THE

MESOZOIC PALAEONTOLOGY

OF

BRITISH SOMALILAND

FORAMINIFERA	*by*	W. A. Macfadyen, M.C., M.A., PH.D.
CORALS AND HYDROZOA	,,	H. Dighton Thomas, M.A., PH.D.
ECHINOIDEA (JURASSIC)	,,	Ethel D. Currie, PH.D., B.SC.
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Part II of the
Geology and Palaeontology of
British Somaliland

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X. JURASSIC AND CRETACEOUS CEPHALOPODA.

By L. F. SPATH, D.Sc.

[PLATES XXIV, XXV.]

CONTENTS.

I. INTRODUCTION.

The cephalopods here dealt with are largely those collected by the Somaliland Petroleum Company's (S.P.C.) expedition. Dr. W. A. Macfadyen's report on this expedition and his map, published in Part I, may be consulted for the localities here mentioned. Other collections, received since the preparation of my (1925) paper on the ammonites and aptychi of the Anglo-Persian Oil Company's (A.P.O.C.) collection, are also discussed. The ammonites, aptychi, and belemnites collected at Daghani, on account of their importance for general correlation, were referred to already in the final part of my Revision of the Jurassic Cephalopod Fauna of Kachh (1933), and my thanks are due to Dr. Macfadyen and Mr. A. G. Brighton for enabling me to study this interesting Daghani material.

Most of the 180 ammonites in the S.P.C. collection are mere fragments and generally in a very poor state of preservation, the two here figured being about the best. The 262 belemnites and 53 aptychi, on the other hand, are often very well preserved and there are generally numbers of specimens of each form. There is, however, only one Jurassic *Nautilus*. The ammonites in the R. A. Farquharson (R.A.F.) collection in the British Museum (Natural History) are in a rather better state of preservation than those collected by the S.P.C. expedition, but again only two have now been selected for illustration, since the great majority belong to types already recorded from Somaliland. The belemnites and one *Nautilus* fragment, however, are poorly preserved. Mr. C. Barrington Brown's few Cretaceous ammonites and belemnites, preserved in the British Museum (C.B.B. Coll.), are, unfortunately, again only small and incomplete.

Works already cited in Dr. Macfadyen's bibliography (Part 1, pp. 39–41) are not again listed. The most important recent paper on cephalopods from Somaliland and neighbouring areas is that by Prof. Stefanini (1933) and, since he there reviews the various ammonite faunas so far recorded, the present paper is confined largely to a discussion of the new evidence.

II. JURASSIC AMMONITES.

a. ***Ammonites from the Daghani Section.***

The more characteristic ammonites from this section (together with the belemnites and aptychi) have already been listed (Spath, 1933), arranged in descending order. The table is now reproduced, with certain modifications and additions, and, in order to facilitate comparison with Dr. Macfadyen's scheme, since published, his symbols and new names have been inserted.

VII. Nubian Sandstone (with wood). 600 metres.

VI. (*q–t*). Top Beds, Gawan Limestone (245 m.).

s–t		(142 m.).	No cephalopods.
r	(φ.202)	(1 m.).	*Aulacosphinctes* sp. ind. ?
q″		(7 m.).	No cephalopods.
q′	(φ.203)	(6 m.).	*Anavirgatites* aff. *ambiguus* (Schneid), *Anavirgatites* cf. *subambiguus* Spath, *Anavirgatites* sp. ind., *Pseudovirgatites* cf. *silvescens* (Schneid), *Pseudovirgatites* spp. ind., *Sublithacoceras* cf. *senex* (Oppel), *Simoceras* sp. nov. ?
q		(88 m.).	No cephalopods.

V. (*j–p*). Daghani Shales (370 m.).

p′		(76 m.).	No cephalopods.
p	(φ.204)	(20 m.).	*Lithacoceras* ? sp. ind., Indeterminable Perisphinctid, *Belemnopsis* sp. juv., *Belemnopsis* sp. nov. (very slender), *Rhopaloteuthis* sp. ind. (=*B. sauvanausus* Pillet and Fromentel =*Belemnites oldhamianus* Waagen *pars* ?), *Aptychus* (*Laevaptychus*) *latus* Parkinson sp. (thin form), *Aptychus* (*Lamellaptychus*) cf. *steraspis* (Oppel), *Aptychus* (*Lamellaptychus*) cf. *euglyptus* (Oppel).
o′		(15 m.).	No cephalopods.
o	(φ.205)	(25 m.).	*Streblites* aff. *serratus* Burckhardt, *Streblites* sp. ind., *Subdichotomoceras* cf. *simoceroides* (Pavlow), *Torquatisphinctes* ? spp. ind., *Waagenia* ? sp. ind., *Aptychus* (*Laevaptychus*) *latus* Parkinson sp. (thicker).
n	(φ.206)	(15 m.).	*Idoceras* sp. ind. (cf. *I. neogaeum* and *I. santarosanum* Burckhardt), *Torquatisphinctes* aff. *similis* Spath, *Planites* ? sp. ind.
m′		(19 m.).	No cephalopods.
m	(φ.207)	(496 m.).	*Idoceras* aff. *laxevolutum* (Fontannes) Burckhardt, *Idoceras* aff. *balderum* (Oppel), *Idoceras* sp. juv. aff. *lorioli* Burckhardt,

Idoceras aff. *subdedalus* Burckhardt,
Perisphinctid, indeterminable,
Sutneria aff. *cyclodorsata* (Moesch) Burckhardt,
Aspidoceras (*Orthaspidoceras* ?) sp. ind.,
Belemnopsis cf. *tanganensis* (Futterer),
Aptychus (*Laevaptychus*) *latus* (Parkinson) (very thick form).

l' (31 m.). No cephalopods.

l (φ.208) (465 m.). *Orthaspidoceras* aff. *orthocera* (d'Orbigny),
Perisphinctids, indeterminable,
Aptychus (*Laevaptychus*) *latus* (Parkinson) (very thick form).

k' (59 m.). No cephalopods.

k (φ.209) (50 m.). *Aptychus* (*Laevaptychus*) *latus* (Parkinson) (very thick form),
Aptychus (*Lamellaptychus*) *euglyptus* (Oppel),
Belemnopsis kuntkotensis (Waagen) (slender form with broad groove),
Belemnopsis macfadyeni sp. nov. (depressed form with narrow groove),
Dicoelites stefaninii sp. nov. (see p. 222).

j (60 m.). No cephalopods.

IV. (*f–i*). Wanderer Limestone (103 m.).

i (φ.211) (5 m.). *Taramelliceras* aff. *greenackeri* (Moesch),
Discosphinctes aff. *eggeri* (Ammon),
Discosphinctes virgulatus (Quenstedt),
Discosphinctes aff. *castroi* (Choffat),
Discosphinctes cf. *metamorphicum* (Neumayr) de Loriol sp.,
Ataxioceras ? aff. *ernesti* (de Loriol), and *A.* ? sp. ind.,
Belemnopsis tanganensis (Futterer) Spath (=*B.* cf. *kantkotensis* but shorter).

h' (43 m.). No cephalopods.

h' (φ.212) (15 m.). *Discosphinctes* ? aff. *gredingensis* (Wegele),
Discosphinctes ? spp. (like those from *i*),
Planites sp. nov. ?
Belemnopsis tanganensis (Futterer) Spath.

g' (23 m.). No cephalopods.

g (φ.213) (10 m.). *Discosphinctes* aff. *progeron* (Ammon),
Planites aff. *polygyratus* (Reinecke) de Loriol sp.,
Planites ? sp. ind.,
Belemnopsis orientalis (Waagen).

f' (6 m.). No cephalopods.

f (φ.213*a*) (1 m.). *Glochiceras nimbatum* (Oppel),
Sutneria sp. juv. ind.,
Discosphinctes geron (*non* Zittel) Quenstedt-Wegele,
Discosphinctes spp. ind.,
Planites aff. *polygyratus* (Reinecke) de Loriol sp.

III. (*c–e*). Gahodleh Shales (113 m.).

e (φ.214) (43 m.). Perisphinctids, indeterminable,
Belemnopsis tanganensis (Futterer) s.s. (slender),
Belemnopsis aff. *tanganensis* (Futterer) (more conical),
Belemnopsis aff. *orientalis* (Waagen).

d' (3 m.). No cephalopods.

d (φ.215) (144 m.). *Belemnopsis tanganensis* (Futterer) s.s.,
Belemnopsis aff. *orientalis* (Waagen).

c' (64 m.). No cephalopods.

II. (*b*). Upper Bihen Limestone s.s. (30 m.).
No cephalopods *in situ* (? *Pachyceras* aff. *indicum* Spath).

I. (*a*). Lower Bihen Limestone s.s., with bands of corals and echinoids (53 m.).
No cephalopods *in situ* (? *Paracenoceras prohexagonum* sp. nov.).

Excluding the Nubian Sandstone (VII), this represents a thickness of 3,000 feet of Jurassic deposits, of which about 2,000 feet belong to the Kimmeridgian and higher beds, which alone appear to be developed in a number of localities in western Somaliland, and e.g. at Ambal in the east (Farquharson, 1924, p. 13), whereas the lowest bed (the Bihen Limestone) is known so far only from just south of Berbera. The absence of ammonites in the uppermost limestones unfortunately does not yet allow of more exact definition of the upper limit of the series than was given in 1925.

There are no cephalopods at all from the highest 460 feet, and the single ammonite listed from *r* (=φ.202) as *Aulacosphinctes* sp. ind. ? is merely a doubtful impression. The next lower assemblage, from *q'* (=φ.203), includes a species of *Pseudovirgatites* comparable to a form figured in 1925 (text-fig. 4, p. 136), and less typical *Anavirgatites*, in addition to scarcely recognizable fragments of *Simoceras* ?, etc. But for the specimens described before, and some more examples now available from the Daghani area (though not collected *in situ*), their age might have been difficult to determine. The new material, however, labelled partly " near Daghani section " and " Daghani Hill (purchased)," and other specimens from south-east and south of Bihendula, as well as examples in the R.A.F. collection, include similar *Pseudovirgatites*; and these are associated with typical *Anavirgatites divisiformis* Spath, together with new forms resembling *Simoceras* as much as *Anavirgatites*, and another, unnamed, species, probably of *Somaliceras*, that indicate a comparatively late age. The last-mentioned ammonite, unfortunately only an impression, is represented in text-fig. 1*c* (p. 210); it will be seen that it differs from the equally irregularly-ribbed Virgatitids just cited in having tubercles at the point of subdivision of the ribs. The new *Pseudoclambites* here figured (Plate XXV, figs. 6*a*, *b*), and a fragment of probably another larger species of the same genus, are preserved in a different matrix, and it is probable that there are a number of horizons, but they can only be Portlandian and higher.

