Cretaceous Research 51 (2014) 95–111

Contents lists available at ScienceDirect

Cretaceous Research

journal homepage: www.elsevier.com/locate/CretRes

Revision of the echinoid genus *Micropedina* Cotteau, 1866 and description of a new species from the upper Cenomanian of Egypt

Marouf A.M. Abdelhamid

Geology Department, Ain Shams University, Cairo, Egypt

ARTICLE INFO

Article history:
Received 12 March 2014
Accepted in revised form 21 May 2014
Available online 2 July 2014

Keywords:
Pedinoida
Taxonomy
Mid-Cretaceous
Egypt

ABSTRACT

Currently, the genus *Micropedina* contains seven species and a single variety, with records from the lower Upper Cretaceous of Europe (Portugal, Spain), North Africa (Algeria, Tunisia and Egypt), West Africa (Nigeria), the Middle East, India and the Americas. In Egypt, a total of five species is known to date. Based on the oblique arrangement of pore pair triads in each compound ambulacral plate, three species cannot be assigned to the genus any longer; these are '*M.*' *sphaeroides*, '*M.*' *rotularis* and '*M.*' *bipatellis*. Using ambulacral plate compounding, two species are valid, *M. olisiponensis* and *M. cotteaui*, in addition to a variety which is here elevated to species rank, *M. gongilensis*, and a new species erected herein, *M. simplex*. Three species are described from the upper Cenomanian Galala Formation of north Wadi Qena (Northeastern Desert, Egypt) namely *M. olisiponensis*, *M. cotteaui* and *M. simplex* sp. nov. The palaeobiogeography, functional morphology and palaeoecology of the genus are discussed.

1. Introduction

There has been much confusion over the genus *Micropedina* and most of its species, this being related to many factors, including whether or not tubercles are crenulate (often difficult to establish due to their very small size), variation of test shape and in number and distribution of tubercles on both ambulacral and interambulacral areas and style of compounding of ambulacral paltes, which is occasionally obscured. Part of this confusion is based on disregard of description or illustrations of plate compounding. Smith *in* Smith and Kroh, 2014 (echinoid directory) synonymized *Micropedina* to the genus *Cottaldia* Desor, 1856. *Micropedina* is considered here as a separate genus. The two genera differ in the disposition of pore pairs and in density of tuberculation. In *Micropedina*, pore pair triads situated in an oblique arrangement; in the other genus, the poriferous zones are uniserial (pore pairs at the same vertical line). Both two genera having fine tubarculation but the primary and milliary tubercles are extremely dense in *Cottaldia*, sparse in *Micropedina*. The present paper is devoted to reviewing of the genus and its constituent species and to a description of specimens from north Wadi Qena, Northeastern Desert, and additional material deposited at the Cairo Geological Museum. Numerous papers have been devoted to Cretaceous echinoids from Egypt, including species of *Micropedina* (e.g., Gregory, 1906; Fourtau, 1909, 1912, 1914, 1921; Stefanini, 1918; Geys, 1992; Abdelhamid and Azab, 2003; El Qot, 2006, 2010; El Qot et al., 2009). Gregory (1906) established *Micropedina bipatellis* for material from the Cenomanian of Gabal Gunnah and the northern side of Gabal Um Raiyig northeast Sinai. Fourtau (1909) erected *Micropedina humei* from the upper Cenomanian of Bahariya Oasis, while Fourtau (1912) described a new species, *Micropedina conica*, from the Cenomanian of Gabal Tibul. The present work is based on ten specimens of *Micropedina* from the upper Cenomanian of two sections at north Wadi Qena, Northeastern Desert, and twenty five deposited in the collections of the Cairo Geological Museum.

