

MEDDELELSER OM GRØNLAND

UDGIVNE AF

KOMMISSIONEN FOR VIDENSKABELIGE UNDERSØGELSER I GRØNLAND

Bd. 127 · Nr. 1

DANSK PEARYLAND-EKSPEDITION 1947-50

LEADER: EIGIL KNUTH

MIDDLE TRIASSIC AMMONITES
FROM PEARY LAND

BY

BERNHARD KUMMEL

WITH 4 FIGURES IN THE TEXT AND 1 PLATE

KØBENHAVN

C. A. REITZELS FORLAG

BIANCO LUNOS BOGTRYKKERI

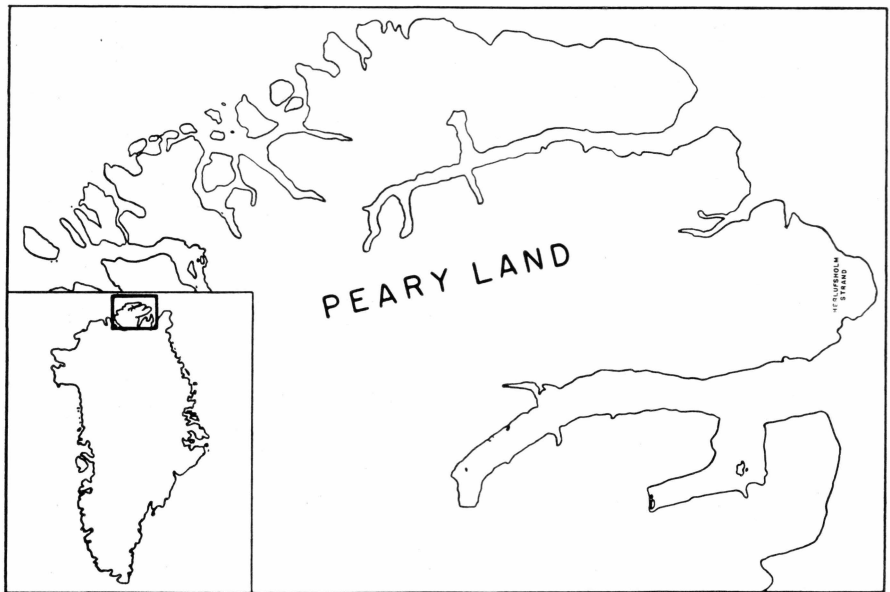
1953

During the past 100 years numerous isolated areas of Triassic strata have been discovered in the circum Arctic region. The Triassic fauna described here is from Herlufsholm Strand on the east coast of Peary Land at latitude 82°40' N., and is the most northern exposure of Triassic rocks known to date. The fauna was collected by Dr. J. C. TROELSEN as geologist of the Danish Peary Land Expedition, 1948—49. For a preliminary account of this Danish expedition see P. C. WINTER, *et al.* (1950). The writer is very grateful to Dr. TROELSEN for entrusting to him the study of this collection.

The Triassic sequence measured by TROELSEN including the fossil identifications is given below. The section includes strata of Scythian and Anisian age. The lower half of the section contains a fish fauna that EIGIL NIELSEN of the Mineralogisk Museum of Copenhagen has indentified as the same as that from the Lower Triassic of Spitzbergen (TROELSEN, personal communication). The invertebrate fossils from these beds are limited in number and poorly preserved. They are only listed here. The upper part of the section contains a very fine, small ammonite fauna that includes:

- Pearylandites troelseni* n. gen., n. sp.
- Groenlandites nielseni* n. gen., n. sp.
- Parapopanoceras* cf. *P. tetsa* McLearn
- Beyrichites* cf. *B. affinis* (Mojsisovics)
- Leiophyllites* sp. indet.

The most important ammonite of this list for the purposes of dating these beds is *Parapopanoceras* which is fairly common in Anisian strata in northern Siberia, Spitzbergen, British Columbia, and New Zealand. *Beyrichites affinis* is recognized from only a fragmentary specimen. Only one nearly mature and two juvenile specimens of *Parapopanoceras* are in the collection. The largest number of specimens are represented by two new genera. Both of these genera have subtrigonal whorl sections with sharp venters. No comparable forms have previously been described. Fortunately enough specimens are available of nearly all growth stages to give fairly complete data on the ontogeny of both of these forms.



Text-fig. 1. Index map of Peary Land showing location of Triassic locality at Herlufsholm Strand.

Section through Triassic Strata at Store Kloft, Herlufsholm Strand, Peary Land (in ascending order). Measured by J. C. TROELSEN in May, 1949.

(The altitude above sea level at the bottom of the section was estimated at 150 meters. The section was measured by PAULIN aneroid.)

Alt. 150—180 meters: Grayish-black, sandy shale. Certain layers are developed as fissile shale or as cross-bedded, thin bedded sandstone. Plant impressions. Fish remains, which by EIGIL NIELSEN have been correlated with the "fish horizon" (also called *Posidomya* shale or *Arctoceras—Anasibirites* zone) of Spitzbergen.

Lot 263 from talus at altitude of 170 meters—contains *Parapopanoceras* cf. *P. tetsa* McLearn, *Pearylandites troelseni* n. gen., n. sp., and *Groenlandites nielseni* n. gen., n. sp.

Lot 235—from talus between altitudes of 170—180 meters—contains *Arctoceras* sp. ind. I.

Lots 231 and 262—from talus between altitude of 170—180 meters—contains *Arctoceras* sp. ind. II.

Lot 233—from talus at altitudes of 170—180 meters—contains *Orbiculoidea* cf. *O. spitzbergensis* (Lundgren).

Alt. 180—ca. 350 meters: covered.

Lots 236, 248, 267, 297—from talus at an altitude of 190 meters—contains *Terebratula* cf. *T. margaritowi* Bittner.

Lots 249, 297, 298—from talus at an altitude of 190 meters—contains *Orbiculoidea* cf. *O. spitzbergensis* (Lundgren).

Lots 254, 264—from talus at an altitude of 190 meters—contains unidentifiable pelecypods.

