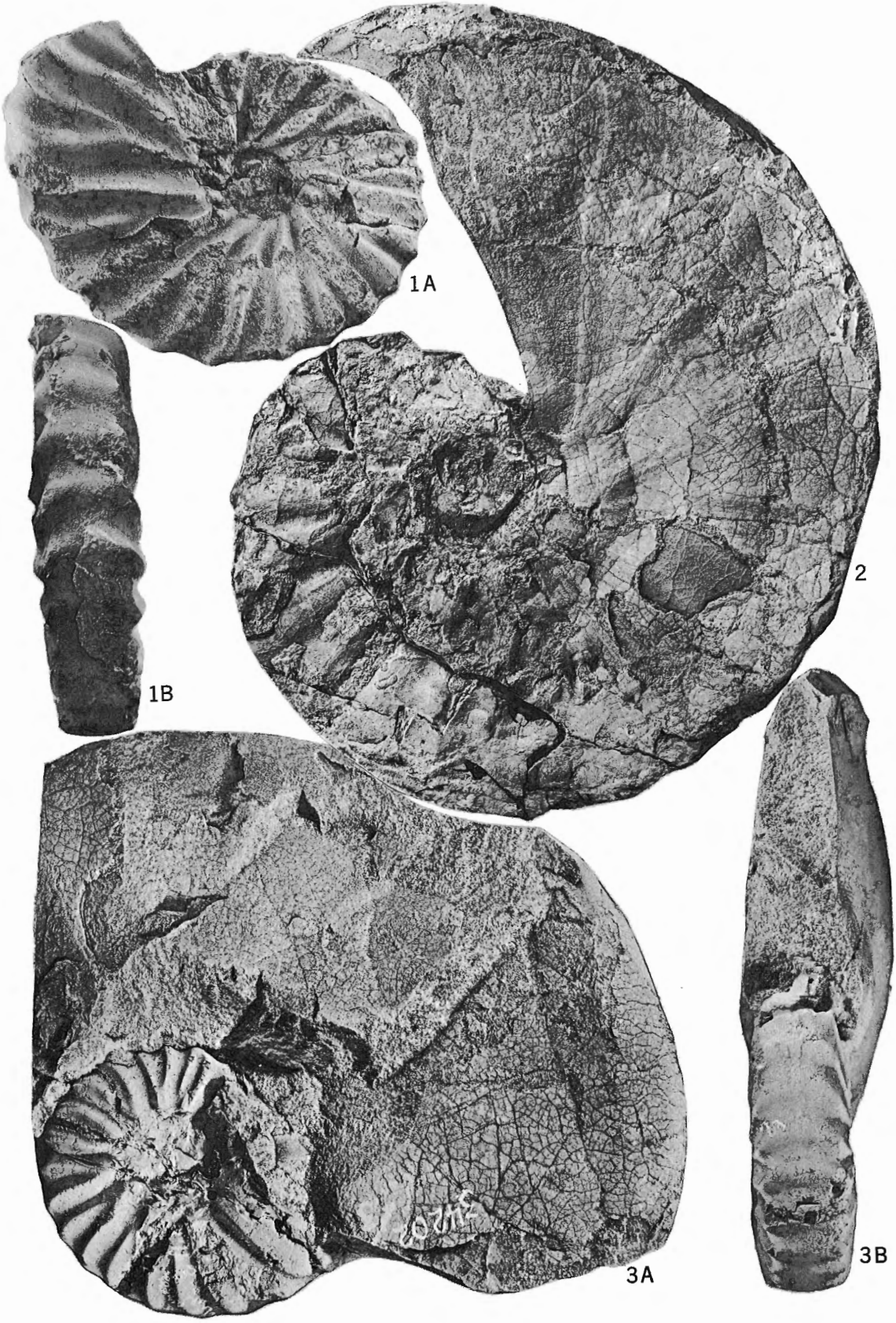
ALBIAN STAGE
Gastroplites spp. Zone

PLATE XXVIII

FIGS. 1A-1B. Gastroplites kingi McLearn, 1931. Holotype. GSC No. 6340. Gastroplites zone (upper part?), late Middle Albian. Near the base of the Fort St. John Shale, south side of Peace River Canyon, just above the mouth of Deep Creek, northeastern British Columbia. Collected by C.M. Sternberg, 1930. Intermediate whorl with typical sculpture of the early growth-stages of the species and genus; somewhat crushed laterally. Combination of high, slender whorl with its parallel flanks and broad, arcuate ribs on the essentially flat venter is diagnostic of this growth-stage of G. kingi. 1A. Lateral view. 1B. Ventral view of the end part of the whorl.

FIG. 2. Gastroplites canadensis McLearn, 1931. GSC loc. 34202, GSC No. 17431. Lateral view of the largely-flattened ultimate whorl (almost completely shell-covered) with the complete mouth border. The extremely coarse ribbing of the early part of the whorl first weakens and then becomes almost lost on the living chamber. Note horn-like protuberance of the ventral part of the mouth border.

FIGS. 3A-3B. Gastroplites canadensis McLearn, 1931. GSC loc. 34202, GSC No. 17432. Fragment of the typical but strongly laterally crushed and partly-flattened living chamber enclosing the almost perfectly preserved, typically-sculptured intermediate whorl (internal cast) showing the suture line. This whorl differs from the holotype (Pl. XXVII, fig. 4) in the broadly arcuate course of the ribs on the venter. It matches Gastroplites canadensis McLearn var. (McLearn, 1933, Pl. 1, figs.1-3). 3A. Lateral view. 3B. Ventral view of the intermediate whorl and the cross-section of living chamber.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3B

