Funginella? *isfahanensis* n. sp. from the upper Albian of Iran

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ABSTRACT

Funginella? isfahanensis n. sp. is a new nominal solitary scleractiniid coral from the upper Albian of Iran. Its dimensions, associated sedimentary facies and descriptions, all conform to those of the four specimens described as "Funginella sp. 2" in Abdel-Gawad and Gameil (1995, Cretaceous and Palaeocene Coral Faunas in Egypt and Greece: Coral Research Bulletin 4, 1-36) from North Sinai, Egypt. A preliminary discussion on small solitary cupolate coral species is presented.

Key words: coral, cupolate-discoid growth, taxonomy, Kolah-Qazi section, Iran.

RESUMEN

Funginella? isfahanensis n. sp. es un nuevo coral escleractinio solitario del Albiano superior de Irán. Sus dimensiones, facies sedimentarias asociadas y descripción, concuerdan con las de cuatro especímenes descritos como "Funginella sp. 2" por Abdel-Gawad y Gameil (1995, Cretaceous and Palaeocene Coral Faunas in Egypt and Greece: Coral Research Bulletin 4, 1-36) para el Sinaí norte, Egipto. Se presenta una descripción preliminar de especies pequeñas de coral solitario en cúpula.

Palabras clave: corales, crecimiento en cúpula-discoidal, taxonomía, sección Kolah-Qazi, Irán.

INTRODUCTION

Little has been published about the solitary corals from the Albian of the Middle Eastern and southwestern Asian countries. Baron-Szabo *et al*. (2003) dealt with colonial corals from the neighborhood of Isfahan. Only a few publications from the Albian of Egypt were available for comparison. Aboul Ela *et al.* (1991) recorded "*Micrabacia* sp." as a common element in shales of the lower Albian of Gabal Manzour section (North Sinai, Egypt). No description was given, but two hemispherical solitary corals of less than 10 mm in diameter were illustrated. They have four complete cycles and a fifth incomplete septal cycle. Abdel-Gawad and Gameil (1995) described solitary corals from lower Albian from the same area: "*Funginella*" sp. 1 (b in Figure 1.6, 96–100 septa) and "*Funginella*" sp. 2 (a in Figure 1.6, 48–50 septa), "*Paracycloseris*" sp. 1 (c in Figure 1.6, 70–80 septa) and sp. 2 (d in Figure 1.6, 60–70 septa). They are found in "highly fossiliferous argillaceous limestones alternating with ferruginous sandstones and

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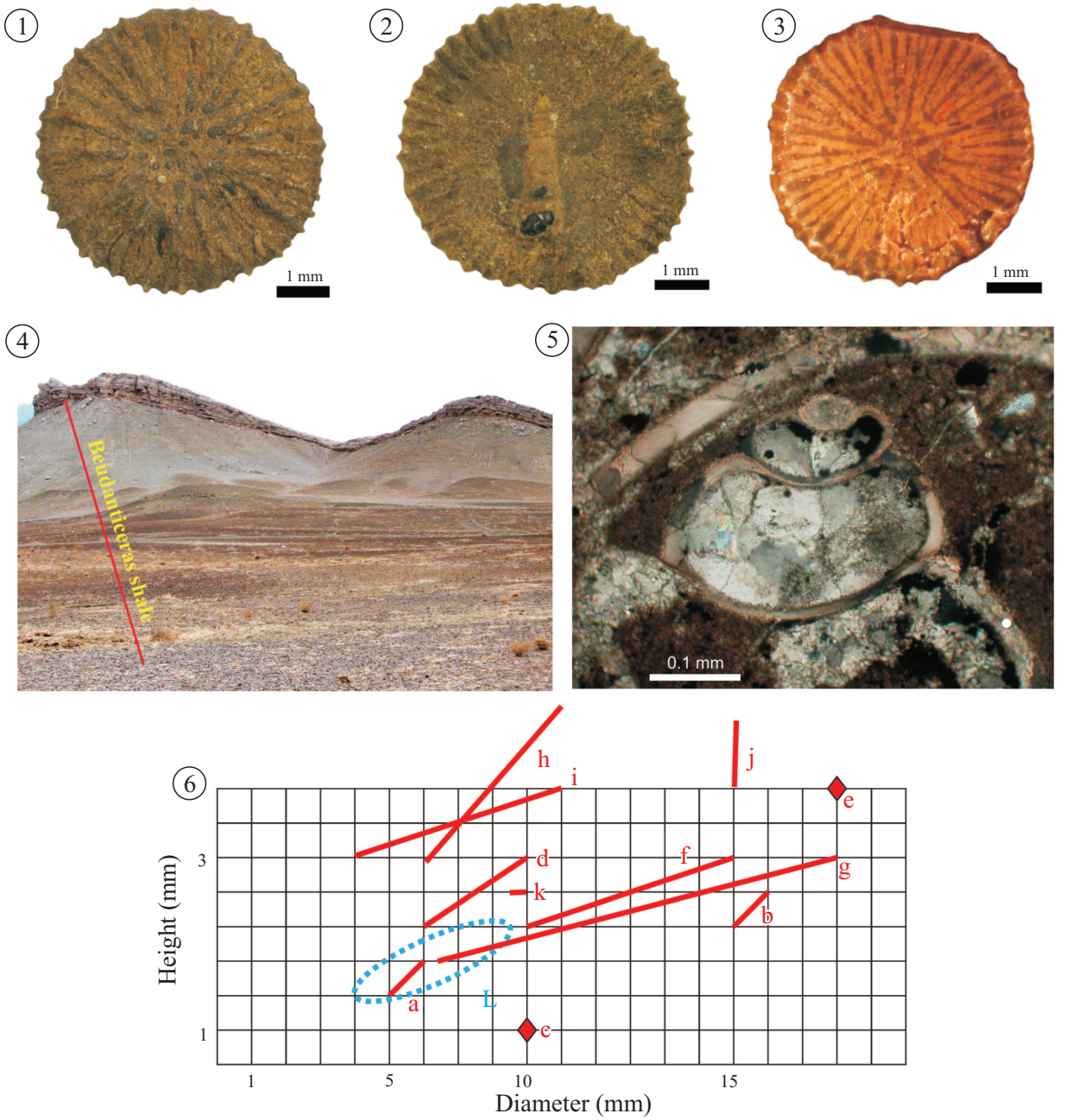

