THE

MESOZOIC PALAEONTOLOGY

OF

BRITISH SOMALILAND

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GASTROPODA AND LAMELLIBRANCHIA	,,	L. R. Cox, M.A.
CEPHALOPODA ..	,,	L. F. Spath, D.SC.

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VIII. JURASSIC GASTROPODA AND LAMELLIBRANCHIA.

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[PLATES XIV–XXI.]

CONTENTS.

I. INTRODUCTION.

The richly fossiliferous sections of Jurassic rocks south of Berbera, in British Somaliland, first discovered by Burton,* have in recent years provided the material for several monographs, of which those by Weir (1925, 1929) and Stefanini (1925) have dealt with the gastropods and lamellibranchs. Jurassic fossils from neighbouring areas have also been described in several recent monographs, most important of which are those by Cottreau (1925*a*), Weir (1929), Basse (1930), and Diaz-Romero (1931), dealing with material from Abyssinia, Jubaland, Arabia, and Dancalia. This and earlier literature,† however, has by no means exhausted the subject of the Jurassic molluscan palaeontology of this region, and the extensive collections obtained from a number of localities in British Somaliland by Mr. R. A. Farquharson in 1923–4, Dr. W. A. Macfadyen and Mr. S. A. Hunt in 1928–30, and Mr. C. Barrington Brown in 1929, with which the present paper mainly deals, have been found to include a number of forms new to science or previously unrecorded from this region. Moreover, the collection made by Dr. Macfadyen and Mr. Hunt from a carefully measured section at Daghani, south of Berbera, has made it possible to record the exact horizons of many species whose stratigraphical position had previously been a matter of surmise.

I have to express my thanks to Professor E. B. Bailey and Dr. E. D. Currie, through whose kindness I was permitted to borrow, for purposes of comparison, a number of the specimens described by Dr. J. Weir, and now deposited in the Hunterian Museum (Glasgow University). The older collections preserved in the British Museum (Natural History), which I have also examined, include the fossils presented by Mrs. E. Lort-Phillips in 1895, and discussed by Gregory, Newton, and Crick in 1896, and, again, by Newton in 1908. Some specimens figured in the present paper and all the specimens in the Farquharson Coll. are in the British Museum (Natural History). Other specimens in the Macfadyen–Hunt and Barrington Brown Colls. are in the Sedgwick Museum (Cambridge).

* See Carter, 1857, p. 622. Burton's specimens are in the British Museum (Natural History).
† For a summary of earlier literature, see Krenkel, 1926, pp. 20–37.

TABLE I. VERTICAL DISTRIBUTION OF SPECIES FOUND IN THE BIHENDULA DISTRICT.

Stage.	*Local Formation.*	*Bed.*	*Species collected from measured Daghani Section.*	*Probable approximate horizons of some other species.*
Basal Cretaceous and Portlandian	Gawan Limestone	..	*Procerithium hunti* sp. nov., *Parallelodon egertonianus* (Stol.)	
Kimmeridgian (Ur.)	Daghani Shales	φ.203 ..		
do. (Mid.)		φ.204 ..	*Parallelodon egertonianus* (Stol.)	
		φ.205 ..	*Aulacomyella farquharsoni* sp. nov.	
		φ.206 ..	*Posidonia somaliensis* sp. nov.	
		φ.207 ..	*Posidonia somaliensis* sp. nov.	
		φ.208 ..	*Posidonia somaliensis* sp. nov.	
		φ.209 ..		
		φ.210 ..		
do. (Lr.)	Wanderer Limestone ..	φ.211 ..	*Parallelodon egertonianus* (Stol.), *Trigonia* cf. *reticulata* Ag., *Gryphaea balli* (Stef.), *Camptonectes* sp. II, *Astarte scytalis* Holdhaus, *Astarte altissima* sp. nov.	*Globularia hemisphaerica* (Roem.), *Ceromyopsis striata* (d'Orb.)
		φ.212 ..		
		φ.213 ..	*Nucula cuneiformis* J. de C. Sow.	
Argovian	Gahodleh Shale	φ.214 ..	*Parallelodon egertonianus* (Stol.), *Nucula cuneiformis* J. de C. Sow.	
		φ.215 ..	*Oxytoma inequivalve* (J. Sow.), *Chlamys* cf. *splendens* (Dollf.), *Camptonectes* sp. I.	
		φ.216 ..	*Proconulus arabiensis* (Newton), *Parallelodon egertonianus* (Stol.), *Exogyra fourtaui* Stef., *Astarte scytalis* Holdhaus.	*Lopha solitaria* (J. de C. Sow.), *Velata inaequistriata* (d'Orb.)
Argovian or Divesian	Bihen Limestone ..	φ.217 ..	*Nerinea somaliensis* Weir, *Trigonia cf. reticulata* Ag., *Chlamys curvivarians* Dtr., *Pseudisocardia macfadyeni* sp. nov., *Venilicardia hunti* sp. nov., *Lucina* sp., *Mactromya aequalis* Ag., *Mactromya* cf. *crassa* Ag., *Pholadomya aubryi* Douv.	
		φ.218 ..	*Chlamys curvivarians* Dtr., *Ceromyopsis somaliensis* Weir, *Lucina* sp.	
		φ.219 ..	*Nerinea somaliensis* Weir, *Mytilus* (*Modiolus*) *imbricatus* (J. Sow.), *Ostrea* (*Liostrea*) *dubiensis* Contej., *Lopha* cf. *gregarea* (J. Sow.), *Ceromyopsis somaliensis* Weir	*Eligmus aualites* (Stef.), *Lima* (*Plagiostoma*) *harronis* Dacqué
		φ.220 ..		
		φ.221 ..		
		φ.222 ..	*Protocardia somaliensis* sp. nov.	
		φ.223 ..	*Gryphaea costellata* (Douv.) ?	
Callovian.	..	φ.224 ..	*Eligmus rollandi* Douv., *Lopha costata* (J. de C. Sow.), *Lucina* cf. *lirata* Phil., *Mactromya daghaniensis* sp. nov., *Eocallista krenkeli* sp. nov.	
		φ.225 ..		
		φ.226 ..	*Aporrhais* cf. *haudnervatus* (Cossm.), *Mytilus* (*Modiolus*) *imbricatus* (J. Sow.), *Eocallista krenkeli* sp. nov., *Pholddomya* (*Homomya*) *inornata* J. de C. Sow.	*Mytilus* (*Musculus*) *somaliensis* sp. nov., *Ceratomya wimmisensis* (Gill.), *C.* cf. *pittieri* (de Lor.), *C. telluris* (Lam.), *Pholadomya lirata* (J. Sow.)
		φ.227 ..	*Globularia* sp., *Ampullella* sp. V, *Architectonica* sp., *Aporrhais* cf. *haudnervatus* (Cossm.), *Cylindrites* cf. *striatus* (Liss.), *Cylindrites* sp., *Mytilus* (*Modiolus*) *imbricatus* (J. Sow.), *M.* (*Arcomytilus*) *laitmairensis* de Lor., *Eligmus polytypus* Eudes-Desl., *E. weiri* sp. nov., *Gryphaea costellata* (Douv.), *Exogyra nana* (J. de C. Sow.), *Chlamys cnrvivarians* Dtr., *Thracia viceliacensis* d'Orb., *Pholadomya* (*Homomya*) *inornata* J. de C. Sow.	
		φ.228 ..	*Corbula daghaniensis* sp. nov.	

II. THE SEQUENCE AT BIHENDULA AND DAGHANI.

Early discussions (Gregory, 1896 and 1900 ; Newton, 1896 and 1908) as to whether the fossiliferous beds south of Berbera should be referred to the Middle or Upper Jurassic call only for a passing allusion ; for detailed investigation of the succession by Messrs. B. K. N. Wyllie and W. R. Smellie, and study of their fossil collections by Gregory, Currie, Weir, and Spath (1925), have shown that the beds have a considerable thickness and an extended stratigraphical range. While, however, numerous ammonites were collected from the upper two-thirds of the succession, enabling the beds to be assigned with considerable accuracy to horizons ranging from Lower Kimmeridgian to Tithonian, fossils of this group were not found in the lower part of the series, which it was, therefore, necessary to date from the evidence of other invertebrate groups. The lowest fossiliferous beds, with echinoids, brachiopods, and lamellibranchs, were regarded as Bathonian or Callovian by Gregory, Currie, and Weir in 1925. The evidence was again reviewed by Weir in 1929 (pp. 2–5), in the light of recent work on the palaeontology of neighbouring regions, and the conclusion was reached that these beds are of Bajocian–Bathonian age. It is satisfactory to record that the further information now available shows that the conclusions of the late Professor Gregory and his colleagues, although doubted in some quarters owing to the lack of ammonite evidence, were approximately correct.

The material collected by Dr. Macfadyen and Mr. Hunt from the measured section at Daghani, west of Bihendula, does not greatly supplement the ammonite evidence already available. Bed φ.214 was the lowest to yield ammonites ; these have proved indeterminate, but have been provisionally assigned to the Argovian by Dr. L. F. Spath. The ammonites from φ.213*a*, immediately above, are provisionally assigned by him to the Lower Kimmeridgian. Below φ.214 there are some 150 m. of fossiliferous Jurassic strata. The gastropod and lamellibranch evidence as to the age of these beds must now be reviewed.

The lowest fossiliferous bed (φ.228) yielded a new species of *Corbula* and several indeterminate fragments of other shells. The overlying bed (φ.227) yielded numerous fossils, including the following, the known stratigraphical range of each of which is indicated in parentheses—

Aporrhais cf. *haudnervatus* (Cossmann) (Callovian),
Cylindrites cf. *striatus* (Lissajous) (Bathonian),
Mytilus (*Modiolus*) *imbricatus* (J. Sow.) (Bajocian–Kimmeridgian),
Mytilus (*Arcomytilus*) *laitmairensis* (de Loriol) (Bathonian–Kimmeridgian),
Eligmus polytypus Eudes-Deslongchamps (Bathonian–Callovian),
Eligmus rollandi Douvillé (Bajocian–Callovian),
Eligmus weiri sp. nov.,
Gryphaea costellata (Douvillé) (Upper Bathonian–Callovian),
Exogyra nana (J. Sow.) (Bathonian–Portlandian),
Chlamys curvivarians Dietrich (Callovian–Kimmeridgian ; reappears in Beds φ.218 and φ.217),
Thracia viceliacensis d'Orbigny (Bathonian),
Pholadomya (*Homomya*) *inornata* J. de C. Sow. (Callovian).

The evidence of the above species is most convincingly in favour of a Bathonian or Callovian age. *E. polytypus* is one of the most characteristic fossils of those stages, occurring in France, Switzerland, Poland, and Algeria ; while *E. rollandi*, perhaps a varietal form of the same species, seems to have had a still wider distribution, occurring in Madagascar and Central Asia, as well as in Sinai and France. *Gryphaea costellata* also appears to be a reliable index-fossil of the uppermost Bathonian and Callovian. The age of the beds in which it occurs in Arabia

(whence it was described by Newton, under the name *Lopha philbyi*) was formerly unknown, but further collections recently made in the same area by Mr. H. St. J. Philby yield definite ammonite evidence of the existence of the Callovian. In Sinai the beds containing this fossil are referred by Douvillé to the Upper Bathonian.

It is, however, impossible to discriminate between the Bathonian and the Callovian from the evidence of the gastropods and lamellibranchs alone. For such discrimination we must depend on the brachiopods, which, according to Miss Muir-Wood's results, indicate a Callovian rather than a Bathonian age.

This Callovian fauna ranges up at least as high as to Bed φ.224, which has yielded *Eligmus rollandi* and, in addition, *Lopha costata* (J. de C. Sow.) (Bajocian–Callovian) and *Eocallista krenkeli* sp. nov. (Callovian of Lithuania). Beds φ.223 to φ.220, amounting to 15 m., have yielded no mollusca except the new species *Protocardia somaliensis* and a small *Gryphaea* which may be an immature specimen of *G. costellata*. But in the top 37 m. of the Bihen Limestone, s. str.* (φ.219 to φ.217), lamellibranchs are again abundant, and are associated with brachiopods belonging to the well-characterised genus *Somalirhynchia*. Besides new species and well-known forms of long range, the lamellibranchs include *Chlamys curvivarians* Dietrich, which has ranged up from the Callovian, but in Tanganyika occurs in the Kimmeridgian, and *Pholadomya aubryi* Douvillé, which, like *C. curvivarians*, was collected by Mr. Philby in the Callovian of Arabia, although in Tunis, according to Douvillé, it occurs at a Divesian or Argovian horizon. The *Somalirhynchia* brachiopod fauna persists into Bed φ.216, in which an important molluscan assemblage, referred to below, is also found.

It seems doubtful if the 166 m. of strata between Beds φ.224 (Callovian) and φ.213*a* (? basal Kimmeridgian) could include the complete sequence of Divesian and Argovian horizons, and more probable that there are gaps in the succession. An ammonite of the Lower Divesian (*athleta* Zone) was collected by a native for Dr. Macfadyen from the Bihendula section ; whence it appears that that horizon is represented there—presumably in the top 52 m. of the Bihen Limestone, above bed φ.224. The lamellibranch fauna of Beds φ.219 to φ.217, at the top of that Limestone, cannot be dated with accuracy, but a Divesian age seems perhaps more probable than an Argovian one.

In Bed φ.216, at the base of the Gahodleh Shales, there appears the important assemblage *Proconulus arabiensis* (Newton), *Parallelodon egertonianus* (Stoliczka), *Exogyra fourtaui* Stefanini, and *Astarte scytalis* Holdhaus. *P. egertonianus* seems to have ranged from the Divesian to the Portlandian, and hence cannot be used as a stratigraphical index. *Proconulus arabiensis* occurs at a Middle Kimmeridgian horizon in Arabia—if we assume that it came from the same bed as ammonites from the same locality described by Crick (1908) ; but in India it appears to occur at a much lower horizon. *Astarte scytalis* occurs in the Spiti Shales of northern India, probably at a Kimmeridgian horizon, and also reappears in Bed φ.211 of the Daghani section, with Lower Kimmeridgian ammonites. Hence, if Bed φ.216 is pre-Kimmeridgian, the evidence of the last species appears to indicate that it is at least high in the Argovian. It is thus possible that the greater part of the Argovian, and perhaps also part of the Divesian, may be missing from the sequence, the Gahodleh Shales marking the base of a fairly complete succession from the uppermost Argovian onwards.

* The term " Bihen Limestone," as used in the present paper, includes only the " Echinoid and Coral Limestones " of the " Lower Bihen Limestone " of the Hunterian Museum Monographs (cf. Weir, 1929, p. 4) ; the overlying " Calcareous Mudstone and Shale " is termed the " Gahodleh Shales," and the " Compact Limestone " above, the " Wanderer Limestone." Of the " Meragalleh Limestone " above, the " Calcareous Mudstone and Shale " is termed the " Daghani Shales," and the " Thin-bedded Compact Limestone " at the top, the " Gawan Limestone."

Bed φ.215 is of interest for the occurrence of the well-known species *Oxytoma inequivalve* (J. Sow.). Bed φ.214, with indeterminate ammonites, contains *Parallelodon egertonianus* and numerous specimens of *Nucula cuneiformis* J. de C. Sow.; in India, the latter species seems to have had a very long range, although in Somaliland it appears to be restricted to about this horizon. Bed φ.211, at the top of the Wanderer Limestone, contains abundant specimens of *Gryphaea balli* (Stefanini), as well as other species; but this *Gryphaea* is not a species of very restricted range, since in a collection from Attock (India) which I have for study it occurs with Argovian ammonites.

From the overlying Daghani Shales, which ammonites show to be of Lower and Middle Kimmeridgian age, Weir (1929, p. 4) records a number of lamellibranchs, including *Parallelodon egertonianus*. It is, however, probable that some of these really came from the " Calcareous Mudstone and Shale " lower in the series, i.e. the Gahodleh Shales, and most of the remainder from the top of the underlying Bihen Limestone (*s. str.*), these being the beds in which they were found by Dr. Macfadyen and Mr. Hunt. *P. egertonianus*, however, was observed by Dr. Macfadyen in Bed φ.204 of the Daghani Shales. The Daghani Shales are mainly of interest for the occurrence, in Beds φ.208 to φ.206, of a species of *Posidonia*—a genus not recorded from the Kimmeridgian of other regions—and, in Bed φ.205, of the peculiar genus *Aulacomyella*, strongly reminiscent of the Triassic genera *Halobia* and *Daonella*. The overlying Gawan Limestone (Portlandian–Tithonian ?) yielded numerous small gastropods referable to *Procerithium*, and closely comparable to certain forms found in the English and French Portlandian.

III. MATERIAL FROM OTHER DISTRICTS.

In addition to Bihendula and Daghani, the following localities of Jurassic mollusca are represented in the collections studied by me. Further Somaliland Jurassic localities have been discussed by Weir (1929, pp. 5–8).

IDA KABEITA, 30 KM. EAST OF BIHENDULA (F.34, φ.10; see Weir, 1929, p. 6).—The isolated patch of Jurassic rocks at this locality yielded *Eligmus weiri* sp. nov., *Lopha* cf. *gregarea* (J. de C. Sow.), *Gryphaea costellata* (Douvillé), and *G. balli* (Stefanini). *E. weiri* and *G. costellata* point to the presence of the lower beds of the Bihen Limestone (Callovian), but *G. balli* appears to indicate the presence of a much higher horizon.

SOUTHERN END OF JIRBA RANGE, 65 KM. EAST OF BERBERA (φ.148).—The following species from this locality appear to indicate both the lower and upper beds of the Bihen Limestone: *Mytilus* (*Musculus*) *somaliensis* sp. nov., *Eligmus rollandi* Douvillé, *E. weiri* sp. nov., *E. aualites* (Stefanini), *Lima* (*Plagiostoma*) *harronis* Dacqué, *Pholadomya aubryi* Douvillé. The species recorded by Weir (1929, p. 6) from these hills appear to come from a higher horizon, equivalent to the Gahodleh Shales.

A QUARTER OF A MILE EAST OF MUKHROH CAMP, NEAR ERTOLEH HILL, SOUTH OF HEIS (F.30). Other exposures in the neighbourhood of Mukhroh Camp (F.61, F.62) have yielded Upper Cretaceous fossils, while Mr. Farquharson's original label shows that the specimens from F.30 were believed to come from Eocene beds. It is possible that the Jurassic fossils labelled as from this locality are wrongly localised. The following species are represented: *Proconulus arabiensis* (Newton), *Nucula cuneiformis* J. de C. Sowerby, *Parallelodon egertonianus* (Stoliczka), *Gryphaea balli* (Stefanini), *Camptonectes* " sp. II," *Astarte scytalis* Holdhaus. The horizons represented are obviously those of the Gahodleh Shales and Wanderer Limestone (Argovian–Lower Kimmeridgian). The specimen recorded as " *Camptonectes* sp. II " and its matrix can

be matched exactly among the specimens collected by Dr. Macfadyen from Bed φ.211 of the Wanderer Limestone at Daghani.

NEAR MADASHON, SOUTH OF BANDAR ZAIDA, EASTERN BRITISH SOMALILAND (B.81, lat. 11° 2′ N., long. 49° 2′ E.).—The fossils from this and the following locality are those referred to by Barrington Brown (1931, p. 263). The species include the following: *Mytilus* (*Modiolus*) *imbricatus* (J. Sow.), *Mytilus* (*Arcomytilus*) *laitmairensis* de Loriol, *Eligmus polytypus* Eudes-Desl., *E. jabbokensis* (Cox), *E. weiri* sp. nov., *Ostrea* (*Liostrea*) *dubiensis* Contejean, *Gryphaea costellata* (Douvillé), *Camptonectes browni* sp. nov., *Lima* (*Plagiostoma*) *harronis* Dacqué. The horizon represented is approximately that of the lower beds of the Bihen Limestone (Callovian).

NEAR ERUDUWE, SOUTH OF BANDAR ZAIDA, EASTERN BRITISH SOMALILAND (B.82, lat. 11° 6′ N., long. 48° 53′ E.).—The following are the species from this locality: *Eligmus polytypus* Eudes–Desl., *E. jabbokensis* (Cox), *Ostrea* (*Liostrea*) *dubiensis* Contejean, *Lopha solitaria* (J. de C. Sow.), *Lima* cf. *schardti* de Loriol. The horizon is the same as that at B.81.

BIYO DADER TUG, GADABURSI, WESTERN SOMALILAND (F.10, lat. 9° 51′ N., long. 43° 35′ E.).—The species from this locality include: *Aporrhais* cf. *haudnervatus* (Cossmann), *Cylindrites* cf. *striatus* (Lissajous), *Mytilus* (*Musculus*) *somaliensis* sp. nov., *Gryphaea costellata* (Douvillé), *Mactromya aequalis* Agassiz, *Ceratomya wimmisensis* (Gilliéron), *Pholadomya lirata* (J. Sow.), *Pholadomya* (*Homomya*) *inornata* J. de C. Sow. The beds are undoubtedly of the same age as the lower part of the Bihen Limestone (Callovian).

IV. GENERAL CHARACTERISTICS OF THE SOMALILAND JURASSIC FAUNA.

Although it is possible, as Neumayr and Uhlig have done, to distinguish between three or four marine faunal provinces of Jurassic times, their molluscan faunas differ much less than do those of the present-day provinces. Such differences as exist are in specific rather than in generic composition, while a considerable number of species seem to have had almost a world-wide distribution.

The beds from the base of the Bihen Limestone (Callovian) to the top of the Wanderer Limestone (Lower Kimmeridgian) seem to have been deposited under normal shallow-water marine conditions. The Callovian beds (φ.228 to φ.224, F.10, B.81, B.82) have yielded about 25 determinate molluscan species, 5 of which (*Mytilus* (*Musculus*) *somaliensis*, *Eligmus weiri*, *Camptonectes browni*, *Mactromya daghaniensis*, and *Corbula daghaniensis*) are described as new. The remainder are referable to known species, most of which occur in the Bathonian or Callovian of Europe. Those not known from Europe are *Aporrhais haudnervatus* (Cossmann) (Callovian, Sinai), *Gryphaea costellata* (Douvillé) (Bathonian–Callovian, Tunis, Sinai, Arabia), *Chlamys curvivarians* Dietrich (Callovian, Arabia; Kimmeridgian, Tanganyika), and *Pholadomya* (*Homomya*) *inornata* J. de C. Sowerby (Bathonian, Trans-Jordan; Callovian, Sinai, Arabia, India). Perhaps the most striking feature of this fauna is the abundance of the genus *Eligmus*; for, although, as already mentioned, this genus is now known to have had a fairly wide geographical distribution, in Somaliland it occurs in extraordinary profusion and diversity of type.

As would be expected, this Callovian fauna has very close affinity with that found in the contemporaneous rocks of the Tuwaiq Plateau (Arabia), further material from which, greatly supplementing the small collection described by Newton in 1921, has recently been collected by Mr. H. St. J. Philby. Besides a number of more widely distributed forms, *Mytilus* (*Musculus*) *somaliensis*, *Chlamys curvivarians*, *Gryphaea costellata*, and *Pholadomya* (*Homomya*) *inornata* may be cited as common to the two areas. Some of these more characteristic forms are also

TABLE II. GENERAL DISTRIBUTION OF THE SPECIES DESCRIBED.

(Species peculiar to Somaliland and indeterminate forms have been omitted; species with which qualified determinations have been made are included.)

Species.	*Age* (in Somaliland).	*Exact Horizon* (at Daghani and Bihendula).	*Other Somaliland Localities.*	*General Distribution* (Ab, Abyssinia; Al, Algeria; Ar, Arabia; Ca, Caucasus; CAs, Central Asia, including Trans-Caspia; D, Dancalia; E, Europe; EAf, East Africa; I, India, Burma, etc.; IS, Italian Somaliland; J, Jubaland; Ma, Madagascar; Mo, Morocco; NZ, New Zealand; Si, Sinai; Sy, Syria; TJ, Trans-Jordan; Tu, Tunis).					
				Bajocian and Bathonian.	Callovian.	Divesian.	Argovian.	Kimmeridgian.	Portlandian and Tithonian.
Proconulus arabiensis (Newton)	Argovian	φ.216	F.30		I			Ab, Ar	
Globularia hemisphaerica (Roemer)	Kimmeridgian (?)	Uncertain						Ab, Al, Ar, E	E
Aporrhais cf. *haudnervatus* (Cossm.)	Callovian	φ.227, φ.226	F.10		Si				
Cylindrites (?) cf. *striatus* (Lissaj.)	Callovian	φ.227	F.10	E					
Nucula cuneiformis J. de C. Sow.	Argovian, Kimmeridgian	φ.214, φ.213*a*	F.30	I	I	I		Ab, Ar, I	
Parallelodon egertonianus (Stol.)	Divesian–Argovian, Argovian, Kimmeridgian, Portlandian	φ.3, φ.216, φ.214, φ.211, φ.204, A.42, φ.5	F.30			IS	I	Ab, Ar, D, EAf	NZ
Trigonia cf. *reticulata* Agassiz	Divesian–Argovian, Kimmeridgian	φ.217, φ.211					E	E	
Mytilus jurensis Roemer	Uncertain	Uncertain			Ar	E	E	Ab, Al, CAs, E, Sy	
Mytilus (*Modiolus*) *imbricatus* (J. Sow.)	Callovian, Divesian–Argovian	φ.227, φ.226, φ.219	B.81	CAs, E, Ma, Mo	E, Tu		E	Ab, Al, Ar, E	E
Mytilus (*Arcomytilus*) *laitmairensis* de Lor.	Callovian	φ.227	B.81	Al, E	Tu		J	Ab, D (?)	
Mytilus (*Musculus*) *somaliensis* sp. nov.	Callovian	Uncertain	F.10, φ.148	TJ (?)	Ar				
Mytilus (*Pharomytilus*) cf. *perplicatus* Étal.	Uncertain	Uncertain			Ar			Ab, Ca, D, E, EAf	
Oxytoma inequivalve (J. Sow.)	Argovian	φ.215		Ca, E, Mo	E, I	E	E	E	
Eligmus polytypus Eudes-Desl.	Callovian	φ.227	B.81, B.82	Al, E	E				
Eligmus rollandi Douvillé	Callovian	φ.224	φ.148, B.81, B.82	CAs, E, J, Ma, Si, TJ	Ar, E, Ma				
Eligmus aualites (Stefanini)	Uncertain	Uncertain	φ.148			IS			
Ostrea (*Liostrea*) *dubiensis* Contej.	Callovian, Divesian–Argovian	φ.219	B.81, B.82				E	Ca, E, I	
Lopha solitaria (J. de C. Sow.)	Callovian, Argovian	φ.216	B.82		Ar		Ca, D (?), E	Al, E	E
Lopha cf. *gregarea* (J. Sow.)	Divesian-Argovian	φ.219	φ.10	E	E, Ma	E, I (?)	E, J	Ab, E	E
Lopha costata (J. de C. Sow.)	Callovian	φ.224		CAs, E, EAf, J, Ma, Mo	E, Ma, Tu				
Gryphaea balli (Stefanini)	Kimmeridgian	φ.211	φ.10, F.30				I		
Gryphaea costellata (Douvillé)	Callovian	φ.227	φ.10, F.10, B.81	Al, Mo, Si	Ar, D				
Exogyra fourtaui Stefanini	Argovian	φ.216					D, I		
Exogyra nana (J. Sow.)	Callovian	φ.227		E, Si	Ar, E, EAf	E, I (?), Si	D (?), E, EAf (?), J (?)	Ab, Ar, Ca, CAs, E, I	E
Chlamys cf. *splendens* (Dollfus)	Argovian	φ.215					E	E	
Chlamys curvivarians Dietrich	Callovian, Divesian–Argovian	φ.227, φ.218, φ.217			Ar			EAf	
Velata inaequistriata (d'Orb.)	Argovian (?)	φ.216 (?)					E, J (?)	Ab, Al, E, EAf	E
Lima cf. *schardti* de Lor.	Callovian		B.82	E					
Lima (*Plagiostoma*) *harronis* Dacqué	Callovian (? and later)	Uncertain	B.81, φ.148			IS		Ab, J	
Lima (*Plagiostoma*) cf. *notata* Goldf.	Uncertain	Uncertain			E	E		E	E
Astarte scytalis Holdhaus	Argovian, Kimmeridgian	φ.216, φ.211	F.30					I	NZ
Lucina cf. *lirata* Phillips	Callovian	φ.224			E, EAf	E	E		
Mactromya aequalis Agassiz	Callovian, Divesian-Argovian	φ.217	F.10	E					
Mactromya cf. *crassa* Agassiz	Divesian–Argovian	φ.217				E			
Mactromya cf. *verioti* (Buvign.)	Uncertain	Uncertain						E	E
Eocallista krenkeli sp. nov.	Callovian	φ.226, φ.224			E				
Ceratomya wimmisensis (Gilliéron)	Callovian	Uncertain	F.10	E	J (?)				
Ceratomya cf. *pittieri* (de Lor.)	Uncertain	Uncertain		E					
Ceratomya excentrica (Roemer)	Uncertain	Uncertain			Ar, Ca		E	Ab, Al, Ca, E, M, Sy	
Ceratomya telluris (Lamarck)	Uncertain	Uncertain		E	E, EAf				
Ceromyopsis striata (d'Orb.)	Uncertain	Uncertain					E	Ab, Ar, E, J (?), Si, Tu	
Ceromyopsis arabica sp. nov.	Uncertain	Uncertain			Ar				
Thracia viceliacensis d'Orb.	Callovian	φ.227		Al, E, Si	J (?)				
Thracia cf. *incerta* (Roemer)	Uncertain	Uncertain			E			Ab, E, EAf	
Pholadomya lirata (J. Sow.)	Callovian	Uncertain	F.10	Al, E	Al, Ar, E, EAf, I, Ma, Si	E			
Pholadomya aubryi Douvillé	Divesian-Argovian	φ.217	φ.148		Ar	Ab (?), Tu (?)			
Pholadomya (*Homomya*) *inornata* J. de C. Sow.	Callovian	φ.227, φ.226	F.10	Si, TJ	Ar, I				

found in the Callovian and underlying Bathonian rocks of Sinai, while *Mytilus* (*Musculus*) *somaliensis*, *Eligmus rollandi*, and *Pholadomya* (*Homomya*) *inornata* occur also in Trans-Jordan.