Alt. ca. 350—ca. 355 meters: Gray, medium to coarse-grained, thick bedded sandstone.

Alt. ca. 355—ca. 380 meters: Dark gray, fine-grained, irregularly bedded, somewhat shaly sandstone with poorly preserved pelecypods and brachiopods.

Alt. ca. 380—ca. 396 meters: Covered.

Alt. ca. 396—ca. 405 meters: Same type of rock as between alt. 355 meters and alt. 380 meters; upwards passing into a hard, medium sandstone with burrows and impressions of plants(?).

Alt. ca. 405—422 meters: covered.

Alt. 422—450 meters: Gray, laminated, irregularly bedded sandstone with shale partings.

Alt. 450—510 meters: Thin bedded, hard, medium grained, light gray, yellow weathering sandstone with burrows or flow structures.

Alt. 510—780 meters: Thin bedded yellow weathering sandstone with a few massive sandstone beds. At alt. 510 meters the weathered sandstone surfaces are honeycombed and contain numerous small, dark-brown to black, ferruginous nodules. At alt. 525 meters the ferruginous nodules are very abundant; many of them are casts of ammonites. At about alt. 528 the nodules cease to occur.

Lot. 268, 269—from talus at an alt. of 510 meters—contains *Beyrichites* cf. *B. affinis* (Mojsisovics) and *Pearylandites troelseni*.

Lots 288, 257—in situ at an alt. of 525 meters—contains *Pearylandites troelseni*.

Lot 258—from talus at an alt. of 530 meters—contains *Leiophyllites* sp. ind.

The lower beds (150—350 meters) of TROELSEN's section contain fish remains which EIGIL NIELSEN correlates with the Scythian fish horizon of Spitzbergen. The invertebrates from this part of the section that are also Scythian in age are as follows:

Arctoceras sp. ind. I

Arctoceras sp. ind. II

Orbiculoidea cf. *O. spitzbergensis* (Lundgren)

Terebratula cf. *T. margaritowi* Bittner

The specimens of *Arctoceras* sp. ind. from the lowermost unit (alt. 150—190 meters) are incomplete crushed examples. Whereas the generic

assignment of these specimens can be made with a fair amount of certainty they cannot be compared specifically with any established species of that genus. *Arctoceras* is common in the upper Scythian beds of Spitzbergen and northern Siberia. *Orbiculoidea spitzbergensis* occurs in Scythian strata of east Greenland and in Spitzbergen. In east Greenland it occurs in the *Ophiceras* beds (SPATH 1935, p. 77) and in Spitzbergen it occurs above the *Myalina* beds but below the *Arctoceras* beds (FREBOLD, 1939, p. 42, 43). *Terebratula* cf. *T. margaritowi* Bittner is a typical Scythian brachiopod previously known from Ussuri Bay, near Vladivostok, and from the Dinwoody formation of Idaho. *Terebratula wittenburgi* Frebold from the Scythian of Spitzbergen is closely similar to *T. margaritowi*.

The beds between altitudes 510 and 530 meters contain *Leiophylites* sp. ind., *Pearylandites troelseni* n. gen., n. sp. and *Beyrichites affinis* (Mojsisovics). Only *Pearylandites troelseni* was found in place, the other specimens, however, must not be far from their original horizon. The specimens of lot 263 from talus at alt. 150—180 meters contains *Parapopanoceras* cf. *P. tetsa* McLearn, *Pearylandites troelseni*, and *Groenlandites nielsenii* n. gen., n. sp. This particular lot (# 263) is thought to come from a calcareous lens at about 525 meters altitude (TROELSEN, personal communication). All the forms from lot 263 and those from altitudes 510 to 530 meters are Anisian in age.

Parapopanoceras is a very common lower Anisian genus with species known from the Kharaulakh Mountains between the Lena and Yana Rivers in northern Siberia (KIPARISOVA, 1937); from Anisian strata of Spitzbergen (MOJSISOVICS, 1886); from British Columbia (MCLEARN, 1946, 1948); from California (HYATT and SMITH 1905); and from New Zealand (BROWN, 1952). The forms from the lower Anisian of California are now placed in *Neopopanoceras* (SPATH, 1951).

Groenlandites and *Pearylandites* are new forms. However, the morphological and phylogenetic interpretation of these two new genera given here support a Lower Middle Triassic age for the fauna.

The interpretation of *Beyrichites affinis* is still open to question. The Peary Land form is thought to be specifically like forms which FREBOLD (1930) has described from Spitzbergen and MOJSISOVICS (1886) originally described from the mouth of the Olenek River of northern Siberia. SPATH (1934) would place the Spitzbergen and Olenek forms in *Arctoceras* and in the upper Scythian. FREBOLD (1930) and MOJSISOVICS (1886) and DIENER (1895) would place these forms in the Anisian. Unfortunately our knowledge of the stratigraphy and faunas of the type area still leaves much to be desired.

The Anisian fauna from Peary Land described here is still too small and fragmentary to compare accurately with other faunas of similar

age. The presence of *Parapopanoceras* indicates some relationship to Anisian horizons of Spitzbergen, Siberia, and British Columbia. Recent paleontological work on Triassic faunas collected by geologists of the U. S. Geological Survey from the Arctic slope of Alaska indicates the presence of Anisian strata in that area. So far *Proteusites*, *Pseudaploceras*, and *Posidonia* are recognized. This fauna is also Anisian in age but has nothing in common with the Peary Land fauna described here.

FREBOLD (1929) has published a series of very good paleogeographic maps for the Triassic of the Arctic region. EARDLEY (1948) has also recently discussed the broader geologic and paleogeographic problems of this region.

SPECIFIC DESCRIPTION

Phylum **Mollusca.**

Class **Cephalopoda.**

Order **Ammonoidea.**

Family **Sibiritidae** MOJSISOVICS, 1896.

Genus **Pearylandites**, n. gen.

Type species: *Pearylandites troelseni*, n. sp.