2. Stratigraphic setting

Two sections exposing Upper Cretaceous strata along the western margin of the northern part of Wadi Qena (Fig. 1) have been measured: the north Wadi Qena section and the Wadi El Burga section. The first is situated at N 27° 57′ 57″, E 32° 30′ 58″, the other lies 25 km south of it, at the mouth of Wadi El-Burga N 27° 44′ 51″, E 32° 33′ 55″, a branch of Wadi Qena. Part of the material in the present paper was collected from upper Cenomanian beds (Galala Formation) at these sections. Three specimens of *Micropedina cotteaui* (Coquand, 1862) and five of *M. olisiponensis* (Forbes, 1850) were collected from a marl bed in a sequence of marls and limestone in the Galala Formation at the north Wadi Qena section (Fig. 2A). This bed is rich in echinoids (Abdelhamid, 2014); the following species have been recorded to date: *Heterodiadema*

E-mail address: Marouf_59@hotmail.com.

http://dx.doi.org/10.1016/j.cretres.2014.05.015
0195-6671/

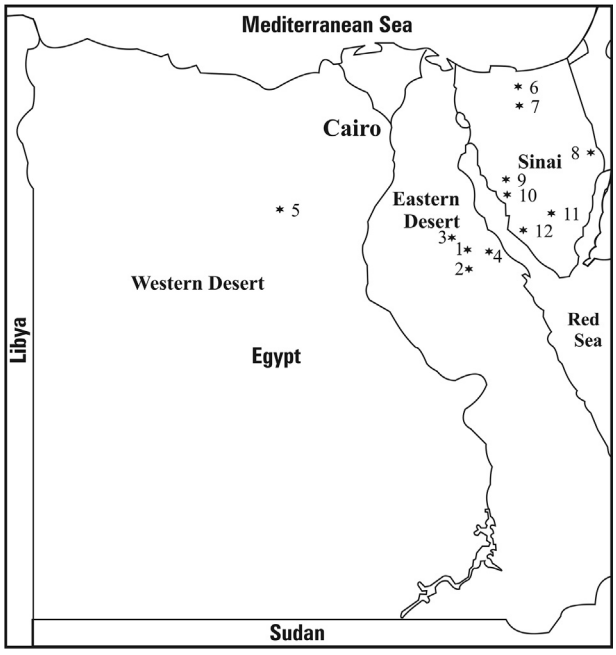

Fig. 1. A. Location map. 1, north Wadi Qena section; 2, Wadi El Burga section; 3, Wadi Hawashiya; 4, Gabal Gharamul; 5, Bahariya Oasis; 6, Gabal El Tourkmania; 7, Gabal Yelleg; 8, Gabal Safra; 9, Wadi Um Hemaiet; 10, Wadi Dara; 11, Gabal Gunna; 12, Gabal Tibul.

libycum (Desor in Agassiz and Desor, 1846), *Tetragramma variolare* (Brongniart, 1822), *Goniopygus menardi* (Desmarest, 1825), *Coenholectypus bairensis* Fourtau, 1912 and *Mecaster pseudofourneli* (Peron and Gauthier in Cotteau, Peron and Gauthier, 1879). This echinoid assemblage overlies a sequence of marl and shale, rich in late Cenomanian oysters *Exogyra* (*Costagyra*) *olisiponensis* Sharpe, 1850, *Ilymatogyra* (*Afrogyra*) *africana* (Lamarck, 1801), and the late Cenomanian inoceramid bivalve *Inoceramus* ex gr. *Pictus* J. de C. Sowerby, 1829 (see Nagm et al., 2011) and yielding the late Cenomanian ammonite *Neolobites vibrayeanus* (d'Orbigny, 1841) (see Wiese and Schulze, 2005; Nagm et al., 2010; Nagm and Wilmsen, 2012). This confirms that the overlying echinoid horizon with *Micropedina olisiponensis* and *M. cotteaui* is of late Cenomanian age. El Qot (2006) recorded *M. olisiponensis* from the *Vascoceras cauvini* Zone in the Sinai. The same author (El Qot, 2010) noted it from the uppermost Cenomanian of the Saint Paul section (in *V. cauvini* Zone). Two specimens of *Micropedina simplex* sp. nov. were collected from a yellowish, nodular marl bed at the Wadi El-Burga section (Fig. 2B). This echinoid forms part of an echinoid assemblage with *Coenholectypus excisus* (Desor in Agassiz and Desor, 1847), *Archiacia sandalina* (Agassiz in Agassiz and Desor, 1847) and *Claviaster libycus* Gauthier, 1889 and the oyster *Rhynchostreon mermeti* (Coquand, 1862). The bed yielding the specimens is stratigraphically lower than the one that yields both *Micropedina cotteaui* and *M. olisiponensis* bed in the north Wadi Qena section. It occurs at the base of a sequence of marl and limestone rich in oysters (*Exogyra* (*Costagyra*) *olisiponensis* Sharpe, 1850 and *Ilymatogyra* (*Afrogyra*) *africana* (Lamarck, 1801) and with *Neolobites vibrayeanus*, suggesting an early late Cenomanian age date.

