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BULLETIN 307

**AMMONITES FROM THE LATE BATHONIAN
"INISKINITES FAUNA" OF CENTRAL
BRITISH COLUMBIA**

Hans Frebald





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Preface

If the Geological Survey is to fulfill one of its principal tasks – determining the energy and mineral resources available to Canada – the geological history of all parts of the country must be understood. Fossils provide the principal means of dating Phanerozoic rocks and thus are critical in establishing the geological succession in many parts of Canada.

Until the results presented in this report became available it had been thought that the late Bathonian was absent from the stratigraphic record in the Canadian Cordillera. This report is thus of importance first in developing a fuller understanding of the Jurassic biostratigraphy of the area and second in understanding the geological history of the Cordilleran region.

Ottawa, May 1978

D.J. McLaren
Director General
Geological Survey of Canada

Critical readers

H.W. Tipper
R.W. Imlay

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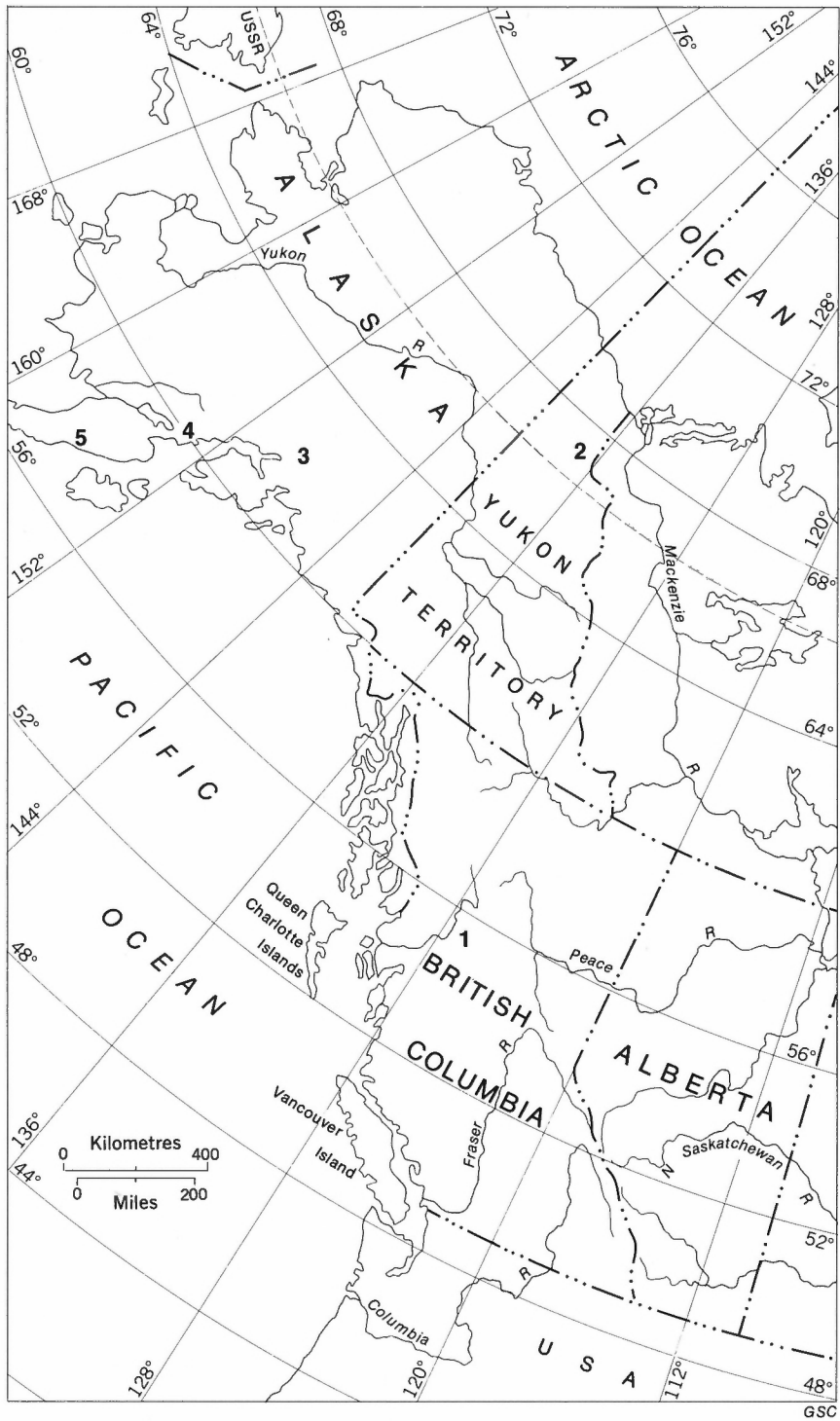
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Figure 1. Locations of **Iniskinites** occurrences in British Columbia, southern Alaska and northern Yukon.

Abstract

An ammonite fauna from the Smithers map area, central British Columbia includes species of the genera *Iniskinites* Imlay, *Lilloettia* Crickmay, *Keplerites* Neumayr and Uhlig, and *Xenocephalites* Spath. This "Iniskinites fauna" is described and compared with a similar ammonite fauna from southern Alaska. The main difference between the two faunas is the absence in British Columbia of the genus *Cadoceras* Fischer which is represented in southern Alaska. The two faunas are considered to be the same age.

In addition to the *Iniskinites* fauna from central British Columbia some ammonites from northern Yukon are discussed. They are *Iniskinites yukonensis* n. sp., *Cadoceras barnstoni* (Meek) and *Keplerites* spp. The specimens apparently originated from a bed in the zone of *Cadoceras variable* considered to be of Late Bathonian age. It is concluded that the beds with *Iniskinites* in British Columbia and southern Alaska are also Upper Bathonian.

Résumé

Une fauna à ammonites découverte dans le secteur de Smithers, dans la partie centrale de la Colombie-Britannique, contient des espèces des genres *Iniskinites* Imlay, *Lilloettia* Crickmay, *Keplerites* Neumayr et Uhlig, et *Xenocephalites* Spath. On décrit cette "faune à *Iniskinites*", puis on la compare à une fauna à ammonites similaire du sud de l'Alaska. Ce qui différencie principalement les deux faunes, est l'absence en Colombie-Britannique du genre *Cadoceras* Fischer, lequel est représenté dans le sud de l'Alaska. On estime que les deux faunes sont contemporaines.

Outre la fauna à *Iniskinites* du centre de la Colombie-Britannique, on étudie quelques ammonites du nord du Yukon, à savoir *Iniskinites yukonensis* n. sp., *Cadoceras barnstoni* (Meek) et *Keplerites* spp. Les spécimens en question proviennent apparemment d'un lit de la zone à *Cadoceras variable* dont on considère qu'elle date du Bathonien supérieur. On en conclut que les lits à *Iniskinites* de Colombie-Britannique et du sud de l'Alaska datent eux aussi du Bathonien supérieur.

Introduction

During field work in 1970 and 1971 in the Smithers area, central British Columbia, H.W. Tipper collected an ammonite fauna from Middle Jurassic beds that contains various species of the genus *Iniskinites* Imlay associated with species of *Lilloettia*, *Keplerites*, *Xenocephalites* and other genera. The genus *Iniskinites* Imlay was previously known only from southern Alaska from where it had been described by Imlay (1953) as "*Kheraicerias*". More recently Imlay (1975) placed these forms into a new genus *Iniskinites*.

Most of Tipper's collections were made in the Tenas Creek Section. The beds containing *Iniskinites* and associated genera are about 53 m thick. They are underlain by beds containing Early Bathonian ammonites previously described by Frebold and Tipper (1973) and overlain by beds with *Lilloettia*, *Keplerites* and other genera but without *Iniskinites*. A description of the lithology and the measurements of the beds in the Tenas Creek Section was given by Tipper and Richards (1976). Their list of ammonites is based on preliminary identifications by Frebold. Particularly, the generic name "*Kheraicerias*", has now to be replaced by "*Iniskinites*".

Another collection (GSC loc. 85434) containing species of *Iniskinites* and other genera is from an outcrop at the Zymoetz River, about 32 km west of the Tenas Creek Section.

In this report the ammonite fauna occurring within the vertical range of the genus *Iniskinites* is referred to as the "*Iniskinites* fauna". One of the main questions concerning this fauna is that of its age. Imlay (1975) placed the southern Alaskan *Iniskinites* fauna in the Early Callovian but indicated that it could be slightly older, i.e. of latest Bathonian age. In this connection some ammonites collected by D.K. Norris in northern Yukon in 1973 are of special interest. The specimens include species of *Iniskinites*, *Cadoceras* and *Keplerites*.

It is probable that *Iniskinites* will be found at other localities in British Columbia.

The author wishes to thank Dr. M.J. Copeland, Geological Survey of Canada, Dr. R.W. Imlay, United States Geological Survey, and Dr. H.W. Tipper, Geological Survey of Canada for critical review of the manuscript.

Composition of the "INISKINITES fauna" and succession of Genera and Species in the Tenas Creek Section of British Columbia

In the Tenas Creek Section (54°31.5'N, 127°14'W) the *Iniskinites* fauna occurs in green and grey sandstones of the lower part of the Ashman Formation of Tipper and Richards (1976). The ammonite genera present in this fauna are *Iniskinites* Imlay, *Xenocephalites* Spath, *Lilloettia* Crickmay, and *Keplerites* Neumayr and Uhlig, the latter represented by species of the subgenus *Seymourites* Kilian and Rebaul. There are also poorly preserved perisphinctids and some fragments probably belonging to the genera *Parareineckia* Imlay and *Oppelia* Waagen.

