

to refer to a former paper<sup>1</sup> for the phylogenetic value of the ascending process. In opposition to what is known of *Allosaurus* and *Megalosaurus*, there are in *Streptospondylus* in each foot four well-developed metatarsal bones, each bearing well-developed toes armed with claws. The claws show the carnivorous pattern.

With the superior crest of the ilium Mr. Parker's nearly complete *Streptospondylus* stood about 4 ft. 9 in. from the ground, and the Paris specimen may have been 6 feet in height; the total length of these two animals was probably 20 and 27 feet. *Megalosaurus*, we may assume, may have attained a maximum length of 30 feet.

Plate XV accompanying this notice gives a reconstruction of *Streptospondylus* as based on the study of Mr. J. Parker's fossil, and Miss A. B. Woodward has had the great kindness to make this drawing according to my directions. The large skull, the feeble but flexible neck, the weak anterior and powerful posterior limbs are well shown.

The principal differences of *Streptospondylus* and other Theropoda have already been pointed out in different parts of this paper; here I wish only to refer once more to the Sauropod-like build of the vertebral column. That the Sauropoda descended from bipedal Saurischia I intend to discuss upon some other occasion. The specific name of the only kind of *Streptospondylus* known till now is *Strept. Cuvieri* (H. v. Meyer); the horizons at which the genus occurs are the Callovian in France and the Oxford Clay at Oxford in England.

#### EXPLANATION OF PLATE XV.

Reconstruction of *Streptospondylus* (the shaded parts indicate the bones that are actually known).

## II.—AN ACCOUNT OF SOME MARINE FOSSILS CONTAINED IN LIMESTONE NODULES FOUND ON THE MEKRAN BEACH, OFF THE ORMARA HEADLAND, BALUCHISTAN.

By R. BULLEN NEWTON, F.G.S.

(PLATES XVI AND XVII.)

THROUGH the kindness of Miss Caroline Birley, of Kensington, I have been privileged to examine a collection of fossil marine shells and other organisms in her possession, which occur in drab-coloured, gritty, and siliceous limestone nodules picked up on the beach off the Ormara Headland, facing the Mekran or Baluchistan coast, 130 miles west of Karachi, by Mr. F. W. Townsend, chief executive officer of the Submarine Telegraph Service in the North Indian Ocean.

So far as the present specimens demonstrate, the nodules vary in size from two to about four inches in diameter, many of them being as round as a ball with perfectly even surfaces, to which are

<sup>1</sup> Nopcsa, "Synopsis und Abstammung der Dinosaurier": Földtani Közlöny, Budapest, 1901.

sometimes attached parasitic forms of modern marine life, such as *Hippothoa*, etc. When split open with a hammer these nodules are invariably found to enclose a fossil of some kind, and most frequently a shell. The condition of the fossil is nearly always that of a natural cast exhibiting internal structures, whilst external features are often preserved in the concavity of the counterpart of the nodule, thus making it possible to obtain a fairly good restoration of the original shell by pressing into it some artists' wax or gutta percha.

A similar plan for obtaining structures was successfully adopted by Professor Ray Lankester when studying the marine shells and other organic remains found as casts in the celebrated sandstone nodules of the Suffolk Crag, known as the 'Box-Stones' (Quart. Journ. Geol. Soc., 1870, vol. xxvi, p. 499). And here it may be interesting to remark that the Suffolk 'Box-Stones' of all the fossiliferous nodules found in the different formations are perhaps the most convenient for comparison with those from the Mekran Coast, since they are most likely to be of an approximate geological age. They may be collected on the beach at Felixstow, after being washed out of the surrounding cliffs, where they occur *in situ*, or they may be obtained from the 'Coprolite-diggings' of the same neighbourhood. Fossils are much more rarely found in them than in the Mekran material, and many a nodule may be cracked open before an organism is discovered; the following genera have, however, been recognized: *Isocardia*, *Cardita*, *Glycymeris* (= *Pectunculus*), *Conus*, *Cassidaria*, *Pyrula*, *Turritella*, *Voluta*, *Mastodon*, etc.

Among the shell-remains of the Mekran nodules are *Cardium*, *Dosinia*, *Mastra*, *Arca*, *Dolium*, *Tugurium*, *Neptunea*, and *Lampusia*; the genera *Cardium* and *Tugurium* being of the most frequent occurrence. Besides these shells there is a Polyzoan encrusting the spire of *Neptunea* belonging to the genus *Membranipora*, which Mr. H. W. Burrows has kindly described for this paper. The Crustacea, represented by a crab's carapace and a species of *Balanus*, both of which are described by Dr. H. Woodward, F.R.S.; but no Echinoderms, Brachiopods, or Cephalopods were observed.

