

Deshayesitid ammonites from the lower Aptian (Lower Cretaceous) of North-East Greenland

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Two deshayesitid ammonite assemblages are described from the Lower Cretaceous succession of the north coast of Hold with Hope, North-East Greenland, and their biostratigraphical significance is assessed. In the earlier assemblage *Prodeshayesites* cf. *bodei* and *P. laeviusculus* occur. The second assemblage contains *Deshayesites boegvadi*. The presence of *P.* cf. *bodei* suggests that the northwest European *bodei* Subzone of the *fissicostatus* Zone is represented in North-East Greenland. The occurrence of *D. boegvadi*, previously recorded only from Kuhn q, probably indicates the later part of the *fissicostatus* Zone, or the *forbesi* or *deshayesi* zones. Other occurrences of Greenland deshayesitid ammonites are discussed briefly. The new finds from Hold with Hope are important biostratigraphical records providing direct correlation between the earliest Aptian of Europe and Greenland.

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Introduction

Deshayesitids are a major component of European early Aptian ammonite faunas and are well known in England (Casey, 1964), northern Germany (Kemper, 1967), the Russian Platform (Glazunova, 1973) and Daghestan (Bogdanova et al., 1979), as well as in NE Greenland (Bøgvad & Rosenkrantz, 1934). They are used to provide a biostratigraphy at zonal and subzonal level (Casey, 1961; Hoedemaeker & Bulot, 1990; Bogdanova & Tovbina, 1994). In England *Prodeshayesites* and *Deshayesites* both appear in the *fissicostatus* Zone, the former at the base of the *bodei* Subzone and the latter in the *obsoletus* Subzone (R. Casey, pers. comm., 1997). The base of the Aptian Stage is currently drawn at the appearance of *Prodeshayesites* (Rawson, 1983; Birkelund et al., 1984).

NE Greenland (Fig. 1) is the most important source of Aptian ammonites in the northern North Atlantic region. Although Aptian faunas are known from Svalbard (e.g. Yershova, 1983), they are relatively poor and do not contain deshayesitids. Onshore exposures of Aptian do not occur in Norway. The faunas ascribed to the Aptian of Greenland remain poorly described, despite important early works by Ravn (1911) and Frebold (1935), particularly on Store Koldewey, Bøgvad &

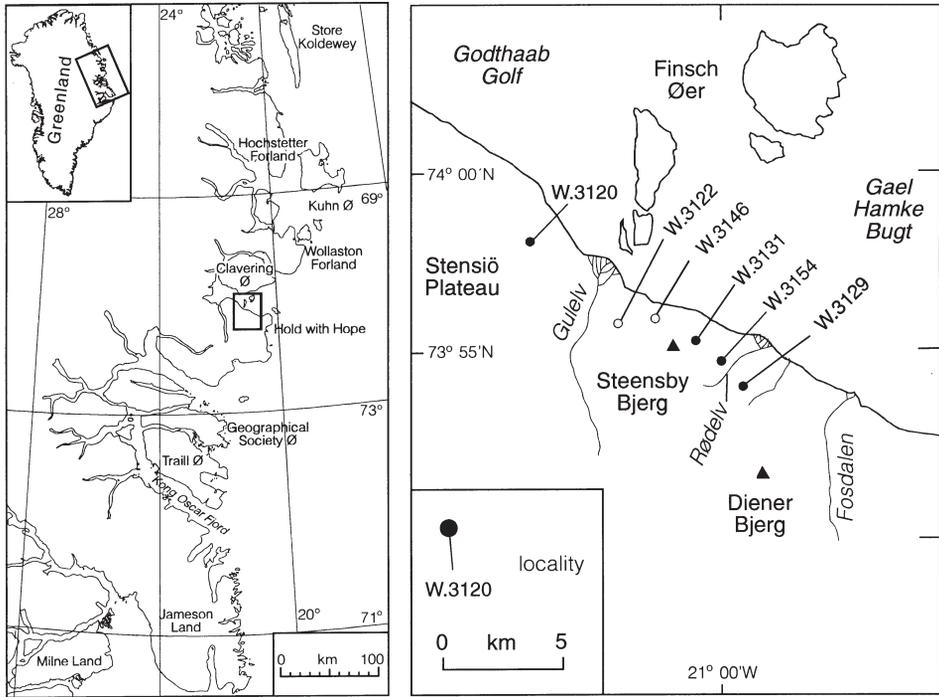


Fig. 1. Location map of NE Greenland showing position of Hold with Hope and localities mentioned in text.

Rosenkrantz (1934) on Kuhn q and Donovan (1953) on Traill q. Spath (1946) and Donovan (1957) reviewed the earlier records of Early Cretaceous ammonites including those of apparent Aptian age in NE Greenland. Subsequent Aptian ammonite records are from Hochstetter Forland (Surlyk, 1978a) and Wollaston Forland (Surlyk, 1978b).