According to Tipper and Richards (1976, p. 62) the thickness of the beds containing *Iniskinites* is about 53 m. The genus *Keplerites* occurs throughout this interval and continues into the overlying beds. It may be assumed that various species of this genus are restricted to certain beds. Unfortunately the poor preservation of the *Keplerites* material prevents accurate species identification. The genus *Iniskinites* that occurs throughout the whole unit seems to indicate restriction of some of its species to certain beds. *Iniskinites tenasensis* Frebold n. sp. was collected only in the lower 12.6 m of the section whereas *I. robustus* Frebold n. sp., *I. cf. I. intermedius* Imlay and *I. cf. I. martini* (Imlay) were found only in the upper 27 m. Furthermore, species of the genera *Lilloettia* and *Xenocephalites* were not collected in the lower part of the section but occur frequently in the upper part where they are associated with *Iniskinites robustus* Frebold n. sp.

The beds containing the "*Iniskinites* fauna" are overlain by younger beds of the Ashman Formation that have yielded species of *Lilloettia*, *Keplerites*, and other ammonites but not *Iniskinites*.

Table 1
Distribution of ammonite genera and species of the "Iniskinites fauna"
in the Tenas Creek Section, British Columbia

GSC Localities	Ammonite Genera and Species	Thickness in metres
85402= 85457	Iniskinites robustus , Lilloettia sp. indet., Xenocephalites vicarius , X. hebetus , Keplerites (Seymourites) aff. K. (S.) ingrahami , K. (S.) sp. indet. 1.	10±
	Dyke	3 to 5
85460	Iniskinites robustus , I. cf. I. robustus , I. cf. I. martini	3.0
85411= Talus from 85402= 85457, 85460	Iniskinites robustus , I. cf. I. robustus , I. cf. I. intermedius , Lilloettia cf. L. lilloetensis , L. sp. , Keplerites (Seymourites) aff. K. (S.) ingrahami , K. (S.) aff. K. (S.) chisikensis	—
85458	Iniskinites cf. I. robustus , Lilloettia cf. L. lilloetensis , Xenocephalites? sp., Keplerites sp. indet.	9.0
85397	Iniskinites spp. indet.	2.4
	Covered	2.1
85462	Iniskinites spp. indet.	3.6
85392	Iniskinites cf. I. abruptus	3.0
85396	Iniskinites tenasensis , Keplerites sp. indet.	4.5
85410	Iniskinites tenasensis	2.1
85413= 85390	Iniskinites tenasensis , Keplerites sp. indet.	6.0

Below beds of the Ashman Formation that contain the "Iniskinites fauna" are the green sandstones of the upper part of the Smithers Formation (Tipper and Richards, 1976). They contain **Epizigzagiceras evolutum** Frebold, **Arctocephalites (Cranocephalites) costidensus** Imlay, **A.? multicostatus** Frebold, **Parareineckia** cf. **P. shelikofana** Imlay, **Cobbanites talkeetnanus** Imlay, **Morrisiceras? dubium** Frebold and **Oppelia** sp. indet. Their age was determined as Early Bathonian (Frebold and Tipper, 1973). This ammonite fauna is very different from that of the overlying beds of the Ashman Formation with **Iniskinites**.

According to Tipper (pers. comm., 1977) no stratigraphic break is indicated at the boundary of the Smithers and Ashman formations.

The occurrence of the various ammonite genera and species of the "Iniskinites fauna" in the Tenas Creek Section is summarized in Table 1.

The ammonites from GSC loc. 85434 were not collected in the Tenas Creek Section. This locality is at the Zymoetz River, 1 mile north of the junction with Nilah Creek at lat. 54°30'N, long. 127°56'W, about 32 km west of the Tenas Creek Section.

Comparison with southern Alaska

In southern Alaska the genus **Iniskinites** Imlay occurs in the lower member of the Shelikof Formation between Puale Bay and Wide Bay, Alaska Peninsula, in the Tonnie Siltstone Member of the Chinitna Formation west of Cook Inlet, and in the lower and upper members of the Chinitna Formation in the Talkeetna Mountains (Imlay, 1975, p. 10-12). In southern Alaska the genus is associated with the same or similar species of other genera, i.e. **Lilloettia**, **Xenocephalites** and **Keplerites (Seymourites)**, as represented in the Tenas Creek area of British Columbia. Consequently there is general similarity of the ammonite faunas of the two compared regions. There are, however, also some differences: The two

new species of the genus **Iniskinites** (i.e. **I. tenasensis** Frebold and **I. robustus** Frebold) in the Tenas Creek area of British Columbia have not been found in southern Alaska and the Alaskan **I. magniformis** (Imlay) has not yet been proven to be present in British Columbia. Furthermore the Alaskan species **I. abruptus** (Imlay), **I. intermedius** (Imlay) and **I. martini** (Imlay) are represented in British Columbia by poorly preserved specimens that cannot be unquestionably identified with the three southern Alaskan species.

Another and more important difference between the ammonite faunas of British Columbia and southern Alaska is the apparent absence of the genus **Cadoceras** in the "Iniskinites fauna" of British Columbia. This genus is well represented in beds with **Iniskinites** of southern Alaska.

Comparison with northern Yukon

In the "Big Bend section" on Porcupine River, northern Yukon (at about 67°26'N, and 137°47'W) the presence of the genus **Iniskinites** Imlay is indicated by a fairly well preserved specimen described in this paper as **I. yukonensis** Frebold n. sp. The specimen was found in 1973 by D.K. Norris as float on the beach of Porcupine River. Other ammonites found by Norris in the talus at the same locality are **Cadoceras barnstoni** (Meek) and **Keplerites** spp. The lithology of the material indicates that the specimens originated from a bed of "yellow concretions" exposed in the section above the beach.

In 1975 T.E. Poulton and J.H. Callomon (1976) collected from these yellow concretions **Cadoceras barnstoni** (Meek), **Cadoceras variabile** Spath, **Keplerites** cf. **K. rosenkrantzi** Spath, some ammonites with certain similarities to **Iniskinites** and some phylloceratids¹).

It is evident that the ammonites of the "yellow concretions" belong to the zone of **Cadoceras variabile** originally distinguished by Callomon (1959, p. 507-509) as the uppermost zone in the Bathonian of East Greenland. The

¹ Description of this fauna is in progress (March 1978).

Table 2

Correlation of Late Bathonian and Callovian ammonite faunas in southern Alaska, northern Yukon and parts of British Columbia

Southern Alaska (Imlay, 1975)	Northern Yukon	Smithers map area British Columbia	Vancouver Island	Age
Zone of <i>Cadoceras</i> (<i>Stenocadoceras</i>) <i>stenoloboide</i>	<i>Cadoceras septentrionale</i>	<i>Cadoceras</i> (<i>Stenocadoceras</i>) (at Ashman Ridge)	<i>Cadoceras</i> (<i>Stenocadoceras</i>) <i>stenoloboide</i>	Callovian
Zone of <i>Cadoceras catostoma</i>		<i>Lilloettia</i> spp., <i>Keplerites</i> spp., no <i>Iniskinites</i>		Late Bathonian or Early Callovian
Subzone of <i>Iniskinites intermedius</i>	<i>Iniskinites yukonensis</i> , <i>Cadoceras barnstoni</i> , <i>Keplerites</i> spp., (Variable Zone)	<i>Iniskinites</i> fauna (see Table 1)	not identified	Late Bathonian

presence of the genus *Iniskinites* Imlay in this zone in northern Yukon is of special interest. Comparison of the northern Yukon fauna with the "*Iniskinites* faunas" of southern Alaska and British Columbia shows that the genus *Lilloettia* and *Xenocephalites* characteristic of the Pacific realm are absent in northern Yukon; the genus *Keplerites* that occurs in all three areas is apparently represented in northern Yukon by species different from those in British Columbia and southern Alaska. The genus *Cadoceras* is apparently absent in British Columbia but is present in southern Alaska and northern Yukon. However, the species of the two areas are different.

The Age of the "*INISKINITES* fauna"

Imlay (1975, p. 7, 14, fig. 8) assigned the "*Iniskinites* fauna" of southern Alaska to the lower part of his *Cadoceras catostoma* Zone, i.e. to his subzone of *Iniskinites intermedius*. As stated above the composition of the ammonite fauna associated with *Iniskinites* in central British Columbia is very similar to that of southern Alaska with the exception that the genera *Cadoceras* and *Paracadoceras* seem to be absent. The *Iniskinites* faunas of southern Alaska and of central British Columbia are here considered to be of the same age and the British Columbia fauna belongs accordingly to Imlay's subzone of *Iniskinites intermedius*.

In his correlation chart Imlay (1975, p. 14, fig. 8) assigned his *Cadoceras catostoma* zone with the *Iniskinites intermedius* subzone to the Early Callovian. He considered the basal part of the southern Alaskan Chinitna Formation (which contains the "*Iniskinites* fauna") to be probably equivalent to beds in East Greenland that contain the lowest occurrences of *Cadoceras* and *Paracadoceras*. As these East Greenland *Cadoceras-Paracadoceras* beds were placed by Callomon (1959, p. 507-509) in the Late Bathonian Variable Zone, Imlay (1975, p. 14) thought it possible that the basal beds of the Alaskan Chinitna Formation could be older than the Calloviense Zone of the Lower Callovian and "even as old as the latest Bathonian provided that the earliest occurrences of *Cadoceras* and *Paracadoceras* in East Greenland are actually latest Bathonian as proposed by Callomon".

