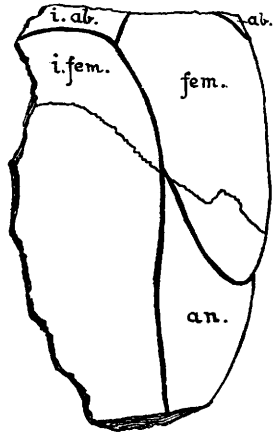
32. *On certain* CHELONIAN REMAINS *from the* WEALDEN *and* PURBECK.

By R. LYDEKKER, Esq., F.G.S., F.Z.S., &c. (Read June 5, 1889.)

a. *Plastron from the Wealden.*

CERTAIN fragments of the plastron of a Chelonian collected by the late Dr. Mantell from the Wealden of Sussex, and now preserved in the British Museum, are of some interest as affording evidence of the presence of an additional series of epidermal shields unknown in any previously described form, and probably indicating an extremely archaic type of structure.

Fig. 1.—*Left hypo- and xiphiplastral of a Chelonian; from the Wealden of Cuckfield.* ($\frac{2}{3}$ nat. size.)



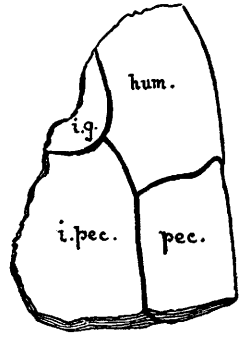
ab., abdominal shield; *fem.*, femoral do.; *an.*, anal do.; *i.ab.*, interabdominal do.; *i.fem.*, interfemoral do.

The first specimen that may be noticed is the imperfect left xiphiplastral, to which is suturally united a portion of the hypoplastral, this bone (No. 3506) being represented in fig. 1. It appears probable that the proximal portion of the bone is broken away, and that the hypoplastral element was originally extended upwards to form the inguinal portion of the bridge for connexion with the carapace. The peculiar features connected with this specimen are, however, the sulci left by the epidermal shields. It will be seen from the figure that on the outer border there are two narrow shields (*an.*, *fem.*) which from their relation to the xiphiplastral suture I take to represent the anal and femoral shields of

the normal type. Above the femoral is seen the commencement of a third lateral shield, which may be correlated with the abdominal. On the inner side of these lateral shields are portions of two larger shields, which may be termed interfemoral and interabdominal. There are no means of determining whether these inner shields were azygous or paired, although I am inclined to think that they were probably azygous. On the dorsal surface of the specimen the absence of any pelvic attachment to the xiphiplastral indicates that the Chelonian under consideration was allied to the Cryptodiran section.

The next specimens are two examples of bones which are provisionally regarded as left hyoplastrals, one of which (No. 3532) is represented in fig. 2, while the other (No. 3533) is figured in Mantell's 'Fossils of Tilgate Forest,' pl. vii. fig. 3. Anteriorly they exhibit surfaces which are assumed to be for the articulation of the epi- and entoplastrals; while posteriorly there is an entire natural surface which appears to have articulated with a mesoplastral element, since, if these bones be rightly determined, it is quite evident that they took no part in the formation of the axillary portion of the bridge. I conclude, therefore, that the structure of the plastron

Fig. 2.—*Left Hyoplastral (?) of a Chelonian; from the Wealden of Cuckfield.* ($\frac{2}{3}$ nat. size.)



i.g., intergular shield; *hum.*, humeral do.; *pec.*, pectoral do.; *i.pec.*, interpectoral do.

was probably of the same general type as in *Sternothærus*, where the hypoplastral forms the inguinal, and the mesoplastral the axillary half of the bridge. The whole plastron must, however, have been much longer and narrower than in that genus, in which respect *Chelodina* makes the nearest approach among existing types. Both specimens exhibit an inner and an outer row of epidermal shields, which affords the ground of reference to the same form as the preceding specimen. The two outer shields I correlate with the humeral and pectoral; while the uppermost of the inner row appears to represent the intergular of *Chelodina*, and the lower

one may be named interpectoral. On this view the gulars will have been placed anteriorly to the intergular in the same manner as in *Chelodina*.