A very modern facies characterizes such a fauna as is here enumerated, the various genera being nearly all found in adjacent seas at the present day; the fauna also seems to indicate shore or shallow-water conditions of existence. But there are certain specific differences to be noted in this assemblage, which appear to suggest a relationship with Mio-Pliocene forms of the Mediterranean area and actual Indian Oceanic species. Moreover, Mr. Edgar Smith, of the British Museum (Nat. Hist.), and Mr. Cosmo Melvill, after an examination of this collection, are of opinion that the species are not represented in modern seas, although showing generic affinities with living mollusca.

With regard to the origin of the Mekran nodules, Mr. Townsend, the collector, seems to think that masses of the upper strata of the Ormara Headland break away from time to time, and so falling upon the beach become rolled and worn by the action of the sea; but it is much more probable that the nodules occur somewhere in the cliff

*in situ*, and like the 'Box-Stones' of Felixstow reach the sea beach as rounded ball-like bodies without the intervention of subsequent marine agencies. The present collection comprises more than eighty examples of these nodules, and I am given to understand that they are to be met with in large numbers on the Mekran Coast, yet, notwithstanding their apparent common occurrence, there seem to be no published observations upon the subject. Among the few writers who have investigated the rocks of the Mekran Coast, Dr. W. T. Blanford's<sup>1</sup> name stands first. He regarded these cliff deposits as of post-Nummulitic age, and named them the 'Mekran Group,' describing as well their more or less flat-topped character and nearly horizontal bedding, as observed at Ras Malan, which is 2,000 feet high, Ormara, and Gwadar. In remarking upon the constitution of these beds he states that "The prevailing rock along the Makran Coast is a pale grey clay, more or less indurated, occasionally intersected by veins of gypsum, usually sandy and often calcareous, occurring in beds of great thickness. With this clay are interstratified bands of shelly limestone, calcareous grit, and sandstone, but these usually form but a small portion of the mass, although their greater hardness makes them conspicuous at the surface." An abundant marine fauna is said to characterize the various beds of the Mekran group with such genera as *Ostrea*, *Pecten*, *Arca*, *Cardium*, *Lucina*, *Cerithium*, *Turritella*, and *Natica*; besides Echinodermata, Corals, and Foraminifera (*Operculina*), but without Brachiopods or Cephalopods. Dr. Blanford further states that "the general facies of the Mekran fauna is utterly different from that of the Lower Tertiaries; the commonest and most characteristic fossils of the Nummulitics are Foraminifera, especially *Nummulites* and *Alveolina*; the most abundant shells in the Mekran Group are barnacles, oysters, and scallops. No junction of the two series has hitherto been observed, but it may be safely asserted that the Mekran Group is newer than the Nummulitics, for while the fauna of the latter appears to be nearly or entirely extinct, at all events in the shallow seas near the coast, several of the Mekran fossils appear identical with the species found living, in water of moderate depth, along the shores of Baluchistan and the Persian Gulf."

Capt. A. W. Stiffe,<sup>2</sup> who next visited the Mekran Coast, found the calcareous deposits to be almost entirely composed of marine organic remains, in parts distinct and perfect, forming a shelly breccia and passing into a more or less compact limestone. His fossils were submitted to Mr. Etheridge, who reported as follows:—"The shells appear to me to be of Miocene age, although all are mere casts, and therefore it is very unsafe to pronounce definitely as to their age. I cannot determine them to belong to the modern species of the Persian Gulf. The cast of *Conus*, *Cypræa*, and *Ostrea* are certainly not those of existing species; and the mass of shelly breccia

<sup>1</sup> Records of the Geological Survey of India, 1872, vol. v, pp. 41-45.

<sup>2</sup> Quart. Journ. Geol. Soc., 1874, vol. xxx, pp. 50-53, with sketch-map of Mekran Coast.

containing *Dentalium*, *Cardita*, *Astarte*, *Venus*, *Trochus*, *Arca*, and *Tellina* I believe to be of more modern date, if not recent.”

In his classical work on “Eastern Persia” Dr. Blanford<sup>1</sup> again referred to the Mekran deposits as belonging to a “late Tertiary formation,” inserting a list of determinations by Mr. Etheridge of a collection of fossils found by Dr. Day at Gwadar, which were considered as exhibiting “a very late facies, and may even be Pleistocene.” This included *Dolium* sp., *Natica Lamarckiana* or a closely allied form, *Cerithium torulosum*, *Turritella* sp., *Fissurella* sp., *Jouanettia*, *Tellina edentula*, *Venus* sp. near *plicata* and *rugosa*, *Cytherea* sp. near *lyrata*, *Astarte* (?) sp. allied to *Circe corrugata*, *Diplodonta* sp., *Cardium*, two sp., one near *C. papyraceum*, *Chama* sp. near *C. isostoma*, *Arca*, four or five species, one of which is *A. (Parallelopipedum) tortuosa*, the others allied to various recent forms, *Pectunculus*, two species, one allied to *P. pectiniformis*, the other to *P. lividus*, *Pecten* somewhat resembling *P. pyxidatus*, *Ostrea* sp., *Temnopleurus*, two sp., *Eupsammia* sp. (coral), *Mæandrina* sp., *Operculina* sp.