Imlay's view of the probable age-equivalence of the southern Alaskan subzone of *Iniskinites intermedius* to the oldest *Cadoceras* beds in East Greenland (i.e. Callomon's zone of *Cadoceras variable*) appears to be confirmed by the above described association of a species of *Iniskinites* with *Cadoceras barnstoni* (Meek) and *C. variable* Spath in the Variable Zone of northern Yukon. The age of the Variable

Zone is Late Bathonian according to Callomon (1959, p. 507-509). The author agrees with this opinion and consequently the *Iniskinites* faunas of northern Yukon, British Columbia and southern Alaska are here assigned to the Late Bathonian.

The age of the beds immediately overlying the beds with the "*Iniskinites* fauna" is uncertain. Imlay (pers. comm., 1978) suggests that the upper part of his Alaskan *Catostoma* Zone that does not contain *Iniskinites* may belong to the Early Callovian. The same age may be considered for the beds with *Lilloettia* spp. and *Keplerites* spp. above the "*Iniskinites* fauna" in the Smithers map area of British Columbia.

The Alaskan ammonite fauna of Imlay's zone of *Cadoceras* (*Stenocadoceras*) *stenoloboide* that is characterized by species of *Cadoceras* (*Cadoceras*), *C. (Stenocadoceras)* and *Pseudocadoceras* is well represented by the same species on Vancouver Island. *C. (Stenocadoceras)* is also present in the Smithers map area of central British Columbia. The age of this *Cadoceras* fauna is Early or Middle Callovian¹.

The age of *Cadoceras septentrionale* Frebold that occurs in northern Yukon above the Variable Zone is probably Early Callovian.

The above correlations are summarized in Table 2.

SYSTEMATIC DESCRIPTIONS

Genus *Iniskinites* Imlay

The various species here assigned to the genus *Iniskinites* Imlay have a stout to globose shape, a very small umbilicus on the septate whorls, an eccentric shaped body chamber and ribs that become stronger ventrally and anteriorly. In these characteristics the described species follow the definition of the genus given by Imlay (1975, p. 23). The suture line of the holotype of *Iniskinites magniformis* (Imlay), the type species of the genus illustrated by Imlay (1953, Pl. 31, fig. 5), differs from that of the species described here in the shape of the first lateral lobe which does not end in a slender and comparatively long branch. It may be that the lateral lobe of the holotype of *I. magniformis* (Imlay) is imperfectly preserved because the suture line of Imlay's hypotype (Imlay, 1975, Pl. 3, fig. 8) clearly shows the slender and fairly long branch of the lateral lobe. In *I. varicostatus* (Imlay) the first lateral lobe also ends in a slender branch (see Imlay, 1953, Pl. 33, fig. 2), that seems to be characteristic of some, if not all species of the

¹ Description of this Vancouver Island fauna is in progress.

genus. Unfortunately the suture lines of the various species of the genus are very imperfectly preserved and the length of the ventral lobe in comparison to that of the lateral lobe is uncertain. In some specimens the length of the first lateral lobe seems to exceed that of the ventral as is the case with *I. varicostatum*.

Iniskinites cf. I. intermedius (Imlay)

Plate 2, Figures 5, 6

cf. *Kheraicerias intermedius* Imlay, 1953, p. 81, Pl. 31, figs. 1-4, Pl. 32, figs. 2,3,5,7,8.

cf. *Iniskinites intermedius* (Imlay), 1975, p. 24, Pl. 3, figs. 3,4.

Material. One specimen from GSC loc. 85411.

Description. Specimen GSC 53991 is apparently somewhat secondarily compressed. The general shape is medium stout. The venter is rounded and grades evenly into the moderately convex flanks. The transition to the unsatisfactorily preserved umbilicus is rounded. The aperture is not preserved.

The measurements and the ratios of the maximum diameter (in parentheses) are: diameter 100 mm, whorl height 51(0.51) mm, whorl thickness 44(0.44) mm. The dimensions of the apparently small umbilicus cannot be measured. The whorl thickness is apparently reduced by the secondary compression of the ammonite. At the beginning of the last whorl the whorl height and whorl thickness are about equal.

In the posterior part of the last whorl the ribs are rather sharp and more numerous than in the anterior part where they are low and separated from each other by fairly wide interspaces. Most of the ribs bifurcate below the half height of the flanks but there are also some undivided ribs. Intercalated ribs are frequent between the rib pairs. All ribs incline gently on the flanks and are bent forward very slightly on the venter.

Suture lines are not traceable.

Comparisons. In its general shape and its ribbing the specimen resembles *Iniskinites intermedius* (Imlay) but there are some differences. The British Columbia specimen is larger than the holotype of the species and at the maximum diameter the whorl is higher than wide and not wider than high as in the holotype. This difference may have been caused, at least in part, by the secondary lateral compression of the British Columbia specimen. The relation of whorl height and whorl thickness seems to change in the course of the ontogenetic development. This is illustrated in the paratype (Imlay, 1953, Pl. 31, figs. 1,2) in which the whorl thickness and the whorl height are almost equal, as is the case in the British Columbia specimen at the beginning of the last whorl.

As stated by Imlay (1975, p. 24), *I. intermedius* (Imlay) "is most similar to *I. martini* (Imlay) but differs by being appreciably smaller and more compressed and by its ribbing being higher and sparser, particularly on the adult body whorl". The ribbing of the British Columbia specimen is similar, almost identical, to that of the holotype of *I. martini* (Imlay) (Imlay, 1953, Pl. 32, figs. 1,4,6). However *I. martini* has a much stouter shape than the British Columbia specimen.

The British Columbia specimen thus shows similarities to *I. intermedius* (Imlay) and *I. martini* (Imlay). More specimens are needed for direct species identification.

Type. Figured specimen, GSC 53991.

Iniskinites cf. I. martini (Imlay)

Plate 3, Figures 4, 5

cf. *Kheraicerias martini* Imlay, 1953, p. 80, Pl. 32, figs. 1,4,6.

cf. *Iniskinites martini* (Imlay) 1975, p. 24, Pl. 4, figs. 1,3-6.

Material. Two specimens from GSC locality 85460.

Description and comparison. Specimen GSC 53992 (Pl. 3, fig. 4) is slightly secondarily deformed but has retained its stout shape. Only part of a whorl is preserved. The whorl is considerably wider than high¹. The flank is slightly convex and grades into the broad moderately rounded venter.

In the posterior part of the whorl the ribs can be seen to begin on the wall of the poorly preserved umbilicus. They are low, slightly inclined forward and separated from each other by interspaces that are wider than the ribs. Anteriorly the interspaces become wider and the primaries broader. The primaries are subdivided into three, occasionally four secondaries. Intercalated ribs occur between some of the bundles of ribs. The ribs cross the venter transversely.

No traceable suture lines can be seen.

In its general shape and ribbing the specimen is similar to the holotype of the species (Imlay, 1953, Pl. 32, figs. 1,4,6) but is somewhat smaller.

Specimen GSC 53994 (Pl. 3, fig. 5) is a poorly preserved septated fragment. Secondary depression of the specimen has enlarged the size of the venter. The remnants of the suture lines cannot be traced in detail. The ribbing is similar to that of the above described specimen.

Types. Figured specimens, GSC 53992, 53994.

Iniskinites tenasensis n. sp. Frebold

Plate 1, Figures 1-5; Plate 2, Figures 1-4

Material. Specimens belonging to this species occur in the lower part of Tenas Creek Section at GSC localities 85390, 85413, 85410, 85396.

Description. The described specimens belong to various stages of growth. The holotype (GSC 54005) is the largest specimen; the paratype (GSC 53993), illustrated in Plate 1, figure 5, the smallest one. No specimens representing earlier stages of growth are known.

All specimens are somewhat secondarily compressed so that no accurate measurements of the whorl thicknesses can be taken. In the least compressed paratype (GSC 54000), illustrated in Plate 2, figures 1-3, the whorl thickness at a diameter of 106 mm is apparently about equal to the height of the whorl which is 57 mm.

The general shape is medium stout at all known stages of growth. The flanks are moderately convex and grade into the rounded venter. The umbilicus is small with gently sloping walls and opens up moderately on the body chamber. In the holotype the body chamber occupies about five-sixths of the last whorl.

In all the specimens the number of the ribs decreases and their interspaces and coarseness increases gradually from the posterior to the anterior part of the whorl. In the largest specimen, the holotype, they become rather strong, high and sharp on the anterior half of the whorl. In earlier stages of growth they are of low relief. The ribs begin faintly on the umbilical wall where they are bent backward. They are gently bent or inclined forward in the lower half of the whorls. At about half the height of the flanks they are subdivided into two or three secondaries that are very slightly inclined forward or backward. With increasing size of the ammonite, subdivision into three secondaries ceases and gives way to bifurcation as is shown in the holotype. Intercalated ribs occur at all stages of growth. Some extend from the venter to the umbilicus, others from the venter to the zone of division of the primaries. The venter is crossed transversely or with a very slight forward bend.

Parts of the suture line are best visible in one of the paratypes (GSC 54000). It is finely subdivided, the saddles

¹ According to Imlay's original description of the species (1953, p. 80) the whorls are "higher than wide". This is apparently in error. Imlay's measurements and the cross-section of the holotype show clearly that the whorl is wider than high.

are fairly broad and the ends of the lateral lobes are long and slender. The first lateral lobe is apparently longer than the ventral lobe.

