GEOLOGICA CARPATHICA, 53, 5, BRATISLAVA, OCTOBER 2002
327–332

URGONIAN (EARLY CRETACEOUS) ECHINOIDS OF THE MIRDITA ZONE (SOUTHEAST ALBANIA)

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(Manuscript received January 29, 2002; accepted in revised form June 18, 2002)

Abstract: Remains of regular echinoids are described for the first time from Urgonian (Barremian–Aptian) strata of the central and southern Mirdita Zone (Albania). Based on spines, five species are distinguished, "*Cidaris*" *strombecki* Desor, ?*Hirudocidaris* gr. *uniformis* (Sorignet), "*Cidaris*" sp. 1, sp. 2 and sp. 3. Extremely rare coronal plates here described as "*Cidaris*" sp. are associated. The taphonomic features of these echinoid remains, the character of the associated fauna and the lithology correspond well to the shallow-water nature of the settings studied.

Key words: Albania, Lower Cretaceous, Mirdita Zone, regular echinoids, taphonomy.

Introduction

Between 1980 and 1985, one of the authors (LHP) collaborated in a project on the stratigraphy and paleogeography of Upper Jurassic-Cretaceous deposits of the Mirdita Zone, financed by the Ministry of Geology and Mines of Albania (Peza & Garori 1985; Peza 1988). Numerous outcrops in these Upper Jurassic and Cretaceous deposits were studied within this project, which also resulted in a large collection of macrofossils (molluscs, corals, amongst other groups) including a small set of echinoid remains. Echinoids are exceptionally rare in these sections and are restricted to Urgonian (Barremian–Aptian) strata. The poor preservation of this material, consisting prevailingly of primary spines, preclude firm taxonomic assignments and, for this reason, most taxa are here referred to in open nomenclature. Despite these uncertainties, these are the first echinoids to be recorded from the Lower Cretaceous of Albania. All specimens are deposited in the Institute of Geology, Tirana (L.H. Peza collection).

Geographic and geologic setting

The Mirdita Zone is situated in the eastern part of Albania (Fig. 1), and comprises Paleozoic, Triassic, Jurassic, Cretaceous, Tertiary and Quaternary deposits. Ophiolites of Middle Jurassic age occupy an important position in the Mirdita Zone. Upper Jurassic and Cretaceous deposits are widely distributed in this zone and form the sedimentary cover of the ophiolites. These sediments are subdivided into four cycles, which rest transgressively over one another, namely:

— the Kimmeridgian-Valanginian cycle, consisting of basal conglomerates and pelagic deposits with *Calpionella* in the upper part;

— the Barremian-Lower Turonian cycle, consisting of basal conglomerates, followed by conglomeratic limestones and the Urgonian type of limestones;

— the Santonian-Lower Campanian cycle, comprising limestones;