Conch evolute, with wide deep umbilicus. Outer whorl subtrigonal in cross section with prominent umbilical tubercles from which ribs extend ventrally. Venter fastigate. Inner whorls more depressed; at first being rounded, then trapezoidal, with prominent ventrolateral tubercles from which ribs extend dorsally. Suture ceratitic with large denticulated first lateral lobe, a smooth second lateral lobe, and a smooth auxiliary lobe. *Pearylandites* appears to be closely allied to *Keyserlingites* and *Durgaites*. It differs from these genera in the subtrigonal and fastigate character of the outer whorls.

Pearylandites troelseni n. sp.

Plate 1, figs. 10—22.

This species includes the largest number of ammonite specimens in the collection. The conch is unique in the several form changes which take place during its ontogeny. Its affinities are clearly with *Durgaites*, but the morphological differences between the Peary Land specimens and typical representatives of *Durgaites* suggest an independent status.

The conch is evolute with a wide, deep umbilicus. The largest specimen and holotype (pl. 1, figs. 10, 11) in the collection measures approximately 38 mm in diameter. In this same specimen the most adoral part of the last whorl measures 16 mm in width and 15 mm in height. The cross section of the outer whorl is subtrigonal. The flanks are convex and strongly converge towards a fastigate venter. No perceptible ventral shoulders are present since the curvature of the flanks from the umbilical shoulder to the fastigate venter is unbroken. The umbilical shoulder, however, is abruptly rounded. The umbilical wall

on the outer whorl is concave and slopes inward. The umbilical wall is 5 mm high on the holotype.

The ornamentation of the outer whorl on the holotype consists of large umbilical tubercles from which low, broad ribs extend radially towards the venter. The ribs disappear about midway between the umbilical shoulder and the venter. The involution of the conch is such that the large umbilical tubercles of the preceding whorls are exposed in the umbilicus.

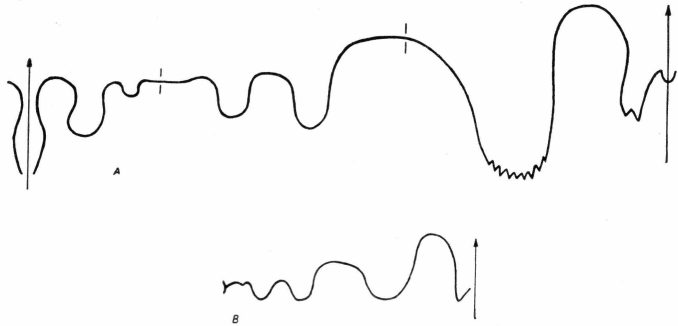
At a smaller diameter the conch has a much different aspect and the whorls are much more depressed. Fortunately the collection contains sufficient numbers of fragmentary specimens so that the ontogenetic development of the conch can be worked out in some detail. On the first four volutions of the conch, that is up to a diameter of approximately 6.5 mm the whorl section is rounded (pl. 1, figs. 19, 21). The width and height of the whorls is about the same. The whorl sides and venter are broadly arched so that no distinct shoulders are present. Along the mid point of the whorl sides are rather large prominent nodes elongated in a ventral-dorsal direction (pl. 1, fig. 20). On the fifth whorl, that is at a diameter of 8 mm the whorl section is trapezoidal in outline. The venter is broad and slightly arched. The ventral shoulders are angular. The whorl sides are slightly convex and slope strongly towards the dorsum. The indentation of the whorl is very slight and all the nodes of the preceding whorl are visible. Along the ventral shoulder are prominent tubercles that extend a short way down the whorl side (pl. 1, figs. 17, 22). The umbilical seam of the succeeding whorl is just above the line of tubercles.

At a diameter of approximately 13 mm the whorls are very depressed. The venter is still only slightly arched but is noticeably fastigate (pl. 1, figs. 14, 15). The arched venter is actually only broken by a sharp change in slope along a mid line. The venter is crossed by numerous fine, faint ribs. The ventral shoulder is acutely angular and with a row of prominent tubercles. The whorl sides are slightly concave and slope towards the dorsum. The umbilical shoulder is broadly rounded but narrow. From this diameter up to that of the holotype there is a gradual increase in the heights of that portion of the whorl section from the tubercles to the center line of the fastigate venter. At a diameter of 21 mm the whorl height is 12 mm and the width 8 mm. The tubercles are on the umbilical shoulders. The venter has a gabled appearance at this stage. On the outer whorl of the holotype the whorl section is sub-trigonal in outline with the tubercles on the umbilical shoulder.

The last half whorl of the holotype is living chamber.

The suture is ceratitic with two lateral lobes and one small auxiliary lobe. Unfortunately only small segments of the suture are visible on

the larger specimens. The complete suture is well shown on one of the specimens at a diameter of approximately 12 mm (pl. 1, fig. 17). The ventral lobe is rather simple with only two small digitations. The ventral saddle is narrow and short. The first lateral saddle is narrow, rounded at its ends and more than twice the length of the ventral saddle. The first lateral lobe is entirely on the venter. It extends well below the ventral lobe and is finely toothed along its base. The second lateral saddle is a little more than half the length of the first lateral saddle and it completely encloses the ventral tubercles. The second lateral



Text-fig. 2. Suture lines of *Pearylandites troelseni* n. gen. n. sp.

- A. from paratype (pl. 1, fig. 17, 18) at a diameter of 12 mm, $\times 9$;
 B. from same specimen (pl. 1, figs. 17, 19) at a diameter of 6 mm, $\times 11$.

lobe and the auxiliary lobe are on the whorl side below the tubercle and do not appear to have any digitations. The dorsal suture has a low, rounded lobe just inside of each umbilical seam and a narrow and longer lobe in the center.