Flamand's monograph (1911) and other published records show that the Bathonian–Callovian molluscan fauna of North-West Africa is closely related to that of Somaliland and these neighbouring areas; for in that region we find the species *Gryphaea costellata*, unknown in Europe, as well as *Eligmus polytypus* and a number of other species common to Somaliland and Europe. Bathonian–Callovian beds are also found in East Africa and Madagascar, and will probably prove to contain a fauna very similar to that of the Somaliland beds, although the more characteristic species of the latter have not yet been found there.

Except for Dr. F. L. Kitchin's monograph of the Trigoniidae, the important and varied gastropod and lamellibranch fauna of the Jurassic of Kachh (India), in which the Callovian is well developed, is still largely undescribed. The J. F. Blake Collection, preserved in the British Museum (Natural History), consists, however, of a representative series of specimens, with labels which indicate their exact geological horizons. Judging by this collection, the Callovian of Kachh includes very few species found in the contemporaneous rocks of Somaliland and also differs considerably from that found in the European beds. The genus *Eligmus* and the species *Mytilus* (*Musculus*) *somaliensis*, *Chlamys curvivarians*, and *Gryphaea costellata*, so characteristic of the Somaliland beds, are unrepresented. One Somaliland species, *Pholadomya* (*Homomya*) *inornata*, has been identified with a Kachh form, but the differences between this and certain European species are not very well defined. It is, however, of interest to note that the two species *Proconulus arabiensis* (Newton) and *Nucula cuneiformis* J. de C. Sowerby, which in Somaliland and Arabia characterise the Argovian–Kimmeridgian, both occur in India in beds of Callovian age, although the *Nucula* ranges up into the Kimmeridgian. At present, however, there is no evidence for assigning Somaliland to Uhlig's (1911) Himamalayan Province as distinct from a Mediterranean–Caucasian Province in Callovian times.

The group of species found in Beds φ.219 to φ.217, which may be of Divesian age, includes several species hitherto found only in Somaliland, together with *Chlamys curvivarians* (apparently a species of long range, found also in Arabia and Tanganyika) and *Pholadomya aubryi* Douvillé, which has been recorded from about the same horizon in North-West Africa and also occurs in the Callovian of Arabia. There is, as yet, no evidence of the incursion of eastern elements, apart from the possible occurrence of *Parallelodon egertonianus* Stoliczka at this horizon.

But in the Argovian–Kimmeridgian Somaliland assemblage, as well as in the contemporaneous faunas of Dancalia and Arabia, there is more evidence of affinity with the Indian fauna. Besides *Proconulus arabiensis* and *Nucula cuneiformis*, already mentioned, there occur the species *Parallelodon egertonianus* and *Astarte scytalis* Holdhaus, which are also found in the Spiti Shales of northern India, and as far afield as New Zealand, although they are unknown from Europe; and also *Gryphaea balli* Stefanini and *Exogyra fourtaui* Stefanini, which are found in the Argovian of India. Besides these forms, there also occur such species as *Globularia hemisphaerica* (Roemer), *Lopha solitaria* (J. de C. Sowerby), and *Velata inaequistriata* (d'Orbigny), which are found in Europe and probably were very widely distributed.

In the middle of the Kimmeridgian series, in the Bihendula district, we find evidence of a change from the normal shallow-water marine conditions under which the beds hitherto considered were deposited. The Daghani Shales, with *Posidonia* and abundant ammonites, represent a facies well known in the Upper Lias and Bathonian–Callovian of various regions, but unusual in the Kimmeridgian. A comparable facies appears, however, to have existed contemporaneously in Dalmatia, where the Lemeš Beds, described by Furlani (1910), consist

of thin-bedded calcareous shales which, although they have not yielded *Posidonia*, contain ammonites, aptychi, and the interesting genus *Aulacomyella*, which is also found in the Daghani Shales. Furlani considers the facies of these beds to be similar to that of the well-known Solnhofen beds, and to indicate probably deposition under shallow-water, lagoonal conditions. The usual interpretation of the *Posidonia*-shale facies, as also of that of the *Daonella* and *Halobia* beds of the Trias, however, is as representing deposition under fairly deep-water (bathyal) conditions.

V. DESCRIPTION OF THE MATERIAL.

Class GASTROPODA.

Family **PLEUROTOMARIIDAE.**

Genus **Pleurotomaria** J. Sowerby, 1821.

1. **Pleurotomaria** sp. I. Pl. XIV, figs. 1*a*, *b*.

1925. *Pleurotomaria neosolodurina* Weir, p. 93 (*non* Dacqué).
1925. *Pleurotomaria* sp. Stefanini, p. 159, pl. xxviii, figs. 5*a*, *b*.
?1930. *Pleurotomaria* sp. Basse, p. 112.

Occurrence and Material.—C.1 ; horizon uncertain ; one specimen.

Remarks.—This specimen, like those described by Weir and Stefanini, is virtually an internal cast, but some traces of adherent shell show that the sculpture consisted of spiral threads crossed by closely spaced axial threads. The spire is much more depressed than in *P. neosolodurina* Dacqué (1905, p. 141, pl. xvi, figs. 5, 6). *P. philea* d'Orbigny (1860, p. 576, pl. ccccxxviii, figs. 1, 2), a Kimmeridgian species which is also known only as an internal cast, is closely comparable in size and shape.

2. **Pleurotomaria** sp. II.

1925. *Pleurotomaria* aff. *discus* Deslongchamps ; Weir, p. 92, pl. xii, figs. 2, 3.

Occurrence and Material.—C.1 ; horizon uncertain ; one specimen.

Remarks.—The specimen now recorded, like the one figured by Weir, has its spire crushed in ; originally, however, the last whorl seems to have been unusually low ; the spire angle is about 90°. The later spire whorls bear a carina, corresponding to the sinus band, well-marked in Weir's specimen, but less distinct in the one now recorded ; this carina is not far above the suture and separates the flattened, vertical side of the whorl from the moderately convex, sloping shoulder. The base is delimited by a second carina, not visible on the spire whorls. The sculpture is reticulate, consisting of spiral threads crossed by growth-threads. *P. münsteri* Roemer (1839, p. 44, pl. xx, fig. 12) appears to be closely comparable in sculpture, but has a higher last whorl and lacks so well-defined a carina delimiting the base.

Family **TROCHIDAE.**

Genus **Proconulus** Cossmann, 1918.

3. **Proconulus arabiensis** (Newton).

1908. *Trochus arabiensis* Newton, p. 8, pl. i, figs. 8, 9.
1925. *Trochus arabiensis* Weir, p. 92.
1930. *Trochus arabiensis* Basse, p. 121, pl. v, fig. 7.

Occurrences and Material.—φ.216 ; Gahodleh Shale (Argovian) ; 3 specimens. A.39, C.1, F.30 ; horizons uncertain ; numerous specimens.

REMARKS.—This species appears to be a characteristic representative of the genus *Proconulus*. In the J. F. Blake Collection from Kachh (India) it is represented by a specimen labelled as coming from the *Nucula*-Flags (i.e. Middle Chari, or Callovian) of Kaora. It thus appears to have had an extended stratigraphical range.

4. **Trochus** [**Proconulus** ?] **ambalensis** Weir. Pl. XIV, figs. 8*a*, *b*, 9.

1925. *Trochus ambalensis* Weir, p. 91, pl. xii, fig. 24.

OCCURRENCE AND MATERIAL.—C.1 ; horizon uncertain ; 5 specimens.

REMARKS.—It is doubtful if this species has any close affinity with *Trochus andreae* de Loriol (1894, p. 13, pl. ii, fig. 5) of the Swiss Rauracian, as suggested by Weir (1929, p. 6), since the apertural characters of the two forms appear to differ considerably. In some specimens, the base, as mentioned by Weir, is ornamented with a single spiral rib, but this is not always developed. The parietal wall is covered with a thick but sharply margined callosity which is continuous with the wide, flattened, somewhat grooved inner lip. The columella is strongly arched, and without folds or teeth. There is no umbilicus.

The apertural features of this species appear to be very similar to those of *T. arabiensis*, and it may be referable to the same genus, *Proconulus*.

Family **AMPULLOSPIRIDAE.**

Genus **Globularia** Swainson, 1840.

5. **Globularia hemisphaerica** (Roemer). Pl. XIV, figs. 2*a*, *b*.

1836. *Nerita hemisphaerica* Roemer, p. 156, pl. x, fig. 7.
1852. *Natica hemisphaerica* d'Orbigny, p. 204, pl. ccxciv, figs. 1, 2.
1872. *Natica hemispherica* de Loriol, p. 118, pl. viii, figs. 4–6.
1881. *Natica hemispherica* de Loriol, p. 33, pl. viii, fig. 7.
1897. *Natica hemisphaerica* Futterer, p. 613.
1930. *Natica hemisphaerica* Basse, p. 142.

OCCURRENCE AND MATERIAL.—C.1 ; horizon uncertain ; one specimen.

REMARKS.—This specimen, an internal cast, agrees closely with specimens of this well-known species from the Kimmeridgian of northern France, and its determination need not be qualified.

6. **Globularia** sp. Pl. XIV, figs. 3*a*, *b*, 4.

DESCRIPTION.—A globose, low-spired form of medium size with a strongly convex last whorl, and with the aperture not greatly dilated.

OCCURRENCES AND MATERIAL.—φ.227 ; Bihen Limestone, 8–12 m. from base (Callovian) ; several specimens. C.1 ; horizon uncertain ; several specimens. F.10 ; Callovian ; 4 specimens.

REMARKS.—" *Natica* " *dubia* Roemer (1836, p. 157, pl. x, figs. 8*a*, *b*), especially as figured by d'Orbigny (1852, p. 215, pl. ccxcix, figs. 3, 4), is closely comparable to this species, but comes from a higher horizon.

Genus **Ampullella** Cox, 1931.

Cox, 1931, p. 38 = *Ampullina* auctt., *non* Bowdich.

7. **Ampullella** sp. I. Pl. XIV, fig. 12.

DESCRIPTION.—An internal cast of a high-spired species with rather feebly convex whorls ; the aperture occupies about two-thirds of the total height.

OCCURRENCE AND MATERIAL.—B.81 ; Callovian ; one specimen.

REMARKS.—" *Natica* " *elea* d'Orbigny (1852, p. 212, pl. ccxcvii, fig. 4) and " *N.*" *phasianelloides* d'Orbigny (1852, p. 212, pl. ccxcvii, fig. 6) are closely comparable in size and shape.

8. **Ampullella** sp. II. Pl. XIV, fig. 15.

?1925. *Pleurotomaria* cf. *spitiensis* Holdhaus; Weir, p. 93.

DESCRIPTION.—An internal cast closely comparable in shape to "*Ampullella* sp. I," but with rather more strongly convex whorls and with deeper sutures.

OCCURRENCE AND MATERIAL.—C.1; horizon uncertain; one specimen.

REMARKS.—Weir's "*Pleurotomaria* cf. *spitiensis*" is a much eroded cast, but appears to represent the same species as the specimen now recorded. I can find no characters to justify its reference to *Pleurotomaria*.

9. **Ampullella** sp. III. Pl. XIV, figs. 13*a*, *b*.

DESCRIPTION.—Internal casts with laterally flattened, gradate whorls, separated by channelled sutures, and forming an acute spire whose height exceeds that of the aperture; the umbilicus of the cast is wide.

OCCURRENCE AND MATERIAL.—C.1; horizon uncertain; 2 specimens.

REMARKS.—Comparable casts have been figured by de Loriol (1872, p. 114, pl. vii, figs. 17, 18) as *Natica eudora* d'Orbigny. Futterer (1897, p. 614), Dacqué (1905, pp. 142, 143), and Cottreau (1925*a*, p. 587) have recorded *N.* cf. *eudora* from the Upper Jurassic of this region.

10. **Ampullella** sp. IV. Pl. XIV, figs. 14*a*, *b*.

DESCRIPTION.—A stout species of medium size, with a low, obtuse spire, occupying less than one-third of the total height, and with a strongly convex last whorl.

OCCURRENCE AND MATERIAL.—C.1; horizon uncertain; 4 specimens.

REMARKS.—"*Natica*" *georgeana* d'Orbigny (1852, p. 214, pl. ccxcviii, figs. 2, 3) is closely comparable in size and shape.

11. **Ampullella** sp. V. Pl. XIV, figs. 5, 6*a*, *b*, 7*a*, *b*.

DESCRIPTION.—This species has a taller spire, more shouldered whorls, and a more laterally compressed last whorl than "*Ampullella* sp. IV." There is considerable variation in the proportionate height of the spire, which in the tallest specimens occupies as much as one-half of the total height of the shell, and in the shorter specimens as little as one-third.

OCCURRENCES AND MATERIAL.—φ.227; Bihen Limestone, 8–12 m. from base (Callovian); numerous specimens. F.10; Callovian; one specimen.

REMARKS.—"*Natica*" *ranvillensis* d'Orbigny (1852, p. 193, pl. ccxc, figs. 3, 4) is fairly close to the tallest specimens of this species.

Family **ARCHITECTONICIDAE.**

Genus **Architectonica** Bolten, 1798 [=*Solarium* Lamarck].

12. **Architectonica** (s. lat.) sp. Pl. XIV, figs. 10, 11.

DESCRIPTION.—Depressed-conical internal casts (apical angle about 120°), with an acutely carinate periphery and a wide umbilicus; the whorls are feebly convex. One specimen shows traces of strong axial ribs on one of its early whorls; these do not occupy the whole width of the whorl, but end abruptly a short distance from each suture.

OCCURRENCES AND MATERIAL.—φ.227; Bihen Limestone, 8–12 m. from base (Callovian); 2 specimens. F.10; Callovian; one specimen.

REMARKS.—Cossmann, in vol. x of his "Essais de Paléoconchologie Comparée" (1915), does not recognise any Jurassic representatives of the Architectonicidae, but includes certain

Jurassic species referred by previous authors to "*Solarium*" in various genera of the Euomphalidae. Those forms referred by him to *Colpomphalus* (loc. cit., pp. 136, 137) are perhaps closest to the one now recorded in the general proportions of the shell, but they are all more rounded at the periphery and nodose.

Family **PROCERITHIIDAE.**

Genus **Procerithium** Cossmann, 1902.

13. **Procerithium hunti** sp. nov. Pl. XV, figs. 5, 6.

DIAGNOSIS.—Shell small, spire angle somewhat variable. Protoconch small, mammillated, consisting of about two smooth, strongly convex whorls. Later whorls about 9, strongly convex, low-embracing, although with their height not much exceeding one-half of their diameter, and bearing, mesially, two spiral keels, which appear on the whorl immediately following the protoconch, and, adjacent to the sutures, two slightly weaker ones, the lower of which is usually the stronger; in some specimens spiral threads are present between the main keels. The base bears one fairly strong spiral keel slightly below the lowest visible on the spire whorls, and about two other weaker ones much lower down. Axial sculpture almost undeveloped in some specimens; in others consisting of slightly retrocurrent, rounded ribs which vary considerably in prominence in different specimens; these appear about four whorls from the aperture and form tubercles where they cross the spirals; in some specimens the tubercles are developed without the ribs. Aperture ovate, entire; inner lip narrowly reflected, separated from the base by a distinct ridge.

DIMENSIONS.—Holotype: height 6·6 mm., diameter 2·4 mm.

OCCURRENCE AND MATERIAL.—A.43; Gawan Limestone (Portlandian); the holotype (G.55746, fig. 5) and numerous paratypes.

REMARKS.—Numerous specimens, all silicified, are scattered over the surface of a bed of chert. The sculptural details of part of the shell are well preserved in many specimens, but not one is perfect, and it has been necessary to select a partly eroded shell as holotype. Although the axial sculpture varies considerably, the main spiral components are essentially the same in all specimens referred to this species. It cannot be identified with any form described from the European Upper Jurassic; the whorls are more strongly convex than in most species of *Procerithium*.

Family **NERINEIDAE.**

Genus **Nerinea** Defrance, 1824.

14. **Nerinea somaliensis** Weir.

1908. *Nerinea* cf. *elatior* d'Orbigny; Newton, p. 3.

1925. *Nerinaea somaliensis* Weir, p. 93 (excluding synonymy), pl. xii, figs. 10, 11.

OCCURRENCES AND MATERIAL.—φ.217, φ.219; Bihen Limestone, top 37 m. (Divesian–Argovian); several specimens. F.53; horizon uncertain; one specimen.

REMARKS.—The material studied by me is not well preserved, and I can add nothing to Weir's account of this species. Specimens of the large Arabian species recorded by Newton (1908, p. 9, pl. i, fig. 10; 1921, p. 391, pl. xi, fig. 1) as *N.* cf. *desvoidyi* d'Orbigny have recently been collected by Mr. H. St. J. Philby, and have proved well enough preserved to be cut in axial section. The section shows no trace of the sharp, prominent fold present on the upper wall of the whorl in *N. somaliensis*. Hence the two forms cannot be considered identical, as suggested by Weir.

Family **PSEUDOMELANIIDAE.**

Genus **Pseudomelania** Pictet and Campiche, 1862.

15. **Pseudomelania** sp. Pl. XIV, figs. 16, 17.

DESCRIPTION.—Internal casts of a large, acute, steeply wound, turriculate gastropod, closely comparable to *Pseudomelania delia* (d'Orbigny) (1851, p. 69, pl. ccl, fig. 4, sub *Chemnitzia*), and the specimen figured as *P.* cf. *delia* by de Loriol (1881, p. 32, pl. viii, fig. 6).

OCCURRENCES AND MATERIAL.—A.39, C.1 ; horizons uncertain ; 10 specimens.

Family **APORRHAIDAE.**

Genus **Aporrhais** Da Costa, 1778.

16. **Aporrhais** cf. **haudnervatus** (Cossmann). Pl. XIV, fig. 18.

The reference to the type-description is :—

1926. *Chenopus* (*Quadrinervus* ?) *haudnervatus* Cossmann, in Douvillé, p. 314, pl. vii, fig. 3.

DESCRIPTION.—The specimens are internal casts of a rather slender species, about 25–30 mm. in height, with strongly convex, low-embracing whorls ornamented with not very strong, rounded axial ribs, crossed by numerous strong, but somewhat unequal spiral threads. The anterior taper of the last whorl is very gradual ; a single, well-marked carina appears on the posterior part of this whorl, just before the aperture.

OCCURRENCES AND MATERIAL.—φ.226, φ.227 ; Bihen Limestone, 8–21 m. from base (Callovian) ; 5 specimens. F.10 ; Callovian ; one specimen.

REMARKS.—These specimens agree well with Cossmann's description and figure of *A. haudnervatus*, from the Callovian of Sinai, but are perhaps too imperfect for definite identification.

17. **Aporrhais** sp. Pl. XIV, fig. 20.

DESCRIPTION.—Internal casts of a moderately large and stout species, about 39 mm. in height. The acute spire consists of strongly convex, rather low-embracing whorls bearing faint traces of axial ribbing. The sculptural details are not well preserved, but numerous spiral ribs become visible on the last whorl, fanning out on to the wing, at the origin of which more than ten appear to have been present. In some of the specimens, a large varicose swelling is present on the last whorl. It is impossible to say if the wing was adherent to the spire.

OCCURRENCE AND MATERIAL.—F.10 ; Callovian ; 8 specimens.

REMARKS.—In their general shape, these specimens are comparable to some of the internal casts of *Harpagodes* figured in Piette's monograph (1864–91), but close comparison is impossible owing to their poor state of preservation.

? Subgenus **Diarthema** Piette, 1864.

18. **Aporrhais** (**Diarthema** ?) sp. Pl. XIV, fig. 19.

DESCRIPTION.—Internal casts of a fairly stout species, about 38 mm. in height and 28 mm. in diameter. The strongly convex spire whorls are ornamented with axial ribs, crossed by three rather conspicuous spiral ribs, which apparently produce tubercles at the points of intersection ; the uppermost spiral delimits a narrow, slightly concave, sloping whorl shoulder, which becomes well-marked on the last whorl. Three further carinae become visible on the last whorl ; the uppermost is close to the lowest visible on the spire whorls, while the other two are low down on the base. Subordinate carinae are intercalated between the main ones, in some cases ultimately becoming nearly as strong as the latter, so that nine carinae are visible where the surface of the last whorl passes into the wing (which, however, is not preserved). One very

inflated varix is present on the side of the last whorl opposite the labrum, while two rather short ones occur between it and the origin of the wing. Except for these varices, the axial element of the sculpture seems to have been inconspicuous on the last whorl.

OCCURRENCE AND MATERIAL.—F.10 ; Callovian ; 2 specimens.

REMARKS.—The most similar described species appears to be *Pterocera paradoxa* Deslongchamps, a Bathonian form upon which the genus *Diarthema* was founded by Piette (1864, pl. ix, figs. 1–12). This is closely comparable both in size and proportions, and in the ornamentation of the spire whorls, but differs considerably in the number and arrangement of the spiral ribs on the last whorl.

Family **BULLIDAE.**

Genus **Bulla** Linné, 1758.

19. **Bulla macfadyeni** sp. nov. Pl. XV, figs. 3*a*, *b*.

DIAGNOSIS.—Shell of medium size, oviform, with strongly convex sides ; bluntly pointed and with no perforation at its posterior end, so that the early whorls are not visible ; diameter nearly three-quarters of the height. Aperture narrow posteriorly, widening gradually anteriorly, but not greatly dilated. Sculpture unknown.

DIMENSIONS.—Holotype : height 29 mm., diameter 21 mm.

OCCURRENCE AND MATERIAL.—C.1 ; horizon uncertain ; the holotype (G.55745, figured), and one paratype.

REMARKS.—Both specimens are internal casts. The most similar described Jurassic species appears to be *B. matronensis* de Loriol (1872, p. 71, pl. v, fig. 9), which, however, is less pointed posteriorly and has a definite, although narrow, apical perforation. The apparent absence of the latter feature in the species now described suggests that it should perhaps be referred to the subgenus *Haminea* Leach.

Family **ACTEONIDAE.**

Genus **Cylindrites** J. de C. Sowerby, 1824.

20. **Cylindrites** (?) cf. **striatus** (Lissajous). Pl. XV, figs. 1, 2*a*, *b*.

The reference to the type-description is :—

1923. *Actaeonina striata* Lissajous, p. 128, pl. xxvii, fig. 7 ; pl. xxviii, fig. 13.

DESCRIPTION.—Internal casts of a fairly large, cylindrical form, with the diameter about one-half of the height, and with flat or even slightly concave, parallel sides. Spire projecting, obtuse, gradate, consisting of round-shouldered whorls with vertical sides. Base somewhat excavated. Aperture narrow, details of columella indeterminate. Surface smooth, except at the anterior end, where a few spiral groves appear to have been present.

DIMENSIONS.—Height (original) ca. 37 mm., diameter ca. 17 mm.

OCCURRENCES AND MATERIAL.—φ.227 ; Bihen Limestone, 8–12 m. from base (Callovian) ; 3 specimens. F.10 ; Callovian ; 3 specimens.

REMARKS.—These specimens agree closely with Lissajous' figures of *Actaeonina striata*, from the Bathonian of southern France. In shape, this is more like a *Cylindrites* than an *Actaeonina*, but it is impossible to observe if the columellar plication characteristic of the former genus was present. The spiral grooves on the anterior end are faintly visible in one specimen. *Cylindrites deserti* Douvillé (1916, p. 28, pl. i, figs. 14*a*, *b*), from the Bajocian of Sinai, is also comparable, but has slightly more strongly convex sides, a less excavated and more gradually tapering base, and a more elevated spire.

21. **Cylindrites** (?) sp. Pl. XV, fig. 4.

DESCRIPTION.—A stouter shell than the form recorded above as *C.* cf. *striatus* (Lissajous), with a more obtuse spire ; the diameter is about two-thirds of the original height. The sides are slightly convex ; the shoulder of each whorl appears to be separated from its side by a definite angle. The whole surface is ornamented with spiral striae.

DIMENSIONS.—Height (original) ca. 25 mm., diameter 17 mm.

OCCURRENCE AND MATERIAL.—φ.227 ; Bihen Limestone, 8–12 m. from base (Callovian) ; one specimen.

Class LAMELLIBRANCHIA.

Family **NUCULIDAE.**

Genus **Nucula** Lamarck, 1799.

22. **Nucula cuneiformis** J. de C. Sowerby.

1840. *Nucula* ? *cuneiformis* J. de C. Sowerby, pl. xxii, fig. 4.
1908. *Nucula cuneiformis* Newton, p. 7, pl. i, figs. 5–7.
1913. *Nucula spitiensis* Holdhaus, p. 428, pl. xcv, figs. 11–13.
1913. *Nucula hyomorpha* Holdhaus, p. 430, pl. xcv, figs. 14–17.
1925. *Nucula cuneiformis* Weir, p. 90.
1925. *Nucula* cf. *spitiensis* Weir, p. 91, pl. xii, fig. 1.
1929. *Nucula cuneiformis* Weir, p. 5, pl. iv, figs. 2–4.
1929. *Nucula spitiensis* var. *ambalensis* Weir, p. 6.
1930. *Nucula cuneiformis* Basse, p. 108, pl. v, figs. 5*a–c*.

OCCURRENCES AND MATERIAL.—φ.213*a*, φ.214 ; base of Wanderer Limestone and top of Gahodleh Shale (Upper Argovian–Lower Kimmeridgian). A.36, A.39, C.1, F.30, F.43 ; horizons uncertain ; numerous specimens.

