Cretaceous Research 85 (2018) 142–171

Contents lists available at ScienceDirect

Cretaceous Research

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

Aptian–early Cenomanian ammonites from north Sinai, Egypt: Systematic paleontology and biostratigraphy

Gamal M. El Qot

Geology Department, Faculty of Science, Benha University, Benha, Egypt

ARTICLE INFO

Article history:
Received 11 May 2017
Received in revised form
24 September 2017
Accepted in revised form 19 October 2017
Available online 21 October 2017

Keywords:
Ammonites
Aptian–early Cenomanian
North Sinai
Egypt

ABSTRACT

The Aptian–lower Cenomanian succession exposed in north Sinai is subdivided into two formations; the Risan Aneiza Formation (Aptian–lower Albian) and the Halal Formation (middle Albian–lower Cenomanian). These deposits are rich in fossils, especially ammonites. Thirty-one ammonite species have been identified and systematically described from the Aptian–lower Cenomanian successions exposed at Gebel El Tourkumanyia, Gebel El Mistan, and Wadi El Karm. The studied ammonites belong to 22 genera, 13 families, and 4 suborders. The genus *Acompsoceras* along with three species *Eogaudryceras* (*Eotetragonites*) *raspaili* Breistroffer, *Mortoniceras* (*Subschloenbachia*) *rostratum* (J. Sowerby) and *Mariella* (*M.*) *essenensis* (Geinitz) are recorded herein for the first time from Egypt. The identified ammonites enabled the recognition of five biozones in Gebel El Tourkumanyia, four biozones in Gebel El Mistan, and two biozones in Wadi El Karm. The five recognized biozones in Gebel El Tourkumanyia are *Aconeceras* (*A.*) *nisus*, *Knemiceras gracile*, *Dipoloceras* (*D.*) *cristatum*, *Mortoniceras* (*M.*) *inflatum*, and *Mortoniceras* (*Subschloenbachia*) *rostratum* zones. The recognized biozones in Gebel El Mistan are *Cheloniceras* (*Epicheloniceras*) *tschernyschewi*, *Knemiceras gracile*, *Dipoloceras* (*D.*) *cristatum*, and *Mortoniceras* (*M.*) *inflatum* zones. The two biozones of Wadi El Karm are *Mortoniceras* (*Subschloenbachia*) *rostratum* and *Mantelliceras saxbii* zones.

1. Introduction

The Lower Cretaceous strata exposed in north Sinai, cropping out mainly along the northern and eastern flanks of El Magharah dome, are very rich in marine invertebrates. Ammonites are considered the main diagnostic fossils here. Only few detailed taxonomic studies were carried out on the ammonites, including those of Douvillé (1916), Mahmoud (1955), Lewy and Raab (1978), Aboul Ela et al. (1991), Hamama (1993), Geyer et al. (1997), Aly and Abdel-Gawad (2001), Hamama and Gabir (2001), Aly et al. (2005), Aly (2006), and Abu-Zied (2006 and 2008). The goal of the present study is to provide a detailed systematic study of the Aptian–early Cenomanian ammonites of North Sinai, Egypt. The identified ammonites are also used to construct a biostratigraphic framework for this interval.

Three sections were selected for this study; Gebel El-Mistan (Latitude 30° 50′N and Longitude 33° 36′E), Gebel El Tourkumanyia (Latitude 30° 47′N and Longitude 33° 29′E) and Wadi El Karm (Latitude 30° 40′N and Longitude 33° 25′E) (Fig. 1).

2. Material and methods

The present work is based on bed by bed collecting of the macrofossil assemblages of the Aptian–lower Cenomanian succession exposed at the three studied sections. The studied material was collected in several field trips during the years 2007–2008. The studied ammonites are housed at the Geology Department, Benha University (BU).

3. Stratigraphy

3.1. Lithostratigraphy

The studied Lower Cretaceous–Cenomanian succession at Gebel El Tourkumanyia, Gebel El Mistan, and Wadi El Karm is subdivided into two lithostratigraphic units: Risan Aneiza and Halal formations.

3.1.1. The Risan Aneiza Formation (Said, 1971)

The Risan Aneiza Formation represents the base of both Gebel El Tourkumanyia and El Mistan sections. It underlies conformably the Halal Formation while its base is unexposed (Fig. 2). It consists

E-mail addresses: g_elqot@hotmail.com, g_elqot@yahoo.com.