These *Pseudovirgatites* and *Anavirgatites* were previously referred to the Upper Kimmeridgian, because Perisphinctids resembling *Anavirgatites palmatus* (Schneid) and its allies had (following Salfeld and others) been taken to occur in the English Kimmeridge Clay, below the *rotundum* (or "*pallasianus*") zone. Much more collecting, however, has since been done in the Upper Kimmeridge Clay and the overlying Portland Sands of Dorset, the results of which collecting I am describing elsewhere. It may suffice to state here that the fauna of Neuburg described by

Schneid (1914), though possibly including a mixture from several horizons, does not seem to comprise any pre-Portlandian forms, while at the same time it does not contain a single Tithonian element in the strict sense. The Somaliland material, unfortunately, is too poorly preserved to allow of the recognition of more of Schneid's species.

It will be seen from the section that the next cephalopod fauna (from *p*=φ.204) occurs in a bed some 550 feet lower, and that the only two Perisphinctids collected are too indefinite for exact dating. From bed *o* (=φ.205), however, there are some *Streblites*, in addition to a doubtful *Waagenia* fragment, that suggest a Middle Kimmeridgian age also for the associated Perisphinctid remains. Still more definite is the occurrence, in *n* (=φ.206), of an *Idoceras* of the group of *I. neogaeum* and *I. santarosanum* Burckhardt (1906, pl. xi, figs. 5–8, and pl. xiv, figs. 5–7), followed in bed *m* (over 60 feet below) by forms of *Idoceras* that are close to the typical *balderum* group. The associated *Aspidoceras*, unfortunately, represents only the umbilical cast of a large form with very prominent inner spines, but the *Sutneria* from the same bed is comparable to the late *S. cyclodorsata*, and not to the earlier *S. platynota* or *S. galar*. The stratigraphical significance of the different species of *Sutneria* in the White Jura of Bavaria has recently been discussed by Wegele (1929, p. 154). I admit that this succession may not hold for Somaliland, and that the *Sutneria* sp. juv. ? here recorded from bed *f*, over a thousand feet below, may be an immature *Klematosphinctes* (=" *Enosphinctes* "). But it cannot be far from the base of the Kimmeridgian, and the forms of *Idoceras* just mentioned are probably not of earlier than *balderum* date.

The *Orthaspidoceras* (or *Physodoceras* ?) from bed *l* (φ.208) suggests a Lower Kimmeridgian age, but it is small (24 mm. diameter), although it already includes the body-chamber. Four Perisphinctids from this bed are unrecognisable, which is a matter for regret, since no ammonites have been collected from some 570 feet of strata below. The next fauna (*i*=φ.211) comprises a single Oppelid (*Taramelliceras*) of a type that occurs already in the *bimammatum* zone ; and the many Perisphinctids, like those from the Montejunto Beds of Portugal, appear to represent a mixture of forms of the *tenuilobatus* and *bimammatum* zones. This, however, may be partly due to the fact that they are all crushed and that the identifications therefore are questionable. The most reliable are perhaps the three Perisphinctids compared to *P. castroi* Choffat (1893, pl. x, fig. 5*a*), to *Ammonites " streichensis "* Quenstedt (1887, pl. cvii, fig. 6, *non* Oppel), and to " *P.* du groupe *lictor*," *non* Fontannes, figured by Simionescu (1907, pl. iv, fig. 4), while small *Discosphinctes* of the *virgulatus* group are apparently the commonest forms.

This seems to indicate that the fauna is basal Kimmeridgian and corresponds approximately to that of the passage beds between the White Jura β and γ recently described by Wegele (1929), but since the Perisphinctids of the next lower beds in the Wanderer Limestone are not very different from those just listed it is difficult to state where the Argovian ends. I previously thought that the lower part of these grey limestones (IV), while identical in facies with the upper part, might be referred to the *bimammatum* zone of the Argovian as appropriately as to the *tenuilobatus* zone of the Lower Kimmeridgian. This might, indeed, be said also of the upper part, and when previously including the whole of the Wanderer Limestone in the Lower Kimmeridgian rather than the Upper Argovian I was relying more on the ammonites from the lower beds *f*, *g*, and *h* (φ.212–213*a*) than on the assemblage from *i* just discussed.

These lower ammonites include first (*h*=φ.212) Perisphinctids of the type of *P. gredingensis* Wegele (1929, pl. v, fig. 7), of the *bimammatum* zone, associated with *Planites* of the *polygyratus* group. The latter occur already in *g* and *f* and a crushed half is now figured (Plate XXV, fig. 5) for comparison with P. de Loriol's type from the *tenuilobatus* zone (1877, pl. vii, fig. 1) as well

as Wegele's earlier form (1929, pl. v, fig. 6). It will be seen that there is also some resemblance to *Biplices*, like *B. africanus*, from Italian Somaliland (Spath, 1930, p. 43, text-fig. 1), but not to Stefanini's *Lithacoceras gananense* (1933, pl. xi, fig. 5), which was erroneously identified with the Jubaland *B. africanus* just cited. In *g* and *f*, however, these *Planites* are associated with *Discosphinctes* that resemble forms from the *tenuilobatus* zone. Such are *D.* aff. *progeron* (Ammon), a *castroi*-like form, with less fine ribbing than the species listed from bed *i*, and *D. geron* (Quenstedt, 1887, pl. civ, fig. 2, *non* Zittel), an ammonite that was considered by Wegele (1929, p. 146 [52]) to be distinct from *D. gerontoides* (Siemiradzki), of the Argovian, and to be characteristic of the *planula* subzone at the base of the Kimmeridgian.

The other ammonites from these beds, unfortunately, are scarcely more definitely identifiable. *Glochiceras nimbatum* (Oppel) is distinct enough, though the absence of the venter may cause difficulty in a crushed impression. But, while Oppel (1863, p. 191) described it as from the *tenuilobatus* zone, all Wegele's examples came from the *bimammatum* zone ; and, as this author pointed out, it has been recorded by other workers from still different horizons. The *Sutneria*, again, as already mentioned, may be an immature *Enosphinctes*, especially as it is on a slab that bears the impression of a strongly grooved Haploceratid, resembling *Ochetoceras subclausum* (Oppel) (1863, pl. lii, fig. 3*a*). Perhaps there is here a parallel to the apparent mixture of Kimmeridgian *Aspidoceras* and Argovian Perisphinctids in the Changamwe Shales of Kenya that has baffled observers for so long.

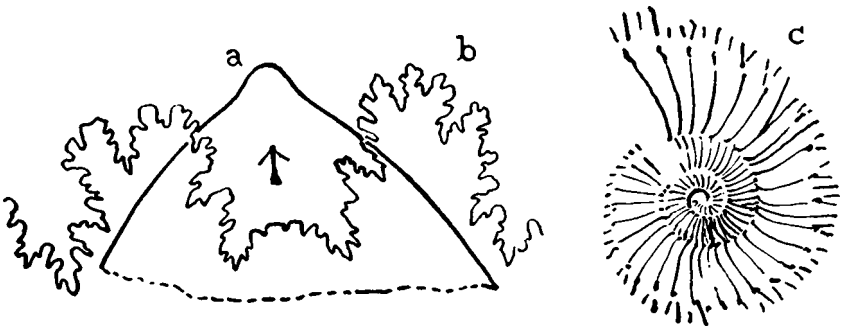

Fig. 1. (*a*, *b*) *Pachyceras* cf. *indicum* Spath. Sectional outline and ventral portion of suture-line of a fragment (B.M., C.36195, S.P.C. Coll.), from near Bihendula (probably Upper Bihen Limestone). (*c*) *Somaliceras* ? sp. nov. Doubtful impression (see p. 208). (B.M., C.36198, S.P.C. Coll.), Daghani Hill (Gawan Limestone ?).

The five Perisphinctid fragments from *e* (φ.214) are quite unrecognisable ; one seems to have the ribbing of an Argovian *Dichotomosphinctes* like *D. plicatilis* (Sowerby) de Riaz sp. (1898, pl. iii, fig. 1*a*). These are the lowest ammonites found *in situ*, but there is a fragment from near Bihendula in Dr. Macfadyen's collection which is of Oxfordian (Divesian) age and is thus the oldest ammonite known from Somaliland ; it is very close to the Kachh species, *Pachyceras indicum* Spath (1931, pl. xx, fig. 2). The age of this species is definitely established in Kachh by its associates in the *athleta* beds ; and the assemblage does not differ materially from similar Divesian faunas in Normandy and Yorkshire. The only difference that can be seen is in the slightly more galeate whorl-shape of the Bihendula fragment and the narrower first lateral lobe of its suture-line (see Text-fig. 1*b*), resembling that of *P. lalandeanum* (d'Orbigny) as figured by R. Douvillé (1912, p. 46, text-fig. 50). This suture-line is sufficiently distinct from that of the Callovian *Chamoussetia* to prevent misidentification of this small fragment, and the later *Cardioceras* (*s. l.*), with a somewhat similar suture-line, has a different type of keel.

It is clear that this *Pachyceras* must have come from a bed some distance below *e*, and, judging by its preservation in a compact grey limestone, it is probably from the Coral beds or Upper Bihen Limestone (II). Since the *Nautilus* here described, which apparently comes from the Echinoid beds (Lower Bihen Limestone, I) below, is compared to a Bathonian form, it is almost certain that the sequence is discontinuous and that there is a gap between the Divesian and Bathonian.

b. Ammonites from other Localities.

The ammonites in the S.P.C. collections include a number of small lots and isolated specimens from various localities in the neighbourhood of Bihendula. They certainly comprise several species not before recorded from Somaliland, especially Perisphinctids, but their preservation is such that it is necessary to await the discovery of more complete examples before dealing with them. There is only one suite, from SURIA MALABLEH, ten miles south-east of Berbera, that may here be mentioned, because it includes

Enosphinctes cf. *eumelus* (d'Orbigny) and
Aspidoceras aff. *karpinskyi* Pavlow.

The latter has the two rows of tubercles rather far apart, as in *A. wynnei* Waagen, even on the globose inner whorls, but its bed is unknown. It is probable that both these forms indicate the *eudoxus* zone. The assemblage, however, also includes fragments of Upper Argovian *Planites* (group of *P. anabreviceps* Dacqué and *P. pseudo-breviceps* Simionescu), *Dichotomosphinctes* (group of *P. paravirguloides*, *P. praestenocyclus* Dacqué and *P. dacquei* Spath), and *Prososphinctes* (true *virguloides*-group, not before recognised from Somaliland), in addition to badly preserved ammonites from the Upper Limestones (*Pseudovirgatites*, *Aulacosphinctoides*, etc.).

The 250 ammonites, belemnites, and aptychi in the R.A.F. collection came from a number of localities, some of which may here be mentioned, but no zonal collecting was attempted. As in some of the assemblages quoted in my (1925) paper on the A.P.O.C. collections, there is occasionally a mixture of Upper Oxfordian, Kimmeridgian, and even later forms ; and, although the matrices may differ, the state of preservation is generally too poor to allow of recognition of the stratigraphical order of the specimens in these assemblages. As usual, Perisphinctid fragments predominate, and I am now recording the other ammonites, chiefly because of the difficulty of identifying incomplete Perisphinctids, especially from such elastic border beds as those between the Kimmeridgian and the Argovian (or Upper Oxfordian).