Our specimens indicate, therefore, a Chelonian of medium size, characterized by the occurrence of a row of median, and probably azygos, plastral shields, dividing the normal plastral shields below the gulars. This series is a continuation of the intergular now found in all *Pleurodira* and some *Cryptodira*, and may in all probability be regarded as indicating an archaic type of structure, the Chelonian plastron having probably been developed from abdominal ribs like those of *Sphenodon*, and apparently showing a tendency to the obliteration of some of its elements with advancing specialization. No existing Chelonian exhibits this multiplication of plastral shields; but Mr. Boulenger has figured a minute interanal shield in two specimens of *Macroclemmys*, one of which also exhibits an equally minute azygos shield in the centre of the plastron.

A feature of a somewhat analogous nature to that characterizing the plastron under consideration is, however, found in the carapace of a Chelonian from the Kimeridgian of Hanover, figured by Dr. Portis in the 'Palæontographica,' vol. xxv. pl. xv., under the name of *Tropidemys Seebachi*. In that specimen the normal azygous series of vertebral shields is divided into two lateral series by a more numerous row of small intervertebral shields, nearly corresponding in number with the underlying neural bones. In the characters of the bony elements of the carapace that specimen corresponds closely with typical species of *Tropidemys*; but the multiplication of the shields should not improbably be regarded as a generic character. It occurs to me that the carapace of the Wealden form may perhaps have had a similar series of intervertebral shields.

b. *The Affinities of* Pleurosternum.

The Purbeck Chelonian to which Sir R. Owen applied the name *Pleurosternum latiscutatum*, as has been shown by Mr. Boulenger and myself, has no connexion with the Pleurosternidæ *, but belongs to the Plesiochelyidæ; and from the evidence afforded by a nearly entire shell of the last-named species from the Wealden, it appears that the plastra described by Sir R. Owen as *Platemys Mantelli* and *P. Dixoni* are really referable to the so-called *Chelone Belli*, which is thus shown to be an allied form.

It may also be observed in this connexion that the so-called *Pleurosternum latiscutatum* was provisionally referred by my friend and myself in the paper above cited to the genus *Plesiochelys*. Subsequent observations have, however, shown that the vertebral shields are much wider than in that genus; and since there are other distinctive features which I shall indicate elsewhere, I feel justified in proposing the new generic name *Hylæochelys* for this Chelonian. I may state, however, that I have found it impossible

* Geol. Mag. decade 3, vol. iv. p. 272 (1887). In this communication *Pleurosternum* was referred to the Pelomedusidæ.

to satisfy myself absolutely that this form is generically distinct from either *Hydropelta* of the Lithographic Limestone or *Chitracephalus* of the Wealden, the type specimens of those two genera being of a character which does not admit of exact comparison. I shall, however, elsewhere adduce certain evidence tending to show that *Hylæochelys* is not identical with *Chitracephalus*. A second species of *Hylæochelys* will be represented by *Chelone Belli*, which appears to be specifically distinct from the type species; and in any case the specific name *Belli*, as the earlier, has a right to stand. The Chelonian from the Kimeridgian of Hanover described by Maack * as *Chelonides Wittei* would appear to indicate a form more or less closely allied to *Hylæochelys*; but the generic name is pre-occupied †. The insufficiently described *Plastremys*, Owen, is probably also identical with this genus.

Reverting to the forms described as *Pleurosternum*, it is evident that the type of *P. emarginatum*, Owen, also belongs to *Hylæochelys*, although the other examples referred to that species by its founder are veritable Pleurosternidæ. Again the specimen from the Wealden of Germany described as *P. Kœneni* ‡ is likewise referable to the new genus, and probably belongs to the type species.

