

# A NEW *ORIONASTRAEA* (RUGOSA) FROM THE LOWER CARBONIFEROUS OF NORTHERN ENGLAND

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ABSTRACT. *Orionastraea magna* sp. nov. is described from the *Orionastraea* Band, Upper *Dibunophyllum* (D<sub>2</sub>) Zone, near Settle, Yorkshire, and the genus is briefly discussed.

*Orionastraea* was erected by Smith (1916, p. 3) for Carboniferous corals previously assigned to the Devonian genus *Phillipsastraea* d'Orbigny. The genus has since been broadly interpreted to include many divergent stocks. Some of the Upper Carboniferous and Lower Permian forms are closely related to the *Protowentzelella* Porfiriev–*Stylastraea* Lonsdale group, whereas the true *Orionastraea* is believed to be phylogenetically connected with the massive forms of *Lithostrotion* Fleming.

## SYSTEMATIC DESCRIPTION

Class ANTHOZOA Ehrenberg 1834  
Order RUGOSA Milne Edwards and Haime 1850  
Family LITHOSTROTIONIDAE d'Orbigny 1851  
Genus ORIONASTRAEA Smith 1916

- 1916 *Orionastraea* Smith, p. 3.
- 1917 *Orionastraea*; Smith, p. 294.
- 1926 *Orionastraea*; Hudson, p. 145.
- 1929 *Orionastraea*; Hudson, p. 441.
- 1934 *Orionastraea*; Hill, p. 90.
- non 1936 *Orionastraea*; Dobrolyubova, p. 17.
- 1940 *Orionastraea*; Hill, p. 187.
- non 1941 *Orionastraea*; Soshkina, Dobrolyubova and Porfiriev, p. 151.
- 1950 *Orionastraea*; Wang, p. 222 (pars).
- 1952 *Orionastraea*; Lecompte, p. 473.
- 1956 *Orionastraea*; Hill, p. F283.
- 1958 *Orionastraea*; Dobrolyubova, p. 199.
- 1964 *Orionastraea*; Yoh and Wu, p. 102.
- 1967 *Orionastraea*; Ivanovsky, p. 33.

*Type species* (selected by Smith 1917, p. 295). *Sarcinula phillipsii* McCoy 1849, p. 125, from the Carboniferous Limestone (D<sub>2</sub>), of Corwen, Merionethshire, Wales.

*Diagnosis.* Astreoid, thamnasterioid or aphroid Lithostrotionidae; columella weakly developed or absent; septa withdrawn from axis and in some from periphery also, when dissepiments become lonsdaleoid.

*Distribution.* The genus is known from the upper part of the Viséan of Australia, China, Russian Platform, and Britain. Some of the Asiatic and Australian forms may be slightly [Palaeontology, Vol. 13, Part 1, 1970, pp. 47–51, pl. 13.]

older than those from Europe, possibly due to difference of origin of species within the genus. Bassler (1950, p. 247) lists '*Orionastraea phillipsii*?' from the Permian of Chitral region, W. Pakistan, and Dobrolyubova (1958, p. 201) also gives the genus as ranging into the Permian. These Permian records are considered to be erroneous and should be referred either to *Lonsdaleiastraea* Gerth or *Wentzelellites* Wu of the Waagenophyllidae (Minato and Kato 1965). The record of the genus in Japan (Hayasaka 1932, p. 273) is doubtful and the form may belong to *Pseudopavona* Yabe, Sugiyama, and Eguchi 1943.

*Remarks.* The following nominal species are referable to *Orionastraea*, although not all are regarded as valid: *Erismolithus tubiporites?* (*radiatus*) Martin 1809; *Sarcinula tuberosa*, *placenta* and *phillipsii* McCoy 1849; *Lithostrotion ensifer* Milne Edwards and Haime 1851; *Phillipsastraea clissiophylloides* [sic], *clissiophylloides stellata* and *fasciculata* Thomson 1898; *Lithostrotion? columnare* R. Etheridge jun. 1900; *Orionastraea indivisa* Hudson 1926; *O. ensifer matura*, *edmondsi*, *edmondsi laciniosa*, *prerete*, *rete*, *garwoodi*, *garwoodi sera* and *garwoodi pristina* Hudson 1929; *O. lonsdaleoides* Hill 1934; *O. kurakovensis*, *rareseptata* and *heteroseptata* Dobrolyubova 1958; *O. huaitoutalaensis*, *minor* and *gigantea* Lo 1962; *Arachnastraea minor* Wu 1964; and *Lithostrotion parvicolumnare* and *O. columellaris* Pickett 1966.