Comparisons. In early stages of growth the species shows some superficial similarities to *Iniskinites intermedius* (Imlay) which, however, is a much smaller species. Furthermore, the ribs of *I. intermedius* are gently inclined forward whereas in *I. tenasensis* they bend gently forward on the lower half of the flank and very slightly backward on its upper part. Finally, *I. tenasensis* seems to have smaller whorl thicknesses than *I. intermedius* (Imlay).

Iniskinites robustus Frebold has strong and rather sharp ribs in mature stages of growth similar to those of the body chamber of *I. tenasensis* Frebold n. sp. However, the transition from finer to stronger and sharper ribs is more abrupt in *I. robustus* than in *I. tenasensis* and the umbilicus of *I. robustus* opens up much wider than in *I. tenasensis*.

Types. Holotype, GSC 54005; Paratypes, GSC 54006, 54000.

Iniskinites cf. *I. abruptus* (Imlay)

Plate 3, Figures 1-3

cf. *Kheraiceras abruptum* Imlay, 1953, p. 80, 81; Pl. 33, figs. 1, 7, 11, 13.

cf. *Iniskinites abruptus* (Imlay), 1975, p. 24, 25; Pl. 5, figs. 1-3.

Material. One specimen from GSC loc. 85392.

Description. Specimen GSC 54001 (Pl. 3, figs. 1-3) has only one side and part of the venter of the slightly secondarily compressed ammonite preserved. The maximum diameter is 123 mm, the height of the last whorl is 63 mm and the width of the umbilicus is 14 mm. The accurate thickness of the whorl is not determinable because of the compression.

The general shape of the ammonite is stout, the venter slightly rounded and broad, rounding gradually into the moderately convex flank. Most of the last whorl belongs to the body chamber. The narrow umbilicus that opens up on the body chamber is somewhat damaged.

At the beginning of the last whorl no traceable remnants of suture lines are visible. The ribs are much finer in this part of the last whorl than those on the body chamber where they are coarse and more widely spaced. The transition from the finer to the coarser ribs is abrupt. The trend of the ribs changes. Some of the primaries are bent slightly backward in the lower part of the flank and bent forward below the half height of the flank where they are subdivided into two or three secondaries that are again very slightly bent backward. In the anterior part of the body chamber there are a few primaries and secondaries that are more or less straight and forwardly inclined. Subdivision of the primaries into three secondaries is restricted to the posterior part of the body chamber. Anteriorly bifurcation prevails. Secondaries are intercalated between pairs of the bifurcated ribs. All secondaries cross the venter transversely.

The aperture is not preserved.

Comparisons. In its general shape, stoutness, and development of the venter and the umbilicus, the specimen is very similar to the holotype of *I. abruptus* (Imlay). The main difference between the two forms is the trend of the ribs which are gently and regularly bent forward in the holotype of *I. abruptus* whereas their trend is irregular in the specimen described here. This irregular trend of the ribs may have been caused in part by the deformation of the specimen. *I. robustus* Frebold n. sp. has similar ribs but its umbilicus opens up at an earlier stage.

Type. Figured specimen, GSC 54001.

Iniskinites robustus Frebold sp. nov.

Plate 4, Figures 1-6; Plate 5, Figures 1-3

Material. The species is represented at GSC localities 85460, 85411 and 85402.

Description. Specimen GSC 53995, the holotype of the species, is from GSC loc. 85460. One flank and half of the venter are preserved. The specimen is slightly secondarily compressed. The general shape is medium stout, the whorls are, in all visible stages of growth, higher than wide with the greatest width at about half the height of the whorl. The umbilicus of the inner whorls is very narrow and the umbilical wall rather steep. With the beginning of the body chamber the umbilicus opens up and the umbilical wall becomes very gently sloping.

The transitions from the umbilicus to the flanks and from the flanks to the moderately rounded venter are gradual. The aperture is not preserved.

The measurements are: Diameter 106 mm, whorl height 45 mm, and the umbilical width 22 mm. The exact whorl thickness is not determinable, it seems to be about equal to the whorl height.

On the septate part of the ammonite and at the beginning of the body chamber the ribs begin on the umbilical wall; in the later stages of growth, they do not extend into the wall.

On the septate part of the last whorl the ribs are numerous and moderately strong. Anteriorly, on the body chamber, they become much coarser and the interspaces larger.

In general the ribs are inclined forward. Some are more or less straight, others are inclined forward on the lower half of the flank and bent slightly backward in the upper half. The trend of the ribs is probably influenced to a certain degree by the secondary compression and distortion of the holotype and other specimens of this species. Some of the primaries are subdivided into two, others into three secondaries. Some of the secondaries are not connected with the main ribs. The venter is crossed transversely. The point of division is somewhat above the half height of the flank.

The suture lines of the holotype are not clearly visible. They are better preserved in paratype GSC 53997.

The paratypes, GSC 53996 from GSC loc. 85460, GSC 53999 from GSC loc. 85411 and GSC 53997 from GSC loc. 85402, are more or less compressed and distorted. The general shape and the ribs are essentially the same as in the holotype. Part of the finely subdivided suture line is fairly well exposed in paratype GSC 53997 (Pl. 4, fig. 6). The saddles are broad and the first lateral lobe is apparently longer than the ventral lobe.

Comparisons. *Iniskinites robustus* n. sp. is somewhat similar to *I. abruptus* (Imlay). Differences in the general shape of the two species – the flanks and the venter of *I. robustus* n. sp. are less rounded than in *I. abruptus* (Imlay) and the ribs of *I. robustus* n. sp. are less regularly bent – are probably caused in part by the secondary compression and distortion of the specimens of *I. robustus* n. sp. Apart from these differences the two species are clearly distinguished by the ribs on the inner whorls which are finer in *I. abruptus* (Imlay) than in *I. robustus* n. sp. and by the umbilicus in *I. robustus* that opens up at an earlier stage than in *I. abruptus*.

Types. Holotype GSC 53995; Paratypes, 53996, 53997, 53999.

Iniskinites cf. *I. robustus* Frebold

Plate 6, Figures 1-3

Material. The described specimens are from GSC loc. 85434 and 85458, others from GSC loc. 85411 and 85460.

Description and comparisons. All specimens are more or less compressed or distorted. No reliable measurements can be taken. Suture lines are not traceable.

The umbilicus of the inner whorls is very narrow, it opens up at the beginning of the body chamber. The ribs are finer on the septate inner whorls than on the body chamber. In this and in their general trend, subdivision and degree of coarseness, they are identical to the ribs of *I. robustus* Frebold. The comparison of the holotype of the species (Pl. 4, figs. 1-3) with the specimen (GSC 54002) of *I. cf. I. robustus* (Pl. 6, figs. 2, 3) shows the similarities. Some of the specimens of *I. cf. I. robustus* are much larger than the holotype and paratypes of the species. This fact and their poor preservation prohibits at present direct identification with the species.

Types. Figured specimens, GSC 54002, 53998.

***Iniskinites* sp. indet.**

Plate 6, Figure 4

Specimen GSC 54003 from GSC loc. 85434 has a very narrow umbilicus and very fine ribs which become stronger and more widely spaced anteriorly. The inner whorls of a *I. magniformis* illustrated by Imlay (1975, Pl. 4, fig. 7) show a similar type of ribs which, however, is also characteristic of *I. abruptus* (Imlay) (see Imlay, 1953, Pl. 33, fig. 7, and 1975, Pl. 5, figs. 1, 2). As specimen GSC 54003 is strongly secondarily compressed a definite species assignment cannot be made.

***Iniskinites yukonensis* Frebold n. sp.**

Plate 9, Figures 1-3

Material. One large specimen from GSC loc. C-27140, Big Bend Section, Porcupine River, northern Yukon, 67°26'N, 137°47'W. Collected by D.K. Norris, 1973.

Description. Specimen GSC 54757 has a maximum diameter of about 127 mm. The general shape is stout, the umbilicus is narrow at the beginning of the last whorl and opens up anteriorly. Most of the preserved part of the last whorl belongs to the body chamber; the aperture is not preserved. Height and thickness of the last whorl are almost equal in size. At a diameter of 126 mm the whorl height is 65 and the whorl thickness 63 mm, at a diameter of 116 mm the whorl height and whorl thickness are both 62 mm. The slightly convex flanks grade gently into the rounded venter. The transition to the umbilicus, which has a moderately steep wall in the anterior part of the whorl, is gradual.

The ribs are straight and forwardly inclined. They cross the venter transversely or are very moderately bent forward. In the posterior part of the whorl they are comparatively fine and numerous. Anteriorly the ribs become gradually broader and coarser, their interspaces wider and their number decreases. At about half the height of the whorl the primaries are subdivided into two or three secondaries. Some intercalated ribs are present between pairs of subdivided ribs. Due to poor preservation the subdivision of the ribs in the anterior part of the whorl is not as clear as in the posterior part. In the posterior part of the whorl the ribs can be seen to continue on the very gentle slope of the umbilicus. In the anterior part of the whorl the ribs disappear in the transition zone of the flanks to the umbilical wall.

Nontraceable remnants of the suture line are present in the posterior part of the whorl. The inner whorls of the specimen are unknown.