ALBIAN STAGE
Gastroplites spp. Zone

PLATE XXIX

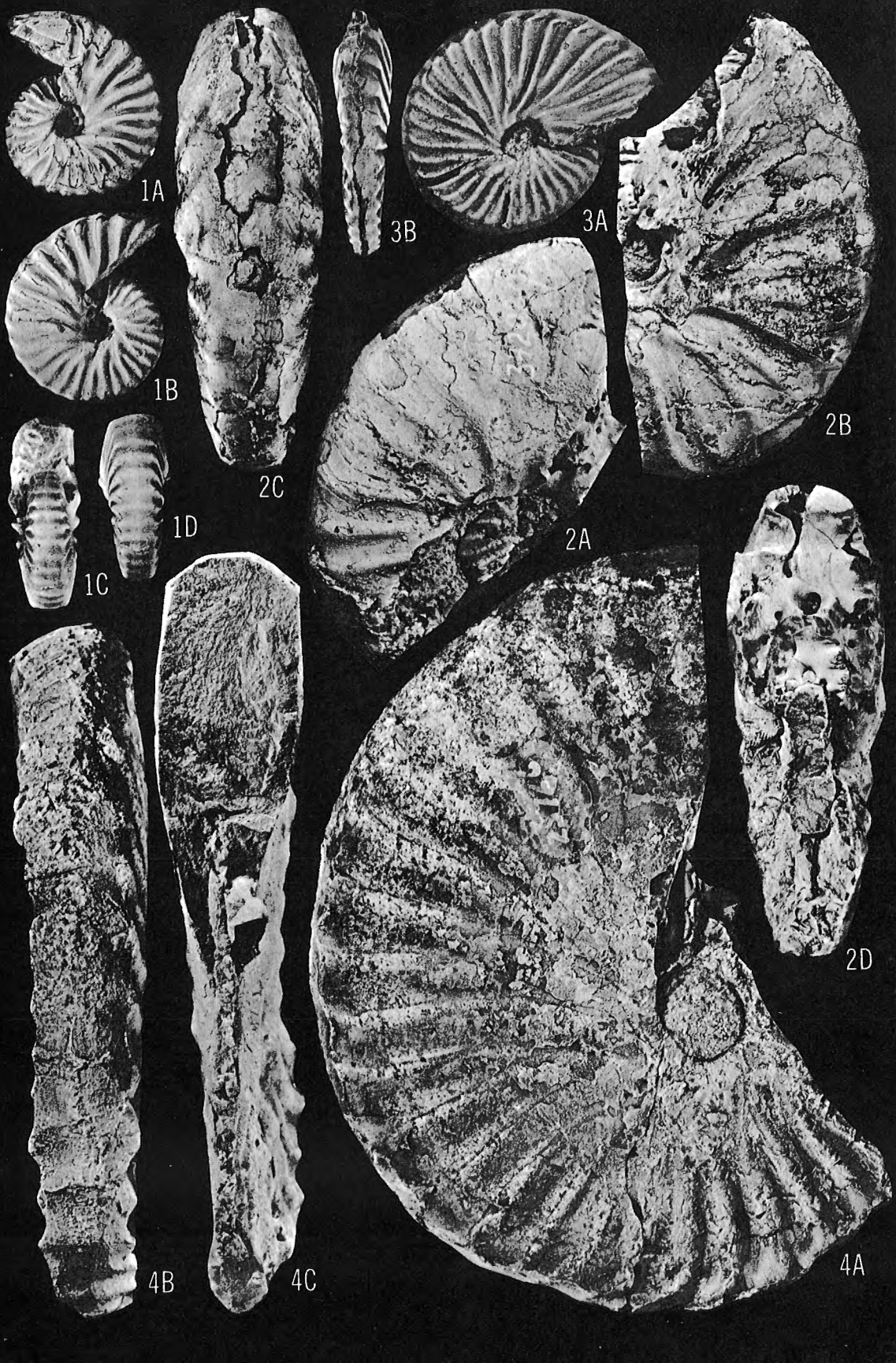
FIGS. 1A-1D. Gastroplites (Paragastroplites) spiekeri McLearn, 1931. GSC loc. 25720, GSC No. 17427. Early whorl corresponding to that visible inside of intermediate whorl of the species shown in figs. 2A, 2D. Like the latter it is characterized by a fairly narrow but still flat venter, distinctly-sloping, straight flanks and well-developed umbilical nodes. 1A. Lateral view. 1B. Lateral view of the other side with stronger umbilical nodes. 1C. Cross-section of imperfectly-preserved anterior end and venter of the early part of the whorl. 1D. Ventral view of middle part.

FIGS. 2A-2D. Gastroplites (Paragastroplites) spiekeri McLearn, 1931. GSC loc. 34202, GSC No. 17428. Fragment of an almost completely shell-covered intermediate whorl representing a growth-stage transitional between that of the holotype (Pl. XXVII, fig. 6) and the adult specimen (Pl. XXX, fig. 1). Ribbing is markedly weakened but the umbilical nodes (bullae-like) are large and strongly developed. 2A. Lateral view showing a fragment of an early whorl with a typical sculpture. 2B. Lateral view of the other side showing the narrow umbilicus with smooth walls and well-developed, bullae-like umbilical nodes. 2C. Ventral view showing the narrow, semi-smooth venter and markedly-sloping flanks. 2D. Cross-section of the whorl and those of two earlier whorls corresponding to the inner whorl shown in fig. 2A.

FIGS. 3A-3B. Gastroplites (Paragastroplites) flexicostatus Imlay, 1961. GSC loc. 37183, GSC No. 17429. A somewhat laterally deformed intermediate whorl preserved as an internal cast. The closely-spaced, flexuous ribs (about 33 secondaries per whorl), markedly clavate, forwardly bent secondaries at the ventral shoulder, and the semi-smooth venter with weakened ribs are diagnostic of the species. 3A. Lateral view. 3B. Ventral view of the end part of the whorl.

FIGS. 4A-4C. Gastroplites (Paragastroplites) flexicostatus Imlay, 1961. GSC loc. 25726, GSC No. 17430. A large, adult representative of the species with an almost completely preserved living chamber. The early fifth of the whorl is septate and almost flattened. The living chamber is only feebly deformed. Except for the weakening of the sculpture on the living chamber this full-grown representative does not differ materially from its half-grown representative (fig. 3) in any of the diagnostic features. Unlike most other Gastroplites forms, G. (P.) flexicostatus retains most of its ornament in the adult state. 4A. Lateral view. 4B. Ventral view of the living chamber showing the weakening or disappearance of the ribs on the venter. 4C. Cross-section of the end part of the living chamber and that of the almost completely flattened early part of the whorl.

PLATE XXIX



ALBIAN STAGE
Gastroplites spp. Zone

PLATE XXX

FIGS. 1A-1C. Gastroplites spiekeri McLearn, 1931. GSC No. 4808c. Although recorded as from the same locality as the cotypes of Gastroplites? (Paragastroplites?) liardense (see under expl. of Pl. XXXII, fig. 1), this specimen of G. (P.) spiekeri probably was collected in (or derived from) older beds of the Gastroplites zone proper. The writer has never seen this species, or for that matter any other Gastroplites species, in association with Gastroplites? (Paragastroplites?) liardense. An almost complete ultimate whorl of an adult specimen. A laterally-distorted internal cast with considerable patches of the poorly-preserved shell layer. The lower part of the mouth border of the living chamber is preserved and outlined in white but the upper parts are lost. The third suture line from the beginning of the living chamber is outlined in white. The ribs of the partly-flattened septate part of the whorl are characteristically clavate and bent forward at the ventral shoulder; the narrow venter between them is smooth to almost smooth and convex. Together with the characteristic pseudocertitic-like appearance of the suture line (fig. 1A; Pl. XXVII, fig. 6) these features identify this specimen as G. (P.) spiekeri. 1A. Lateral view. 1B. Cross-section of the end part of the living chamber and the venter of the early, septate part of the whorl. 1C. Ventral view of the middle part of the living chamber.