3. Revision of *Micropedina* Cotteau, 1866

Diagnosis. Test of moderate size, subglobular, nearly flattened on adoral surface. Compound ambulacral plates trigeminate with pore pairs arranged in oblique triads, the adoral pore pair being displaced from the adradial suture and the adapical one closest to that suture. The tubercles are small, numerous, homogeneous, perforate and non-crenulate (before Smith and Bengtson, 1991), of equal size in both ambulacral and interambulacral areas, forming horizontal and vertical series (4–6 columns per ambulacrum, 12–16 columns per interambulacrum). Coronal plates are low and elongate. Peristome is small. Apical disc is dicyclic; the hydropores cover genital plates 1, 2 and 3 (only mentioned in Cotteau, 1866) (Cotteau, 1866, p. 822; Pomel, 1883, p. 98; Duncan, 1889, p. 75; Lambert and Thiéry, 1910, p. 206; Fell, 1966, p. U359). Between 1866 and 1991, all echinoid workers agreed unanimously that the tubercles of the genus were non-crenulate, and that it could be assigned to the family Pedinidae Pomel, 1883 in order Pedinoida Mortensen, 1939. Smith and Bengtson (1991) described *M. olisiponensis* from the

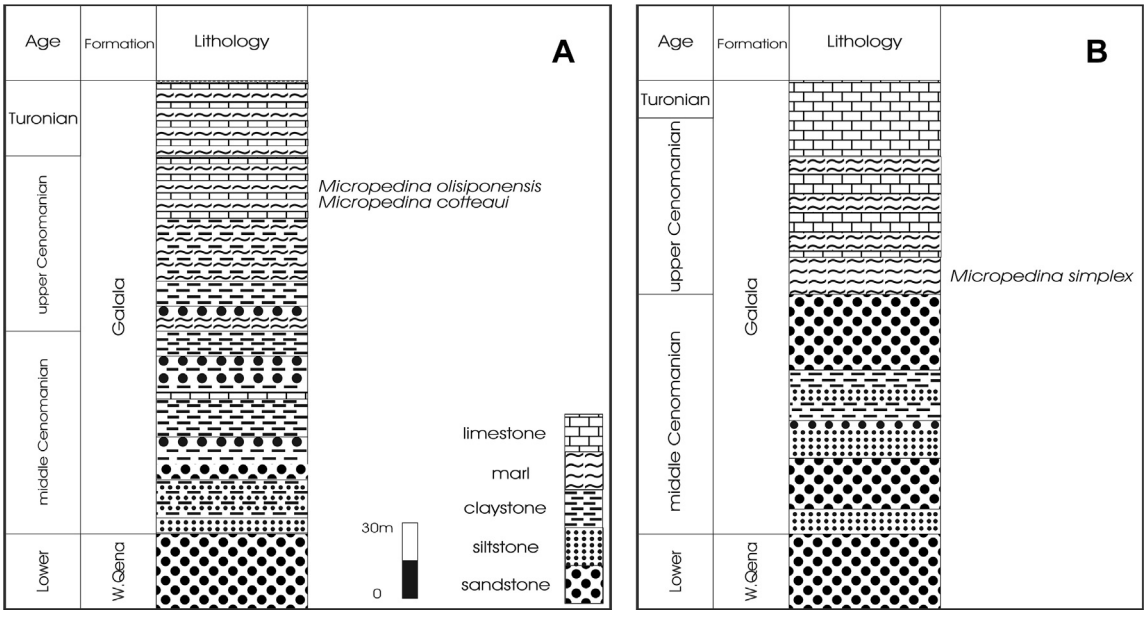

Fig. 2. Stratigraphic section of the Cenomanian succession (Galala Formation) showing *Micropedina* horizon at north Wadi Qena section (A) and Wadi El-Burga section (B).