A further allusion is made to the Mekran Group in Medicott & Blanford’s work on India,<sup>2</sup> with the remark that it “appears to be of later age than the Miocene Gaj Beds”; and, again, on the evidence of the Echinoidea (*Temnopleurus simplex*, Duncan & Sladen, etc.) found in these deposits Dr. P. M. Duncan and Mr. W. P. Sladen<sup>3</sup> came to the conclusion that the beds were younger than the Gaj Series (=Miocene) of India, and consequently might be regarded as Pliocene. In Mr. R. D. Oldham’s edition of Medicott & Blanford’s “Manual,” 1893, p. 316, it is stated that “The Mekran Group is of shallow-water marine origin and abounds in Mollusca, Echinoderms, etc., many of the species being apparently the same as living forms. The Echinoderms alone have as yet been examined in detail; they belong, without exception, to living genera, while most of the species are very closely allied to recent forms, and one species alone is doubtfully identical with a Gaj form. The general facies of the fauna is distinctly Pliocene.” Lastly, Capt. Stiffe, in exhibiting “a fossil *Cardium* (?)” before the Geological Society in January, 1899, which had been found at the foot of the Cliffs of Ormara, stated that “the fossils in the clay are difficult to find, and probably are generally enclosed in nodules of the clay somewhat altered, as in this specimen.” (Abstracts Proc. Geol. Soc. London, 1899, No. 701, pp. 31, 32.

With the exception of the extracts just quoted, and which deal exclusively with the fauna of the ‘Mekran Group,’ there are no monographs on the invertebrate fossils of the Tertiary formations of India which render much assistance in the determination of the specimens from the Mekran nodules. It may be as well, however,

<sup>1</sup> “Eastern Persia,” 1876, vol. ii, pp. 462–465.

<sup>2</sup> “A Manual of the Geology of India,” 1879, vol. ii, pp. 470, 471.

<sup>3</sup> “The Fossil Echinoidea from the Mekran Series (Pliocene) of the Coast of Biluchistan and of the Persian Gulf”: Mem. Geol. Surv. India, Pal. Indica, 1886, pp. 369–382, pls. lvi–lviii.

to refer briefly to the remaining literature which treats of the Tertiary invertebrates of other parts of India.

One of the earliest papers is that by James de Carle Sowerby,<sup>1</sup> who determined Capt. Grant's Tertiary collections from Cutch as belonging to Nummulitic and later Tertiary horizons; this was succeeded in 1853 by D'Archiac & Haime's memoir<sup>2</sup> on the Nummulitic fossils of India, which unfortunately is not a reliable work, since Secondary and Tertiary specimens are mixed up together and regarded as coming from the same series of beds.

Then followed Stoliczka's<sup>3</sup> work on the Tertiary Crabs of Sind and Cutch; Duncan's<sup>4</sup> on the Fossil Corals of Sind; the Tertiary Echinoids of Western Sind being monographed by Duncan & Sladen<sup>5</sup> between 1882 and 1886; lastly, we have the very important treatise on the Miocene Fauna of Burma written by Dr. Fritz Noetling,<sup>6</sup> containing a large number of plates illustrative of the fossils (chiefly Mollusca) of that region, accompanied by a voluminous text.

In describing this fauna Dr. Noetling was able to trace, in a general way, its correlation with the Miocene of Java and the Miocene (Gajian) of Western India. He believed also that the present Indian Ocean fauna was directly derived from the Miocene faunas of India, Burma, Sumatra, and Java. Until more is known of the Tertiary Mollusca of Western India and its connection with the shells now living in the surrounding seas it would be premature to definitely state the age of the Mekran nodules, although we may assume, provisionally, that they are Pliocene and probably synchronous with the beds of the 'Mekran Group,' which Dr. Blanford first recognized as younger than either the Eocene or the Miocene periods. In support of this horizon we have the undoubted presence of a northern genus, *Neptunea*, associated with forms that belong to a torrid or warmer sea, an exactly similar phenomenon being known in the Pliocene beds of Europe, and that without any apparent disturbance of the deposits containing them. Further, in comparing this limited fauna of the Mekran nodules with either the Burmese Miocene fossils described by F. Noetling, or the specimens monographed by Dr. K. Martin from the Upper Tertiary beds of Java, there is insufficient evidence to prove a similarity in facies so as to suggest its correlation with the faunas of those two sets of deposits.

It would have been interesting to have compared the fossils of the present collection with the original specimens of the so-called

<sup>1</sup> Appendix to Capt. Grant's "Memoir to illustrate a Geological Map of Cutch": Trans. Geol. Soc. London, 1840, ser. II, vol. V, pp. 289-329, pls. xxiv-xxvi.