FIGS. 2A-2E. Gastroplites anguinus McLearn, 1931. Holotype. GSC No. 6338. Gastroplites zone, late Middle Albian. Upper sandstone member of the Peace River Formation, Peace River, 8 miles below the mouth of Cadotte River, Alberta. Collected by F.H. McLearn, Geological Survey of Canada, 1917. An internal cast of wholly septate, presumably intermediate whorl. The species differs from all other Gastroplites forms known in its considerably wider umbilicus. 2A. Lateral view clearly showing suture lines. 2B. Other side. 2C. Ventral view of the anterior part of the whorl. Unwhitened to show the suture lines. 2D. The same view as in 2C but whitened to show the character of ribs on the venter. 2E. Cross-section of the anterior end and the venter of the early part of the whorl.

FIGS. 3A-3C. Gastroplites cantianus Spath, 1937 var. GSC loc. 25733, GSC No. 17433. A fragmentary ultimate whorl mostly shell-covered. Living chamber is apparently preserved nearly to its mouth border. This specimen combines the steeply-sloping flanks similar to those of G. (P.) spiekeri with the broad and flat venter of G. canadensis. The ribs are continuous across the venter which they cross in a gentle forward loop. The cross-section of the penultimate whorl is quite similar to that of the early part of the ultimate whorl (fig. 3C) but the next inner whorl has already the rounded venter distinctive of G. cantianus. The gently convex appearance of the venter near the end of the living chamber and the presence of numerous striae on the surface of ribs and furrows are not known in the type specimen; these distinctions are, however, believed to be only of infraspecific rank. 3A. Lateral view. 3B. Ventral view of the end part of the living chamber. 3C. Cross-section of the ultimate whorl and that of the penultimate whorl.


2D
2C
2A
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ALBIAN STAGE
Gastroplites spp. Zone

PLATE XXXI

FIGS. 1A-1D. "Gastroplites" (a new genus?) n. sp. A. GSC loc. 40602, GSC No. 17419. Fragment of a mostly shell-covered, ultimate whorl with well-preserved suture line. The beginning of the living chamber occupies the upper third of the fragment. The rest is septate. Only the venter of the ultimate whorl is more or less flattened; that of the preceeding whorls is more or less regularly rounded as in Arcthoplites. The ribs cross the venter in a marked forward loop without interruption or noticeable weakening. The suture line is much more complex than that of Gastroplites and is more similar to that of Cleoniceras or Sonneratia. Although superficially similar to G. cantianus Spath, this form is probably only a homoeomorph of Gastroplites. 1A. Lateral view. 1B. Ventral view. 1C. Cross-sections of ultimate and penultimate whorls. 1D. Lateral part of the external suture line from the opposite part of fig. 1A (see also figs. 2 and 6).

FIGS. 2A-2I. "Gastroplites" (a new genus?) n. sp. A. GSC loc. 25883, GSC No. 17420. An almost complete ultimate whorl with the mouth border of the living chamber partly preserved. 2A. Lateral view. 2B. The same with the end part of the living chamber removed. 2C. Fragment of the intermediate whorl and a complete inner whorl. 2D. Same whorls as in 2C in cross-section. 2E. Lateral part of external suture line of the early part of ultimate whorl, X 2. 2F. Ventral part of the same suture line as in fig. 2E. 2G. Cross-section of the specimen shown in fig. 2B. 2H. Cross-section with the end part of the living chamber. 2I. Ventral view of the end part of the living chamber.

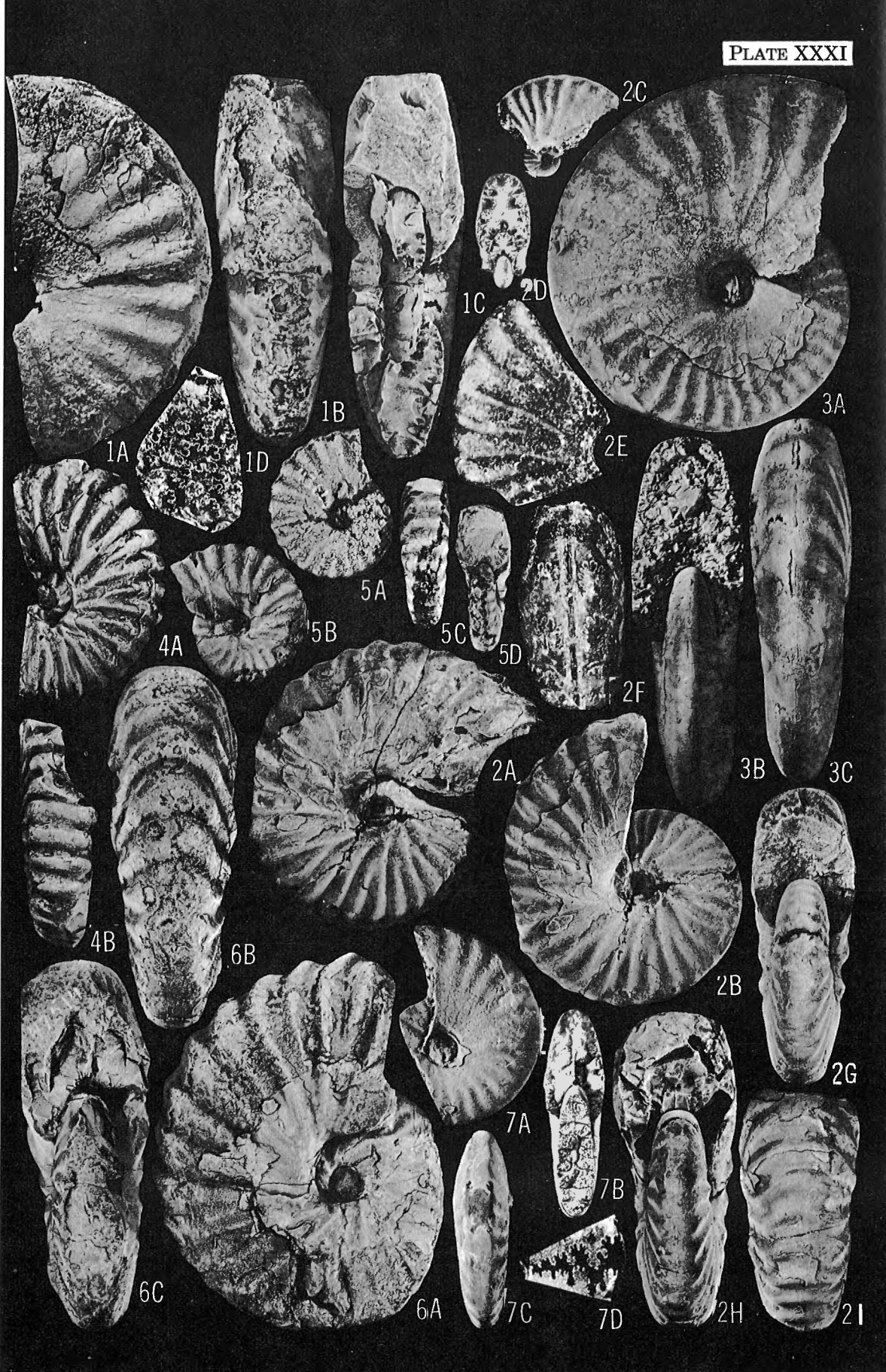
FIGS. 3A-3C. Gastroplites? (Paragastroplites?) n. sp. aff. liardense (Whiteaves, 1889). GSC loc. 43618, GSC No. 17421. Internal cast of wholly septate whorl. A pathological swelling occurs in its middle part (figs. 3A, 3B). For critical morphological features see under Pl. XXXII, fig. 4. 3A. Lateral view. Several suture lines are clearly visible. 3B. Cross-section of the anterior part of the whorl and the venter of its early part. 3C. Ventral view of the anterior part of the whorl. Several suture lines are visible.