REMARKS.—Sowerby's type is no longer extant, but several specimens of known horizon from the Jurassic of Kachh are in the J. F. Blake collection at the British Museum. These come from the Bathonian, Callovian and Divesian. Both Indian and Somaliland specimens vary considerably in shape, but individuals agreeing very closely can be selected from the two localities. Holdhaus, having no Kachh specimens for comparison, described specimens from the Spiti Shales as two distinct species, *N. spitiensis* and *N. hyomorpha*. Both of these forms can be closely matched among the Somaliland material, and show complete intergradation. The range of this species in India seems, therefore, to have been unusually long, although in Somaliland there is no evidence of its occurrence at a pre-Kimmeridgian horizon.

N. subhammeri Roeder (1882, p. 74, pl. iii, figs. 8*a*, *b*) is a closely comparable species from the European Upper Jurassic.

Family **ARCIDAE.**

Genus **Parallelodon** Meek and Worthen, 1866.

23. **Parallelodon egertonianus** (Stoliczka).

1865. *Macrodon egertonianum* Stoliczka, p. 89, pl. viii, fig. 7.
1896. *Parallelodon egertonianus* Newton, p. 296.
1908. *Parallelodon egertonianus* Newton, p. 5, pl. i, figs. 1–4.
1910. *Parallelodon egertonianum* Tipper, p. 339, pl. xxxv, fig. 1.
1913. *Arca* (*Cucullaea*) *egertoniana* Holdhaus, p. 434, pl. xcv, figs. 1–10.
1925. *Parallelodon egertonianus* (with var. *crebricostatus*) Stefanini, p. 171, pl. xxxi, figs. 6–8.
1925. *Parallelodon egertonianus* Weir, p. 91.
1927. *Parallelodon egertonianus* Gregory, p. 325.
1930. *Parallelodon egertonianus* Weir, p. 81, pl. ix, fig. 12.
1930. *Parallelodon egertonianus* Basse, p. 109, pl. iv, figs. 3*a*, *b*.
1931. *Parallelodon egertonianus* Diaz-Romero, p. 28.

OCCURRENCES AND MATERIAL.—φ.3 ; Bihen Limestone (?) ; 4 specimens. φ.214, φ.216 ; Gahodleh Shale (Upper Argovian) ; 7 specimens. φ.211 ; Wanderer Limestone (Lower Kimmeridgian) ; noted by Dr. Macfadyen but not collected. φ.204 ; Daghani Shales (Middle Kimmeridgian) ; noted by Dr. Macfadyen but not collected. A.42 ; probably Daghani Shales ; 3 specimens. φ.5 ; Gawan Limestone (Portlandian) ; noted by Dr. Macfadyen but not collected. A.35, A.39, C.1, F.43, F.30 ; horizons uncertain ; numerous specimens.

REMARKS.—Statements that this species occurs in Bajocian beds in Tibet are based on the misidentification of certain ammonites from the Spiti Shales, which are not of Bajocian, but of Upper Jurassic or basal Cretaceous age. Specimens from Niti preserved in the British Museum (Natural History) may possibly come from the basal Belemnite beds of the Spiti Shales, which are of Argovian age ; they are somewhat crushed, and obviously did not occur in nodules, as do the fossils from higher horizons. Stefanini (1925, p. 173) states that in southern Italian Somaliland the horizon of this species appears to be Oxfordian s. str. (i.e. Divesian), but there is no authentic record of its occurrence in earlier beds.

Family **TRIGONIIDAE.**

Genus **Trigonia** Bruguière, 1789.

24. **Trigonia** cf. **reticulata** Agassiz.

References to descriptions of the type-form are :—

1841. *Trigonia reticulata* Agassiz, p. 39, pl. xi, fig. 10.
1930. *Trigonia reticulata* Arkell, p. 81 (with full synonymy), pl. vi, figs. 1–4.

OCCURRENCES AND MATERIAL.—φ.211 ; Wanderer Limestone (Lower Kimmeridgian) ; 4 specimens. φ.217 ; Bihen Limestone, top bed (Divesian–Argovian) ; one specimen.

REMARKS.—These are ill-preserved moulds of a costate *Trigonia* agreeing in shape with the widespread Upper Jurassic species *T. reticulata*, which, in Arkell's opinion (loc. cit.), includes in its synonymy *T. papillata*, *T. monilifera*, *T. parvula*, and *T. meriani*, all described by Agassiz. They do not, however, attain the size of *T. reticulata*, the largest measuring 31 mm. in length and 28 mm. in height. *T. spitiensis* Holdhaus (1913, p. 438, pl. xcix, figs. 5, 6), from the Spiti Shales, is also closely comparable.

Family **MYTILIDAE.**

Genus **Mytilus** Linné, 1758.

25. **Mytilus jurensis** (Mérian MS.) Roemer. Pl. XV, figs. 15–17.

1836. *Mytilus jurensis* Mérian MS., Roemer, p. 89, pl. iv, fig. 10.
1836. *Mytilus jurensis* Bronn, p. 359, pl. xix, fig. 14.
1862. *Mytilus jurensis* Thurmann and Étallon, p. 220, pl. xxix, fig. 4.
1870. *Mytilus* (? *Modiola*) *tigrensis* Blanford, p. 201, pl. viii, fig. 3.
1872. *Mytilus jurensis* de Loriol, p. 346, pl. xix, fig. 9.
1886. *Modiola* cf. *imbricata* Sow. ; Douvillé, p. 227, pl. xii, fig. 10.
1893. *Mytilus jurensis* Fiebelkorn, p. 403, pl. xiv, fig. 19.
1897. *Mytilus jurensis* Futterer, p. 593.
1897. *Mytilus tigrensis* Futterer, p. 592, pl. xx, figs. 1–2.
1905. *Mytilus alatus* Krumbeck, p. 108, pl. xi, figs. 4–5.
1911. *Mytilus jurensis* Flamand, p. 926, pl. ix, fig. 13.
1925*a*. *Mytilus jurensis* Cottreau, p. 584.
1929. *Mytilus* (*Modiola*) *blanfordi* Weir, p. 30 (*pars*), pl. ii, fig. 17 (*non* figs. 15, 16).

DESCRIPTION.—The specimens referred to this species vary considerably in width and obliquity. In those of average proportions, which have a sickle-like shape, the hinge-margin occupies from two-thirds to three-quarters of the total length, and makes a well-defined angle with the feebly concave, straight, or feebly convex posterior margin, so that the postero-dorsal region of the shell is more or less alate. A line joining the umbo to the most distant point of the postero-ventral margin makes an angle of about 45° with the hinge-margin. An ill-defined, rounded-off, concavely curved ridge passes from the umbo towards the posterior end of the ventral margin, which is usually angularly concave near its middle. The part of the shell ventral to this ridge is narrow ; the antero-ventral (" buccal ") region is slightly swollen, but its margin does not project beyond the umbones. The general directions of the posterior and ventral margins usually converge fairly rapidly.

A few specimens (fig. 17) are more elongate in shape, the line joining the umbo to the most remote point of the margins making an angle as low as 30° with the hinge-margin. In such specimens the postero-dorsal wing is definitely developed, although it is more obtuse-angled than in the commoner variety. This postero-dorsal region may be limited by an umbonal ridge dorsal to the usual diagonal ridge ; between the two ridges the surface of the shell is somewhat flattened. The " buccal " gibbosity tends to be more pronounced in this variety.

A third variety (fig. 15) is much more oblique, with almost straight and only slightly convergent posterior and ventral margins. The line joining the umbo to the most remote points of the margins may make an angle of as much as 70° with the hinge-margin.

OCCURRENCE AND MATERIAL.—C.1 ; horizon uncertain ; 14 specimens.

REMARKS.—Specimens of average proportions agree closely with the holotype of *M. tigrensis* Blanford (British Museum 74547), but their posterior wing is slightly more pronounced, as in *M. alatus* Krumbeck. The close affinity of *M. tigrensis* and *M. alatus* with *M. jurensis* has been pointed out by both Futterer and Krumbeck (loc. cit.). The European species varies considerably in width, as will be shown by a comparison of Roemer's figure with Bronn's (the former, being cited by Bronn, is apparently the prior one) ; average specimens, however, e.g. the one figured by de Loriol (loc. cit.), are of much the same shape as the holotype of *M. tigrensis*. Usually the postero-dorsal angle is rounded off, but in specimens from Porrentruy (Switzerland) in the British Museum quite a well-defined wing is developed, as in *M. alatus* and the specimens now described. Consequently I have no hesitation in placing *M. alatus* as well as *M. tigrensis* in the synonymy of *M. jurensis*. *M. jurensis* itself differs very little from, and may possibly be a synonym of, the British Corallian species, *M. ungulatus* Young and Bird *non* Linné (see Arkell, 1929, p. 50, pl. ii, fig. 5).

Subgenus **Modiolus** Lamarck, 1899.

26. **Mytilus (Modiolus) imbricatus** (J. Sowerby). Pl. XVI, figs. 3–5.

1818. *Modiola imbricata* J. Sowerby, vol. iii, p. 21, pl. ccxii, figs. 1, 3.
1836. *Modiola imbricata* Roemer, p. 92, pl. v, figs. 8*a–c*.
1837. *Mytilus subaequiplicatus* Goldfuss, p. 177, pl. cxxxi, figs. 7*a*, *b* (? *non* Roemer, sp.).
1870. *Modiola imbricaria* var., Blanford, p. 201, pl. viii, fig. 2.
1872. *Mytilus subaequiplicatus* de Loriol, p. 344, pl. xix, figs. 7, 8 (? *non* Roemer, sp.).
1875. *Mytilus aequiplicatus* de Loriol, p. 154, pl. xviii, figs. 21*a*, *b* (? *non* Strombeck, sp.).
1882. *Modiola blanfordi* Rochebrune, p. 13.
1883. *Modiola imbricata* de Loriol, p. 60, pl. ix, figs. 1–8.
1894*a*. *Modiola aequiplicata* de Loriol, p. 131, pl. ix, figs. 6–8 (? *non* Strombeck).

1895. *Modiola angustissima* Newton, p. 83, pl. iii, fig. 4.
1897. *Modiola pantanellii* Futterer, p. 594, pl. xx, figs. 4, 4*a*.
1905. *Modiola subangustissima* Dacqué, p. 136, pl. xv, fig. 8.
1911. *Modiola aequiplicata* Boden, p. 68 [190], pl. vii, figs. 13, 14 (*non* Strombeck).
1911. *Modiola* cf. *subaequiplicata* Flamand, p. 925, pl. ix, fig. 14.
1925. *Modiola imbricata* Weir, p. 88.
1929. *Mytilus* (*Modiola*) *blanfordi* Weir, p. 30, pl. ii, figs. 15, 16 (*non* fig. 17).
1929. *Mytilus* (*Modiola*) *subangustissimus* Weir, p. 30, pl. ii, figs. 18–21.
1930. *Modiola subangustissima* Basse, p. 138, pl. v, figs. 11*a*, *b*.

OCCURRENCES AND MATERIAL.—φ.227, φ.226, φ.219 ; Bihen Limestone, 8–21 m. from base (Callovian) and 50 m. from base (Divesian–Argovian) ; several specimens. A.39, C.1 ; horizons uncertain ; numerous specimens. B.81 ; Callovian ; 6 specimens.

REMARKS.—Weir (1929) has remarked on the difficulty of distinguishing Lower Bihen Limestone specimens, which he calls *M. blanfordi*, from those from higher horizons, which he refers to *M. subangustissimus*. After careful comparison of a series of specimens, I am unable to see any average difference at all. I have also compared this material with a large series of specimens of *M. imbricatus* from the English Great Oolite and Cornbrash, and again can find no grounds for specific discrimination, since such variations as occur in the Somaliland specimens can be matched among the English ones. The surface-ornamentation, consisting of more or less equidistant growth-imbrications, also agrees closely.

Strombeck gave no figure with his original description (1832, p. 401) of the Upper Jurassic form, *M. aequiplicatus*, but, since he describes it as of nearly the same shape as *M. plicatus* (J. Sowerby), it is probable that the type-form of the species is as figured by Roemer (1836, p. 93, pl. v, fig. 7), who changes the trivial name to *subaequiplicatus*. It seems very doubtful if the elongate, parallel-sided form represented is the same species as the *M. subaequiplicatus* or *M. aequiplicatus* of Goldfuss and later authors. The close similarity between this latter species and *M. imbricatus* has been commented upon frequently, and I think that there is every justification for uniting the two ; in other words, for considering *M. imbricatus* to range throughout the Middle and Upper Jurassic.

Arkell (1929, p. 51) has suggested that certain Upper Jurassic specimens recorded by de Loriol and others as *M. aequiplicatus* and *M. imbricatus* may be immature specimens of *M. ungulatus* Young and Bird. There is, however, no evidence that any of the Somaliland specimens now recorded are the young of the allied species, *M. jurensis*, described above ; certain immature specimens of that species in the collection are of the same shape as full-grown specimens. In *M. imbricatus* the diagonal ridge is more pronounced and the " buccal " region more swollen than in *M. jurensis*, while the shell is usually less oblique and the postero-dorsal angle more rounded off.

Similar differences distinguish Blanford's " *M. imbricaria* var.," renamed *M. blanfordi* by Rochebrune and (independently) by Weir, from his *M. tigrensis*. The horizon of Blanford's specimens is doubtful, so that it is uncertain if the name *M. blanfordi* could correctly be restricted to Middle Jurassic specimens were it considered desirable to distinguish them from specimens of higher horizon. If, however, *M. imbricatus* is accepted as a species of long range, I am of opinion that Blanford's original determination may be accepted ; I also consider *M. angustissima* Newton, from Madagascar, as well as *M. pantanellii* Futterer and *M. subangustissima* Dacqué, to belong to the same species.

Subgenus **Arcomytilus** Agassiz, 1840.

27. **Mytilus (Arcomytilus) laitmairensis** de Loriol. Pl. XV, figs. 13, 14.

1883. *Mytilus laitmairensis* de Loriol, p. 57, pl. viii, figs. 6–12.
1897. *Mytilus* aff. *subpectinatus* d'Orbigny; Futterer, p. 593, pl. xx, fig. 3.
1911. *Mytilus laitmairensis* Flamand, p. 901, pl. xi, fig. 23.
1925. *Mytilus subpectinatus* Weir, p. 89 (*non* d'Orbigny).
1929. *Mytilus autissiodorensis* Weir, p. 29, pl. ii, figs. 12, 13 (*non* Cotteau).
1930. *Mytilus subpectinatus* Basse, p. 138, pl. v, fig. 10 (*non* d'Orbigny).
1931. *Mytilus laitmairensis* Diaz-Romero, p. 29, pl. ii, figs. 11, 12.

DESCRIPTION.—The specimens resemble the well-known species *M. pectinatus* J. Sowerby in size and sculpture, but have a rounded postero-ventral margin in contrast to the flattened margin characteristic of that species, and lack the ridges proceeding from the umbo towards the extremities of the margin in question. There is frequently a tendency for about three of the radiating threads ornamenting the surface to stand out more prominently than the remainder.

OCCURRENCES AND MATERIAL.—φ.227; Bihen Limestone, 8–12 m. from base (Callovian); 3 specimens. C.1; horizon uncertain; 4 specimens. B.81; Callovian; one specimen.

REMARKS.—The typical *M. pectinatus* (=*subpectinatus* d'Orbigny), the subgenotype of *Arcomytilus*, has been recorded from Somaliland by Dacqué (1905, p. 136, pl. xv, fig. 22). *M. laitmairensis*, originally described from the *Mytilus*-Beds (Bathonian)* of the Vaudois Alps (Switzerland), differs from that species in the characters enumerated above. It is, however, possible that the two forms may prove to be varieties of one and the same species, while it is certain that they are not characteristic of different geological horizons. Intermediate forms (e.g. the specimen figured by Basse, loc. cit.) exist in which the postero-ventral margin is less convex than in typical *M. laitmairensis* and there is some indication of umbonal ridges. Round-margined forms have been figured as *M. pectinatus* by Goldfuss (1837, pl. cxxix, fig. 2*c*) and others. In any case it is not feasible to maintain a subgeneric distinction between the typical *M. pectinatus* (*Arcomytilus*) and the round-margined forms (*Hormomya*).

Subgenus **Musculus** Bolten, 1798.

28. **Mytilus (Musculus) somaliensis** sp. nov. Pl. XVI, figs. 1, 2*a*, *b*.

?1886. *Modiola aspera* Douvillé, p. 228, pl. xii, fig. 11 (*non* J. Sowerby).
?1925. *Mytilus asper* Cox, p. 176 (*non* J. Sowerby, sp.).
1925. *Modiola autissiodorensis* Stefanini, p. 170, pl. xxviii, fig. 7 (*non* Cotteau).
?1931. *Mytilus* cf. *autissiodorensis* Diaz-Romero, p. 30.

DIAGNOSIS.—Shell gibbose, attaining a considerable size. Hinge-margin moderately short, less than one-half of the length of the shell; obliquity variable, the diagonal from the umbo to the most remote point of the margin making an angle of about 30° to 45° with the hinge-margin. Posterior margin evenly convex, more or less parallel to the ventral margin in general direction. Diagonal ridges well-defined, curved, the shell strongly swollen between them. "Buccal" region inflated, separated from the body of the shell by a sulcus, to which corresponds a pronounced inflexion of the ventral margin; its margin is strongly convex, sometimes projecting, very slightly beyond the umbo. Sculpture of body of shell consisting of fairly coarse radial threads which occasionally bifurcate and bear closely spaced, obscure scales, most conspicuous

* De Loriol's conclusion, based mainly on the lamellibranch fossils, that these beds are of Bathonian age was disagreed with by Gilliéron and Rabowski, who considered them to be younger; it has, however, now been confirmed by the discovery of Callovian and Oxfordian ammonites in overlying beds (Heim, 1921, p. 617).

near the posterior margin ; the spaces between the radial threads bear regularly spaced, delicate transverse threads. " Buccal " region smooth except at its anterior end, where a few radial threads are present.

DIMENSIONS.—Holotype (of average size) : length 35·5 mm., height 32·0 mm., inflation 22·2 mm. Largest specimen : length 80 mm., height 38 mm., inflation 41 mm.

OCCURRENCES AND MATERIAL.—φ.148 ; Bihen Limestone (Callovian–Argovian) ; one specimen. A.39, C.1 ; horizon uncertain ; the holotype (L.61136, figs. 2*a*, *b*) and numerous other specimens. F.10 ; Callovian ; 2 specimens.

REMARKS.—This species is distinguished from *M. autissiodorensis* (Cotteau), from the Upper Jurassic of France and England, by its larger size and by its coarser and scaly ribs. In *M. pulcher* (Phillips) (=*M. cancellatus* (Roemer)), which ranges from the Callovian to the Argovian in Europe, the umbones are less anterior and the " buccal " region less inflated, so that the ventral margin is straighter. *Modiolaria inexpectata* Cossmann (1915, p. 4, pl. iii, figs. 6–9), from the French Bathonian, is much smaller.

The Trans-Jordan specimens recorded by me as *M. asper* are ill-preserved, but, like Douvillé's Shoa specimen, probably belong to the species now described. The true *M. asper* is not a *Musculus*, but an *Arcomya* ; its " buccal " region is not swollen, as in the present species, and its radial ribs are more delicate.

Subgenus **Pharomytilus** Rollier, 1914.

29. **Mytilus** (**Pharomytilus**) cf. **perplicatus** Étallon.

References to descriptions of the type-form are :—

1862. *Mytilus perplicatus* Étallon, p. 223, pl. xxix, fig. 8.
1872. *Mytilus perplicatus* de Loriol, p. 348, pl. xix, figs. 10, 11.
1897. *Mytilus perplicatus* Futterer, p. 591.
1914. *Modiola perplicata* Hennig, p. 176, pl. xiv, fig. 4.
1931. *Modiola perplicata* Diaz-Romero, p. 31, pl. ii, fig. 13.

OCCURRENCE AND MATERIAL.—C.1 ; horizon uncertain ; one fragment.

REMARKS.—According to de Loriol (loc. cit.) *M. perplicatus* is distinguished from the Middle Jurassic species *M. sowerbianus* d'Orbigny (=*Modiola plicata* J. Sowerby, *non Mytilus plicatus* Gmelin) by the fact that each of the ribs on the part of the shell adjacent to the dorsal margin splits up into two ribs about half-way between that margin and the diagonal carina, instead of into a group of several fine ones. This distinction between Upper and Middle Jurassic forms holds good in specimens examined by me. In the fragment now recorded the ribs clearly bifurcate.

Family **PTERIIDAE.**

Genus **Oxytoma** Meek, 1864.

30. **Oxytoma inequivalve** (J. Sowerby). Pl. XV, figs. 11, 12.

1819. *Avicula inequivalvis* J. Sowerby, vol. iii, p. 78, pl. ccxliv, figs. 2, 3.
1901. *Oxytoma inaequivalve* Waagen, pp. 1–23, pl. i (with synonymy).
1909. *Oxytoma inaequivalvis* Borissiak, p. 19, pl. i, figs. 3–8, 10.
1909. *Oxytoma* cf. *interlaevigata* Quenstedt ; Borissiak, p. 21, pl. i, fig. 9.
1933. *Oxytoma expansa* Arkell, p. 190, pl. xxiv, figs. 1–5.

DESCRIPTION.—The specimens occur in a rubbly bed which breaks up into small fragments, and hence are all incomplete. The left valve is of moderate convexity, with an elongate posterior auricle, but with a shallow subauricular sinus. There are about 12–13 somewhat unequal and unevenly spaced primary ribs, with a very weak secondary rib occupying the middle of each interspace, which is otherwise smooth except for one or two very faint tertiary ribs. There are no well-preserved specimens of the right valve, which seems to have been flat. The diameter of the largest specimen, when complete, was about 20 mm.

OCCURRENCE AND MATERIAL.—φ.215 ; Gahodleh Shale (Argovian) ; numerous specimens.

REMARKS.—*O. inequivalve* has been discussed most recently by Arkell (loc. cit.), who has definitely selected as lectotype the Middle Liassic specimen figured by Sowerby (loc. cit., fig. 2) and has suggested that the Callovian syntype (loc. cit., fig. 3) should be referred to *O. expansum* (Phillips). Dr. Arkell points out certain differences between the Liassic lectotype and the Upper Jurassic specimens figured in his monograph, but a representative series of Liassic specimens will be found to include specimens agreeing in every character with his definition of *O. expansum*. From my observations, I think it improbable that definite varieties of *O. inequivalve* will be found to characterise definite horizons, except locally, and fully agree with Waagen and Gillet (1924) in conceiving this as a species ranging from the Rhaetic to the Lower Cretaceous.

The ornamentation of the Somaliland specimens agrees fairly well with that of the " var. *interlaevigata* Quenst." of Waagen (loc. cit., p. 14, pl. i, figs. 8, 10), and of the Callovian specimen figured by Borissiak (loc. cit.) as *O.* cf. *interlaevigata*.

Genus **Posidonia** Bronn, 1828.

31. **Posidonia somaliensis** sp. nov. Pl. XV, figs. 7, 8.

DIAGNOSIS.—Of medium size for the genus, suborbicular or ovate, the length usually slightly in excess of the height, although occasionally the height may exceed the length ; equilateral to slightly inequilateral. Umbones small, pointed, level with or rising slightly above the hinge-margin, and usually placed between the middle and the anterior two-fifths of the shell-length, although occasionally they may be slightly posterior to median. Hinge-margin usually short ; anterior margin more or less flattened and sub-vertical, meeting the hinge-margin in a high, shoulder-like angle ; posterior margin with its upper part oblique and nearly straight, making an obtuse angle with the hinge-margin, and with its lower part flattened-convex and subvertical ; ventral margin strongly and symmetrically convex. Surface of shell concentrically plicated.

DIMENSIONS.—Holotype (a specimen of average size) : length 19·7 mm., height 17·0 mm. Paratype (associated with holotype) : length 17·0 mm., height 17·0 mm. The largest specimen is about 40 mm. in diameter.

OCCURRENCES AND MATERIAL.—φ.206, φ.207, φ.208 ; Daghani Shales (Middle Kimmeridgian); the holotype (L.61134, fig. 8, right-hand specimen) and numerous other specimens.

REMARKS.—This species occurs in considerable numbers, preserved in a sandy shale. Its presence at this horizon is of interest in view of the fact that elsewhere the genus is very rare in the Upper Jurassic. It is readily distinguished from the Middle Jurassic species, *P. ornati* Quenstedt (*alpina* Gras), discussed most recently by Guillaume (1928, p. 222, pl. x, figs. 4–13) and Weir (1930, p. 83, pl. x, figs. 14–21), by its more orbicular shape and the more median position of its umbones, as well as by its larger average size.

Genus **Aulacomyella** Furlani, 1910.

Furlani, 1910, footnote to explanation of pl. iii ; =*Posidoniella* Furlani, 1910, p. 85, *non* de Koninck.

32. **Aulacomyella farquharsoni** sp. nov. Pl. XV, figs. 9, 10.

DIAGNOSIS.—Shell thin, flat, of moderate size (length up to about 40 mm.), apparently equivalve, suborbicular, or with the length slightly in excess of the height, subequilateral or somewhat inequilateral. Umbones small, pointed, level with the hinge-margin, median or posterior to median. Hinge-margin straight, fairly short, extending mainly on the posterior side of the umbones. Anterior margin semicircular, curving round so as to merge with the hinge-margin just in front of the umbo. Posterior margin more flattened, its general direction making a slightly obtuse angle with the hinge-margin ; in it occurs a distinct sinus corresponding to a shallow radial groove, whose direction makes an angle of 30° or more (varying in different specimens) with the hinge-margin and which delimits an obtusely triangular posterior wing. Sculpture consisting of irregularly distributed, fine radial threads, originating a short distance from the umbo, crossed by concentric wrinkles which often fade away towards the ventral margin. On the posterior wing, the radial threads are inconspicuous.

DIMENSIONS.—Holotype ; height (estimated) 27 mm., length 36 mm.

OCCURRENCES AND MATERIAL.—φ.205 ; Daghani Shales (Middle Kimmeridgian) : F.53 ; apparently the same bed ; the holotype (L.61135, fig. 9), and numerous other specimens.

REMARKS.—Innumerable specimens of this species are crowded together along the bedding planes of a light shaly marl. Both in its general aspect and in its gregarious mode of occurrence it is strongly reminiscent of the Triassic genera *Halobia* and *Daonella*. It lacks, however, the raised anterior wing of the former genus, while its definite posterior wing and the sinus in its posterior margin separate it from *Daonella*. It seems to be congeneric with the Dalmatian Upper Jurassic species, *A. problematica* Furlani, upon which the genus *Aulacomyella* was founded. In that species there appears to be no definite sinus in the posterior margin, but, according to Furlani's description, a " bundle of thickened ribs " (not obvious in the figures) radiates from the umbo on the posterior side of the shell, and apparently delimits a wing-like area. As in the species now described, the anterior margin is almost semicircular, merging with the hinge-margin just in front of the umbo, while the posterior margin is much more flattened. The sculpture is very similar to that of the Somaliland species ; the umbones are perhaps slightly more prominent.

A smaller but somewhat similar species, *Monotis similis* Münster (Goldfuss, 1836, p. 139, pl. cxx, figs. 9*a–c*), with which *M. lacunosae* Quenstedt (1857, p. 630, pl. lxxviii, fig. 6) is probably synonymous, occurs gregariously in the German Upper Jurassic. Its hinge-margin is longer than in *Aulacomyella*, and it has no definite posterior wing.

Young specimens of *A. farquharsoni* have no radial ribbing, and are easily mistaken for specimens of *Posidonia*.

Family **VULSELLIDAE.**

Genus **Eligmus** Eudes-Deslongchamps, 1856.

33. **Eligmus polytypus** Eudes-Deslongchamps. Pl. XVI, figs. 11*a*, *b*, 12*a*, *b*, 13, 14.

1856. *Eligmus polytypus* Eudes-Deslongchamps, p. 287, pl. xv, figs. 1–17 ; pl. xvi, figs. 1–15.
1867. *Eligmus polytypus* Laube, p. 14, pl. i, figs. 1–3.
1883. *Eligmus polytypus* de Loriol, p. 75, pl. xi, figs. 2–7.
1900. *Heligmus polytypus* Cossmann, p. 168.