Remarks.—*Pearylandites troelseni* is closely similar in its ontogenetic development to the type species of *Durgaites* except for the appearance of the last whorl and the fastigate character of the venter. The status of the genus *Durgaites* has been rather confused until the recent review by SPATH (1934). The genotype, *Keyserlingites dieneri* Mojsisovics was originally described as *Ceratites subrobustus* by DIENER (1897, p. 20, pl. 16), who at that time thought his Himalayan specimen came from the lower Triassic and that it was identical in form to the Siberian species described by MOJSISOVICS (1886, p. 44). This opinion was sanctioned by MOJSISOVICS (DIENER, 1907, p. 74). However, later MOJSISOVICS (1902, p. 328) considered DIENER's species to be distinct and named it *Keyserlingites dieneri*. DIENER (1905, p. 788) established *Durgaites* for *Keyserlingites dieneri* as a subgenus of *Keyserlingites*. In 1907, DIENER described further specimens of *Durgaites* from the Himalayan Muschelkalk and ably demonstrated many important differences

and also the close affinity of the Himalayan and Siberian species of *Keyserlingites*. He, however, at that time abandoned *Durgaites* altogether and placed *Keyserlingites* as a subgenus of *Ceratites*. In the Fossilium Catalogues DIENER (1915) did list *Durgaites* as a subgenus of *Keyserlingites*. The discovery of new material from Spitzbergen and time has emphasized the differences between these two groups of forms and warrants considering *Durgaites* as an independent genus (SPATH, 1934, p. 257).

The Himalayan species of *Durgaites* are all large forms that, as DIENER (1907, p. 74—79) has pointed out, at their mature stages are difficult to separate from the Siberian *Keyserlingites*. Fortunately DIENER (1907) was able to study the inner whorls of some of his species. At a diameter of 22 mm. *Durgaites dieneri* has a trapezoidal whorl section with a row of tubercles along the ventral shoulder very similar to what is found in *Pearylandites troelseni*. The ventral area bears transverse ribs that are more conspicuous than found on *Pearylandites troelseni*. During the ontogeny of *D. dieneri* the whorl section becomes more inflated and rounded in appearance. According to DIENER (1907, p. 77) this change is made by addition to the ventral part of the whorl section, above the primary tubercles. The degree of involution also increases with growth. *Pearylandites troelseni* modifies its whorl section in a somewhat similar manner. However, instead of becoming inflated and rounded the whorl section becomes subtrigonal in cross section. On the outer whorl of *D. dieneri* a row of low nodes are developed on the ventral shoulder. The primary nodes are just above the umbilical shoulder.

Other Himalayan Anisian species that have been placed in *Durgaites* by SPATH (1934, p. 358—9) are "*Sibirites*" *prahlada* Diener (1895, p. 37, pl. 7, figs. 5a—d) and "*Ceratites*" sp. ind. ex. aff. *C. middendorffi*, non KEYSERLING (DIENER, 1895, p. 28, pl. 5, figs. 7a, b). Both of these forms appear to be young individuals or the inner whorls of *Durgaites*. "*Sibirites*" *prahlada* is somewhat similar to *Pearylandites troelseni* except for rather strong curved ribs across the venter. The whorl section is depressed and the venter broadly arched.

Another controversial species that probably belongs in *Durgaites* is the Timor "*Tirolites*" *meridianus* Welter (1922, p. 149, pl. 168, figs. 14—17). SPATH (1930, p. 83) established the genus *Anastephanites* for this unique species. WELTER lists the locality of this species as Bihati, Block H which has yielded a large number of typical lower Triassic species. In 1930, SPATH accepted the lower Triassic age assignment. SMITH (1932, p. 19) concluded that "*Tirolites*" *meridianus* Welter was probably identical to "*Sibirites*" *prahlada* Diener. In 1934, SPATH (p. 358) came to the conclusion that this Timor species was the inner

whorls of *Durgaites* and questioned its lower Triassic age. "*Tirolites*" *meridianus* has a striking resemblance to *Pearylandites troelseni* except for its low, arched venter which also bears prominent transverse ribs. The degree of involution, lateral position of the tubercles, and depressed whorl section are similar to the early whorls of *Pearylandites troelseni*. The suture has two, rather simple lateral lobes with a large first lateral saddle.

SPATH (1934, p. 359) would also accept "*Tirolites*" *pacificus* Hyatt and Smith, from the *Parapopanoceras* beds, Inyo Range, Inyo County, California. The general morphological characters of the conch support this generic assignment. The suture, however, is quite different. The first lateral lobe is broad and short, the second lateral lobe is very small and smooth. The first lateral saddle is likewise small. In most species of *Durgaites* the first lateral saddle is large and rounded.

Occurrence.—The holotype, pl. 1, figs. 10, 11, and an unfigured specimen came from about 525 meters above sea level and was found in place (Lot 257, 261, 228). Another specimen was collected from the talus 510 feet above sea level (Lot 268). Most of the specimens, however, were collected from the talus at a point about 170 meters above sea level (Lot 263). TROELSEN believes that these particular specimens came from a calcareous lense at about 525 meters elevation (personal communication).

Herlufsholm Strand, Peary Land.

Family **Hungaritidae** WAAGEN, 1895.

Genus **Groenlandites** n. gen.

Type species: *Groenlandites nielseni* n. sp.

Conch involute with subtrigonal whorl section on the outer volution. Umbilical shoulder sharply rounded, umbilical wall vertical. Early volutions more rounded in cross section, with radial ribs that decrease in prominence adorally. Living chamber one half volution in length. Suture ceratitic, with large first lateral lobe, much smaller second lateral lobe and a still smaller auxiliary lobe on the umbilical shoulder. *Groenlandites* differs from *Neodalmatites* mainly in its less advanced suture. It is likewise similar in some respects to *Arctohungarites* and *Hungarites* from which it differs in details of conch shape, ornamentation, and suture.

Groenlandites nielseni, n. sp.

Plate 1, figs. 1—9.

There are fourteen, mostly fragmentary, specimens in the collections that can be assigned to this genus.

The conch is involute, with a small deep umbilicus. The outer whorls are subtrigonal in cross section and only slightly higher than wide. The whorl sides are broadly convex and converge strongly towards a sharp angular venter. No ventral shoulders are present. The umbilical shoulder is sharply rounded and the umbilical wall is vertical.

