THE STOKES COLLECTION OF ANTARCTIC FOSSILS.

MR. F. W. STOKES, artist to the late Belgian Antarctic expedition, collected in February, 1902, a few specimens of fossils upon the Antarctic continent at Admiralty Inlet, Louis Philippe Land, south of South America. These fossils are the first which have ever been brought back by any of the expeditions to the far south, and great praise is due Mr. Stokes for affording this means of identification for the first time, of the age of sedimentary strata upon Antarctica. The collection is not large, containing scarcely more than a dozen specimens, but a sufficient number of species have been recognized to determine somewhat definitely the age of the strata containing them, and to permit of important conclusions as to the faunal geography of Upper Cretaceous time. In the study of the collection the writer is indebted to Dr. T. W. Stanton, of Washington, for valuable suggestions.

The specimens were all collected from a talus slope. Most of them occur in concretionary nodules of a very dense, fine-grained brown sandstone, but the two specimens of Hamites are from a coarser-grained glauconitic sandstone which is reddish in color upon its weathered surfaces. The most perfect specimens of *Tubulostium callosum* occur completely weathered out, but the same species also occurs in the brown sandstone nodules. The original stratigraphic position of all the specimens was probably approximately at the same horizon.

As might be expected, several of the species prove to be undescribed forms and are here described for the first time. The species recognized are as follows :

Lucina? townsendi White.
Lagena ? antarctica, n. sp.
Tubulostium callosum Stol.
Olcostephanus antarctica, n. sp.
Haploceras? sp. undet.
Hamites elatior Forbes ?

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Hamites, sp. undet.
Glyphaea stokesi, n. sp.

The presence of the ammonites at once marks the fauna as of Mesozoic age, and the presence of such uncoiled forms as Hamites stamps it at once as Cretaceous. In an examination of the fauna for the purpose of making a closer correlation and to determine the relationships of the fauna with the Cretaceous faunas of other portions of the earth, it is found that these relationships point in two directions. The three species, *Tubulostium callosum*, *Lagena? antarctica* and *Olcostephanus antarctica*, seem to connect the fauna with the Middle or Upper Cretaceous faunas of southern India. The first of these is a peculiar little gastropod which is specifically identical with one originally described from the Utatur formation of southern India. The second species, *Lagena? antarctica*, is most closely related to *L. secans* Stol. from the Ariyalur formation of the same region, and the third, *Olcostephanus antarctica*, most closely resembles *Ammonites madrasinus* Stol., also from the Ariyalur beds of India. In the correlation of these deposits in India, the Ariyalur formation has been referred to the Upper Cretaceous by the Indian geologists, while the Utatur beds are placed in the Middle Cretaceous. The weight of the evidence afforded by the antarctic fossils, therefore, leans about equally towards the correlation of the beds containing them with the Middle or with the Upper Cretaceous beds of India, which would naturally lead to giving them a place in about the middle of the series.

In addition to these three species which establish the relationship of the Antarctic fauna with that of southern India, there are two species, *Lucina? townsendi* and *Hamites elatior* which are identified with forms which have been described by White from islands in the Straits of Magellan, thus establishing the connection of the fauna with that of the continent of South America. The specimens of *Tubulostium callosum* also, are somewhat closely allied to a species described by Stanton[1] as *T. pupoides* from the Cretaceous beds of Patagonia.

The evidence afforded by the specimens in the Stokes collec-

[1] Rep. Princeton Univ. Exped. to Patagonia, Vol. IV, Pt. I, p. 30.

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tion seems to establish the relationship of this Antarctic fauna with the Middle or Upper Cretaceous faunas of southern India on the one hand and on the other hand with the Cretaceous faunas of southern South America, and it is believed that the evidence is sufficient to demonstrate the existence of a shallow water connection between these three regions in later Cretaceous time, possibly by way of Australia.

DESCRIPTION OF SPECIES.

MOLLUSCA.

PELECYPODA.

Lucina? townsendi White. Plate I, Figs. 2–3.