1907. *Heligmus polytypus* Douvillé, p. 105.
1911. *Eligmus polytypus* Flamand, p. 900, pl. vi, figs. 12*a–c*.
1924. *Heligmus polytypus* Cossmann, p. 25, pl. v, figs. 19–21 ; pl. vii, fig. 27.

DESCRIPTION.—The specimens vary from suborbicular to lunate-ovate in shape, and closely resemble typical specimens of *E. polytypus* in sculpture. The sharp, occasionally divaricating radial ribs usually number about 20 at the ventral margin ; they may occupy almost the entire surface of the shell, but usually originate at a short distance from the umbo and are absent from the postero-dorsal region, as also, occasionally, from the antero-dorsal region. The postero-dorsal margins of the two valves have a series of irregular jags or undulations, the depth of which varies considerably in different specimens ; the gape of these margins is, however, very slight. In one specimen the internal platform for the support of the adductor muscle may be observed.

OCCURRENCES AND MATERIAL.—φ.227 ; Bihen Limestone, 8–12 m. from base (Callovian) ; 8 specimens. C.1 ; horizon uncertain ; one specimen. B.81, B.82 ; Callovian ; 13 specimens.

REMARKS.—The Somaliland specimens are distinguished from typical French ones by their much less pronounced postero-dorsal gape. In this character, however, which does not appear to be one of specific importance, they agree with specimens from the *Mytilus*-Beds (Bathonian) of the Vaudois Alps figured by de Loriol (loc. cit.).

34. **Eligmus rollandi** Douvillé. Pl. XVI, figs. 6, 7, 8, 9*a*, *b*, 10*a*, *b*.
1907. *Heligmus rollandi* Douvillé, p. 105, pl. xv, figs. 1–3.
1916. *Heligmus integer* Douvillé, p. 33, pl. ii, figs. 13–16.
1924. *Heligmus* cf. *rollandi* Cossmann, p. 25, pl. v, figs. 32, 40 ; pl. vi, fig. 63.
1925. *Alectryonia pulligera* Weir, p. 86, pl. xii, fig. 5 (*non* Goldfuss, sp.).
1925. *Lopha humei* Stefanini, p. 165, pl. xxviii, fig. 8.
1927. *Heligmus rollandi* Pcelinzev, p. 1093, pl. lv, fig. 14.
1929. *Heligmus asiaticus* Weir, p. 22, pl. i, figs. 20–3.
1929. *Heligmus rollandi* Weir, p. 23, pl. i, figs. 24, 27 (*non* 25, 26, 28).
1929. *Heligmus rollandi* Barrabé, p. 124, pl. vii, fig. 20.
1930. *Heligmus rollandi* Besairie, p. 200, pl. x, figs. 4, 4*a*, 5.

OCCURRENCES AND MATERIAL.—φ.224 ; Bihen Limestone, 26–32 m. from base (Callovian) ; one specimen. φ.148, F.53 ; Bihen Limestone ; 5 specimens. A.39, C.1 ; horizon uncertain ; numerous specimens.

REMARKS.—These specimens closely resemble those referred to *E. polytypus*, and show a comparable range of variation in shape and sculpture. They differ solely in the absence of crenulations along the postero-dorsal margins, which have no appreciable gape. In view of the extreme variability of *E. polytypus* and the fact that the crenulations are not very pronounced in some of the specimens referred to that species, it is doubtful if this constitutes a specific difference. It may, however, be noted that in the Somaliland material the two forms do not occur together among specimens from the same locality and bed, and in view of this fact I have refrained from uniting them in synonymy. There is every gradation between the more weakly-ribbed forms, representing the typical *E. rollandi*, and forms with strong, acute ribs, corresponding to *E. integer*. *Lopha humei* Stefanini also agrees closely with some of the specimens in the series now described, and has therefore been included in the synonymy of *E. rollandi*. The specimens referred by Weir (1929, p. 22, pl. i, figs. 29–32) to *E. integer* appear, however, to be separable as a distinct species (see *E. weiri*, sp. nov., described below). Some, at least, of those referred by the same author (1929, p. 23, pl. i, figs. 25, 26, 28) to *E. rollandi* appear to possess a definite attachment-area, and probably belong to the species recorded in the present paper (p. 171) as *Lopha solitaria*.

Now that *E. rollandi* is known to have had a very wide geographical distribution, it seems preferable to abandon my previous conception (1925, p. 175) of *E. asiaticus* Douvillé, from Sinai and Trans-Jordan, as a distinct species, and to follow Douvillé (1916, p. 59) in regarding it as a race or variety of *E. rollandi*. Occasional Somaliland specimens are comparable to the most strongly ribbed specimens of that variety, but in the majority the ribbing is much more prominent, while smooth specimens, corresponding to *E. laevis* Douvillé (1916, p. 60, pl. vi, figs. 18, 19), appear to be absent.

E. rollandi is remarkably similar to *Ostrea perdalianae* Meneghini (1857, p. 263, pl. E, figs. 17*a–d*), from the Bathonian of Sardinia ; according to Meneghini, however, a definite attachment-area is present in that species.

35. **Eligmus rollandi** Douvillé var. **jabbokensis** (Cox). Pl. XVI, figs. 15*a*, *b*.

1925. *Ostrea jabbokensis* Cox, p. 172, pl. xiv, figs. 1*a*, *b*.

DESCRIPTION.—This form, which is suborbicular in outline, has closely spaced, rounded or acute ribs similar to those of the typical *E. rollandi*, but is characterised by its extreme gibbosity ; its inflation may attain three-quarters of its length. The umbones are always more or less opisthogyrate ; in the holotype they are somewhat posterior, but more frequently they are sub-median in position. The largest specimen is 37 mm. in length.

OCCURRENCES AND MATERIAL.—B.81, B.82 ; Callovian ; 12 specimens. C.1, F.53 ; horizon uncertain ; 4 specimens.

REMARKS.—When *O. jabbokensis* was originally described, the holotype, a right valve, was the only available specimen. The specimens now recorded show that this form is an *Eligmus* which can scarcely be maintained as specifically distinct from *E. rollandi*, although it is much more gibbose than typical specimens of that species. It may, however, be distinguished as a varietal form. " *Lopha* " *humei* Stefanini, discussed above, is more or less intermediate between this and the typical *E. rollandi*.

36. **Eligmus weiri** sp. nov. Pl. XVI, figs. 16, 17*a*, *b*, 18*a*, *b*, 19.

1925. *Alectryonia solitaria* Weir, p. 85, pl. xii, fig. 9 (*non* Sowerby, sp.).
1925. *Alectryonia* aff. *solitaria* Weir, p. 86, pl. xii, fig. 8.
1929. *Heligmus integer* Weir, p. 22, pl. i, figs. 29–32 (*non* Douvillé).

DIAGNOSIS.—Shell usually subequilateral and suborbicular, with the height frequently slightly in excess of the length ; but occasionally inequilateral and ovate, with the length exceeding the height. On the average more gibbose and attaining a larger size than *E. rollandi* ; immature specimens are proportionately more gibbose than full-grown ones, so that the umbonal region is usually strongly convex. Ornamentation consisting of wide, occasionally bifurcating ribs, which are usually V-shaped in cross-section and extend over the entire surface, but sometimes are more rounded and depressed, extending over only a portion of the surface, leaving the umbonal, anterior, and posterior regions smooth. Postero-dorsal margins not crenulated or gaping.

DIMENSIONS.—Holotype : length 35·4 mm., height 42·2 mm., inflation 19·1 mm.

OCCURRENCES AND MATERIAL.—φ.227 ; Bihen Limestone, 8–12 m. from base (Callovian) ; one specimen. φ.148 ; Bihen Limestone ; 3 specimens. φ.10, F.34 ; probably Callovian ; 2 specimens. B.81 ; Callovian ; 2 specimens. C.1 ; horizon uncertain ; the holotype (L.61137, fig. 16) and numerous other specimens.

REMARKS.—This species may be distinguished without difficulty from *E. integer* by its more orbicular shape, its greater gibbosity, and its coarser ribbing. Some specimens are almost as

gibbose as *E. jabbokensis*, but may be distinguished by their coarser ribbing and the fact that their umbones are not opisthogyrate. A specimen was sectioned, but showed no trace of a muscle-attachment platform. The complete absence of attachment-area, however, justifies reference of the species to *Eligmus* rather than to *Lopha*.

37. **Eligmus aualites** (Stefanini). Pl. XVII, figs. 1*a*, *b*, 2, 3.

1925. *Arctostrea aualites* Stefanini, p. 167, pl. xxix, fig. 8.

1925. *Alectryonia hastellata* Weir, p. 86, pl. xii, figs. 6, 7 (*non* Schlotheim, sp.).

DESCRIPTION.—This remarkable species is characterised by its elongate, regularly lunate shape, many specimens being much narrower and more curved than the one figured by Stefanini; the inflation is but slight. The greater part of the shell lies posterior to the small pointed umbones, and the anterior and ventral margins sweep round in a strongly convex, uninterrupted curve to meet the concave postero-dorsal margin at the more or less pointed posterior extremity of the shell. The most inflated region frequently lies between the ridges which, in each valve, follow the general lunate curve of the shell and are situated at about two-thirds of the distance from the umbo to the ventral margin. The sculpture consists of closely spaced, occasionally divaricating, acute ribs which diverge from a line which runs from the umbo to the posterior end of the shell and keeps fairly close to the postero-dorsal margin; about 16–22 of these ribs meet the sharply crenulated anterior and ventral margins. Between the line of divergence and the ridge already mentioned the ribs are frequently faint, while occasionally the surface of the shell is flattened and smoothed off in a remarkable manner; but between the ridge and the ventral margin the ribs are very prominent and sometimes have their crests slightly truncated and crossed by imbricating growth-layers. The short ribs which run from the line of divergence to the postero-dorsal margin are usually weak and are sometimes nearly obsolete; the margin, however, is always crenulated. A few specimens are slightly inequivalve, either valve being the more strongly inflated; most of the specimens, however, are equivalve. No trace of an attachment-area is ever present. The length of the largest specimen is 45 mm., its height 25 mm.

OCCURRENCES AND MATERIAL.—φ.148; Bihen Limestone (Callovian-Argovian); 7 specimens. A.39, C.1; horizon uncertain; numerous specimens.

REMARKS.—The absence of an attachment-area has led me to refer this species, like those described above, to the genus *Eligmus* rather than to *Lopha* or *Arctostrea*. Stefanini records that in southern Italian Somaliland it occurs in beds regarded by him as Oxfordian. The specimens recorded by Diaz-Romero (1931) as *Arctostrea aualites* are considered in the present paper to be referable to *Lopha solitaria* (see p. 171).

Family **OSTREIDAE.**

Genus **Ostrea** Linné, 1758.

Subgenus **Liostrea** Douvillé, 1904.

38. **Ostrea** (**Liostrea**) sp. I. Pl. XVII, figs. 6*a*, *b*.

OCCURRENCE AND MATERIAL.—C.1; horizon uncertain; one specimen.

DESCRIPTION AND REMARKS.—This specimen is a compressed, subequilateral, elongate-ovate oyster with a posterior wing limited by a well-marked sinus in the ventral margin; its height is 38 mm., its length 50 mm. The lower valve is flat except for its marginal region, which is turned up like the rim of a saucer; its attachment-area is small. The upper valve is quite flat. The growth-lamellae are well-marked, but do not imbricate to any extent.

In shape this specimen is reminiscent of *O. moreana* Buvignier (1852, p. 26, pl. xvi, figs. 41–3), but its attachment-area is very much smaller.

39. **Ostrea (Liostrea)** sp. II. Pl. XVII, figs. 7, 8.

OCCURRENCE AND MATERIAL.—C.1 ; horizon uncertain ; 2 specimens.

DESCRIPTION AND REMARKS.—These are subequivalve, subequilateral, unribbed oysters of medium size and moderate inflation. One is 84 mm. in height and 32 mm. in length ; the other is suborbicular (diameter 35 mm.), although in early stages of growth it seems to have been similar in shape to the first specimen.

These two specimens probably belong to a species of *Liostrea*, although no attachment-area is visible even in the more orbicular specimen, the umbonal region of which is uneroded. *O.* (*L.*) *multiformis* Koch & Dunker, as interpreted by de Loriol (1875, p. 213, pl. xxiv, figs. 6–10), is comparable to the taller one in outline, but has a large attachment-area.

40. **Ostrea (Liostrea) dubiensis** Contejean. Pl. XVII, figs. 4*a*, *b*, 5.

1859. *Ostrea dubiensis* Contejean, p. 320, pl. xxi, figs. 4–11.
1862. *Ostrea dubiensis* Thurmann & Étallon, p. 272, pl. xxxix, fig. 6.
1867. *Ostrea dubiensis* de Loriol, p. 115, pl. xi, figs. 2, 3.
1872. *Ostrea dubiensis* de Loriol, p. 407, pl. xxiv, figs. 19–25.
1882. *Ostrea dubiensis* Roeder, p. 31, pl. iii, figs. 10*a*, *b*.

DESCRIPTION.—This species is variable, but all the specimens can be matched with figures cited above. The shape of the shell may be ovate, trigonal, or lunate. The lower valve varies from flat to moderately convex, and sometimes has a fairly large attachment-surface ; the upper valve is usually flat. The maximum height attained is about 16 mm., but most specimens are considerably smaller.

OCCURRENCES AND MATERIAL.—φ.219 ; Bihen Limestone, 50 m. from base (Divesian-Argovian) ; 20 specimens. B.81, B.82 ; Callovian ; 14 specimens.

REMARKS.—This species is liable to be confused with *Exogyra nana*, but differs in the fact that the umbo of its right valve is not spirally incoiled. In Europe the species ranges from the Argovian (" Terrain à Chailles ") to the Lower Portlandian.

Genus **Lopha** Bolten, 1798.

41. **Lopha solitaria** (J. de C. Sowerby). Pl. XVII, figs. 9*a*, *b*, 10, 11*a*, *b*, 12*a*, *b*.

1824. *Ostrea solitaria* J. de C. Sowerby, vol. v, p. 105, pl. cccclxviii, fig. 1.
1835. *Ostrea solitaria* Roemer, p. 58, pl. iii, figs. 2*b*, *c* (? *non* 2*a*).
1857. *Ostrea dextrorsum* Quenstedt, p. 751, pl. xci, fig. 30.
1872. *Ostrea pulligera* de Loriol, p. 402, pl. xxiv, figs. 1–6 (*non* Goldfuss).
1875. *Ostrea pulligera* de Loriol, p. 221, pl. xxiv, figs. 4*a*, *b* (*non* 5) (*non* Goldfuss).
1878. *Actinostreon solitarium* Bayle, pl. cxxxii, figs. 2–6.
1911. *Ostrea* (*Exogyra*) *semisolitaria* Flamand, p. 924, pl. ix, figs. 2–6 (*non* Étallon).
1921. *Lopha solitaria* Newton, p. 393, pl. xi, figs. 4, 5.
1925. *Alectryonia rastellaris* Weir, p. 86 (*pars*), pl. xii, figs. 15, 17 (*non* 16) (*non* Münster, sp.).
1931. *Arctostrea aualites* Diaz-Romero, p. 39, pl. iii, fig. 11 (*non* Stefanini).
1931. *Lopha pulligera* Diaz-Romero, p. 40, pl. iii, figs. 12, 13 (*non* Goldfuss).
1931. *Lopha stefaninii* Diaz-Romero, p. 41, pl. iii, figs. 14*a*, *b*.

DESCRIPTION.—The majority of specimens are 35–40 mm. in height, the largest measuring 48 mm. The convexity varies, some specimens being fairly gibbose. Usually the lower valve is more inflated than the upper one, although some specimens are nearly equivalve. The shell is lunately curved and variable in width, which sometimes is approximately equal to the height, but at other times is considerably less. The attachment-area of the lower valve is usually conspicuous, occupying from one-tenth to one-third of the total surface ; the shells are not gregarious.

The lower valve is ornamented with sharp ribs radiating from the attachment-area to the margins. Their number may increase either by dichotomisation or by intercalation, and in the narrower specimens they may diverge laterally from a median ridge. On the upper valve a smooth convex area is usually present near the umbo, and is of about the same size as the attachment-area of the other valve ; the rest of the surface bears radial ribs somewhat less prominent than those of the other valve. On both valves the ribs may bear small vaulted scales formed by imbricating growth-lamellae.

OCCURRENCES AND MATERIAL.—C.1 ; horizon unrecorded, but one specimen is attached to *Somalirhynchia africana* Weir, similar to specimens from φ.216 (Argovian) ; numerous specimens.

REMARKS.—These specimens are undoubtedly referable to the European species which de Loriol (loc. cit.) has referred to *O. pulligera* Goldfuss, and show comparable variations. It is probable that Goldfuss's species was misinterpreted by de Loriol, since it was originally described (Goldfuss, 1833, p. 5, pl. lxxii, fig. 11) as gregarious in habit, frequently growing in clusters, with the lower valve attached by nearly its entire surface, whereas de Loriol's and the present specimens are not gregarious. Except for their slightly smaller average size, the present specimens—especially the wider ones—agree very well with specimens of *O. solitaria* from the English Corallian, and, in my opinion, are referable to that species, as are also de Loriol's specimens. There is every gradation between the wider specimens and the narrower and more lunate ones with ribs diverging from a central ridge (cf. de Loriol, 1875, pl. xxiv, figs. 4*a*, *b*) ; such specimens can therefore scarcely be referred to a distinct species, and certainly not to a distinct genus, *Arctostrea*, the diagnostic characters of which are thus obviously valueless.

The three forms figured by Diaz–Romero (loc. cit.) as *Arctostrea aualites*, *Lopha pulligera*, and *L. stefaninii* can all be matched with specimens of the series now recorded, but the same author's " *Lopha* cf. *solitaria* n.var." (loc. cit., pl. iii, fig. 15) appears too incomplete for determination. The Arabian specimen recorded by Newton (loc. cit.) as *O. solitaria* is probably correctly determined, although of unusual shape. The Algerian specimens referred by Flamand (loc. cit.) to *O. semisolitaria* Étallon may be referable to *O. solitaria*, but the true *O. semisolitaria* (Thurmann and Étallon, 1862, p. 279, pl. xl, fig. 1), a species of gregarious habit, appears distinct, and may be a synonym of *O. gregarea* J. Sowerby. I am uncertain whether Dacqué's " *Alectryonia pulligera* " (1905, p. 135, pl. xv, fig. 21) from Somaliland belongs to the present species or to *Eligmus*.

42. **Lopha** cf. **gregarea** (J. Sowerby). Pl. XVII, fig. 15.

The reference to the type-description is :—

1816. *Ostrea gregarea* J. Sowerby, vol. ii, p. 19, pl. cxi, figs. 1, 3.

The synonymy of the form now recorded is :—

1905. *Alectryonia rastellaris* Dacqué, p. 134, pl. xv, fig. 7.
1925. *Alectryonia rastellaris* Weir, p. 86 (*pars*), pl. xii, fig. 16 (*non* figs. 15, 17).
1929. *Arctostrea* cf. *asellus* Greppin ; Weir, p. 21, pl. i, fig. 19.

DESCRIPTION.—Small specimens, attaining a height of about 20 mm., much resembling those referred to *O. solitaria*, but with the radial ribs more closely spaced and more rounded.

OCCURRENCES AND MATERIAL.—φ.219 ; Bihen Limestone, 50 m. from base (Divesian–Argovian) ; 2 specimens. φ.3, φ.10 ; Bihen Limestone ; 3 specimens.

REMARKS.—These specimens appear to belong to the species recorded by Weir under the names cited above. They agree well with small specimens of *O. gregarea* and, in view of their

horizon, are better referred (with qualification) to that species than to the Bajocian form *L. asellus*. *L. gregarea* has often been cited under the name *rastellaris* Münster; whether Münster's types should be referred to Sowerby's species is, however, a little doubtful.

43. **Lopha costata** (J. de C. Sowerby). Pl. XVII, fig. 13.

1825. *Ostrea costata* J. de C. Sowerby, vol. v, p. 143, pl. cccclxxxviii, fig. 3.
1853. *Ostrea costata* Morris and Lycett, p. 3, pl. i, figs. 5, 5*a*.
1883. *Ostrea costata* de Loriol, p. 77, pl. xi, figs. 8–18 (? *non* fig. 25).
1924. *Ostrea* (*Alectryonia*) *costata* Hennig, p. 33, pl. iii, fig. 2.
1929. *Arctostrea costata* Weir, p. 21, pl. i, fig. 17.

Occurrence and Material.—φ.224; Bihen Limestone, 26–32 m. from base (Callovian); 5 specimens.

Remarks.—These are quite typical specimens of this widespread Middle Jurassic species.

Genus **Gryphaea** Lamarck, 1801.

Note.—The genotype of *Gryphaea* is *G. arcuata* Lamarck, designated by Dall, 1898, *Trans. Wagner Free Inst. Phila.*, vol. iii, p. 672. *G. angulata* Lamarck, cited as genotype by many authorities, was published only as a *nomen nudum* with the original description of *Gryphaea*, and hence was not available for subsequent designation as genotype. *G. arcuata*, being accompanied by references to published figures, was validly introduced. Hence *Liogryphaea* P. Fischer, type *G. arcuata*, is an absolute synonym of *Gryphaea*.

44. **Gryphaea balli** (Stefanini). Pl. XVIII, figs. 1, 2*a–c*, 3*a*, *b*, 4, 5, 6*a–c*, 7*a*, *b*.

1925. *Liogryphaea balli* Stefanini, p. 164, pl. xxix, fig. 2.
1925. *Exogyra fourtaui* Stefanini, p. 168 (*pars*), pl. xxix, fig. 4 (*non* fig. 3).
1929. *Liostrea arabica* Weir, p. 18, pl. i, fig. 1 (? *non* Stefanini).
1929. *Liogryphaea balli* Weir, p. 19, pl. i, figs. 2–4.
1929. *Exogyra fourtaui* Weir, p. 20 (*pars*), pl. i, fig. 9 (*non* figs. 6–8, 10).
?1931. *Exogyra fourtaui* Diaz-Romero, p. 38 (*pars*), pl. iii, figs. 9–10 (*non* figs. 6–8).

Description.—Some account of the variations of this species, as shown by the large series of specimens collected from the same bed by Dr. Macfadyen, seems desirable. Usually, the left valve is strongly gibbose, with the attachment-area very small. The umbo, however, is never greatly incurved and only occasionally projects over the plane of the right valve; usually it is more or less twisted in a posterior direction. In some specimens, the attachment-area is much larger, and the shell attains a cylindrical form. In many specimens there is no definite posterior lobe, but sometimes this is well developed, and may form a rostrum-like projection, separated by a sulcus from the main part of the valve. Occasional specimens, which combine a large attachment-area with a well-defined lobe, show some approach to *O. kakurensis* Krumbeck (1905, p. 106, pl. xii, fig. 1), from Syria. Occasionally, especially in the less inflated specimens, the valve becomes lunate in shape, with the posterior lobe undifferentiated from the rest of the shell. A few ill-defined radial folds are sometimes present on the most inflated part of the left valve, while the concentric growth corrugations are frequently pronounced.

The right valve is slightly concave and more or less lunate in shape, but its umbo is never spirally incoiled, as in *Exogyra*. The thickness of the shell of this valve is often considerable, and the ligamental area may make an angle of nearly 90° with that of the other valve, so that a well-marked gap occurs between them. This valve, like the other one, bears well-marked growth-rugae.

The largest specimens of this species are about 45 mm. in height.

OCCURRENCES AND MATERIAL.—φ.211 ; top of Wanderer Limestone (Lower Kimmeridgian) , about 130 specimens. F.30 ; horizon uncertain ; several specimens.

REMARKS.—Of the two specimens figured by Stefanini (loc. cit.) as *Exogyra fourtaui*, the smaller (figs. 4*a*, *b*) agrees well with the more lunate specimens referred by me to *G. balli* ; the umbo of its right valve is not spirally incoiled, as in *Exogyra*. It is conceivable that the specimens figured as *E. vinassai* by Diaz-Romero (1931, p. 35, pl. ii, figs. 17–20, pl. iii, figs. 1, 2) may belong to a small race of *G. balli*, since the umbo of their right valve does not appear to be spirally incoiled. Douvillé's " *Exogyra imbricata* Krauss " (1886, p. 230, pl. xii, figs. 8–9), however, upon which the name *E. vinassai* was originally founded (Diaz-Romero, 1929, p. 61), seems to have an incoiled right umbo, and may possibly be referable to *E. fourtaui*, described below. The specimen referred by Weir (loc. cit.) to *Liostrea arabica* Stefanini is merely a rather wide specimen of *G. balli*.

45. **Gryphaea costellata** (Douvillé). Pl. XVII, fig. 17.

1911. *Ostrea vuargnensis* Flamand, pl. xi, figs. 19*a–c* (? *non* figs. 18, 20, 21, 22) (*non* de Loriol).
1916. *Liogryphaea costellata* Douvillé, p. 58, pl. vi, figs. 10–12.
1921. *Lopha* (?) *philbyi* Newton, p. 393, pl. xi, figs. 2, 3.
1925. *Ostrea philbyi* Weir, p. 85, pl. xii, figs. 12–14, 27.
1929. *Liogryphaea costellata* Weir, p. 2.
1931. *Liogryphaea* cf. *costellata* Diaz-Romero, p. 43, pl. iii, figs. 16, 17.

OCCURRENCES AND MATERIAL.—φ.227 ; Bihen Limestone, 8–12 m. from base (Callovian) ; numerous specimens. φ.223 ; Bihen Limestone, 32–37 m. from base ; one doubtful specimen. F.53 ; probably Lower Bihen Limestone ; 4 specimens. φ.10, F.34 ; probably Callovian ; several specimens. B.81 ; Callovian ; 9 specimens. F.10 ; Callovian ; one specimen.

REMARKS.—It is probable that this well-characterised species will prove to be a good index-fossil of the Bathonian–Callovian (see Introduction, p. 149). It is not a typical *Gryphaea*, but is referred to that genus for convenience.

46. **Gryphaea** ? sp. indet.

1929. *Exogyra* cf. *davidsoni* Whidborne ; Weir, p. 19, pl. i, fig. 5.

REMARKS.—This form is not represented in the collections studied by me. The specimen recorded by Dr. Weir, a decorticated lower valve, said to come from the Lower Bihen Limestone, is not determinate. It may be an *Exogyra*, but more probably is a *Gryphaea* comparable to the well-known Oxfordian and Corallian species, *G. dilatata* J. Sowerby.

Genus **Exogyra** Say, 1820.

47. **Exogyra fourtaui** Stefanini. Pl. XVII, figs. 14*a*, *b*.

1925. *Exogyra fourtaui* Stefanini, p. 168 (*pars*), pl. xxix, fig. 3 (*non* fig. 4).
1929. *Exogyra fourtaui* Weir, p. 20 (*pars*), pl. i, figs. 6–8, 10 (*non* fig. 9).
1931. *Exogyra fourtaui* Diaz-Romero, p. 38 (*pars*), pl. iii, figs. 6–8 (? *non* figs. 9, 10).

DESCRIPTION.—In this species, the left valve is more pronouncedly lunate than in most specimens of *Gryphaea balli*, and the most inflated region of the valve is marked by a well-defined, lunately curved ridge which proceeds from the posteriorly recurved umbo to the postero-ventral corner of the shell. No posterior lobe is ever developed. The right valve, which may be either concave or slightly convex, has a definitely spirally incoiled umbo. Successive growth-stages form a zone of fine imbricating lamellae, widest on the anterior side of the valve, where they may, as described by Stefanini, be separated by a curved ridge from a non-lamellose region representing an early stage of growth. The largest specimen is about 36 mm. in height.

OCCURRENCES AND MATERIAL.—φ.216 ; Gahodleh Shale (Argovian) ; 2 specimens. F.43, C.1 ; horizon uncertain ; 8 specimens.