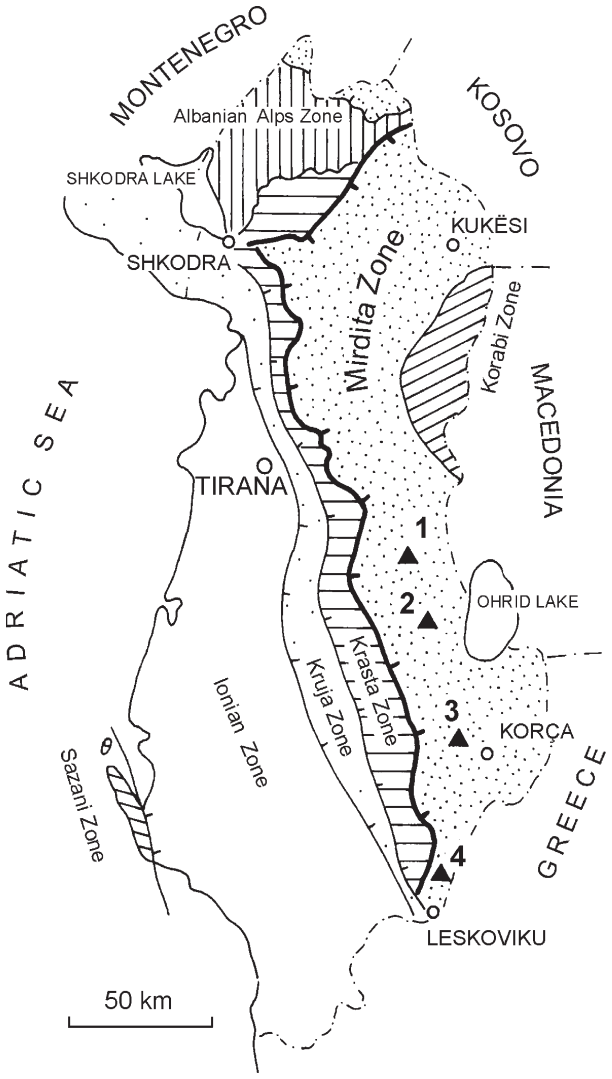

Fig. 1. Map of Albania showing tectonic units; solid triangles refer to sections which have yielded echinoid material: 1 — Farreti, 2 — Llënga, 3 — Voskopi, 4 — Radanj (Përroi and Omit).

— and the Upper Maastrichtian-Middle Eocene cycle, represented by pelagic limestones and marls with flysch deposits of the latest Maastrichtian and earliest Paleogene age at the top. Prior to the start of each cycle, the Mirdita Zone emerged and was exposed (Peza & Garori 1985; Peza 1988).

Localities

Four localities in the Mirdita Zone have yielded echinoid remains (for locations see Fig. 1): 1 — Farreti near the village of Farreti (Fig. 2), 2 — Llënga near the village of Llënga (Fig. 3), 3 — Voskopi west of the town of Korça (Fig. 4), and 4 — two outcrops (Përroi and Omit) near Radanj, near the city of Leskovik (Fig. 5).

Systematic descriptions

Echinoidea
Cidaroida Claus, 1880

"*Cidaris*" *strombecki* Desor, 1858
(for synonymy see Smith & Wright 1989, p. 100)
Fig. 6a,b; Fig. 7.16–20

Material: 2 complete and 6 incomplete spines.
Occurrence and distribution: Urgonian (Barremian-Aptian), Radanj (Përroi and Omit sections).

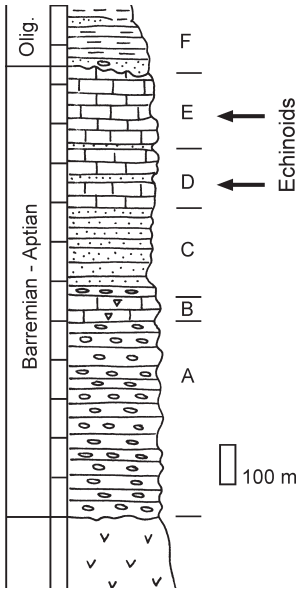

Fig. 3. Llënga section. A — thick-bedded to massive conglomerates trangressively overlying ophiolites (clasts representing mainly ophiolite, as well as Triassic, Upper Jurassic and Neocomian limestones); B — limestones with rudists; C — sandstones; D — limestones with sandstone intercalations; E — limestones (rich faunas occur in units D and E, for example, nerineacean gastropods *Aptyxiella libanotica* (Delpey), *Nerinea vogti* Mortillet, and microfossils *Carpathoporella fontis* (Patrulius), *Palaeodictyoconus arabicus* (Henson), amongst others) (Peza & Garori 1985; Peza 1988); F — Oligocene marls and sandstones.

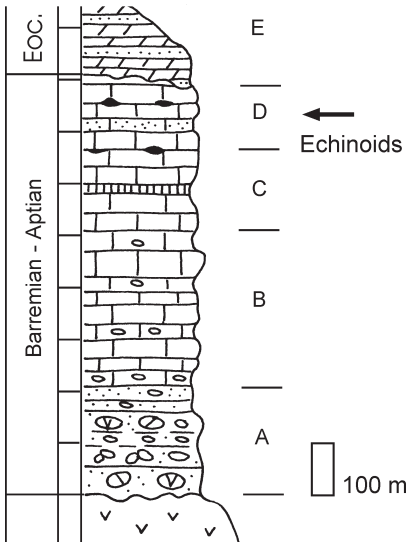

Fig. 2. Farreti section. A — conglomerates transgressively overlying ophiolites; B — conglomeratic limestones; C — sandy clayey limestones with limonitic layers; D — limestones with chert lenses and sandy clayey limestones, both rich in fossils: gastropods (e.g. *Multiptyxis prefleuriaui* (Delpey), *Diptyxis munellae* Kollmann & Peza, and others), corals (e.g., *Epismilia robusta* (Koby), and others) and algae (e.g., *Cylindroporella sugdeni* Elliot, and others) (Peza 1988; Kollmann & Peza 1997); E — Eocene yellow sandstones and marls.

