MONOGRAPH (No. III)

OF

THE FOSSIL REPTILIA

OF THE

KIMMERIDGE CLAY.

Order—SAUROPTERYGIA, *Owen*.

Genus—Pliosaurus, *Owen*.

The first* and second† Monographs relating to the *Reptilia* of the Kimmeridge Clay were mainly expository of the dental characters of *Pliosaurus*, and indicative of the gigantic size attained by some individuals of the genus. In the present Monograph I propose to treat of this genus more at large, and submit the evidences that I have obtained of its specific modifications.

The generic characters of the teeth, in regard to shape and structure, have been sufficiently exemplified in the first two Monographs: those of the skeleton are chiefly shown by vertebræ from the region of the neck. These resemble, at first sight, the vertebræ of the genus *Ichthyosaurus* in their extreme shortness as compared with their breadth and depth. A cervical vertebra of a *Pliosaurus*, from the Kimmeridge Clay of Foxcombe Hill, near Oxford, measures, for example, in breadth, six inches; in depth, or vertical diameter, five inches; while in length, or the diameter corresponding with the axis of the animal's body, or of its vertebral column, it measures only an inch and a half. Nevertheless, with these ichthyosaurian proportions is associated an essentially plesiosaurian type of structure. The lower surface of the cervical centrums show the pair of vascular foramina: the terminal articular surfaces are flat, not concave: the cervical rib was ligamentously tied, in some species, to two processes, the di- and par-apophyses,—occupying two thirds of the fore-and-aft extent of the side of the

* Vol. of Pal. Soc. for the year 1859; Monogr. of the 'Reptilia of the Kim. Clay,' pp. 15, 16, Pl. VII, 1861.

† Vol. of Pal. Soc. for the year 1860; Monogr. of the 'Reptilia of the Kim. Clay,' pp. 27, 28, Pl. XII, 1863 (1862 on the cover).

centrum, slightly projecting beyond the surface, and divided by a deep linear fissure. I have rarely seen an instance in which the neurapophyses were anchylosed to the centrum, and never one with the pleurapophyses so attached. In a specimen of *Pliosaurus* from the Kimmeridge Clay of Market-Downham, in the collection of C. B. Rose, Esq., F.G.S. (at Yarmouth), there are twenty of these short cervical vertebræ, at the trunk end of which series the costal processes begin to climb, as in *Plesiosaurus*, upon the neurapophysis,—the diapophysis growing at the expense of the parapophysis, until the rib becomes supported, in the dorsal region, upon a single strong and prominent process: this is subdepressed, with an oval transverse section, which is rather sharp at the anterior margin. The vertebral centrums begin to gain in length as the costal processes rise in position, and those of the dorsal region have attained to quite plesiosaurian proportions. Throughout the rest of the column the vertebræ closely repeat the plesiosaurian characters on a large scale. The sides, or non-articular surface of the centrum, are rugous near the articular ends, elsewhere smooth, and in the dorsal region longitudinally concave. In the caudal vertebræ the costal process is undivided, prominent, with a vertically elliptical section, continuous with the neurapophysial surface at the base of the tail: the lower surface of the centrum is square-shaped and nearly flat: its angles are marked by the hypapophysial surfaces, of which the anterior pair is usually the largest.

The generic character derived from the organs of locomotion is the apparent absence of the antibrachial and cnemial bones, which seem to be represented by a proximal row of three large "carpal" and "tarsal" ossicles. On the homology of these I shall offer remarks in the sequel.