1890. *Lucina? townsendi* White. *Proc. U. S. Nat. Mus.*, Vol. XIII, p. 14. Pl. III, Figs. 1–2.

Description.—Shell attaining a length of 70^{mm} in the larger of the two specimens in the collection, subovate in outline, moderately convex, the greatest convexity being one-fourth the total height of the shell below the beaks, the hinge-line arcuate, about two-thirds the total length of the shell. Anterior margin rounded in outline, passing imperceptibly into the more gently rounded ventral margin; posterior margin rather sharply rounded below and in the casts sinuate above. In the internal casts the postero-dorsal surface is rather abruptly depressed, this depression being bounded internally by a slight sinuous, rounded ridge. The adductor muscle impressions are subequal, of rather large size, the posterior ones included almost wholly within the depressed portion of the valve and its bounding ridge, the anterior ones just below the anterior extremity of the hinge-line. Surface markings of the exterior of the valves poorly preserved, apparently consisting of somewhat irregular growth lines only; the surface of the casts marked in the lower third of the valves by more or less irregular and rather obscure, flattened, radiating ribs which become obsolete before reaching the ventral margin.

The dimensions of the smaller and better preserved of the two specimens are: length, 43^{mm}; height, 38^{mm}; thickness through both valves, 22^{mm}. The dimensions of the larger example are: length, 70^{mm}; height, 56^{mm}; thickness through both valves, 42^{mm}.

—Walker Museum Pal. Coll. No. 9707–9708.

Remarks.—The generic reference of these shells cannot be made with certainty because the hinge-characters are not well preserved in either specimen. On the right valve of the smaller specimen, however, near the anterior extremity of the hinge-line, several processes are exhibited which seem to resemble the teeth of the genus Trigonarca. The species seems to be identical, however, with White's *Lucina? townsendi*, described from islands in the Straits of Magellan, and in the absence of any definite proof to the contrary his generic identification is allowed to stand.

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GASTROPODA.

Lagena? antarctica, n. sp. Plate I, Figs. 4, 5.

Description.—Shell rather small, fusiform, with about four volutions, the periphery forming a sharp revolving keel. Spire elevated, its height but little less than that of the outer volution. From the revolving keel the surface of each volution slopes abruptly to the suture below, the upper surface of the volution has a much longer concave slope to the suture above. The outer slope of the last volution drops abruptly from the periphery, is then concave for a short distance and then continues in a nearly straight or slightly convex line to near the anterior extremity of the shell where it is again concave.

Surface of shell marked by fine lines of growth which bend backward in passing from the suture to the peripheral keel.

The dimensions of the only specimen observed are: total height 19.5 mm, diameter of last volution on the periphery 11 mm.

—Walker Museum, Pal. Coll. No. 9713.

Remarks.—This species is established upon a single specimen which preserves the mould of the exterior and a cast of the interior of the shell. It is a rather unusual form of gasteropod shell in Cretaceous faunas and agrees most closely with a species described as *L. secans* Stol., from the Upper Cretaceous of southern India. The antarctic species[1] here described may be distinguished from the Indian species by the absence of the angular revolving rib upon the outer volution below the peripheral keel. In other respects the two species are much alike.

Tubulostium callosum Stol. Plate I, Figs. 6–17.

1898. *Tubulostium callosum* Stoliczka. *Pal. Ind.*, "Cret. Faun. of S. Ind., Gasteropoda," p. 241. Pl. XVII, Figs. 26–32.

Description.—Shell sinistral, thick and rugose, more or less nearly discoidal in form, sometimes with a low spire, aperture circular, entire. Volutions exceedingly irregular, apparently three or four in number, the inner ones being eroded in all specimens observed so that their number, cannot be accurately determined. The peripheral portion of the shell is much thickened, the thickened portion being divided into three strong, more or less irregular revolving ribs; the shell is also marked by conspicuous, irregular lines of growth.

The dimensions of the best preserved specimen are: maximum diameter 17 mm, height of outer volution 8 mm, diameter of aperture 3 mm.