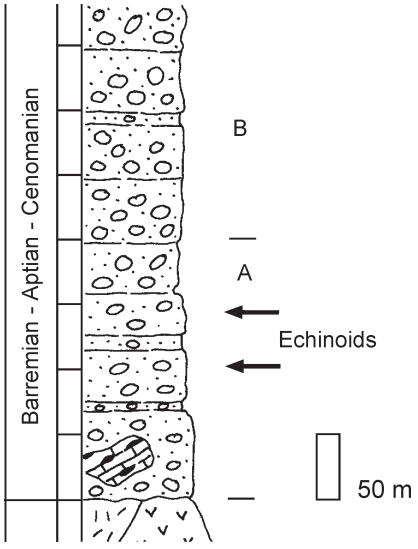

Fig. 4. Voskopi section. A — grey conglomerates (Barremian–Aptian) transgressively overlying ophiolites (effusives and serpentinites). Ophiolite pebbles prevail, and blocks of pelagic limestones with ammonites and calpionellids of Kimmeridgian –Berriasian age are present (the conglomerate matrix contains a rich fauna, for example, the gastropod *Pchelintsevia coquandi* (d'Orbigny), and corals *Dimorphocaenia* sp., *Eugyra* sp.); B — reddish conglomerates (Aptian–Cenomanian) (Peza & Garori 1985; Peza 1988).

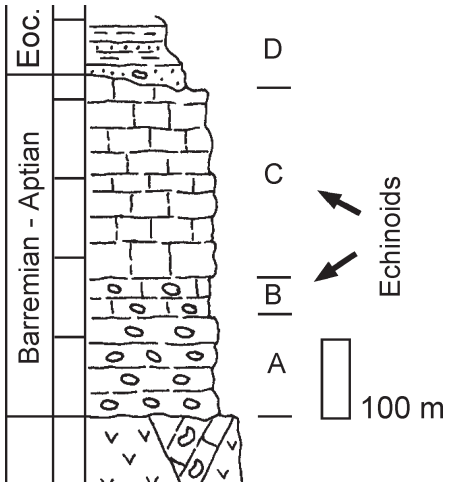

Fig. 5. Radanj (Përroi and Omit sections). A — conglomerates covering the ophiolite bedrock and Triassic limestones; B — conglomeratic limestones; C — limestone (*Plesioptyxis preolisiponensis* (Delpey) var. *delpeyi* Peza, *Nerinea* sp., and *Orbitolina* sp. are the principal faunal components in units B and C; this section has yielded most of the echinoid remains) (Peza & Garori 1985; Peza 1988); D — Middle Eocene sandstones and other deposits.

Description: Spines stout and tapering at both ends with circular cross-sections. Maximum diameter lies in the middle part (Fig. 6a,b) or in upper third (Fig. 7.18). Neck is short and smooth, milled ring relatively acute. Base is poorly preserved but its perforation is distinct in a single specimen. The shaft is covered with large granules proximally, densely arranged or in rather irregular vertical rows. These granules may rapidly pass into ribs distally (Fig. 7.16,19), or may only be elongated. More massive ribs alternate with narrow ones, which may disappear distally. The widest ribs occasionally terminate in large tubercles or blunt processes distally (Fig. 7.16), or coalesce into a relatively sharp point (Fig. 6b).

Remarks: "*Cidaris*" *strombecki* is known only by its spines, which makes the generic assignment uncertain (Smith & Wright 1989). All material referred to in the literature comes from the Albian–Cenomanian of England, France and Germany (see, e.g. Cotteau 1862; Geinitz 1871; Smith & Wright 1989; Wright 1864). The bilaterally symmetrical spine in Fig. 7.20 is only provisionally assigned to "*C.*" *strombecki* on account of the poor preservation of its surface ornament.

? *Hirudocidaris* gr. *uniformis* (Sorignet, 1850)
Fig. 7.9,10,13

Material: 6 spine fragments.

Occurrence and distribution: Urgonian (Barremian–Aptian), Radanj, Voskopi, Llënga and Farreti sections.

Description: Spines oblong and cylindrical of circular cross-section. Neck is very short and shaft longitudinally ribbed. The most massive ribs extend from the tip of spine down to the base (Fig. 7.13), while thinner secondary ones occur between the middle shaft and neck. Some ribs occasionally coalesce distally reflecting tapering of the spine. Base poorly preserved.