FIGS. 4A-4B. Gastroplites aff. canadensis (Whiteaves, 1892). GSC loc. 40606, GSC No. 17422. A fragmentary, mostly shell-covered, intermediate? whorl of a Gastroplites form closely matching G. canadensis (Pl. XXVII, fig. 4) in all respects except for the appearance of the secondary ribs on the flank. The secondaries of G. aff. canadensis (fig. 4A) are, indeed, more or less convex forward while those of G. canadensis are either straight or more or less concave forward. In G. aff. canadensis the posterior secondary of the bundle tends, furthermore, to be more nearly radial while in G. canadensis it is the anterior rib of the bundle that occupies this position. The taxonomic significance of this distinction is uncertain. 4A. Lateral view. 4B. Ventral view.

FIGS. 5A-5D. Gastroplites aff. canadensis (Whiteaves, 1892). GSC loc. 43618, GSC No. 17423. A mostly shell-covered, complete, early whorl showing the same appearance of secondaries as the specimen figured in fig. 4. 5A. Lateral view. 5B. Lateral view of the other side. 5C. Ventral view. 5D. Cross-section.

FIGS. 6A-6C. "Gastroplites" (a new genus?) n. sp. A. GSC loc. 47514, GSC No. 17424. An almost complete, partly shell-covered, ultimate whorl of a large, presumably adult representative of the form concerned. 6A. Lateral view. 6B. Ventral view of the middle part of the whorl. 6C. Cross-section of the anterior end of the living chamber. The venter of the early part of the whorl is strongly deformed and abraded.

FIGS. 7A-7D. Gastroplites? (Paragastroplites?) n. sp. aff. liardense (Whiteaves, 1892). GSC loc. 40602, GSC No. 17425. A partly shell-covered inner whorl, fragmentary but well-preserved. As in the later growth-stages, the venter is narrow, arched and almost to quite smooth. The heavy, swollen ribs bend forward at the ventral shoulder and then disappear on the venter or only cross it as ill-defined, low ridges. The ribs gradually widen and swell more and more towards the ventral shoulder; they are barely perceptible in the proximity of the umbilical shoulder. The suture line is rather simple and completely Gastroplites-like at this early growth-stage. 7A. Lateral view. 7B. Cross-section of the anterior end and that of the early part of the whorl. The high-arched venter of still younger whorl is visible in the middle of the broken portion of the outer whorl. 7C. Ventral view of the anterior part of the whorl. 7D. Lateral portions of two external suture lines occurring near the anterior end of the whorl. The same sutures are outlined in black in fig. 7C.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ALBIAN STAGE
Gastroplites? liardense Zone

PLATE XXXII

FIG. 1. Gastroplites? (Paragastroplites?) liardense (Whiteaves, 1889). Cotype. GSC No. 4808. Gastroplites? liardense zone, earliest Upper Albian? Lepine Formation, Liard River below old Fort Halkelt, northeastern British Columbia. Collected by R.G. McConnell, 1887. Internal cast of a completely-flattened, medium-sized specimen including early part of living chamber. So far as known, the heavy, swollen and flexuous ribs continue uninterrupted across the rounded venter and do not fade out on the living chamber. These features are diagnostic of the species and distinguish it from Gastroplites (Paragastroplites) spiekeri, the genotype of Paragastroplites Imlay, 1961.

FIG. 2. Gastroplites? (Paragastroplites?) liardense (Whiteaves, 1889). Cotype. GSC No. 4808b. Same locality, age and collector as for the specimen shown in fig. 1. Internal cast of completely-flattened, fragmentary, fairly large specimen including the early part of the living chamber. The suture line is much more elaborately frilled and has smaller number of auxiliary lobes than that of Gastroplites (Paragastroplites) spiekeri (see fig. 6; Pl. XXVII, fig. 6A); it is much more similar to that of G.? (P.?) n. sp. aff. liardense and Neogastroplites.

FIG. 3. Gastroplites? (Paragastroplites?) liardense (Whiteaves, 1889). Cotype. GSC No. 4808a. Same locality, age, and collector as for the specimen shown in fig. 1. Completely-flattened fragment of the living chamber of a large, typical specimen preserved as an internal cast.

FIGS. 4A-4B. Gastroplites? (Paragastroplites?) n. sp. aff. liardense (Whiteaves, 1889). GSC loc. 43618, GSC No. 17434. Large, mostly shell-covered, ultimate whorl of a typical representative including most of the living chamber. Combines the heavy, swollen and flexuous ribs of Gastroplites (Paragastroplites) and its more or less rounded, narrow, and smooth to semi-smooth venter with much more complex suture line resembling that of Cleoniceras (see figs. 4B, 6) and G. (P.?) liardense. 4A. Lateral view. 4B. Lateral suture line of the adjoining part of fig. 4A.