—Walker Museum Pal. Coll. No. 9711.

Remarks.—This little shell has been identified with a south Indian species although none of the Indian specimens which have been illustrated are as nearly discoid in form as some of the Antarctic ones. The Indian specimens, so far as illustrated at least, agree most closely with Fig. 17 upon the accompanying Plate I. The four specimens here illustrated show a regular gradation from the more discoid to the more heliciform shells, and without doubt all are members of a single species.

[1] *Pal. Ind.*, "Cret. Faun. of S. India Gasteropoda," p. 138, pl. 11, f. 20.

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All of the Antarctic specimens are sinistral; in the original description the species is said to be usually sinistral, but some of the Indian specimens are dextrally coiled and in a larger collection from Antarctica both forms of shell would doubtless be discovered. The species is also somewhat closely allied to *T. pupoides* Stanton, from the Cretaceous beds of Patagonia.

CEPHALOPODA.

Olcostephanus antarctica, n. sp. Plate II, Figs. 1–2.

Description.—Shell discoid, compressed, dorsum regularly rounded, the aperture two-thirds as broad as high. Umbilicus of moderate size with nearly vertical sides, leaving about three-eighths of the inner whorls exposed. Surface of whorls marked by sharply elevated transverse ribs which are continuous uninterruptedly across the dorsum, their crests being from two to three millimeters apart; most of these ribs originate in a row of tubercles upon the edge of the umbilicus, each tubercle giving rise to two or three ribs, but between the ribs originating in this way there are others which start on the edge of the umbilicus between the bases of the tubercles. The crest of each rib is surmounted by a row of small, low, tubercles about two millimeters apart.

The maximum diameter of the type specimen is 68 mm, the height of the aperture 30 mm, and the width of the aperture 20 mm.

—Walker Museum Pall. Coll. No. 9706.

Remarks.—This type of Ammonite shell, with strong lateral ribs which usually originate in fascicles from nodes on the border of the umbilicus and continue uninterruptedly across the dorsum, is uncommon in the Cretaceous faunas of North America, where it is recognized only in beds of Neocomian or Lower Cretaceous age on the Pacific coast. In Europe the genus is restricted to the Upper Jurassic and Lower Cretaceous. The antarctic species here described, however, is not closely similar to any of the American or European species of the genus, but is allied to several species of Ammonites (*A. kaliki* Stoliczka, *A. madrasinus* Stoliczka, and *A. bhawani* Stoliczka),[1] from the Middle Cretaceous beds of Southern India, all of which should probably be referred to the genus Olcostephanus. *O. antarctica* may be distinguished from all of the Indian species, however, by the line of low tubercles which surmounts each one of the lateral ribs of the shell.

Haploceras? sp. undet. Plate II, Fig. 5.

A single distorted and imperfect specimen of a cephalopod with all the inner whorls destroyed, may be referred to the genus *Haploceras* with a query. The surface of the shell is smooth, the dorsum rounded, with the lateral surfaces gently convex and rounding rather abruptly into the umbilicus which is of moderate size. So far as can be determined the margin of the aperture is continuous, not being produced forward on the sides and on the dorsum, but the specimen is not in a condition to show the form of the aperture with certainty. None of the sutures are preserved.

[1] *Pal. Ind.*, "Foss. Ceph. of Cret. of S. India."

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The dimensions of the specimen are: maximum diameter 34^{mm}, height of aperture 17^{mm}, width of aperture 14^{mm}.

—Walker Museum, Pal. Coll. No. 9712.

Hamites elatior Forbes? Plate II, Fig. 3.

1890. *Hamites elatior* Forbes? White, *Proc. U. S. Nat. Mus.*, Vol. XIII, p. 13. Pl. II, Figs. 1–2.

Two specimens in the collection may be referred provisionally to the genus Hamites. One of these is a fragmentary cast of the straight portion of an individual whose diameter must have been about 60^{mm}. On this specimen the annular ridges are closer together than on the other one, the intervals ranging from 3 to 4^{mm}, and on one side the annulations exhibit a shallow sinuosity. The specimen seems to possess all of the essential characters of *H. elatior* Forbes? as identified by White from the Straits of Magellan and is therefore so identified. — Walker Museum, Pal. Coll. No. 9709.