Remarks: Because of poor preservation, assignment of these spines is uncertain. The species *H. uniformis* (Sorignet) comprising the *uniformis* and *essenensis* subspecies is known from the Upper Albian–Middle Cenomanian of England (Smith et al. 1988; Smith & Wright 1989) and the Cenomanian of France and Germany (Lambert 1894; Schlüter 1892; for additional references see Smith & Wright 1989). Spines de-

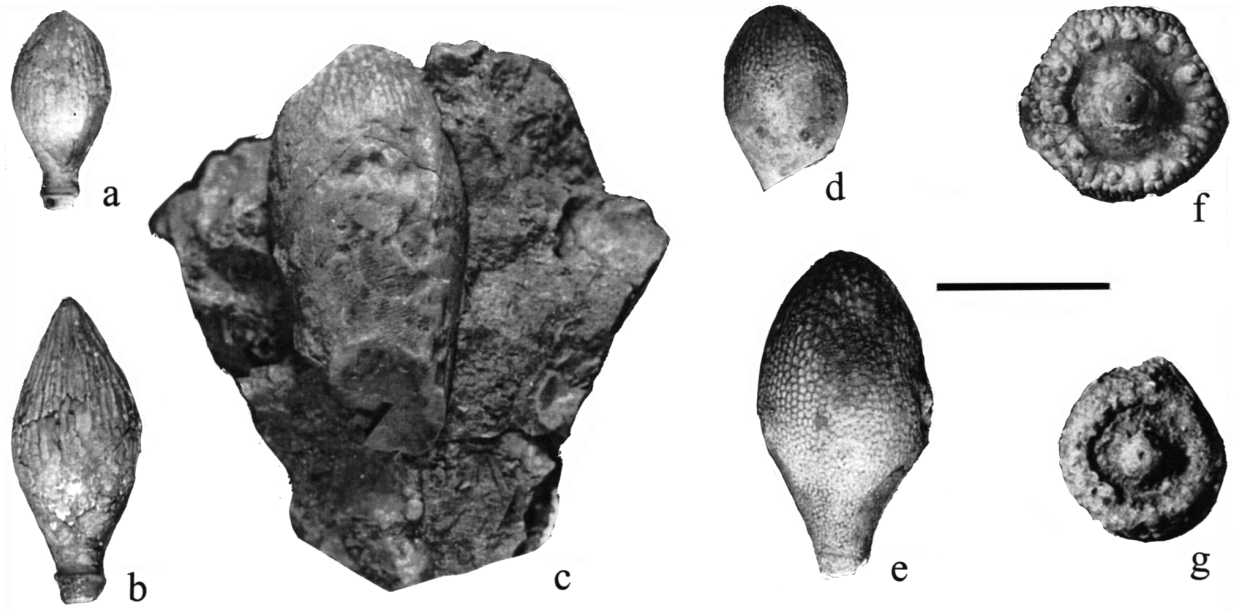

Fig. 6. Echinoid spines and test plates of the Mirdita Zone. a, b — "*Cidaris*" *strombecki* Desor (Nos. 238/1, 238/3); c–e — "*Cidaris*" sp. 3 (Nos. 238/2, 1296/2, 1296/1); f, g — "*Cidaris*" sp. (Nos. 238/4, 238/5). Barremian–Aptian, Radanj (a–c, f, g), Llënga (d, e). Scale bar = 10 mm. All specimens in L.H. Peza collection at the Institute of Geology, Tirana.