The fauna of AMBAL (see Spath, 1925, p. 154) can now be increased by the following species :—

Waagenia aff. *hildebrandti* (Beyrich) Futterer,
Physodoceras cyclotum (Oppel),
Sutneria cf. *cyclodorsata* (Moesch),
Glochiceras (*Metahaploceras* ?) sp. juv.

The Perisphinctids, preserved in brown calcite, are immature *Katroliceras* or *Subdichotomoceras*, but when the previous list was given the type-specimen of *P. sparsiplicatus* Waagen had not been studied. This name was therefore wrongly used for one of the doubtful Ambal forms, and there is as yet no evidence, from Somaliland, of that Portlandian fauna which temporarily invaded Kachh in the east and Tanganyika in the south. There are also crushed ammonites from Ambal, indicating the presence of higher (post-*Waagenia*) beds, but the forms are indeterminable.

From TAR ADIN there are only two impressions of doubtful *Aulacosphinctoides*, but a number of new forms can now be added to the BIHENDULA fauna. One of the most interesting is a species of *Virgatosimoceras*, unfortunately too crushed to be figured, and the other ammonites

from the higher beds (*Anavirgatites*, *Aulacosphinctoides*, etc.) are also in a very poor state of preservation.

On the other hand, there are new forms from the lower beds, e.g. :—

Idoceras sp. nov. aff. *neogaeum* Burckhardt,
Sutneria sp. nov. aff. *galar* (Oppel) Fontannes,
Sutneria aff. *cyclodorsata* (Moesch),
Aspidoceras sp. juv.

The first is more densely costate than the Mexican form figured by Burckhardt (1906, pl. xi, fig. 6), but much more loosely coiled than *I. farquharsoni* sp. nov. (Plate XXIV, fig. 1) ; the last (*Aspidoceras*) is striated almost as much as the similarly immature *A. microplum* (Oppel) figured by Fontannes (1879, pl. xii, fig. 2*a*). The resemblance of such young *Aspidoceras* to immature *Sutneria* in the smooth stage may be considerable.

A still earlier fauna from Bihendula is identical with that from Bihen (grey shales) previously (1925, p. 157) considered to be probably of Lower Kimmeridgian age. The " *Ataxioceras* " are not typical forms (" *polyploci* "), but belong to the early groups (partly *Planites* ?) of *A. ernesti* (de Loriol), *A. weymouthense* Spath, and *A. schilli* (Oppel), and they are associated with *Discosphinctes* of the *fraasi* group. They are probably Upper Argovian rather than Lower Kimmeridgian, if the strict European standard applies, but at present there is no evidence that the typical *Ataxioceras* of the Central European Lower Kimmeridgian spread very far. *Parallelodon egertonianus* and *Belemnopsis tanganensis* occur in the same hand-specimens as the ammonites.

There are also a few impressions of *Pseudovirgatites* (?) from the upper beds of MERAGALLEH and the usual Upper Argovian Perisphinctids (*Planites* of the *anabreviceps* group, *Dichotomosphinctes* and *Prososphinctes*) from the track to GLANDU, between Deberaweina and Buramo. The last are associated with poor ammonite impressions in a dark and occasionally greenish shale, which seems to occur again in the BUR AD RANGE, to the north, where it has yielded many aptychi (*Laevaptychus*) of the *latus* group, so that the age of this shale may be assumed to be Lower Kimmeridgian. There is also a rock from this locality consisting almost entirely of slender guards of *Belemnopsis*, but the exact age of the following new forms from the Bur Ad Range is not yet established :—

Idoceras farquharsoni sp. nov.,
Idoceras sp. nov. aff. *schroederi* Wegele,
Idoceras sp. juv. cf. *neogaeum* Burckhardt,
Nebrodites ? sp. ind.,
Prososphinctes inaequalis sp. nov.

Like other undetermined Perisphinctids, they are probably from the base of the Kimmeridgian, i.e. the sub-zone of *Idoceras* (*Subnebrodites*) *planula*, rather than the higher sub-zone of *Idoceras balderum*, for the Somaliland species of *Idoceras* are all distinguished by their sharp ribs.

A similar fauna is that of DUR-DUR-AD, where *Aspidoceras*, *Glochiceras* (including young *Metahaploceras* ?), *Idoceras*, and an impression of a large *Nebrodites* occurred in association with various Perisphinctids, resembling that figured in Plate XXV, fig. 1, at least as regards mode of preservation. Though better than most of the other ammonites here dealt with, these Perisphinctids are too immature to be identified with accuracy, and they probably include the inner whorls of *Torquatisphinctes* and of *Katroliceras* as well as of *Planites*. The presence of :—

Idoceras montejuntense Dacqué and
Nebrodites sp. cf. *planula-gigas* (Quenstedt)

in this fauna and in an identical mode of preservation suggests a Lower Kimmeridgian age.

c. *Description of New Species of Jurassic Ammonites.*

Family **PERISPHINCTIDAE** Hyatt.

Subfamily **PERISPHINCTINAE** Spath.

Genus **Prososphinctes** Schindewolf, 1925, emend.

1. **Prososphinctes inaequalis** sp. nov. Pl. XXV, figs. 1*a*, *b*.

DIAGNOSIS.—A rather evolute (sublatumbilicate) Perisphinctid with rounded whorls, slightly higher than wide (coiling subplaty-, subleptogyral). Venter evenly arched, sides very slightly flattened; umbilical rim rounded. Close and sharp, lamellar ribs, strongly projected at both ends, irregular and bifurcating, either at outer third of whorl-side or on broad venter. Indistinct constrictions on inner whorls. Suture-line unknown.

DIMENSIONS.—

Diameter (in mm.)	55
Whorl-height (in % of diameter)	·35
Whorl-thickness (in % of diameter)	·33
Umbilicus (in % of diameter)	·44

OCCURRENCE AND MATERIAL.—Daba Dulla, Bur Ad Range, western Somaliland; Lower Kimmeridgian (by association with *Idoceras montejuntense*); the holotype (B.M. No. C.30312, R.A.F. Coll.).

There are a number of inner whorls of Perisphinctids from Somaliland, too small to be determined specifically, that probably include the present form.

REMARKS.—This species has some resemblance to forms of *Divisosphinctes* Beurlen, as recently restricted (Spath, 1931, p. 470), i.e. to forms of the *bifurcatus* group; but, whereas in typical forms of this group from Rians (Var) and Raix (Charente) the ribs are biconcave forward, the present species has costae with but a single curve. The ventral ribbing also is far more irregular and is not parabolar, as in forms recently discussed under *Biplices auritus* Spath (1931, p. 427). *Perisphinctes pseudobifurcatus* Choffat (1893, pl. xii, fig. 9) may be closer; and the same author's *P. torresensis* (*pars*, pl. xiv, fig. 10 only) is also somewhat comparable.

Subfamily **IDOCERATINAE** Spath.

Genus **Idoceras** Burckhardt, 1906.

2. **Idoceras farquharsoni** sp. nov. Pl. XXIV, figs. 1*a*, *b*.

DIAGNOSIS.—A rather evolute (sublatumbilicate) *Idoceras*, with compressed whorls (coiling subplaty–, subleptogyral), narrowly arched venter, with faint groove in median line, and strongly flattened sides; umbilical wall low and edge rounded. Close, blunt ribs, distinctly inclined forward and single or bifurcating at outer whorl-third, but not regularly. Peripheral chevrons symmetrical or asymmetrical, noticeably weakened in siphonal line. Suture-line incompletely shown.

DIMENSIONS.—

Diameter (in mm.)	102
Whorl-height (in % of diameter) ..	·37
Whorl-thickness (in % of diameter)	·25
Umbilicus (in % of diameter) ..	·44

OCCURRENCE AND MATERIAL.—Daba Dulla, Bur Ad Range, western Somaliland; Lower Kimmeridgian; the holotype (B.M. No. C.30303, R.A.F. Coll.), with body-chamber occupying last third of outer whorl.

REMARKS.—*I. farquharsoni* cannot be identified with any of the numerous Mexican species of *Idoceras* described by Burckhardt (1906, 1912) ; and the comparative sharpness of the ribbing and absence of any tendency to develop a laterally smooth body-chamber separates it from the *balderum* group. Even the early forms of the *planula* subzone recently figured by Wegele (1929, pl. ix [xiii]) have more advanced peripheral chevrons, and it is thus possible that the present species is earlier in date. On the other hand, it has often been shown that it is unsafe to deduce the date of existence of a given form from its stage of evolution, and the present species in any case is associated with undescribed *Idoceras* that are at least as advanced as *I. schroederi* Wegele. Species of *Prososphinctes* with somewhat similar ribbing lack the peripheral interruption.

Family **ASPIDOCERATIDAE** Zittel.

Subfamily **SIMOCERATINAE** Spath.

Genus **Pseudoclambites** Spath, 1925.

3. **Pseudoclambites costatus** sp. nov. Pl. XXV, figs. 6*a*, *b*.

DIAGNOSIS.—Rather evolute (sublatumbilicate) with rounded whorls, slightly higher than wide (coiling substeno–, subleptogyral). Venter distinctly channelled, sides very slightly flattened. Umbilical slope steep, but edge rounded. Inner whorls and suture-line unknown. Ribs on earlier part of body-chamber close and continuous across the side, breaking up into irregular straight secondaries at ventral edge ; later more distant, fading away before smooth periphery is reached.

DIMENSIONS.—

Diameter (in mm.)	70
Whorl-height (in % of diameter) ..	·34
Whorl-thickness (in % of diameter)	·31
Umbilicus (in % of diameter) ..	·44

OCCURRENCE AND MATERIAL.—σ.5, S.E. of Bihendula (" Meragalleh Limestone ") ; Portlandian ? ; the holotype (B.M., C.36196, S.P.C. Coll.), all body-chamber.

REMARKS.—Although as yet incompletely known, this species adds to our knowledge of the genus. For the type of costation can now be recognised to be that of *Simoceras rothpletzi* and *S. broilii* Schneid (resembling ventrally Schneid's [1914] fig. 3*a*, pl. vii, and laterally Schneid's fig. 1, pl. vii). The broad ventral groove, however, and different type of coiling proclaim *Pseudoclambites* to be an independent development in the subfamily Simoceratinae. *P. aenigmaticus* Spath differs in its fainter ornamentation, with the ribs apparently more pronounced at the umbilical border and near the ventral shoulder instead of at the middle of the side, as in *P. costatus*.

III. CRETACEOUS AMMONITES.

Mr. Barrington Brown (1931, p. 264) has already briefly recorded the occurrence of ammonites in a grey marl which, on the strength of these few remains, was assigned to the Barremian or Upper Neocomian. To my original determinaton of some of these eight small fragments as " Holcodiscids " I may now add that they include :—

Holcodiscus (*Astieridiscus*) cf. *gastaldianus* (d'Orb.),
Holcodiscus (*Astieridiscus*) cf. *caillaudianus* (d'Orb.),
Pseudothurmannia ? sp. ind.,
Procheloniceras ? [*Hamulina* ?] sp. ind.