As to the history of the present genus, I may briefly state that in a 'Report on British Fossil Reptiles,' communicated to the Meeting of the British Association for the Advancement of Sciences, held in 1839, and printed in the volume of 'Reports' for that year,* I described certain fossils, from which were deduced the two species of *Plesiosaurus*, called "*grandis*," p. 83, and "*trochanterius*," p. 85. In my second Report on the same class of fossils communicated to the Association in 1841, I pointed out (p. 60) the characters by which those two species departed so far from the type-characters of *Plesiosaurus* as to merit being placed in a distinct genus or subgenus, for which I proposed the name of *Pliosaurus;* admitting at the same time in reference to the two species, that "subsequent discoveries and observations were needed to supply distinct and recognisable characters for them"—"the two forms of femora, on which they were founded, not having then been found so associated with vertebræ and other bones as to aid in their definition."†

I propose in the present Monograph to describe and figure the specimens, among those that have subsequently come under my notice, which afford good grounds for the acceptance of the two species, and for the addition of a third to the genus *Pliosaurus*. It may seem strange that jaws which have lost all their teeth should yield new characters derivable from the number, proportions, and disposition of such organs; but herein a

* 'Report of Brit. Assoc.,' 8vo, pp. 83, 86, 1839. † Ib. (Second Report), p. 54, 1841.

Palæontologist's mode of work is like that of Antiquaries of another order, who read inscriptions on Roman buildings by the nail-marks when the letters themselves have been wrenched off for the sake of the metal.

Species—PLIOSAURUS GRANDIS, *Owen*. Plates I and II.

PLESIOSAURUS GRANDIS, *Ow*. Report on British Fossil Reptiles, 8vo, p. 83, 1839.
PLEIOSAURUS BRACHYDEIRUS, *Ow*. Odontography, 4to, p. 283 (?), 1840.

The most complete example of the skull of a Pliosaur which has come under my observation was disinterred from the Kimmeridge Clay, at Kimmeridge, Dorsetshire, under the superintendence of J. C. Mansel, Esq., F.G.S., of Longthorne, in that county. This skull is also the largest of such specimens hitherto found; and, since the matrix has been removed, it has yielded the most instructive characters of cranial structure and dentition. Originally sent to me by Mr. Mansel for determination and description, the specimen has since been presented by its discoverer to the British Museum. The same liberal donor has subsequently enriched the National Collection by a lower jaw and part of the cranium, with evidence of the locomotive organs of the *Pliosaurus trochanterius*. I shall premise to the descriptions some of the dimensions of both specimens.

TABLE OF ADMEASUREMENTS.

	Pliosaurus grandis.			*Pliosaurus trochanterius.*		
	Feet.	Inches.	Lines.	Feet.	Inches.	Lines.
Length of the mandible in a straight line from the fore end of the symphysis to the angle of the jaw . .	5	8	—	4	4	—
Ib., following the curve on the outer side of the ramus	5	11	—	4	5	6
Length of the alveolar series following the curve . .	3	7	—	1	9	6
Length of the "symphysis mandibulæ" . . .	1	1	6	1	4	6
Greatest breadth of ditto	—	7	3	—	7	4
Breadth at posterior part of ditto	—	6	9	—	7	4
Depth of, at the same part	—	5	6	—	3	9
Depth of ramus anterior to articular surface . .	—	4	3	—	4	9
Breadth of mandible at the hind end of the alveolar series	1	11	—	—	8	8
Length of cranium from the occipital condyle to the end of muzzle*	4	9	—	—	—	—
Greatest breadth of premaxillaries, viz., across the fourth pair of alveoli	—	6	9	—	—	—
Breadth behind the fifth pair of alveoli . . .	—	5	6	—	—	—
Breadth of cranium behind the alveolar series . .	2	1	—	—	—	—
Length of palato-nares	—	5	—	—	—	—
Breadth of ditto	—	1	8	—	—	—
Distance from their back part to end of occipital condyle	—	6	5	—	—	—

* The tympanic articulations for the lower jaw, which extend the cranium beyond the condyle, are broken off.

