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XXX.—Carcinological investigation on the genera Pemphix, Glyphea, and Aræosternus

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medium cæteris minores et sex circa caudam interstitiis haud interruptæ; apertura parva, longitudinis totius $\frac{2}{3}$ adæquans; columella callo tenui sed satis distincto superneque labro juncto induta; labrum ad marginem tenue, extra costa ultima incrassatum, paululum infra suturam sinu subsemicirculari ornatum, intus liris parvis 6-7 armatum; canalis angustus, aliquanto elongatus.

Long. 6 mill., diam. fere 2.

Hab. Singapore, 7 fms. Coll. Cuming.

This uniformly rich-brown species is remarkable for the six ribs which are continuous up the spire, and the three lirations which traverse each whorl. They are very prominent on the ribs, standing out like little transverse nodules, and are almost obsolete in the interspaces.

Pleurotoma (Taranis?) turritispira.

Testa fusiformi-ovata, turrita, tenuis, sordide albida vel pallide straminea; anfractus 6, primi 2 pallide rubescentes, minute spiraliter granoso-lirati, convexi, cæteri superne decliviter tabulati et angulati, infra angulum fere plani, liris spiralibus præcipuis 4 (suprema ad angulum, cæteris infra eam sitis) et liris tenuioribus paucis supra angulum cincti, ubique incrementi lineis elevatis inter liras ornati; anfr. ultimus magnus, inter et infra liras 4 præcipuas liris aliis numerosis minoribus succinctus; apertura longitudinis totius ad $\frac{1}{2}$ æquans; labrum tenue, haud sinuatum; columella leviter contorta, callo tenuissimo amicta; canalis brevis, subangustus, leviter recurvus, ad sinistram flexus.

Long. 6 mill., diam. 2.

Hab. Japan.

Under a simple lens the two apical whorls appear almost smooth; but by the aid of a more powerful microscope they are seen to be covered with numerous close spiral series of minute granules.

XXX.—*Carcinological Investigation on the Genera Pemphix, Glyphea, and Aræosternus.* By T. C. WINKLER.

[Concluded from p. 149.]

VI. *The Genus Pemphix compared with the Genus Glyphea.*

In the preceding pages we have glanced at the organization of *Pemphix Sueuri*, Meyer, we have given a short historical sketch of the genus *Glyphea*, followed by a description of the

representatives of that genus which exist in the Musée Teyler, we have studied the organization of *Aræosternus Wienckeii*, De Man, according to the description published by the learned carcinologist of Leyden; and now let us examine into the differences which separate and the resemblances which unite the genus *Pemphix* and the *Glyphea*, in order to learn whether it is permissible to regard the genus *Pemphix* as the direct ancestor, the original of the genus *Glyphea*.

Let us first see what are the differences.

The cephalothorax in *Pemphix* is distinguished from that of the *Glyphea* by the principal grooves which divide it into three distinct parts, and by the form of the regions which are surrounded by these furrows. The cephalothorax of the *Glyphea* is divided into two principal parts by a single groove, the nuchal or transverse groove. In general the surface of the cephalothorax in *Pemphix* is more ornate than that of the *Glyphea*, the tubercles are more robust, the different regions are characterized by convex forms, depressions, &c. The front is more pointed, and the lateral incisions or sinuses of the anterior margin of the carapace are deeper than in the genus *Glyphea*.

There is one interesting question, namely to know whether the ambulatory legs of *Pemphix* differ or not from those of the *Glyphea*. We know that von Meyer ('Neue Gattungen fossiler Krebse,' p. 6), in speaking of the anterior limbs, says, "The anterior limb is stouter and longer than the others; it would hardly seem that it was armed with a pincer, such as has been ascribed to it. One would rather think that its last joint was a slightly curved claw, and that the penultimate joint had no finger-like process. Pictet (Traité de Pal. ii. p. 444) says that the anterior limbs are not well known." Quenstedt places *Pemphix Sueuri* among the Locustinæ, *i. e.* among those Macrurous Crustacea of which the first pair of limbs possess no chelæ. This author, in speaking of the description given by Hermann von Meyer, says (Handb. der Petrefact. p. 324), "According to him the anterior limbs are stronger than the rest, and terminated in a pincer." Here the author places a? He proceeds, "Although in examining the figure one is not convinced of it, it is nevertheless certain that the succeeding legs bear pincers. In the Muschelkalk of Wiesen, in Switzerland, I have found a specimen in which the terminal joint of the first pair was perfectly preserved; it only terminates in a claw, as in the Locustæ."