The dimensions of three of the specimens are as follows:

	Diameter	Width of last whorl	Height of last whorl	Diameter of umbilicus
Type specimen.....	20 mm	10 mm	11 mm	5 mm
Paratype 1.....	12.8 mm	6 mm	6 mm	3.5 mm
Paratype 2.....	6 mm	2.5 mm	2.5 mm	2.5 mm

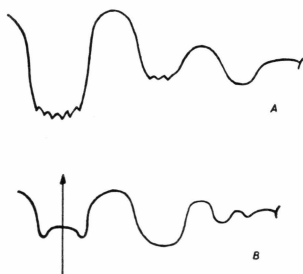
At a diameter of 6 mm the whorls are rounded in cross section with broadly rounded ventral and umbilical shoulders. The venter is also broadly rounded. Each volution encloses approximately half of the preceeding whorl. The whorl sides are convex and grade gradually onto the rounded umbilical and ventral shoulders. Short, radial ribs are present on the whorl sides between the umbilical and ventral shoulders. There are about 12 such ribs per half volution.

At a diameter of about 10 mm the venter begins to become fastigate. The height and width of the whorls is about equal. The whorl sides are inflated. The ventral shoulders are broadly convex. The radial ribs are more conspicuous and are closer to the umbilical seam than to the venter. The dorsal part of the rib (that end toward the umbilicus) is slightly enlarged. Ventrally the ribs decrease in size rapidly. One of the paratypes (pl. 1, figs. 5—7) at a diameter of 12.8 mm has two rather large bulbous nodes on the umbilical shoulder on the adoral quarter volution. Similar enlarged nodes are not conspicuous or present on the other specimens available. The smaller ribs which are so conspicuous up to a diameter of about 12 mm, begin to disappear. On the adoral half volutions of the largest specimens the ribs are only faintly discernable on the whorl sides of the internal molds. On these mature specimens the living chamber is one half volution. The height-width proportions increase most rapidly on the living chamber forming a conspicuous subtrigonal cross section.

The suture is ceratitic. The ventral lobe is divided by a shallow siphonal saddle. Each limb of the ventral lobe is short, narrow and with two inconspicuous serrations. The first lateral lobe is large and finely denticulated. The second lateral lobe is much smaller, weakly denticulated and generally asymmetrical. An even smaller auxilliary lobe is present on the umbilical shoulders. The saddles are all well rounded.

Remarks.—This Peary Land species has certain similarities with several Middle Triassic genera including *Arctohungarites* Diener, 1916,

Hungarites Mojsisovics, 1879, and *Neodalmatites* Spath, 1951. Only two species have been assigned to *Neodalmatites*; the type species—*N. parvus* (Smith) and *N. minutus* (Smith) both from the *Daonella dubia* zone of the *Ceratites trinodosus* subzone, West Humboldt Range, Nevada. *Groenlandites nielseni* is more evolute than *N. parvus* and *N. minutus*. Its umbilical shoulders are more sharply rounded on the outer whorl. The shape of the whorl section is most similar to *N. minutus*; *N. parvus* has a whorl section that is more lenticular. The lateral sculpture of *N. parvus* and *N. minutus* consists of weak fold-like ribs whereas in *Groenlandites* the ribbing is fine and obscure on the outer whorl. On



Text-fig. 3. Suture lines of *Groenlandites nielseni* n. gen. n. sp.
 A. from paratype (pl. 1, fig. 4) at a diameter of 17 mm, $\times 6.5$;
 B. from paratype (pl. 1, figs. 8, 9) at a diameter of 6 mm, $\times 11$.

the inner whorl, however, there are close similarities. The adolescent specimen figured by SMITH (1914, pl. 30, figs. 8, 9) of a diameter of 4.5 mm is nearly the same as the specimen figured on Plate 1, figs. 8, 9, except that the conch is slightly more involute and the whorl section more depressed. The kind and nature of the ribbing at this stage is strikingly similar. The immature specimen on Plate 1, figs. 5, 6, 7, showing the beginning of the fastigate venter and the large lateral nodes compares closely with the immature specimen of *N. minutus* figured by SMITH (1914, pl. 29, figs. 17, 18).

The suture of *Neodalmatites* has more elements than that of *Groenlandites*. The suture of *N. minutus* figured by SMITH (1941, pl. 29, fig. 19) shows a wide, low first lateral lobe, a second lateral of half that size and five gradually decreasing auxiliary lobes. There is, however, again a most close similarity between the suture of an adolescent specimen of 7 mm diameter as figured by SMITH (1914, pl. 30, fig. 7) and the suture of *Groenlandites nielseni* at a diameter of 6 mm (text fig. 3).

KIPARISOVA (1937) and McLEARN (1946, 1948) have described numerous species of hungaritids from northern Siberia and British Columbia that are in many ways comparable to *Groenlandites*. *Arcto-*

hungarites—type species, *Hungarites triformis* Mojsisovics, 1886—includes involute compressed ammonites with a sharp venter that in some forms tends to become rounded towards the aperture. The greatest width of the whorl section is towards the venter. The whorl sides of the living chamber have sigmoidal ribs. KIPARISOVA (1937) described several species of *Hungarites* from northern Siberia from the same general area of the type locality of *Hungarites triformis*. Many of KIPARISOVA's species have distinct angular ventrolateral edges and compressed conchs and are quite different in form from *Arctohungarites triformis* (Mojsisovics). Unfortunately the limited English text and the poor illustrations makes interpretation of these hungaritids difficult. The degree of involution, ornamentation, and inflation is quite variable among these Siberian species. *Hungarites probus* Kiparisova, *H. gusevi* Kiparisova, and *H. grumulus* Kiparisova are inflated species with converging whorl sides similar to that found in *Groenlandites*. Whether or not all of these hungaritids described by KIPARISOVA should be placed in *Arctohungarites* is uncertain on the data available. The suture of these Arctic hungaritids is likewise more advanced than in *Groenlandites*, generally having two denticulated auxiliary lobes. SPATH (1951) has noted a "general resemblance" between *Arctohungarites* and *Neodalmatites*.