Comparisons. In its general shape, the narrow umbilicus that opens up in mature stages of growth and its ribbing, *Iniskinites yukonensis* n. sp. shows certain similarities to

other species of the genus. *I. magniformis* (Imlay) and *I. martini* (Imlay) are distinguished mainly by their globose shape and differences in ribbing, *I. intermedius* (Imlay) by its much smaller size. *I. abruptus* (Imlay) has depressed whorls that are wider than high contrary to the whorls of *I. yukonensis* n. sp. which are nearly as high as wide. Furthermore, the change from finer to coarser ribbing is abrupt in *I. abruptus* (Imlay) whereas it is a gradual transition in *I. yukonensis* n. sp. In this regard there is some similarity of *I. yukonensis* n. sp. to *I. tenasensis* n. sp. in that the transition from finer to coarser ribs is gradual. However, the shape and trend of the ribs in *I. tenasensis* n. sp. is somewhat different from that of *I. yukonensis* n. sp.

Type. Holotype, GSC 54757.

Genus ***Kepplerites*** Neumayr and Uhlig, 1892

Subgenus ***Seymourites*** Kilian and Reboul, 1909

Specimens belonging to ***Kepplerites* (*Seymourites*)** were found at various localities in the Texas Creek Section. Unfortunately they are all fragments that are not specifically identifiable. Some of the better preserved specimens are described. Apparently several species are represented.

***Kepplerites* (*Seymourites*) aff. *K. (S.) ingrahami* (McLearn)**

Plate 7, Figures 1, 3

Material. Two specimens, one from GSC loc. 85457, and one from GSC loc. 85411.

Description and comparisons. Specimen GSC 54012 from GSC loc. 85457 is an impression of one whorl. The inner whorls are missing and the shape of the venter is unknown. The flank is moderately convex with gradual transitions to the umbilicus and venter.

The ribs are moderately strong, finer on the septate part of the whorl than on the body chamber. The interspaces are wider than the ribs. The ribs are bent backward on the umbilical wall and curve forward strongly on the flank. The primary ribs are thicker and higher than the secondaries that arise from flattened tubercles or swellings below the half height of the flank. Most of the primaries trifurcate. In addition there are intercalary ribs between pairs of trifurcated ribs.

The specimen is too incomplete to warrant specific identification. The ribs resemble those of the specimens of ***K. (S.) ingrahami*** (McLearn) described by Imlay (1953, p. 97, Pl. 50, figs. 1,4). The holotype of the species (McLearn, 1929, p. 9, Pl. 7, figs. 1,2) does not show the ribs clearly enough for comparison.

The smaller specimen, GSC 54756 from GSC loc. 85411, is incomplete and secondarily compressed. Particularly the venter is damaged.

The primary ribs are fine and rather sharp. They are separated by much wider interspaces, bent backward on the umbilical wall, swing forward strongly on the flanks, and end in small tubercles below the half height of the flanks where they are subdivided into still finer secondaries that continue the forward bend on the flanks but cross the venter transversely. Trifurcation is prevailing. In addition, intercalated ribs are present between the pairs of subdivided ribs. They extend to the line of tubercles.

In the trend and shape of the ribs the specimen resembles the inner whorl of the specimen of ***K. (S.) ingrahami*** (McLearn) shown by Imlay (1953, Pl. 50, fig. 2).

Types. Figured specimens, GSC 54012, 54756.

Keplerites (Seymourites) aff. K. (S.) chisikensis Imlay

Plate 7, Figure 6

aff. **Keplerites (Seymourites) tychonis** (Ravn) Imlay, 1953, p. 96, Pl. 48, figs. 14, 17.

aff. **Keplerites (Seymourites) chisikensis** Imlay, 1975, p. 15, Pl. 1, figs. 1-5.

Material. One fragment from GSC loc. 85411.

Description and comparisons. Specimen GSC 54011 has only part of the body chamber and part of the preceding whorl preserved. The right hand side of the ammonite is secondarily compressed. The lower part of the flank of the body chamber is rather flat, the upper part slightly convex. The transition to the very moderately rounded venter is gradual. The umbilical wall of the body chamber is gently inclined. At the aperture there is a shallow forwardly inclined constriction that is followed by a low swelling. The preceding whorl is only visible in part, its umbilical wall, the upper part of the flanks and the venter are not exposed.

The ribs of the penultimate whorl are rather fine and forwardly inclined. The interspaces are apparently larger than in the holotype of the species (Imlay, 1975, Pl. 1, figs. 1-5). The primaries end in swellings or very small tubercles. At this point most of the primaries are subdivided into three secondaries. On the body chamber the ribs are not as sharp as on the preceding whorl. They swing backward on the umbilical wall and are inclined forward on the flanks. There are about three secondaries to one primary. At the point of division a slight swelling is present. Anteriorly, in the slightly contracted front part of the body chamber, the ribs fade away. The holotype also shows fading of the ribs near the end of the body chamber.

Keplerites (Seymourites) sp. indet. 1

Plate 7, Figure 2

Material. One specimen from GSC loc. 85457.

Description. Specimen GSC 54013 is the impression of a medium sized whorl. Venter and umbilicus are not preserved.

The primary ribs are straight, rather strong, and slightly inclined forward. Somewhat below the half height of the flank they end in fairly large, rounded nodes. The interspaces are much wider than the primaries. At the nodes most of the primaries are subdivided into four or five rather fine secondaries that are gently inclined forward. Ribs of the same strength as the secondaries are intercalated between pairs of subdivided ribs. They reach down the flank to about the line of nodes.

The specimen is too imperfectly preserved for species identification.

Keplerites (Seymourites) sp. indet. 2

Plate 7, Figure 5

Material. One fragment from GSC loc. 85434.

Description and comparisons. Specimen GSC 54010 from GSC loc. 85434 is strongly laterally compressed, only parts of two whorls are preserved. No reliable measurements can be taken.

On the flanks of the preserved part of the last whorl the rather sharp ribs are inclined forward, on the umbilical wall backward. The primaries are subdivided into two or three secondaries. There are also intercalated ribs that reach down to the line of division. The point of division is indistinctly marked by swellings or tubercles.

On the poorly preserved part of the preceding whorl the primaries are separated from each other by rather wide

interspaces. The point of division is clearly marked by tubercles. The specimen is too poorly preserved for detailed comparison with other species.

Keplerites sp. indet.

Plate 7, Figure 4

Specimen GSC 54014 from loc. 85458 is a laterally compressed whorl fragment. The flanks were apparently moderately convex with gradual transition to the venter. The umbilicus was apparently fairly wide. It shows part of a steep wall of unknown depth. The widely spaced primary ribs begin on the umbilical wall where they are bent slightly backward, are straight and fairly strong on the flank where they are inclined forward, and end in a conical tubercle somewhat below the half height of the flank where they are subdivided into two or three secondaries that are weaker than the primaries. Intercalated ribs are common between the pairs of subdivided ribs. They end at the line of subdivision. The conical shape of the tubercles is visible on the other flank of the ammonite which is not illustrated.

The fragment shows ribs and tubercles similar to those of **Gowericeras spinosum** Imlay (1953, p. 99, Pl. 53, figs. 8, 11). That species is now assigned by Imlay (1975, p. 6 in stratigraphic table) to **Keplerites**.

Genus **Xenocephalites** Spath 1928

Xenocephalites hebetus Imlay

Plate 7, Figures 9, 10

Xenocephalites hebetus Imlay, 1953, p. 78, Pl. 29, figs. 6-8, 11.

Material. One specimen from GSC loc. 85402 (= GSC loc. 85457).

Description. Specimen GSC 54754 is secondarily depressed. The original shape was apparently globose, the whorl thickness exceeding the whorl height. The size of the umbilicus is not accurately determinable because of the secondary depression. The suture line and aperture are not preserved.

The ribs begin on the umbilical wall and are strongly inclined forward on the flanks. They are high and most of them bifurcate. Some secondary ribs are intercalated between pairs of bifurcated ribs. They extend to the line of bifurcation. The interspaces between the ribs become progressively wider from the posterior to the anterior part of the whorl and the ribs become stronger. The strength of the ribs also increases on the venter. In the posterior part of the whorl the venter is crossed almost transversely. Anteriorly the ribs are arched forward.

Comparison. The specimen is similar to Imlay's paratype of the species (Imlay, 1953, Pl. 29, figs. 6, 7).

Xenocephalites vicarius Imlay

Plate 7, Figures 7, 8

Xenocephalites vicarius Imlay, 1953, p. 78, Pl. 28, figs. 1-8.

Material. One specimen from GSC loc. 85457 (= GSC loc. 85402).

Description and comparison. Specimen GSC 54755 is laterally compressed and distorted, whereby the two sides have come to look quite different. The description and identification of the ammonite is based mainly on its well preserved right side. Before the secondary compression the ammonite was apparently moderately inflated. The flank is moderately convex, grading into the venter which is rounded at the end of the penultimate whorl and becomes broader anteriorly on the last whorl. The suture line is not visible and the aperture is not preserved.

At the end of the penultimate whorl the ribs are rather fine, almost radial; on the last whorl they become progressively stronger, particularly on the venter. They are strongly inclined forward on the flank and more gently so on the venter. Some ribs bifurcate below the half height of the flanks, others remain undivided. Both the general outline, trend, and shape of the ribs shown on the right side of the specimen are very similar to those of equally sized specimens of the species described by Imlay.

The left side of the ammonite that has been exposed to the secondary compression more strongly than the right side has a wider umbilicus, less convex flanks, and probably because of the absence of the shell, sharper and thinner ribs.

Other incompletely preserved, more or less secondarily compressed specimens are not specifically identified. They are found infrequently at various localities.