FIG. 5. Gastroplites? (Paragastroplites?) liardense (Whiteaves, 1889). GSC No. 4808e. The same locality as for the other cotypes of the species shown in figs. 1-3. Fragment of the wholly septate, intermediate whorl largely preserved as an internal cast. Almost completely flattened. The suture line is almost as complex as that of the much larger specimen shown in fig. 3.

FIG. 6. Gastroplites (Paragastroplites) spiekeri McLearn, 1931. GSC No. 4808d. Although recorded as from the same locality as the cotypes of Gastroplites? (Paragastroplites?) liardense, this specimen of G. (P.) spiekeri probably was collected in or derived from the older beds. The writer has not seen this, or any other Gastroplites species, in association with Gastroplites? (Paragastroplites?) liardense, which appears to characterize the youngest Gastroplites zone known in the western interior region of Canada. This adult suture line of G. (P.) spiekeri is shown for the purpose of comparison with those of G.? (P.?) liardense and G.? (Paragastroplites?) n. sp. aff. liardense shown in figs 2 and 4B.

PLATE XXXII

ALBIAN STAGE
Neogastroplites Zone

PLATE XXXIII

FIG. 1. Posidonia? nahwisi (McLearn, 1931) var. goodrichensis (McLearn, 1943). GSC loc. 14805?, GSC No. 9710. A medium-sized internal cast of the right valve incomplete in the lower-posterior part; it shows clearly the diagnostic characters of the species such as the nearly central, opisthogyrous beak and almost equal, angular wings, as well as those of the variant such as markedly oblique outline and the ribs extending continuously across the back of the shell.

FIGS. 2A-2C. Neogastroplites selwyni (McLearn, 1933) (=N. haasi Reeside and Cobban, 1960). GSC loc. 14757, GSC No. 9711. Fragment of an intermediate whorl and the mold of the ventral part of the next older whorl. The intermediate whorl lacks the siphonal row of nodes, which is diagnostic of the species. The ventral part of the inner whorl is still essentially Gastroplites-like. 2A. Lateral view showing the umbilical and ventro-lateral rows of nodes. 2B. Ventral view showing the absence of the siphonal row of nodes. 2C. Ventral view of the Gastroplites-like inner whorl.

FIG. 3. Posidonia? nahwisi (McLearn, 1931) var. goodrichensis (McLearn, 1943). GSC loc. 14752, GSC No. 9713. An internal cast of a small (half-grown?) but otherwise typical right valve. The central part of the valve is strongly abraded simulating the interruption of the ribs.

FIG. 4. Posidonia? nahwisi (McLearn, 1931) var. goodrichensis (McLearn, 1943). Holotype. GSC No. 8943. Neogastroplites zone, lower part, Upper Albian. Goodrich Formation, on Hulcross Creek, Pine River area, northeastern British Columbia. Collected by G. Shaw, Geological Survey of Canada, 1942. Internal cast of a small (half-grown?) but otherwise typical right valve closely comparable to the corresponding growth-stages of the medium-sized right valve shown in fig. 1.

FIG. 5. Posidonia nahwisi (McLearn, 1931) var. goodrichensis (McLearn, 1943). GSC loc. 14737, GSC No. 9717a. Internal cast of a small and incomplete left valve showing diagnostic features of the variant, such as the marked obliquity of the shell and the continuation of the ribs across the back of the shell.

FIGS. 6A-6B. Neogastroplites selwyni (McLearn, 1933). Holotype. GSC No. 8008. Basal part of Neogastroplites zone, Neogastroplites selwyni subzone, Upper Albian. Shaftsbury Formation, on Peace River near Fort St. John. Collected by A.R. Selwyn, Geological Survey of Canada, 1875. Internal cast of the living chamber of a medium-sized specimen exhibiting all diagnostic features of the species mentioned in the explanation of fig. 2. 6A. Lateral view. 6B. Ventral view. The left dorso-ventral shoulder and nodes are only partly preserved in places.


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ALBIAN STAGE
Neogastroplites Zone

PLATE XXXIV

FIG. 1. Posidonia? nahwisi (McLearn, 1931) f. typ. Holotype. GSC loc. 5995, GSC No. 6344, X 1/2. Lateral view of the middle part of the valve (an internal cast) of a large but fragmentary representative of the typical form of the species exhibiting the essentially erect shape of the shell and the interruption of the concentric ribs in its middle part, which are diagnostic of this form.

FIG. 2. Posidonia? nahwisi (McLearn, 1931) var. moberliensis (McLearn, 1943). Holotype. GSC No. 8945. Lower part of Neogastroplites zone, Neogastroplites cornutus subzone? Upper Albian. Goodrich Formation. Coal Creek, south of Peace River Canyon, northeastern British Columbia. Collected by J. Spivak, Geological Survey of Canada, 1942. Lateral view of the exterior of the moderately-sized left valve (an internal cast) exhibiting the diagnostic features of the variant, such as the very oblique outline of the shell and strongly-inflated umbones.

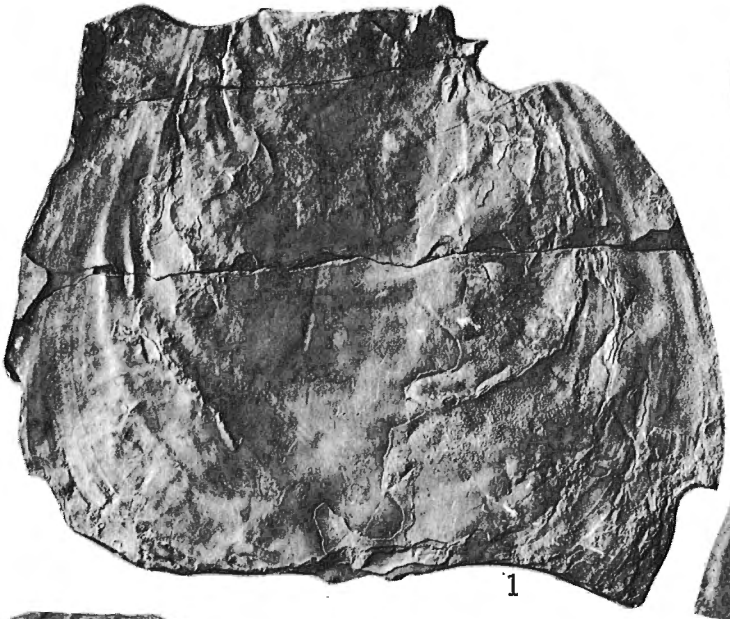
FIG. 3. Posidonia? nahwisi (McLearn, 1931) f. typ. GSC loc. 5995, GSC No. 9704. Lateral view of the exterior of the upper part of the moderately-sized representative (an internal cast) of the typical form of the species exhibiting its diagnostic features listed in the description of fig. 1.