SPATH (1951) likewise interpreted *Arctohungarites* as a Lower Triassic genus. MOJSISOVIC (1886, 1888) concluded that the beds that yielded his "*Hungarites*" *triformis* and "*Meekoceras*" *affine* were younger than those of the Olenek fauna proper and he placed them in the lower Muschelkalk (Anisian). The collections with *Arctohungarites* studied by KIPARISOVA from the region of the Olenek, Lena, and Omoloi Rivers include many species of ammonites and pelecypods among which are *Parapopanoceras torelli* (Mojsisovics) which is generally accepted as a good guide for Anisian strata. Also present in the same faunas are *Danubites* and *Hollandites*. This association strongly suggests that MOJSISOVIC's interpretation is correct.

The hungaritids from the Middle Triassic of British Columbia described by McLEARN (1946, 1948) are quite similar to the Siberian species of KIPARISOVA (1937). McLEARN was uncertain as to the affinities of many of his forms and placed them in *Hungarites* with query. He later (McLEARN, 1951) placed most of these forms in *Longobardites* s. l.

As outlined above the Peary Land material described here is similar in many respects to *Neodalmatites*, *Arctohungarites*, and *Hungarites* but with significant differences. The conch is most similar to *Neodalmatites* but the Peary Land forms differ in the type of ornamentation and suture; from *Arctohungarites* the conch shape is distinct but the suture is somewhat similar; from *Hungarites* it differs in lacking the angular ventrolateral edges and in the suture. The interpretation

of Lower and Middle Triassic sharp ventered ammonites still leaves much to be desired as has already been noted by SPATH (1951) and McLEARN (1950). As SPATH (1951, p. 18) has stated "oxycones are always end forms, and they originate from root stocks with rounded venters, often through carinatisulcate intermediaries." SPATH (1951) interpreted the family Hungaritidae as including Anisian-Ladinian offshoots of the Ceratitidae.

Occurrence.—From talus 170 meters above sea level, Herlufsholm Strand, Peary Land. Lot 263.

Family **Megaphyllitidae** MOJSISOVICS, 1896.

Genus **Parapopanoceras** HAUG, 1894.

Type species: *Popanoceras verneuli* Mojsisovics, 1886.

Parapopanoceras has long been recognized from Anisian strata of Spitzbergen and California. Recently McLEARN (1946, 1948) has described several species from Middle Triassic (Anisian) formation of British Columbia. KIPARISOVA (1937) has described *P. torelli* (Mojsisovics) from the Kharaulakh Mountains, Mount Khalanchekur, in the region of the Omoloi River, northern Siberia. BROWNE (1952) established the genus *Beaumontites* for forms from New Zealand that cannot be generically separated from *Parapopanoceras*. *Beaumontites* should be placed in synonymy of *Parapopanoceras*.

SPATH (1951) has recently clarified much of the taxonomic disorder of *Parapopanoceras* and established two new genera. The type species of *Parapopanoceras* is *Popanoceras verneuli* Mojsisovics, 1886. *Dienerites* Mojsisovics, 1902, is a synonym of *Parapopanoceras*. *Ptychopopanoceras* Spath, 1951, type species, *Popanoceras hyatti* Mojsisovics, 1886, was proposed for those Parapopanoceratids with radial folds. *Neopopanoceras* Spath, 1951, type species, *Popanoceras* (*Parapopanoceras*) *haugi* Hyatt and Smith, 1905, differs from *Parapopanoceras* in being more evolute and with a different suture.

Parapopanoceras cf. *P. tetsa* McLearn.

Plate 1, figs. 24, 25.

One nearly complete partially weathered specimen and two fragmentary juvenile specimens are available. The largest specimen (pl. 1, figs. 24, 25) is 25 mm in diameter. The conch is smooth, involute, compressed, with a narrowly rounded venter. The umbilicus is eccentric. The eccentricity of the umbilicus involves only the last volution. The whorl

sides are broadly rounded. The umbilical shoulders are very low and gently rounded. The suture is ceratitic with rounded saddles and denticulated lobes. The ventral lobe is divided by a fairly deep smooth saddle. The first and second lateral lobes are likewise with small denticulations. The area of the auxiliary series appears to be slightly worn and it is not certain how much of the finer details are missing. The auxiliary series includes four lobes which rapidly diminish in size towards the umbilical seam. Only the first of these has coarse small toothing.

The two juvenile specimens also assigned to this species, one consists of the well preserved inner volutions of a specimen whose outer



Text-fig. 4. Suture line of *Parapopanoceras* cf. *P. tetsa* McLearn (pl. 1, figs. 24—25), $\times 10$.

whorls are badly eroded, but sufficiently intact to show complete agreement with the complete specimen described above. This juvenile specimen measures 7 mm in diameter. The whorls at this diameter are 6 mm wide and about 3 mm high. The conch is extremely involute, smooth, and globular. The suture is already ceratitic and of the pattern of the larger specimen referred to above. The dorsal suture consists of a narrow, long dorsal lobe with only two conspicuous denticulations and three similar lobes on each side. These lobes diminish in size toward the umbilical seam.

The other juvenile specimen measures 6.5 mm in diameter; it agrees in all details to the specimens described above.

Remarks.—The Peary Land specimens agree very well in the general features of the conch with the New Zealand and British Columbia species, especially in the eccentric pattern of the umbilicus. The Spitzbergen species with their modified body chambers do not become eccentrically coiled until a very late stage. Since the Peary Land specimens are either immature or slightly weathered the details of the suture are not known. Specific comparison with other species is not advisable.

Occurrence.—From talus 170 meters above sea level, Herlufsholm Strand, Peary Land. Lot 263.

Family **Beyrichitidae** SPATH, 1934.Genus **Beyrichites** WAAGEN, 1895.*Beyrichites* cf. *B. affinis* (MOJSISOVICS).