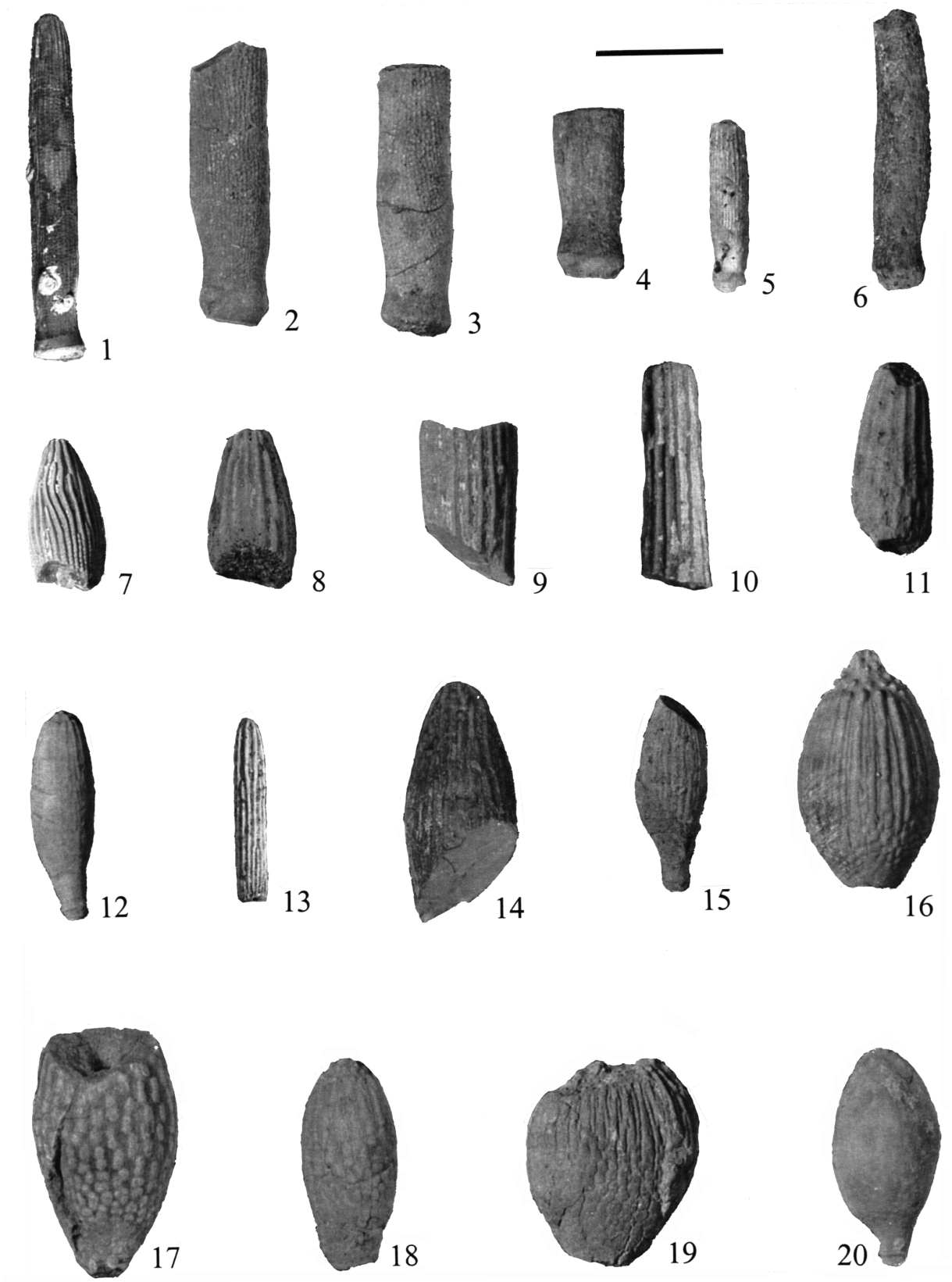

Fig. 7. Urgonian echinoid spines of the Mirdita Zone. **1–6** — "*Cidaris*" sp. 1 (1–4 — Nos. 235/1– 235/4; 5, 6 — Nos. 238/6, 238/7); **7, 8, 11, 12, 14, 15** — "*Cidaris* " sp. 2 (Nos. 238/8– 238/13); **9, 10, 13** — ? *Hirudocidaris* gr. *uniformis* (Sorignet) (Nos. 238/14 –238/16); **16–20** — *"Cidaris" strombecki* Desor (Nos. 238/17–238/21). Scale bar = 10 mm. All specimens are from Barremian-Aptian deposits at Radanj (Geological Institute, Tirana, collection of L. H. Peza).

scribed as *Cidaris lardyi* Desor, 1856 (see Mitrović-Petrović 1977 — Pl. 1: Fig. 7, except central specimen) from the Neocomian and Urgonian (Barremian–Aptian) of Serbia also are similar, but longitudinal ribs are composed of granules (for a new revision of this species see Smith & Wright 1989).

"*Cidaris*" sp. 1
Fig. 7.1–6

Material: 8 more or less fragmentary spines.

Occurrence and distribution: Urgonian (Barremian–Aptian), Radanj (Përroi and Omit sections).

Description: Cylindrical spines of circular cross-sections, with long narrow shafts and slightly expressed short necks and low collars. Base of the only better preserved specimen has a crenulate margin and shallow acetabulum. Shaft is covered with many small granules arranged in longitudinal series, distally coalescing into thin ribs.