<sup>2</sup> "Description des Animaux Fossiles du Group Nummulitique de l'Inde," 1853-1854, 2 vols., plates and text.

<sup>3</sup> "Observations on Fossil Crabs from Tertiary Deposits in Sind and Kutch": Mem. Soc. Geol. India, Pal. Indica, 1871, pp. 16, pls. v.

<sup>4</sup> "Sind Fossil Corals and Alcyonaria": *ibid.*, 1880, pp. 110, pls. xxviii.

<sup>5</sup> "Tertiary Echinoidea of Western Sind": *ibid.*, 1882-1886, text and plates.

<sup>6</sup> "Fauna of the Miocene Beds of Burma": *ibid.*, new series, 1901, vol. I, pp. 378, pls. xxv.

'Mekran Group,' referred to in the foregoing literature, but, unfortunately, I have not been able to trace them either in the Museum of the Geological Society or in the British Museum, and I can only conclude that they may possibly be among the Indian Survey collections at Calcutta.

As it seems fairly apparent that no previous writers have called attention to the occurrence of these fossiliferous nodules, it is to be hoped that the present communication may be of sufficient interest to induce the authorities of the Indian Geological Survey to re-examine the rocks of the Mekran coast, with the view of discovering the exact position of the bed whence the nodules were derived, so that its relationship to the other deposits of the Mekran Group could be properly established.

## DESCRIPTION OF THE SHELLS.

### Lamellibranchia.

#### ARCA BLANFORDI, n.sp. (Pl. XVI, Fig. 5.)

Shell subquadrate, ventricose, arched, with an angulate, truncated, deep posterior side, the anterior area being rounded and oblique; umbones subcentral, rounded, strongly incurved; surface radiately ribbed and sulcated; ribs about 27, with depressed summits, angulated margins; surface transversely striated.

*Dimensions.*—Of moderate-sized right valve: umbono-ventral, 45; antero-posterior, 45; diameter of valve, 20 mm.

In its contour and general radiate appearance this species resembles *Arca rhombea* of Born, found off Ceylon and the Chinese seas, and which also occurs in the raised beach deposits of Karachi, India. It differs, however, in the valves being more rounded and arched, besides showing an absence of nodulous ornamentation on the ribs, which is especially developed on the anterior half of *A. rhombea*. The specimen figured is taken from a wax squeeze of a fairly well-preserved right valve found in one of the nodules, showing the more elevated region partially covered with costæ, the ventral area being stripped of the shell, thus exhibiting an impression of the extremely fine and close longitudinal striæ which adorn the internal surface of the valve, and which extend to within a short distance of the margin.

This shell is named in honour of Dr. W. T. Blanford, C.I.E., F.R.S., a former Director of the Geological Survey of India, and one of the earliest writers on the geology of the Mekran Coast.

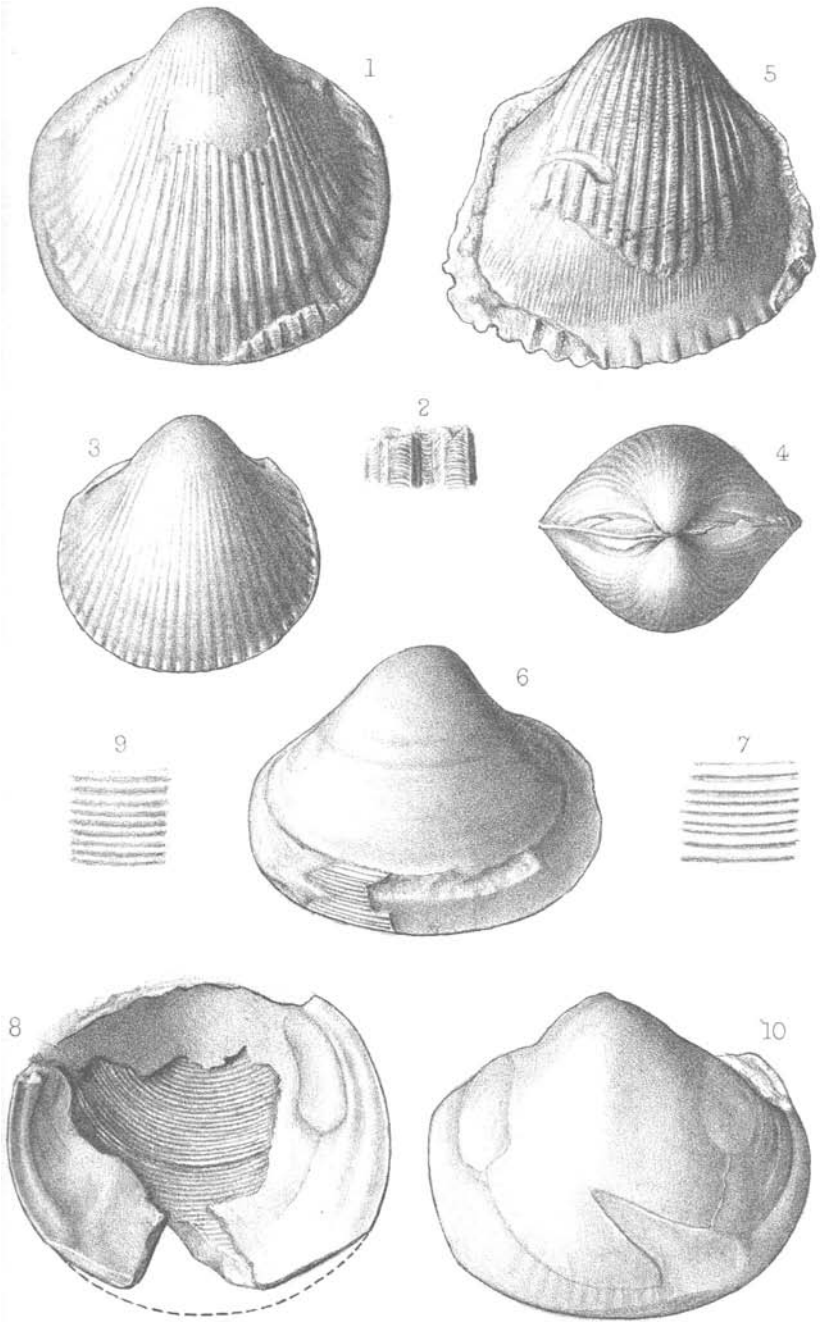
*Examples.*—Only three or four specimens in the collection.