It is therefore doubtful if we are to regard the feet of the first pair in *Pemphix* as a difference distinguishing that Crustacean from the *Glyphea*, or whether we are justified in finding

in them an analogy. Probably the ambulatory legs of *Pemphix* were monodactyle, like those of the *Glyphea*.

Let us now examine the analogies:—

In *Pemphix Sueuri* we find the cylindroid form of the cephalothorax of the *Glyphea*. Like that of the *Glyphea*, it is covered with tubercles and divided by impressed lines or grooves. Von Meyer described the carapace of *Pemphix* as granulated and covered with tubercles.

The outer antennæ of *Pemphix* are long, multiarticulate, and situated upon jointed peduncles, exactly like the outer antennæ of the *Glyphea*. On the first joint of the antennary peduncle we observe a protective scale or movable lamina, resembling the scale which protects the peduncle of the outer antennæ of the *Glyphea*.

The inner antennæ of *Pemphix* are shorter than the outer, and terminate in two filaments, like the same organs in the *Glyphea*.

The caudal fin of *Pemphix* exactly resembles that of the *Glyphea*; we again meet with the same characteristic form of the seventh segment of the abdomen and the same form of the lateral plates of the sixth segment, of which the two outer are divided into two parts by a transverse line as by a hinge.

The abdomen in *Pemphix* is exactly analogous to that of the *Glyphea*; and the same may be said as to the general habit of *Pemphix Sueuri*.

Considering the very great resemblance of the organization of *Pemphix* to that of the *Glyphea*, and at the same time the comparatively unimportant differences which distinguish the latter from the former, is it not permissible to see in the genus *Pemphix* the Triassic ancestor of the genus *Glyphea*? No doubt in the geological ages which separate the formation of the beds of the Triassic epoch from the times in which lived the species of Crustacea whose petrified remains we find at present in the sediments and deposits of the Jurassic, Cretaceous, and Tertiary epochs, some anatomical characters may have been changed or modified: the arrangement of the grooves of the cephalothorax may have become different from what it was; the cephalothorax may have become more adorned with tubercles; the rostrum may have become less produced; and in this way the descendants of the genus *Pemphix* presented themselves under the form of the genus *Glyphea* in the period that immediately succeeded the Triassic epoch.

VII. The Genus Glyphea compared with the Genus Aræosternus.

We have just seen that very probably the genus *Pempfix* is the stock, the origin, of the genus *Glyphea*. Now we shall seek the existing representative of this genus; we wish to see whether a form of Macrurous Crustacean analogous to the fossil genus still exists in the present creation. For this purpose let us compare the genus *Glyphea* with the genus *Aræosternus*, De Man.

In the first place as regards the differences.

The surface of the cephalothorax of most *Glyphea* is adorned with tubercles, in some species (*Glyphea Heeri*, Opp.) with hollow points or with small holes, sometimes with spines (*Glyphea Münsteri*), and in some species it is even almost entirely smooth (*Glyphea major*, Opp.). The tubercles are very often situated upon projecting lines, so as to form beaded rows, as may be seen in *Glyphea Regleyana*; among the specimens of *Glyphea Lundgreni* we also find some that are smooth.

The surface of the cephalothorax of *Aræosternus Wieneckeii*, De Man, is adorned with a multitude of rugosities or very slightly elevated tubercles, broad and flat, which bear small tufts of hair of a yellow colour. M. De Man says the carapace does not bear spines, as in the *Palinuri*, but the entire surface is covered "with numerous small transverse tufts of very short yellow hairs, a few longer hairs being scattered among them." In this point, therefore, there is no very great difference between the *Glyphea* and *Aræosternus Wieneckeii*.

