FOSSILS FROM SINGAPORE
WITH THE AUTHOR'S COMPLIMENTS.

FOSSILS FROM SINGAPORE.

BY

R. BULLEN NEWTON, F.G.S.


London: Dulau & Co., 37, Soho Square, W.
Notice of Some Fossils from Singapore Discovered by John B. Scrivenor, F.G.S., Geologist to the Federated Malay States.

By R. Bullen Newton, F.G.S.,
of the Department of Geology, British Museum (Nat. Hist.), Cromwell Road, S.W.

(Plate XXV.)

Introduction.

As representing the first fossils yet recorded from Singapore, these specimens are of considerable interest. They principally consist of marine Lamellibranch remains accompanied by an obscure indeterminable Gastropod, and a few fragmentary terrestrial plants. Their condition, however, as casts and impressions renders them most difficult to work out satisfactorily, more especially the shells where only external features of the valves are available for study. Some of the specimens, however, retain certain points of structure or contour which appear to have an important bearing on their probable geological age. The association of land and marine organisms would at once suggest an estuarine or lagoon origin for the beds containing them, more especially as the mollusca belong to genera or families which may be regarded as of shallow-water habit, whilst the plant-remains might be accounted for by the close proximity of land or the transporting agency of river action. Among the shells, that referred to Goniomya is of chief interest, since it belongs almost exclusively to the Mesozoic period, being particularly characteristic of Jurassic rocks and of much rarer occurrence in deposits of Cretaceous age.

Although exceedingly rare, Goniomya has also been found in Palaeozoic rocks, Krotow having figured and described G. Artiensis from the Russian Permian (Soc. of Naturalists Imp. University of Kasan, 1885, vol. xiii, p. 225, pl. iii, fig. 20), and an unnamed form from rocks of similar age in the Central Himalayas has been more recently recorded by Dr. Carl Diener (Palaeontologia Indica,
The plant structures, although obscure, are also important. A leaf-like body has been referred to *Podozamites cf. lanceolatus* (Lindley & Hutton), a genus and species which enjoyed an extensive geographical distribution during the Bajocian stage of Jurassic times, having been recorded from Yorkshire (Haiburn Wyke); Spitsbergen; Orenburg; East Siberia; Astrabad, Persia; India (Upper Gondwana Beds); China; Japan; and Korea.

*Podozamites* is but one member of a large group of similar plants, generally included under the Cycadaeae, which were of abundant occurrence in the Mesozoic period, and of which *Williamsonia* may be regarded as the type. Such a flora has been described by Feistmantel as typical of the Upper Gondwana deposits of India, and it is of further interest to note that marine molluscan remains have been also found in some of those beds associated with the plants (R. D. Oldham's edition of Medlicott & Blanford's "A Manual of the Geology of India," 1893, p. 180).

The Singapore Clays, therefore, with their estuarine contents, may be of Middle Jurassic age, and about the horizon of the Inferior Oolite of England or the so-called Bajocian of Continental geologists. They possibly represent an extension or outlier of the Upper Gondwana rocks of India, as well as forming part of the other fossiliferous areas of Eastern Asia, including Korea, Japan, and Siberia, which have yielded a similar vegetation.

Mr. John B. Scrivenor, the discoverer of these fossils, has furnished the following account of the beds and locality, stating that the specimens were obtained "from a 2 ft. (circa) bed of silty clay with obscure plant-remains, forming a part of the series of shale and sandstone beds which embraces all the known sedimentary rocks of Singapore Island apart from surface deposits, and exposed in a big quarry on the north flank of Mount Guthrie, Tanjong Pagar, Singapore Town.

"What remains of Mount Guthrie is likely to disappear before long; in fact, the original hill extended over the spot where I found the fossils. The specimens take some time to collect, as they are sparsely distributed. I send the best fossil leaf I could find and also an object which may be a fruit. I also saw obscure vegetable remains in shale at Tanjong Malang, close by; and at Mount Wallich, also close by, I saw one piece of badly-preserved fossil wood. In the Mount Guthrie quarry, about 50 yards from the fossiliferous horizon, I found a 6 inch seam of very poor brown coal.

"The shale and sandstone series is very highly inclined in this part of Singapore; in one section I saw the beds are vertical. At Mount Guthrie the strike is N.N.W.–S.S.E., the dip about 75° W.S.W.

