A NEW ORIONASTREA (RUGOSA) FROM THE LOWER CARBONIFEROUS OF NORTHERN ENGLAND

by M. KATO and M. MITCHELL

ABSTRACT. *Orionastrea magna* sp. nov. is described from the *Orionastrea* Band, Upper *Dibunophyllum* (D3) Zone, near Settle, Yorkshire, and the genus is briefly discussed.

*Orionastrea* 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 *Protowentzelevella Portiriev–Stylastera* Lonsdale group, whereas the true *Orionastrea* 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 ORIONASTREA Smith 1916

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

Type species (selected by Smith 1917, p. 295). *Sarcinula phillipsii* McCoy 1849, p. 125, from the Carboniferous Limestone (D3), of Corwen, Merionethshire, Wales.

Diagnosis. Astreoid, thamasterioid or aphiroid Lithostrotionidae; columnella weakly developed or absent; septa withdrawn from axis and in some from periphery also, when dissepiments become lonsdaloidal.

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

older than those from Europe, possibly due to difference of origin of species within the genus. Bassler (1950, p. 247) lists "Orionastraea philippii" 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 Lonsdaleiastrae Geth or Wentzekeii Wu of the Waagenophyliidae (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: Ertosiphilus tubiporus (radiatus) Martin 1809; Sarcinula tuberosa, placenta and philippisi McCoy 1849; Lithostracem ensiifer Milne Edwards and Haine 1851; Phillipsastraea classisphyllodes sic, chissiphilodes stellata and fasiculata Thomson 1898; Lithostracem? columnare R. Etheridge jun. 1900; Orionastraea indivisa Hudson 1926; O. ensifer mutra, edmondsi, edmondsi laciniosa, prerete, rete, garwoodi, garwoodi seca and garwoodi pristina Hudson 1929; O. lonsdaleoides Hill 1934; O. kurokawensis, rarespetata and heteroseptata Dobrolyubova 1958; O. huaitoutalaensis, minor and gigantea Lo 1962; Arachnastraeai minor Wu 1964; and Lithostracem parvicolurnare and O. cohonelaris Picket 1966.

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

Columnaria solidia Stuckenberg 1895, non Ludwig 1862 ('Uralastrae') Fomichev; C. zitteli Stuckenberg 1895 ('Uralastrae'); C. coalai Stuckenberg 1895 (Stylastrae); Protolonsdaleiastrae abasaurae Gorsky 1832 (Protolonsdaleiastrae Gorsky); Orionastraea asiaticus Lee and Yu 1934 (Arachnastraeai Yabe and Hayasaka); O. campophyliodes, Colummariia stossenbergi Cernavesky (MS), O. breviseptata, O. breviseptata major Dobrolyubova 1936; and O. huhsi Wilson and Langbein 1962 (all 'Uralastrae').

'Uralastraeai' was proposed by Fomichev (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. 6, 7. Orionastraea ensifer (Milne Edwards and Haine), 6. ×3; 7. ×2. Limestone band of Round Point, Upper Cromhall Sandstone, Upper Dibunophyllum (D.) Zone, Clifton side of Aven Gorge, Bristol, Gloucestershire. Sections of typeopaty; 8. T.S. UHR 18933a; 7. L.S. UHR 18931b.


Figs. 6–9 are for comparison. Note the presence of 'annular growth' in figs. 1, 2, 7, and 9.
Orionastra magna sp. nov.

Plate 13, figs. 1–5

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

cf. 1958 *Orionastra magna philippi* (McCoy); Dobrolyubova, p. 201, pl. 34, fig. 2; pl. 35.

Name. Refers to large size of tabularia.

*Holotype.* GSM 65802, from the *Orionastra* Band, Upper *Dibunophyllum* (D.) Zone, low escarpment, 3/4 mile NE. of Brunton House, 1/4 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 *Orionastra* Band, Low South Bank, south side of Stockdale Beck, opposite Stockdale Farm, 2 miles E. of Settle; SME 13857, from *Orionastra* Band, right bank of Cow Gill, 1 mile N. of New Houses, 3/4 mile SW. of Bordley, which is 71/2 miles E. of Settle. All the GSM material is in the Garwood Collection.

*Diagnosis.* Corallum platy, mainly thamnasteriod, 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 × 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 thamnasteriod, and sometimes aphroid. All internal skeletal elements are very thin.

The tabularia are round or oval and weakly differentiated from the dissepentaria by somewhat crowded concentric vertically inclined inner margins of dissepentia. 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 dissepentaria which form the greater part of the corallum consist of confluent septa and some large irregular dissepentia that prevent the thamnasteriod elongation of septa. The aphroid tendency is marked in SME 13857.

(b) In longitudinal section. The tabularia are clearly differentiated from the dissepentaria. The tabulae, 25 in 10 mm., are flat or slightly dome shaped and are incomplete. No columella is present. The dissepentaria are composed of numerous fine, horizontally elongate dissepentia and are often penetrated by the cut ends of the septa. Weak ‘periodicity’ may be discernible with slight crowding of dissepentia occurring three times in 10 mm. (Pl. 13, fig. 2).
Remarks. The present form was listed by Garwood and Gooyear (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. phillipsi* is not present at Settle (Hudson 1929, p. 452).

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

In general appearance, the form resembles *Orionastraea phillipsi* of late D₂ 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 aphroid tendency, and also a weakly developed columnella. Dobrolyubova’s *phillipsi* may stand between *phillipsi* McCoy and *garwoodi* Hudson, although it has much larger tabularia.

Distribution. *O. magna* is known only from the *Orionastraea* Band (D₂ 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. 25–5) that this horizon at Settle is the equivalent of the Hardraw Limestone.

Acknowledgements. The authors acknowledge the assistance of the following: the late Dr. H. Dighton Thomas, British Museum (Natural History), Dr. F. W. Anderson, Institute of Geological Sciences (GSM), Professor M. Minato, Hokkaido University (UHR), and Dr. C. L. Forbes, Sedgwick Museum, Cambridge (SME). Initials in brackets are prefixes of specimens in the respective museums. Mr. Mitchell publishes with the permission of the Director of the Institute of Geological Sciences.

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Typescript received 17 March 1969