Figure 1. 1: RGM.532526. *Funginella*? *isfahanensis* n. sp., holotype, top view. 2: RGM.532526. *Funginella*? *isfahanensis* n. sp., holotype, basal view incuding a turritellid gastropod as substratum. 3: RGM.532521 *Funginella*? *isfahanensis* n. sp., paratype; polished top view. 4: *Beudanticeras* shale in the Kolah-Qazi area. 5: RGM.532527. A thin section of the turritellid gastropod limestone. 6: Height against diameter plot, a = "*Funginella* sp. 2" *in* Abdel-Gawad *et al.*, (1995); b = "*Funginella* sp. 1" in Abdel-Gawad *et al.* (1995); c = "*Paracycloseris* sp. 1" *in* Abdel-Gawad *et al.* (1995); d = "*Paracycloseris* sp. 2" *in* Abdel-Gawad *et al.* (1995), e = *Funginella martini* d'Orbigny, 1850 *in* Beauvais (1982), f = *Actinoseris cenomaniensis* d'Orbigny, 1850 *in* Fromentel (1861, p. 127), g = "*Cycloseris" escosurae* Mallada, 1887 *in* Russo *et al.* (1996), h = *Asteroseris coronula* (Fromentel, 1863) *in* Fromentel (1867), i = *Cyclophyllopsis aptiensis* (de Fromentel, 1863) *in* Fromentel (1863, p. 362), j = *Actinoseris provincialis* (d'Orbigny, 1850) *in* Fromentel (1870, p. 371-372), k = *Actinoseris? alloiteaui in* Beauvais and Zlatarski (1966, p. 1171) and L = *Funginella? isfahanensis* sp. nov.

claystones" (Abdel-Gawad and Gameil , 1995, p. 3). Their original aragonitic composition is altered into calcite, which makes exact identification difficult.

However, the genus *Paracycloseris* Wells, 1934 was originally described by one species from sediments of Jamaica that were regarded as Campanian, but are now considered to be upper Maastrichtian (Löser, 2005, p. 188). Its holotype looks quite different: for instance, it has a broad papillose columella and has a patellate instead of a cupolate form (see the picture and description of the holotype of *P. elizabethae* Wells, 1934 in Baron-Szabo, 2002: 145, pl. 105, figs 1, 3, 4).

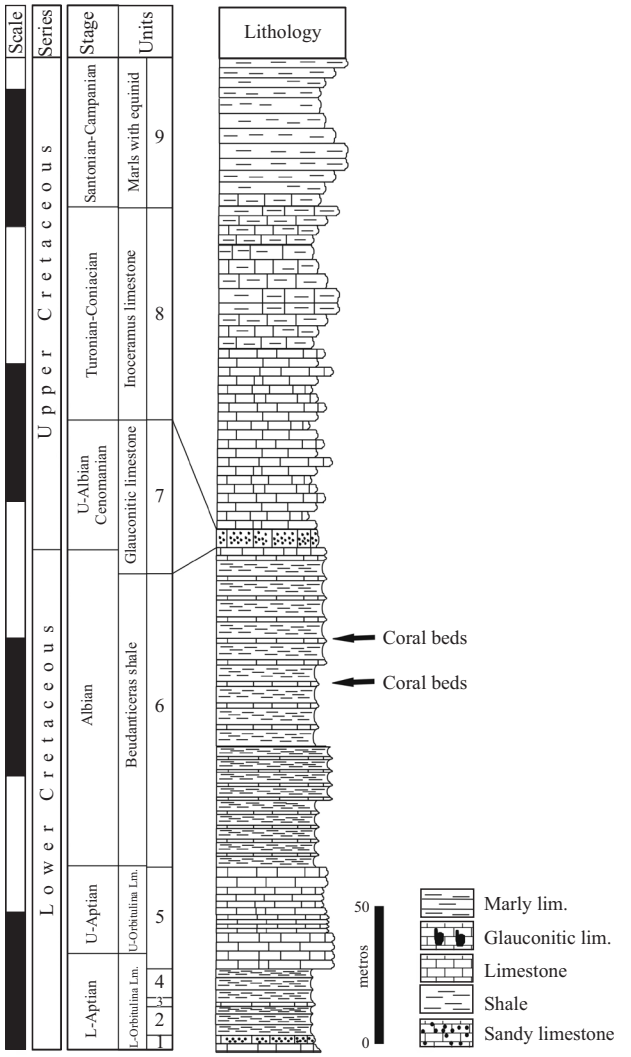

Figure 2. Stratigraphic column. Arrows indicate the position of the studied material.