Traditionally in NE Greenland (Spath, 1946; Donovan, 1957) two principal Aptian ammonite faunas have been recognised. An early Aptian fauna was characterised by deshayesitids and a late Aptian fauna by aconeceratids. However, this generalisation should be treated with extreme caution. Aconeceratids have not been found in association with deshayesitids in NE Greenland. Recent collections made by CASP (Cambridge Arctic Shelf Programme), especially in Wollaston Forland and Store Koldewey, have demonstrated that the bulk of so-called Aptian non-deshayesitid faunas are of probable Barremian age because of the presence of the belemnite *Oxyteuthis* in large numbers (confirmed by P. Doyle, 1998) and also of Barremian rather than Aptian dinoflagellate cyst assemblages (Nøhr-Hansen, 1993; A.M. Koraini, pers. comm., 1997). *Oxyteuthis* is common in northern Europe (England and Germany) in the Barremian, and is rare in the lowermost Aptian (Mutterlose, 1990). At present, the only Aptian strata that can be confirmed in eastern Greenland are those containing deshayesitid ammonites investigated herein, and those recognised from the presence of dinoflagellate cysts of the *Pseudoceratium nudum* and *Circulodinium brevispinosum* zones (Nøhr-Hansen, 1993).

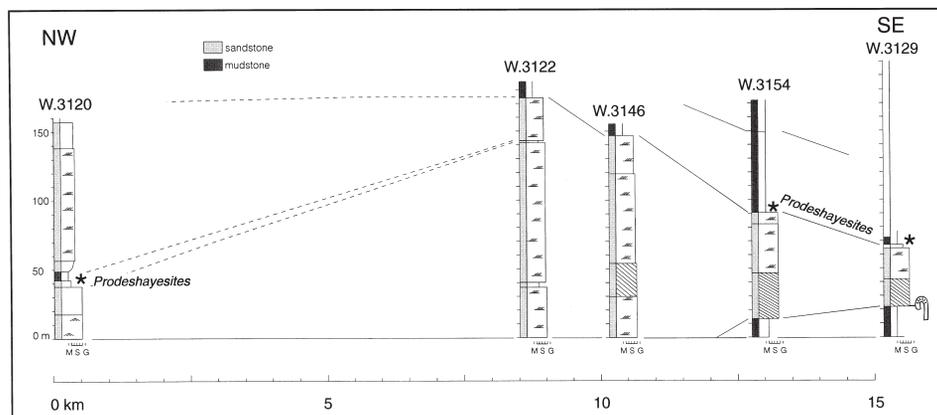


Fig. 2. Summary stratigraphic logs of northern Hold with Hope, showing occurrences of early Aptian *Prodeshayesites* and *Deshayesites*, and late Barremian heteromorph ammonites (see Fig. 1 for localities).

In Greenland deshayesitid ammonites were first reported by Rosenkrantz (1930, p. 439) from eastern Kuhn q, as *Parahoplitoides* cf. *deshayesi* (Leymerie). They were subsequently described as *Deshayesites boegvadi* Rosenkrantz (in Bøgvad & Rosenkrantz, 1934). In northern Hold with Hope, deshayesitids were first identified by L.F. Spath (in Koch, 1931) as *Deshayesites* aff. *laeviusculus* (von Koenen), which were found together with a specimen initially identified as a coarsely ribbed *Deshayesites* or an *Archoplites jachromensis* (Nikitin). The latter specimen was of potential Albian age but Spath (1946) subsequently reidentified it as a coarse-ribbed form of *Deshayesites*. New collections of deshayesitids from accurately measured sections on Hold with Hope are discussed further below. From Wollaston Forland, Surlyk (1978a) recorded *Deshayesites deshayesi* (d'Orbigny) from the base of a fining upwards sequence, but it was unfigured. Further poorly preserved deshayesitids were collected by E. Blanc and S.R.A.K. in 1997 (CASP Collections) from loose blocks in Kuhn Passet. Surlyk (1978b) also figured a single specimen identified as *D. deshayesi* from northeast Hochstetter Forland, which he believed represented the *D. forbesi* or *D. deshayesi* zones, but the specimen is not reassessed here.

This article describes the occurrences and assesses the age of newly collected, well preserved *Prodeshayesites* and *Deshayesites* faunas from localities on Hold with Hope (Figs. 1-2).