Hamites sp. undet. Plate II, Fig. 4.

The second specimen referred to Hamites is a portion of the impression of the exterior of a very large individual, which, judging from the curvature of the fragment at hand, must have had a diameter of 80^{mm} or more. It is a part of the straight portion of the shell with the crests of the annulations about 6.5^{mm} apart. The raised annular ridges are not symmetrical, the slope on one side being more abrupt than on the other.

—Walker Museum, Pal. Coll. No. 9710.

ARTHROPODA.

MALACOSTRACA.

Decapoda.

Glyphaea stokesi, n. sp. Plate I, Fig. 1.

Description.— Cephalothorax highest toward the front, somewhat flattened both dorsally and laterally, with a short, sharply pointed rostrum. Anterior margin sinuate between the rostrum and the base of the antennae, it rounds regularly into the gently convex ventral margin. From a little in front of the middle of the ventral margin of the lateral surface of the cephalothorax a a conspicuous rounded furrow is directed obliquely upward and backward, crossing the flattened dorsal surface transversely at about one-third of the total length of the cephalothorax from its posterior extremity; from the same point of origin at the ventral margin another furrow describes a sigmoidal curve first forward, then upward and nearly vertical, and then forward and nearly horizontal again, becoming less and less sharply defined to the anterior margin just above the base of the antennae; from this sigmoidal furrow there are two shorter and less well defined furrows directed obliquely downward and forward towards the antero-ventral margin. At the posterior extremity of the cephalothorax a transverse furrow extends across the dorsal surface close to and parallel with the margin. Between the two principal furrows upon the lateral surface of the cephalothorax, and just above their

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point of origin, there is a subcircular, depressed-convex, node-like elevation, and between the two shorter furrows which are directed obliquely downward and forward from the sigmoidal furrow is another similar subelliptical elevation. Just back of the base of the antennae is a rather sharp, keel-like ridge reaching backward to the first of the short oblique furrows. Back of the base of the rostrum, upon the dorsal side of the cephalothorax there are two small, sharply pointed tubercles upon each side of the median line; the anterior one is the larger and is situated almost directly in front of the smaller posterior one.

Abdomen consisting of six segments and a strong telson posteriorly, altogether being as long or longer than the cephalothorax.

The dimensions of the type specimen are: extreme length of cephalothorax 32^{mm}, greatest height 14^{mm}, length of rostrum 4^{mm}.

—Walker Museum, Pal. Coll. No. 9705.

Remarks. — This species is represented in the collection by a single specimen which exhibits in good condition one side of the cephalothorax up to the dorsal median line, with the segments of the abdomen and the telson attached but imperfectly preserved and recurved along the ventral side. Fragments of the legs and the basal joint of one of the antennae are also preserved but not in such a condition as to admit of description. The specimen represents a species which is quite distinct from any of those previously described from the Cretaceous.

EXPLANATION OF PLATES

PLATE I.

FIG. 1. *Glyphaea stokesi*, n. sp. Lateral view of the type specimen.

FIGS. 2–3. *Lucina? townsendi* White. 2. Laterial view of the right valve of a small specimen. 3. A larger, less perfect specimen believed to belong to the same species.

FIGS. 4–5. *Lagena? antarctica*, n. sp. 4. Lateral view of a wax cast taken from a natural mould of the exterior. 5. The natural cast of the interior of the shell.

FIGS. 6–17. *Tubulostium cullosum*. Stol. Three views each of four different specimens.

PLATE II.

FIGS. 1–2. *Olcostephanus antarctica*, n. sp. 1. Lateral view of the type specimen. In part an internal cast and in part an impression of the exterior. 2. Lateral view of a wax cast taken from the natural mould of the exterior. Same specimen as Fig. 1.

FIG. 3. *Hamites elatior* Forbes? Lateral view of an imperfect cast of the interior.