In *Pliosaurus grandis* the number of alveoli on each side of the upper jaw is twenty-seven or twenty-eight. The first pair (Pl. II, *a*) are terminal and approximate; the outlet of each measures 1 inch 3 lines in long diameter, which lies in the axis of the jaw: the second alveolus (*b*), with an outlet 1 inch 9 lines in long diameter, which is transverse to the jaw's axis, is divided by a partition (*a'*) of 4 lines breadth from the first: the third socket (*c*) is divided by a partition (*b'*), half an inch in breadth, from the second; its outlet is circular, and 2 inches in diameter: the fourth socket (*d*) is of similar size, and at rather less distance from the third: the fifth socket (*e*) is less in transverse diameter than the third, but is equal in fore-and-aft diameter to the fourth, from which it stands 9 lines apart. These five pairs of alveoli are in the premaxillary bones, and occupy the whole of their alveolar extent. An interval of rather more than 2 inches intervenes between the last premaxillary and the first maxillary alveolus, which is the sixth of the series; and this interval is traversed obliquely by the maxillo-premaxillary suture (Pl. I, 22). The maxillary alveoli have partition walls of about 4 lines in thickness at their free border; but these become thinner as the teeth decrease in size in the hinder third part of the series. The alveoli increase in size from the first to the fourth maxillary tooth (ninth of the dental series); the longest diameter of the aperture of this socket is 3 inches: thence the alveoli gradually decrease in size to a diameter of half an inch. The form of the alveolar aperture is, for the most part, a full oval, nearly circular, with the long diameter inclining more or less transversely.

The margins of the larger maxillary alveoli are the most prominent. The entire alveolar series describes longitudinally and horizontally a gently undulated course (Pl. I, fig. 1), the premaxillary series forming a slight convexity, and the larger maxillary alveoli a similar convexity, outward. Longitudinally and vertically (Pl. I, fig. 2) the alveolar border is almost straight as far as the seventeenth tooth, and then gently bends upward to the end of the series. A groove, deepening into fossæ answering in number to the alveoli, extends along the inner side of each premaxillary series (Pl. II, *nn*). This groove is interrupted at the diastema between the premaxillary and maxillary alveoli: it recommences at the inner side of the maxillary series (Pl. II, *n*), also deepening into pits opposite the inner and back part of the alveoli, and continues, though feebly indicated, along the hinder third of the alveolar series.

The bony palate is entire, save at the palato-nares (Pl. II, *r*, *r*); but on the inner side of the twelfth socket, counting backward, on each side, there is a nervo-vascular foramen terminating a canal in the upper jaw, directed obliquely downward and forward: the foramen is elliptical, an inch in diameter; a shallow channel extends a few inches in advance of its outlet, and three or four similar but smaller foramina succeed each other anteriorly near the inner wall of the internal alveolar groove, leading to a linear channel 7 inches long, which, with its fellow on the opposite side, defines the base of a median longitudinal ridge of the bony palate between the first three pairs of maxillary alveoli, which ridge (fig. 1, 21) is transversely convex, and about an inch in breadth. As the bony palate expands in breadth, behind the nervo-vascular foramina, it presents trans-

versely a broader median convexity, bounded by lateral shallow concavities. On the transverse line, between the sixteenth pair of alveoli, are the anterior ends of the palatine bones, which are divided by a median suture (Pl. I, 20, 20). The major part of the palato-nares are bounded by the pterygoids (ib., 24, 24), which extend backward to the base of the occipital condyle (ib., 1), underlapping the basi-sphenoid and basi-occipital, developing ridges which project below the level of the lateral parts of the fossa, and converge to meet behind the area, including the posterior nostrils. External to these ridges the pterygoids diverge to abut against the tympanic pedicles. The mesial border of an ectopterygoid is preserved at 25, fig. 1.