Stratigraphy

During the CASP East Greenland Expeditions of 1995 and 1996 detailed stratigraphical studies were made in northern Hold with Hope and a new lithostratigraphy was established (Kelly et al., in press). Biostratigraphical collections show that two deshayesitid ammonite faunas occur in outcrops of the Steensby Bjerg Formation extending for about 10 km from Stensiö Plateau to Diener Bjerg. Although the two genera do not occur successively in any one section, it is believed that the occurrences

represent two events: an earlier one with *Prodeshayesites*, and a later one with *Deshayesites*. *Prodeshayesites* occurs only in northwest Stensiö Plateau, in the Stensiö Plateau Member. *Deshayesites* occurs in the cliffs from northeast Steensby Bjerg, Rødelv and Diener Bjerg (Figs. 1-2) in the upper part of the Gulelv and base of the Rødelv members. The latter occurrences in the Gulelv and Rødelv members are probably at the same horizon, but there is a diachronous boundary between these units (Kelly et al., in press). At Stensiö Plateau (W.3120), up to 50 m of the Steensby Bjerg Formation, the BIDelv and Stribedal members, underlie the *Prodeshayesites* interval and rest unconformably on Middle Jurassic sandstones. The sandstones with minor mudstones of the Stribedal Member contain late Barremian dinoflagellate cysts (A.M. Khoraini, pers. comm., 1996). The sandstones of the BIDelv Member contain slumped beds with reworked Hauterivian belemnite (P. Doyle, pers. comm., 1998) and bivalve faunas. Below the occurrence of *Deshayesites* in the east (W.3129), c. 60 m of Gulelv Member sandstones rest unconformably on Middle Jurassic sedimentary rocks. A large-scale cross-bedded unit in the Gulelv Member, with cross sets up to 40 m in thickness, has a mudstone at its base which contains late Barremian dinoflagellate cysts, and at its junction with the large-scale cross-beds a concretion horizon contains a large ancyloceratid ammonite, *Audouliceras*, of late Barremian aspect. The detailed lithostratigraphy of these beds is described by Kelly et al. (in press).

The fauna of *Prodeshayesites* cf. *bodei* (von Koenen, 1902) and *P. laeviusculus* (von Koenen, 1902) is associated with *Eulytoceras* sp.; the phragmocone of a belemnite (?*Oxyteuthis*); bivalves (*Neocomiceramus* sp. and an undetermined nuculacean); crustacean limb fragments; and the trace-fossils *Zoophycos*, *Planolites* and *Muensteria*. *Prodeshayesites* cf. *bodei*, *Eulytoceras*, *Neocomiceramus* and the trace fossils occur commonly at locality W.3120, but the other taxa are rare. The associated dinoflagellate cyst assemblage belongs to the *Pseudoceratium nudum* Zone of Nøhr-Hansen (1993) and is consistent with an early Aptian age (A.M. Koraini, pers. comm., 1996). *Prodeshayesites boegvadi* (Rosenkrantz, 1934) occurs in a dark organic-rich sandy mudstone, weathering pale orange. Benthos is rare and includes lucinacean bivalves and gastropods, together with wood and wood-boring bivalves, belemnites (probably *Oxyteuthis*) and a single articulated teleost fish skeleton. The dinoflagellate cysts also belong to the *P. nudum* Zone.

Systematics

Type, figured and cited specimens in the CASP Collections are transferred to the Sedgwick Museum, University of Cambridge. In this article the CASP numbers prefixed K are retained to facilitate reference to the specimens within CASP together with the Sedgwick Museum numbers which are prefixed X.

- Order Ammonoidea, Zittel, 1884
- Suborder Ancyloceratina Wiedmann, 1966
- Superfamily Deshayesitaceae Stoyanow, 1949
- Family Deshayesitidae Stoyanow, 1949
- Subfamily Deshayesitinae Stoyanow, 1949
- Genus *Prodeshayesites* Casey, 1961

