OLCOSTEPHANUS (AMMONITINA) FROM THE FOSSIL BLUFF FORMATION, ALEXANDER ISLAND, AND ITS STRATIGRAPHICAL SIGNIFICANCE

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ABSTRACT. Two examples of the ammonite genus *Olcostephanus* Neumayr are described from Alexander Island for the first time. They were found near the top of a thick sedimentary succession in Ablation Valley (70° 49′ S, 68° 25′ W), which comprises part of the Fossil Bluff Formation. The occurrence of this genus suggests a Valanginian age and therefore implies that the Lower Cretaceous succession on Alexander Island is more complete than was previously suspected.

INTRODUCTION

In February 1984, two examples of the cosmopolitan Lower Cretaceous ammonite *Olcostephanus* Neumayr were discovered in Ablation Valley, Alexander Island (Fig. 1). They were collected during a systematic re-examination of the biostratigraphy of approximately 2500 m of siltstones, sandstones and conglomerates spanning the Jurassic–Cretaceous boundary. The succession, which comprises part of the Fossil Bluff Formation, consists of four major coarsening-upward cycles (Butterworth, 1985) and is truncated by a prominent thrust. Its age-range, as deduced from ammonites and belemnites, was previously thought to be late Jurassic (Kimmeridgian) to earliest Cretaceous (Berriasian), (Willey, 1973; Thomson, 1979). No evidence for the later Neocomian (i.e. Valanginian–Hauterivian) stages had been found and the relationship between the Ablation Valley succession and the extensive Aptian–Albian sequences further south was uncertain (Taylor and others, 1979). The *Olcostephanus* were collected from siltstones approximately 70 m below the thrust zone (Figs. 1 and 3) and their presence has a significant bearing on the age of the sequence.

SYSTEMATIC DESCRIPTIONS

Superfamily PERISPHINCTACEAE Steinmann, 1890
Family OLCOSTEPHANIDAE Haug, 1910
Subfamily OLCOSTEPHANINAE Haug, 1910
Genus *Olcostephanus* Neumayr, 1875

Olcostephanus cf. *guebhardi* (Kilian, 1902) Fig. 2a, b

cf. 1902 *Holcostephanus* (*Astieria*) cf. *atherstoni* Sharpe; Karakasch, p. 103, pl. 1., fig. 3.

cf. 1902 *Holcostephanus* (*Astieria*) *guebhardi* Kilian, p. 866, pl. 57, fig. 2a, b.

cf. 1907 *Astieria sharpei* Karakasch, p. 123

Material. One incomplete internal mould (KG.2943.1) from scree at the west end of the ridge along the south side of Ablation Valley, Alexander Island (70° 50′ S, 68° 32′ W).