FIGS. 4A-4B. Neogastroplites cornutus (Whiteaves, 1885) var. E of Reeside and Cobban (1960). GSC loc. 13782, GSC No. 13676. A fragmentary, intermediate whorl (septate to the end) of a moderately stout but strongly laterally compressed and partly-crushed variant of the species; mostly shell-covered. 4A. Lateral view. 4B. Ventral view of the earlier part of the whorl. The right ventral shoulder and nodes are only locally and imperfectly preserved.

FIG. 5. Neogastroplites cornutus (Whiteaves, 1885) var. D of Reeside and Cobban (1960). GSC No. 8007, X 3/4. Lower (but not the basal) part of Neogastroplites zone, Neogastroplites cornutus subzone, Upper Albian. Fort St. John Group, north bank of Peace River, 4 miles east of Cache Creek, Alberta. Lateral view of the ultimate whorl of an almost flattened, medium-sized representative (an internal cast) of this moderately slender variant of the species with the completely-preserved living chamber. Note the horn-like protuberance formed by the ventral part of the mouth border. The last suture line is outlined in white. The large, horn-like nodes on the shell margin form part of the siphonal row of nodes.

FIG. 6. Neogastroplites? sp. indet. GSC loc. 14721, GSC No. 9718-9718a. A poor, mostly-flattened fragment probably belonging to Neogastroplites ex gr. cornutus-muelleri. Lateral view.

FIG. 7. Posidonia? nahwisi (McLearn, 1931) var. goodrichensis (McLearn, 1943). GSC No. 8944. Lower part of Neogastroplites zone, Neogastroplites cornutus subzone?, Upper Albian. Goodrich Formation on Hulcross Creek, Pine River valley, northeastern British Columbia; collected by R.T.D. Wickenden, Geological Survey of Canada, 1942.



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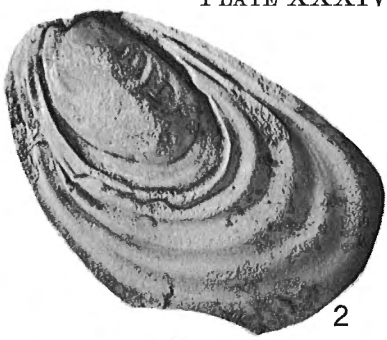

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ALBIAN STAGE

Neogastroplites Zone

PLATE XXXV

FIG. 1. Neogastroplites cornutus (Whiteaves, 1885) var. E of Reeside and Cobban (1960). GSC loc. 14006, GSC No. 13677. An internal cast of the laterally-deformed and fragmentary, wholly septate (penultimate?) whorl. Lateral view.

FIGS. 2A-2C. Neogastroplites americanus (Reeside and Weymouth, 1931) var. A of Reeside and Cobban (1960). GSC loc. 24693, GSC No. 13633. A laterally-deformed early whorl (shell-covered) of the extremely slender variant of N. americanus. This variant resembles strongly Gastroplites flexicostatus Imlay, 1961 in whorl-shape, density and appearance of its flexuous ribs, and its narrow venter. At this early growth-stage N. americanus var. A has hardly any median nodes and so can only be distinguished from G. flexicostatus because of its markedly-ribbed venter. 2A. Lateral view. 2B. Lateral view of the other side. 2C. Ventral view. One or two incipient median (siphonal) nodes are dimly visible near the anterior end of the shell.

FIGS. 3A-3B. Neogastroplites americanus (Reeside and Weymouth, 1931) var. D of Reeside and Cobban (1960). GSC loc. 24693, GSC No. 13635. An essentially-undeformed but fragmentary inner whorl (shell-covered) of the sturdy and globose variant of N. americanus. Like all other variants of the species, var. D differs from the corresponding variants of other Neogastroplites species in the greater density of ribbing and greater number of ribs per whorl. The median (siphonal) nodes are barely budding at the anterior end of the whorl (fig. 3B). 3A. Lateral view. 3B. Ventral view of the anterior part of the whorl. The anterior end is at the lower side of the photograph.

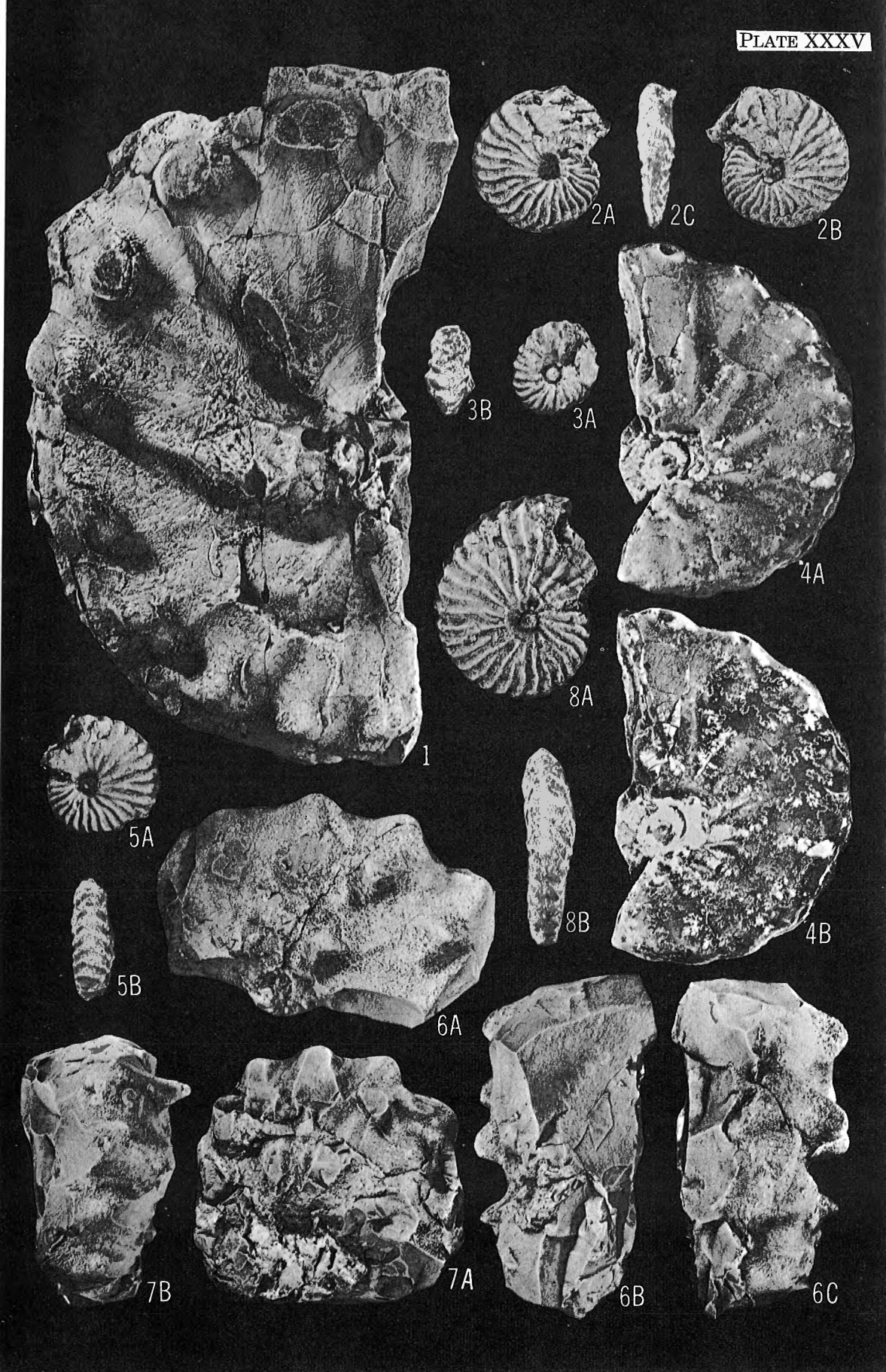
FIGS. 4A-4B. Neogastroplites cornutus (Whiteaves, 1885) var. D of Reeside and Cobban (1960). GSC loc. 13781, GSC No. 13673. A strongly laterally deformed internal cast of the intermediate whorl (wholly septate) of this moderately sturdy variant of N. cornutus. 4A. Lateral view of the whitened specimen to show the ribbing habit and the position of the umbilical, ventro-lateral and median (siphonal) nodes on the whorl. 4B. Same view of the unwhitened specimen showing well-preserved suture lines.