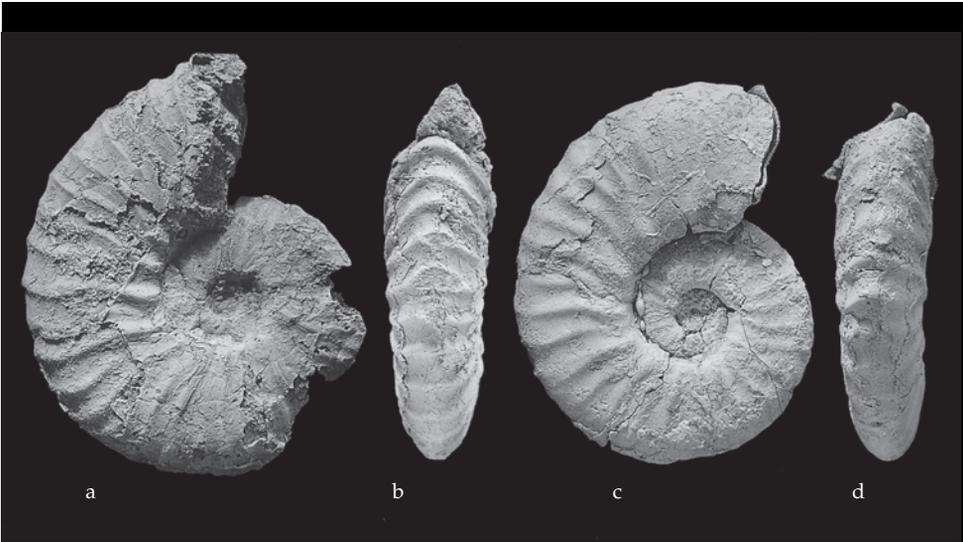


Fig. 3 A-D *Prodeshayesites* cf. *bodei* (von Koenen, 1902). 3A-B, K. 7282 (X.27804), lateral and ventral aspects; 3C-D, K.7283 (X.27805), lateral and ventral aspects; Stensiö Plateau Member, Steensby Bjerg Formation, early Aptian, *bodei* Subzone, loc. W.3120, northwest Stensiö Plateau. Specimens are at natural and have been coated with ammonium chloride prior to photography.

Type species — By original designation: *Ammonites fissicostatus* Phillips (1829), Speeton Clay, Lower Aptian, Speeton, Yorkshire, NE England. A neotype was designated by Casey (1964, p. 356) as BMNH C24718, same horizon and locality, thus negating Kemper's (1967) subsequent argument for replacing Phillips' *Ammonites fissicostatus* with *Hoplitides bodei* var. *tenuicostatus* von Koenen (1902) on the grounds that it was a *nomen dubium* (see Casey 1980, p. 656).

Remarks — Wright et al. (1996) included *Paradeshayesites* Kemper, 1967 in *Prodeshayesites*. This is followed herein.

Although *Prodeshayesites* has been described from southeast France (Delanoy, 1991), Delanoy et al. (in press) stated that the previous citations of *Prodeshayesites* and *Paradeshayesites* in the 'Pseudocrioceras Beds' at the historical Lower Aptian stratotype at La Bédoule, Bouches-du-Rhône, are actually Barremian *Martellites*. This is the material from Bed 52 of Busnardo (1984). Thus the geographical range of *Prodeshayesites* is restricted to North-East Greenland, eastern and southern England, and northern Germany.

Prodeshayesites cf. *bodei* (von Koenen, 1902)
Fig. 3A-D.

- cf. 1902 *Hoplitides Bodei* — von Koenen, pl. 9, figs 1a-c.
- 1931 *Deshayesites* or *Archthoplites (jachromensis* Nik.) — Koch, p. 98.
- 1932 *Archthoplites jachromensis* Nik. — Rosenkrantz, p. 196.
- 1935 *Archthoplites (jachromensis* Nik.) — Koch, p. 104.
- non 1973 *Deshayesites* aff. *bodei* Koenen — Glazunova, p. 126, pl. 81, fig. 1a-b.

Types — The lectotype of *Hoplitides Bodei* von Koenen was designated by Casey (1964), as the original of von Koenen, 1902, p. 9, fig. 1a-c, early Aptian, *bodei* Subzone, Timmern, Brunswick, Germany, but it is lost. Kemper (1967, p. 123, pl. 12, fig. 6) designated a neotype (Nationaal Natuurhistorisch Museum, Leiden, RGM 61 665), from the *tenuicostatus* Zone, Alstätte.

Material — K.7248 (X.27801), K.7251 (X.27802), K.7279 (X.27803), K.7282 (X.27804), K.7283 (X.27805), K.7943 (X.27806), loc. W.3120, cliffs, northwest Stensiö Plateau, Hold with Hope.

Description — Evolute compressed deshayesitid, up to 72 mm in diameter. Whorl cross-section oval, compressed, widest at about one quarter to one third of the whorl height out from the umbilicus and tapering towards venter. Venter is sharply rounded and shows no sign of flattening. Ribs widely spaced and rounded, gently sigmoidal, slightly swept forward from the umbilicus, slightly recurved in mid-flank and again swept forward over the venter, which they cross without interruption. Weak umbilical bullae occur. Secondary ribs usually alternate with primaries and intercalate at about one third the distance across the flank of the whorl. Umbilicus wide with steeply inclined umbilical walls. The degree of overlap with previous whorl decreases in the last half whorl as the rate of increase in whorl height reduces while the coiling becomes more evolute. The apertural margin is simple, forwardly inclined in mid-flank and becoming increasingly so towards the venter in a beak-like projection.