#### MACTRA MEKRANENSIS, n.sp. (Pl. XVI, Figs. 6, 7.)

Shell subtriangularly ovate, cordiform, moderately convex, obtusely angulate posteriorly; umbones nearly central; sculpture consisting of narrow, depressed, smooth, concentric banding of equal width, each band separated by an extremely narrow sulcation.

*Dimensions.*—Right valve: umbono-ventral, 40; antero-posterior, 47; diameter, 10 mm.

The specimen referred to this form is represented by a right valve, being mainly an internal cast, yet retaining a small patch of original



G.M. Woodward del. et lith.

West, Newman imp.

Tertiary Shells in nodules from the Mekran Coast

shell structure on the postero-ventral region, which well illustrates the smooth, narrow-banded character of the sculpture. I have not been successful in discovering a shell which is suitable for comparison with this species, either among modern or fossil forms, its chief characters having reference to the triangularly oval shape and the regular concentric banding which ornaments the valve.

*Example.*—One specimen only in the collection.

CARDIUM MELVILLI, n.sp. (Pl. XVI, Figs. 1-4.)

Shell globose, nearly equilateral, radiately costated; costæ about 37, depressed, angulated at the sides, separated by narrow, deep interspaces about one-half the width of the ribs (as seen near the ventral margin); umbones rounded, incurved, subcentral.

	Largest.	Smallest.
<i>Dimensions.</i> —Umbono-ventral ... ..	48 ...	35 mm.
Antero-posterior ... ..	48 ...	35 "
Diameter (closed valves) ... ..	38 ...	28 "

This is one of the most abundant shells found in the Mekran nodules, though always occurring as internal casts. Some original costal structure still remains on the ventral area of the larger specimen selected for illustration, showing that the ribs have rather wide flattened summits covered with delicately vaulted surface lineations, angulated sides, and divided by narrow sulcations which are closely and concavely striated within. In its well-arched and globular form and the great number of its ribs this species resembles *C. asiaticum* of Bruguière and *C. multispinosum* of Reeve, both living Pacific shells, though differing in the structural details of the costæ. In *C. asiaticum* the costæ are more elevated and narrower, besides being sharply lamelliform on the posterior region of the valves; and instead of lineations the surface exhibits a minutely granulate structure. The ribs in *C. multispinosum* are more rounded, besides being numerous spined with small projections. I know of no Miocene or Pliocene shell which suggests affinities with this species.

The species is named after Mr. J. Cosmo Melvill, M.A., F.L.S., who is one of our principal authorities on the modern conchology of the Persian Gulf.

*Examples.*—Numerously represented in the collection.

DOSINIA sp. (Pl. XVI, Figs. 8-10.)

This shell is represented by a fractured left valve which exhibits both internal and external characters, the former including parts of the anterior and posterior surfaces, with complete margins, and giving good views of the adductor scar markings; through the broken surface of the centre of the valve the typical concentric lineations of this genus are well exposed. The other half of the nodule contains a natural cast of the valve showing impressions of the muscular markings and the pallial line with its conspicuously lanceolate, triangular sinus.

It is not possible to say more in connection with the specimen than that it somewhat resembles the European species *D. exoleta*, which is similarly orbicular, besides agreeing in general dimensions;



in sculpture characters, however, the Mekran specimen may possess more regular striations.