The number of alveoli in each ramus of the mandible (Pl. I, fig. 3) is twenty-five or twenty-six. The five alveoli corresponding with the premaxillary sockets in the upper jaw are the largest. They are separated by similar intervals. Between the fifth and the sixth alveolus is a diastema of about 8 lines; the long diameter of the sixth alveolus is 1 inch 10 lines. An interval of 5 lines divides it from the seventh socket. The succeeding ones are closer together: they gradually increase in size to the twelfth or thirteenth, but do not obtain the size of those opposed to them above; they then gradually decrease in size and depth to a diameter of about half an inch.

The summits of crowns of successional teeth protrude from fossæ at the inner and back part of the anterior alveoli. The crown of a more advanced successional tooth projects into the bottom of the socket of the third and fifth of the symphysial series: these teeth show the characters of the genus *Pliosaurus*.

The inter-alveolar part of the "symphysis mandibulæ" forms a median longitudinal rising, less convex or ridge-like than the one on the palate above. Fossæ are discernible on the inner side of the mandibular alveoli, but less marked in the upper jaw. The apex of a successional tooth appears in two of these pits. On the inner side of the posterior third of the mandibular ramus there is a wide and deep channel between the surangular (29) and angular (30) elements; and this groove is continued forward indicative of the upper border of the splenial (31) which extends along the inner side of the lower half of the dentary nearly to the symphysis. The articular surface of the mandible (29), 7 inches in transverse, and 5 inches in antero-posterior extent, is slightly concave transversely at the inner three fourths of its extent, and then gently convex at the outer fourth; it is more concave from before backwards in the major part of its extent, but the peripheral boundary is not entire.

The plesiosaurian affinities, as contradistinguished from the ichthyosaurian, are exemplified in the more complete and separate sockets of all the teeth, and in the smaller proportion contributed by the premaxillaries to their support and to the formation of the upper jaw.

The palato-nares of *Pliosaurus* are more linear and approximate than the species of *Plesiosaurus* (*Pl. Hawkinsii*, Pl. XVI;* and *Pl. rostratus*, Pl. XIII,* ib.), in which they have been observed.

* Vol. of Pal. Soc. for the year 1863; Monogr. of the 'Reptilia of the Liassic Formations,' 1865.

Species—PLIOSAURUS BRACHYDEIRUS, *Owen* (?).

In the Museum of Geology at Oxford are considerable proportions of the upper and lower jaws of a *Pliosaurus* from the Kimmeridge Clay at Market-Raisin.* The teeth, in number, proportions, and arrangement, correspond so closely with those in the specimen above described as to induce me to believe them to belong to the same species. The following are the differences which I have noted between them: the widest diastema divides the fourth upper tooth from the fifth in the Oxford specimen, not the fifth from the sixth: the maxillo-premaxillary suture with the lateral compression at this interval, as in the British Museum specimen. If the pair of small anterior sockets and teeth are wanting, either through age or accident, in the Oxford specimen the difference noted would be accounted for. It may be remarked that the number of alveoli—twenty-six—on the least imperfect side of the upper jaw is the same in both skulls, and in both a small part of the series is wanting posteriorly. In both the premaxillary part of the jaw containing four pairs of large teeth is slightly expanded. In the maxillary part of the Oxford specimen the teeth increase in size to the sixth; in the British Museum specimen to the fifth; beyond which they gradually diminish. The length of the best-preserved alveolar series is 3 feet in the Oxford specimen, and 3 feet 7 inches in that in the British Museum.

In the mandible from Market-Raisin there are thirty-five sockets in each side; in that from Kimmeridge there are only thirty: but as neither specimens have the alveolar series quite complete, I do not feel that there is sufficient ground to reject the hypothesis of individual variety. In all the essential characters, including length of symphysis mandibulæ, the Market-Raisin skull agrees with that in the Kimmeridge example of *Pliosaurus grandis*, and differs from that of *Pliosaurus trochanterius*, about to be described. If, however, the minor differences which have been noted between the Oxford specimen and that figured in Pls. I and II, should prove to be constant, the specific name "*brachydeirus*," by which I originally indicated Dr. Buckland's magnificent specimen† from Market-Raisin, might be retained for it.