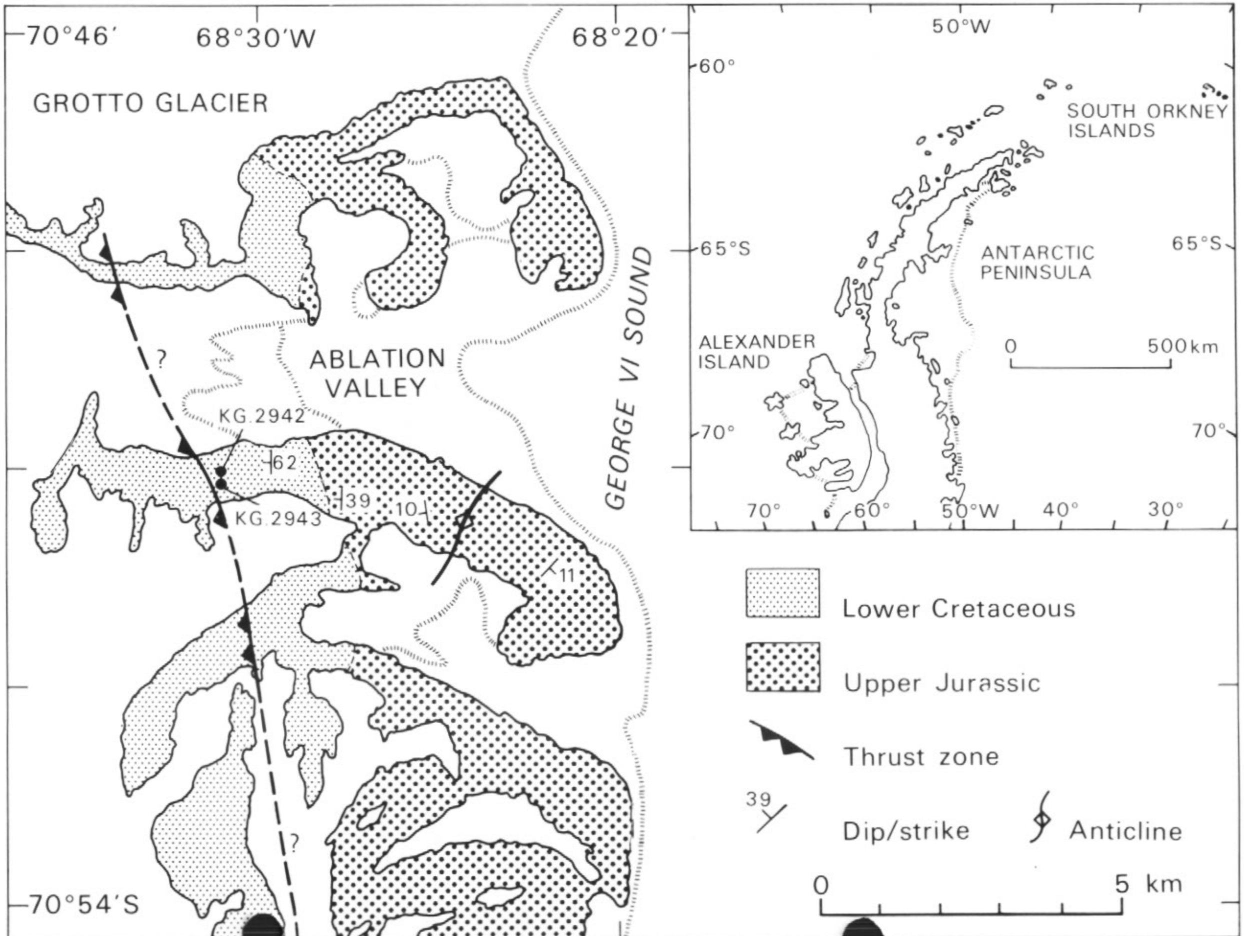

Fig. 1. Sketch map of Ablation Valley, Alexander Island (see inset) showing the localities from which *Olcostephanus* were collected.