Another difference consists in the presence of a protective lamina or scale in the *Glyphea* and the complete absence of this organ in *Aræosternus*. This scale is greatly developed in most *Glyphea*. M. Oppel says (Paläont. Mittheil. p. 56), "Although this movable scale is not often met with, it appears nevertheless that it must have existed; for I have found it in several species of *Glyphea*, and especially in the well-preserved specimens. It is narrow and pointed, and does not attain the length of the peduncles of the outer antennæ." Although von Meyer says that *Glyphea gratiosa* (his *Selenisca gratiosa*) does not possess a movable scale, yet it may be that the specimen had been provided with such an organ and had lost it. *Aræosternus*, on the contrary, does not possess this protective plate; M. De Man says "an antennal scale is wanting."

Another difference is observable in the laminæ which form the caudal fin. The external laminæ of the *Glyphea* are

divided transversely, or separated by an oblique hinge; all the specimens which present the caudal fin intact offer this peculiarity. Etallon mentions this division of the outer plates of the caudal fin in speaking of the *Glypheæ* of the "terrain à chailles" which he has examined; von Meyer, Oppel, and other naturalists also speak of them. According to the figure of *Aræosternus Wieneckeï*, all the laminae of the caudal fin of this species are membranous in the inferior two thirds of their length, and calcified in the superior third. M. De Man says, "The seventh segment (the telson) is quadrangular, a little longer than broad; the anterior third is calcified, and furnished with several tufts of short hairs, as on the margins of the other segments; the other part is membranous, with many longitudinal series of very small tufts of short hairs. The lateral lamellæ of the sixth segment are broad, and form with the seventh segment the caudal fin; their upper surfaces are covered with several longitudinal series of tufts of hairs, resembling those of the upper surface of the seventh segment." Moreover the seventh segment of the abdomen of *Aræosternus* is of quadrangular form, while in the *Glypheæ* this organ is in general more or less triangular. There is therefore a considerable difference between the caudal fin of the *Glypheæ* and that of *Aræosternus Wieneckeï*.

These are the differences which separate the *Glypheæ* from *Aræosternus*. Now let us examine the analogies.

On glancing at the figure of *Glypheæ Sæmanni*, Opp., in pl. i. of the 'Paläontologische Mittheilungen,' and at the same time at the figure of the natural size of the unique specimen of *Aræosternus Wieneckeï*, De Man, drawn by that naturalist himself, one is at once struck with the very great analogy or resemblance which exists between these two forms of Crustaceans. No doubt the habit of the one is also that of the other genus.

The cephalothorax of the *Glypheæ* is of an elongate cylindroid form. M. De Man says of the cephalothorax of his *Aræosternus* that it has an elongate subcylindrical form, and that its superior surface has an elongate rectangular form; its greatest width, which occurs a little behind the cervical groove, is in proportion to the length as 5 to 8. The front of the *Glypheæ* is not much pointed; and at its sides there are seen the two sinuses which lodge the ocular peduncles. In *Aræosternus*, according to M. De Man, we observe a broad triangular front, slightly curved downwards. It is separated from the external angles of the cephalothorax by two deep triangular incisions, in which the eyes appear. The posterior margin

of the cephalothorax of *Glyphea* is semilunar; and M. De Man describes this part of the cephalothorax of *Aræosternus* as "the curved posterior margin of the upper surface of the cephalothorax." It appears therefore that the general form of the cephalothorax of *Glyphea* does not materially differ from that of *Aræosternus*.

A transverse furrow, the cervical groove, a little behind the middle of the cephalothorax, divides the carapace of all the *Glypheæ* into two principal parts. This groove, which is rather deep on the two sides of the back, is directed forwards and downwards. See the description of this groove in *Glyphea Lundgreni*, Schlüter (Verhandl. Rheinl. und Westfalens, 1874, p. 48). It is remarkable that M. De Man speaks nearly in the same terms of the cervical groove of *Aræosternus*:—"The cervical groove occurs a little behind the middle; its lateral parts are directed downwards and forwards towards the anterior part of the sternum." There is therefore no essential difference in this character.

The abdomen of several species of *Glypheæ* is perfectly smooth; there are only some of them in which that part of the body is adorned with a few scattered tubercles. That of *Aræosternus* is also smooth—that is to say, without tubercles or spines; only it is ornamented with a multitude of small tufts of hairs, except on the superior or dorsal surface. The lateral plates of the segments of the abdomen are also of the same form in both genera.