REMARKS.—Stefanini's figure (loc. cit.) shows the well-defined, lunately curved ridge which marks the most inflated region of the valve in this species, but, unfortunately, the figured specimen lacks its right valve, and the spiral incoiling of the right umbo is not mentioned in the specific description. I have, however, no doubt of the specific identity of the specimens now described with the figured one in question. In the smaller specimen figured by Stefanini (loc. cit., fig. 4), the umbo is definitely not incoiled ; hence it is probable that the specimen belongs to *Gryphaea balli* and not to the present species. The specimen represented in Weir's fig. 9 lacks its right valve, but appears from its shape to represent *G. balli*, as do also figs. 9 and 10 of Diaz–Romero.

48. **Exogyra nana** (J. Sowerby). Pl. XVII, figs. 16*a*, *b*.

1822. *Gryphaea nana* J. Sowerby, vol. iv, p. 114, pl. ccclxxxiii, fig. 3.
1897. *Exogyra bruntrutana* Futterer, p. 582, pl. xix, figs. 1, 1*a*.
1905. *Exogyra bruntrutana* Dacqué, p. 135, pl. xv, fig. 18.
1921. *Exogyra bruntrutana* Newton, p. 394, pl. xi, fig. 6.
1929. *Exogyra nana* Weir, p. 20, pl. i, figs. 11–13.
1930. *Exogyra bruntrutana* Basse, p. 120, pl. iv, figs. 11*a–c*.
1930. *Exogyra nana* Weir, p. 85, pl. x, figs. 27–29.
1931. *Exogyra nana* Diaz–Romero, p. 37.

OCCURRENCES AND MATERIAL.—φ.227 ; Bihen Limestone, 8–12 metres from base (Callovian) ; several specimens. φ.3 ; Bihen Limestone ; one specimen.

REMARKS.—A species of long range which has been fully discussed by previous workers.

Family **PECTINIDAE.**

Genus **Chlamys** Bolten, 1798.

49. **Chlamys** cf. **splendens** (Dollfus). Pl. XVIII, fig. 10.

References to descriptions of the type-form are :—

1863. *Pecten splendens* Dollfus, p. 78, pl. xiv, figs. 7–9.
1931. *Chlamys splendens* Arkell, p. 107, pl. x, figs. 1–5 ; pl. xiv, fig. 5.

DESCRIPTION.—The single specimen examined is an internal mould of a left valve which retains some shell near the umbo and part of the anterior auricle. The height appears to have been slightly in excess of the length. The auricular margins of the body of the shell are concave, meeting at the umbo at an angle of about 85°, but in general direction diverging at a slightly obtuse angle. The sculpture consists of somewhat irregularly distributed, scaled ribs which (allowing for those on the slightly broken posterior region) numbered about 25 near the umbo, increasing to about 30 near the ventral margin ; they increase by intercalation and not by bifurcation. Near the umbo, concentric threads form a delicate reticulate pattern with the radial ribs. By the anterior auricular margin, the body of the shell bears a series of fine, closely spaced threads roughly perpendicular to that margin ; the corresponding region on the posterior side of the shell is not preserved. The body of the shell rises above the auricle in a definite step. The auricle itself bears a series of concentric, imbricating lamellae about 0·5 mm. apart, but no radial riblets.

The original height of the shell was about 40 mm., its length about 37 mm.

OCCURRENCE AND MATERIAL.—φ.215 ; Gahodleh Shale (Argovian) ; one specimen.

REMARKS.—This specimen agrees with left valves of *C. splendens* from the Corallian of Malton (Yorkshire) in the approximate number of its ribs and in their sculpture and mode of increase ; in the presence of the finely reticulate sculpture near the umbo and of the threads

on the region adjacent to the auricular margin ; and in the sculpture of the auricle. The shell, however, is somewhat flatter, the auricular margins of its body diverge at a slightly greater angle, and the body rises above the auricle in a more pronounced step. Such differences are trifling, and it is most probable that the Somaliland species is identical with the European one. *Pecten bipartitus* Futterer (1894, p. 32, pl. v, figs. 4, 4*a*), from Tanga, belongs to the same group, but has fewer ribs.

50. **Chlamys curvivarians** Dietrich. Pl. XVIII, figs. 14, 15.

1929. *Chlamys* sp. Weir, p. 25, pl. i, fig. 38.

1933. *Pecten* (*Chlamys*) *curvivarians* Dietrich, p. 63, pl. viii, figs. 122, 123.

DESCRIPTION.—Small-medium, equivalve, not much inflated, subequilateral, suborbicular or with the height slightly in excess of the length. Sculpture consisting of small, radiating, rounded ribs which, to a varying extent, fan out and increase by dichotomisation or intercalation towards the lateral margins ; their number varies in different specimens. Both ribs and interspaces, which are usually of about the same width, are ornamented with fine transverse threads. Right anterior auricle large, smooth except for growth-threads ; right posterior auricle small, obtusely triangular ; byssal sinus deep. Auricles of left valve unknown.

OCCURRENCES AND MATERIAL.—φ.227 ; Bihen Limestone, 8–12 metres from base (? Callovian) ; 2 specimens. φ.217, φ.218 ; Bihen Limestone, 52–84 metres from base (Divesian–Argovian) ; 3 specimens. C.1 ; one specimen.

REMARKS.—These specimens do not appear to be separable from this species, recently described by Dietrich from beds of approximately Kimmeridgian age, at Tendaguru, Tanganyika, where it is associated with *Trigonia smeei* J. de C. Sowerby. The specimen figured by Weir (loc. cit.) is also stated to come from a Kimmeridgian horizon.

Specimens of this species have, however, recently been collected by Mr. H. St. J. B. Philby from the Tuwaiq plateau, Central Arabia, where associated ammonites show them to be of Callovian age, while bed φ.227 is certainly not later than Callovian. This therefore seems to be a species of somewhat extended range. Specimens from the higher Somaliland horizons, φ.217 and φ.218, do not seem to differ specifically from the Callovian specimens. The variations observable in the extent to which the ribs bifurcate and fan out towards the lateral margins do not correspond to differences in geological horizon. In extreme forms, such as the specimen represented in fig. 15, there is very little fanning out of the ribs.

Subgenus **Aequipecten** Fischer, 1886.

51. **Chlamys (Aequipecten) macfadyeni** sp. nov. Pl. XVIII, figs. 11*a*, *b*.

?1925. *Lima* cf. *duplicata* (Sow.) ; Weir, p. 88.

DIAGNOSIS.—Of medium size, gibbose, subequivalve, subequilateral, with the height slightly in excess of the length. Sculpture consisting of about 19 rounded ribs separated by rather narrower interspaces ; the ribs are crossed by numerous very fine threads, arched in V's pointing towards the umbo. The interspaces may be occupied (although not in the holotype) by a weak secondary riblet. The inflated region of the valve, on which the ribs are situated, is limited by slightly curved ridges which diverge from the umbo at an angle slightly less than 90° ; each of these ridges is separated from the adjacent margin of the auricle by a slightly concave area, bearing a fine striation perpendicular to the margin. Posterior auricles small, obtusely triangular ; anterior auricles (unknown complete) slightly larger. Presence of byssal notch doubtful.

DIMENSIONS.—Holotype : length 19·5 mm., height 21·3 mm., inflation 12·8 mm.

OCCURRENCE AND MATERIAL.—C.1 ; horizon unknown, probably Argovian or Kimmeridgian ; the holotype (L.61138) and one fragment, the latter preserved in the matrix of a specimen of *Plagiostoma harronis*.

REMARKS.—*Pecten palmyrensis* Krumbeck (1905, p. 102, pl. iii, figs. 8*a*, *b*), from the Upper Jurassic of Syria, appears closely related to the species now described, and has similar concave striated areas, limited by ridges, adjacent to the lower margins of the auricles. The ridges in question are more curved than in the species now described, and the shell has more ribs. *Chlamys* (*Aequipecten*) *syriacus* Cossmann (1926, p. 325, pl. viii, figs. 7*a–c*), from the Callovian (?) of Sinai, is also very similar, but is more rounded at the umbones and has more ribs. *Pecten araricus* Étallon (1862, p. 251, pl. xxxv, fig. 3), from the Upper Jurassic of Switzerland, is also comparable, but is more orbicular and much larger. Weir's "*Lima* cf. *duplicata*," which I have examined, is an incomplete and eroded specimen, which most probably belongs to the species now described.

52. **Chlamys (Aequipecten)** sp. indet. Pl. XVIII, fig. 8.

DESCRIPTION.—This specimen is a left valve with its exterior embedded in matrix (a yellow shale), but with its interior well exposed. It is pronouncedly inequilateral, with its height in excess of its length, and has eight depressed ribs, which are open V-shaped in cross-section and decrease in width laterally. The auricles are comparatively small. Traces of fine transverse threads are visible, crossing both ribs and interspaces.

DIMENSIONS.—Length 12·0 mm., height 13·3 mm.

OCCURRENCE AND MATERIAL.—F.53 ; horizon uncertain ; one specimen.

REMARKS.—It is most probable that this is a small specimen of the well-known Upper Jurassic species *C.* (*Ae.*) *inaequicostata* (Phillips) (see Arkell, 1931, p. 118, pl. viii, figs. 4–7). It is unfortunate that the exterior is not visible.

Genus **Camptonectes** Meek, 1864.

53. **Camptonectes browni** sp. nov. Pl. XVIII, figs. 13*a*, *b*.

DIAGNOSIS.—Small-medium, inequilateral, slightly higher than long, gibbose, valves equally inflated. Anterior auricular margin of body of shell strongly concave, posterior auricular margin convex, so that the umbonal region is bent in an anterior direction. In the right valve, the anterior auricular margin, and sometimes (less conspicuously) the posterior auricular margin, is bordered by a narrow, depressed strip, separated from the inflated region of the valve by a shallow groove. Posterior auricles small, obtusely triangular ; anterior auricles fairly small ; byssal notch moderately deep. Ornamentation consisting of fine, occasionally divaricating, fan-wise radiating, rounded threads, separated by punctate interspaces ; in places, by intensification of the growth-threads between the punctae, the surface of the threads may become nodose. On the left valve, a few radiating threads, stronger than and distinct from those belonging to the *Camptonectes* ornament, are present near the umbo. Growth-stages accentuated at irregular intervals. Auricles ornamented only by growth-ridges.

DIMENSIONS.—Holotype : length 20·8 mm., height 23·5 mm., inflation 10·0 mm.

OCCURRENCE AND MATERIAL.—B.81 ; Callovian ; the holotype (L. 61215) and one other specimen.

REMARKS.—This species is readily distinguished from other members of its genus by its prosogyrous umbonal region and by the depressed strip adjacent to the right anterior auricle.

54. **Camptonectes** sp. I. Pl. XVIII, fig. 12.

DESCRIPTION.—These specimens are crushed and incomplete, but were originally nearly orbicular in shape, the largest measuring about 28 mm. in diameter. The ornamentation consists of numerous prominent fan-wise radiating *Camptonectes* threads, which are pronouncedly sinuous and irregular, increasing by dichotomisation and intercalation, and frequently reuniting in later growth-stages; these threads are crossed in places by concentric threads, which form a well-marked reticulate pattern with them; definite punctae are absent. The auricles are not well preserved, but seem to have been similarly ornamented.

OCCURRENCE AND MATERIAL.—φ.215; Gahodleh Shale (Argovian); 3 specimens.

REMARKS.—The radiating threads are more prominent and irregular and the shell is more orbicular than in *Pecten comatus* Goldfuss (1833, p. 50, pl. xci, fig. 5), which seems to be the most similar species hitherto described.

55. **Camptonectes** sp. II. Pl. XVIII, fig. 9.

DESCRIPTION.—These specimens, the largest of which is only 16 mm. in height, are preserved on the surface of a bed of limestone and show only the interior of the shell, except in one case where the mould of the exterior is visible and shows well-defined *Camptonectes* ornamentation. The shell is subequilateral, with the height slightly in excess of the length. Except in size, these specimens appear to agree well with the well-known species *C. lens* (J. Sowerby) (see Arkell, 1930, p. 94, pl. vii, fig. 1; pl. ix, figs. 4–7).

OCCURRENCES AND MATERIAL.—φ.211; Wanderer Limestone (Lower Kimmeridgian); 4 specimens. F.30; similar matrix; one specimen.

Genus **Velata** Quenstedt, 1856.

56. **Velata inaequistriata** (Voltz MS., d'Orbigny).

1850. *Hinnites inaequistriatus* d'Orbigny, vol. ii, p. 22.
1897. *Hinnites* (*Pleuronectites*) *inaequistriatus* Futterer, p. 588, pl. xix, figs. 6, 7.
?1925. *Hinnites* (*Pleuronectites*) *aubryi* Weir, p. 87.
1925. *Hinnites* (*Pleuronectites*) *inaequistriatus* Weir, p. 87.
?1929. *Velata aubryi* Weir, p. 6, pl. i, figs. 10, 40.
1929. *Velata inaequistriata* Weir, p. 25, pl. i, figs. 42, 43.

REMARKS.—This species is not represented in Dr. Macfadyen's collection, but the specimens described by Dr. Weir have been sent to me for examination. The two recorded as *V. aubryi* are most probably immature specimens of *V. inaequistriata*, which have not reached the stage at which spines appear on the ribs. One of them is attached to a specimen of *Exogyra fourtaui*, a species which, according to specimens of known horizon in Dr. Macfadyen's collection, occurs in the Gahodleh Shale (Argovian).

If the brief comment on this species in d'Orbigny's " Prodrome " can be accepted as a specific diagnosis, it appears that the species must be attributed to that author, since earlier references are purely *nomina nuda*. *V. aubryi* (Douvillé) (1886, p. 228, pl. xii, fig. 3), from Abyssinia, probably comes from a much later horizon than Bathonian, and may be merely a non-spinose form of *V. inaequistriata*. It has no close affinity with *V. abjecta* (Phillips), as suggested by Dacqué (cf. Weir, 1930, p. 88).

The specimen from the Callovian of the Tuwaiq Plateau (Arabia) recorded by Newton (1921, p. 396, pl. xi, fig. 8) as *Hinnites* cf. *inaequistriatus* is generically indeterminate.

Family **LIMIDAE.**

Genus **Lima** Bruguière, 1792.

57. **Lima** cf. **schardti** de Loriol. Pl. XIX, figs. 1*a*, *b*.

The reference to the type-description is :—

1883. *Lima schardti* de Loriol, p. 71, pl. x, figs. 5–11.

DESCRIPTION.—This specimen, a somewhat damaged right valve, is about 44 mm. in height and 38 mm. in length ; the umbonal region and auricles are obscured. The obliquity seems to have been slight. The sculpture consists of about 26 prominent rounded ribs separated by deep rounded interspaces which become slightly wider than the ribs near the ventral margin. The ribs bear rather irregular, coarse, transverse, lamellose scales.

OCCURRENCE AND MATERIAL.—B.82 ; Callovian ; one specimen.

REMARKS.—*L. schardti*, which occurs typically in the *Mytilus*-Beds (Bathonian) of the Vaudois Alps (Switzerland), is the only described species which resembles this specimen in the ornamentation of its ribs ; the specimen, however, is not well enough preserved for the determination to be definite.

Subgenus **Plagiostoma** J. Sowerby, 1812.

58. **Lima** (**Plagiostoma**) **harronis** Dacqué. Pl. XIX, figs. 2, 3.

1905. *Lima harronis* Dacqué, p. 133, pl. xv, figs. 13, 14.
1925. *Lima* cf. *harronis* Weir, p. 88.
1929. *Lima* (*Plagiostoma*) cf. *astartina* Thurmann ; Weir, p. 27, pl. ii, figs. 7–11.
?1929. *Lima* (*Plagiostoma*) *harronis* Weir, p. 26, pl. ii, figs. 3, 4.
1929. *Lima* (*Plagiostoma*) aff. *anonii* Greppin ; Weir, p. 26, pl. ii, fig. 1.
1930. *Lima harronis* Basse, p. 106.

DESCRIPTION.—The specimens referred to this species are characterised by the length and straightness of the well-marked ridge which delimits the long, narrow, well-impressed lunule. The general direction of the somewhat feebly convex postero-ventral margin is more or less parallel to this ridge, so that the shell is trapeziform in shape. The obliquity is considerable, the longest line that can be drawn from the umbo to the ventral margin making only a small angle with the anterior ridge. The umbonal angle is about 90°, the hinge-margin short. The convexity of the shell is not great.

The specimens may be separated into two varieties, which agree in shape, but differ in ornamentation. In the first variety there are about 60 feebly convex ribs, separated by narrow punctate grooves ; while in the second variety, the ribs, if they may be so termed, number 70–80, and are absolutely flat over the greater part of the surface, which is thus smooth except for the punctate grooves ; these are narrower and shallower than in the first variety. In large specimens of this smooth variety, however, the ribs become slightly convex towards the ventral margin and their number may increase by intercalation. In both varieties, the lunule is ornamented with slit-like grooves, which are crossed by the lines of growth.

DIMENSIONS.—Largest specimen of the more strongly ribbed variety : length 48·5 mm., height 56·0 mm., inflation 22·0 mm. Largest specimen of smoother variety : length 66·0 mm., height 76·0 mm., inflation 35·5 mm.

OCCURRENCES AND MATERIAL.—φ.148 ; Bihen Limestone (Callovian–Argovian) ; 2 specimens (smoother variety). C.1 ; horizon uncertain ; 8 specimens (both varieties). B.81 ; Callovian ; one small specimen. Attached matrix appears to indicate that both varieties may be associated in the same bed.

REMARKS.—The original specimen of this species figured by Dacqué is much smaller than most of those now described, and he does not mention if any of the other specimens of his

type-series were larger. Species of this group are, however, well known to show considerable local variation in size as well as in sculpture and, in view of their similarity in shape, I think that there is every justification for referring the specimens now described to Dacqué's species. It is difficult to tell if the specimen figured by Dacqué, described as having 75 ribs, belongs to the variety with flat or with slightly convex ribs, but probably it is closer to the latter variety.

L. harronis appears to be distinct from any of the European forms. *L. meroe* de Loriol (1894*a*, p. 151, pl. x, figs. 17, 18) is less oblique, with a shorter lunule. *L. streitbergensis* de Loriol (1881, p. 82, pl. xi, fig. 13, *non* d'Orbigny) is a wider shell. *L. astartina* Thurmann (Thurmann and Étallon, 1862, p. 243, pl. xxxiii, fig. 4), with which Weir provisionally identifies the more strongly ribbed variety, is much more equilateral, with a wider and shorter lunule. *L. annonii* Mérian MS., Greppin (1900, p. 129, pl. xi, fig. 5) is closely comparable to the smoother Somaliland variety, but its type-horizon (Bajocian) must be considerably older than that of the Somaliland specimens. The shell recorded by Weir (loc. cit.) as *L.* a ff. *anonii* [*sic*] appears to belong to *L. harronis*, as here interpreted, its sculpture being identical with that of the smoother variety, but it is decidedly abnormal in shape in view of its much expanded ventral region and comparatively short anterior margin.

59. **Lima (Plagiostoma)** cf. **notata** Goldfuss.

1925. *Lima* sp. Weir, p. 88, pl. xii, fig. 4.
1929. *Lima* (*Plagiostoma*) *notata* Weir, p. 27, pl. ii, fig. 5.

This species, recorded by Weir, is not represented in the collections examined by me.

Family **ASTARTIDAE.**

Genus **Astarte** J. Sowerby, 1816.

60. **Astarte scytalis** Holdhaus. Pl. XIX, figs. 4*a*, *b*, 5.

1913. *Astarte scytalis* Holdhaus, p. 444, pl. c, figs. 2, 3.
1913. *Astarte sowerbyana* Holdhaus, p. 443 (excluding reference to *A. major*), pl. xcix, figs. 12, 13, 15; pl. c, fig. 1.
1925. *Astarte scytalis* Weir, p. 90.
1925. *Astarte mülleri* Stefanini, p. 174, pl. xxviii, fig. 9 (*non* Dacqué).
1929. *Astarte scytalis* Weir, p. 5, pl. iii, fig. 20.

DESCRIPTION.—Many of the specimens agree closely with the original figures of *A. scytalis*, both in outline and inflation, but some which have a similar outline are much less gibbose, while others, whether equally gibbose or more compressed, are less elongate. In a few specimens, the umbones are terminal, but usually the anterior margin projects beyond them to a slight extent. One fairly well-marked variety is short and subrectangular in outline.

OCCURRENCES AND MATERIAL.—φ.216; Gahodleh Shale (Lower Kimmeridgian); one specimen. φ.211; Wanderer Limestone (Lower Kimmeridgian); one specimen. A.39, C.1, F.30; horizons uncertain; numerous specimens.

REMARKS.—Although there is considerable difference in gibbosity between the most compressed and the most inflated specimens, I am convinced that this cannot be made the basis for specific discrimination. Since, moreover, the more compressed specimens are not consistently less elongate than the gibbose ones, *A. sowerbyana* is considered to be a synonym of *A. scytalis*. Both forms were originally described from the Spiti Shales. Although Holdhaus places it (with a query) in the synonymy of *A. sowerbyana*, the species *A. major* J. de C. Sowerby (1840, pl. lxi, fig. 1), from the Kachh Jurassic, must be considered distinct on account of its much larger size. Numerous Kachh specimens in the J. F. Blake collection (preserved in the British Museum), however, closely resemble the Somaliland specimens in shape and show a comparable

variation in gibbosity. The Kachh species *A. unilateralis* J. de C. Sowerby (1840, pl. xxi, fig. 14) and the closely comparable Spiti Shales species *A. hermanni* Oppel (Holdhaus, loc. cit., p. 440, pl. xcix, figs. 7–11, 14) are more trigonal in shape, with their postero-dorsal margin scarcely rising above the umbones, and their escutcheon somewhat shorter. *A. spitiensis* Stoliczka (Holdhaus, loc. cit., p. 444, pl. c, figs. 4–8) is also comparable, but is shorter on the average, with a more rounded outline. *A. stefaninii* Basse (1930, p. 110, pl. xxi, figs. 9*a–c*), from Abyssinia, is very similar to some of the specimens now described, although shorter than the majority of them ; it may possibly belong to the same species.

61. **Astarte altissima** sp. nov. Pl. XIX, fig. 6.

DIAGNOSIS.—Shell small, compressed, trigonal, rather inequilateral, considerably higher than long, with acutely pointed, somewhat prosogyrous umbones. Anterior margin concave ; lunule slightly excavated. Postero-dorsal margin convex, sloping steeply ; posterior margin flattened ; ventral margin strongly convex. Internal margins denticulate. Sculpture consisting of thin, nearly equidistant, concentric ridges, about 1·5 mm. apart.

DIMENSIONS.—Length 10·1 mm., height 12·8 mm., inflation 6·2 mm.

OCCURRENCE AND MATERIAL.—φ.211 ; Wanderer Limestone (Lower Kimmeridgian) ; the holotype only (L.61140).

REMARKS.—This shell is taller and more acute at the umbo than any Jurassic *Astarte* hitherto described.

Family **ISOCARDIIDAE.**

Genus **Pseudisocardia** Douvillé, 1921.

62. **Pseudisocardia macfadyeni** sp. nov. Pl. XIX, figs. 8*a*, *b*, 9.

DIAGNOSIS.—Shell of medium size, not much inflated, ovate-trigonal, with a sub-rostrate anterior end and prominent, prosogyrous umbones placed at about the anterior third of the length. Postero-dorsal margin convex, sloping steeply ; posterior margin flattened, sub-vertical ; ventral margin strongly convex ; antero-dorsal margin flat, sloping very steeply. Posterior slope evenly rounded, without trace of a carina.

DIMENSIONS.—Holotype : length 39·0 mm., height 36·5 mm., inflation 21·5 mm.

OCCURRENCES AND MATERIAL.—φ.217 ; Bihen Limestone, top bed (Divesian–Argovian) ; one specimen. C.1 ; probably the same bed ; the holotype (L.61141, figs. 8*a*, *b*) and several other specimens.

REMARKS.—The specimens are all internal casts with their hinge-region more or less obscured, and showing no trace of pallial line. This species closely resembles and is presumably congeneric with the Oxfordian species " *Venilicardia* " *renaudoti* de Loriol (1904, p. 164, pl. xx, figs. 9–11), but is slightly taller and more trigonal. *V. renaudoti* has not the hinge of a *Venilicardia*, a fact appreciated by Rollier (1913, p. 210), who refers it to *Isocardia*. Its hinge approximates to those of the genera *Pseudisocardia* and *Pseudotrapezium* (see Douvillé, 1921, p. 121), which differ very little from one another ; whilst the general shape of the shell suggests affinity with the former genus rather than the latter.

The French Callovian species figured by Cossmann (1907, p. 131, pl. ii, figs. 4, 5 ; 1915, p. 6, pl. i, figs. 3, 4 ; pl. iii, fig. 17 (" var. *dassei* ")) as *Isocardia campaniensis* d'Orb. is similar in shape ; it is, however, quite distinct from the true *I. campaniensis*, the type of which has been figured by Cottreau (1925, p. 18 [150], pl. xxxix, figs. 13, 14). *Isocardia subtenera* Müller (1900, p. 534, pl. xviii, figs. 9, 10), from the Callovian (?) of East Africa, is also rather similar, but more gibbose.

Genus **Venilicardia** Stoliczka, 1870.

63. **Venilicardia hunti** sp. nov. Pl. XIX, figs. 14*a*, *b*.

DIAGNOSIS.—Shell of medium size, moderately gibbose, ovate, with the height about five-sixths of the length; the postero-dorsal, posterior, ventral, and anterior margins forming an even, uninterrupted curve. Umbones prosogyrous, placed at the anterior fifth of the length, level with the postero-dorsal margin, but rising considerably above the anterior end of the shell; posterior slope smoothly rounded, without ridges. External sculpture and hinge-structure unknown.

DIMENSIONS.—Length 36·1 mm., height 30·0 mm., inflation 19·3 mm.

OCCURRENCE AND MATERIAL.—φ.217; Bihen Limestone, top bed (Divesian–Argovian); the holotype only (L.61143).

REMARKS.—The holotype is an internal cast, but its shape is suggestive of the genus *Venilicardia*. The following species are closely comparable in shape: *Cyprina maranvillensis* de Loriol (1872, p. 221, pl. xiii, fig. 14), from the French Sequanian, which is smaller, with a better defined postero-dorsal angle; *Venilicardia chatillonensis* de Loriol (1904, p. 166, pl. xx, figs. 12, 13) and *V. berlieri* de Loriol (1904, p. 167, pl. xx, fig. 14), from the Swiss Oxfordian, in both of which the umbones are more anterior. The hinge-structure of these forms also is unknown.

Genus **Pseudotrapezium** Fischer, 1887.

64. **Pseudotrapezium** sp. Pl. XIX, figs. 7*a*, *b*.

DESCRIPTION.—Shell small-medium, moderately gibbose, subtrigonal, very inequilateral, slightly longer than high, posteriorly truncated, with a sharply carinated posterior slope; the most inflated region of the shell is slightly anterior to median. Umbones acute, strongly prosogyrous, rising conspicuously above the postero-dorsal margin, and placed at about the anterior fifth of the length. Postero-dorsal margin slightly convex, sloping, making a well-marked, obtuse angle with the straight, vertical posterior margin. Ventral margin moderately and symmetrically convex; anterior margin strongly convex, merging with the steeply sloping antero-dorsal margin. Carina of posterior slope convex along its entire length. Sculpture and hinge-structure unknown.

DIMENSIONS.—Length 20·0 mm., height 19·1 mm., inflation 15·7 mm.

OCCURRENCE AND MATERIAL.—C.1; horizon uncertain; the figured specimen only.