Genus *Lilloettia* Crickmay 1930

Lilloettia cf. *L. lilloetensis* Crickmay

Plate 8, Figures 1-3

cf. *Lilloettia lilloetensis* Crickmay, 1930, p. 62, Pl. 18, figs. 1-4.

cf. *Lilloettia lilloetensis* Crickmay, Imlay, 1953, p. 77, Pl. 30, figs. 1, 2, 4, 8.

cf. *Lilloettia lilloetensis* Crickmay, Frebald, 1967, p. 11, Pl. 1, figs. 7-9; Pl. 3, fig. 3.

Material. The described specimens are from GSC locs. 85458 and 85411.

Description. Specimen GSC 54007 from GSC loc. 85458 is secondarily compressed which has particularly affected the posterior half of the last whorl by reducing its original thickness and deforming the venter. In the anterior half of the last whorl the venter is still rounded. The maximum diameter is about 120 mm, the whorl height 69 mm. No reliable measurements of the original whorl thicknesses and their relationship to the respective whorl heights can be given. It is, however, probable that the specimen had originally a relatively compressed shape. The umbilicus is narrow.

At the beginning of the last whorl the ribs have disappeared from the lower part of the flanks. Anteriorly they become progressively weaker and shorter. There is a broad shallow constriction with a low swelling at the end of the whorl.

The smallest specimen GSC 54008, from loc. 85458, is slightly compressed and the anterior part of the last whorl is broken and distorted. The umbilicus is very narrow. At a diameter of 43 mm the whorl height is 23 mm and the whorl thickness, which is somewhat reduced by the compression, is 16 mm.

The numerous forwardly inclined, rather fine ribs, begin a little below the half height of the flanks where they are thin and subdivided into two secondaries. Intercalated ribs occur between pairs of bifurcated ribs. The strength of the ribs increases towards and on the venter.

Specimen GSC 54753 from GSC loc. 85411 is somewhat compressed and the preserved parts of the venter are distorted. On the posterior part of the whorl the ribs start at the umbilicus. Anteriorly they begin below the half height of the flanks. The strength of the ribs increases progressively from the beginning towards the end of the whorl and from the flanks towards the venter.

Comparisons. In their general shape the three specimens are similar to *L. lilloetensis* Crickmay. The holotype of the species is smaller than the described specimen GSC 54007 (Pl. 8, fig. 1) and ribs are only visible up to a diameter of 70 mm contrary to specimen GSC 54007 which shows ribs to a diameter of about 115 mm.

Lilloettia sp.

Plate 8, Figures 4, 5

Material. One specimen from GSC loc. 85411.

Description. Specimen GSC 54752 has a maximum diameter of 100 mm. Its right hand side and most of the venter is missing and the umbilical region damaged. The general shape is stout, the whorl higher than wide at the end of the whorl and apparently wider than high at its beginning. Because of poor preservation accurate measurements cannot be taken. At the end of the whorl the venter is broad and almost flat; at its beginning it is moderately rounded. The body chamber occupies about five-sixths of the whorl. The aperture is not preserved.

The suture line is very poorly preserved and cannot be traced.

On the septate part of the whorl the ribs seem to begin below half the height of the flank. They are fairly broad and cross the venter almost transversely or bent very slightly forward. Some bifurcate. At the posterior end of the body chamber no ribbing is present on the lower half of the flank and anteriorly the ribs disappear more and more ventrally but remain fairly strong on the venter where they are bent moderately forward.

Comparisons. The specimen is distinguished from known species of the genus *Lilloettia* mainly by its general shape. *L. lilloetensis* Crickmay and *L. stantoni* Imlay have a higher cross-section, *L. buckmani* (Crickmay) and *L. milleri* Imlay a broader cross-section. *L. mertonyarwoodi* Crickmay has a different whorl cross-section and finer ribs. Better preserved specimens are needed for detailed comparisons.

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PLATES

All photographs are in natural size, except suture lines. All illustrated fossils have been assigned to the Geological Survey of Canada (GSC), Ottawa, Canada.

Plate 1

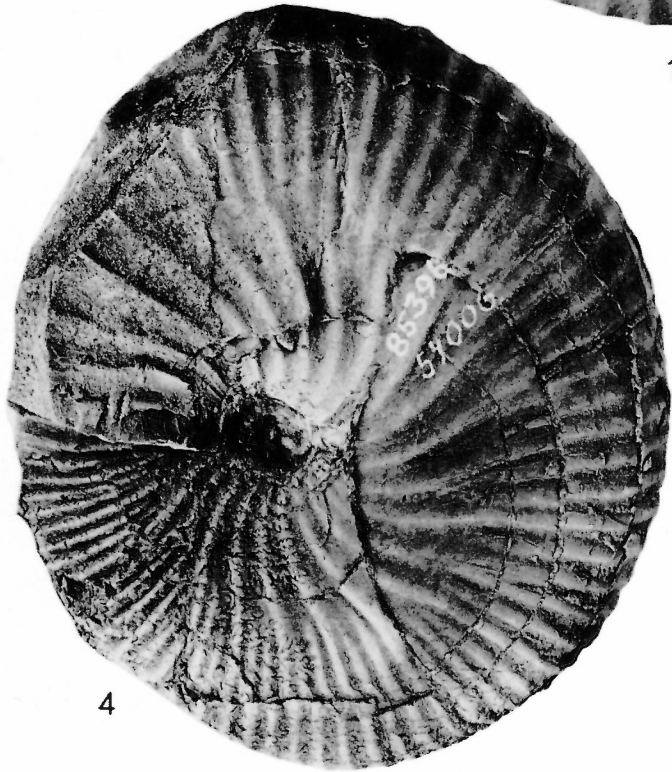
- Figures 1-5. **Iniskinites tenasensis** Frebold, n. sp. p. 4.
Figures 1-3. Holotype. GSC 54005, GSC loc. 85396.
Figure 1. Lateral view. GSC photo 203230-M.
Figure 2. Venter and ribs on posterior part of last whorl. Beginning of last whorl is still septate. The cross-section is deformed. GSC photo 203230-Y.
Figure 3. Venter and ribs of anterior part of last whorl. GSC photo 203230-N.
Figure 4. Paratype GSC 54006, GSC loc. 85396. Lateral view. GSC photo 203230-K.
Figure 5. Paratype GSC 53993, GSC loc. 85410. Rubbercast from impression. Lateral view. GSC photo 203230-O.



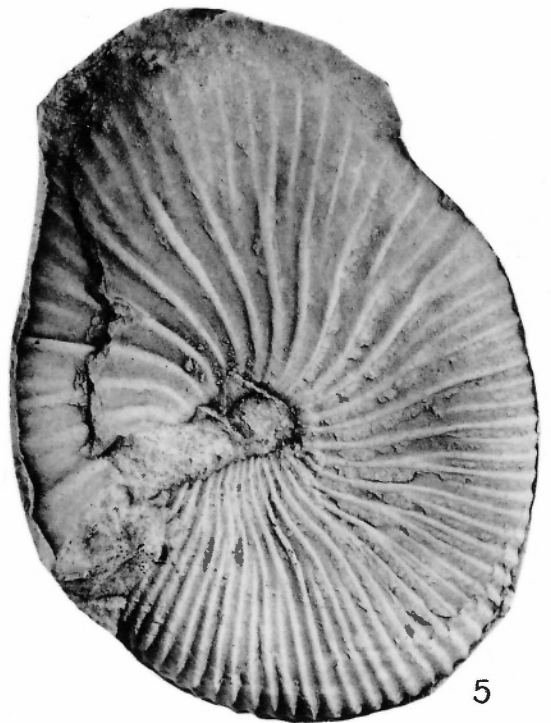
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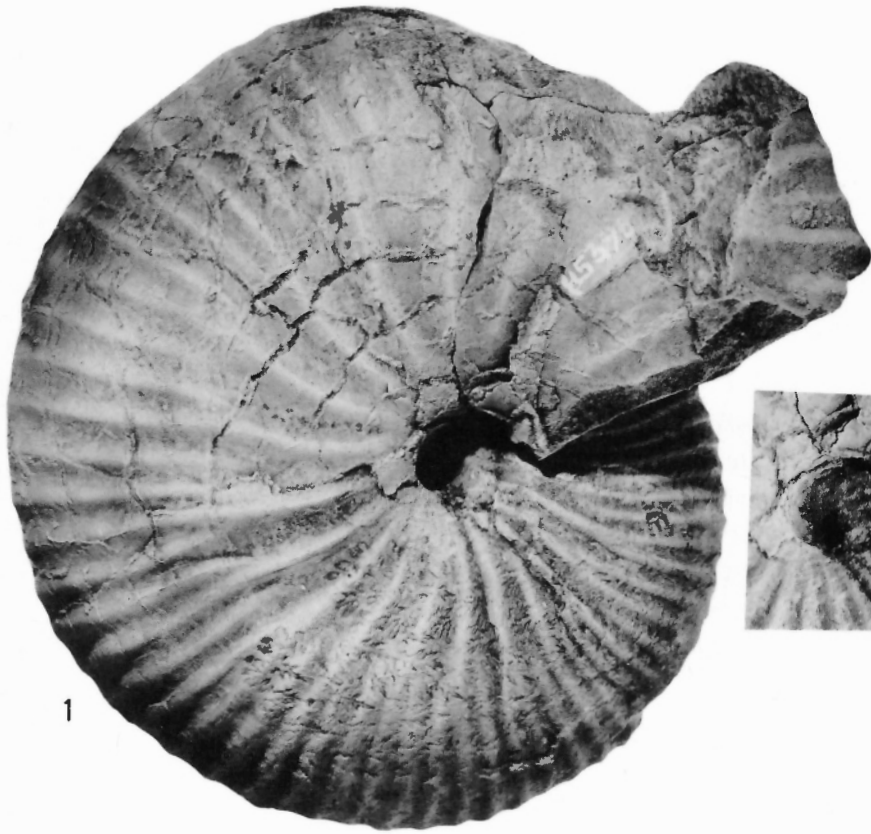
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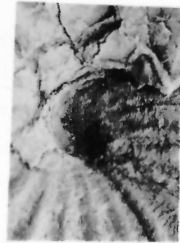
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Plate 2