The removal of these three species from *Pleurosternum* will reduce the four species assigned to that genus by its founder, Sir R. Owen §, to two, viz. *P. concinnum* and *P. ovatum*. The former species is the first of the four which are referred to the genus in the original memoir, and, as pointed out by Prof. Cope ‖, must undoubtedly be regarded as the type of the genus. In the joint communication by Mr. Boulenger and myself published in the 'Geological Magazine,' to which reference has been already made, it was shown that the plastron described by Sir R. Owen at an earlier date under the name of *Platemys Bullocki*, and erroneously supposed to have been obtained from the London Clay, was in reality from the Purbeck, and appeared to be specifically identical with the type of *Pleurosternum ovatum* and with some of the specimens described as *P. emarginatum*. We accordingly proposed to supersede the name *Pleurosternum ovatum* by *Pleurosternum Bullocki*, making no mention of *P. concinnum*. It had, however, escaped our notice that Prof. Cope ¶ had seen occasion to regard the so-called *Platemys Bullocki* as generically distinct from *Pleurosternum* (typified by *P. concinnum*), and had proposed for it the name *Digerrhum*.

It appears, indeed, so far as I can gather, that Prof. Cope was induced to separate *Platemys Bullocki* from *Pleurosternum* on the ground that the latter had no intergular shield. A portion of such shield is, however, clearly seen in *P. concinnum*—the type of the latter genus—and the distinction consequently falls to the ground.

* 'Palæontographica,' vol. xviii. part 2, p. 133 (1869).
† In 1834 for a genus of Lepidoptera.
‡ Grabbe, 'Zeitschr. deutsch. geol. Ges.' vol. xxxvi. p. 19 (1884).
§ 'Wealden and Purbeck Reptilia' (Mon. Pal. Soc.), pt. i. p. 2 (1853).
‖ Geol. Mag. decade 3, vol. iv. p. 573 (1887).
¶ Trans. Amer. Phil. Soc. vol. xiv. pt. i. p. 156 (1870).

At one time I thought that the undermentioned specimens might on other grounds justify the retention of *Digerrhum* as a form closely allied to *Pleurosternum*, but further consideration induced me to regard all the above-mentioned forms as referable to one genus, and probably to a single species, for which the name *Pleurosternum Bullocki* should be adopted.

It may be added that while *Pleurosternum* was, from the assumed absence of the intergular, referred by Prof. Cope to the Cryptodira as the type of a family, *Digerrhum* was classed among the Pleurodira in the existing family Sternothæridæ, which is included by Mr. Boulenger among the Pelomedusidæ.

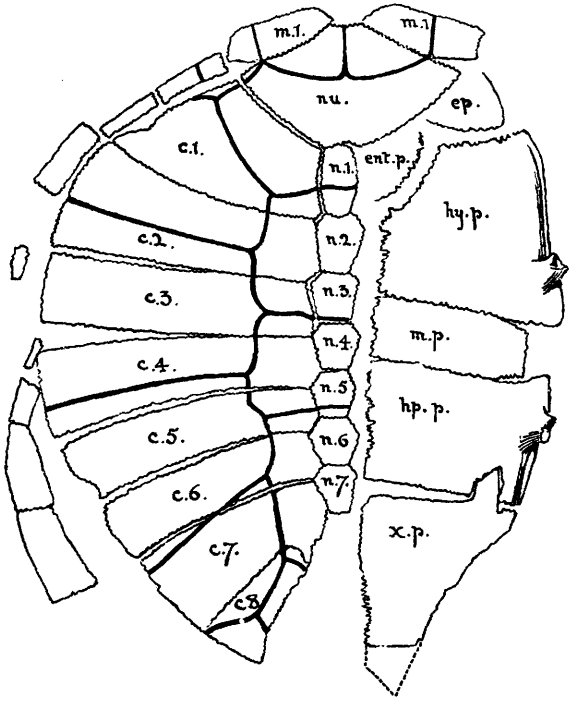
Having now cleared the ground, we may proceed to consider the specimens which I have to bring to notice as affording evidence of the affinities of *Pleurosternum*. It may be observed in the first place that the most distinctive feature of this genus is the presence of a complete mesoplastral element in the plastron (fig. 3), this feature occurring elsewhere, so far as is known, only in the allied *Helochelys* of the Neocomian, in the existing Pleurodiran genus *Sternothærus*, and possibly in the Triassic *Proganochelys*; while such an element, although of a different type, is considered to have been probably developed in the Wealden form described in the first part of this communication.