In both genera the ocular peduncles are cylindrical and lodged in sinuses of the anterior margin of the cephalothorax. M. De Man calls these sinuses in *Aræosternus* "deep triangular notches, into which the eyes project," which may almost be said of the genus *Glyphea*.

The jaw-feet of the *Glypheæ* consist of four joints, like those of *Aræosternus*.

The inner antennæ of the *Glypheæ* consist of a peduncle composed of three joints and of two multiarticulate terminal filaments. The inner antennæ of *Aræosternus*, according to M. De Man, are like those of the *Palinuri*; that is to say, the first joint is the longest and extends as far as the carpocerite of the outer antennæ; the second and third joints are of equal length, and together as long as the basal joint; and the terminal filaments are very short. It would therefore seem that these organs in the two genera only differ in the relative length of the filaments.

The outer antennæ of the two genera are exactly alike as regards the joints of their peduncle and the multiarticulate terminal filaments, which are a little shorter than

the carapace. They differ only, as we have seen above, in the presence of a movable scale in the *Glypheæ* and the deficiency of that organ in *Aræosternus*. On the other hand, the basal joint of the outer antennæ of the latter is armed at the outer angle with a small spine. Is this spine a rudimentary protective lamina?

The legs of the first pair in the *Glypheæ* are much more robust than those of the succeeding pairs; they do not possess pincers, but are monodactyle. We may say precisely the same thing of the anterior legs of *Aræosternus*. On comparing an anterior limb of *Glypheæ tenuis*, Opp., with a leg of the first pair of *Aræosternus*, one is struck with the incontestable resemblance which exists between these two organs. We recognize in these limbs the same structure, the same form of joints, the same three or four conical spines at the inferior margin of the propodite, and especially the same single small triangular finely pointed finger.

M. De Man says of the other ambulatory legs of his *Aræosternus* that they gradually become shorter and are formed like those of the *Palinuri*. One cannot judge otherwise of the last four pairs of ambulatory legs of the *Glypheæ*; the analogy is here incontestable.

Aræosternus is furnished with natatory false legs; they are of an ovoid pointed form and of foliaceous structure. I have observed a similar natatory leg in one of the specimens of *Glypheæ pseudoscyllarus* in the Musée Teyler, as already stated. On comparing the enlarged figure of this organ with the false feet of *Aræosternus*, one is struck with the great resemblance of these parts.

From the enumeration of this multitude of analogies, compared with the very restricted number of differences between the fossil *Glypheæ* and the existing *Aræosternus*, it is easy to conceive the idea that the genus *Aræosternus* is derived from the genus *Glypheæ*, that the same form of crustacean which already existed at the Triassic epoch, has maintained itself, with some modifications, during all the geological periods which have succeeded the Trias to the present day. I therefore see in the *Aræosternus Wieneckeï*, De Man, the last representative of the *Glypheæ*, a genus of Crustacea which in its turn was a descendant of the genus *Pemphix*.

VIII. Considerations and Observations.

In the preceding I believe I have demonstrated the continuation or uninterrupted succession of a special form of Crustacean from the Trias to the present time—a form which presented itself first as *Pemphix*, afterwards became modified

to give origin to the *Glypheæ*, and finally, after having undergone some further changes, is at present known as *Aræosternus*. The investigation of the existence of this long series of animal forms has made known to us a multitude of peculiarities with regard to the modifications and bodily changes undergone, the grade of generic development, &c. of this form of Crustacean.