*Dimensions.*—Left valve; umbono-ventral, 50; antero-posterior, 50; diameter, 10 mm.

*Examples.*—There is only one specimen in the collection.

### Gastropoda.

#### NEPTUNEA BURROWSI, n.sp. (Pl. XVII, Figs. 5-7.)

Shell turreted and fusiform, with a tricarinate body-whorl, which terminates anteriorly in a narrow straight canal. Upper surface of whorls oblique, slightly excavated, and furnished with rounded bicarinate margins; lower surface of whorls narrow, vertical, excavated, and unicarinate; shell structure closely, minutely, and spirally funiculate.

*Dimensions.*—Height, 37; diameter, 23 mm.

The test of this specimen is encircled throughout with regular narrow cord-like costellæ, separated by microscopically narrow sulcations, and crossed by fine and slightly curved striations of growth. There are ten costellæ on the oblique sutural region of the body-whorl, and six on the vertical surface of the penultimate whorl, these being margined above and below by a double row of more prominent ones, whilst the upper oblique region of the same whorl bears about eight costellæ. No varices or longitudinal costæ are present such as characterize the shells of the Muricidæ. There is no doubt that the Mekran shell bears a strong resemblance to some of the carinate forms of *Neptunea* which Searles Wood long ago described from the English Crag deposits as varieties of *Trophon antiquum*, Linnæus (see Mon. Pal. Soc., 1848, pl. v, figs. 1a, 1b), and which show a very similar funiculate shell-structure, i.e., var. *jugosum*. Moreover, the occurrence of *Neptunea* itself, which is more characteristic of boreal than warmer climates, in association with genera that belong essentially to warmer seas as are found in the Pliocene formations of Europe, would tend to prove that the Mekran nodules are of Pliocene age.

The specimen shows both cast and shell structure, the left of the spire being partially enveloped by a parasitic Polyzoan belonging to the genus *Membranipora*. The protoconch is unfortunately not preserved. I have named this interesting specimen after my friend Mr. H. W. Burrows, F.G.S., who for many years has studied the Crag fauna, and who is good enough on the present occasion to confirm my generic determination of this shell.

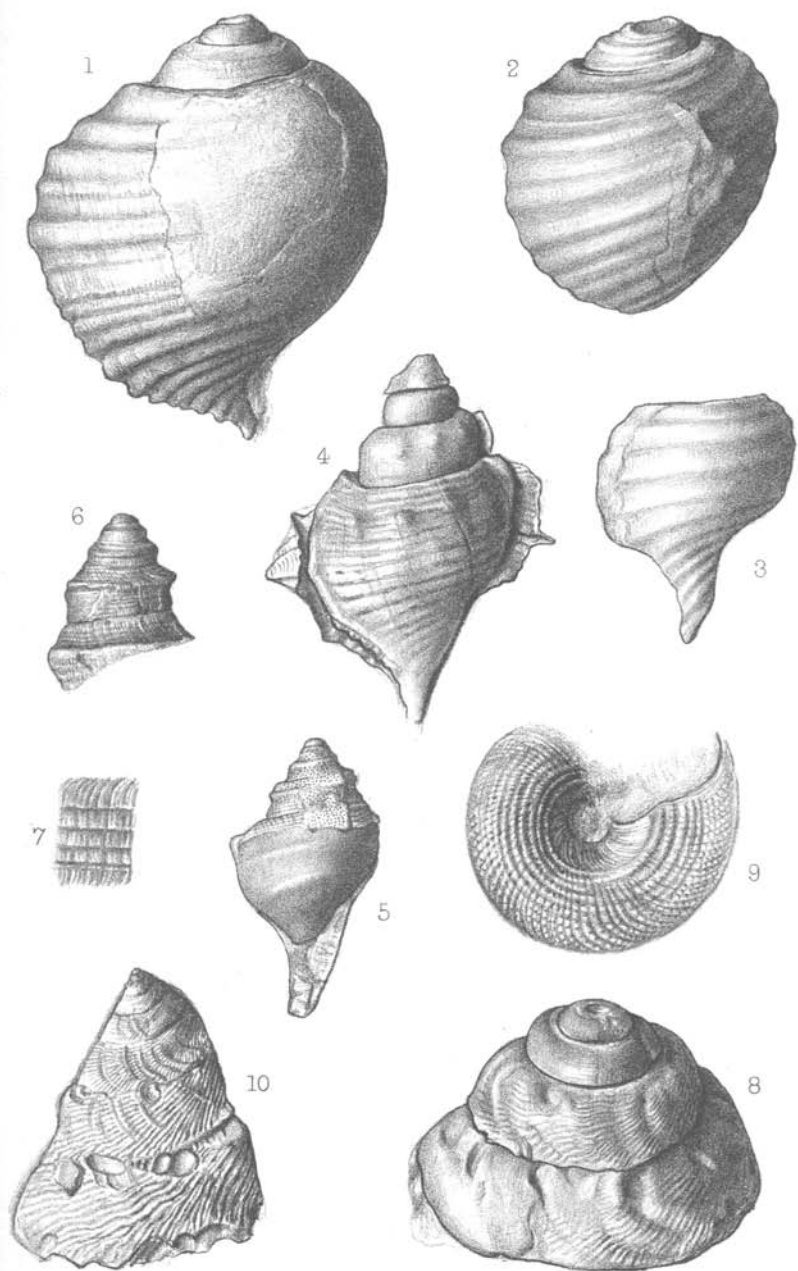
*Examples.*—One specimen only in the collection.