1886. *Meekoceras affine*, Mojsisovics, Arktische Triasfaunen, Mem. Acad. Imp. Sci. Nat. St. Petersburg., 7th ser., vol. 33, p. 86, pl. 11, fig. 17.
1888. *Meekoceras affine*, Mojsisovics, Über einige Arktische Trias-Ammoniten des Nördlichen Sibiriens, *ibid.*, vol. 36, p. 16, 20, 21.
1895. *Meekoceras affine*, Mojsisovics, Diener: The Cephalopoda of the Muschelkalk, Palaeont. Indica, ser. 15, vol. 2, pt. 2, p. 47, pl. 8, figs. 4, 5.
1897. *Meekoceras affine*, Mojsisovics, Diener: The Cephalopoda of the Lower Trias, *ibid.*, ser. 15, vol. 2, pt. 1, p. 73.
1907. *Beyrichites affinis*, (Mojsisovics), Diener: The Fauna of the Himalayan Muschelkalk, *ibid.*, ser. 15, vol. 5, no. 2, p. 82.
1930. *Beyrichites affinis*, (Mojsisovics), Frebold: Die Altersstellung des Fischhorizontes, des Grippianiveaus und des unteren Saurierhorizontes in Spitzbergen, Skrifter om Svalbard og Ishavet, No. 28, p. 25, pl. 6, figs. 4, 5.
1934. *Arctoceras affinis*, (Mojsisovics), Spath: Brit. Mus. Cat. Cephalopoda, vol. 4, p. 251, 420.

One incomplete and poorly preserved specimen appears to be very similar to MOJSISOVICS' species. The specimen is in an irregularly laminated, calcareous, micaceous sandstone. Only six camerae and a portion of the living chamber of one side of the conch are preserved. No part of the venter is preserved. The specimen is about 41 mm in diameter. The whorl sides are slightly convex. The umbilical shoulders are sharply rounded and the umbilical wall vertical. The umbilicus measures about 7 mm. The ventral lobe is not visible but the first and second lateral lobe and one auxiliary lobe are clearly visible on the whorl sides. The coarse preservation, however, has destroyed most of the denticulations of the lobes. The first lateral lobe has nearly parallel sides, is higher than wide and the denticulations appear to be confined to the rounded basal portion of the lobe. The second lateral lobe is half the size of the first lateral and the auxiliary is still much smaller. The saddles are broadly rounded and symmetrical.

Remarks.—This Peary Land specimen compares very favorably with MOJSISOVICS'S species especially in the degree of involution, character of the umbilicus and suture. FREBOLD (1930) has assigned specimens from Spitzbergen to *Beyrichites affinis*. The Peary Land, Spitzbergen, and Siberian specimens are very similar in most characters as far as can be told from the literature.

The age of *Beyrichites affinis* is not definitely known. The bulk of the material studied by MOJSISOVICS for his "Arktische Triasfaunen" monograph (1886) belongs to the *Olenikites* fauna including species of *Olenikites*, *Keyserlingites*, *Czekanowskites*, *Svalbardiceras*, *Sibirites*, and *Prosphingites*. The *Olenikites* fauna is considered late Scythian (Pro-

hungaitan) in age (SPATH, 1934). Down river from Mengilach on the Olenek River where the *Olenikites* fauna was collected, MOJSISOVICS described a small fauna from Karangaty including *Arctohungarites triformis* (Mojsisovics), *Beyrichites affinis* (Mojsisovics) and *Monophyllites* ind. At that time MOJSISOVICS (1886) considered the *Olenikites* fauna as Werfen in age but stressed that the small fauna from Karangaty was younger. In 1888, MOJSISOVICS described additional material from the Olenek River mouth region plus a small fauna from near the mouth of the Jena River. This latter fauna included *Arctohungarites triformis* and *Beyrichites affinis*. MOJSISOVICS concluded that this Jena River fauna and that from Karangaty on the Olenek River were lower Muschelkalk (lower Middle Triassic) in age. DIENER (1897, p. 47, 48) identified "*Meekoceras*" *affine* Mojsisovics from the Muschelkalk of the Himalayas. However, as noted by FREBOLD (1930, p. 26) the Himalayan forms have longer and narrower saddles than the Arctic forms. DIENER placed these forms in *Beyrichites* in 1907.

SPATH (1934, p. 251) placed FREBOLD's *Beyrichites affinis* in *Arctoceras* and considered it and *Arctohungarites* as upper Scythian in age. SPATH (1934, p. 420) further commented that *Meekoceras affine* Mojsisovics was morphologically intermediate between *Arctoceras* and *Beyrichites*.

It is of course not certain that the Peary Land specimen described here belongs in "*Meekoceras*" *affine* Mojsisovics, but the evidence available is strongly suggestive of this identification. The association of *Beyrichites affinis* with *Parapopanoceras* would tend to support arguments that this species is Anisian in age.

Occurrence.—From talus 510 meters above sea level, Herlufsholm Strand, Peary Land. Lot 269.

Leiophyllites sp. indet.

Plate 1, fig. 23.

One poorly preserved, incomplete, juvenile specimen measuring 11.5 mm in diameter can be assigned to *Leiophyllites*. The conch is evolute and the whorl sections rounded. The suture has a divided ventral lobe with a large first lateral lobe, a small second lateral lobe and probably a small auxiliary lobe on the umbilical wall. Only the first lateral lobe is denticulated. The saddles are well rounded.

Remarks.—The specimen is too poorly preserved and incomplete to compare with specific species of *Leiophyllites*. It is placed in this genus mainly on the character of the suture, degree of involution, and shape of whorl sections.

Occurrence.—From talus 530 meters above sea level, Herlufsholm Strand, Peary Land. Lot 258.