Palæontological researches have shown that the most ancient Crustacea were Macrurous, that the Anomura made their appearance long before the Brachyura, and that the Brachyura did not show themselves until a comparatively recent geological period, namely in the Cretaceous. The most ancient Macrurous Decapods have been found in the Bunter Sandstone of Soultz-les-bains; these are forms analogous to the genera *Gebia* and *Galathea*. After the Bunter we find the Muschelkalk, which has preserved for us two forms of the genus *Pempnix*. In the Jurassic deposits, including the Lias, we meet with a great number of genera of Macrurous Decapoda, known at present under the names of *Eryon*, *Glyphea*, *Eryma*, *Pterochirus*, *Megachirus*, *Palinurina*, *Cancrinos*, and many others. In the Cretaceous again we find several Macrurous genera, side by side with the first Brachyura. In the present day the reverse is the case; in the existing fauna we count at least three species of Brachyurous Crustacea for one Macruran. The most recent palæontological investigations, the most complete treatises upon fossil Crustacea, prove that the close of the Cretaceous period and the whole of the Tertiary period are characterized by a predominance of Brachyurous Crustacea. It would appear, then, that in the Cretaceous period Nature prepared for the production of Brachyurous species—species which she scatters in the existing period with so much prodigality. The result of carcinological researches with regard to the predominance of certain forms of Decapod Crustaceans is, on the one hand, absolute predominance of Macrurous and almost complete absence of Brachyurous Crustacea in the older strata of our globe, and, on the other, a very great predominance of Brachyurous Crustacea, with continuation of the Macrurous Crustacea, in the more modern deposits.

The investigations of palæontologists have further taught us that each of the different formations of the globe contains only remains of Crustaceans of a form proper to it, or, to express myself more precisely, that no *species* of Crustacean of a given period has lived during another period, while the *genus* has been able to exist during several consecutive geological periods. For example, none of the *species* of Macrurous

Crustacea of the Lithographic Limestone has as yet been met with in the Cretaceous; it has sufficed for Nature to interpose the Kimmeridgian and the Portlandian to cause the disappearance of all similarity, all identity between the *species* of Crustacea of the Jurassic and Cretaceous deposits. But the *genus* has survived during the successive changes of the earth's crust; witness the *genus Glyphea*, which we have at present in hand, which has existed from the Lias, and perhaps even from the Trias, to the Tertiary beds of Monte Bolca, and even to the present day in the form of *Aræosternus*.

Let us now turn our attention to the alternate development and decrease of the *genus Glyphea* during the successive periods of its existence. In the Trias it presents itself for the first time in the form of the *genus Pemphix*, consisting of two species, *P. Sueuri* and *P. Alberti*, Meyer. In the Lower Lias the species have increased in number, as we already find in it four species—*Glyphea grandis*, Mey., and *G. Heeri*, *G. major*, and *G. alpina*, Opp. In the Middle Lias we only know three species, *G. liasina*, Mey., and *G. Terquemi* and *G. amalthæa*, Opp. It would appear that in the Bradfordian external conditions were unfavourable to the *genus*; we only meet with a single species, *G. pustulosa*, Mey. In the Inferior Oolite there exist two species, *G. solitaria* and *G. crassa*; and the same number occur in the Kellowian, *G. Martini*, Etall., and *G. ornata*, Quenst. But in the Oxfordian the *genus Glyphea* attains its greatest development; it there presents as many as eight species—*G. Regleyana*, Mey.*, *G. Etalloni*, Opp.†, *G. vulgaris*, Mey.‡, *G. speciosa*, Mey., *G. Münsteri*, Mey.§, *G. ventrosa*, Mey., *G. Udressieri*, Mey.||, and *G. Mandelslohi*, Mey. In the period that follows the Oxfordian, in the deposits of the Lithographic Limestone, the number of species is considerably diminished; we only meet with four species, namely *G. pseudoscyllarus*, Mey.¶, *G. squamosa*, Mey.**, *G. tenuis*, Opp., and *G. Sæmanni*, Opp. In the Corallian only two species appear, *G. Bronni*, Römm., and *G. Ferroni*, Etall. The Kimmeridgian, on the other hand, contains double the number of the preceding formation; we find in it *G. gratiosa*, Opp.††, *G. rostrata*, M'Coy‡‡, *G. jurensis*, Opp., and *G. Meyeri*, Opp. In the Cretaceous period the number

* *Palinurus Regleyanus*, Desm.

† *Glyphea rostrata*, Etall. non Phill.

‡ *Palinurus Regleyanus*, Desm.

§ *Palinurus Münsteri*, Voltz.

|| *Palinurus squamifer*, E. Desl.

¶ *Macrourites*, sp., Schl.

†† *Selenisca gratiosa*, Mey.