REMARKS.—This specimen closely resembles *Pseudotrapezium swindonense* Cox (1929, p. 184, pl. vi, figs. 4*a*, *b*), from the British Portlandian, but its umbones are slightly more acute, rising more above the dorsal margins. The Kimmeridgian species *Cyprina securiformis* Contejean (1859, p. 259, pl. xxvi, fig. 10), *non* Sharpe, renamed *Venilicardia contejeani* by Rollier (1913, p. 171), is higher at its posterior end and more inflated in its posterior region. Judging by Struckmann's figure (1878, pl. iv, figs. 8*a*, *b*), young specimens of the large Kimmeridgian species *Isocardia cornuta* Kloeden, referred to *Venilicardia* by Rollier (1913, p. 172), are more elongate than the specimen now described, with less prominent umbones; it seems probable, moreover, that the present specimen is full-grown. Like *P. swindonense*, it is referred to *Pseudotrapezium* on account of its general external similarity to such species as *P. bathonicum* (d'Orbigny), of the Great Oolite.

Family **LUCINIDAE.**

Genus **Lucina** Bruguière, 1792.

65. **Lucina** cf. **lirata** Phillips. Pl. XIX, fig. 13.

The reference to the type-description is :—

1829. *Lucina lirata* Phillips, p. 140, pl. vi, fig. 11.

DESCRIPTION.—This specimen, which has had its anterior end broken away, was apparently originally suborbicular in shape, with almost median umbones ; its posterior end is vertically truncated. The umbones are fairly prominent, the antero-dorsal margin being concave. The surface is ornamented with closely spaced concentric threads.

DIMENSIONS.—Length (original) ? 30·0 mm., height 30·0 mm., inflation 16·6 mm.

OCCURRENCE AND MATERIAL.—φ.224 ; Bihen Limestone, 26–32 m. from base (Callovian) ; one specimen.

REMARKS.—It is unfortunate that the holotype of *L. lirata* is no longer extant, since the original figure is most probably inaccurate. The *Lucina* which occurs commonly in the " Kelloways Rock " (i.e. Oxfordian) of Scarborough, and may with some confidence be assumed to be the species named by Phillips, is suborbicular in shape, with a truncated posterior extremity, which is much higher than is represented in Phillips' figure.

The Somaliland specimen now recorded agrees well with this British Oxfordian species. *Lucina substriata* Roemer (1836, p. 118, pl. vii, fig. 18; Thurmann and Étallon, 1862, p. 197, pl. xxiv, fig. 7) is also comparable in shape, but is more rounded posteriorly. The British Corallian form recorded by Blake and Hudleston (1877, pl. xiv, fig. 8) as *L. aspera* Buvignier is comparable, but has a smooth surface. Its identity with Buvignier's species (1852, p. 12, pl. x, figs. 12–14) is to be queried, since the latter is not truncated posteriorly, and has a more strongly convex ventral margin, an exterior ornamented with concentric threads, and a very rugose interior (the British species is smooth internally).

66. **Lucina** sp. Pl. XIX, fig. 15.

DESCRIPTION.—These specimens are ovate in shape, with the length slightly in excess of the height, and with a rounded posterior end ; the inflation is not great. The umbones are submedian and not very prominent, while the antero-dorsal margin is not appreciably concave. The sculpture, preserved on one specimen, consists of raised concentric threads, about 1 mm. apart.

DIMENSIONS.—Largest specimen : length 28·0 mm., height 26·0 mm., inflation 12·0 mm.

OCCURRENCES AND MATERIAL.—φ.217, φ.218 ; Bihen Limestone, top 32 m. (Divesian–Argovian) ; 4 specimens.

REMARKS.—The more elongate shape, the rounded posterior extremity, and the straighter postero-dorsal margin distinguish this species from the one recorded as *L.* cf. *lirata*. It is not determinate specifically, but is comparable to *L. rupellensis* d'Orbigny (see Cottreau, 1929, p. 111, pl. liv, figs. 8, 9), from the French Corallian.

Family **MACTROMYACIDAE** (=**UNICARDIIDAE**).

Genus **Mactromya** Agassiz, 1842.

NOTE.—The genotype of *Mactromya*, as designated by Herrmannsen in 1847, is *Lutraria concentrica* Münster. *Unicardium* d'Orbigny is a synonym of *Mactromya*.

67. **Mactromya aequalis** Agassiz. Pl. XIX, figs. 16, 17*a*, *b*.

1843. *Mactromya aequalis* Agassiz, p. 196, pl. 9*d*, figs. 5–8.
1912. *Mactromya aequalis* Lissajous, p. 97, pl. xii, fig. 11.
1915. *Arcomya bicorrugata* Cossmann, p. 12, pl. i, fig. 5 ; pl. ii, figs. 9–11 ; pl. iii, figs. 14-16.

OCCURRENCES AND MATERIAL.—F.10 ; Callovian ; one specimen. φ.217 ; Bihen Limestone, top bed (Divesian–Argovian) ; one specimen.

REMARKS.—These specimens belong to a subequilateral, ovate, somewhat compressed *Mactromya* bearing irregular concentric rugae. In shape and proportions they agree well with the French Upper Bathonian species *M. aequalis*, as figured by Lissajous, although in the original figure of the species published by Agassiz the umbones are slightly more prominent.

No appreciable differences appear to exist between *M. aequalis* and *M. quadrata* (Roemer) (=*Mya rugosa* Roemer *non* Gmelin ; *Mactromya rugosa* auctt.), of the Kimmeridgian. The two forms are identical in shape and are similarly ornamented with concentric rugae which are coarser on the posterior end of the shell than on the anterior end. Hence it is difficult to decide to which species to refer specimens from intermediate horizons, such as those now recorded. *Arcomya bicorrugata* Cossmann, from the French Bathonian, appears unquestionably to be the same form as *M. aequalis*.

68. **Mactromya** cf. **verioti** (Buvignier). Pl. XX, fig. 12.

References to descriptions of the type-form are :—

1852. *Cardium verioti* Buvignier, p. 16, pl. xvii, figs. 1–5.
1868. *Cardium verioti* de Loriol, p. 125, pl. ix, fig. 8.
1925*a*. *Unicardium verioti* Cox, p. 150, pl. iii, fig. 1.

DESCRIPTION.—The specimens referred provisionally to this species are gibbose, rectangularly ovate in outline, and somewhat inequilateral, with fairly prominent umbones, which are posterior to median. Raised growth-threads, 1 mm. to 2 mm. apart, produce a rugose surface.

OCCURRENCE AND MATERIAL.—C.1 ; horizon uncertain ; 3 specimens.

REMARKS.—The largest specimen, which is the only full-grown one, agrees very well with specimens of Buvignier's species from the British Portlandian. In the Bathonian species, *M. varicosa* (J. Sowerby) (1821, vol. iii, pl. ccxcvi), the umbones are similarly placed, but are more inflated, incurved, and prosogyrous. *M. gibbosa* (Morris and Lycett) (1854, p. 132, pl. xiv, fig. 11), another comparable Bathonian species, has almost median umbones. *M. laevigata* (Lahusen) (1883, pp. 32, 93, pl. ii, fig. 30), from the Russian Oxfordian, is somewhat comparable in shape, but smoother.

The French Kimmeridgian shell figured by de Loriol (1872, p. 254, pl. xv, fig. 8) as *Unicardium excentricum* d'Orbigny is also somewhat similar, but more elongate ; it is distinct from the less gibbose form previously figured by Dollfus (1863, p. 68, pl. xi, figs. 23–5) under the same name, and described as having its anal side elongate and its buccal side short. D'Orbigny's type of *U. excentricum* (Cottreau, 1932, pl. lxvi, figs. 4, 5) is less rectangular in shape. The Russian species *M. heteroclita* (d'Orbigny) (1845, p. 460, pl. xxxix, figs. 9, 10) is less gibbose.

69. **Mactromya** cf. **crassa** Agassiz. Pl. XX, fig. 3.

References to descriptions of the type-form are :—

1845. *Mactromya crassa* Agassiz, p. xviii.
1897. *Unicardium gibbosum* de Loriol, p. 87, pl. xii, figs. 11, 12 (*non* Agassiz, sp.).
1913. *Mactromya crassa* Rollier, p. 218, pl. xv, fig. 6.

DESCRIPTION.—This specimen is a large, gibbose, ovate, very slightly inequilateral internal cast, with rounded and moderately prominent umbones, which are slightly anterior to median. In size and shape it agrees particularly well with a specimen figured by de Loriol (loc. cit., fig. 12) as *Unicardium gibbosum*, and referred by Rollier to *M. crassa*.

DIMENSIONS.—Length 49·0 mm., height 43·7 mm., inflation 31·6 mm.

OCCURRENCE AND MATERIAL.—φ.217 ; Bihen Limestone, top bed (Divesian–Argovian) ; one specimen.

70. **Mactromya daghaniensis** sp. nov. Pl. XX, figs. 1*a–c*.

DIAGNOSIS.—Gibbose, rectangular-ovate, inequilateral, with not very prominent umbones placed at about the anterior third of the length. Sculpture consisting of fairly closely spaced growth-threads.

DIMENSIONS.—Length 19·5 mm., height 16·4 mm., inflation 14·4 mm.

OCCURRENCE AND MATERIAL.—φ.224 ; Bihen Limestone, 26–32 m. from base (Callovian) ; the holotype only (L.61144).

REMARKS.—The anterior position of the umbones distinguishes this species from those mentioned above in connexion with *M.* cf. *verioti*. *M. impressa* (Morris and Lycett) (1853, p. 73, pl. viii, figs. 9*a–c*), from the British Bathonian, is less gibbose. *M. callirhoe* (d'Orbigny) (see Cottreau, 1929, p. 112, pl. liv, figs. 14, 15), from the French Corallian, is slightly more elongate.

It is possible that the holotype is not fully grown, but the species appears distinct enough to name.

Family **VENERIDAE.**

Genus **Eocallista** Douvillé, 1921.

71. **Eocallista krenkeli** sp. nov. Pl. XIX, figs. 11*a*, *b*, 12.

1915. *Cypricardia nuculiformis* Krenkel, p. 326, pl. xxvii, figs. 9, 10 (*non Cyrena nuculaeformis* Roemer ; ? *non Cypricardia nuculiformis* (Morris and Lycett)).

DIAGNOSIS.—Shell small-medium, of moderate gibbosity, cuneiform, with small, anteriorly directed umbones placed at about the anterior quarter of the length. Postero-dorsal margin moderately convex, sloping steeply, converging with the strongly convex ventral margin, which joins the anterior margin in an even curve. Posterior slope not ridged. Surface ornamented with evenly spaced concentric threads. Pallial sinus very shallow. Hinge-structure unknown.

DIMENSIONS.—Holotype : length 18·4 mm., height 15·2 mm., inflation 9·8 mm. Largest paratype (L.53545) : length 23·0 mm., height 20·0 mm., inflation 15·0 mm.

OCCURRENCES AND MATERIAL.—φ.226 ; Bihen Limestone, 16–21 m. from base (Callovian) ; the holotype (L.61142) and two other specimens. φ.224 ; Bihen Limestone, 26–32 m. from base (Callovian) ; one specimen. F.43 ; horizon uncertain ; 3 specimens. Bihen (Lort-Phillips Coll.) ; 9 specimens.

REMARKS.—The Somaliland specimens appear to be referable to the Lithuanian Callovian species which Krenkel (loc. cit.) records as *Cypricardia nuculiformis* Morris and Lycett ; this species is less elongate than, although probably congeneric with, the English Bathonian form which Morris and Lycett (1853, p. 76, pl. vii, figs. 10, 10*a*, *b*) quite erroneously identify with *Cyrena nuculaeformis* Roemer, a Wealden form. The species now described also much resembles the Portlandian species *Cyprina pulchella* de Loriol (1867, p. 55, pl. iv, figs. 10, 11), which Douvillé (1921, p. 123) refers to his new genus *Eocallista*. The Somaliland specimens do not show the hinge-structure, but the hinge of a left valve from Lithuania figured by Krenkel (loc. cit., fig. 9) is very similar to that of *Eocallista*. Hence the species may, with some confidence, be referred to that genus.

Astarte dancalensis Diaz-Romero (1931, p. 44, pl. iii, figs. 20–2) may perhaps be congeneric with the species now described, but the shell is higher and the umbones more anterior.

Family **CARDIIDAE.**

Genus **Protocardia** Beyrich, 1845.

72. **Protocardia somaliensis** sp. nov. Pl. XX, figs. 2*a*, *b*.

DIAGNOSIS.—Large-medium, of moderate gibbosity, ovate, with the length slightly in excess of the height. Umbones prominent, very slightly anterior to median; posterior slope with an ill-defined ridge. Anterior, ventral, and posterior margins forming an uninterrupted curve; ventral margin nearly symmetrically convex. The main surface of the shell is ornamented with concentric threads, the posterior area with radial threads.

DIMENSIONS.—Holotype: length 56·0 mm., height 51·5 mm., inflation 34·0 mm.

OCCURRENCES AND MATERIAL.—φ.222; Bihen Limestone, 37–41 metres from base (Divesian–Argovian); 2 specimens. C.1 (? same bed); the holotype (L.61145, figured) and 4 other specimens.

REMARKS.—The holotype is an internal cast showing impressions of the lateral hinge-teeth characteristic of the family Cardiidae, and of large posterior adductor scars. Traces of radial threads on the posterior area are visible on two of the paratypes, one of which also shows the concentric threads. In size and shape, this species much resembles *Cardium bannesianum* Contejean (1859, p. 276, pl. xv, figs. 1–5), which Basse (1930, p. 140, pl. v, fig. 8) has identified in Arabia and Somaliland. It is, however, less elongate and slightly more equilateral, and differs particularly in the presence of radial threads on the posterior area. Other comparable species are *P. dissimilis* (J. Sowerby), from the Portlandian, which is larger and more elongate, and an unnamed form which occurs as internal casts in the Northampton Sands (Inferior Oolite).

Family **CERATOMYACIDAE.**

Genus **Ceratomya** Fischer, 1887.

73. **Ceratomya wimmisensis** (Gilliéron). Pl. XX, figs. 6*a*, *b*.

1883. *Ceromya concentrica* de Loriol, p. 18, pl. v, figs. 1–5 (*non* J. de C. Sowerby, sp.).
1886. *Ceromya wimmisensis* Gilliéron, p. 141.
1918. *Ceromya wimmisensis* Gerber, p. 12, pl. i, figs. 3–6.
1925. *Ceromya concentrica* Weir, p. 89 (*non* J. de C. Sowerby, sp.).
1929. *Ceratomya wimmisensis* Weir, p. 31, pl. iii, fig. 2.

OCCURRENCES AND MATERIAL.—F.10; Callovian; 2 specimens. C.1; horizon unknown; 2 specimens.

REMARKS.—According to Gilliéron and Gerber *C. wimmisensis* is distinguished from the closely comparable species *C. concentrica* (J. de C. Sowerby) by being more elongate and less inflated, and by the development of eccentric riblets in the earlier stages of growth. The specimens now recorded are without doubt more elongate than average specimens of *C. concentrica*, although the difference in inflation is inappreciable. Their sculpture is not well preserved, but one specimen from F.10 bears riblets which are slightly eccentric near the umbo, although they are concentric over the greater part of the surface. The type-occurrence of the species is in the *Mytilus*-Beds (Bathonian) of the Vaudois Alps (Switzerland).

74. **Ceratomya** cf. **pittieri** (de Loriol). Pl. XX, figs. 7*a*, *b*.

The reference to the type-description is:—

1883. *Ceromya pittieri* de Loriol, p. 25, pl. vi, figs. 3, 4.

DESCRIPTION.—This specimen differs from *C. concentrica* (J. de C. Sowerby) and *C. wimmisensis* (Gilliéron) mainly in the position of its umbones, which project slightly beyond the anterior end of the shell and are more incoiled. The shell is also more rectangular in shape,

with its dorsal and ventral margins subparallel. It is strongly inflated, the most gibbose region being at about the anterior quarter of the length. The sculpture consists of fine, closely spaced, evenly curved ribs, which are concentric over the entire surface, even near the umbones.

DIMENSIONS.—Length 53·0 mm., height 41·0 mm., inflation 41·6 mm.

OCCURRENCE AND MATERIAL.—C.1 ; horizon uncertain ; one specimen.

REMARKS.—In shape, this specimen agrees well with the figures of *C. pittieri*, from the *Mytilus*-Beds of the Vaudois Alps, except that its most inflated region is somewhat more anterior ; the sculpture of *C. pittieri*, however, is unknown. *C. similis* (Lycett) (Morris and Lycett, 1853, p. 109, pl. xii, fig. 12), from the British Bajocian, also appears to be comparable is shape, but has broader umbones and is less strongly and more evenly inflated. *C. plicata* (Agassiz) (see Gerber, 1918, p. 8, pl. i, figs. 2*a*, *b*), with which the Abyssinian species *C. paucilirata* Blanford (1870, p. 203, pl. viii, fig. 6) appears synonymous, has more widely spaced ribs, which are eccentric near the umbo.

75. **Ceratomya excentrica** (Roemer).

1836. *Isocardia excentrica* Voltz, Roemer, p. 106, pl. vii, figs. 4*a–c*.
1842. *Ceromya excentrica* Agassiz, p. 28, pls. 8*a–c*.
1925. *Ceromya excentrica* Weir, p. 89.
1929. *Ceratomya excentrica* Weir, p. 31, pl. iii, fig. 4.

This species, recorded by Weir from an unknown horizon at Bihen, is not represented in the material examined by me.

76. **Ceratomya telluris** (Lamarck). Pl. XX, fig. 11.

1819. *Cardium telluris* Lamarck, vol. vi, part 1, p. 19.
1850. *Ceromya elegans* Deshayes, p. 163, pl. xxiv, figs. 3–5.
1900. *Ceromya aequatorialis* Müller, p. 536, pl. xviii, figs. 7, 7*a*.
1900. *Ceratomya ? goniophora* Cossmann, p. 200, text-fig. 13.
1913. *Ceratomya goniophora* Cossmann, p. 10, pl. iii, figs. 6–8 (*non* figs. 4, 5).
1923. *Ceratomya goniophora* Lissajous, p. 205, pl. xxxii, figs. 10, 10*a*.

DESCRIPTION.—The shell referred to this peculiar species is subtrigonal and strongly gibbose, with the height exceeding the length ; the umbonal region is acute, the umbones terminal, slightly prosogyrous, incoiled, and somewhat separated. A sharp keel, which runs from the umbo to an angular bend of the ventral margin, and corresponds to the most inflated region of the shell, separates the short, flattened-convex anterior end from the tapering, obliquely truncated posterior region. This posterior region is itself crossed by a rather obscure, obtuse carina, which runs in a curve from the umbo to the postero-ventral corner. Between the two carinae, the surface is slightly concave ; behind and dorsal to the more posterior carina it falls away steeply to the posterior and postero-dorsal margins, which meet at an obtuse angle. Posterior to the angular bend, where the main carina meets it, the ventral margin is flat ; in front of that bend it is feebly convex and merged with the anterior margin. The ornamentation consists of a series of flattened, chevron-shaped ribs which diverge upwards at a slightly acute angle from the main carina ; in addition to these ribs, which are most marked in the later stages of growth, especially in front of the main carina, there occurs a series of sulci which follow the growth-stages of the shell and are most conspicuous on its upper portion ; these two series are most conspicuously superimposed on the median part of the anterior surface of the shell, crossing at an obtuse angle, and producing a characteristic reticulate pattern ; perhaps owing to erosion, the region immediately adjacent to the anterior margin is, however, smooth.

DIMENSIONS.—Length 24·0 mm., height 25·0 mm., inflation 25·7 mm.

OCCURRENCE AND MATERIAL.—C.1 ; horizon uncertain, matrix resembling that of the lower part of the Bihen Limestone (Callovian) ; one specimen.

REMARKS.—This specimen does not appear to be separable specifically from two specimens (regd. 81190) from the Bathonian (?) of St. Marceau (Sarthe), preserved in the British Museum (Natural History), and labelled " *Cardium telluris* " in an old handwriting. Lamarck's type of that species has not been figured, but Lissajous (loc. cit.) states that he has examined it at Geneva, and ascertained its identity with *C. goniophora* Cossmann. Both Cossmann and Lissajous have overlooked the fact that this species had also been named by Deshayes, who published a good description and figures under the name *Ceromya elegans*. Lamarck records the species from St. Jean d'Assé and Chauffour (Sarthe), Cossmann from St. Gaultier (Indre) and Veuxhaulles (Côte d'Or), Lissajous from Hurigny (Saône-et-Loire), at all of which localities the horizon is probably Bathonian ; Deshayes records it from " l'oolite sableuse supérieure à la grande oolite " of Alençon (Orne). In some French specimens, only the flattened chevron-shaped ribs are developed, the sulci following the growth-stages being absent. The specimen now recorded differs from French ones in the obscureness of the chevrons on its umbonal region (especially posterior to the main carina, where only the growth-sulci are visible), in its somewhat less acute umbones, and in the wider angle between the main carina and the more posterior one.

There is little doubt that *C. aequatorialis* Müller, from the Callovian of East Africa, should be considered a synonym of *C. telluris* ; in shape and sculpture it is even closer to French specimens than is the Somaliland shell now recorded. The Jubaland specimen recorded by Weir (1929, p. 32, pl. iii, fig. 6) as *Ceromyopis* cf. *aequatorialis* appears to be distinguished by the longitudinal grooving of its ribs.

In France a Callovian mutation of *C. telluris*, similarly ornamented, but with a less well-defined main carina and certain other differences in shape, has been described by Cossmann (1924, p. 50, pl. vi, figs. 55, 56) as *C. granifera* and by Lissajous (1923, p. 207, pl. xxxii, figs. 9, 9*b*, *c*) as *C. cossmanni*. It may, therefore, be noted that the African specimens are much closer to the typical *C. telluris*.

Genus **Ceromyopsis** de Loriol, 1897.

77. **Ceromyopsis somaliensis** Weir. Pl. XX, figs. 9*a*, *b*.

?1925. *Anisocardia paquieri* Stefanini, p. 175 (? *non* Rollier).
1925. *Isocardia striata* Weir, p. 90 (*pars*, *non* d'Orbigny, sp.).
1929. *Ceromyopsis somaliensis* Weir, p. 33, pl. iii, fig. 9.

OCCURRENCES AND MATERIAL.—φ.218, φ.219 ; Bihen Limestone, 47–53 m. from base (Divesian–Argovian) ; 2 small specimens, doubtfully referable to this species. C.1 ; horizon uncertain ; 8 typical specimens.

REMARKS.—There is little to add to the description of this species given by Weir. The concentric ribs appear to be more closely spaced in later stages of growth than in early stages. In some specimens the inflation exceeds the length.

78. **Ceromyopsis striata** (d'Orbigny). Pl. XIX, fig. 10.

1822. *Isocardia striata* d'Orbigny, p. 104, pl. vii, figs. 7–9.
1842. *Ceromya inflata* Agassiz, p. 33, pl. 8*e*, figs. 13–21.
1872. *Isocardia striata* de Loriol, p. 224, pl. xiii, figs. 16–21.
1897. *Isocardia striata* Futterer, p. 602, pl. xxi, figs. 3, 3*a*.
1930. *Isocardia striata* Basse, p. 139, pl. iv, fig. 8.

OCCURRENCES AND MATERIAL.—F.53, also " Bihen " (Lort-Phillips Coll.) ; horizon uncertain ; 10 specimens.

REMARKS.—Most of the specimens agree quite well with published figures of European specimens of this well-known species, but in some the posterior lobe is better developed. This may not be a character of importance.

79. **Ceromyopsis arabica** sp. nov. Pl. XX, fig. 10.

DIAGNOSIS.—Shell very tall and gibbose, with its height approximately twice its length ; umbones terminal, very strongly prosogyrous and incoiled ; umbonal region rising prominently above the dorsal margins. Posterior lobe low and elongate, distinctly separated from the inflated body of the shell. Ventral margin strongly convex. Sculpture consisting of concentric ribs, which are more closely spaced in the later stages of growth than in the earlier stages.

DIMENSIONS.—Holotype (L.61443, Callovian of Central Arabia) ; length ca. 21 mm., height 35·5 mm., inflation ca. 39 mm.

OCCURRENCE AND MATERIAL.—A.39, C.1 ; horizon uncertain ; 2 specimens.

REMARKS.—The Somaliland specimens are rather eroded and incomplete, but can be referred with confidence to this species, the type-specimen of which is one of a number collected in Arabia by Mr. H. St. J. Philby. This species is closely comparable to certain French Callovian specimens in the British Museum collection (regd. 70812) determined as *C. sarthacensis* (d'Orbigny), but is smaller, with a proportionately taller and narrower body. The French species in question seems, however, to be an undescribed form distinct from the true *C. sarthacensis*, which has now been figured by Cottreau (1925, p. 9 [141], pl. xxxvii, figs. 7, 8), and is a much wider and less gibbose form. *C. helvetica* de Loriol (1897, p. 80, pl. xii, figs. 1, 2), from the Swiss Oxfordian, is also a wider shell.

80. **Ceromyopsis** sp. Pl. XX, fig. 8.

DESCRIPTION.—Fairly gibbose, subtrigonal, with the length and height approximately equal, and with subterminal, strongly prosogyrous, but only slightly incoiled umbones. The posterior lobe is of moderate length. The surface bears fairly coarse concentric crenulations. Maximum length about 40 mm.

OCCURRENCES AND MATERIAL.—B.81 ; Callovian; one specimen. F.10 ; Callovian ; 3 specimens.

REMARKS.—This species is rather less gibbose than *C. somaliensis* and is further distinguished by its coarser concentric sculpture. *C. rostrata* Douvillé (1916, p. 32, pl. iv, figs. 6*a*, *b*), from the Bajocian of Sinai, appears to be closely comparable, but, unless the published photographs are misleading, its lobe is placed in a more ventral position than in the specimens now recorded. The present species may be identical with the form from the Callovian (Kimmeridgian according to Müller) of the Mahokonde R., Tanganyika Territory, misidentified by Müller (1900, p. 534, pl. xviii, fig. 1) as *Isocardia striata* d'Orbigny. The Somaliland specimens are not well enough preserved to serve as the types of a new species.

Family **LATERNULIDAE** (=**ANATINIDAE**).

Genus **Cercomya** Agassiz, 1843.

81. **Cercomya** sp. Pl. XXI, figs. 4*a*, *b*.

DESCRIPTION.—Shell of medium size, nearly twice as long as high, slightly inequivalve, with the left valve a little more inflated than the right one, especially posterior to the umbones. Umbones broad, submedian ; posterior umbonal ridges well-defined. Antero-dorsal margin subparallel to ventral margin ; anterior margin strongly and evenly convex ; ventral margin slightly concave. Posterior end of shell tapering slowly, bent towards the right-hand side, and with a slight posterior gape. Surface of shell irregularly corrugated.

DIMENSIONS.—Length ca. 30 mm., height 16·7 mm., inflation 11·3 mm.

OCCURRENCE AND MATERIAL.—Bihen (Lort-Phillips Coll.) ; horizon uncertain ; one specimen (L.53523).

REMARKS.—This specimen is an internal cast bearing faint traces of the concentric corrugations. It is not closely comparable to any European Jurassic species of *Cercomya*, although it appears to be referable to that genus. *C. schoensis* Futterer (1897, p. 611, pl. xxii, figs. 3, 4) has its umbones in a more posterior position and tapers more towards its posterior end. *Plectomya rugosa* (Roemer) (1836, p. 120, pl. viii, fig. 4, sub *Tellina*) bears some resemblance in shape, but is less gibbose and has a straight posterior end.

Genus **Thracia** Blainville, 1824.

82. **Thracia viceliacensis** d'Orbigny. Pl. XX, fig. 5.

1850. *Thracia viceliacensis* d'Orbigny, vol. i, p. 306.
1911. *Thracia viceliacensis* Thevenin, p. 134, text-fig.
1911. *Thracia viceliacensis* Flamand, p. 903, pl. xi, figs. 17*a*, *b*.
1912. *Thracia viceliacensis* Lissajous, p. 102, pl. xii, fig. 20.
1916. *Thracia viceliacensis* Douvillé, p. 56, pl. vi, fig. 9.
1929. *Thracia viceliacensis* Weir, p. 34, pl. iii, fig. 19.

OCCURRENCES AND MATERIAL.—φ.227 ; Bihen Limestone, 8–12 m. from base (Callovian) ; one specimen. C.1 ; one specimen.