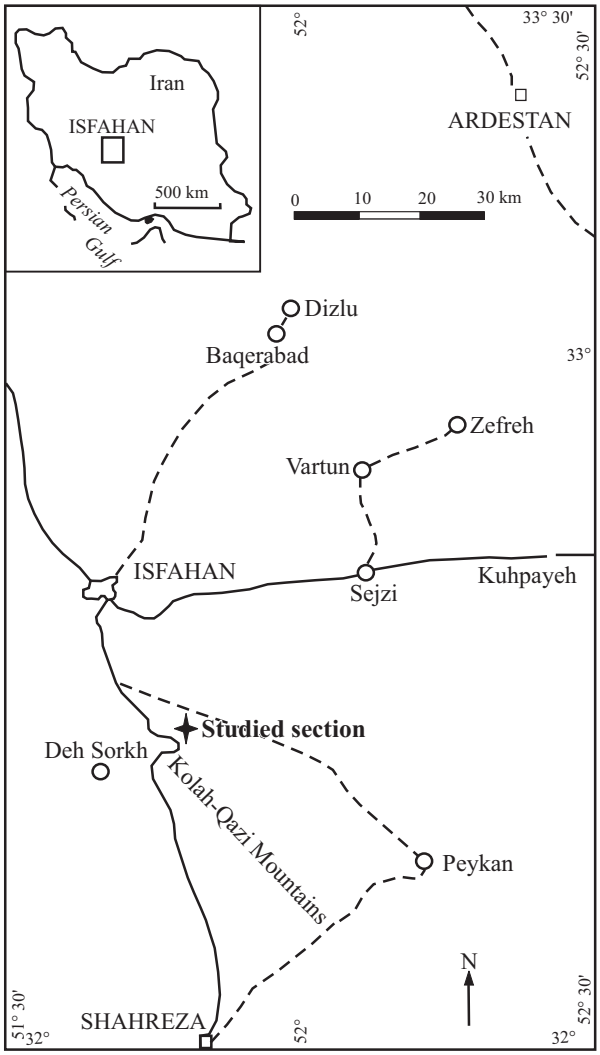

Figure 3. Geographic position of the Kolah-Qazi section, from which the studied material was obtained.

MATERIAL AND METHODS

The studied material was collected from the middle part of the Albian *Beudanticeras* Shale (Figure 1.4 and Figure 2, see also Yazdi *et al.*, 2009) at the Kolah-Qazi section (central Iran, 25 km southeast of Isfahan, near Baharestan new town, and 2 km south of Isfahan – Shiraz road, at the entrance of Kolah–Qazi valley, lat. N 51°46´32", long. E 32°26´50" GPS-WGS84 coordinates; Figure 3). One hundred and thirty two specimens were collected, from this material 122 are stored at Isfahan University as EUIM.3764-EUIM.3885 and ten specimens in the paleontological collection of NCB Naturalis in Leiden, The Netherlands, labeled RGM.532517 - RGM.532526.

The *Beudanticeras* Shale is a 120 m thick olive-green to grayish shale, with concretions, cone-in-cone structures, and intercalations of thin-bedded, lens-forming, dark gray limestone (5–30 cm), filled with small turritellid gastropods (Figure 1.5) and nuculid bivalves. Trigoniids and ammonites can be found throughout the unit (*Tetragonites* sp., *Beudanticeras* sp., *Beudanticeras beudanti*, *Douvilleiceras* sp., *Puzosia* sp. (Yazdi *et al.*, 2009), which indicate the upper Albian stage.

The specimens were photographed in top, bottom and side views wherever possible, and the diameter (ø), height (*h*) and number of septa per 10 mm (ns/10mm) were measured. Petrographic thin sections were prepared for three specimens to establish details of the preservation and the top for one specimen was polished for analysis of the columella. Another thin section was prepared from a fragment of the limestone filled with turritellid gastropods.

Abbreviations used: EUIM: acronym for the collection at Isfahan University; MNHN: Musee National d'Histoire Naturelle, Paris, France; NCB: Netherlands Centre for Biodiversity, Leiden ,The Netherlands; RGM: acronym for the former "Rijks Geologisch en Mineralogisch Museum",

now part of NCB Naturalis in Leiden, still in use as institution and collection codes for the geological collections. RMNH.COEL: acronym for the cnidarian collection of NCB Naturalis.

RESULTS

A thin section of RGM.532524 (Figure 4.1e) revealed that the original aragonite is altered into calcite. Crystals seem to cross the original boundaries of the septa and the filling between the septa. The thin sections of specimens RGM.532517 and RGM.532523 revealed the same structure. The recrystalization also explains why breaking a specimen did not result in a precise lateral view of the septa. The thin section of the consolidated packstone with the turritellid gastropods shows a very fine-grained limestone with dark elements, probably organic.