#### LAMPUSIA cf. AFFINIS, Deshayes. (Pl. XVII, Fig. 4.)

*Triton affinis*, Deshayes: "Expédition Scientifique de Morée, 1833, vol. iii (Zoologie), p. 188, pl. xxii, figs. 23, 24.

*Triton corrugatum*, Hörnes: Foss. Moll. Tertiaer-Beckens Wien, 1852, p. 205, pl. xx, figs. 1-4; non Lamarck.

There are several natural casts of this shell, all giving dorsal views and appearing to be related to *Triton affinis* of Deshayes,



G.M. Woodward del. et lith.

West, Newman imp.

Tertiary Shells in nodules  
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from the Upper Tertiaries of Greece, Italy, France, and Germany. Strong spiral costæ ornament the body-whorl, and a series of distant nodular tubercles surround the obtusely carinate margin, with evidence of a second obtuse tubercled margin below. The shell shows also the varixed labrum with a corresponding varix on the other side extending up the penultimate whorl. Except for their want of sharpness the Mekran casts resemble fairly closely those examples from the Vienna Basin Miocene deposits figured by Hörnes under the name of *T. corrugatum*.

*Dimensions*.—Height, 50; diameter, 33 mm.

*Examples*.—There are five very good specimens of this shell.

*TUGURIUM MEKRANENSE*, n.sp. (Pl. XVII, Figs. 8–10.)

Shell conical; whorls five or six, flattened, ornamented with numerous closely set, oblique, elevated, and rounded riblets, crossed by a series of equidistant, oblique, rather swollen growth ridges; suture distinct, and bearing agglutinations; base umbilicated, slightly concave, and furnished with a reticulate spiral sculpture.

*Dimensions*.—Height, 30; diameter, 50 mm.

This is one of the most abundant shells of the Mekran nodules. In sculpture it is very similar to *Xenophora crispa* of König, a species found in the Italian Pliocene, and which exists in the Mediterranean at the present day, although in that species the oblique striations of the upper surface of the whorls are coarser, more crenulated in structure, and considerably less regular in arrangement.

Again, *T. mekranense* is in no way related to *X. infundibulum* of Brocchi, also from the Pliocene of Italy, which is of larger size, imperforate, much excavated at the base and without basal reticulate sculpture; the upper surface of the whorls is also much more coarsely ornamented. On account of the umbilication and the fact that agglutinations take place at the suture this form is recognized under Fischer's name of *Tugurium*.

*Examples*.—Very numerous represented.

*DOLIUM TOWNSENDI*, n.sp. (Pl. XVII, Fig. 1.)

Shell thin, ovally globular, ventricose; volutions about five, penultimate and earlier whorls compressed, and showing obtuse median angulation, suture sunken, spire moderately elevated; body-whorl prominently sculptured with 15 or 16 rounded, ridge-like, spiral costæ of more regular occurrence below than above, and divided by depressed interspaces of variable widths which are sometimes faintly ridged in the centre; the postero-central rib is thicker and more important than the others.

*Dimensions*.—Height, 55; diameter, 47 mm.

The somewhat irregularly disposed costæ of this shell seem to separate it from other species. Beneath the rounded sutural margin of the body-whorl occurs a fairly wide excavated space followed by three prominent costæ and a fourth obscure one, all of which are separated by narrow interspaces; then follows the postero-central rib, which is stronger and thicker than the others. After the postero-central rib occurs a similar width of interspace as is found

above, then succeed five rounded ribs extremely close together with very narrow interstices, these being succeeded by a series of five or six more prominent and more widely separated ribs which are nearly equidistant from each other.

This species is represented by only one shell, showing external dorsal characters. The vacant space on the body-whorl indicates a considerable absence of shell structure, although the sculpture details are well preserved in the neighbourhood of the aperture and the base. It appears to differ from other species, both fossil and recent, in the possession of a prominent postero-central rib and the general irregularity of the rib system.

The specific name of this shell is given as a slight acknowledgement to Mr. F. W. Townsend for having collected and sent to London so interesting a collection of specimens illustrative of the geology of the Mekran coast.

*Examples.*—One specimen only.