REMARKS.—These are subtrigonal, subequilateral specimens agreeing well with d'Orbigny's type, from the French Bathonian, as figured by Thevenin (loc. cit.), except that they are somewhat less trigonal. In the better preserved specimen, it may be seen that the sloping antero-dorsal margin and the oblique anterior margin are both straight, meeting one another in an obtuse angle at about two-thirds of the height of the shell. The specimens from the *Mytilus*-Beds of the Vaudois Alps which are figured as this species by de Loriol (1883, p. 15, pl. vi, figs. 8–11) appear to have a lower posterior end than the type-form, and their specific identity is a little doubtful.

83. **Thracia** cf. **incerta** (Roemer). Pl. XX, fig. 4.

References to descriptions of the type-form are :—

1836. *Tellina incerta* Thurmann, Roemer, p. 121, pl. viii, fig. 7.
1845. *Corimya studeri* Agassiz, p. 269, pl. 35.
1872. *Thracia incerta* de Loriol, p. 203 (with full synonymy), pl. xi, figs. 9, 10.

DESCRIPTION.—The Somaliland specimens do not attain the size of European specimens of *T. incerta*, the largest being about 34 mm. in length and 24 mm. in height. The smallest specimens, like European ones, are almost equilateral, but the larger ones have their umbones somewhat anterior to median ; otherwise, however, they agree well with typical specimens of the species.

OCCURRENCE AND MATERIAL.—Bihen (Lort-Phillips Coll.) ; horizon uncertain ; 5 specimens.

Family **PHOLADOMYACIDAE.**

Genus **Pholadomya** G. B. Sowerby, 1823.

84. **Pholadomya lirata** (J. Sowerby). Pl. XXI, figs. 8, 9.

1818. *Cardita ? lirata* J. Sowerby, vol. ii, p. 220, pl. cxcvii, fig. 3.
1840. *Pholadomya carinata* Goldfuss, p. 267, pl. clv, figs. 6*a*, *b*.
1840. *Pholadomya granosa* J. de C. Sowerby, p. 327, pl. xxi, fig. 9.
1842. *Pholadomya carinata* Agassiz, p. 84, pl. 4′, figs. 4–6.

1863. *Pholadomya lyrata* Lycett, p. 87, pl. xliii, figs. 3, 3*a*.
1911. *Pholadomya texta* Flamand, p. 896, pl. v, figs. 1, 4 (*non* Agassiz).
1916. *Pholadomya carinata* Douvillé, p. 55, pl. vi, fig. 8.

DESCRIPTION.—The specimens referred to this species are ovate-trigonal in shape, ranging up to about 40 mm. in length and 33·5 mm. in height. The radiating ribs are unevenly spaced and number 6–8, the second or third from the anterior end forming a prominent but somewhat rounded keel, while the remainder are not very prominent. The anterior end of the shell is moderately convex. The concentric sculpture consists of moderately strong crenulations, which form small tubercles where they cross the ribs, especially on the main one.

OCCURRENCES AND MATERIAL.—C.1 ; horizon uncertain ; 4 specimens. F.10 ; Callovian ; 2 specimens.

REMARKS.—After comparison of the type-specimen of *P. lirata*, which is labelled as coming from the Fullers Earth, with Goldfuss's figure of *P. carinata*, I can find no differences to justify specific distinction between the two forms. A series of British specimens of *P. lirata* will show considerable variation in elongation and in the prominence of the ribs and concentric crenulations. The Cornbrash specimen figured by Lycett (loc. cit.), which I consider to be correctly determined, is shorter and more strongly ornamented than the holotype ; its ornamentation is comparable to that of the specimen figured by Agassiz (loc. cit.) as *P. carinata*. I have also examined the holotype (a crushed specimen) and topotypes of *P. granosa* J. de C. Sowerby, from the Callovian of Kachh, and can find no grounds for distinguishing this species from *P. lirata*. The form from the *Mytilus*-Beds of the Vaudois Alps, which de Loriol (1883, p. 31, pl. i, fig. 12 ; pl. ii, figs. 1–3) refers to *P. texta* Agassiz, but which Gilliéron (1886, p. 145) renames *P. percarinata*, is closely comparable to *P. lirata*, but is larger and taller, with more prominent umbones. *P. ragazii* Futterer (1897, p. 603, pl. xxi, figs. 4–6) is a Kimmeridgian representative of the same group ; apparently it has no ribs anterior to the main carina.

85. **Pholadomya aubryi** Douvillé. Pl. XXI, figs. 10, 11.

1886. *Pholadomya aubryi* Douvillé, p. 225, pl. xii, fig. 6.
1908. *Pholadomya* cf. *carinata* Goldfuss ; Newton, p. 3.
1925. *Pholadomya carinata* Weir, p. 89 (*pars*, *non* Goldfuss).

DESCRIPTION.—The specimens referred to this species are comparatively small for the genus, ranging up to about 37 mm. in length. They are subtrigonal in shape, but vary in elongation, the height being in some cases slightly in excess of the length, while in most cases the length exceeds the height. The sculpture always consists of five sharp ribs, the second of which from the anterior end is very prominent, delimiting the short, flattened anterior end of the shell. The intervals between the main rib and the three posterior to it are sometimes nearly equal but at other times very unequal ; the ribbed area occupies the greater part of the main surface of the shell, leaving only a comparatively small unornamented area in the postero-dorsal corner. The concentric sculpture is also characteristic, consisting of nearly equidistant sulci which form notches where they cross the ribs.

OCCURRENCES AND MATERIAL.—φ.217 ; Bihen Limestone, top bed (Divesian–Argovian) ; 3 specimens. φ.3, φ.148 ; Bihen Limestone ; 3 specimens. Bihen (Lort-Phillips Coll.) ; horizon uncertain ; 8 specimens.

REMARKS.—Douvillé's type is slightly more elongate than average specimens of the series now described, but agrees well with several individuals ; its sculpture is exactly like that of the Somaliland specimens. Some specimens of the Portuguese Lusitanian species *P. delgadoi* Choffat (1893, p. 19, pl. viii, figs. 5–12) are closely comparable, but in that species the number of ribs is more variable.

Douvillé (1908, p. 153) has recorded *P. aubryi* from Tunis, where he suggests that its horizon may be Oxfordian or Rauracian. It has also been collected by Mr. H. St. J. Philby in Arabia from beds which appear to be Callovian in age.

86. **Pholadomya somaliensis** sp. nov. Pl. XXI, figs. 1, 2*a*, *b*.

1925. *Pholadomya carinata* Weir, p. 89 (*pars*, *non* Goldfuss).

DIAGNOSIS.—Shell large, very gibbose, trigonal, with the height slightly in excess of the length ; anterior end moderately convex. Umbones broad ; postero-dorsal outline of shell almost straight. Sculpture consisting of five main ribs crossed by concentric crenulations, which form tubercles at the points of intersection ; the second main rib from the anterior end is the most prominent, and forms a conspicuous keel ; the three ribs posterior to it diverge at comparatively narrow angles, leaving the posterior half of the main surface of the shell unornamented. A very weak additional rib is sometimes developed anterior to the main ribs, and another one posterior to them.

DIMENSIONS.—Holotype : length 62 mm., height 63 mm., inflation 57 mm.

OCCURRENCE AND MATERIAL.—C.1 ; horizon uncertain ; the holotype (L. 61146) and 6 other specimens.

REMARKS.—The five main ribs are developed and are similarly arranged in all the specimens examined. The most closely comparable described species appears to be *P. schafarziki* Papp (1907, p. 155, pl. iii, figs. 1, 1*a*, *b*), from the Callovian or Oxfordian of the Caucasus ; but that species is broader at the umbo, while its main rib is situated further from the anterior end of the shell. Its larger size, greater height, and fewer ribs distinguish the species now described from *P. lirata* (J. Sowerby), described above. It shows some approach to *P. percarinata* Gilliéron (=*P. texta* de Loriol, 1883, p. 31, pl. i, fig. 12 ; pl. ii, figs. 1–3, *non* Agassiz), but is slightly taller, notwithstanding its broader umbones, and has fewer ribs. *P. texta* itself (Agassiz, 1842, p. 81, pl. 4*b*, figs. 7–9) has about the same number of ribs, but these are weaker and not definitely tuberculate, while the shell itself is more elongate and less trigonal. In shape, the new species much resembles the well-known Upper Jurassic form *P. protei* (Brongniart) and the closely related, if not synonymous, species *P. paucicosta* Roemer, but in those forms the concentric sculpture is less pronounced, and the ribbing less constant.

Subgenus **Homomya** Agassiz, 1842.

87. **Pholadomya (Homomya) inornata** J. de C. Sowerby. Pl. XXI, figs. 5, 6*a*, *b*, 7.

1840. *Pholadomya inornata* J. de C. Sowerby, p. 327, pl. xxi, fig. 8.

?1916. *Pholadomya inornata* Douvillé, p. 55, pl. iv, fig. 5.

?1925. *Pholadomya* (*Homomya*) *gibbosa* (J. Sowerby) var. *asiatica* Cox, p. 178, pl. xiv, figs. 8*a*, *b* (*non P. asiatica* Redlich, 1894).

1925. *Homomya* cf. *tibetica* Stoliczka ; Weir, p. 90.

DESCRIPTION.—The specimens referred to this species range up to about 65 mm. in length and 53 mm. in height ; they vary somewhat in relative elongation, the height normally being about two-thirds of the length. The main characteristic is the prominence and anterior position of the umbones. In front of the umbones, the profile of the shell shows only a very slight dorsal concavity ; the anterior margin is flattened-convex. The shape of the posterior end of the shell is rather variable ; in some specimens, the shell tapers very slightly in this direction, so that its end is somewhat pointed ; at other times, the postero-dorsal and ventral margins are subparallel, and the posterior end of the shell is obliquely subtruncate. There is no trace

of a sulcus running from the umbo to the ventral margin. The sculptural details are imperfectly preserved, but some specimens show traces of radiating riblets crossing the concentric crenulations near the umbo.

OCCURRENCES AND MATERIAL.—φ.226, φ.227 ; Bihen Limestone, 8–21 m. from base (Callovian) ; 3 specimens. C.1 ; horizon uncertain ; 6 specimens. F.10 ; Callovian ; one specimen.

REMARKS.—These specimens are considerably smaller than the Trans-Jordan specimens described by me as a new variety of *P.* (*H.*) *gibbosa* (J. Sowerby), but agree with them in shape ; the varietal name used by me proves to be a homonym and so in any case must be abandoned. The Indian Callovian species *P. inornata*, with which a specimen from the Bathonian of Sinai was identified by Douvillé (loc. cit.), was ignored by me previously, owing to the small size and distorted condition of the holotype. I have now examined further Indian specimens, presumably referable to *P. inornata*, in the J. F. Blake Collection. I am of opinion that the Somaliland specimens, which are not very much larger than the Indian ones, may be identified with this species, which appears to be rather variable. The Jordan Valley and Sinai specimens probably belong to a large race of this species.

P. inornata seems to be closely related to *P. gibbosa*, but its umbones are more anterior and more prominent than in that species. *Homomya martini* Rollier (1911*a*, p. 243, for *H. gibbosa* Martin, 1863, p. 59, pl. ii, figs. 1–5), from the French Bathonian, is closely comparable. *H. choffati* Borissiak (1909*a*, p. 60, pl. iii, fig. 1, = *H.* cf. *gibbosa* Choffat, 1893, p. 32, pl. ix, fig. 1) is also very similar and possibly a synonym.

The French Callovian species recorded by Cossmann (1907, p. 134, pl. i, fig. 17) as *P. inornata* appears, however, to be distinct. In a later paper (1924, p. 53) the same author identifies the species in question with *P. ovulum* Agassiz.

Family **CORBULIDAE.**

Genus **Corbula** Bruguière, 1792.

88. **Corbula daghaniensis** sp. nov. Pl. XXI, fig. 3.

DIAGNOSIS.—Shell small-medium, trigonally ovate, slightly longer than high ; right valve very gibbose, with a prominent inflated umbo placed at about the anterior third of the length, and a narrow, pointed posterior rostrum situated slightly above the middle of the height of the shell. Sculpture consisting of concentric corrugations which are fairly regularly spaced over the greater part of the surface, but become crowded together near the posterior end of the ventral margin owing to the position of the rostrum. Left valve unknown.

DIMENSIONS.—Holotype : length 10·5 mm., height 8·4 mm., inflation 5·5 mm.

OCCURRENCE AND MATERIAL.—φ.228 ; Bihen Limestone, basal bed (Callovian) ; the holotype (L.61147) and one ill-preserved specimen, both right valves.

REMARKS.—The strong inflation of the right valve suggests that this species is a *Corbula* and not a *Cuspidaria* (in which genus the left valve is the more gibbose). *C. hulliana* Morris (see Arkell, 1931*a*, p. 598, pl. xlix, figs. 10, 11), from the English Bathonian, is perhaps the most closely comparable described species, but is shorter, with no definite posterior rostrum. Other comparable forms are *C. eastonii* Vogel (1900, p. 62, pl. iii, figs. 9–12), from the Jurassic of Borneo, which is a smaller and more elongate species, and *C. pseudomucronata* Hennig (1924, p. 103, pl. iii, fig. 9), from the Oxfordian of Tanganyika, which is also a smaller species. No species at all similar is known from any pre-Middle Jurassic horizon.

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PLATES I to XXV

WITH EXPLANATIONS


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PLATE XIV.

JURASSIC GASTROPODA.

(*Photographs by* L. R. Cox. *All figures are of natural size.*)

Figs. 1*a*, *b*. *Pleurotomaria* sp. I. Bihendula district; horizon uncertain. Brit. Mus., G.55747, S.P.C. Coll. (P. 154.)

,, 2*a*, *b*. *Globularia hemisphaerica* (Roemer). Bihendula district; horizon uncertain. Sedgwick Mus., F.1035, S.P.C. Coll. (P. 155.)

,, 3*a*, *b*. *Globularia* sp. Bed φ.227, Daghani; Callovian. Brit. Mus., G.55749, S.P.C. Coll. (P. 155.)

Fig. 4. *Globularia* sp. Bihendula district; horizon uncertain. Brit. Mus., G.55750, S.P.C. Coll. (P. 155.)

Figs. 5, 6*a*, *b*. *Ampullella* sp. V. Bed φ.227, Daghani; Callovian. Brit. Mus., G.55751–2, S.P.C. Coll. (P. 156.)

,, 7*a*, *b*. *Ampullella* sp. V. F.10, Biyo Dader Tug, Gadabursi district; Callovian. Brit. Mus., G.49089, Farquharson Coll. (P. 156.)

,, 8*a*, *b*, 9. "*Trochus*" [*Proconulus* ?] *ambalensis* Weir, showing variation in sculpture of base. Bihendula district; horizon uncertain. Sedgwick Mus., F.1036–7, S.P.C. Coll. (P. 155.)

,, 10, 11. *Architectonica* sp. Bed φ.227, Daghani; Callovian. Brit. Mus., G.55755–6, S.P.C. Coll. (P. 156.)

Fig. 12. *Ampullella* sp. I. B.81, near Madashon; Callovian. Brit. Mus., G.55765, Barrington Brown Coll. (P. 155.)

Figs. 13*a*, *b*. *Ampullella* sp. III. Bihendula district; horizon uncertain. Brit. Mus., G.55757, S.P.C. Coll. (P.156.)

,, 14*a*, *b*. *Ampullella* sp. IV. Bihendula district; horizon uncertain. Brit. Mus., G.55758, S.P.C. Coll. (P. 156.)

Fig. 15. *Ampullella* sp. II. Bihendula district; horizon uncertain. Brit. Mus., G.55759, S.P.C. Coll. (P. 156.)

Figs. 16, 17. *Pseudomelania* sp. Bihendula district; horizon uncertain. Brit. Mus., G.55760–1, S.P.C. Coll. (P. 158.)

Fig. 18. *Aporrhais* cf. *haudnervatus* (Cossmann). Bed φ.227, Daghani; Callovian. Brit. Mus., G.55762, S.P.C. Coll. (P. 158.)

,, 19. *Aporrhais* (*Diarthema* ?) sp. F.10, Biyo Dader Tug, Gadabursi district; Callovian. Brit. Mus., G.49072, Farquharson Coll. (P. 158.)

,, 20. *Aporrhais* sp. F.10, Biyo Dader Tug, Gadabursi district; Callovian. Brit. Mus., G.49070, Farquharson Coll. (P. 158.)

PLATE XV.

JURASSIC GASTROPODA AND LAMELLIBRANCHIA.

(*Photographs by* L. R. Cox. *All figures are of natural size unless otherwise stated.*)

Figs. 1, 2*a*, *b*. *Cylindrites* ? cf. *striatus* (Lissajous). F.10, Biyo Dader Tug, Gadabursi ; Callovian. Brit. Mus., G.49080–1, Farquharson Coll. (P. 159.)

,, 3*a*, *b*. *Bulla macfadyeni* sp. nov. Bihendula district ; horizon uncertain. Holotype, Brit. Mus., G.55745, S.P.C. Coll. (P. 159.)

Fig. 4. *Cylindrites* ? sp. Bed φ.227, Daghani ; Callovian. Brit. Mus., G.55763, S.P.C. Coll. (P. 160.)

,, 5. *Procerithium hunti* sp. nov., × 3¾. A.43, Flatbush Hill, near Daghani ; Portlandian. Holotype, Brit. Mus., G.55746, S.P.C. Coll. (P. 157.)

,, 6. *Procerithium hunti* sp. nov., × 4. Same locality and horizon. Brit. Mus., G.55764, S.P.C. Coll.

,, 7. *Posidonia somaliensis* sp. nov. Bed φ.207, Daghani ; Middle Kimmeridgian. Brit. Mus., L.61148, S.P.C. Coll. (P. 166.)

,, 8. *Posidonia somaliensis* sp. nov. Same locality and horizon. Holotype (larger specimen) and measured paratype, Brit. Mus., L.61134, S.P.C. Coll.

,, 9. *Aulacomyella farquharsoni* sp. nov. Bed φ.205, Daghani ; Middle Kimmeridgian. Holotype, Brit. Mus., L.61135, S.P.C. Coll. (P. 167.)

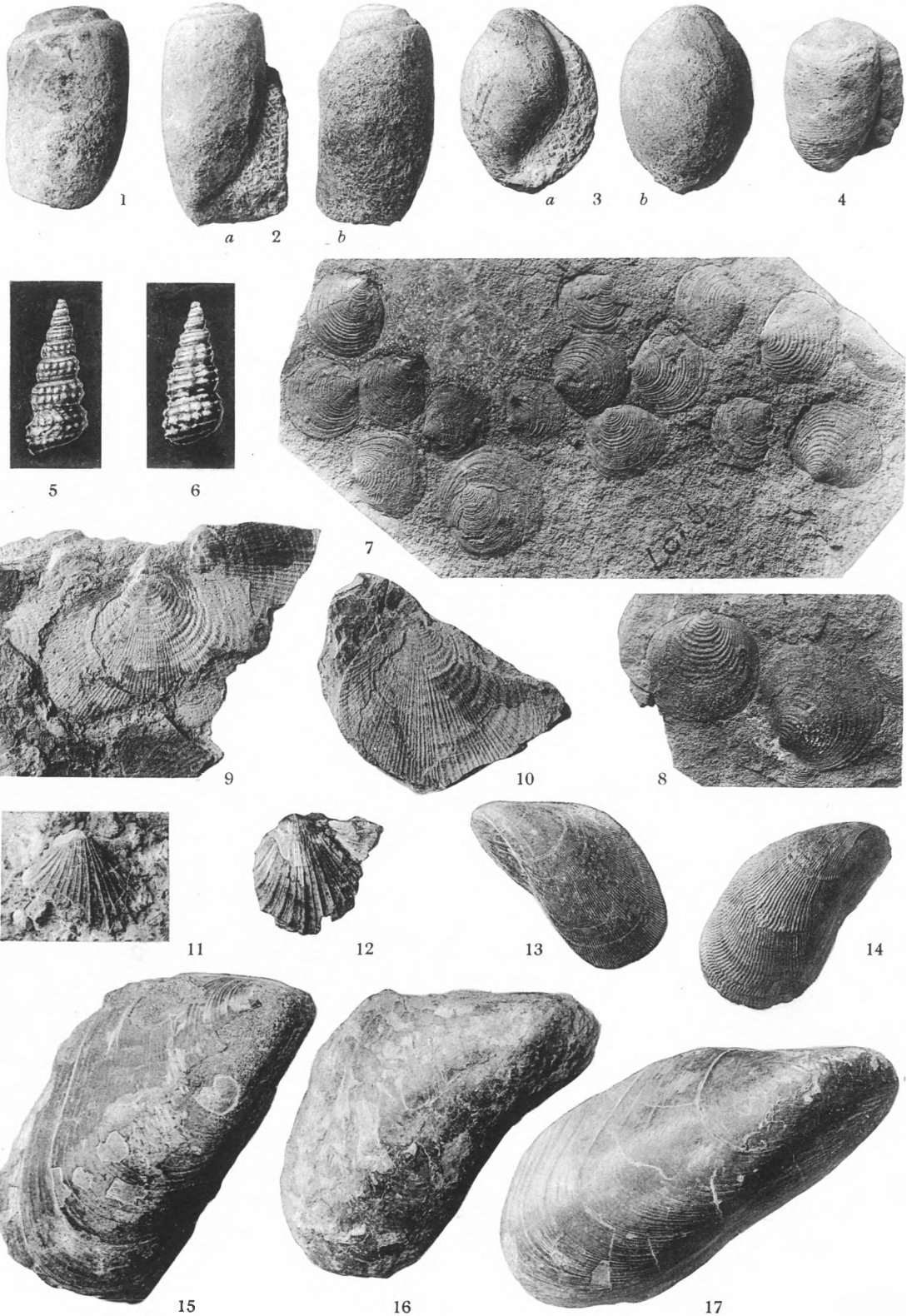
,, 10. *Aulacomyella farquharsoni* sp. nov. F.53, Bihendula ; apparently from the same bed as the holotype. Brit. Mus., L.53551, Farquharson Coll.

Figs. 11, 12. *Oxytoma inequivalve* (J. Sowerby), × 1¾. Bed φ.215, Daghani ; Argovian. Sedgwick Mus., F.1038–9, S.P.C. Coll. (P. 165.)

Fig. 13. *Mytilus* (*Arcomytilus*) *laitmairensis* de Loriol. Bihendula district ; horizon uncertain. Sedgwick Mus., F.1040, S.P.C. Coll. (P. 164.)

,, 14. *Mytilus* (*Arcomytilus*) *laitmairensis* de Loriol. B.81, near Madashon ; Callovian. Sedgwick Mus., F.1041, Barrington Brown Coll.

Figs. 15, 16, 17. *Mytilus jurensis* Roemer. Bihendula district ; horizon uncertain. Sedgwick Mus., F.1042–4, S.P.C. Coll. (P. 161.)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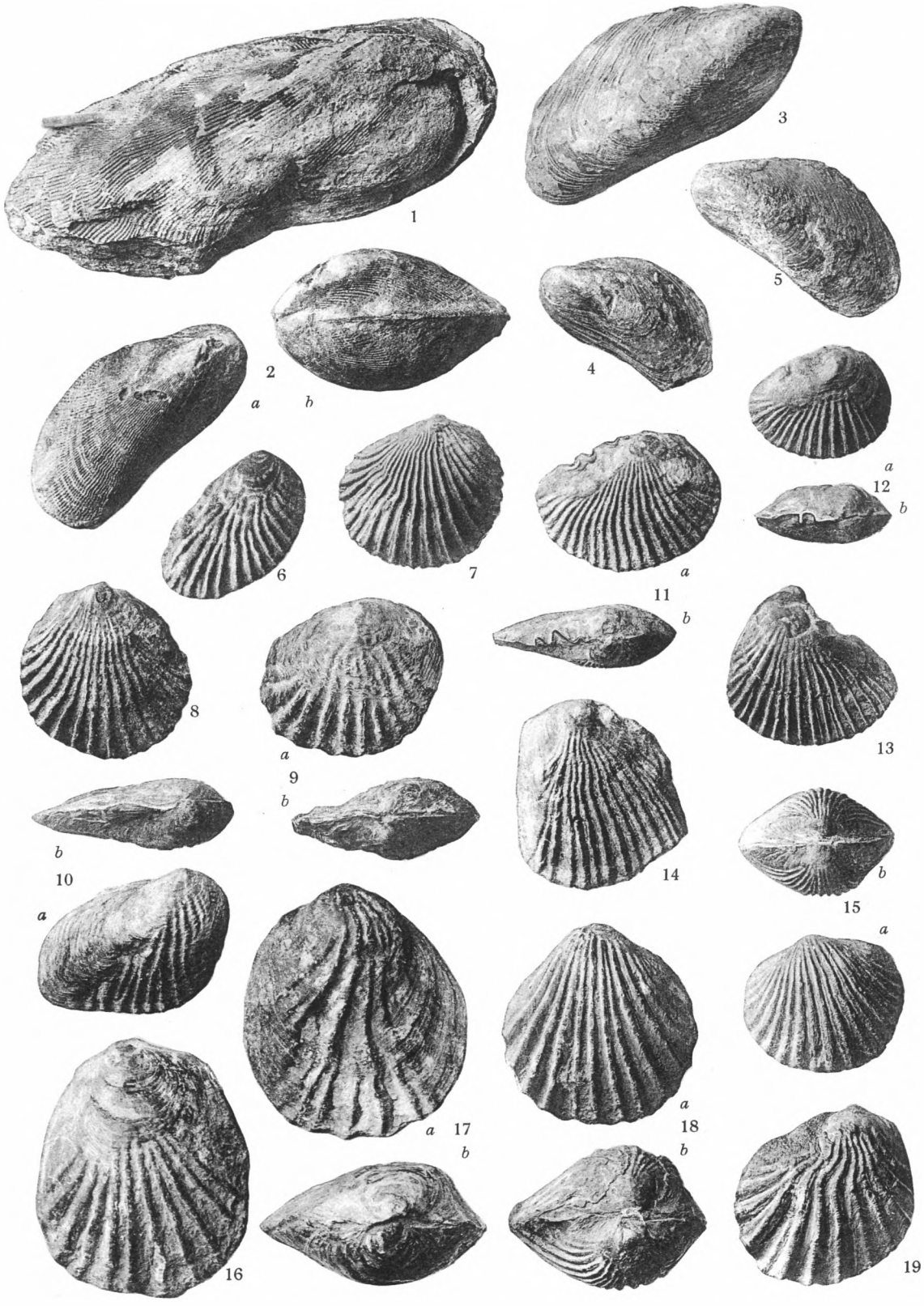
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PLATE XVI.

JURASSIC LAMELLIBRANCHIA.

(*Photographs by* L. R. Cox. *All figures are of natural size.*)

Fig. 1. *Mytilus* (*Musculus*) *somaliensis* sp. nov. Bihendula district, horizon uncertain (? Callovian). Largest paratype, Brit. Mus., L.61155, S.P.C. Coll. (P. 164.)

Figs. 2*a*, *b*. *Mytilus* (*Musculus*) *somaliensis* sp. nov. Bihendula district, horizon uncertain (? Callovian). Holotype, Brit. Mus., L.61136, S.P.C. Coll.

Fig. 3. *Mytilus* (*Modiolus*) *imbricatus* (J. Sowerby). Bihendula district, horizon uncertain. Sedgwick Mus., F.1045, S.P.C. Coll. (P. 162.)

,, 4. *Mytilus* (*Modiolus*) *imbricatus* (J. Sowerby). Bed φ.227, Daghani; Callovian. Sedgwick Mus., F.1046, S.P.C. Coll.

,, 5. *Mytilus* (*Modiolus*) *imbricatus* (J. Sowerby). Bed φ.219, Daghani; Divesian–Argovian. Sedgwick Mus., F.1047, S.P.C. Coll.