The first (B.M., No. C.35177) is only a nucleus of about 15 mm. diameter, but the *Holcodiscus* ornamentation is very distinct, as it is also in an example (No. C.35183) of 18 mm. and two smaller fragments (Nos. C.35184 and 35178) of the second form. They compare well with typical young specimens of d'Orbigny's species from Barrème, Anglès, etc., in the Astier Collection in the British Museum, and they are similarly preserved in an almost identical, compact limestone. The three fragments (Nos. C.35179–81) doubtfully referred to *Pseudothurmannia* show the tabulate periphery and straight, single costation of forms of the group of *P. angulicostata* (d'Orbigny), but their preservation in a more conglomeratic matrix (apparently from a " condensed " bed) is very poor.

The last form, again, is represented only by a small whorl-fragment or portion of the hook of an uncoiled ammonoid, and bears only three unituberculate and bifurcating principal ribs with about four single intermediaries. Unlike the much larger example of *Hamulina haueri* (Hohenegger) figured by Uhlig (1882, pl. x, fig. 4), the present fragment has ribs that are not continued on to the smooth inner (umbilical ? or dorsal ?) side. There also is no sign of bituberculation, and the ribs show that peculiar flattening and rectangular cross-section which is so typically developed in the genera *Prochelonicerαs* (see e.g. Uhlig, 1882, pl. xxiii) or *Colombiceras* (see Spath, 1931*b*, p. 654). Crushed specimens of the former, on account of their oblique ornamentation, often show resemblance to small portions of uncoiled forms. In the Somaliland fragment under discussion, if belonging to a heteromorph ammonoid, little more than half of the hook is preserved and nothing of the straight shafts. Although the divergent ribbing seems scarcely to have been developed on a coiled shell, I prefer to group the fragment with *Prochelonicerαs* on account of what appears to be a concave dorsal area, with suggestion of ribbing due to contact with a previous whorl.

There is a possibility that this last fragment is not of the same age as the Holcodiscids (in a harder and less white limestone matrix) and it could also represent a portion of an Aptian *Tonohamites* (group of *T. decurrens* Roemer and *T. proteus* Spath, 1930). This, however, again has a convex dorsum.

IV. APTYCHI.

There are about 75 aptychi in the new collections, the great majority of them being opercula of *Aspidoceras* (so-called " *Laevaptychus* "), whereas only seven belonged to Oppelids (" *Lamellaptychus* "). The comparatively few specimens that were collected *in situ* in the Daghani Section have already been listed. The use of specific names for aptychi is to be deprecated, and I am not now referring, for example, the thin form of the highest zone ($p=\varphi$.204) to *Laevaptychus meneghinii* (Zigno) just because it is thinner than the forms from the lower beds. Trauth (1931, p. 71) considered that *L. meneghinii* differed from *L. latus* merely in a decreased thickness-ratio, and that both ranged from the Upper Oxfordian to the Tithonian. But no species of *Aspidoceras* has such a long range, and, while the common English Kimmeridge Clay (*eudoxus* zone) aptychi of the " *latus* " group (really *L. flamandi* Thurmann sp.) are comparatively thin, there are many thick forms in the much later Solnhofen flags (*steraspis* zone). There is thus apparently no stratigraphical significance in the occurrence of only thin aptychi in the highest bed at Daghani, and in the absence of the forms of *Aspidoceras* to which they belonged it is mpossible to use the specific name " *latus* " in more than a very wide sense, i.e. as an equivalent of *Laevaptychus*.

It is not even probable that Parkinson's (1811, pl. xiii, figs. 9, 12) type came from the English Kimmeridge Clay, and aptychi certainly do not occur in Hampshire, as H. v. Meyer and Trauth have stated. It is also clear that "*A.*" *latus* cannot at the same time belong to *Euaspidoceras*

perarmatum of the Argovian, to *Physodoceras circumspinosum* of the Lower Kimmeridgian (subzone of *Sutneria platynota*), to *Aspidoceras longispinum* of the *pseudomutabilis* (=*eudoxus*) zone and to still other ammonites occurring as high as the Tithonian or top of the Jurassic.

The aptychus here figured (Plate XXV, figs. 7*a–d*) is one of a suite of well-preserved examples from near Bihendula, but they were not collected *in situ*. This figured example is slightly more elongated than the two aptychi from the same locality figured by Stefanini (1925, pl. xxviii, figs. 3, 4), both of which were left by Trauth in *A. latus*. There is, however, considerable variability in shape, and these *A. latus* are associated with equally thick examples which I cannot separate from *A. obliquus* Quenstedt (No. 188), *A. hoplisus* (No.190) or *A. pippini* Oppel (No.184). Now all these have a wide internal (dorsal) margin which meets the equally broad symphysal margin in a conspicuous edge, about 4 mm. long, in the figured specimen. This edge, at the apex (in Trauth's sense), is well seen in Parkinson's figure as well as in Stefanini's figs. 3*a* and 4*a*, and in Oppel's *A. pippini* (1863, pl. lxxii, figs. 1*c*, 3*c*) and *A. hoplisus* (*ibid.*, pl. lxxiii, fig. 4*b*). In the English examples, on the other hand, a triangular internal margin meets the symphysal edge in a more or less acute point ; and all the large and most of the small specimens examined from Kimmeridge, Ringstead Bay, Devizes, or Ely, are thin.

One of the exceptional and slightly thicker forms is possibly the *A. latus* figured by Damon (1888, pl. xiv, fig. 5), if the specimen (B.M., No. C.3320) doubtfully marked by Crick is the original ; but it is somewhat worn and rather suspect, like other specimens stated by Damon to have come from " Weymouth." In any case, it seems to me unnatural to pick out forms of the thin *flamandi* type of the *pseudomutabilis* zone, the thick *latus* group of the *steraspis* zone and the gigantic forms of the *meneghinii* group of presumably still higher beds (see Zittel, 1870, p. 17), and to unite them in purely morphological units, based on measurements of length and breadth.

The example here figured is then rather close in outline to what Trauth (1931, p. 40) would include in *L. longus* (Meyer), e.g. forms like the small example figured by Quenstedt (1849, pl. xxii, fig. 13), previously recorded from Somaliland (Spath, 1925, p. 153). According to Meyer (1829, p. 129), however, *A. laevis longus* is also thinner than *A. laevis latus*, whereas the Somaliland example is characterised by unusual thickness. Trauth admitted that this difference in thickness did not always apply, and could not be used as a distinguishing feature between the two " species." But it would be difficult to prove that *A. longus*, as understood by Trauth on the one hand, and Meyer's original on the other, are identical, or that either belonged to a different form of *Aspidoceras* from that to which *A. latus* belonged, not to mention the innumerable transitions between the two ; and aptychi with identical proportions in extra-European areas may belong to species that have been given yet other distinct specific names. Thus in Kimmeridge Bay, where the *Aspidoceras*-bearing beds are exposed on the ledges of the foreshore for only a few square yards, it is not unusual to find the aptychi *in situ* in the crushed shells of *Aspidoceras* ; but, though the latter may be attached to various forms of the *longispinum* group according to the differences in tuberculation, the aptychi do not differ appreciably. Unfortunately, there are as yet very few observations on the variability of aptychi in a given ammonite species, although *Aspidoceras hoplisum* and *Waagenia autharis* (Oppel) apparently are not too scarce to allow of such investigation. The inclusion of the aptychus of the latter form in a different group of *Laevaptychus* from that of *Waagenia hybonota* merely because it is more slender seems to me an intolerable systematic confusion. It may be doubted whether subgenera of *Bufonites* (Deluc, 1800, or whichever name has priority before

Trigonellites Parkinson, 1811, and *Aptychus* H. v. Meyer, 1829) are wanted for the opercula of different ammonite genera ; but surely those of discoidal species of *Waagenia* and of globose *Aspidoceras* should be kept separate, especially since they are also dissimilar.

The same principles apply to the lamellose aptychi of the Oppelids. They are well known for e.g. species of *Taramelliceras* (*A. euglyptus*), *Fontannesiella* (*A. lithographicus*) and *Neochetoceras* (*A. steraspis*), or for *Haploceras elimatum* (*A. beyrichi*), but their separation from the earlier " *Cornaptychus* " or the contemporary " *Punctaptychus* " is as yet very problematical. In the circumstances it is not advisable to treat the few forms of " *Lamellaptychus* " known from Somaliland with an artificial accuracy and compare their measurements with those of published figures. It must suffice to state that in the soft shales of *p* (=φ.204) two types of *Lamellaptychus* seem to occur, of which one compares well with *L. bous* (Oppel) (1863, pl. lxx, fig. 1), but is not so coarsely ribbed as *L. euglyptus* (*ibid.*, fig. 5), although it has its deep internal excision. A form of the latter group occurs in *k* (=φ.209), and also on a loose boulder found in the Daghani River and covered with valves of *Aulacomyella*. The small forms of the second type are not definitely identifiable and are, perhaps, only small specimens of the first (*bous*) group. Another form of *Lamellaptychus*, from bed σ.217, associated with two doubtful fragments of Perisphinctids, is characterised by a conspicuous smooth and slanting lateral facet, more distinctly defined than in *A. beyrichi*, figured by Favre (1880, pl. iii, figs. 17–19), and proportionately much wider in the middle. The presence of this facet may be due partly to the smallness of the specimen (length = 8 mm.), and partly to its excellent state of preservation ; for the *imbricati* are generally crushed or incomplete at the lateral margin, and I cannot recall an illustration showing it so conspicuously, except, perhaps, Pictet's (1867, p. 124, pl. xxviii, fig. 11) *A. malbosi*. This, however, is a " *Punctaptychus* " of a different group.

V. JURASSIC BELEMNITES.

a. ***Belemnites from the Daghani Section.***

These have also already been listed and discussed (Spath, 1933, pp. 661 &c.) in connection with the belemnites of Kachh, and I am now figuring a few of the more important types. The very slender species of *Belemnopsis* from bed *p* (φ.204), previously recorded as new, is unusually acicular, i.e. less tapering and more cylindrical even than the *B. kuntkotensis* here figured (Plate XXIV, fig. 4), but, as it is available only in fragments and occurs in association with others that cannot satisfactorily be separated from *Belemnopsis* like *B. tanganensis* or *B. gerardi*, except by their small size, it cannot now be named.