Measurements (in mm)

	Dm	sep.	Wh	Wt	Wo	Uw	ribs
K.7248 (X.27801)	50	c. 32	20	>8	—	15	21*
K.7279 (X.27803)	72	c. 50	21	16	—	21	—
K.7282 (X.27804)	60	38	23	15	4	14	18*
K.7283 (X.27805)	55	c. 37	23	14	4	17	30
K.7943 (X.27806)	69	—	25	—	—	22	19*

Remarks — *P. cf. bodei* differs from *P. bodei* sensu stricto by its less strongly pronounced ribs. It is more evolute and more strongly ribbed than *P. laeviusculus* with which it is associated, but does not reach as large a size. It is possible that the two taxa represent a sexually dimorphic pair, *P. cf. bodei* representing the microconch and *P. laeviusculus* the macroconch (Wright et al., 1996). Glazunova (1973) identified *Deshayesites* aff. *bodei* from the Volga region of the Russian Platform, but the figured specimen is probably *Deshayesites* sensu stricto, with finer ribbing and less acutely rounded venter than the Greenland specimens.

Occurrence — *P. bodei* Subzone, *fissicostatus* Zone, early Aptian in NE Greenland; the species sensu stricto occurs in eastern England and northern Germany.

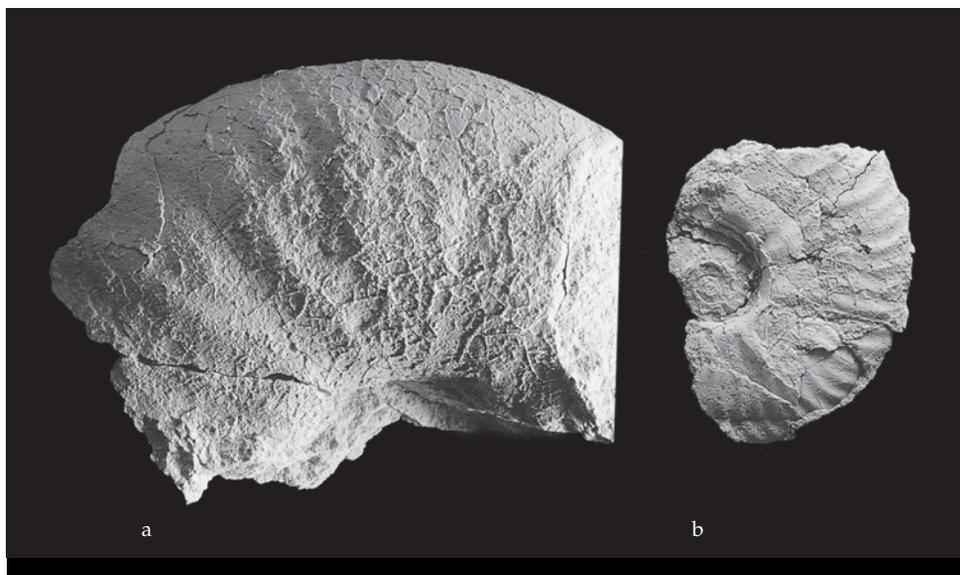


Fig. 4A-B *Prodeshayesites laeviusculus* (von Koenen, 1902), 4A, K.7251 (X.27802), 4B, K.7281 (X.27810), both lateral aspect, Stensiö Plateau Member, Steensby Bjerg Formation, loc. W.3120, early Aptian, *bodei* Subzone, northwest Stensiö Plateau. Specimens are at natural and have been coated with ammonium chloride prior to photography.

Prodeshayesites laeviusculus (von Koenen, 1902)

Fig. 4A-B.

- *p. 1902 *Hoplitides laeviusculus* — v. Koenen, p. 224, pl. 8, figs. 4a-b, 5a-b only.
- 1931 *Deshayesites* aff. *laeviusculus* (v. Koenen) — Koch p. 98.
- 1935 *Deshayesites* aff. *laeviusculus* (v. Koenen) — Koch p. 104.
- 1946 *Deshayesites* aff. *laeviusculus* (v. Koenen) — Spath, p. 8.
- 1949 *Deshayesites laeviusculus* (von Koenen) — Spath, in Maync, p. 262.
- 1957 *Deshayesites* aff. *laeviusculus* (von Koenen) — Donovan, p. 208.
- non 1964 *Prodeshayesites laeviusculus* (von Koenen) — Casey, p. 367, pl. 61, figs 6a, b; text-fig. 131 (= *P. germanicus* Casey, fide Kemper, 1967).
- . 1967 *Paradeshayesites laeviusculus* (von Koenen) — Kemper, p. 125, pl. 11, fig. 1; pl. 12, fig. 1; pl. 13, figs. 3a-c, 6.
- non 1991 *Paradeshayesites* gr. *laeviusculus* (von Koenen) — Delanoy, p. 439, text-fig. 2d.
- . 1996 *Prodeshayesites laeviusculus* (von Koenen) — Wright et al., p. 271, figs 211.2d-e (figure after Kemper, 1967).