Figs. 6, 7, 8, 9*a*, *b*, 10*a*, *b*. *Eligmus rollandi* Douvillé. Bihendula district; horizon uncertain (? Callovian). Sedgwick Mus., F.1048–52, S.P.C. Coll. (P. 168.)

,, 11*a*, *b*. *Eligmus polytypus* Eudes-Deslongchamps. B.81, near Madashon; Callovian. Sedgwick Mus., F.1053, Barrington Brown Coll. (P. 167.)

,, 12*a*, *b*. *Eligmus polytypus* Eudes-Deslongchamps. B.82, near Eruduwe; Callovian. Sedgwick Mus., F.1054, Barrington Brown Coll.

,, 13, 14. *Eligmus polytypus* Eudes-Deslongchamps. Bed φ.227, Daghani; Callovian. Sedgwick Mus., F.1055–6, S.P.C. Coll.

,, 15*a*, *b*. *Eligmus rollandi* Douvillé var. *jabbokensis* (Cox). Bihendula district; horizon uncertain (? Callovian). Sedgwick Mus., F.1057, S.P.C. Coll. (P. 169.)

Fig. 16. *Eligmus weiri* sp. nov. Bihendula district, horizon uncertain. Holotype, Brit. Mus., L.61137, S.P.C. Coll. (P. 169.)

Figs. 17*a*, *b*. *Eligmus weiri* sp. nov. Bihendula district, horizon uncertain. Brit. Mus., L.61167, S.P.C. Coll.

,, 18*a*, *b*. *Eligmus weiri* sp. nov. F.34, Ida Kabeita Hill; ? Callovian. Brit. Mus., L.53557, Farquharson Coll.

,, 19. *Eligmus weiri* sp. nov. Bihendula district, horizon uncertain. Brit. Mus., L.61168, S.P.C. Coll.

PLATE XVII.

JURASSIC LAMELLIBRANCHIA.

(*Photographs by* L. R. Cox. *All figures are of natural size unless otherwise stated.*)

Figs. 1*a*, *b*, 2, 3. *Eligmus aualites* (Stefanini). Bihendula district; horizon uncertain. Sedgwick Mus., F.1058–60, S.P.C. Coll. (P. 170.)

,, 4*a*, *b*, 5. *Ostrea* (*Liostrea*) *dubiensis* Contejean. B.81, near Madashon; Callovian. Sedgwick Mus., F.1061–2, Barrington Brown Coll. (P. 171.)

,, 6*a*, *b*. *Ostrea* (*Liostrea*) sp. I. Bihendula district; horizon uncertain. Brit. Mus., L.61172, S.P.C. Coll. (P. 170.)

,, 7, 8. *Ostrea* (*Liostrea*) sp. II. Bihendula district; horizon uncertain. Brit. Mus., L.61173–4, S.P.C. Coll. (P. 171.)

,, 9*a*, *b*, 10, 11*a*, *b*, 12*a*, *b*. *Lopha solitaria* (J. de C. Sowerby). Bihendula district, horizon uncertain, probably Argovian. Sedgwick Mus., F.1063–6, S.P.C. Coll. (P. 171.)

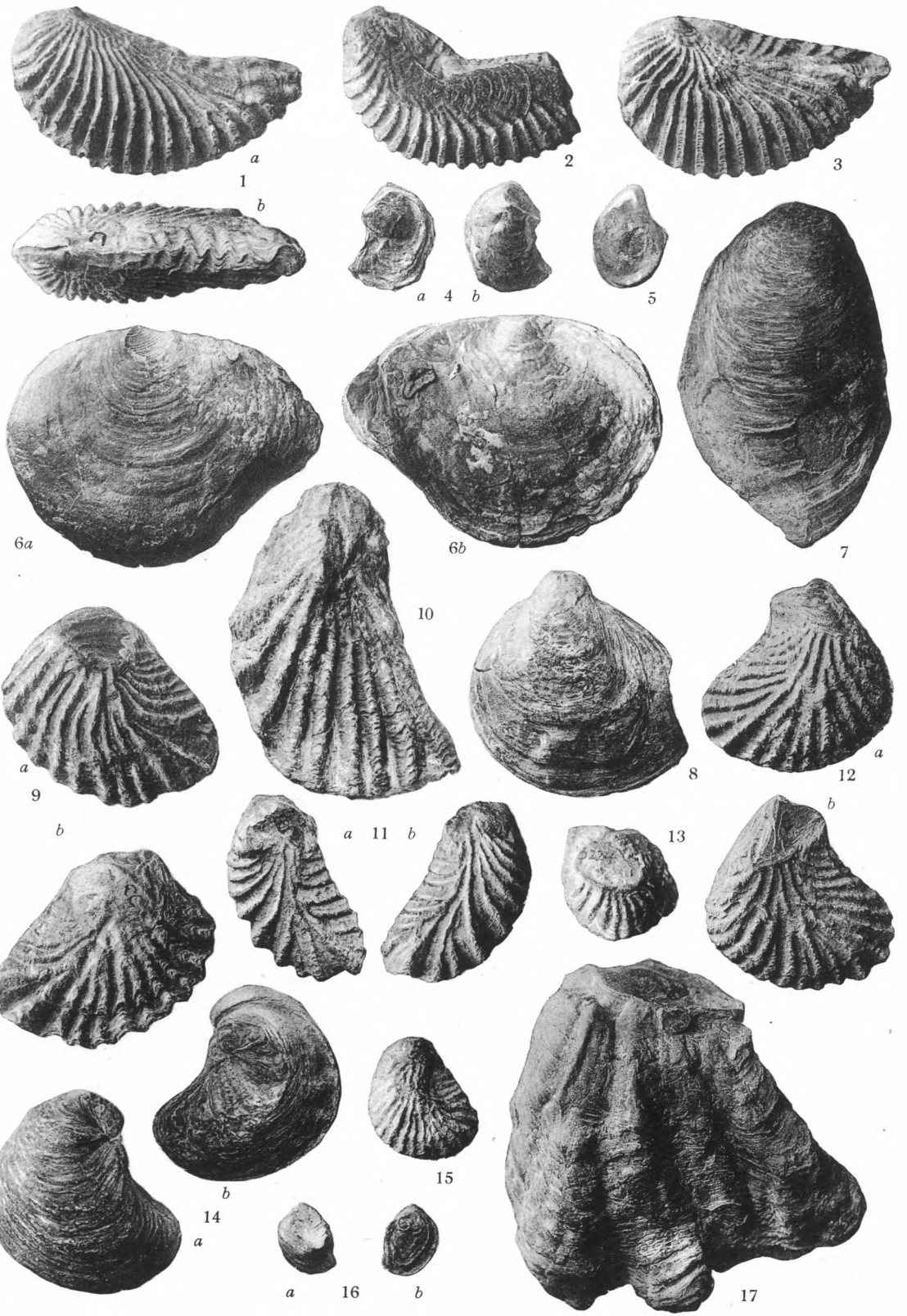
Fig. 13. *Lopha costata* (J. de C. Sowerby), × 1¾. Bed φ.224, Daghani; Callovian. Sedgwick Mus., F.1067, S.P.C. Coll. (P. 173.)

Figs. 14*a*, *b*. *Exogyra fourtaui* Stefanini. Bed φ.216, Daghani; Argovian. Sedgwick Mus., F.1068, S.P.C. Coll. (P. 174.)

Fig. 15. *Lopha* cf. *gregarea* (J. Sowerby). φ.10, Ida Kabeita; ? Callovian. Brit. Mus., L.61181, S.P.C. Coll. (P. 172.)

Figs. 16*a*, *b*. *Exogyra nana* (J. Sowerby). Bed φ.227, Daghani; Callovian. Sedgwick Mus., F.1069, S.P.C. Coll. (P. 175.)

Fig. 17. *Gryphaea costellata* (Douvillé). F.10, Biyo Dader Tug, Gadabursi district; Callovian. Brit. Mus., L.53539, Farquharson Coll. (P. 174.)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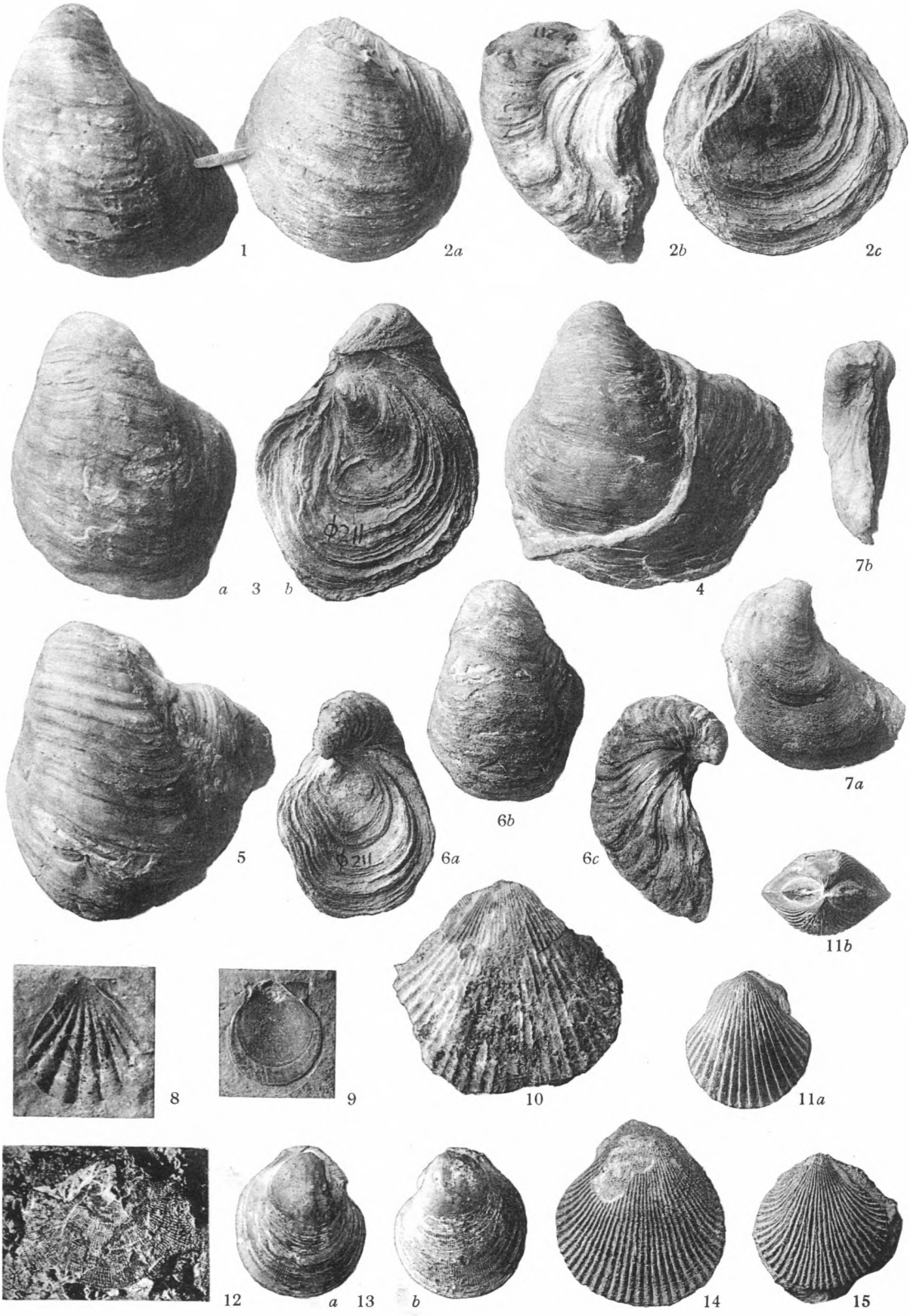
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2b
2c
a
3
b
4
7b
5
6a
6b
6c
7a
11b
8
9
10
11a
12
a
13
b
14
15

PLATE XVIII.

JURASSIC LAMELLIBRANCHIA.

(*Photographs by* L. R. Cox. *All figures are of natural size unless otherwise stated.*)

Figs. 1, 2*a*, *b*, *c*, 3*a*, *b*. *Gryphaea balli* (Stefanini). Bed φ.211, Daghani; Lower Kimmeridgian. Sedgwick Mus., F.1070–2, S.P.C. Coll. (P. 173.)

Fig. 4. *Gryphaea balli* (Stefanini). F.30, ? ½ mile E. of Mukhroh Camp, S. of Heis; horizon uncertain. Brit Mus., L.53623, Farquharson Coll.

Figs. 5, 6*a*, *b*, *c*, 7*a*, *b*. *Gryphaea balli* (Stefanini). Bed φ.211, Daghani; Lower Kimmeridgian. Sedgwick Mus., F.1073–5, S.P.C. Coll.

Fig. 8. *Chlamys* (*Aequipecten*) sp., × 1¾. F.53, Bihendula; horizon uncertain. Brit. Mus., L.53562, Farquharson Coll. (P.177.)

,, 9. *Camptonectes* sp. II. Bed φ.211, Daghani; Lower Kimmeridgian. Brit. Mus., L.61190, S.P.C. Coll. (P.178.)

,, 10. *Chlamys* cf. *splendens* (Dollfus). Bed φ.215, Daghani; Argovian. Brit. Mus., L.61189, S.P.C. Coll. (P. 175.)

Figs. 11*a*, *b*. *Chlamys* (*Aequipecten*) *macfadyeni* sp. nov. Bihendula district; horizon uncertain. Holotype, Brit. Mus., L.61138, S.P.C. Coll. (P. 176.)

Fig. 12. *Camptonectes* sp. I, × 2·3. Bed φ.215, Daghani; Argovian. Brit. Mus., L.61191, S.P.C. Coll. (P. 178.)

Figs. 13*a*, *b*. *Camptonectes browni* sp. nov. B.81, near Madashon; Callovian. Holotype, Brit. Mus., L.61215, Barrington Brown Coll. (P. 177.)

Fig. 14. *Chlamys curvivarians* Dietrich. Bihendula district; horizon uncertain. Sedgwick Mus., F.1076, S.P.C. Coll. (P. 176.)

,, 15. *Chlamys curvivarians* Dietrich. Bed φ.227, Daghani; Callovian. Sedgwick Mus., F.1077, S.P.C. Coll.

PLATE XIX.

JURASSIC LAMELLIBRANCHIA.

(*Photographs by* L. R. Cox. *All figures are of natural size unless otherwise stated.*)

Figs. 1*a*, *b*. *Lima* cf. *schardti* de Loriol; (*a*) natural size, (*b*) × 1¾, showing ornamentation of ribs. B.82, near Eruduwe; Callovian. Brit. Mus., L.61221, Barrington Brown Coll. (P. 179.)

,, 2, 3. *Lima* (*Plagiostoma*) *harronis* Dacqué. Bihendula district; horizon uncertain. Sedgwick Mus., F.1078–9, S.P.C. Coll. (P. 179.)

,, 4*a*, *b*, 5. *Astarte scytalis* Holdhaus. Bihendula district; horizon uncertain. Sedgwick Mus., F.1080–1, S.P.C. Coll. (P. 180.)

Fig. 6. *Astarte altissima* sp. nov., × 1¾. Bed φ.211, Daghani; Lower Kimmeridgian. Holotype, Brit. Mus., 61140, S.P.C. Coll. (P. 181.)

Figs. 7*a*, *b*. *Pseudotrapezium* sp. Bihendula district; horizon uncertain. Brit. Mus., L.61197, S.P.C. Coll. (P. 182.)

,, 8*a*, *b*. *Pseudisocardia macfadyeni* sp. nov. Bihendula district; horizon uncertain, probably Divesian–Argovian. Holotype, Brit. Mus., L.61141, S.P.C. Coll. (P. 181.)

Fig. 9. *Pseudisocardia macfadyeni* sp. nov. Bihendula district; horizon uncertain, probably Divesian–Argovian. Brit. Mus., L.61198, S.P.C. Coll.

,, 10. *Ceromyopsis striata* (d'Orbigny). Bihendula district; horizon uncertain. Brit. Mus., L.53569, Lort-Phillips Coll. (P. 188.)

Figs. 11*a*, *b*. *Eocallista krenkeli* sp. nov. Bihendula district; horizon uncertain. Brit. Mus., L.53565, Lort-Phillips Coll. (P. 185.)

Fig. 12. *Eocallista krenkeli* sp. nov. Bed φ.226, Daghani; Callovian. Holotype, Brit. Mus., L.61142, S.P.C. Coll.

,, 13. *Lucina* cf. *lirata* Phillips. Bed φ.224, Daghani; Callovian. Brit. Mus., L.61199, S.P.C. Coll. (P. 183.)

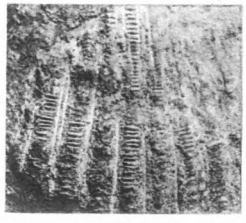
Figs. 14*a*, *b*. *Venilicardia hunti* sp. nov. Bed φ.217, Daghani; Divesian–Argovian. Holotype, Brit. Mus., L.61143, S.P.C. Coll. (P. 182.)

Fig. 15. *Lucina* sp. Bed φ.217, Daghani; Divesian–Argovian. Brit. Mus., L.61200, S.P.C. Coll. (P. 183.)

,, 16. *Mactromya aequalis* Agassiz. Bed φ.217, Daghani; Divesian–Argovian. Sedgwick Mus., F.1082, S.P.C. Coll. (P. 183.)

Figs. 17*a*, *b*. *Mactromya aequalis* Agassiz. F.10, Biyo Dader Tug, Gadabursi district; Callovian. Brit. Mus., L.53543, Farquharson Coll.

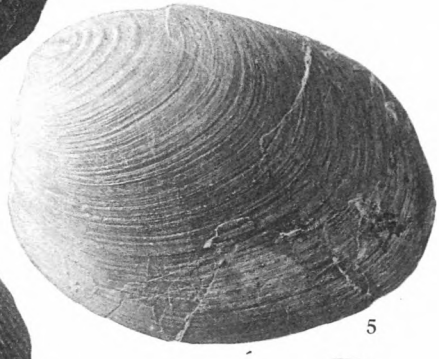
1a



1b

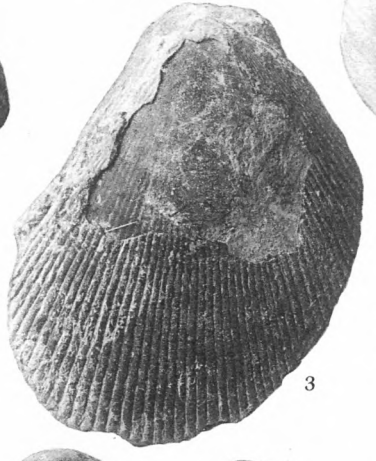
2

b 4 a

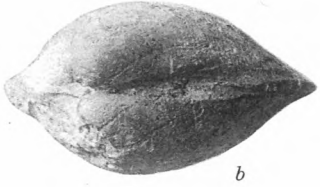


5

b 7 a



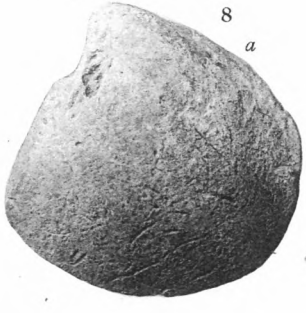
3



b 8

10

6



a

a 11 b

12

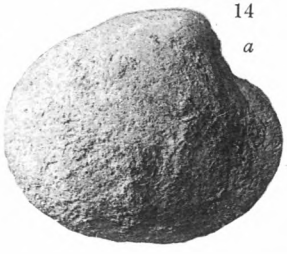
13

b 14 a

15

b 17 a

9



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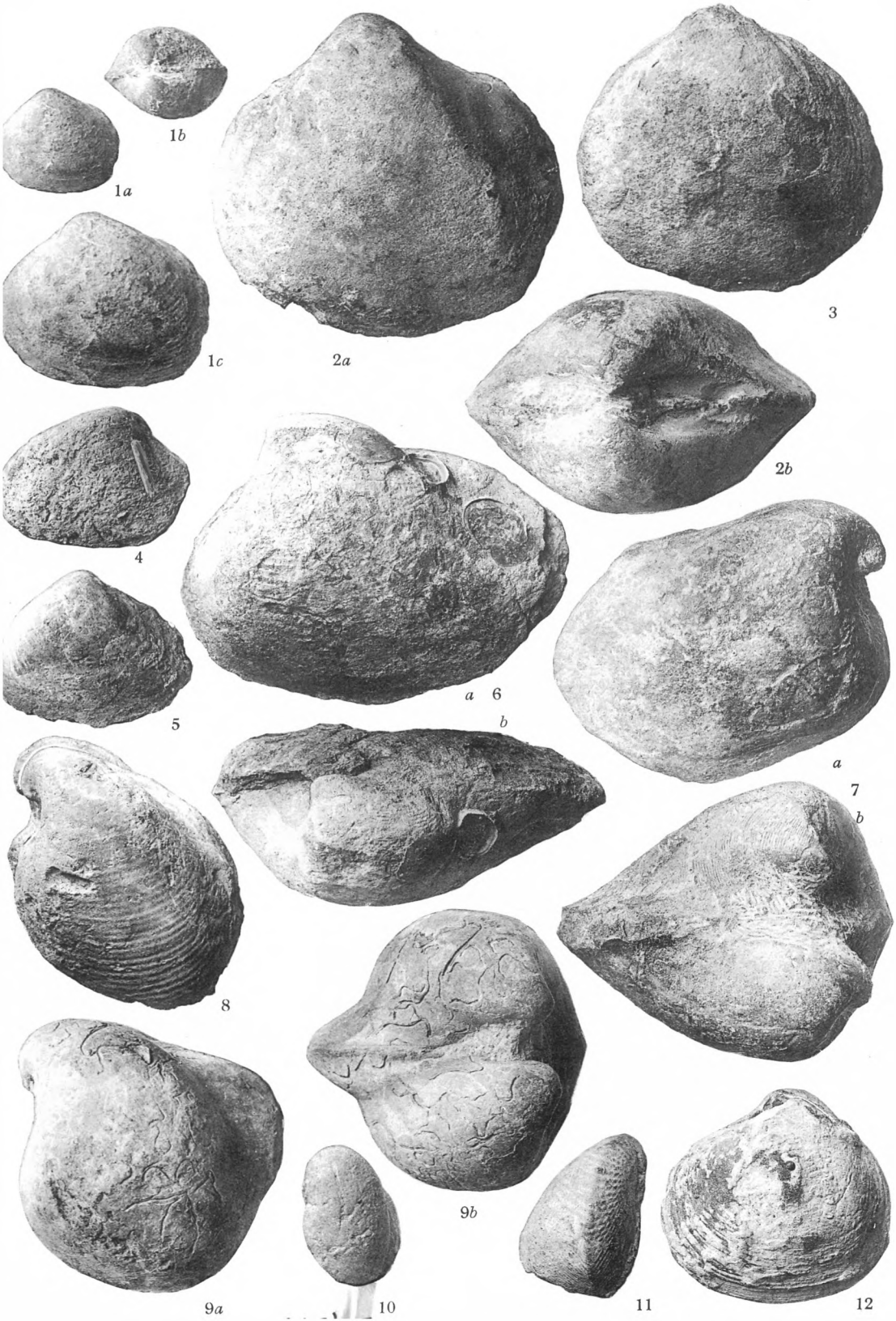
1b
1a
1c
2a
3
2b
4
5
a 6
b
a
7
b
8
9b
9a
10
11
12

PLATE XX.

JURASSIC LAMELLIBRANCHIA.

(*Photographs by* L. R. Cox. *All figures are of natural size unless otherwise stated.*)

Figs. 1*a*, *b*, *c*. *Mactromya daghaniensis* sp. nov. ; (*a*), (*b*) natural size, (*c*) × 1¾. Bed φ.224, Daghani ; Callovian. Holotype, Brit. Mus., L.61144, S.P.C. Coll. (P. 185.)

,, 2*a*, *b*. *Protocardia somaliensis* sp. nov. Bihendula district ; horizon uncertain, probably Divesian–Argovian. Holotype, Brit. Mus., L.61145, S.P.C. Coll. (P. 186.)

Fig. 3. *Mactromya* cf. *crassa* Agassiz. Bed φ.217, Daghani ; Divesian–Argovian. Brit. Mus., L.61202, S.P.C. Coll. (P. 184.)

,, 4. *Thracia* cf. *incerta* (Roemer). Bihendula district ; horizon uncertain. Brit. Mus., L.53521, Lort-Phillips Coll. (P. 190.)

,, 5. *Thracia viceliacensis* d'Orbigny. Bed φ.227, Daghani ; Callovian. Sedgwick Mus., F.1083, S.P.C. Coll. (P. 190.)

Figs. 6*a*, *b*. *Ceratomya wimmisensis* (Gilliéron). F.10, Biyo Dader Tug, Gadabursi district ; Callovian. Brit. Mus., L.53535, Farquharson Coll. (P. 186.)

,, 7*a*, *b*. *Ceratomya* cf. *pittieri* (de Loriol). Bihendula district ; horizon uncertain. Brit. Mus., L.61204, S.P.C. Coll. (P. 186.)

Fig. 8. *Ceromyopsis* sp. B.81, near Madashon ; Callovian. Brit. Mus., L.61222, Barrington Brown Coll. (P. 189.)

Figs. 9*a*, *b*. *Ceromyopsis somaliensis* Weir. Bihendula district ; horizon uncertain. Sedgwick Mus., F.1084, S.P.C. Coll. (P. 188.)

Fig. 10. *Ceromyopsis arabica* sp. nov. Bihendula district ; horizon uncertain. Brit. Mus., L.61206, S.P.C. Coll. (P. 189.)

,, 11. *Ceratomya telluris* (Lamarck). Bihendula district ; horizon uncertain, probably Callovian. Sedgwick Mus., F.1085, S.P.C. Coll. (P. 187.)

,, 12. *Mactromya* cf. *verioti* (Buvignier). Bihendula district ; horizon uncertain. Brit. Mus., L.61208, S.P.C. Coll. (P. 184.)

PLATE XXI.

JURASSIC LAMELLIBRANCHIA.

(*Photographs by* L. R. Cox. *All figures are of natural size unless otherwise stated.*)

Fig. 1. *Pholadomya somaliensis* sp. nov. Bihendula district; horizon uncertain. Brit. Mus., L.61209, S.P.C. Coll. (P. 192.)

Figs. 2*a*, *b*. *Pholadomya somaliensis* sp. nov. Bihendula district; horizon uncertain. Holotype, Brit. Mus., L.61146, S.P.C. Coll.

Fig. 3. *Corbula daghaniensis* sp. nov., × 1¾. Bed φ.228, Daghani; Callovian. Holotype, Brit. Mus,. L.61147, S.P.C. Coll. (P. 193.)

Figs. 4*a*, *b*. *Cercomya* sp. Bihendula district; horizon uncertain. Brit. Mus., L.53523, Lort-Phillips Coll. (P. 189.)

,, 5, 6*a*, *b*. *Pholadomya* (*Homomya*) *inornata* J. de C. Sowerby. Bihendula district; horizon uncertain, probably Callovian. Sedgwick Mus., F.1086–7, S.P.C. Coll. (P. 192.)

Fig. 7. *Pholadomya* (*Homomya*) *inornata* J. de C. Sowerby. F.10, Biyo Dader Tug, Gadabursi district; Callovian. Brit. Mus., L.53540, Farquharson Coll.

,, 8. *Pholadomya lirata* (J. Sowerby). Bihendula district; horizon uncertain, probably Callovian. Sedgwick Mus., F.1088, S.P.C. Coll. (P. 190.)

,, 9. *Pholadomya lirata* (J. Sowerby). F.10, Biyo Dader Tug, Gadabursi district; Callovian. Brit. Mus., L.53542, Farquharson Coll.

,, 10. *Pholadomya aubryi* Douvillé. Bed φ.217, Daghani; Divesian–Argovian. Sedgwick Mus., F.1089, S.P.C. Coll. (P. 191.)

,, 11. *Pholadomya aubryi* Douvillé. φ.3, Bihendula; Bihen Limestone, exact horizon uncertain. Sedgwick Mus., F.1090, S.P.C. Coll.

PLATE XXI