Further the shell is comparatively smooth, and has an intergular but no nuchal epidermal shield; while the entoplastral is wide and of relatively large size. There is, moreover, a full series of neural bones, of which the 8th articulates with the 1st suprapygal; while the vertebral shields are relatively wide.

The first of the two specimens I have to bring under the notice of the Society is a small slab of rock (B.M. No. 48262), showing the greater part of the flattened shell of an immature Chelonian. This specimen, which is represented of two thirds the natural size in fig. 3, shows the greater part of the median line and of the left half of the carapace, the right half of the latter having been chiselled away in order to exhibit the dorsal surface of the plastron. The general contour of the specimen, the absence of the nuchal shield, and more especially the complete mesoplastral bones, at once indicate that it belongs to the Pleurosternidæ. It will be seen from the figure that the first marginal bone of either side encroaches so largely on the anterior border of the nuchal, as to leave scarcely any free border to that bone; and I was at first inclined to consider this a specific distinction from *Pleurosternum Bullocki*. Finding, however, that the same feature occurs in another young carapace (and, indeed, in all the young specimens in the Museum), while all the adult specimens show a more normal type of nuchal, I have finally come to the conclusion that the feature obtaining in the nuchal of the specimen under consideration should probably be regarded as characteristic of immaturity. It should, however, be observed that in Sir R. Owen's figure of the type specimen of *P. concinnum*, the first marginals appear to have a somewhat similar relation to the nuchal as obtains in the present young specimen; but an inspection of the

figure shows that there is some confusion between bony sutures and the sulci formed by horny shields, so that it is quite possible the figure may be incorrect in this respect. And even if correct, I should be disposed to regard this feature merely as an individual abnormality, seeing that the associated plastron presents no characters by which it can be specifically distinguished from that of *P. Bullocki*,

Fig. 3.—*The imperfect Shell of an immature individual of* Pleurosternum Bullocki; *from the Purbeck of Swanage.* ($\frac{2}{3}$ nat. size.) (B. M. No. 48262).



The costals of the right side have been removed in order to exhibit the dorsal aspect of the plastron.

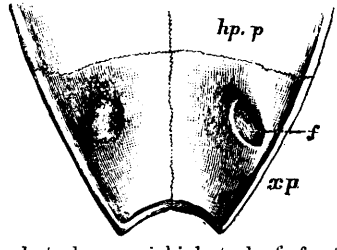
m. 1, first marginal bones; *nu.*, nuchal; *n.* 1–*n.* 7, neurals; *c.* 1–*c.* 8, costals; *ep.*, epiplastral; *ent.p.*, entoplastral; *hy.p.*, hyoplastral; *m.p.*, mesoplastral; *hp.p.*, hypoplastral; *x.p.*, xiphiplastral.

and bearing in mind that if this feature be regarded as specific, we should have to refer all the young specimens to *P. concinnum*, and all the adult specimens (except the solitary type of the latter) to *P. Bullocki*. I accordingly regard the specimen represented in fig. 3 as probably belonging to a young individual of the latter and only definable Purbeck species of the genus. The importance of this specimen is that it shows the absence of any connexion between the

bones of the pelvis and the plastron. This specimen differs from adult examples of *P. Bullocki* not only in the above-mentioned point, but also in the relatively wider vertebral and costal shields, and the circumstance that the first marginal bone articulates wholly with the nuchal instead of largely with the first costal; while, as shown by other specimens, the mesoplastral terminates outwardly in a point. All these features must apparently be regarded as characteristic of the young.