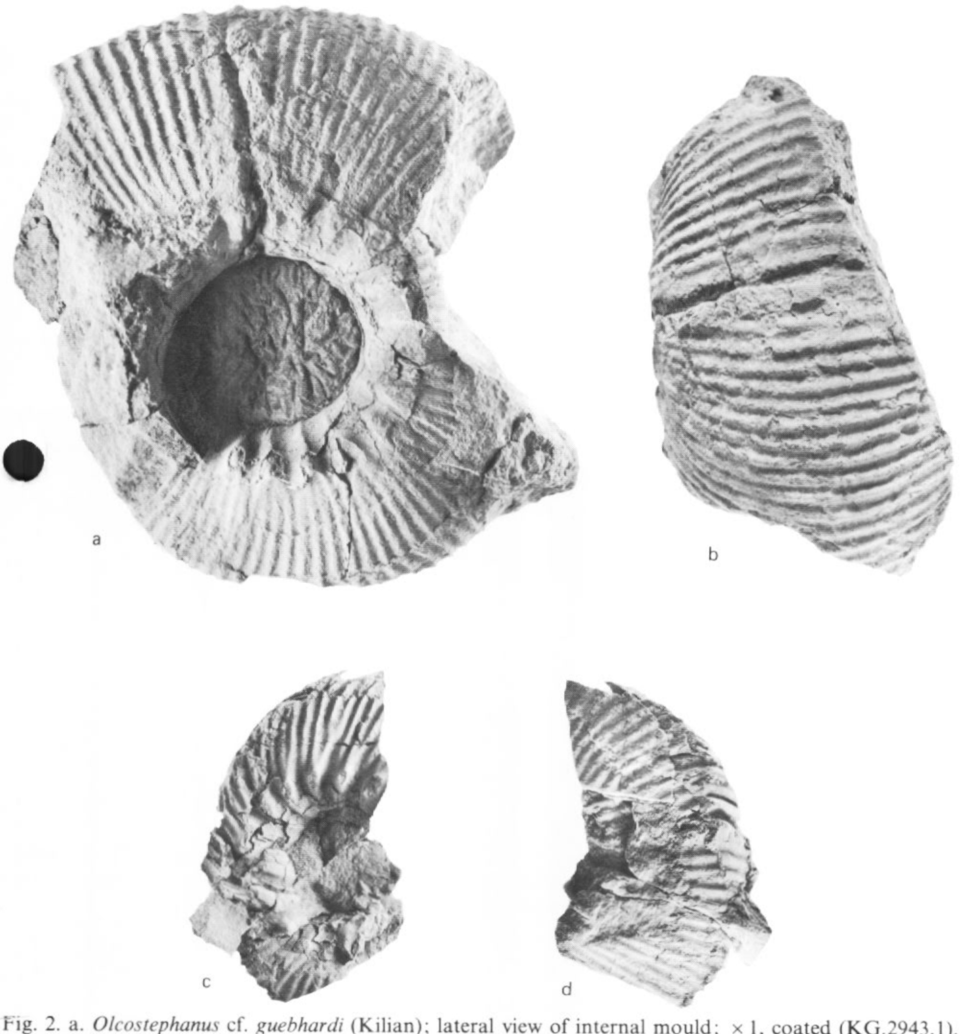

Fig. 2. a. *Olcostephanus* cf. *guebhardi* (Kilian); lateral view of internal mould; × 1, coated (KG.2943.1). b. *O.* cf. *guebhardi* (Kilian); ventral view of same specimen; × 1, coated (KG.2943.1). c. *Olcostephanus* sp.; lateral view of crushed internal mould; × 1, coated (KG.2942.14). d. *O.* sp.; ventral view of same specimen; × 1, coated (KG.2942.14).

Description. The specimen is strongly involute, with a deep umbilicus and broadly convex flanks, the greatest width (estimated to be about 50 mm) being at the umbilical edge. The whorl section is moderately depressed, and the shell diameter is approximately 85 mm. The ornament consists of stout, radial primary ribs, which cross the steep umbilical wall and divide into bundles of four or five secondary ribs at prominent tubercles on the umbilical rim (Fig. 2a). These secondaries cross the flanks radially and are uninterrupted on the venter (Fig. 2b). Between the bundles there are occasional intercalated ribs and, on the outer whorl, there is a gently prorsiradiate constriction which cuts across the ribs (Figs. 2a, b).

Remarks. The specimen closely resembles the holotype of *Olcostephanus guebhardi* (= *Holcostephanus* (*Astieria*) *guebhardi* Kilian, 1902, p. 866, pl. 57, fig. 2a, b), though

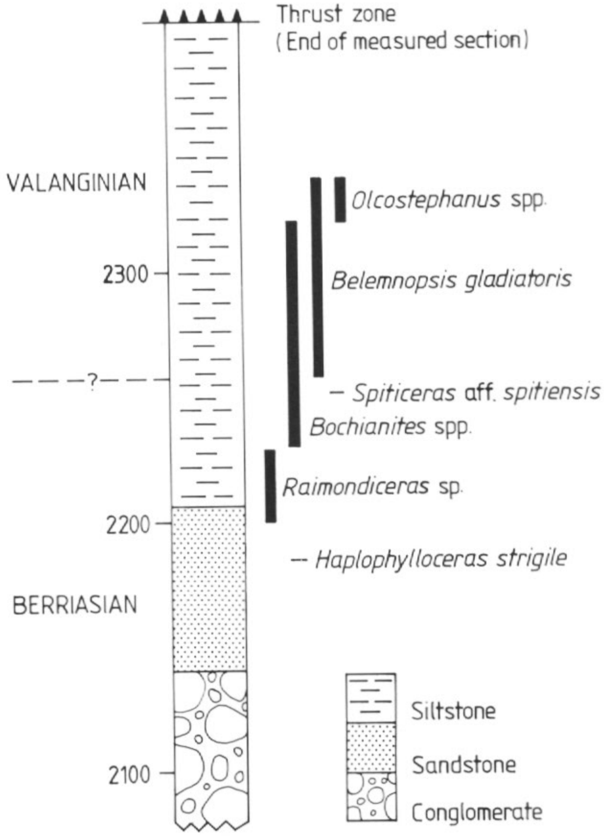

Fig. 3. Generalized section of uppermost part of Ablation Valley succession showing extents of fossil groups mentioned in text. The figures indicate height in metres above the base of the measured section. The position of the stage boundary is only approximate.

it differs slightly in its more arched whorl section and angular umbilical rim. Constrictions are absent on the French specimen.

There are similarities too with *O. sakalavensis* (Besairie) from Pakistan (Fatmi, 1977, pl. 3, fig. 2a) and the Malagasy Republic (e.g. Cooper, 1981, fig. 57). However, typically that species has rursiradiate primary ribs and prorsiradiate secondaries. Furthermore, the tubercles are rather weak, and Spath (1939, pl. V, fig. 5) illustrated an almost untuberculate example from the Malagasy Republic.

The holotype of *O. rabei* (Besairie), refigured by Cooper (1981, fig. 69 A, B), is also close to the Antarctic specimen, but like *O. sakalavensis*, the secondary ribs are prorsiradiate.

Comparison with other Antarctic *Olcostephanus* described by Thomson (1981) from the South Orkney Islands (Fig. 1) is difficult because of the poor preservation of the material. However, the bundling of the ribs is sufficiently clear to show that the example from South Orkney Islands does not belong to the same species as the Alexander Island specimen.

Occurrence. O. guebhardi (Kilian) has been recorded from France, southern Germany, Switzerland, Italy, the Crimea and Bulgaria, mainly in rocks of early Hauterivian age.