*DOLIUM* cf. *HOCHSTETTERI*, K. Martin. (Pl. XVII, Figs. 2, 3.)

*Dolium Hochstetteri*, K. Martin: "Die Tertiärschichten auf Java," 1879-80, p. 39, pl. vii, fig. 8.

It is interesting to find in this collection two examples of a *Dolium* which show a greater regularity of sculpture details than was observed in *D. Townsendi*. These possess a system of ribbing which strongly resembles what is present in Martin's *Dolium Hochstetteri* from the Upper Tertiaries of Java, and which approaches it also in general contour. The chief difference is probably the occasional presence in the Mekran specimens of an obscure median rib between the more prominent ones, which are not observable in Martin's figures. Among living shells this form of *Dolium* is related to *D. costatum* of Menke and Lamarck's *D. maculatum*, both well-known Indian Ocean species. The smaller of the two shells consists only of the body-whorl and the twisted anterior prolongation. The dorsal diameter of the larger specimen is 35 mm.

*Examples.*—Two specimens.

#### EXPLANATION OF PLATES.

Figures are drawn natural size, except a few magnifications which are introduced to illustrate shell structures.

#### PLATE XVI.

##### CARDIUM MELVILLI, n.sp.

- FIG. 1.—Right valve, showing rib structure on ventral margin.  
 ,, 2.—Magnified view of ribs, as preserved on Fig. 1.  
 ,, 3. } Views of a smaller specimen of the same species.  
 ,, 4. }

##### ARCA BLANFORDI, n.sp.

- ,, 5.—Right valve, showing costæ and striated internal surface at the fracture in the ventral region: drawn from wax impression of specimen.

##### MACTRA MEKRANENSIS, n.sp.

- ,, 6.—Right valve, with small patch of sculpture.  
 ,, 7.—Magnified view of sculpture.

DOSINIA sp.

- FIG. 8.—Left valve, showing partial sculpture and internal characters: drawn from a wax impression of specimen.  
 ,, 9.—Magnified view of shell ornamentation.  
 ,, 10.—Internal natural cast of same specimen, showing muscular scar impressions, pallial line, and lanceolate sinus.

PLATE XVII.

DOLIUM TOWNSENDI, n.sp.

- FIG. 1.—Dorsal view of specimen.

DOLIUM cf. HOCHSTETTERI, Martin.

- ,, 2.—Dorsal aspect of the larger-sized specimen.  
 ,, 3.—Smaller specimen, showing twisted columella.

LAMPUSIA cf. AFFINIS, Deshayes.

- ,, 4.—Specimen showing lateral varices.

NEPTUNEA BURROWSI, n.sp.

- ,, 5.—General view of specimen, showing anterior canal, with encrusting *Membranipora* on spire.  
 ,, 6.—Another view of same specimen, showing shell structure.  
 ,, 7.—Magnified view of funiculate sculpture.

TUGURIUM (XENOPHORA) MEKRANENSE, n.sp.

- ,, 8.—General view of specimen.  
 ,, 9.—Basal view of another specimen, showing reticulate ornamentation.  
 ,, 10.—Fragment of another specimen, showing external sculpturing and foreign attachments at the suture.

III.—NOTE ON A BRYOZOAN ATTACHED TO *NEPTUNEA* FOUND IN ONE OF THE MEKRAN NODULES.

By HENRY W. BURROWS, F.G.S.

*MEMBRANIPORA LACROIXI* (V. Audouin).

- Flustra Lacroixii*, V. Audouin: in J. C. Savigny's "Description de l'Égypte," Hist. Nat. Polypes, Planches, 1817, vol. ii, pl. x, fig. 9; Explication des Planches, 1826, vol. i, pt. 4, p. 240.  
*Conopeum reticulatum*, J. E. Gray: List British Animals British Museum, pt. i, Radiated Animals, 1848, p. 108.  
*Membranipora Lacroixii*, G. Busk: Cat. Marine Polyzoa British Museum, pt. ii, 1854, p. 60, pl. lxix, figs. 1-3.  
*Biflustra Lacroixii*, F. A. Smitt: pt. ii of "Floridan Bryozoa," Kongl. Svenska Vetensk.-Akad. Handl. (Stockholm), 1873, vol. xi, No. 4, p. 18, pl. iv, figs. 85-88.

For other references and synonyms, see Miss E. C. Jelly's "A Synonymic Catalogue of the Recent Marine Bryozoa, including Fossil Synonyms," 1889, pp. 162-164.

DIAGNOSIS.—*Zoarium*, adnate.

*Zoecia*, oval or ovato-quadrangular, often elongated; area (usually) coincident with the whole of the front of the cell (front 'wall' membranous in the living state). Margins thick, strongly crenulate.

*Oecia*, none.

*Avicularia* (?), small, subcircular or roundedly triangular, situate in the anterior angles of the space between the zoecial walls, sparsely developed.