* 'Second Report on British Fossil Reptiles,' "Report of British Association," p. 61, 1841.

† 'Odontography,' p. 283.

Species—PLIOSAURUS TROCHANTERIUS, *Owen*. Plate III.

PLESIOSAURUS TROCHANTERIUS, *Ow*. Report on British Fossil Reptiles, 8vo, p. 85, 1839.

In the work above cited the specific character of the fossil Reptile in question was indicated by modifications of the femur; but the chief distinction between *Pliosaurus trochanterius* and *Pl. grandis* is conspicuous in the greater relative extent of the symphysis mandibulæ in the former, and in the greater proportion of the dental series lodged in that part of the lower jaw. This character is exemplified in the fourth admeasurement in the "Table," p. 3, and in Pl. III, fig. 3, as compared with Pl. I, fig. 3.

The surangular developes in *Pliosaurus trochanterius* [Pl. III, fig. 4, 29′] a low but well-marked angular coronoid process. Anterior to this the upper border of the mandible becomes thick and transversely convex; and, an inch below the border, the outer side of the ramus is impressed by a wide and deep longitudinal groove. So much of the articular surface as is preserved agrees in structure and form with that in *Pliosaurus grandis;* and the extent of the angular projection behind the articular cavity to the same.

The fore part of the symphysis, including the first three pairs of teeth, has been subject to such violent horizontal force as to be crushed in that direction, and broken across both the upper and the under surfaces of the rest of the mandible, without having been detached from the intervening structure or tissue of the bone. The bottoms of the sockets only of the included teeth are preserved, with parts of the partitions which, here, are only from 2 to 3 lines thick. These sockets increase in size to the third. The diameter of the outlet of the fifth socket, which is the first entire one, measures 1 inch 9 lines across; it is rather less longitudinally. The outlets of most of the alveoli are subcircular, with a tendency to a subquadrate section, with intervals not exceeding 2 lines, and they retain a uniformity of size to within four or five sockets at the end of the series, which progressively decrease in size.

The total number of teeth, as shown by sockets, in each mandibular ramus is fourteen; of which ten occupy the symphysial part of the jaw (Pl. III, fig. 3).

The upper surface of the symphysis between the first six teeth is flush with the alveolar outlets, is smooth, and slightly convex transversely. Beyond the sixth pair of teeth the intervening surface rises above the inner borders of the alveoli as high as half an inch between the ninth—eleventh pairs of sockets; the upper surface of the hinder part of the symphysis becomes slightly convex transversely, and the pointed anterior ends of the splenials (31) enter into its composition.*

No part of the upper jaws of this skull of *Pliosaurus trochanterius* has been preserved;

* Some of the matrix retained in the interval appears to prolong, in the figure, the symphysis beyond its true posterior limit.

but the quarrymen extracted the hind part of the cranium (Pl. III, fig. 1). It shows a hemispheroid condyle (1) 2 inches 8 lines in basal diameter. The foramen magnum is a full transverse ellipse, 1 inch 3 lines across. The broad and low occipital surface includes the thick horizontal backwardly projecting paroccipital ridges, below which extend still more backward and somewhat downward the short and broad tympanics, terminated each by a condyle convex in its outer two thirds, concave transversely at the inner third: the breadth of this condyle (28) is 5 inches.

The upper transverse ridge of the occiput is broken away. The parietal region (7) is formed by a lofty median vertical wall of bone, slightly expanding below to form the side walls of a miserably small cerebral cavity.

I have neither respect nor inclination for undue multiplication of genera; but the degree of difference in the number of mandibular teeth and extent of the symphysis tempts to a view of the present evidence of *Pliosaurus trochanterius* as testifying to something more than specific distinction from the *Pliosaurus grandis*. I leave, however, the opening for a "name" to any labourer in gattungsmackery who may yield to the temptation.