The second specimen (B.M. No. R. 1524) is a portion of an adult plastron, which shows both the dorsal and ventral surfaces of the bone. It agrees in all respects with other specimens of the plastron of *P. Bullocki*, and there can be no hesitation in referring it to that species.

Fig. 4.—*Dorsal Aspect of the Posterior Extremity of the Plastron of* Pleurosternum Bullocki; *from the Purbeck of Dorsetshire.* ($\frac{1}{3}$ nat. size.)



hp.p., hypoplastral; *xp.*, xiphiplastral; *f.*, facet for pubis.

The peculiar feature of this specimen (fig. 4) is the presence on the dorsal aspect of the xiphiplastral of a facet (*f*), for the articulation of the pubis. This facet occupies precisely the same position as in the plastron of the Jurassic Pleurodiran genus *Plesiochelys*, where only the pubis unites with the plastron; and also corresponds to the pubic articulation in existing Pleurodirans, where both pubis and ischium unite with the xiphiplastral. Whereas, however, in true Pleurodira, the union between the pelvis and plastron is a sutural one, in the present instance these bones appear merely to have articulated by smooth facets.

If I am right in referring these two types of pelvis to a single species (and in any case they indicate extremely nearly allied forms which cannot be generically separated), it would appear that while the young of *Pleurosternum* had a type of pelvic structure similar to that which obtains in the Cryptodira, the adult approximated to the Pleurodiran modification. This being so, it remains to consider whether we are to regard these Chelonians as Cryptodirans approximating to the Pleurodira, or as very generalized Pleurodirans, or as the representatives of a section distinct from both.

This, I admit, is a question of some difficulty; but since it is practically certain, as M. Dollo has pointed out, that we must regard both the Cryptodira and Pleurodira as divergent branches from an original

common stock, it is quite evident that such stock must have had a plastron of very much the type of that of the Pleurosternidæ; that is to say there must have been a mesoplastral bone and an intergular shield, since these features, if once lost, would be very unlikely to reappear. Further, we should expect such an ancestral type to show such differences in the relation of the pelvis to the plastron as we find obtaining in the specimens before us. If we refer the Pleurosternidæ to the Cryptodira, we should destroy the definition of that section by the inclusion of a form with a union between the pelvis and the plastron; while if we assign them to the Pleurodira, we should equally invalidate the definition of that group, since we should have to include a genus with a free pelvis in the young.

Under these circumstances, it appears to be the preferable course to regard this family as the representative of a generalized section, of which the earlier (unknown) members were the common ancestors of the Cryptodira and Pleurodira; and I accordingly propose for this section the name of Amphichelydia.

The Neocomian genus *Helochelys* will certainly come in the Pleurosternidæ; while I think the Baënidæ of Prof. Cope, as represented by the Upper Jurassic *Platychelys* and the Eocene *Baëna*, may probably be likewise included in the same family, and will certainly come in the same section. Prof. Cope has, indeed, remarked on the peculiarly generalized affinities of *Baëna*, which he regards as exhibiting decided evidence of affinity with the Pleurodira, especially in the approximation towards a union between the pelvis and the plastron.

The Amphichelydia, as thus exemplified, will include all those forms hitherto referred to the Cryptodira which possess a mesoplastral bone, and will thus enable us to add to the definition of that section the absence of this bone.

Finally, I may observe that the pectoral girdle and humerus of *Pleurosternum* are of a decidedly Pleurodiran type, coming near to those of the existing *Chelys*. I have, indeed, studiously avoided all reference to the structure of the skull and neck, which affords such an important distinction between the existing members of the Cryptodira and Pleurodira, since it will be quite evident that any evidence adduced from them can have no possible bearing in a case where their structure is totally unknown.

Discussion.

The Chairman said that some interesting points of difference between the living and extinct forms of Chelonia had been well brought out by the Author.

Prof. Blake inquired in what state the horny scutes of the Chelonia are preserved.

The Author said by impressions on the underlying bone. In the Stonesfield Slate the scutes themselves of the *Testudo Stricklandi* of Phillips are preserved.