The scatter plot of height vs. diameter (Figure 4.4) of these specimens shows one cluster of points. Vaguely visible in the scatter plot are narrowings at diameters of about 4.0, 6.0 and 7.5 mm. Further statistics are presented in Table 1. The number of septa was calculated from the number of septa/10 mm counts multiplied by the diameter and π to get a comparable variable with the taxa in the literature. The range of height and diameter values for the present sample is also plotted as ellipse "*L"* in Figure 1.6. The dimensions of the present sample overlap those of the four specimens of "*Funginella*" sp. 2 in Abdel-Gawad and Gameil (1995, p. 22).

DISCUSSION

Because the dimensions of "*Funginella* sp. 2" in Abdel-Gawad and Gameil (1995, p. 22) are overlapped by the height and diameter of the present specimens and their description also fits the present material, it is only logical to assume that both populations belong to the same species. It is fully understandable that Abdel-Gawad and Gameil (1995) did not described their "*Funginella* sp. 2" as a new species, because they had only four specimens whose shell had been recrystalized. Since the sample used in the present study is large enough to have a clear picture of a population it is preferable to name the species. The maximum of the calculated septa (see Table 1) is 60. This is the case with, for instance, EUIM.3866. However, when counting the real number of septa instead of using the calculation, the number of septa turned out to be 48, but the shape of the coral was ellipsoid and not circular. EUIM.3817 has only 50 septa. So, the calculation of the number of septa by counting the number from only a part of the coral is not accurate. However, more than 48 septa mean that the fifth septal cycle has begun to develop.

Both Iranian and Egyptian materials seem to be found in comparable sedimentary rocks. Samples of the fossiliferous limestones of the *Beudanticeras* Shale that were collected with the corals show an association of gastropods dominated by only one form and are comparable with monospecific turritellid associations in Tertiary deposits, which would point to fully marine fine-grained muddy bottom about 10 to 40 m depth below sea grass environments (pers. comm. Frank Wesselingh). The low energy conditions as well as the organic part in the limestones confirm this "deeper" environment. It is well possible that sea level changes during deposition of the *Beudanticeras* Shale varied from about 30–50 m depth where the consolidated limestone lenses are probably the shallowest parts of the depositional environment.

SYSTEMATIC PALEONTOLOGY

Order Scleractinia Bourne, 1900
Suborder Fungiina Verrill, 1865
Family Funginellidae Alloiteau, 1952
Genus *Funginella* d'Orbigny, 1850

***Funginella*? *isfahanensis* n. sp.**
Figures 1.1–1.3, 4.1a–4.1e, 4.2, 4.3

?1995 *Funginella* sp. 2. Abdel-Gawad and Gameil, 1995, p. 22, pl. 9, fig. 5.

Derivation of the name. After the city of Isfahan, close to the type locality.
Holotype. RGM.532526 (Figures 1.1, 1.2).
Paratypes. RGM.532517-RGM.532525; EUIM.3764-EUIM.3885 (Figures 4.1-4.3, 1.3).
Type locality. The Kolah-Qazi section, central Iran, 25 km southeast of Isfahan, near Baharestan new town, and 2 km south of Isfahan–Shiraz road, at the entrance of Kolah–Qazi

Table 1. Statistics of the studied specimens of Funginella? Isfahanensis sp. nov. (n = 119).

Variable	Minimum	Mean ± std. dev.	maximum	Correlation with h	Correlation with ø	correlation with n_{septa}/10 mm
Height (h)	0.8 mm	1.5 ± 0.3 mm	2.4 mm	1	0.65	-0.54
Diameter (ø)	4.0 mm	6 ± 0.8 mm	8.6 mm	0.65	1	-0.79
n_{septa}/10 mm	18	27 ± 4	42	-0.54	-0.785	1
calculated n_{septa}	37	49 ± 4	60			