Remarks: This species partly resembles *Cidaris lardyi* Desor, 1856 from the Lower Cretaceous (Urgonian) of Switzerland (see e.g. de Loriol 1873) from which it differs in its less pronounced shaft ornament. Similar specimens are also known from the Neocomian and Urgonian (Barremian–Aptian) of Serbia (see Mitrović-Petrović 1977 — Pl. 1: Fig. 7, central specimen) and the Aptian of Bulgaria (Dimitrova 1979 — Pl. 1: Fig. 10a,b; text-Fig. A, 4). The studied spines differ from those of the Upper Aptian of Faringdon, England (Smith & Wright 1989 — Pl. 11: Figs. 7–9), mainly by their denser granulation and slight ribs developed only distally.

"*Cidaris*" sp. 2
Fig. 7.7,8,11,12,14,15

Material: 20 spines and fragments.

Occurrence and distribution: Urgonian (Barremian–Aptian), Radanj, Voskopi, Llënga, and Farreti sections.

Description: Spines are mostly glandiform and bulbous, with longitudinal ribs in central and distal portions. The ribs are less pronounced than in ?*Hirudocidaris* (see above) and pass into faint granules on the neck. Shaft not sharply demarcated from neck. Bases of spines (Fig. 7.12,15) are poorly preserved.

Remarks: The spines are reminiscent of those of *Cidaris ryzacantha* Gras (see Mitrović-Petrović 1977 — Pl. 1: Fig. 8) from the Neocomian and Urgonian (Barremian-Aptian) of Serbia or of those of e.g., *Cidaris nesselsdorfensis* de Loriol from the Lower Cretaceous (Valanginian, Hauterivian) of Štramberk in the Moravian part of the Outer Western Carpathians (see de Loriol 1901).

"Cidaris" sp. 3
Fig. 6c,d,e

Material: One complete and two incomplete spines.

Occurrence and distribution: Urgonian (Barremian–Aptian), Radanj and Llënga sections.

Description: Shaft stout, bulbous with maximum diameter at midlength, tapering to both ends, circular in cross-section. Basal part poorly preserved. Shaft covered by densely packed, small granules, increasing in size distally and arranged into dense, poorly defined longitudinal rows.

Remarks: These specimens (especially the best-preserved one in Fig. 6e) appear to be closely similar to the spine from the Lower Cretaceous of Serbia described as *Pseudocidaris* sp. (Mitrović-Petrović 1977 — Pl. 2: Fig. 5).

"Cidaris" sp.
Fig. 6f,g

Material: 2 isolated coronal plates.

Occurrence and distribution: Urgonian (Barremian–Aptian), Radanj (Përroi and Omit sections).

Description: Interambulacral plates with centrally lying tubercle, which is perforate and slightly crenulate. Surrounding areole circular, moderately sunken. Scrobicular circle composed of about 12 larger tubercles bordering the areole and some smaller tubercles in between. The remainder of the plate surface regularly rimming the scrobicule is covered by densely packed miliary tubercles.

Remarks: Unlike the spines, these plates are not herein classified as independent species because their pertinence to some of the described spines is highly probable. The poor preservation of the plate in Fig. 6g is probably due to diagenetic dissolution and recent weathering rather than the result of taphonomic processes.

Conclusions

1. In the present paper, the first echinoid remains ever to be recorded from the Lower Cretaceous of Albania are described. They were collected from Urgonian (Barremian–Aptian) deposits of the central and southern parts of the Mirdita Zone.

2. Echinoid remains are very rare there and their preservation is such that detailed taxonomic treatment is virtually impossible. Therefore, open nomenclature is favoured for most of them.

3. Echinoids are represented by dissociated skeletal parts, that is spines and, more rarely, coronal plates. Based on these spines, five species of regular echinoids ("*Cidaris*" *strombecki* Desor, ?*Hirudocidaris* gr. *uniformis* (Sorignet), "*Cidaris*" sp. 1., sp. 2 and sp. 3) are distinguished. Coronal plates, referred here to "*Cidaris*" sp., may belong to one of the species defined on the basis of spines.

4. The material described indicates complete post-mortem disarticulation of echinoid tests and relatively short-distance transportation and rapid burial (frequent fragmentation but only slight abrasion and relatively good preservation of surface ornament) of their remains. These taphonomic features fit well with the shallow-water conditions under which the Barremian-Aptian rocks of the Mirdita Zone were deposited (Peza & Garori 1985; Peza 1988).

Acknowledgement: We thank John W.M. Jagt from the Natural History Museum Maastrich, for insightful comments to the manuscript of this paper.

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