The *Pliosaurus grandis* retains more similarity with the type Sauropterygians (*Pl. dolichodeirus*, e. g.) in the proportions of the symphysis and of the number of symphysially located teeth. Nevertheless, modifications in these particulars are presented, though in a minor degree, by species of true *Plesiosauri* [compare, in the 'Monograph of the Fossil Reptilia of the Liassic Formations,'* Pl. III, fig. 2 (*Plesiosaurus dolichoderius*), with Pl. XVI, fig. 2 (*Plesiosaurus Hawkinsii*)].

The specimen figured in Pl. III, fig. 2, includes the part of the maxillary bones, with eight or nine pairs of alveoli at or very near to the hind end of the series, of a smaller individual of the *Pliosaurus trochanterius* than that to which the lower jaw, figs. 3, 4, 5, belongs. The transverse section above the figure shows the medial (20) and inner alveolar (21) palatal ridges; also the prominent longitudinal medial ridge on the upper surface (here turned down) of that part of the skull; a similar rising occurs in *Plesiosaurus* (comp. Monogr. cited,* Pl. III, fig. 1, *Ples. dolichodeirus*, Pl. VI, *Ples. homalospandylus*, Pl. XVI, fig. 1, *Ples. Hawkinsii*).

This fragment measures 11 inches in length, and 6 inches in greatest breadth. It is from the same locality and formation as the larger skull, viz., the Kimmeridge Clay of Kimmeridge. Both specimens have been liberally presented to the British Museum by the discoverer, J. C. Mansel, Esq., F.G.S.

PLIOSAURUS PORTLANDICUS, *Owen*. Plate IV, figs. 1, 2, 3.

The true and sufficient generic distinction from *Plesiosaurus* indicated by the term *Pliosaurus*, and suggested by modifications of the shape of the teeth and proportions of

* Vol. of Pal. Soc. for the year 1863, published 1865.

the cervical vertebræ, is confirmed by the structure of the bony framework of the paddles. The modification in question, like the fore-and-aft compression or shortness of the cervical centrums, exemplifies the nearer resemblance, I will not say affinity, of *Pliosaurus* to *Ichthyosaurus;* the segment of the natatory limb which answers to the anti-brachium and the cnemion in the higher Vertebrates being scarcely more marked or differentiated in the present genus of huge *Sauropterygia* than in *Ichythyopterygia*.

The first indication of the modification in question was given by a specimen in which only the proximal halves of the two bones, or two chief bones, succeeding the femur were preserved along with that bone.

The inference which I drew from close inspection and comparison of the preserved portions of the two cnemial bones was subsequently confirmed or strengthened by the condition of the same segment of the fin-bones in the magnificent specimen of those bones restored by Mr. Mansel, probably from the bones of the skeleton of the *Pliosaurus grandis* to which the above described skull belonged, and of which fin-bones a cast is exhibited in the Palæontological Gallery of the British Museum.

Nevertheless, with the close general affinities illustrated by most of the framework and dentition of *Plio-* to *Plesio-saurus*, I waited in hopes of an opportunity of acquiring certainty as to the structure of the middle segments of the limb before committing myself to a publication of what I am now able to positively state to be a generic character of *Pliosaurus*.

The wished-for evidence reached me this year in the form of a block of Portland stone, in which were imbedded the femur, cnemion, tarsus, and part of the metatarsus and digits of a right hind-limb, referable by the character about to be described to the genus *Plio-saurus*. The specimen, moreover, had the additional interest of being the first evidence of that genus from the Upper Oolite of Portland Island. It is figured rather less than half the natural size in Pl. IV.