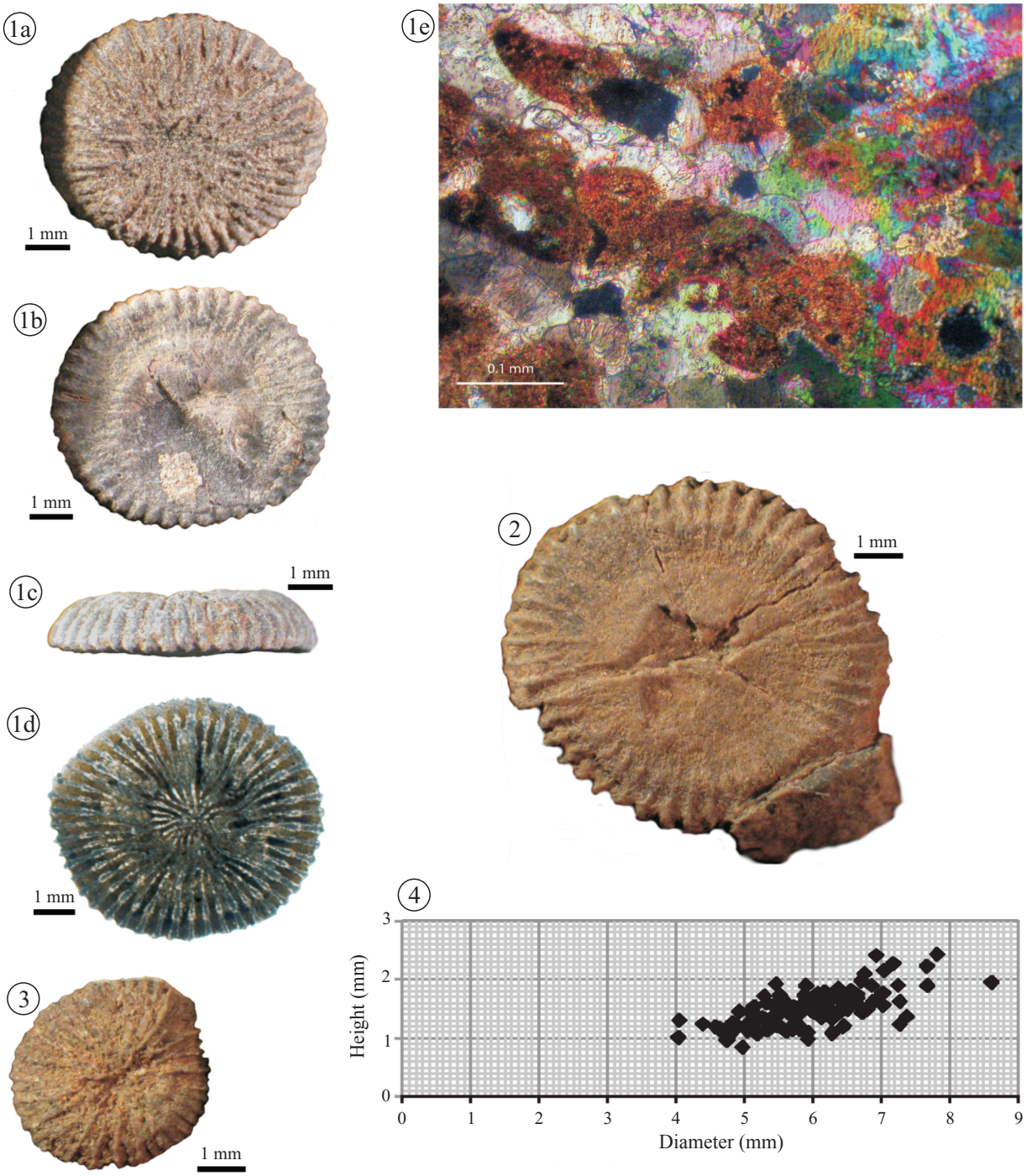

Figure 4. 1a-1e: RGM.532524. *Funginella*? *isfahanensis* n. sp., paratype. a-c: top, basal and side view before making a thin section from it, d: thin section with a thickness of about 150 µm, e: (through polarized light) thickness of thin section reduced to about 30 µm; the recrystalization is visible, the light parts are the areas where the septa used to be, general profile of the septa is still visible. 2: EUIM.3840. *Funginella*? *isfahanensis* n. sp. Paratype, basal view. 3: EUIM.3814. *Funginella*? i*sfahanensis* n. sp., paratype, top view. 4: Scatter plot of the height against diameter of the studied specimens.

valley (GPS-WGS84 coordinates lat. N 51°46′32”, long. E 32°26′50”).

Stratigraphic horizon. *Beudanticeras* Shale, upper Albian, Lower Cretaceous.

Diagnosis. Cupolate to discoid solitary corallum of about 6 mm in diameter and circa 1.5 mm in height having four cycles of costosepta, sometimes an incomplete fifth cycle all arranged in six systems and irregularly forking away from the center of the corallite, when looked from above. Costosepta equal in thickness, compact, synapticulae seldom present, septal margins dentate and septal sides granulate. Columella weakly developed.

Description. Small cupolate solitary coral without concentric rings on base. Shallow circular calicular fossa. Four complete septal cycles, commonly with an incomplete fifth cycle and arranged in six systems are present. Costosepta more or less regularly dentate and granulate on their sides. The first cycle continues to the centre of the corallite, the second has some large dentate structures which, together with the proximal dents on the first septa, can form a structure looking like a spongy columella. The third cycle seems to branch away from the second, while the fourth seems to branch away from the second in some specimens and sometimes away from the third septa in others. Costosepta are compact. In the thin section (Figure 4.1d) some intervals in the costosepta near the centre are visible. They are probably due to dentations of the costosepta. In some broken fragments (RGM 532520) a few wavy structures are visible, which could be interpreted as possible fulturae. However, since the breaking of the specimens goes through the septa, it is not completely sure if this observation is trustworthy. Thickness of costosepta is more or less the same for all the cycles. Calicular fossa is circular and small. Columella is not clearly visible, synapticulae are seldom present. (For dimensions see Table 1).