*Orionastraea* is considered to be restricted to the Lower Carboniferous and to be phylogenetically connected with the massive forms of *Lithostrotion*. The Upper Carboniferous and Permian species from the boreal province which have been referred to *Orionastraea* have rudimentary walls, ill-defined minor septa, lack columella and have thin skeletal elements, and are related to the *Protowentzelella-Stylastraea* lineage. The suggested genera for the following species are given in brackets:

*Columnaria solida* Stuckenberg 1895, non Ludwig 1862 ('*Uralastraea*' Fomitchev); *C. zitteli* Stuckenberg 1895 ('*Uralastraea*'); *C. toulai* Stuckenberg 1895 (*Stylastraea*); *Protolonsdaleiastraea atbassarica* Gorsky 1832 (*Protolonsdaleiastraea* Gorsky); *Orionastraea asiatica* Lee and Yu 1934 (*Arachnastraea* Yabe and Hayasaka); *O. campophylloides*, *Columnaria stuckenbergi* Gerasimov (MS), *O. brevisseptata*, *O. brevisseptata major* Dobrolyubova 1936; and *O. hudsoni* Wilson and Langenheim 1962 (all '*Uralastraea*').

'*Uralastraea*' was proposed by Fomitchev (1953) for *Orionastraea* of Upper Carboniferous and Lower Permian age but no type species was designated and the genus is a *nomen nudum* (Hill 1957, p. 51).

#### EXPLANATION OF PLATE 13

- Figs. 1-5. *Orionastraea magna* sp. nov.  $\times 1.5$ . *Orionastraea* Band, Upper *Dibunophyllum* ( $D_2$ ) Zone, low escarpment,  $\frac{1}{3}$  mile NE. of Brunton House,  $\frac{1}{3}$  mile S. of Feizor, which is 3 miles NW. of Settle, Yorkshire. 1, L.S. slide PF 3387 of paratype GSM 65803. 2-5, Sections of holotype, GSM 65802; 2, L.S. slide PL 309; 3-5, T.S. slides PL 310, 312-13.
- Figs. 6, 7. *Orionastraea ensifer* (Milne Edwards and Haime). 6,  $\times 3$ ; 7,  $\times 2$ . Limestone band of Round Point, Upper Cromhall Sandstone, Upper *Dibunophyllum* ( $D_2$ ) Zone, Clifton side of Avon Gorge, Bristol, Gloucestershire. Sections of topotype; 6, T.S. UHR 18931a; 7, L.S. UHR 18931b.
- Figs. 8, 9. *Orionastraea phillipsii* (McCoy).  $\times 2$ . Upper *Dibunophyllum* ( $D_2$ ) Zone, Hafod-y-Calch, Corwen, Merionethshire. Sections of topotype; 8, T.S. UHR 18932; 9, L.S. UHR 18934.
- Figs. 6-9 are for comparison. Note the presence of 'annular growth' in figs. 1, 2, 7, and 9.

*Orionastraea magna* sp. nov.

Plate 13, figs. 1-5

1924 *Orionastraea phillipsi*, exceptionally large variety; Garwood and Goodyear, pp. 219, 227, 232 (in text only).

cf. 1958 *Orionastraea phillipsi* (McCoy); Dobrolyubova, p. 201, pl. 34, fig. 2; pl. 35.

*Name.* Refers to large size of tabularia.

*Holotype.* GSM 65802, from the *Orionastraea* Band, Upper *Dibunophyllum* ( $D_2$ ) Zone, low escarpment,  $\frac{1}{3}$  mile NE. of Brunton House,  $\frac{1}{3}$  mile S. of Feizor, which is 3 miles NW. of Settle, Yorkshire.