The species of *Rhopaloteuthis* found in the same bed (Plate XXIV, fig. 6) is larger than *R. sauvanausa* (d'Orbigny) as figured by Pillet and Fromentel (1875, pl. i, fig. 2), but has a similar eccentric mucro ; only if the Lémenc form has an alveolus that reaches almost to the apex of the guard, then the form here described is closer to d'Orbigny's (1843, pl. xxi, figs. 1–3) original *B. sauvanausus*, although this is far more hastate. The (presumably Callovian) paratype of Waagen's *Belemnites oldhamianus* (1873, p. 15, pl. i, fig. 5 only), which I have shown to be distinct from *Conobelus*? *oldhamianus* (*ibid.*, fig. 6), is also comparable. It is slightly shorter and still distinctly depressed at the alveolar end, whereas the figured Somaliland example, after being first strongly flattened, becomes almost circular in cross-section at a corresponding stage (upper end of fig. 6, Plate XXIV). *B. argovianus* Meyer, mentioned by Waagen, is far less like the form here dealt with than *R. sauvanausa*, but, as I am now discussing individuals and not species, detailed description of both the Somaliland and the Kachh forms must await the discovery of more material.

The *Belemnopsis* previously recorded as *B.* cf. *tanganensis* (Futterer) from bed *m* (=φ.207) is represented by a single small fragment ; like the higher form mentioned above, it has a short groove, ending some way from the apex, but this is apparently of no significance. For in the example figured in Plate XXIV, figs. 4*a*, *b*, from the still earlier bed *k* (=φ.209) the groove reaches almost to the apex, while in others it is even shorter than in those from higher beds. This figured example is now attached to *B. kuntkotensis* (Waagen) rather than to *B. tanganensis*, because it is somewhat less hastate and more conical than either Futterer's types and the Meragalleh example previously figured (Spath, 1927, pl. i, fig. 3) or the form occurring in bed *e* (=φ.241), now illustrated in Plate XXV, fig. 2. I formerly considered that this earlier form could be distinguished from the similar, if perhaps smaller, belemnites of higher beds by its deeper and wider groove (of irregular length), but large fragments, essentially like Stefanini's (1925) pl. xxvii, figs. 7–8, occur apparently throughout a thickness of 870 feet (beds *k–d*), and it is very doubtful whether the small differences that could be found in these guards are of specific importance.

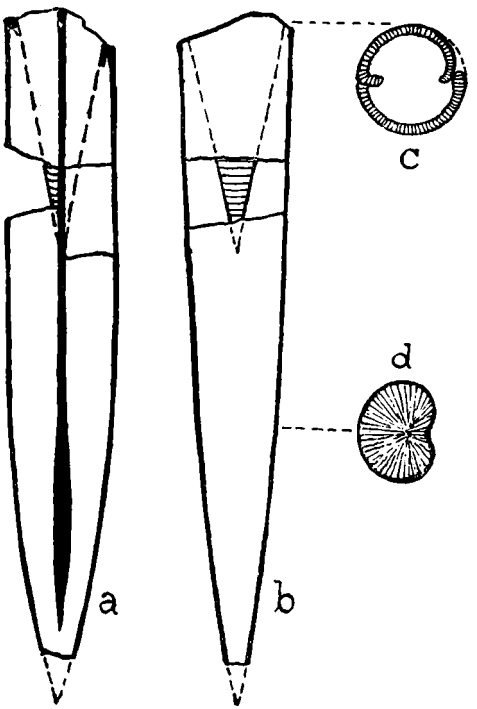

Fig. 2. *Belemnopsis orientalis* (Waagen). Ventral (*a*) and lateral (*b*) views with cross-sections, showing displacement at alveolar end (*c*), which causes apparently less conical shape than type. (No. 461, S.P.C. Coll.), Daghani Section, bed *g* (=φ.213).

Associated with *B. kuntkotensis* in bed *k* there also occur *B. macfadyeni* sp. nov., described below (Plate XXIV, fig. 2), and *Dicoelites stefaninii* sp. nov., characterised by its wide dorsal furrow being confined to the apical half of the guard (Plate XXV, fig. 3).

In bed *i* (=φ.211) fragments of large *Belemnopsis tanganensis* (? or *B. gerardi* Oppel sp.) are plentiful, while there is only one from *h* (=φ.212). The former is probably the horizon of the specimen in the Farquharson Collection, which I figured in 1927 (pl. i, fig. 3*b*), but the slender *B. kuntkotensis* figured from bed *k* (Plate XXIV, fig. 4) also occurred already in *i*.

Similar fragments of large *B. tanganensis* are found again in bed *g* (=φ.213), where they are associated with a shorter form (Text-fig. 2) which I previously recorded as *B. orientalis* (Waagen). In side-view it has the conical shape of this species, and also its shallow groove ; but the ventral aspect is somewhat hastate, owing to displacement at the alveolar end and the usual flattening at the lower third. It will be seen that it is far less slender than *B. gerardi* or *B. alfurica* (Boehm), while differing from the more elongated *B. macfadyeni*, as also from the shorter Kachh form I figured in 1931 (pl. cxvii, fig. 6), in its conical shape.

The form from the next lower bed (*e*=φ.214), which is now figured (Plate XXIV, figs. 3*a*, *b*) as *B.* aff. *orientalis* (Waagen), has a deeper groove than the type or the form from bed *g*, and this groove reaches to the apex.

Unfortunately, as there is again only a single example, it is impossible to appraise the value of this difference, and the belemnite (No.467) listed as a more conical species than *B. tanganensis*, from the same bed *e*, is also unique. It is comparable to the form figured in Text-fig. 2, but the hastate shape is natural, and not due to displacement of the thin alveolar end. The form is thus somewhat intermediate between *B. orientalis* and *B. gerardi* and its allies. The examples of *B. tanganensis* from *e* do not seem to differ from those of the higher beds above discussed.

The lowest belemnite assemblage, from bed *d* (=φ.215), consists only of a few fragments, but it still includes *B. tanganensis* in addition to the form also found in *e* which was described as being intermediate between *B. orientalis* and the *gerardi* group. This assemblage is thus still closely allied to that from the overlying beds and is probably still of Upper Argovian age.

It is unfortunate that no belemnites have been collected *in situ* in the lower beds, for, as Dietrich (1933, p. 23) has recently again shown, the exact age of *B. tanganensis* (as also of *B. gerardi*) is still doubtful, and the pre-Kimmeridgian or pre-Upper Argovian beds of Kenya are also incompletely explored or feebly developed, at least down to the Callovian.

b. ***Belemnites from other Localities.***

There is a very large number of examples of that belemnite which was figured by Weir (1929, p. 18, pl. iii, fig. 25) as *Belemnites sauvanaui* d'Orbigny, but which I previously (1927, p. 18) considered to be probably identical with Oppel's *Conobelus conophorus* (see Zittel, 1868, p. 34, pl. i, figs. 4, 5). The only Bihendula examples (B.M., Nos. C.25916–17) which were then before me, however, had no phragmocones, and it is on the strength of the new, well-preserved Somaliland material that I (1933, p. 665) have been able to prove the siphuncle to be on the same side as the ventral groove. The belemnite, therefore, is not a *Conobelus* but a *Rhopaloteuthis*, and I have referred it to the group of *Rhopaloteuthis spissa* (Gilliéron).

An example of this new species (*R. somaliensis*) is now figured (Plate XXV, figs. 4*a*, *b*) and described below. Unfortunately, its exact horizon is unknown. Typical examples as well as the slender variety, from " north of the Rest House, Bihendula," are marked " Bihen Limestone," and others, from " near Bihendula," are labelled " most probably Bihen Limestone." But over a hundred specimens from the same locality (and preserved in the same black calcite with often an orange matrix in the alveolus) are marked " most probably Meragalleh Limestone." This does not agree with Dr. Macfadyen's statement (1933, p. 28) that belemnites " are common in the Gahodleh Shales instead of appearing for the first time in the Wanderer Limestone " ; and since there are examples of *R. somaliensis* from Ambal (B.M., Nos. C.30194–5) I am inclined to think that it is of Middle Kimmeridgian age, like the ammonites discussed on p. 211 ; i.e. that the horizon of this species is probably not greatly different from that of the much larger *R.* sp. ind. (Plate XXIV, fig. 6).

In association with *R. somaliensis*, in the Bihendula assemblages just mentioned, there were found *Belemnopsis* cf. *tanganensis*, in thin, slender examples, and larger fragments of more robust specimens; also a large number of examples of the Bihendula form figured by Stefanini (1925, pl. xxvii, fig. 10) as *Belemnites latesulcatus* d'Orbigny, and recorded by Weir (1929, p. 18) from Ambal. I at first took these to be specimens of *B. tanganensis* with the apex worn away by weathering, and some may be thus worn; but the lateral lines are very distinct almost down to the rounded point, in some well-preserved individuals, and the ventral groove is too short and too shallow for comparison with Futterer's slender species. This form is, therefore, now also described under a new name (*Belemnopsis sublatesulcata* sp. nov. Text-figs. 3*a*, *b*, p. 221).

It is associated with three more belemnites in the different collections from Bihendula, namely *Duvalia* aff. *ensifer* (Oppel) Zittel sp. (Plate XXIV, figs. 5*a*, *b*), *Hibolites* cf. *semisulcatus* (Münster) (see Spath, 1927, pl. iii, fig. 2), and *Rhopaloteuthis* sp. ind. (Text-fig. 3*c*, p. 221). They are all, unfortunately, represented only by single examples and cannot, therefore, be described in detail. But the first (B.M., No. C.30239) may well be a forerunner of Oppel's species, at least as interpreted by the two *Diphya*-Limestone specimens figured by Zittel (1868, pl. i, figs. 9 and 11). It is more inflated than either and differs sufficiently in shape to receive a new name when more material, collected *in situ*, becomes available. The last (*Rhopaloteuthis* sp. ind.) is difficult to place since it appears to be connected by transitions with the slender variety of *R. somaliensis* sp. nov. on the one hand and *Belemnopsis sublatesulcata* on the other, the groove, although short, being wide. None of these passage-forms, however, is complete enough for definite identification and the distinctness of the groove may be merely dependent on the state of preservation.

The example of *Hibolites* cf. *semisulcatus* (B.M., No. C.30240) does not seem to differ from Stefanini's *Belemnites sauvanaui* (1925, pl. xxvii, fig. 9) and has the double lateral lines very well marked. But it shows neither groove nor alveolus at the same size and there is no asymmetry of the guard.

c. ***Description of New Species of Jurassic Belemnites.***

Family **BELEMNITIDAE** d'Orbigny.

Subfamily **BELEMNOPSINAE** Naef, emend.

Genus **Belemnopsis** Bayle, 1878.

1. **Belemnopsis macfadyeni** sp. nov. Pl. XXIV, figs. 2*a*, *b*.

1933. *Belemnopsis* aff. *tanganensis* (Futterer), depressed form with narrow groove; Spath, p. 812.

DIAGNOSIS.—Rostrum long, very slightly hastate, almost tubular, with nearly circular cross-section at alveolar end, but considerable depression at lower third; ventral flattening beginning a few millimetres from pointed apex. Ventral groove narrow, reaching to apex, with angular borders, but becoming shallow for a short distance at lower fifth of the guard. Alveolus occupying one-third of the length of the guard; alveolar angle 16°. Lateral lines present.