Remarks. The assignment of this species to a particular genus is not an easy task. There are several genera known to have small cupolate to discoid solitary corals. Wells (1956) cited *Cyclastraea* Alloiteau, 1952; *Cycloseris* Milne Edwards and Haime, 1849; *Cyclolites* Lamarck, 1801; *Micrabacia* Milne Edwards and Haime, 1849, and *Discocyathus* Milne Edwards and Haime, 1848. Since the specimens described from the Sinai were published as *Funginella* we take that genus also into account. Russo *et al*. (1996) listed *Funginellastraea* Alloiteau, 1952, *Cyclolitopsis* and *Cyclophyllopsis* having similar growth forms. Löser (pers. comm.) suggested regarding *Microseris*, *Actinoseris* and *Asteroseris* as possibilities.

Below, all these genera will be treated in alphabetical order having first a selected historical overview of the development of the concepts of these taxa combined with some remarks and comparisons with *F.*? *isfahanensis*.

Genus *Actinoseris* d'Orbigny, 1849

Type species. *Actinoseris cenomaniensis* d'Orbigny, 1850.

Actinoseris was established as "une Cycloseris dont la columelle est central, ronde et non en fente allongée" (d'Orbigny, 1849a: p. 12 [a *Cycloseris* where the columella is central, round and the calicinal fossa is not elongated]). Fromentel (1861) synonymised *Actinoseris* with *Cycloseris*. *Actinoseris* was considered a foraminifer by Vaughan and Wells (1943, p. 345), was kept as a separate species in Alloiteau (1957) and it was a junior synonym of *Cycloseris* according to Wells (1956, F388). Baron-Szabo (2002, p. 130) questionably regarded it as a junior synonym of *Micrabacia*. Löser (pers. comm.) regards it as a separate genus in the family Asteroseriidae, closely related to *Microseris* and related to the Fungiidae. *Funginella*? *isfahanensis* does fit into the original description of *Actinoseris*. The type species of *Actinoseris* differs from *F.*? *isfahanensis* in having medium common simple synapticulae, a columella of isolated granules and nine cycles of septa and being larger. Other *Actinoseris* species are *Actinoseris alloiteaui* Beauvais and Zlatarski, 1966 from upper Barremian to Lower Aptian of Bulgary and *Actinoseris provincialis* d'Orbigny, 1850 from the Cenomanian to Maastrichtian of France and Spain. *A. provincialis* is bigger. The holotype of *A. alloiteaui* is slightly larger than the largest specimens of *F.*? *isfahanensis* and its density of septa is smaller, but not out of the range of the current sample of *F.*? *isfahanensis*. The anastomization of the septa is similar.

Genus *Asteroseris* de Fromentel, 1867

Type species. *Stephanoseris coronula* de Fromentel, 1863.

Asteroseris de Fromentel was considered a junior synonym of *Micrabacia* by Vaughan and Wells (1943, p. 145). *Asteroseris* was characterized by "septes anastomosés sans ordre, endothèque absente, columelle essentielle, fasciculaire" (Alloiteau, 1952, p. 664). Wells (1956, p. F388) regarded *Asteroseris* as a junior synonym of *Cycloseris*. This opinion was shared by Baron-Szabo (2002, p. 97). Alloiteau (1957) and Löser (pers. comm.) retains *Asteroseris* as a separate genus. This is supported by the difference in shape of the calicular fossa (circular for *Asteroseris* versus elliptical for Cycloseris). *F.*? *isfahanensis* is not placed in *Asteroseris* due to the lack of a clear columella.

Asteroseris curonula differs from *F.*? *isfahanensis* in having a fair amount of simple synapticulae and a columella that is formed by fusion of the septa in the center and being relatively higher.

Genus *Cyclastraea* Alloiteau, 1952

Type species. *Cyclolites spinosa* de Fromentel, 1863.

Cyclastraea was defined as "discoid; muraille fortement plissée; septes entièrement compacts à bord distal armé de fortes dents aiguës; faces laterals avec careens verticals; columelle fasciculo-papilleuse" (Alloiteau, 1952, p. 655). Wells (1956) described *Cyclastraea* as "solitary, cupolate with basal epitheca. Septa imperforate with strong dentations and vertical carinae" (F379). Baron-Szabo (2002) regarded *Cyclastraea* as a questionable junior synonym of *Cycloseris*. Löser (pers. comm.) regards it to be a junior synonym of *Microseris*. *F.*? *isfahanensis* lacks the strong carinae.

Genus *Cyclophyllopsis* Alloiteau, 1952

Type species. *Cyclolites aptiensis* de Fromentel, 1863

(Type series: 3 paralectotypes MNHN: A25825, Lectotype M03597 selected by Alloiteau (1957, p. 341) should be the specimen figured by Fromentel in his pl. 66, fig. 3, 3a-b.).

Original diagnosis of the genus: "simple et discoid; muraille s'étendant sur la base et la moitié de la hauteur; synapticules assez nombreuses, par endroits coalescentes; pseudo-columelle fasciculo-papileuse" (Alloiteau, 1952, p. 655).

Baron-Szabo (2002) regarded Cyclophyllopsis as a questionable synonym of *Cycloseris*. Lectotype and paralectotypes do not belong to the same species and no thin section was found, the genus should be forgotten (Löser, pers. comm.).

Based on the original description *Cyclophyllopsis aptiensis* differs from *Funginella*? *isfahanensis* in being higher in juvenile stages, and having numerous synapticulae.