*Paratypes.* GSM 65800-1, 65803, horizon and locality as for holotype; GSM 66699, 66700, 66703-6, from *Orionastraea* Band, Low South Bank, south side of Stockdale Beck, opposite Stockdale Farm, 2 miles E. of Settle; SME 13857, from *Orionastraea* Band, right bank of Cow Gill,  $\frac{1}{4}$  mile N. of New Houses,  $\frac{2}{3}$  mile SW. of Bordley, which is  $7\frac{1}{2}$  miles E. of Settle. All the GSM material is in the Garwood Collection.

*Diagnosis.* Corallum platy, mainly thamnasterioid, with tabularia exceptionally large, 4-5 mm. in diameter. Skeletal elements notably thin. Major septa 15. Columella absent.

*Description.* External characters. Corallum is compound, large, flat, expanded and platy. The size of the corallum is not known, only broken specimens being preserved. The largest fragments have an area of  $129 \times 91$  mm. (GSM 66699) and a thickness of at least 44 mm. (GSM 65800-1).

Numerous fine concentric striations or wrinkles are present on the epitheca of the corallum's lower surface. These wrinkles indicate rapid lateral expansion of the coral. The upper surface is comparatively smooth.

Internal characters. (a) In transverse section. The corallum is mainly thamnasterioid, and sometimes aphroid. All internal skeletal elements are very thin.

The tabularia are round or oval and weakly differentiated from the dissepimentaria by somewhat crowded concentric vertically inclined inner margins of dissepiments. The diameter of tabularia is 4-5 mm., a little less in SME 13857, and their centres are 15-20 mm. apart.

Septa are very thin, but may be finely trabecular. There are 14 or 15, rarely 17, slightly flexuous major septa. They fall short of the centre of the tabularia which are open due to the lack of axial structure. Septa are confluent with corresponding ones of neighbouring corallites. The columella is absent in specimens from Feizor. A few major septa extend to the centre of tabularia in SME 13857 and also in specimens from Low South Bank but without thickening into a columella. Minor septa are of variable length, rarely extending to the tabularia and may sometimes not be developed.

The dissepimentaria which form the greater part of the corallum consist of confluent septa and some large irregular dissepiments that prevent the thamnasterioid elongation of septa. The aphroid tendency is marked in SME 13857.

(b) In longitudinal section. The tabularia are clearly differentiated from the dissepimentaria. The tabulae, 25 in 10 mm., are flat or slightly dome shaped and are incomplete. No columella is present. The dissepimentaria are composed of numerous fine, horizontally elongate dissepiments and are often penetrated by the cut ends of the septa. Weak 'periodicity' may be discernible with slight crowding of dissepiments occurring three times in 10 mm. (Pl. 13, fig. 2).

*Remarks.* The present form was listed by Garwood and Goodyear (1924, pp. 219, 227, 232) as *O. phillipsi*, exceptionally large variety, and the label on GSM 65801 reads 'Orionastraea phillipsi (McCoy), this specimen has been identified by Mr. S. Smith'. However, McCoy's species has a tabularium diameter of about 2.5 mm. and the large size of the tabularia of *O. magna* makes it easily recognizable. It is probable that *O. phillipsii* is not present at Settle (Hudson 1929, p. 452).

Hudson (1929, pp. 451–2) lists *O. indivisa*, *prerete* and *rete* from the *Orionastraea* Band of the Settle district but the large size and thamnasterioid corallites distinguish *O. magna* from these species.

In general appearance, the form resembles *Orionastraea phillipsi* of late D<sub>2</sub> age described and figured by Dobrolyubova (1958, p. 201; pl. 34, fig. 2; pl. 35) from the Russian Platform. The Russian form, however, has slightly smaller tabularia in comparison with *O. magna*, a less pronounced aphyroid tendency, and also a weakly developed columella. Dobrolyubova's *phillipsi* may stand between *phillipsii* McCoy and *garwoodi* Hudson, although it has much larger tabularia.