BIBLIOGRAPHY

- BROWNE, R. A. S., 1952, Early Triassic Ammonoids from Beaumont Station, Wairaki, Survey District, with an Appendix by J. Marwick: Trans. Royal Soc. New Zealand, vol. 79, pp. 528—534.
- DIENER, CARL, 1895, The Cephalopods of the Muschelkalk: India Geol. Survey Mem., Palaeontologia Indica, ser. 15, vol. 2, pt. 2, pp. 1—118, pls. 1—31.
- 1897, The Cephalopoda of the Lower Trias: India Geol. Survey Mem., Palaeontologia Indica, ser. 15, vol. 2, pt. 1, pp. 1—181, pls. 1—23.
- 1905, Entwurf einer Systematik der Ceratitiden des Muschelkalkes: S. B. Akad. Wiss. Wien, Bd. 114, pp. 765—806.
- 1907, The fauna of the Himalayan Muschelkalk: India Geol. Survey Mem., Palaeontologia Indica, ser. 15, vol. 5, Mem. 2, pp. 1—139, pls. 1—17.
- 1915, Fossilium Catalogus, pt. 8, Cephalopoda Triadica: 369 pp., W. Junk, Berlin.
- 1916, Einige Bemerkungen zur Nomenklatur der Triascephalopoden: Centralbl. Min. Geol. Paläont., pp. 97—105.
- EARDLEY, A. J., 1948, Ancient Arctica: Jour. Geology, vol. 56, pp. 409—436.
- FREBOLD, H., 1929, Untersuchungen über die Fauna, die Stratigraphie und Paläogeographie der Trias Spitzbergens, auf Grund der von Norwegischen Expeditionen gesammelten Materialien: Skr. Svalb. og Ishavet, Nr. 26, pp. 1—66, pls. 1—6.
- 1930, Die Altersstellung des Fischhorizontes, des Grippianiveaus und des unteren Saurierhorizontes in Spitzbergen: Skr. Svalb. og Ishavet, Nr. 28, pp. 1—36, pls. 1—6.
- 1939, Das Festungsprofil auf Spitzbergen. V. Stratigraphie und Invertebraten Fauna der älteren Eotrias: Skr. Svalb. og Ishavet, Nr. 77, pp. 1—58, pls. 1—3.
- HYATT, A., and SMITH, J. P., 1905, The Triassic cephalopod genera of America: U. S. Geol. Surv. Prof. Paper 40, pp. 1—394, pls. 1—85.
- KIPARISOVA, L., 1937, Fauna of the Triassic Deposits of the Arctic regions of the Soviet Union: Arctic Institute of the U.S.S.R., vol. 91, pp. 228—246 (English Summary), pls. 1—9.
- MCLEARN, F. H., 1946, 1948, A Middle Triassic (Anisian) Fauna in Halfway, Sikanni Chief, and Tetsa Valleys, Northeastern British Columbia; Appendix I, the Middle Triassic of Liard River, British Columbia, by E. D. Kindle; Appendix II, New Middle Triassic Species from Northeastern British Columbia, by F. H. McLearn; three fossil plates; Geol. Surv., Canada, Paper 46—1, February, 1946; Supplement to Appendix II. Additional New Middle Triassic Species from Northeastern British Columbia, by F. H. McLearn, September, 1946, with Plates 4 to 7; Second Edition, with Plates 8 to 12, 1948.
- 1951, The Ammonoid Family Hungaritidae and the species *Longobardites nevadanus* in the Middle Triassic series of Northeastern British Columbia: Geol. Surv., Canada, Suppl. to Paper 46—1, pp. 1—26.

- MOJSISOVICS, EDMUND, 1886, Arktische Triasfaunen: Mem. Acad. Imp. Sci. Nat. St. Petersbourg, ser. 7, tome 33, pp. 1—159, pls. 1—20.
- 1888, Über einige Arktische Trias-Ammoniten des Nördlichen Sibrien: Mem. Acad. Imp. Sci. St. Petersbourg, ser. 7, tome 36, pp. 1—21, pls. 1—3.
- 1902, Das Gebirge um Hallstatt. — 1. Abt., Die Cephalopoden der Hallstätter Kalke: Abh. geol. Reichsanst. Wien, Band 6, Suppl. Heft., pp. 175—356, pls. 1—23.
- SMITH, J. P., 1914, Middle Triassic marine invertebrate faunas of North America: U. S. Geol. Survey Prof. Paper 83, pp. 1—254, pls. 1—99.
- 1932, Lower Triassic Ammonoids of North America: U. S. Geol. Survey Prof. Paper 167, pp. 1—199, pls. 1—81.
- SPATH, L. F., 1930, The Eotriassic Invertebrate Fauna of East Greenland: Medd. om Grønland, Bd. 83, pp. 1—90, pls. 1—12.
- 1934, Catalogue of the Fossil Cephalopoda in the British Museum (Natural History) Part 4, The Ammonoidea of the Trias: London, pp. 1—521, pls. 1—18.
- 1935, Additions to the Eotriassic Invertebrate Fauna of East Greenland: Medd. om Grønland, Bd. 98, pp. 1—115, pls. 1—23.
- 1951, Catalogue of the Fossil Cephalopoda in the British Museum (Natural History) Part 5, The Ammonoidea of the Trias (II): London, pp. 1—228.
- WELTER, O. A., 1922, Die Ammoniten der unteren Trias von Timor: Paläontologie von Timor, Lief. 11, pp. 83—154, pls. 155—171.
- WINTER, P. C., *et. al.*, 1950, A preliminary account of the Danish Pearyland Expedition, 1948—9: "Arctic", Journ. Arctic Institute of N. A., vol. 3, no. 1, pp. 3—43.

Plate 1.

(All figures $\times 2$ unless otherwise indicated).

- Figs. 1—9. *Groenlandites nielsenii* Kummel, n. sp. 1, 2. Holotype. 3, 4. Paratypes, mature specimens that are slightly crushed. 5, 6, 7. Adolescent specimen. 8, 9. Juvenile specimen. All from talus at 170 meters above sea level. Lot 263.
- 10—22. *Pearylandites trolseni* Kummel, n. sp. 10, 11. Holotype, from about 525 meters above sea level, *in situ*, Lot 257; 12—22. Paratypes, from Lot 263 from talus, 170 meters above sea level. 18. Whorl segment of fig. 17. 19. Inner whorl segment of fig. 17.
- 23. *Leiophyllites* sp. indet. From talus 530 meters above sea level. Lot 258.
- 24—25. *Parapopanoceras* cf. *P. tetsa* McLearn. From talus at 170 meters above sea level. Lot 263.