FIGS. 5A-5B. Neogastroplites americanus (Reeside and Weymouth, 1931) var. C of Reeside and Cobban (1960). GSC loc. 24693, GSC No. 13634. A somewhat laterally deformed, mostly shell-covered early whorl of this intermediate variant of N. americanus; it is close to var. A in general appearance but is considerably sturdier (but not globose) at the comparable diameter of the whorl. The median (siphonal) nodes are not yet present at this growth-stage. 5A. Lateral view. 5B. Ventral view of the anterior part of the whorl. The strong ribs cross the venter in a marked forward loop without any weakening.

FIGS. 6A-6C. Neogastroplites cornutus (Whiteaves, 1885) var. E of Reeside and Cobban (1960). GSC loc. 13782, GSC No. 13674. A shell-covered, laterally-deformed fragment of an intermediate(?) whorl of this extremely sturdy and low-whorled variant of N. cornutus. A poorly-preserved, globose inner whorl comparable in size but more coarsely-ribbed than the specimen of N. americanus shown in fig. 3. 6A. Lateral view. 6B. Cross-section with the inner whorl in the foreground (middle of the photograph). 6C. Ventral view.

FIGS. 7A-7B. Neogastroplites cornutus (Whiteaves, 1885) var. E of Reeside and Cobban (1960). GSC loc. 13782, GSC No. 13675. A partly shell-covered, fragmentary intermediate whorl of the sturdy variant of N. cornutus representing an earlier growth-stage than the intermediate whorl shown in fig. 6. The partly-flattened, early part of the whorl (lower side of fig. 7A) is much more sparsely and coarsely ribbed than the comparable growth-stages of the sturdy and globose variants (variants D and E) of N. americanus. 7A. Lateral view. 7B. Ventral view. Left ventral shoulder is absent.

FIGS. 8A-8B. Neogastroplites americanus (Reeside and Weymouth, 1931) var. A of Reeside and Cobban (1960). GSC loc. 24693, GSC No. 13632. A shell-covered, somewhat laterally deformed, intermediate (wholly septate) whorl of the same extremely slender variant of N. americanus as that shown in fig. 2. A later growth-stage, the convex venter of which becomes more and more clearly nodose near the anterior end of the whorl. 8A. Lateral view. 8B. Ventral view.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ALBIAN STAGE
Neogastroplites Zone

PLATE XXXVI

FIGS. 1A-1D. Neogastroplites maclearni Reeside and Cobban, 1960. Variant C of Reeside and Cobban (1960). GSC loc. 17300, GSC No. 13653. A largely shell-covered, undeformed, intermediate (wholly septate) whorl of the intermediate variant of the species connecting its extreme variants shown in figs. 4-5 and 3, 7. Although closely similar to N. americanus, N. maclearni differs from it in having a considerably smaller number of ribs per whorl. From N. cornutus it differs, on the contrary, in its finer and stronger sculpture. N. selwyni differs in lacking the median (siphonal) nodes and in the somewhat finer sculpture. 1A-1B. Two lateral views. 1C. Cross-section of the anterior end and the still tabulate, Gastroplites-like venter of the early part of the whorl. 1D. Ventral view of the anterior part of the whorl showing well-developed median nodes.

FIGS. 2A-2D. Neogastroplites maclearni Reeside and Cobban, 1960. Variant B of Reeside and Cobban (1960). GSC loc. 17300, GSC No. 13645. Internal cast of the intermediate whorl (wholly septate) of the more slender variant transitional between those shown in figs. 1 and 5. 2A-2B. Two lateral views. 2C. Ventral view of the anterior part of the whorl showing typically-developed median nodes. 2D. Cross-section of the anterior end and the venter of the early part of the whorl already showing incipient median nodes.

FIGS. 3A-3C. Neogastroplites maclearni Reeside and Cobban, 1960. Variant D of Cobban and Reeside (1960). GSC loc. 17300, GSC No. 13658. Internal cast of an intermediate whorl of a stout, round-ventered variant connecting the intermediate and the extremely stout variants of the species shown in figs. 2, 6, 7, and 8. 3A. Lateral view. 3B. Cross-section of the anterior end and the venter of the early part of the whorl still lacking the median nodes.