*Distribution.* *O. magna* is known only from the *Orionastraea* Band (D<sub>2</sub> Zone) of the Settle district. The conflicting views on the correlation of the *Orionastraea* Band with the Hardraw or Simonstone Limestones of Wensleydale are discussed by Garwood and Goodyear (1924, pp. 205–6). Hicks (1959, pp. 33–7) re-examined the evidence in the Ingleborough area and confirmed the view of the Geological Survey (Dakyns and others 1890, pp. 25–8) that this horizon at Settle is the equivalent of the Hardraw Limestone.

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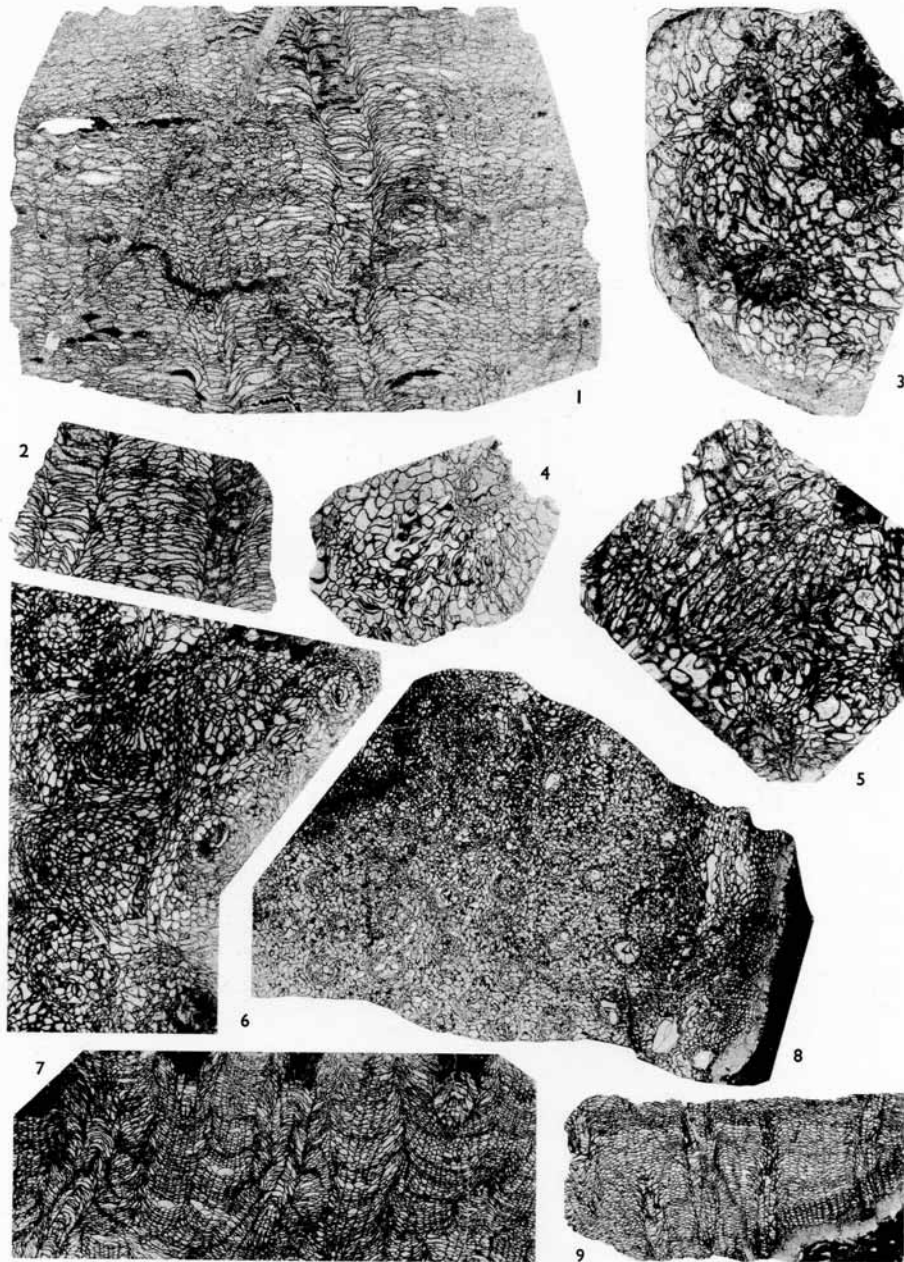
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