Genus *Cycloseris* Milne Edwards and Haime, 1849

Type species. *Fungia cyclolites* Lamarck, 1816 (syntypes: MNHN 73-74)

Cycloseris was originally described as "Polypier simple, libre. Cloisons très-nombreuses, s'unissant par leur bord interne" (Milne Edwards and Haime, 1849, p. 72).

The available material of recent *C. cyclolites* (RMNH. COEL.34559, '63-'64, '66, '69-'70) from New Caledonia shows a small ellipsoidal calice and a small ellipsoid spongy columella. The costae of *C. cyclolites* are dentate; the septa are arranged in four to six cycles in six systems. Lower cycles are stronger, thicker and higher than higher cycles. Young specimens vary from discoid to patellate, older specimens are increasingly cupolate in shape with concave bottom. Young specimens do not have a closed wall at the bottom, it closes when growing up. Adult specimens show clear rows of ornaments on the sides of the septa, more or less identical on each side of the septum and at the bottom of the septa bigger structures (fulturae) are developed, which grew on the septa in a later growth phase. *F.*? *isfahanensis* shows a closed wall at the bottom from the smallest to the largest specimens.

Russo *et al.* (1996) treated *Cycloseris*? *escosurae* Mallada, 1887 from the Lower Alpian of Spain, which has a similar behavior as *Funginella*? *isfahanensis* in that it often has small particles on which it has been growing. *Cycloseris*? *escosurae* is mostly attached on foraminiferal tests, while the present species prefers the more readily available turritellid shells. It has more septa and gets bigger and shows regular simple synapticulae, while *F.*? *isfahanensis* has hardly to no synapticulae.

Genus *Cyclolites* Lamarck, 1801

Type species. *Cyclolites elliptica* Lamarck, 1801 (="porpite elliptique… Guettard, 1770, mem. Vol. 2, p. 342, pl. 21, fig. 17, 18.").

Cyclolites was originally described as "Polypier libre, orbiculaire ou elliptique, convexe et lamelleux en-dessus, applati en desous avec des lignes circulaires concentriques. Il constitue une seule étoile lamelleuse" (Lamarck, 1801, p. 369), presenting four species according to the next order: *C. numismalis*, *C. hemisphaerica*, *C. elliptica* and *C. cristata*. Milne Edwards and Haime (1849) named *C. elleptica* [sic] Lamarck as only example of *Cyclolites*, which we regard as the first secondary designation of *C. elliptica* as type species for this genus. Alloiteau (1957, p. 331-332) presented a strong reasoning for this selection: *Cyclolites* as defined by Lamarck is a very polyphyletic group and only appropriate to be used as describing the overall shape of these corals*:* cyclolitoid, meaning hemispheroid corallite with a flat base, considered to be discoid to cupolate shaped. *Cyclolites numismalis,* as the first in the list of Lamarck's species, could be regarded as the type species of *Cyclolites*, but is a junior synonym of the Silurian rugose coral *Madrepora porpita* Linnaeus, 1767. This would make *Palaeocyclus* Milne Edwards and Haime, 1849, having the same type species, a junior synonym of *Cyclolites*. The second species of Lamarck, *C. hemisphaerica*, was suspected by Alloiteau to be a badly drawn *C. elliptica*, which was the third species of Lamarck. The last one, *C. cristata*, became the type species of *Aspidiscus* Kœnig, 1825. The type specimen(s) of *C. elliptica* are considered to be lost. To avoid confusion Alloiteau suggested that the main part of the Cretaceous "*Cyclolites*" were to be reassigned to *Cunnolites*. Alloiteau (1957) created *Cunnolites barrerei* as a replacement for *C. elliptica* and selected a specimen from coll. Depéret (lab. Geol. de Sorbonne) as "Neoholotype", supposedly from Coustouges, France, which is near Perpignan. *Cyclolites* as a genus name was reestablished by Löser (2009, p. 133) with Faujas de Saint-Fond, 1799 as author of the genus, since in Faujas (1799) referred directly to Lamarck (1801, p. 369) and this would mean that, if the date of publication of Faujas would have been correct, the name would indeed be first published, completely with description in Faujas and the author would have become "Lamarck in Faujas (1799)". However, Pasteur (1802), who translated Faujas (1799) into the Dutch language, stated that the first part of the Dutch translation was published only after the first five parts of Faujas had been published. The reference to *Cyclolites* and to Lamarck occurred in the second part of the Dutch translation (Pasteur, 1804), meaning that those references occurred in the parts of the French original that were published after 1802, so that Lamarck (1801) remains the correct author and year of publication of the generic name *Cyclolites*.

Cyclolites differs with *Funginella* in having perforations in their septa. *Funginella*? *isfahanensis* differs also from *Cyclolites/Cunnolites* species in being a lot smaller in its adult stage.

Genus *Cyclolitopsis* Reuss, 1874

Type species. *Cyclolites patera* d'Achiardi, 1867. Alloiteau

(1952, p. 667) described this genus as patellate and fixed with a short peduncle when young. Alloiteau (1957) presented a more or less turbinate form. We know Cyclolitopsis only from Alloiteau (1952, 1957). *Funginella*? *isfahanensis* differs in being cupolate.