https://doi.org/10.1016/j.cretres.2017.10.013
0195-6671/

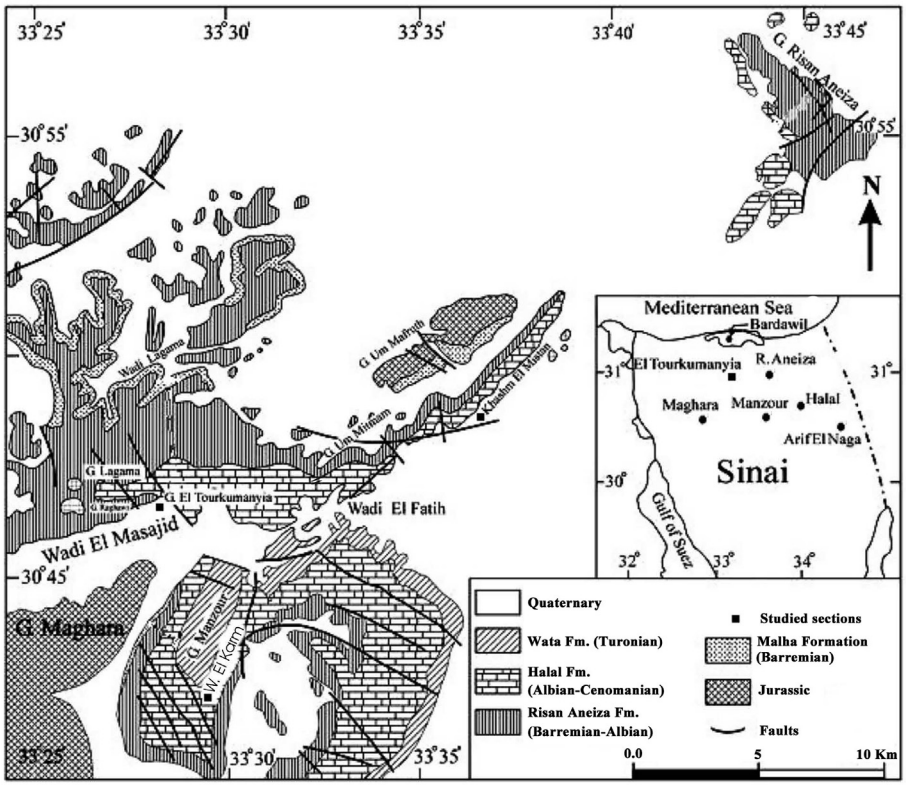

Fig. 1. Geological map of the study area, after Abu-Zeid (2008).

mainly of yellow and yellowish gray marl, oolitic limestone, dolomitic limestone and sandy limestone with yellowish gray and green shales and sandstone interbeds. It attains a thickness of 335 m at Gebel El Tourkumanyia and 168 m at Gebel El Mistan (Fig. 3). The formation is highly fossiliferous, containing many bivalves such as *Trigonia picteti* (Coquand), *Pterotrigonia* (*Scabrotrigonia*) *scabra* (Lamarck), *Gervillaria alaeformis* (Sowerby), in addition to several rudist banks that characterize the upper part of the formation. Gastropods include *Colombellina* (*C.*) *fusiformis* Douvill, *Pyrazus* (*P.*) *valeriae* (Verneuil and Lorière), *Tylostoma* (*T.*) spp., and *Ampullina* (*A.*) spp. The Risan Aneiza Formation also yields the early Aptian ammonite *Deshayesites deshayesi* (d'Orbigny) at the basal part (Abu-Zied, 2006 and 2008) and the early Albian ammonite *Knemiceras gracile* Douvill in the upper part of the formation. Likewise, the formation is very rich in smaller benthic and planktic foraminifera (Abu-Zied, 2007) in addition to the conspicuous beds with abundant *Orbitolina* spp. including *Palorbitolina lenticularis* (Blumenbach), *Orbitolina* (*Mesorbitolina*) *lotzei* (Schroeder), and *O.* (*M.*) *texana* (Roemer). Based on the occurrence of *Deshayesites deshayesi* (d'Orbigny) in the basal part of the formation and *Knemiceras gracile* Douvill in its upper part, the Risan Aneiza Formation at both studied sections is assigned the Aptian to early Albian age.

3.1.2. The Halal Formation (Said, 1971)

The Halal Formation was first proposed by Said (1971) at Gebel Halal. At Gebel El Tourkumanyia and Gebel El Mistan, the Halal Formation overlies conformably the Risan Aneiza Formation while at Wadi El Karm (Dame section) the base of the formation is unexposed. In the studied sections, the formation consists mainly of white, gray dolomitic limestone, chalky limestone, limestone and marl with shale interbeds (Figs. 2–4). The formation is 210 m thick at Gebel El Tourkumanyia, 115 m at Gebel El Mistan, and 55 m at Wadi El Karm. The Halal Formation is highly fossiliferous. At Gebel El Tourkumanyia and Gebel El Mistan, it yields oysters *Ceratostreon flabellatum* (Goldfuss), *Rhynchostreon suborbiculatum* (Lamarck), and *Chondrodonta* sp. In addition, numerous rudist beds composed of caprinids and radiolitids including *Ichthyosarcolites* sp., *Sellaea* sp. and *Eoradiolites liratus* (Conrad). Among the gastropods are *Acteonella delgadoi* Choffat, *Pterocera incerta* d'Orbigny, *Colombellina* (*C.*) *fusiformis* Douvill, and *Pyrazus* (*P.*) *valeriae* (Verneuil and Lorière). The middle part of the formation is very rich in late Albian ammonites such as *Dipoloceras* (*D.*) *cristatum* (Deluc *in* Brongniart), *Mortoniceras inflatum* (Sowerby), while its upper part yields rare and relatively poorly preserved specimens of early Cenomanian ammonite *Sharpeiceras laticlavium* (Sharpe). The formation contains also rich planktonic foraminifera such as *Favusella washitensis* (Carsey), *Rotalipora subticinensis* (Gandolfi) and *Ticinella praeticinensis* Sigal (Abu-Zied, 2007), while beds of *Orbitolina* (*Mesorbitolina*) *subconcava* Leymerie characterize the lower and middle parts of the formation. In Wadi El Karm, the basal part yields the late Albian ammonite *Mortoniceras* (*Subschloenbachia*) *rostratum* (J. Sowerby) and the oysters *Ceratostreon flabellatum* (Goldfuss) and *Rhynchostreon suborbiculatum* (Lamarck). The upper part of the formation yields the early Cenomanian ammonites *Mantelliceras saxbii* (Sharpe) and *Sharpeiceras laticlavium* (Sharpe). The above mentioned fauna indicates that the Halal Formation is middle Albian–early Cenomanian in age at Gebel El Tourkumanyia and Gebel El Mistan, and late Albian–early Cenomanian age at Wadi El Karm.

3.2. Biostratigraphy

The stratigraphic distribution of the identified ammonites enabled the subdivision of the studied sequence into five zones in Gebel El Tourkumanyia, four zones in Gebel El Mistan, and two zones in Wadi El Karm (Figs. 2–4). The proposed zones are