- Figures 1-4. **Iniskinites tenasensis** Frebold, n. sp. p. 4. Paratype, GSC no. 54000, GSC loc. 85396.
- Figure 1. Lateral view. GSC photo 202679-J.
- Figure 2. Detailed view of umbilicus. GSC photo 202178-K.
- Figure 3. Venter. GSC photo 202177-U.
- Figure 4. Part of suture line, somewhat enlarged. GSC photo 203230-J.
- Figures 5-6. **Iniskinites** cf. **I. intermedius** (Imlay). p. 4. Figured specimen, GSC 53991, GSC loc. 85411.
- Figure 5. Lateral view. GSC photo 203259-L.
- Figure 6. Part of venter. GSC photo 203259-J.



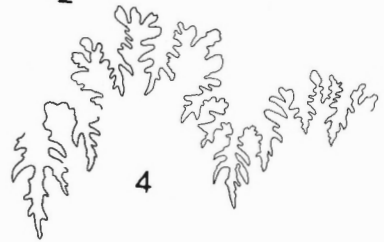
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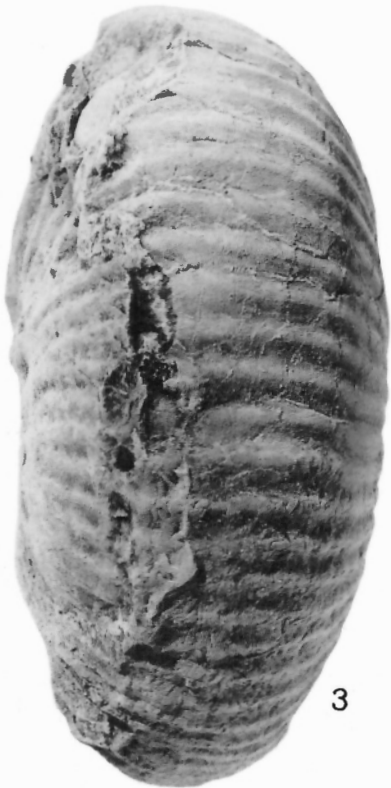
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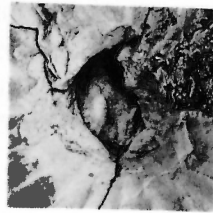
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Plate 3

- Figures 1-3. **Iniskinites** cf. **I. abruptus** (Imlay). p. 5. Figured specimen GSC 54001, GSC loc. 85392.
- Figure 1. Lateral view. GSC photo 202679-L.
- Figure 2. Detailed view of umbilicus. GSC photo 202178-D.
- Figure 3. Venter. GSC photo 202177-W.
- Figures 4-5. **Iniskinites** cf. **I. martini** (Imlay). p. 4.
- Figure 4. Figured specimen. GSC 53992, GSC loc. 85460. Lateral view. GSC photo 203259-M.
- Figure 5. Figured specimen. GSC 53994, GSC loc. 85460. Venter. GSC photo 202177-L.



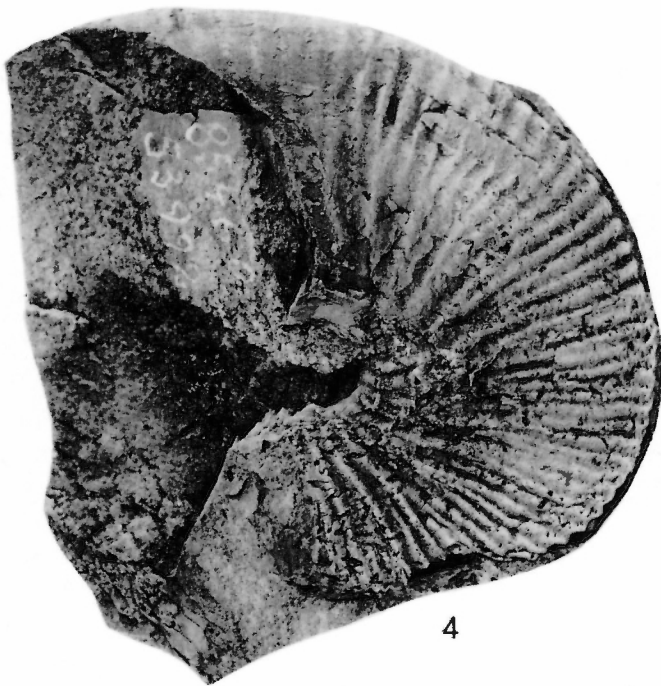
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Plate 4

- Figures 1-6. **Iniskinites robustus** Frebold, n. sp. p. 5.
Figures 1-3. Holotype GSC 53995, GSC loc. 85460.
Figure 1. Lateral view. GSC photo 202178-R.
Figure 2. Venter. GSC photo 202178-H.
Figure 3. Detailed view of umbilicus. GSC photo 202178-F.
Figures 4-5. Paratype GSC 53996, GSC loc. 85460.
Figure 4. Lateral view. GSC photo 202178-D.
Figure 5. Venter. GSC photo 202178-Q.
Figure 6. Part of suture line of paratype GSC 53997, GSC loc. 85402 (Pl. 5, fig. 2),
GSC photo 203230-I. Somewhat enlarged.

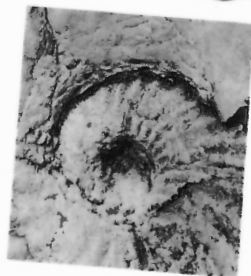
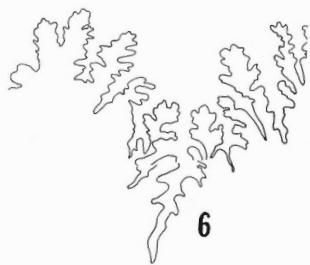


Plate 5

- Figures 1-3. **Iniskinites robustus** Frebold, n. sp. p. 5.
Figures 1,3. Paratype GSC 53999, GSC loc. 85411.
Figure 1. Lateral view. GSC photo 202178-P.
Figure 3. Venter. GSC photo 202178-I.
Figure 2. Paratype GSC 53997, GSC loc. 85402. Lateral view. GSC photo 202177-V.



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Plate 6

- Figures 1-3. **Iniskinites** cf. **I. robustus** Frebold n. sp. p. 5.
Figure 1. Figured specimen GSC 53998, GSC loc. 85458. Lateral view. GSC photo 202177-X.
Figures 2,3. Figured specimen GSC 54002, GSC loc. 85434.
Figure 2. Lateral view. GSC photo 202679-H.
Figure 3. Venter. GSC photo 202679-I.
Figure 4. **Iniskinites** sp. indet. p. 6. Figured specimen GSC 54003, GSC loc. 85434.
Lateral view. GSC photo 202178-A.



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Plate 7

- Figures 1,3. **Kepplerites (Seymourites) aff. K. (S.) ingrahami** McLearn, p. 6.
- Figure 1. Figured specimen GSC 54012, GSC loc. 85457. Lateral view of rubbercast. GSC photo 203230-P.
- Figure 3. Figured specimen GSC 54756, GSC loc. 85411. Lateral view. GSC photo 203230-U.
- Figure 2. **Kepplerites (Seymourites) sp. indet. 1.** p. 7. Figured specimen GSC 54013, GSC loc. 85457. Lateral view of rubbercast. GSC photo 203230-Q.
- Figure 4. **Kepplerites sp. indet.** p. 7. Figured specimen GSC 54014, GSC loc. 85458. Lateral view. GSC photo 202177-P.
- Figure 5. **Kepplerites (Seymourites) sp. indet. 2.** p. 7. Figured specimen GSC 54010, GSC loc. 85434. Lateral view. GSC photo 202177-M.
- Figure 6. **Kepplerites (Seymourites) aff. K. (S.) chisikensis** Imlay p. 7. Figured specimen GSC 54011, GSC loc. 85411. Lateral view. GSC photo 203230-A.
- Figures 7,8. **Xenocephalites vicarius** Imlay, p. 7. Figured specimen GSC 54755, GSC loc. 85457. Lateral views. GSC photos 203230-S (Fig. 8), 203230-T (Fig. 7). In Fig. 7 part of the last whorl is removed.
- Figures 9,10. **Xenocephalites hebetus** Imlay p. 7. Figured specimen GSC 54754, GSC loc. 85402.
- Figure 9. Venter. GSC photo 203259.
- Figure 10. Lateral view. GSC photo 203230-X.