Type — Lectotype, designated Casey (1964): Geologisches Institut, Göttingen, Nr. 457-1, original of von Koenen (1902, pl. 8, figs. 4a-c, early Aptian, *bodei* Subzone, Timmern, Braunschweig, Germany

Material — K.4247 (X.27807), K.7250 (X.27808), K.7251 (X.27809), K.7281 (X.27810), Stensiö Plateau Member, Steensby Bjerg Formation, loc. W.3120, cliffs, northwest Stensiö Plateau, Hold with Hope.

Description — Involute deshayesitid with weakly inflated flanks, compressed-oval whorl section and rounded venter. The umbilical walls are steep in small specimens, up to c. 20 mm in diameter, but thereafter become less inclined and the umbilical shoulder less well defined. The ribbing is similar to that in *P. cf. bodei*, but is less forwardly swept and less strong. The largest specimen (K.7251 = X.27809) is a fragment of a body chamber of an individual which must have had a diameter in the order of 100 mm, and which shows a whorl height of 46 mm, thickness of c. 20 mm and bears feeble coarse ribbing.

Measurements (in mm)

	Dm	sep.	Wh	Wt	Wo	Uw	ribs
K.7250 (X.27808)*	67	c. 42	c. 30	—	—	c. 17	—

*specimen crushed

Remarks — These specimens are not as well preserved as the associated *Prodeshayesites cf. bodei* described above; they are usually crushed. *P. laeviusculus* differs in reaching a larger size, having a more involute coiling with narrower umbilicus and weaker, but less forwardly inclined ribbing and flatter flanks. *Deshayesites boegvadi* (Rosenkrantz) (see below) is more evolute than *P. laeviusculus*, with flatter and more ventrally-tapering flanks and with a less acutely rounded venter.

The large fragment (K.7251 = X.27809) is very closely comparable to the outer whorl of *P. laeviusculus laeviusculus* illustrated by Kemper (1967, pl. 11, fig. 1). Kemper (1967) believed that Casey's (1964) specimens of *P. laeviusculus* from eastern England were actually *Prodeshayesites germanicus* Casey = *P. tenuicostatus* (von Koenen).

Wright et al. (1996) suggested that *P. laeviusculus* was a macroconch (see remarks on *P. cf. bodei* above).

Occurrence — Early Aptian, *fissicostatus* Zone (= German *tenuicostatus* Zone), *bodei* Subzone, north Germany and NE Greenland.

Genus *Deshayesites* Kazansky, 1914

Type species — By original designation: *Ammonites deshayesi* Leymerie, in d'Orbigny (1841), Argiles B Plicatules, lower Aptian, Haute Marne, France.

Remarks — In addition to occurring in Europe, Sardinia, Georgia, and Greenland (Wright et al., 1996), the genus reaches east to Daghistan (Bogdanova et al., 1979).

Deshayesites boegvadi (Rosenkrantz, 1934)

Fig. 5A-C.

- . 1930 *Parahoplites* cf. *deshayesi* (Leymerie) — Rosenkrantz, p. 439 [non Leymerie].
- *. 1934 *Deshayesites boegvadi* sp. nov. — Rosenkrantz, in Bøgvad & Rosenkrantz, p. 22, pl. 3, figs. 1-3; pl. 4 fig. 1-2.