DIMENSIONS.—

Length of guard	122 mm.
Length of alveolus	39 mm.
Diameter (ventro-dorsal) at alveolar end	13·5 mm.
Diameter (lateral) at alveolar end	15 mm.
Diameter (ventro-dorsal) at lower third	13·5 mm.
Diameter (lateral) at lower third	17 mm.

OCCURRENCES AND MATERIAL.—φ.209, Daghani, near Bihendula ; Lower Kimmeridgian ; the holotype (B.M., No. C.42143, S.P.C. Coll.) and 2 doubtful specimens (S.M., Nos. 402, 403, S.P.C. Coll.). Eilo Range ; 2 doubtful specimens (B.M. Nos. C.9276*a*, *b*, Major Leckie Coll.).

REMARKS.—The specimens here associated with the holotype are doubtfully referred to the same species because they are incomplete. One example (No. 403), with an eccentric point, is more depressed and slightly more hastate and thus suggestive of *Rhopaloteuthis* ; the two Eilo Range specimens, associated with two fragments referred to *B. tanganensis*, are more conical, and could be attached to *B. orientalis*, above discussed, but for the narrow groove. How far the character of this groove can be relied on for specific distinction is as yet doubtful. The two examples of *B. taliabutica* figured by Boehm (1907, pl. xi, figs. 5*b* and 6*b*) seem to differ widely in the width of the groove, yet Stolley (1929, p. 159) left both in the same " species." There does not seem to be any resemblance between the numerous Timor forms figured by this author and the Somaliland species here described.

2. **Belemnopsis sublatesulcata** sp. nov. Text-figs. 3*a*, *b*.

?1925. *Belemnites* (*Belemnopsis*) *latesulcatus*, d'Orbigny ; Stefanini, p. 156, pl. xxvii, fig.10.

1929. *Belemnites* (*Belemnopsis*) *latesulcatus*, d'Orbigny ; Weir, p. 18, pl. v, fig. 21.

DIAGNOSIS.—Rostrum short, subclavate, with blunt apex ; cross-section slightly depressed at lower third, but more circular or (on account of faint lateral compression) subquadrate in alveolar region. Ventral groove broad and tending to become very shallow towards apex, which it does not reach. Lateral lines distinct. Alveolus one-third the length of the whole guard ; alveolar angle 21°.

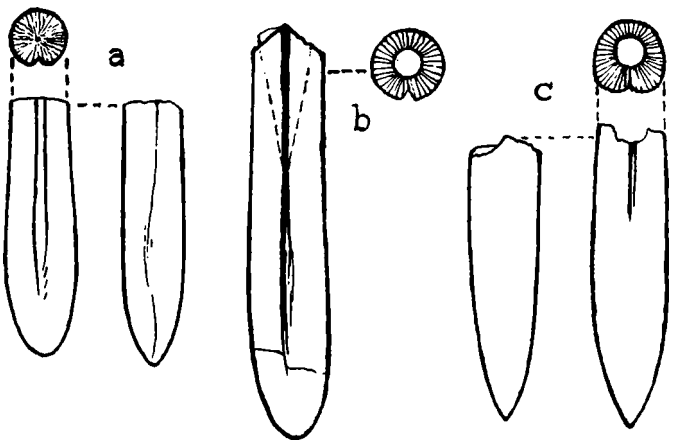

Fig. 3. (*a*, *b*). *Belemnopsis sublatesulcata*, sp. nov. Holotype (*b*) and paratype (*a*). B. M. Nos. C.42153, C.42145 (S.P.C. Coll.). Near Bihendula. (*c*) *Rhopaloteuthis* sp. ind. Side and ventral views with cross-section showing position of alveolus nearer dorsal side. B.M., No. C.42144 (S.P.C. Coll.). Near Bihendula (see p. 220).

DIMENSIONS.—

Length of guard	53 mm.
Length of alveolus	18 mm.
Diameter (ventro-dorsal) at alveolar end ..	9 mm.
Diameter (lateral) at alveolar end ..	8·5 mm.
Diameter (ventro-dorsal) at lower third	9·3 mm.
Diameter (lateral) at lower third ..	11 mm.

OCCURRENCES AND MATERIAL.—Near Bihendula ; ? Lower Kimmeridgian ; the holotype (B.M., No. C.42153), the figured paratype (B.M., No. C.42145), and 11 other specimens in S.P.C. Coll. (S.P.C. Nos. 239, 329 ?, 358, 360, 363, 376, 378 ?, 379, 381, 385, 388), and one specimen in R.A.F. Coll. (B.M., No. C.30241). [Ambal, *fide* Weir.]

REMARKS.—It is not certain that the unique fragment figured by Stefanini belongs to the species here described ; for this occurs in association with examples of *Belemnopsis* (of the so-called *tanganensis* group) which, when worn, may resemble some of the more doubtful individuals of *B. sublatesulcata* (e.g. Nos. 243, 383). The true *B. latesulcata*, as interpreted by Riche (1893, p. 327, pl. ii, figs. 13–17) and Maire (1925, p. 10), is a more hastate form, with considerable depression, while *B. mulleri* (Gilliéron) (1873, p. 203, pl. viii, figs. 8, 9) has a more quadrate section.

Genus **Dicoelites** G. Boehm, 1906.

3. **Dicoelites stefaninii** sp. nov. Pl. XXV, figs. 3*a–c*.

1933. *Dicoelites* sp. nov., Spath, pp. 663, 812.

DIAGNOSIS.—Rostrum long and slender, acicular in young stage, later slightly hastate, with gently tapering apex ; cross-section depressed at thickest part of guard, with ventro-dorsal flattening, more circular at alveolar end. Long and wide ventral groove, reaching almost to apex ; wide but sometimes shallower dorsal groove, not distinct in alveolar region, but occasionally becoming visible again as a faint line near anterior end. Dorsal groove generally ending farther from apex than ventral one, but in some apical halves it is impossible to distinguish the two sides. Lateral lines present. Alveolus approximately one-quarter to one-fifth of the length of the guard ; alveolar angle about 18°.

DIMENSIONS.—

	Holotype	*Paratype I* (*No.* 490)	*Paratype II* (*No.* 486)
Length of guard in mm.	72	75?	76
Length of alveolus in mm.	?	16	16
Ventro-dorsal diameter (maximum) ..	5·5	7	6·5
Ventro-dorsal diameter (at alveolar end) ..	5·67	7	7
Lateral diameter (maximum)	6·5	8	8
Lateral diameter (at alveolar end) ..	5·67	6·75	6·75

OCCURRENCES AND MATERIAL.—Lower Kimmeridgian, bed *k* (=φ.209), Daghani Section ; also from locality E, near Bihendula, and from Wanderer Spring (Upper Shales) ; the holotype (B.M., No. C.42149) and several other specimens in S.P.C. Coll. (S.P.C. Nos. 418, 486–8, 490–2, 493 (19 fragments)).

REMARKS.—This species cannot be compared with the conical forms of *Dicoelites* to which Stolley (1929, p. 196) would restrict the generic name, and his slender and more cylindrical "*Prodicoelites*," assumed to be of pre-Callovian age, are charcterised by a short, alveolar, dorsal furrow. *D. dicoelus* (Rothpletz) (1892, p. 105), the type of *Dicoelites*, was itself described as having a dorsal furrow which, though pronounced, was neither so deep nor so long as the ventral groove, and which never seemed to come far below the alveolus. In *D. littlei* Stefanini (1925, p. 152, pl. xxvii, figs. 4–6) the dorsal furrow is slightly shorter than the ventral, as in some examples of the form here described, but it is well marked and relatively deeper than the ventral groove in the sub-alveolar region. Moreover, the furrows are narrow, whereas in the

present species they are both very wide and shallow, and the dorsal one is marked almost only on the apical half of the guard. Mlle. E. Basse (1930, p. 123) may have taken *D. stefaninii* to be the young of *D. littlei*, since she speaks of the hemicylindrical grooves being remarkably well developed.

I have elsewhere discussed the insignificance for classificatory purposes of the presence of a faint dorsal groove at the alveolar end only, since this may be found in individuals of certain *Belemnopsis* as well as in some examples of *D. stefaninii*. The latter occurs together with abundant *Belemnopsis* of the *tanganensis* group, some of which show a slight dorsal groove at the anterior end, like the Kachh examples I figured (1931*b*, pl. cxxiv, figs. 6*b*, 8*b*). There is almost perfect identity in all features, except the dorsal groove of the apical half in *D. stefaninii*, and this small species and the large *D. littlei* are thus probably more closely related to certain *Belemnopsis* than to the earlier *Dicoelites* of the *kieuwensis–meyrati* group, or to *D. dicoelus* and its allies with an alveolar furrow. In Rothpletz's figs. 9 and 9*b* of *D. dicoelus*, however, the width of the furrows is as striking as in *D. stefaninii* and the accidental inversion of the figures enhances the similarity.

Subfamily **DUVALINAE** Pavlow.

Genus **Rhopaloteuthis** Lissajous, 1915.

4. **Rhopaloteuthis somaliensis** sp. nov. Pl. XXV, figs. 4*a*, *b*.

1929. *Belemnites* (*Belemnopsis*) *sauvanaui*, d'Orbigny ; Weir, p. 18, pl. iii, fig. 5.
1933. *Rhopaloteuthis* (*Belemnopsis*) *sauvanaui* (d'Orbigny) Weir ; Spath, p. 665.

DIAGNOSIS.—Rostrum very short, subclavate, with apex more or less sharply pointed ; cross-section circular, occasionally with slight lateral flattening. Ventral groove longer or shorter than alveolus, narrow and deep only at anterior end and sometimes disappearing only very gradually towards apex ; lateral lines present. Alveolus two-thirds to three-quarters of the length of the guard or less (one-half in var. *attenuata*) ; alveolar angle 20°.

DIMENSIONS.—

	Holotype.	*Paratype I* (*No.* 251).	*Paratype II* (*No.* 253).	*Holotype of var. attenuata.*
Length of guard in mm.	31	33	32	30
Length of alveolus in mm. ..	21	22	24	15
Diameter (greatest) in mm. ..	9·67	10·25	9·5	7·25
Diameter (at alveolar end) in mm.	9.5	9·33	9·5?	7

OCCURRENCES AND MATERIAL.—Lower Kimmeridgian (?), Bihendula ; the holotypes of the species (B.M., No. C.42147) and of the var. *attenuata* (B.M., No. C.42146) and 114 other specimens in S.P.C. Coll. (S.P.C. Nos. 234–259, 261–316, 318–388, *pars*), and 2 specimens in R.A.F. Coll. (B.M., Nos. C.25916–7). Ambal ; 2 specimens in R.A.F. Coll. (B.M., Nos. 30194–5). [Daras, *fide* Weir.]