Olcostephanus sp.
Fig. 2c, d

Material. One incomplete, crushed internal and external mould (KG.2942.14) from the western end of the ridge along the south side of Ablation Valley, Alexander Island (70° 50′ S, 68° 32′ W).

Description. This small specimen has been strongly distorted obliquely to the venter, and the direction of ribs and degree of inflation of the phragmocone are difficult to determine with any certainty. However, it is considered to have been moderately evolute with stout primary ribs on the umbilical wall which appear to be radial or gently rursiradiate. On the rounded umbilical edge these ribs swell into prominent, pointed tubercles, which give rise to two or three (?)prorsiradiate ribs; at least one of these divides on the flank (Fig. 2c). Between the bundles, an intercalated rib is usually present. All the ribs apparently continue over the venter without interruption (Fig. 2d).

Remarks. The specimen is poorly preserved and, although assignable to *Olcostephanus* on the general form of the shell, ribs and tubercles, it cannot be designated with certainty to any species. It is possible that the specimen represents a juvenile of *O.* cf. *guebhardi* but it would appear to be distinguished both by the shape of its tubercules and the number of secondary ribs per tubercle. *Olcostephanus* sp. is similar to some specimens figured as *O. baini* (Sharpe) (e.g. Cooper, 1981, figs. 115A, C; 129B), though the ribbing differs from the holotype of this species (Sharpe, 1856, p. 197, pl. 23, fig. 2a, b).

Other species that can be compared with the Antarctic specimen are *O. mitreanus* (d'Orbigny) from the Neocomian of France (see Cottreau, 1934, p. 49, pl. 69, figs. 12–14), *O. rogersi* (Kitchin, 1908, p. 201, pl. IX, fig. 3 and pl. X, fig. 2) from the Valanginian of South Africa, *O. wynnei* Spath (1939, p. 29, pl. XIX, fig. 6a, b) from the Valanginian of Pakistan and *O. detonii* (Rodighiero) (= *Spiticeras? detonii* Rodighiero, 1919, p. 94, pl. 9, fig. 12) from the Neocomian of Italy. However, in all these examples, the primary ribs and tubercles extend too far onto the flanks to allow close comparison with the material described here.

SIGNIFICANCE

The genus *Olcostephanus* is mainly restricted to the Upper Valanginian and Lower Hauterivian (Cooper, 1981) and, despite *O. guebhardi* being predominantly of early Hauterivian age, it is here considered that the Ablation Valley specimens are Valanginian. This interpretation is indicated by the occurrence a little below the *Olcostephanus* horizon of *Bochianites* aff. *versteeghi* Boehm and *Haplophylloceras strigile* (Blanford) (Fig. 3). These species are similar to those found in some southern hemisphere Jurassic–Cretaceous transition sequences (e.g. Boehm, 1904), and suggested a Berriasian age to Taylor and others (1979, p. 36). This is supported by the presence of a specimen of *Spiticeras* aff. *spitiensis* (Blanford), which is usually considered as Berriasian in age. Two specimens of the ammonite *Raimondiceras* Spath were also found in the sequence (Fig. 3). This genus has been found in both the Berriasian and the Valanginian (Leanza, 1981), whereas *Spiticeras* is unknown in the Valanginian.

Associated with *Olcostephanus* are abundant *Belemnopsis gladiatoris* Willey, first described from the Fossil Bluff Formation by Willey (1973). *B. gladiatoris* is apparently represented in the Upper Valanginian of South Africa by a specimen illustrated by Cooper (1981, p. 355, fig. 204) as *B. africana* (Tate). An example has also been cited from the Valanginian of the Malagasy Republic (Willey, 1973, p. 36).

Also included as *B. gladiatoris* are the specimens figured by Feruglio (1936, pl. X, figs. 1–4) as *Belemnites* (*Belemnopsis*) *patagoniensis* Favre from the Lower Cretaceous of Argentina.

The fauna discussed here suggests that the part of the sedimentry succession in Ablation Valley below the thrust (Fig. 3) represents the transition between the Berriasian and the Valanginian. The top of the Berriasian is delimited by *Spiticeras* aff. *spitiensis* and *Raimondiceras* sp. but its full extent is uncertain. It is thought to consist of approximately 800 metres of mostly unfossiliferous sedimentary rocks previously referred to as 'Undifferentiated Tithonian/Berriasian' by Elliott (1974). The Valanginian comprises some 150 m of moderately fossiliferous siltstones above this zone, up to the thrust (Fig. 3). This is the first time that this stage has been recognized in the Fossil Bluff Formation and its presence may be taken as a preliminary indication that the Lower Cretaceous succession on Alexander Island is more complete than previously suspected. The possibility now exists that there may be an uninterrupted transition from the Jurassic–Cretaceous boundary beds to the extensive Aptian–Albian strata further south.

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