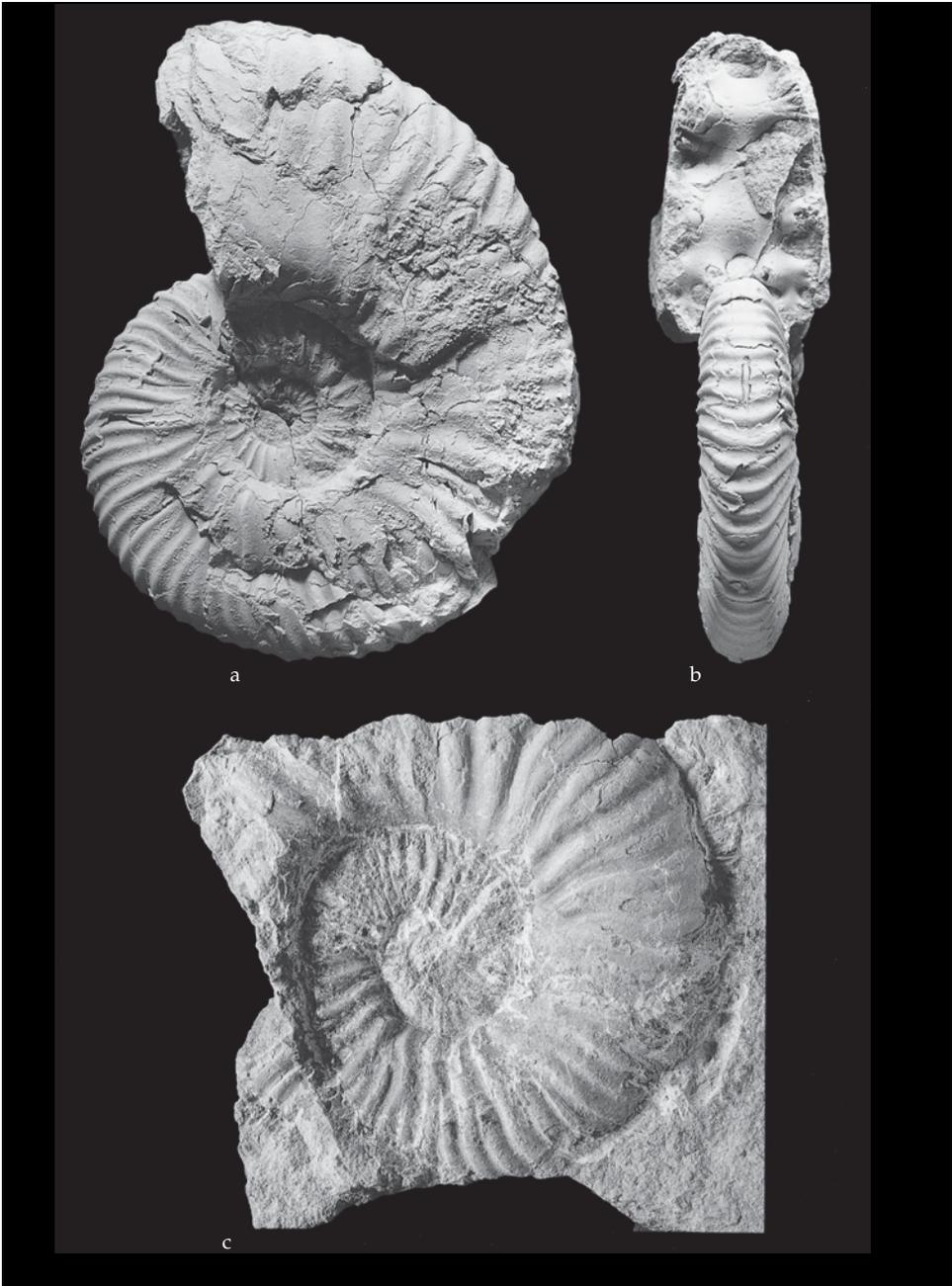


Fig. 5A-C, *Deshayesites boegvadi* (Rosenkrantz, 1934), 5A, B, K.7897 (X.27816), lateral and ventral aspects of septate portion only, locality W.3131, northeast Steensby Bjerg; 5C, K.7406 (X.27813), lateral aspect of body chamber, loc. W.3129, north of Dierner Bjerg, near base of Rødelv Member, Steensby Bjerg Formation, early Aptian, *fissicostatus* to *deshayesi* zones. Specimens are at natural size and have been coated with ammonium chloride prior to photography.

1946 *Deshayesites boegvadi* Rosenkrantz — Spath, p. 7.

1949 *Parahoplitoides/Deshayesites boegvadi* Rosenkrantz — Maync, p. 262.

1957 *Deshayesites boegvadi* Rosenkrantz — Donovan, p. 208.

Types — The holotype, by original designation (figured by Rosenkrantz, in Bøgvad & Rosenkrantz, 1934, pl. 3, fig. 1), and paratypes are in the Mineralogical Museum, Copenhagen.

Material — K.7388 (X.27811), K.7405 (X.27812), K.7406 (X.27813), K.7408 (X.27814), K.7412 (X.27815), loc. W.3129, north Diener Bjerg, upper part of Guleelv Member; K.7897(X.27816), loc. W.3131 NE Steensby Bjerg, Hold with Hope.

Description — Evolute compressed deshayesitid, up to 150 mm in diameter. Whorls flat-sided, widest near umbilicus and tapering to venter which is rounded and shows weak flattening; at larger dimensions flanks are feebly inflated. Ribbing weakly sigmoidal, widely-spaced and rounded, the largest specimen having a maximum spacing of 8 mm at venter; gently swept forward, and more strongly so at the umbilicus and over the venter. Ribs bifurcate or intercalate at about one third the distance across the flank of the whorl. Degree of overlap with previous whorl decreases in the last half whorl. Umbilicus wide with inclined walls and rounded umbilical shoulder.

Measurements (in mm)

	Dm	sep.	Wh	Wt	Wo	Uw	ribs
Holotype+	130	c90	45	—	—	50	c40
K.7406 (X.27813)	c.90	c.60	31	—	—	37	c.30*
K.7897 (X.27816)	150+	109	58	35	11	42	57

+ Measurements based on illustration in Bøgvad & Rosenkrantz, pl. 3, fig. 1.