"The strike and petrological characteristics of the series wherever seen suggest a connection with the shale and sandstone of the Federated Malay States; but, again, were these rocks situated in Sarawak [Borneo] the petrological evidence and the presence of the obscure vegetable remains would not be sufficient alone to separate
them from the shale and sandstone of Upper Sarawak and Santubong” [Borneo].

Description of the Fossils.

The matrix containing the fossils is a light drab-coloured compact clay, varying slightly in tint and particularly soft to the touch, marking everything as if it were chalk, although according to the acid test no calcareous constituents are present. Dr. G. T. Prior, of the British Museum, who has examined the material, has detected some minute particles of silica entering into its structure.

The specimens herewith described and figured have been mainly collected by Mr. John B. Scrivenor, although a second series from the same locality and beds was subsequently furnished to the writer by Dr. R. Hanitsch, of the Raffles Museum, Singapore, three of which are represented on the Plate by Figs. 3, 4, and 17. Through the good services of both Mr. Scrivenor and Dr. Hanitsch the specimens selected for illustration have been presented to the British Museum. A word of praise should be extended to the artist, Mr. A. H. Searle, for the excellent drawings he has constructed from obscure and difficult material, and which, thanks to the collotype process, have been satisfactorily reproduced on the Plate.

LAMELLIBRANCHIA.

Cucullea Scrivenor, sp. nov. (Pl. XXV, Fig. 13.)

Shell small, compressed, inequilateral, subquadrate, oblique; umbo very anterior; dorsal margin horizontal, short; anterior area short, deep, obliquely and roundly truncated; posterior region wide, produced, rounded, and bearing an elongate oblique depression, with an angulation at the posterior end of the hinge-line; ventral margin nearly parallel with dorsal line; ornamentation consisting of extremely fine concentric growth-lines crossed by a series of delicate radial striations.

Dimensions.—Length 13, height 7 mm.

The specimen referred to this form is a small, rather compressed right valve, embedded in the rock, and, like the other specimens from this locality, only showing external characters. It appears to differ from previously described forms of this genus by its very inequilateral character, the umbo being within a small distance of the anterior margin, and the relatively long and narrow posterior depression. The sculpture markings are obscure, but when properly shaded the valve shows decussating striations.

Collector.—Mr. J. B. Scrivenor.
ARCA sp. (Pl. XXV, Fig. 14.)

Shell narrow, elongate; hinge-line horizontal and parallel with ventral border; umbo depressed, anterior, oblique; carinated obliquely and obtusely from umbal region to postero-ventral margin; anterior end rounded, posterior truncated, and area depressed; sculpture consisting of very obscure concentric lineations without evidence of radial striae.

Dimensions.—Length 20, height 8 mm.

This description applies to a natural cast of a right valve embedded in the rock showing the external surface. Narrow forms of *Arca* are fairly common in Jurassic deposits, but they are invariably ornamented with radial striation; as no such sculpture exists in the Singapore fossil it may be inferred that none was ever present, although it is possible that the counterpart, which does not appear to have been preserved, might have yielded a better interpretation of the original surface structure.

Collector.—Mr. J. B. Scrivenor.

GERVILLA HANITSCHI, sp. nov. (Pl. XXV, Fig. 4.)

Shell lanceolate, subcylindrical, curved at ventral margin, moderately convex at carina; anterior area, shortest, with an acute cuneiform termination, narrow and produced posteriorly; umbal region terminal; dorsal area, constituting a long narrow obliquely striated depression, entirely bordered within by an obtuse carina, and above by an obscure lengthened hinge-line; growth-lines slightly impressed.

Dimensions.—Length 54, height 12 mm.

This interesting specimen consists of a natural cast and counterpart, showing external surface of a left valve, which resembles in many of its characters some Jurassic forms of the genus, such as *G. monotis*, Deslongchamps, from the Bathonian of Britain and Europe, or *G. acuta*, J. de C. Sowerby, of Bajocian age. From the former it appears to differ in its lesser convexity and longer hinge-line, and from the latter in its less oblique and more lengthy hinge area.

Collector.—Dr. Hanitsch.

VOLSELLA cf. MODIOLLA, Goldfuss. (Pl. XXV, Fig. 5.)