REMARKS.—This species shows great variability and the example figured by Weir seems to have little resemblance to the holotype (Plate XXV, fig. 4). In the latter, and still more so in paratype II, as in Weir's example, the point is sharp, while in the more elongated var. *attenuata* the shape is still more hastate and the apex long and pointed.

There are also specimens (e.g. Nos. 350 and 357) with a more conical shape, and in one of them the ventral groove is unusually long and distinct. These, however, are all connected with the typical examples by passage-forms (if one can speak of passage-forms when dealing

with belemnite guards), and it seems impossible to divide this apparently homogeneous assemblage up into a number of morphological "species." Moreover, since they were purchased from the Arabs, and probably were collected at different spots near Bihendula, it would be inadvisable to increase the large number of belemnite species of doubtful horizon.

R. aenigmatica (d'Orbigny), as figured and described by Kilian (1887, p. 176, pl. iii, fig. 1) and Sayn (in Sayn and Roman, 1928, p. 199, text-fig. 32, p. 200), is remarkably similar, but more inflated.

VI. CRETACEOUS BELEMNITES.

The two fragments of *Hibolites*, *Mesohibolites*, or *Neohibolites* already recorded by C. Barrington Brown (1931, p. 264) and now in the British Museum (Nos. C.35185–6) are too incomplete for identification. Coming from the same bed as the ammonites above discussed (p. 214), they may be tentatively attached to a species like *H. subfusiformis* Raspail (see d'Orbigny, 1840, pl. iv, figs. 9–16), which, according to Kilian (1910, p. 244, and table to p. 278), occurs together with Holcodiscids (and *Orbitolina*) in the Barremian, although it is found also in lower beds. *Mesohibolites minaret* (Raspail), as figured by Uhlig (1882, pl. i, figs. 8, 9), seems somewhat less slender than the Somaliland fragments; the latter, however, are only apical portions without trace of a groove.

VII. NAUTILI.

There are only two Jurassic nautili before me, as compared with 110 Tertiary examples. One fragment of a *Paracenoceras* of the *hexagonum* group (B.M., No. C.7394) has already been referred to in 1927 (p. 29) as resembling *P. hexagonoides* Spath, being more depressed than the true *P. hexagonum* (J. de C. Sowerby) at the same diameter. But this fragment is too small for definite identification and its horizon is unknown. The second example is now described as a new species:—

Family **NAUTILIDAE** Owen, emend.

Subfamily **PARACENOCERATINAE** Spath.

Genus **Paracenoceras** Spath, 1927.

Paracenoceras prohexagonum sp. nov. Text-fig. 4.

DIAGNOSIS.—A *Paracenoceras* like the genotype (*P. hexagonum*), but with wider and more distinctly sulcate periphery at same diameter, concave sides, more pronounced ventro-lateral and umbilical edges, and higher and less rounded umbilical slope. Siphuncle near dorsal margin. Septa closely spaced, with sinus forward at umbilical and ventro-lateral edges more pronounced than in *P. hexagonum*. Ventral sinus (directed backward) rather deep. Ornamentation of test unknown.

DIMENSIONS.—

Diameter in mm. (restored)	105
Whorl-height (in % of diameter) ..	·52
Whorl-thickness (in % of diameter) ..	·57
Umbilicus (in % of diameter)	·12

OCCURRENCE AND MATERIAL.—Bihendula (locality φ.3); Bihen Limestone (probably Lower = I (*a*) of section on p. 208), Bathonian ?; the holotype (B.M., No. C.36200, S.P.C. Coll.).

REMARKS.—This species is named, not so much because the Somaliland fragment differs from all the forms of *Paracenoceras* previously discussed (1927, p. 26, etc.), but because a name is wanted for the early (Bathonian) forerunners of the Argovian *P. hexagonum*. These are known from the Stonesfield Slate (B.M., Nos. C.1096*a* and C.8011*a*, *b*), while a Ranville (Normandy) specimen from the Tesson Collection (B.M., No. 37023) probably also belongs to this species, although it is less closely septate (at a much smaller diameter). This French

example was labelled first *Nautilus latidorsatus* d'Orbigny and then (by Foord) *N. clausus* ? d'Orbigny, but its concave sides and broad, sulcate periphery characterise it as a forerunner of the *hexagonum*-group.

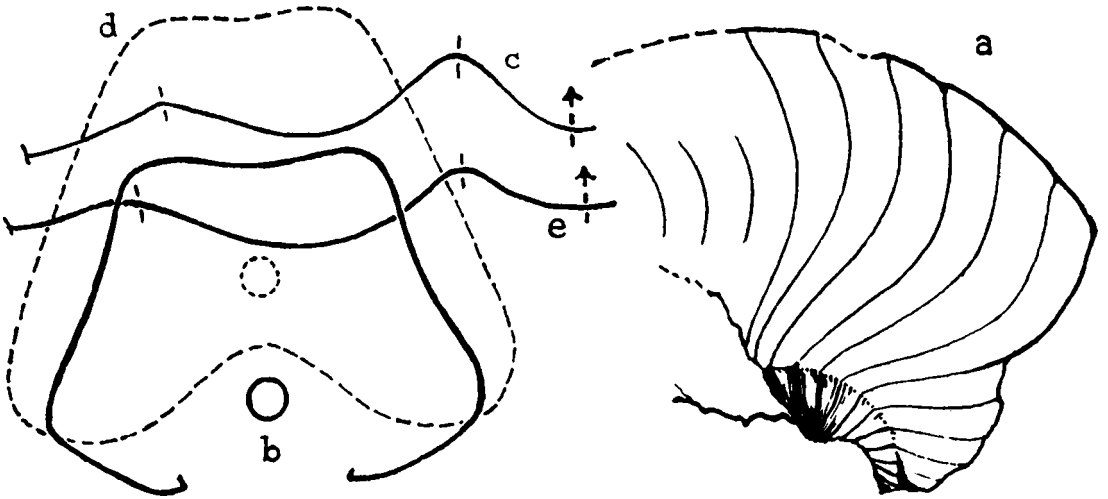

Fig. 4. (*a–c*). *Paracenoceras prohexagonum* sp. nov. Holotype fragment (*a*) with outline whorl-section at smaller end (*b*) and septal edge (*c*). B.M., C.36200 (S.P.C. Coll.), Bihendula (Lower ? Bihen Limestone). (*d, e*). *P. hexagonum* (J. de C. Sowerby). Outline whorl-section (*d*) and septal edge (*e*) of inner whorls of a large typical example (B.M., No. 88979) from the Calcareous Grit of Marcham, near Abingdon, Berks.

P. dorso-excavatum (Parona and Bonarelli) (1895, p. 82, pl. ii, fig. 1) differs chiefly in having a less prominent umbilical shoulder and less curved septal edges. *P. ennianum* (Dacqué) (1905, p. 144, pl. xvii, fig. 5) and its close ally *P. hexagonum* (J. de C. Sowerby), as here interpreted (Text-figs. 4*d*, *e*), also have different suture-lines and a different whorl-shape, while *P. kumagunense* (Waagen) (see Spath, 1927, p. 26) has a narrower periphery and flat whorl-sides.

VIII. STRATIGRAPHICAL AND PALAEONTOLOGICAL RESULTS.

The ammonite faunas of Somaliland have only recently (Spath, 1933, p. 810) been discussed in detail and correlated with those of Kenya and Kachh. There is little of importance to add to this summary, and the value of such new evidence as is afforded, for example, by the single Nautilus (*Paracenoceras prohexagonum*) from the Bihen Limestone must not be overrated. For such an isolated *Nautilus* is likely to be found in almost any Jurassic formation, and neither its Bathonian age nor its affinity with the European forms referred to above is definitely established.

The general correlation, therefore, is still tentative :—

Gawan Limestone.	Portlandian (and Tithonian ?).
Daghani Shales.	Middle and Lower Kimmeridgian.
Wanderer Limestone.	Lowest Kimmeridgian ?
Gahodleh Shales.	Argovian.
Bihen Limestone (Upper).	Divesian.
Bihen Limestone (Lower).	Bathonian ?

Also, since there are so many gaps in the succession (see pp. 206–8), it is not possible to fix the limits of the different stages more definitely. It will be noticed that the indeterminable ammonoid remains from horizon *e* (=φ.214) are not now included in the Lower Kimmeridgian,

as they were in Dr. Macfadyen's first correlation (pp. 28, 60), although the belemnites are comparable to those from beds above ; but whether the Lower Bihen Limestone fauna is Callovian or Bathonian, or includes representatives of both these formations, cannot be decided from the cephalopods so far found.

A correction is also necessary with regard to the *Anavirgatites* fauna, first recorded in 1925, and then referred to the Upper Kimmeridgian ("*palmatus*" zone). As already mentioned (p. 208), I am now inclined to include this in the Lower Portlandian rather than the Upper Kimmeridgian. For Schneid's Neuburg ammonites came from a considerable thickness of beds (over 130 ft.), and it seems probable that his *Anavirgatites palmatus* is not an early form. I took this species as the zone fossil for those Upper Kimmeridgian beds (below the clays with *Pavlovia* [*Pallasiceras*] *rounda*) that (following Salfeld) had generally been considered to contain *Virgatites*. But detailed collecting in the 850 ft. of Upper Kimmeridge Clay of the Isle of Purbeck during the last two years has already yielded enough material to show that the previous identifications were wrong. This is not the place to give the sequence in detail, and, without illustrations, it is useless to discuss these difficult Perisphinctids ; but I may add that in Bavaria, also, Roll (1933, p. 557) has now shown the Neuburg Beds to be separated from the Solnhofen *steraspis* zone below by some 330 ft. of limestones and marls (Reisberg Beds) in which ammonites occur that have never been described. There is thus scope for much more research, and, unfortunately, the Somaliland *Anavirgatites* beds are also separated by over 660 ft. of strata without recognisable ammonites from the presumed equivalent ($o = \varphi.205$) of the *steraspis* zone below.

It was previously noticed that there was scarcely a Kachh species listed from the Daghani Section. The other ammonites mentioned above from the various collections confirm the impression that, on the whole, the faunas differ specifically, as well as in general facies. I may here quote the following :—" Even when comparison has been made to Kachh species, as in some *Torquatisphinctes*, the associated *Idoceras* or thick aptychi indicate important faunal differences, and even the examples of *Waagenia* known from Somaliland are associated with species unknown in Kachh. This, no doubt, is partly a question of difference in age " ; and it might be held that " the two successions supplement each other, so that the Portlandian *Anavirgatites* fauna may yet be found somewhere in the higher Katrol Group, as the *Taramelliceras kachhense* fauna may yet turn up in Somaliland, but it seems to me now that the difference is due more to geographical causes, and that, while Kachh species were able freely to migrate among the isolated remnants of Lemuria to Madagascar and East Africa, the Somaliland and Abyssinian area was more open to the influx of European elements by way of a marine connexion across Northern Africa, as suggested already in 1925 (p. 161)."