The femur (Pl. IV, figs. 1 and 2, 65) presents the usual plesiosauroid proportions and characters, the pliosaurian affinity being faintly indicated, as usual, by the greater extent of the tract (above 67′) external to the fibular division (above 67) of the distal articular extremity: the tuberosity (fig. 2, *tr*) and contiguous rough surfaces for the attachment of muscles, at and near to the proximal end, are also a little more strongly marked, as in the *Pliosaurus grandis*, but the tuberosity is less distinctly prominent than in *Pliosaurus trochanterius*. The head of the femur (fig. 3, nat. size), subconvex and oblong, is slightly nipped in, as it were, near its outer third part from side to side; the long axis of this surface is at right angles to the plane of the expanded and compressed distal end of the bone. A few of the crateriform elevations on the rough articular surface are preserved. The inner side of the bone is exposed in the block of matrix. The roughness for ligamentous or tendinal attachment ceases about one third of the way down the shaft. This part, gradually contracting, assumes first a circular transverse section, then becomes compressed from without inwards instead

of from side to side, increasing in breadth and diminishing in thickness to the distal articular end. The surfaces for tibia (66) and fibula (67) are indicated by, or meet at, a widely open angle. The projecting part of the femur beyond the tibial surface is rounded off; that beyond the fibula is, as above remarked, of greater extent, and may have terminated more angularly, but the extreme end has been broken away (fig. 2, 65). The representatives of tibia and fibula appear in size and shape, as in *Ichthyosaurus*, to be a first series of tarsal ossicles; they, however, markedly exceed in size the ossicles of the two succeeding rows, properly constituting the tarsal segment of the fin. The bone (66) answering to the tibia in *Plesiosaurus* (fig. 4, 66) is an irregular oval or oblong flat plate, the margin adapted to the femur being longest and least convex. The breadth of this bone exceeds its length, and the inner or tibial, and the outer or fibular, margins are rounded or strongly convex; the distal margin is more even or straight at its middle part. The length of the bone (in the axis of the femur) is 2 inches; the breadth of the bone is 2 inches 9 lines: an interval of 5 lines between it and the femur indicates most probably the thickness of ligamentous matter which dissolved away after the carcase of the Reptile had sunk into the fine sand or sandy mud now hardened into Portland stone.

The fibula (67) is less than the tibia, measuring 1 inch 9 lines in length, and 2 inches 8 lines in breadth: the margin towards the femur is almost straight; the outer and inner margins convex; the distal one is produced into a low rounded angle opposite the interspace between the tarsal bones *a* and *cl'*, and this slight modification is interesting because the homologous bone in *Plesiosaurus* (fig. 4, 67) shows a similar angular production between the same tarsal ossicles, whilst the distal end of the tibia is truncate.

Another character which would seem to show that a tarsal structure or arrangement immediately followed the femur is evidenced by a depression in the matrix indicative of a third bone, smaller than either fibula or tibia, and of an oval form with the long axis parallel with that of the fin and the small end of the oval produced towards the femur. This ossicle I regard as the homologue of the fabella (67′), which is present in some *Plesiosauri* (*Pl. rugosus*, for example, fig. 4, 67′), where its homotype in the fore-limb is represented by a detached olecranal process of the ulna. But the bone (67′) in *Pliosaurus portlandicus* is relatively larger and less triangular in shape than in *Plesiosaurus rugosus*.

The thickness of these tarsal-like representatives of tibia and fibula is about 4 lines.

The three bones of the proximal tarsal row are more uniform in size and shape than in most *Plesiosauri*, the innermost or scaphoid (*s*) is, however, the smallest: it is transversely elliptical in shape, 1 inch 9 lines in breath, 1 inch 2 lines in length; the original ligamentous interspace between it and the tibia is 3 lines. The astragalus (*a*) has a produced part of its proximal margin directed toward the interspace between the tibia and fibula. This modification somewhat interferes with the regularity of its elliptical contour. Its length is 1 inch 4 lines; its breadth 1 inch 11 lines. The interspace between it and the scaphoid is reduced to 2 lines; that between it and the cnemial bones is from 4 to 5 lines. The calcaneum (*cl'*) is the largest of this row; its proximal margin is straight and