Genus *Discocyathus* Milne Edwards and Haime, 1848

Discocyathus Milne Edwards and Haime, 1848, differs in having clear pali and a clear columella and in not having a clear cupolate shape.

Genus *Funginella* d'Orbigny, 1849 *sensu* Alloiteau, 1957

Type species. *Funginella neocomiensis* d'Orbigny, 1850.

Funginella was originally described as "*Cyclolites* à calice circulaire, déprimé, don't la columelle est ronde et non pas transverse; les cloisons grosses, saillantes" (d'Orbigny, 1849a, p. 11). It was synonymised with *Cyclolites* in Fromentel (1867) and Wells (1936, p. 113). The latter selected *Cyclolites haueriana* Michelin, 1846 as "genolectotype". Alloiteau (1952, p. 662, 1957, p. 335) and also M. Beauvais (1982, tome II, 116-117) retained it as a separate species, while considering *F. neocomiensis* d'Orbigny, 1850, from the Hauterivian of France as the type. We assume that Alloiteau was not aware of Wells (1936) at that time and, at least, his citations of page numbers of the publications of d'Orbigny are erroneous. *F. neocomiensis* as described in Alloiteau (1957, p. 335) has compact septa, which separates it from *Cyclolites*. *Funginella* was regarded as a junior synonym of *Cycloseris* by Baron-Szabo (2002). We retain Funginella as a separate genus, regarding the shape of the calicular fossa as distinctive between the two genera, although further research is needed. *Funginella* was the generic assignment of the Sinai material in Abdel-Gawad and Gameil (1995), which is regarded to be the same species as the Iranian coral.

F.? *isfahanensis* differs from *F. neocomiensis* in having six systems of septa instead of eight and in having slightly less septa/10mm. *F. neocomiensis* has about 30 septa/10 mm. It differs from *F. martini* d'Orbigny, 1850 (23–26 septa/10mm) in having more septa/10mm.

Genus *Funginellastraea* Alloiteau, 1952

Type species. *Funginella alpina* d'Orbigny, 1850

First description: "Discoïde, libre; partie central du disque basal portant une *Orthophragmina* commensale; septes entièrement compacts, à faces laterals ornée de files nombreuses, serrées, de granules subcoalescents" (Alloiteau, 1952, p. 663). Russo *et al.* (1996) cited two other species with different foraminifera as substrate. Baron-Szabo (2002, p. 97) regarded *Funginellastraea* as a questionable synonym of *Cycloseris*.

Genus *Micrabacia* Milne Edwards and Haime, 1849

Funginella? *isfahanensis* does not belong to *Micrabacia*, since the costae and the septa are confluent, while *Micrabacia* is defined by the alternation of the septa and costae. However, the Campanian to Maastrichtian *Micrabacia senoniensis* from Western Europe is often preserved with only a small part of the basal wall, with the costae not preserved. The stratigraphic position of the present species is the same as the oldest reported *Micrabacia* specimens. However, their reports are vague (*Micrabacia* sp. in the Albian of North Sinai in Aboul Ela *et al.* (1991) and *Micrabacia*? sp. in the "Neocoomsandstein" in Tönsberg near Oerlinghausen, Germany in Weerth (1884). Further study of those specimens is necessary for better comparison and to check if those specimens are really *Micrabacia*.

Genus *Microseris* de Fromentel, 1867

Type species: *Microseris hemisphaerica* de Fromentel, 1867.

The genus *Microseris* was defined as "hémisphérique; la muraille, horizontalle, nue et couverte de granulations éparses qui ne simulent pas des côtes. Les cloisons sont larges, arquées et se réunissent en se soudant au centre où on remarque une petite fossette columellaire arrondie. Les synapticules sont rares, mais bien développées. Ce genre, voisin des *Cycloseris*, s'en distingue par son aspect general et l'absence de côtes sur le plateau. Celles-ci sont remplecées par des granulations éparses" (Fromentel, 1870 vol. 23, p. 367-368).

Microseris was considered to be a junior synonym of *Micrabacia* by Vaughan and Wells (1943, p. 145). Alloiteau (1952, p. 664) retained it as a separate genus. He diagnosed *Microseris* as "septes anastomosés suivant une loi precise, endothèque présente, columelle pariétale rudimentaire" (p. 664). Wells (1956, p. F388) regarded *Microseris* as a junior synonym of *Cycloseris*. Baron-Szabo (2002, p. 231) agreed with Wells. Löser (pers. comm.) retains *Microseris* as a separate genus within the Asteroseriidae. *Funginella isfahanensis* is not placed in *Microseris*, for its septa do not bifurcate according to a precise rule.

Microseris hemisphaerica differs from *F.*? *isfahanensis* in having nine cycles of septa and having simple synapticulae.

CONCLUSIONS

Actinoseris is a serious candidate as genus for this species. However, awaiting further research, we have assigned this species tentatively to *Funginella* sensu Alloiteau (1957) and Beauvais (1982) as is done with the material from the Sinai described by Abdel-Gawad and Gameil (1995). Both taxa and indeed most other small discoid to cupolate genera are in need of further revision.

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