* Total in last half whorl.

Remarks — Of the two illustrated specimens from Hold with Hope, K. 7406 (X.27813) appears to have a comparable intensity of ribbing to the holotype. K.7897 (X.27816) has slightly finer ribbing than the holotype, but the whorl cross section with greatest width at the umbilical shoulder and flat sides tapering towards the venter in the two specimens are closely comparable. A poorly preserved *Deshayesites* specimen was also seen from near the base of the Rrdelv Formation at loc. W.3154.

K.7897 (X.27816) also shows some similarities to the specimen illustrated as *Deshayesites latilobatus* (Sintsov) by Glazonova (1973, pl. 78, fig. 3; pl. 79, fig. 1) from Ulyanovsk, on the Volga River, in the style and density of the ribbing, but is slightly more evolute. It is interesting to note that the specimens of *D. boegvadi* illustrated here together with the range of material illustrated by Glazonova (1973) from the *deshayesi* Zone of the Volga River, have generally straighter and less coarse sigmoidal ribbing than the material illustrated by Bogdanova et al. (1979) from the *dechyi/deshayesi* Zone of Dagestan.

East Greenland			England/Germany		Mediterranean
Species	Zone	Subzone	Zones	Subzones	Zones
			<i>D. deshayesi</i>		<i>D. deshayesi</i>
			<i>D. forbesi</i>		<i>D. weissii</i>
<i>Prodeshayesites boegvadi</i> with <i>P. laeviusculus</i>	<i>P. fissicostatus</i>	<i>P. bodei</i>	<i>P. fissicostatus</i>	<i>P. obsoletus</i> <i>P. bodei</i>	<i>D. tuarkyricus</i>

Fig. 6. Correlation of the Greenland *Prodeshayesites* and *Deshayesites* occurrences with the standard zonal schemes of Europe (after Casey, 1961 and Hoedemaeker & Bulot, 1990).

Prodeshayesites laeviusculus (von Koenen), described above, is a much more involute species than *D. boegvadi* with a narrower umbilus and less strong ribbing on the body chamber. *P. cf. bodei* is a much smaller species than *D. boegvadi*, with coarser ribbing at comparable diameter and an acutely rounded venter.

The deshayesitid figured by Surlyk (1978a) as *Deshayesites deshayesi* (d’Orbigny) from northern Hochstetter Forland shows less than half a whorl and is only illustrated in lateral aspect. However, from the photograph alone it is difficult to compare accurately with the new Greenland specimens. Identification as *P. boegvadi* cannot be precluded, but the specimen is more finely ribbed than *Prodeshayesites bodei*. Surlyk (1978b) also recorded *D. deshayesi* from the base of a fining upwards sequence on Wollaston Forland, but it was unfigured and therefore cannot be compared. Loose specimens of *Deshayesites* in the CASP Collections from Kuhnpasset, Wollaston Forland (K.9153 and K.9198 — not illustrated) are poorly preserved in a coarse sandstone, and show coarse ornamentation with definite branching rather than intercalation of ribs.

Conclusions

Two deshayesitid faunas are recognised in northern Hold with Hope, North-East Greenland. The first is characterised by *Prodeshayesites cf. bodei* (von Koenen) and *P. laeviusculus* (von Koenen). It is correlated with the *bodei* Subzone at the base of the *Prodeshayesites fissicostatus* Zone in northern Europe, which indicates the beginning of the Aptian Stage (Fig. 6). The second fauna contains *Deshayesites boegvadi* (Rosenkrantz) which was originally described from Kuhn q, further north in North-East Greenland, and which represents an unknown interval within the range of *Deshayesites* s.s. from the late *fissicostatus* to *deshayesi* zones.

The *P. bodei* Subzone is the earliest subzone of the *P. fissicostatus* Zone in northern and eastern England (Casey, 1961), and in northern Germany (Kemper, 1973; formerly the *P. tenuicostatus* Zone of Kemper, 1967). Thus the appearance of *Prodeshayesites* in the Stensiö Plateau Member indicates the earliest Aptian event in eastern Greenland. Recent revisions of the European standard zonation of the Aptian have been reviewed by Hoedemaeker & Bulot (1990), Hoedemaeker et al. (1993) and Bogdanova & Tovbina (1994). The *P. fissicostatus* Zone of Casey (1961) in northwest Europe is currently correlated with the *Deshayesites tuarkyricus* Zone of the Mediterranean (Hoede-

maecker & Bulot, 1990; Bogdanova & Tovbina, 1994). Whether the base of the Mediterranean *Deshayesites tuarkyricus* Zone correlates with the base of the *fissicostatus* Zone or with the appearance of *Deshayesites* s.s. in the upper part of the same zone remains a matter for debate (see Ropolo et al., this volume).

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