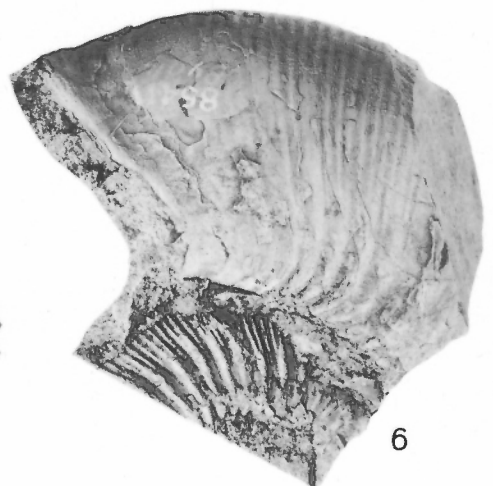
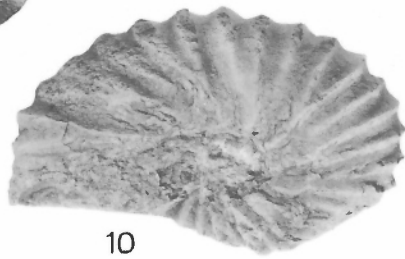
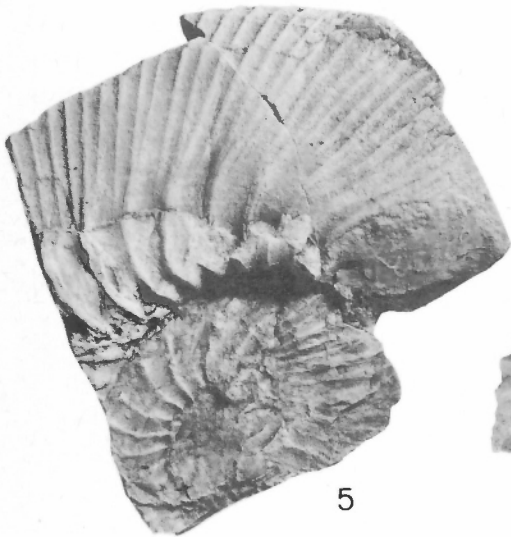
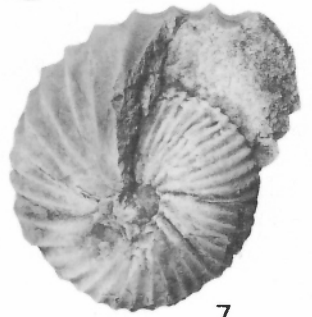
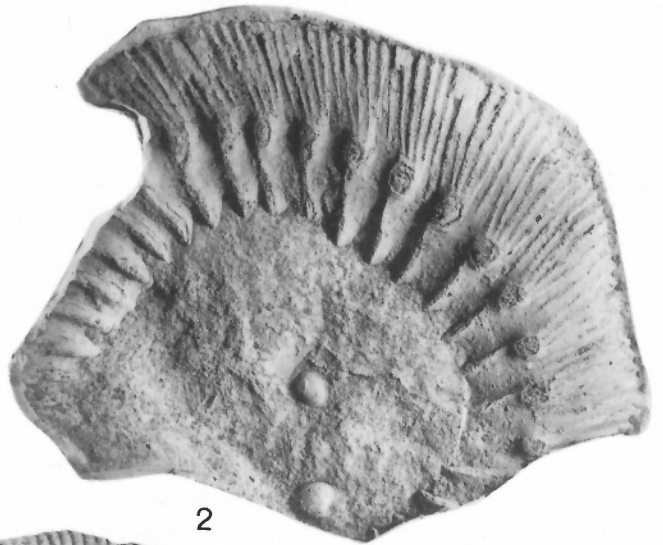
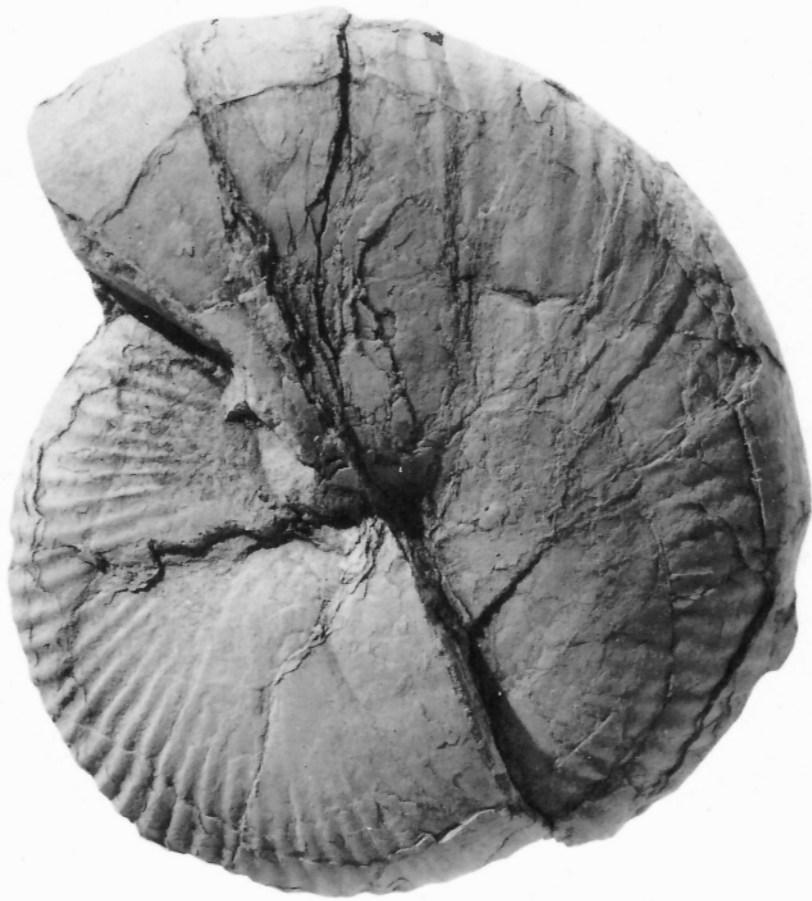
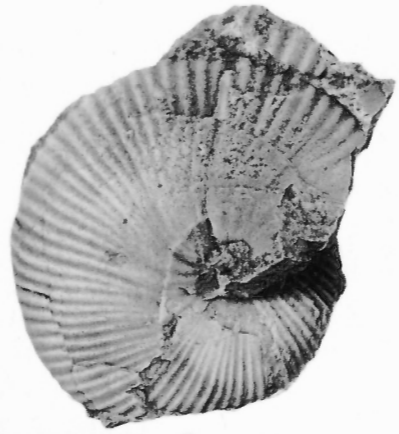


Plate 8

- Figures 1-3. **Lilloettia** cf. **L. lilloetensis** Crickmay p. 8.
Figure 1. Figured specimen GSC 54007, GSC loc. 85458. Lateral view. GSC photo 203230-F.
Figure 2. Figured specimen GSC 54753, GSC loc. 85411. Lateral view. GSC photo 203230-W.
Figure 3. Figured specimen GSC 54008, GSC loc. 85458. Lateral view. GSC photo 202178-X.
Figures 4,5. **Lilloettia** sp. p. 8. Figured specimen GSC 54752, GSC loc. 85411.
Figure 4. Lateral view. GSC photo 203230-Z.
Figure 5. Part of venter at end of whorl. GSC photo 203240-V.



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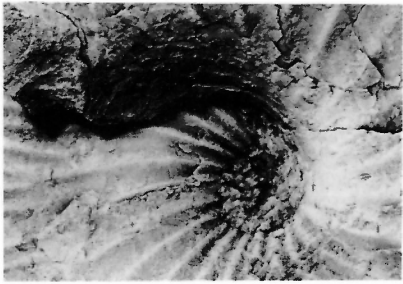
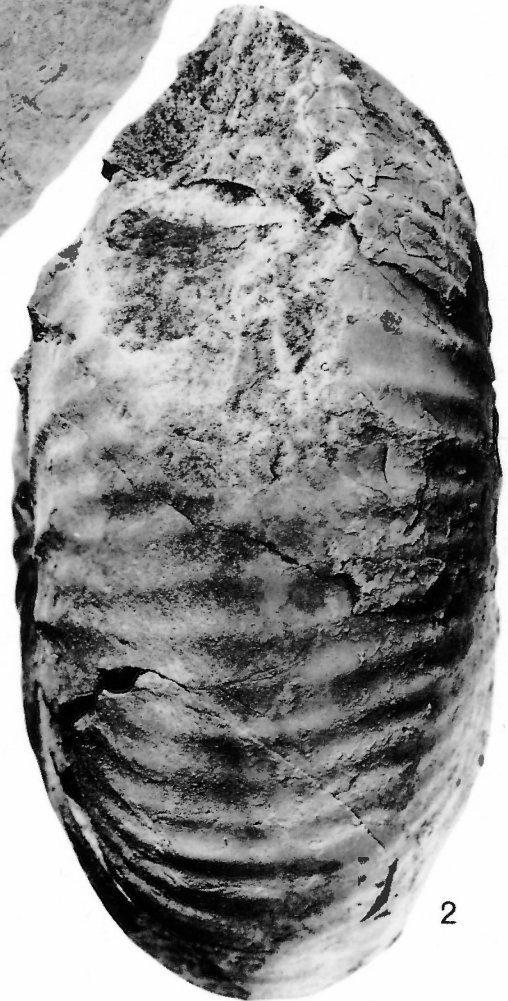
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Plate 9

- Figures 1-3. **Iniskinites yukonensis** Frebold n. sp. p. 6. Holotype, GSC 54757, GSC loc. C-27140.
Figure 1. Lateral view. GSC photo 202178-T.
Figure 2. Venter. GSC photo 202178-J.
Figure 3. Detailed view of umbilicus. GSC photo 202178-E.



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