Since this was written, Stefanini (1933, pp. 23–40) has described a number of Macrocephalitids, Perisphinctids (*Choffatia*, *Grossouvria*, *Subgrossouvria*) and *Hecticoceras* from Italian Somaliland that show a striking resemblance to Kachh forms, whatever their specific names. It is important to note that this resemblance is confined to Bathonian–Callovian forms, not known from British Somaliland. The few later ammonites recorded by Stefanini are compared to species known from Abyssinia, Jubaland and Kenya, but not from Kachh. Since, however, the beds at the top of the Argovian (*bimammatum* zone) and the lower part of the Kimmeridgian, so widespread in E. Africa, are poorly represented in Kachh, and since also there may be no true Lower Kimmeridgian at all, this difference is of little significance.

The ammonites described by Mlle. Basse (1930) may be briefly reviewed, although they do not include anything new or affect the general correlation. *Perisphinctes* (*Virgatosphinctes*) *dacquei* and the associated, but less characteristic, fragments from Tagfidadaedi apparently

belong to the same fauna as the ammonites (also preserved in a bright yellow matrix) from the neighbouring Tug Turfa. These were described by Crick already in 1897, and, when I referred to them (1925, p. 158), I attached them to Spiti Shales species ; their exact horizon in the Portlandian or Tithonian, however, is not yet known. In any case, if the ammonites show Tithonian affinities, as Mlle. Basse says, it is difficult to see how the limestone that yielded them can present a special, lithogical, facies of the " Sequanian–Kimmeridgian."

The Perisphinctids from Cabenaoua and the Bourka River, like those from the neighbouring localities Harro Rufa and Atchabo, described by Dacqué, are the usual Perisphinctids (with the exception of an unfigured " *Virgatites* cf. *dorsoplanus* ") and they are here referred to the Lower Kimmeridgian rather than to the Upper Oxfordian, on the strength of an *Idoceras* fragment (not *I. balderum* Oppel sp.) and some cellulose aptychi. At Dire-Dawa (Diré-Daoua) the same Perisphinctids of Oxfordian aspect are associated with *Aspidoceras* and *Simaspidoceras* (group of *Asp. argobbae* Dacqué) that have been taken to be of much later date. But it is possible that the ammonites from some localities, as for example from Dar As (No. 1), do not constitute a uniform fauna as formerly supposed (1925, p. 154), and that there is an admixture of Upper Oxfordian and Kimmeridgian forms at other places also.

Whether the " Sequanian–Kimmeridgian " ammonite fragments from Arabia (Yemen) are correctly determined seems doubtful, for *Virgatites* cf. *dorsoplanus* here again is clearly out of place. No doubt there were occasional, temporary transgressions in Upper Jurassic times over the Somali-Peninsula and Abyssinia as well as Arabia, but the faunas known from this last area are as yet too scanty to show how the connexion between the Mediterranean Sea and the Indian Ocean was effected. The European influence, if perhaps not predominant in the Somaliland ammonite faunas, is undoubtedly felt. But, as I stated in 1925 (p. 163), ammonites are remarkably independent of facies and of strikingly wide horizontal distribution ; unfortunately, our knowledge of the Somaliland Jurassic is as yet far too incomplete to act as a much-needed check on the European sequence.

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PLATES I to XXV

WITH EXPLANATIONS


b 1 a
2a
a 3 b
a 4 b
5
a b
a 6 b
2 b
No. 409.
Φ209

PLATE XXIV.

JURASSIC CEPHALOPODA.

(*Photographs by* H. G. HERRING. *All figures are of natural size.*)

Figs. 1*a*, *b*. *Idoceras farquharsoni* sp. nov. F.7, Daba Dulla, Bur Ad Range ; Lower Kimmeridgian. Holotype, Brit. Mus., C.30303, Farquharson Coll. (P.213.)

„ 2*a*, *b*. *Belemnopsis macfadyeni* sp. nov., lateral and ventral views. Bed. φ.209 (= *k*), Daghani ; Lower Kimmeridgian. Holotype, Brit. Mus., C.42143, S.P.C. Coll. (P. 220.)

„ 3*a*, *b*. *Belemnopsis* aff. *orientalis* (Waagen), lateral and ventral views. Bed φ.214 (= *e*), Daghani ; Argovian. Brit. Mus., C.42154, S.P.C. Coll. (P. 219.)

„ 4*a*, *b*. *Belemnopsis kuntkotensis* (Waagen), lateral and ventral views. Bed φ.209 (= *k*), Daghani ; Lower Kimmeridgian. Sedgwick Mus., S.P.C. Coll., No. 419. (P. 218.)

„ 5*a*, *b*. *Duvalia* aff. *ensifer* (Oppel) Zittel sp., lateral and ventral views. F.53, Bihendula ; ? Lower Kimmeridgian. Brit. Mus., C.30239, Farquharson Coll. (P. 220.)

„ 6*a*, *b*. *Rhopaloteuthis* sp. ; (*a*) lateral view with upper half in section, (*b*) ventral view with portion missing in (*a*) replaced. Bed φ.204 (= *p*), Daghani ; Middle Kimmeridgian. Brit. Mus., C.42152, S.P.C. Coll. (P. 219.)

PLATE XXV.

JURASSIC CEPHALOPODA.

(*Photographs by* H. G. HERRING. *All figures are of natural size.*)

Figs. 1*a*, *b*. *Prososphinctes inaequalis* sp. nov. F.7, Daba Dulla, Bur Ad Range ; Lower Kimmeridgian. Holotype, Brit. Mus., C.30312, Farquharson Coll. (P. 213.)

,, 2*a*, *b*, *c*. *Belemnopsis tanganensis* (Futterer), lateral and ventral views and cross-section at X. Bed φ.214 (= *e*), Daghani ; Argovian. Sedgwick Mus., S.P.C. Coll., No. 477. (P. 218.)

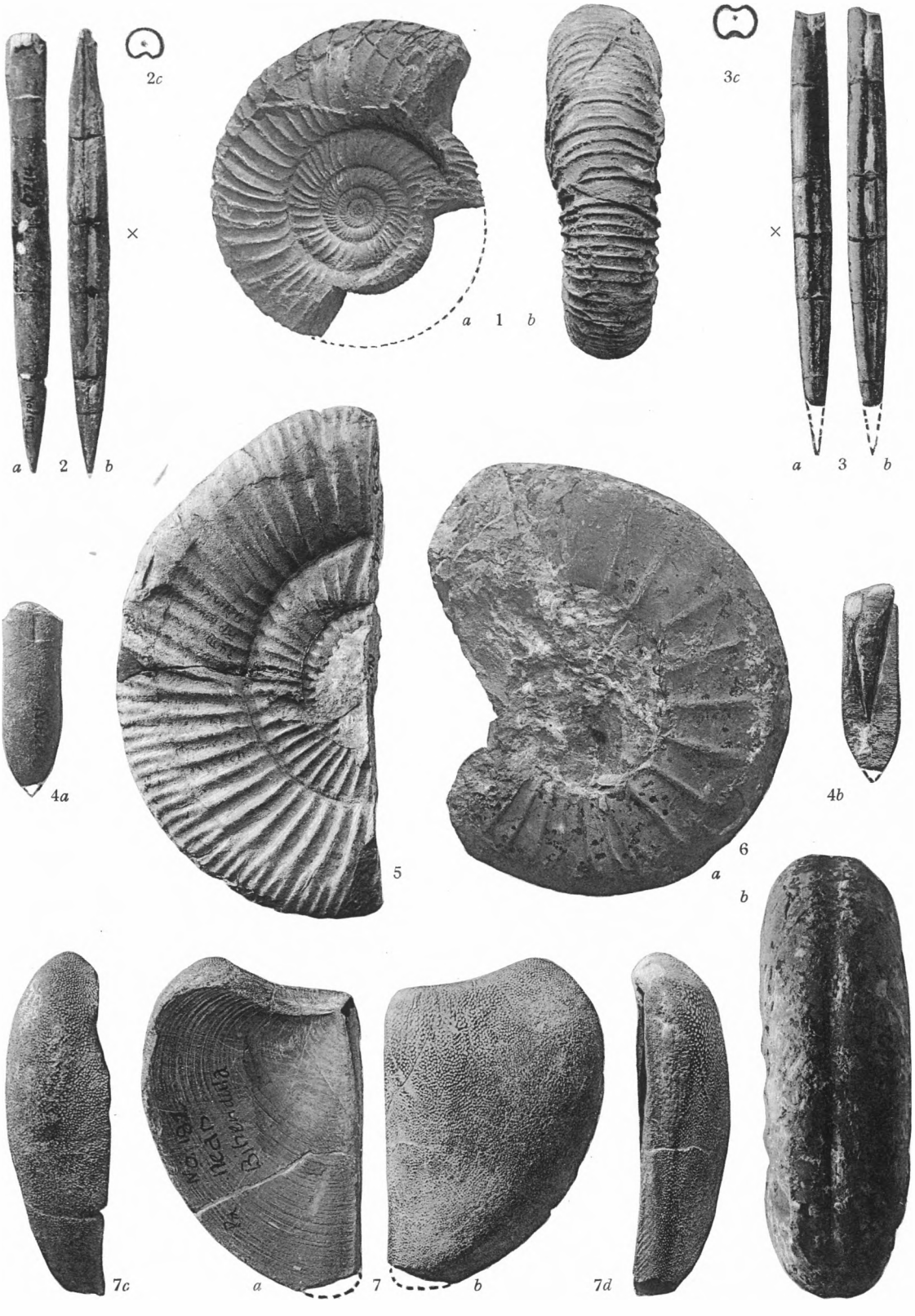
,, 3*a*, *b*, *c*. *Dicoelites stefaninii* sp. nov., dorsal and ventral views and cross-section at X. Bed φ.209 (= *k*), Daghani ; Lower Kimmeridgian. Holotype, Brit. Mus., C.42149, S.P.C. Coll. (P. 222.)

,, 4*a*, *b*. *Rhopaloteuthis somaliensis* sp. nov., lateral and section views (ventral groove on left of (*a*) and right of (*b*)). Bihendula district ; horizon uncertain (? Lower Kimmeridgian). Holotype, Brit. Mus., C.42147, S.P.C. Coll. (P. 223.)

Fig. 5. *Planites* aff. *polygyratus* (Reinecke) de Loriol sp., crushed fragment. Bed φ.213 (= *g*), Daghani ; ? Lower Kimmeridgian. Brit. Mus., C.36197, S.P.C. Coll. (P. 209.)

Figs. 6*a*, *b*. *Pseudoclambites costatus* sp. nov. σ.5, scarp south of Rest House, Bihendula ; ? Portlandian. Holotype, Brit. Mus., C.36196, S.P.C. Coll. (P. 214.)

Figs. 7*a*, *b*, *c*, *d*. *Aptychus* (*Laevaptychus*) *latus* (Parkinson). Bihendula district ; horizon uncertain (? Kimmeridgian). Sedgwick Mus., S.P.C. Coll., No. 181. (P. 216.)


2c
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