FIG. 4. *Hamites* sp. undet. Lateral view of a plaster cast taken from the natural mould of the exterior.

FIG. 5 *Haploceras?* sp. undet. Lateral view of the only specimen observed.

STUART WELLER.

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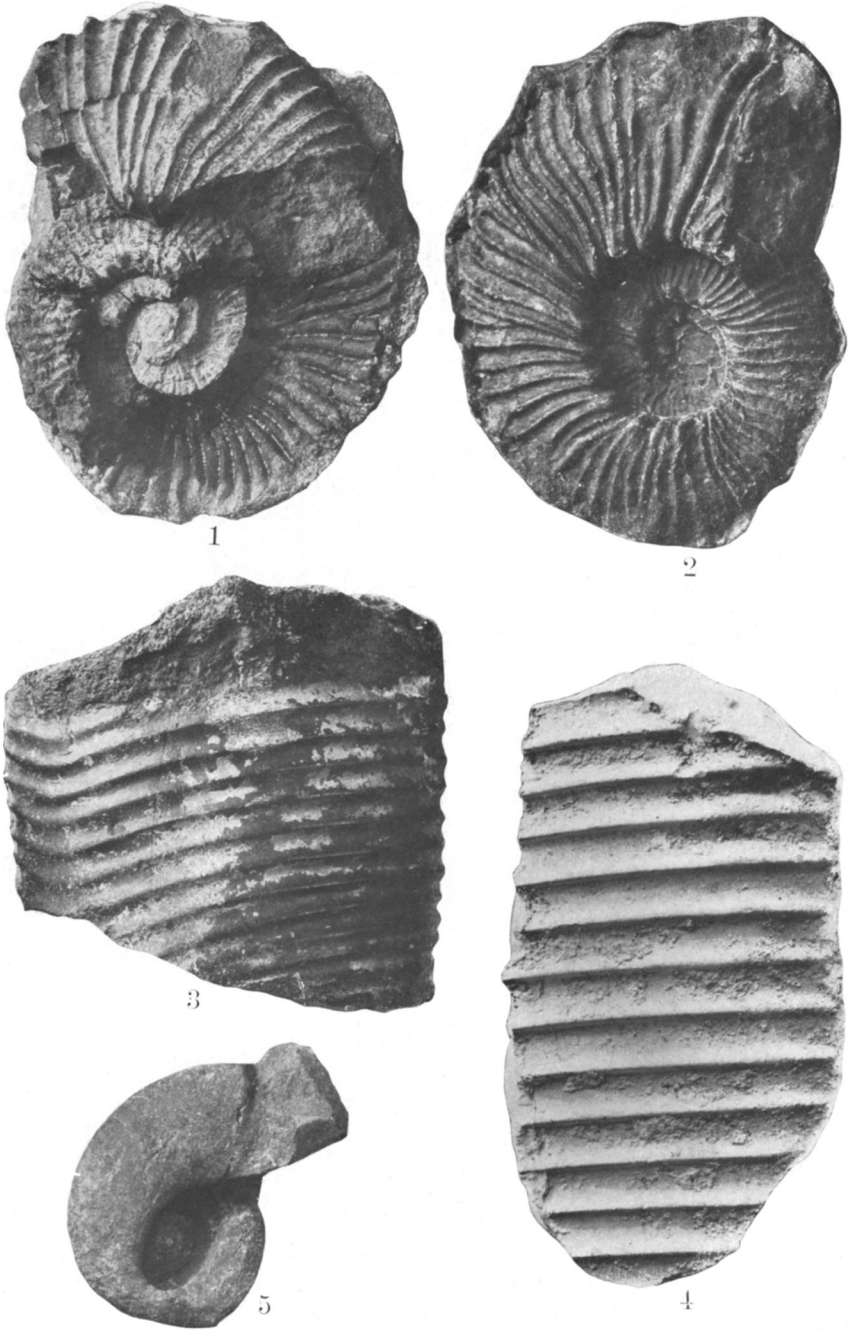

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