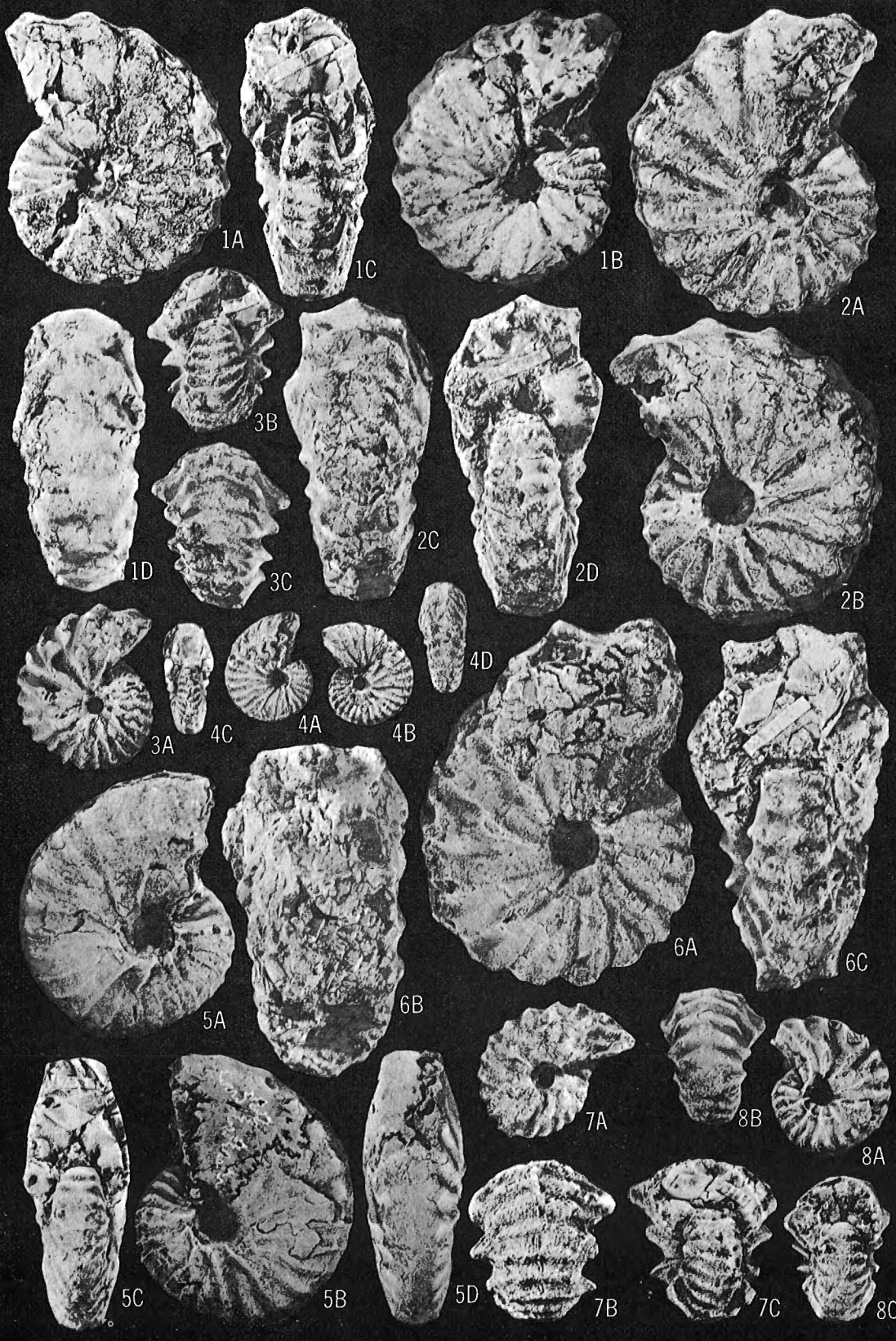
FIGS. 4A-4D. Neogastroplites maclearni Reeside and Cobban, 1960. Variant A of Reeside and Cobban (1960). GSC loc. 17300, GSC No. 13642. An internal cast of undeformed, completely Gastroplites-like early whorl of the extremely slender variant. At this growth-stage Neogastroplites maclearni, and other Neogastroplites species, cannot be distinguished from Gastroplites. 4A-4B. Two lateral views. 4C. Cross-section of the anterior end and the venter of the early part of the whorl. 4D. Ventral view of the anterior part of the whorl.

FIGS. 5A-5D. Neogastroplites maclearni Reeside and Cobban, 1960. Variant A of Reeside and Cobban (1960). GSC loc. 17300, GSC No. 13638. A largely shell-covered, undeformed, intermediate whorl (wholly septate) of the extremely slender variant. The median nodes are barely discernible even at the anterior end of the whorl and are completely absent on its earlier parts. 5A-5B. Two lateral views. The lateral part of the external suture line is outlined in white in fig. 5B. 5C. The cross-section of the anterior end and the venter of the early part of the whorl. The venter remains tabulate and almost flat throughout and the cross-section resembles strongly that of Gastroplites. 5D. Ventral view of the anterior half of the whorl. The incipient, median nodes near the anterior end are barely discernible.

FIGS. 6A-6C. Neogastroplites maclearni Reeside and Cobban, 1960. Variant C of Cobban and Reeside (1960). GSC loc. 17300, GSC No. 13652. Intermediate (wholly septate) whorl of the same intermediate variant as that shown in fig. 1, mostly shell-covered and somewhat laterally deformed. 6A. Lateral view. 6B. Ventral view of the anterior, mostly deeply eroded, part of the whorl. Ventro-lateral and median nodes are only preserved near the end of the whorl. 6C. Cross-section of the anterior end and the venter of the early part of the whorl. The median nodes are well developed throughout.

FIGS. 7A-7C. Neogastroplites maclearni Reeside and Cobban, 1960. Variant E of Cobban and Reeside (1960). GSC loc. 17300, GSC No. 13666. Internal cast of a somewhat-deformed, intermediate (wholly septate?) whorl of the extremely sturdy and low whorled variant. All five rows of nodes occur on the low-arched venter and the deep, funnel-like umbilicus is devoid of them. 7A. Lateral view. 7B. Ventral view of the anterior part of the whorl showing all five rows of nodes. 7C. Cross-section of the fragmentary anterior end and the ventral view of the only indistinctly nodose, early part of the whorl.

FIGS. 8A-8C. Neogastroplites maclearni Reeside and Cobban, 1960. Variant D of Cobban and Reeside (1960). GSC loc. 17300, GSC No. 13662. A shell-covered, undeformed, intermediate (wholly septate?) whorl of a sturdy variant (same as that shown in fig. 3) transitional between the extremely sturdy variant shown in fig. 7 and the intermediate variant shown in fig. 1. The whorl is low but high arched and the umbilical shoulder is rounded instead of sharp as in variant E (fig. 7). 8A. Lateral view. 8B. Ventral view of the anterior part of the whorl. 8C. Cross-section of the anterior end and venter of the early part of the whorl. The incipient median (siphonal) nodes only appear at the anterior end.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