In general contour and flatness this shell is closely related to *Mytilus compressus* of Goldfuss, originally described from Hanover and the Stonesfield Slate. The principal distinction appears to be in the concentric lineations; which are fewer and more distant in the Singapore fossils, although some obscure ones are traceable between the more important striae, especially on the lateral areas. The umbo is not terminal as in *Mytilus*, so that this form is recognized as a true *Volvilla* (= *Modiola*). The specimen shows an external view of a left valve embedded in matrix.

Dimensions.—Length 20, height (maximum) 10 mm.

Collector.—Mr. J. B. Scrivenor.
Mesozoic Fossils from Singapore.
ascertaining the exact length of the fossil, although it is probable that it was a much shorter form, such as has been figured by Dr. Yabe from Korea and compared with *P. pulchellus* of Heer from Spitzbergen (Kongl. Svensk. Vetensk.-Akad. Handl. [Stockholm], 1876, vol. xiv, No. 5, p. 38, pl. ix, figs. 10–14). A slight resemblance can also be traced to a pinna recently figured by Mr. Seward from the Stonesfield Slate as *P. Stonesfieldensis* (Catalogue Mesozoic Plants British Museum, Liassic and Oolitic Floras of England, 1904, pl. iii, fig. 4, p. 123), in which a basal notch has been likewise observed.

Remains of this plant are frequently found in a poor state of preservation, and only detached pinnae as a rule are obtained, these being sometimes damaged at their terminations like the Singapore specimens. The species is a very variable one, the pinnae differing considerably in dimensions and the number of parallel venations never being quite the same. Its geographical distribution is extensive. Originally described from the Yorkshire Oolites, it has since been recorded from European countries, Spitzbergen, Siberia, Persia, India (Upper Gondwana Beds), China, Japan, and Korea. For an exhaustive synonymy of the species Mr. Seward’s British Museum Catalogue should be consulted.

**Collectors.**—Mr. J. B. Scrivenor (Fig. 16) and Dr. Hanitsch (Fig. 17).

**Carpolithes** sp. (Pl. XXV, Fig. 18.)

An isolated seed, buried in the matrix, of apparently a Cycadean character has been provisionally referred to the genus *Carpolithes.* It is of rather oblong contour with nearly parallel sides, and bearing a longitudinal rounded ridge on the right margin, which may represent a fractured edge of the outer cuticle of the seed. The central oval and convex body, which is possibly the naked seed itself, is minutely and concentrically striated, especially on the sides.

In connection with the remains of *Podozamites* it is interesting to find a seed of this character in association, as the assemblage is suggestive of a Lower Oolite flora, such as characterise the rocks of the Yorkshire coast, Stonesfield, and the more distant Jurassic regions.

**Dimensions.**—Width 7, height 8 mm.

**Collector.**—Mr. J. B. Scrivenor.

**EXPLANATION OF PLATE XXV.**

**Fig.**

1. *Goniomya* Scrivenori, sp. nov. External view of a left valve. × 2.
   Nat. size.
6. *[? Nuculoid shell].* External view of a right valve, showing obscure anterior notch. Nat. size.
7. *[? Nuculana] sp.* External view of a right valve, the dotted line showing probable rostrum. Nat. size.
FIG.
8. ? Thracia sp. Natural cast of an imperfect left valve showing external features. Nat. size.
9. Astario Guthriensis, sp. nov. External view of right valve. × 2.
10. A. Guthriensis, var. Outer view of a right valve. × 2.
11, 12. A. Scrivenori, sp. nov. External views of right valves. Fig. 12 drawn from a wax cast of original cavity. Nat. size.
13. Oecullus Scrivenori, sp. nov. External view of right valve. × 2.
15. ? Lucina sp. Outer aspect of a fragmentary right valve. × 2.
16. Podocanites cf. lanceolatus. An incomplete pinna showing the probable base as tapering to a point where attachment to the rachis might have been effected. Nat. size.
17. Podocanites cf. lanceolatus. A more imperfect fragment of another pinna with an obscure indication of a basal notch. × 2.
18. Carpolithes sp. Longitudinal view of a seed showing on the right margin the remains of a possible outer integument. × 2.

Note.—Specimens represented by Figs. 3, 4, and 17 were collected and presented to the British Museum by Dr. R. Hantisch; the remainder were collected by Mr. J. B. Scrivenor and similarly presented by him to the same institution.