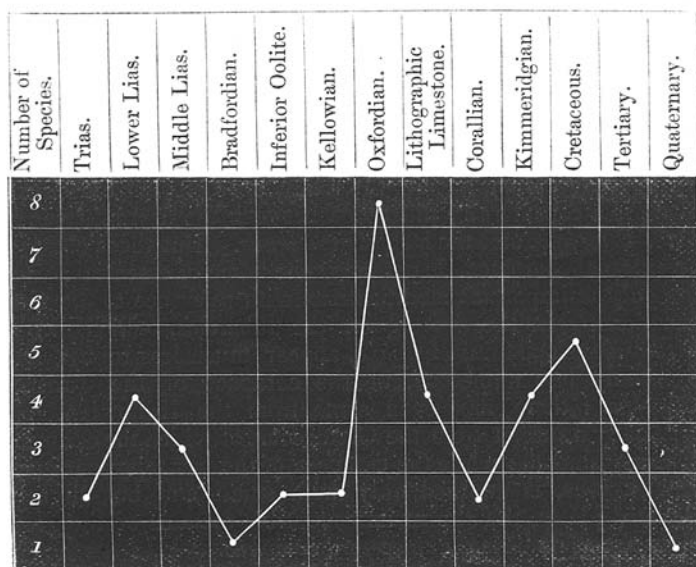
** *Orphnea*, sp., Münt.

‡‡ *Astacus rostratus*, M'Coy.

of species of *Glyphea* still further increases; we find here *G. neocomiensis*, Rob.-Desv., *G. cretacea*, M'Coy, *G. Carteri*, Bell, *G. Lundgreni*, Schlüt., and an undetermined species, *Glyphea*, sp., Dixon. In the Tertiary the genus diminishes in number of species; there are only three—*G. numismalis*, Opp., *G. Hauensteini*, Mey., and the species placed among the *Palinuri* by Desmarest. Finally, in the Quaternary or actual period the number of species decreases considerably; we know only a single species, *Aræosternus Wieneckeii*, De Man.

The following graphic Table enables us to follow the alternate progressive and retrograde course of the genus *Glyphea* through the geological ages of the globe.

Graphic Table of the Genus *Glyphea*.



This Table teaches us that the genus *Glyphea* has existed during the innumerable ages which have succeeded one another from the Triassic epoch to the present time, that it first appeared in the form which has been named *Pemphix*, that it traversed the Jurassic, Cretaceous, and Tertiary periods, and that it seems now to be approaching extinction in the form to which the name of *Aræosternus* has been given. An existence so long and uninterrupted shows us that this form of Crustacean has had a very considerable vitality, a remarkable

force of resistance, a tenacity which nothing could overcome. Although this form has certainly undergone some modifications (of which we shall speak presently), in general it has remained the same as it was during this long series of ages; it has not been able to change its monodactyle feet into pincers; it has not been able to conceal its long tail beneath its carapace. It is supposed that it is a progress in organization if the monodactyle foot becomes changed into a didactyle pincer; it is believed that in these pincers the didactyle Crustacean possesses a more effective means of seizing its prey than the monodactyle Crustacean has in its claws. It is also supposed that it is an advance in the organization of the Crustacean when the abdomen bends so as to remain concealed beneath the carapace; it is generally believed that the Brachyurous Decapod Crustacean* is the highest type of the organization of the Crustacea. And yet the generic form of the *Glypheæ* has survived through geological ages; it has been victorious in the battle of life, in which its contemporaries, *Eryma*, *Megachirus*, *Eryon*, and several other genera, have succumbed*.

The surface of the body of the *Glypheæ* has not remained without alteration during the many ages of their existence; there is a considerable difference between the first representative, *Pemphix*, and the last, *Aræosternus*. But these changes of external characters do not merit the name of essential; they are only unimportant modifications with reference to the vital functions. In the first place, the tubercles, which are so highly developed in *Pemphix*, appear much less robust, and especially less numerous, in the carapace of the Jurassic *Glypheæ*: there are even some from the Kellowian, and especially a species from the Cretaceous, of which the carapace is nearly smooth; while the carapace of the last representative, *Aræosternus*, is adorned only with small and but slightly elevated plates, the almost imperceptible remains of the great tubercles of its Triassic ancestor, *Pemphix*.

The *Glypheæ* are not the only animals the existing representatives of which no longer present the ornamentation of the outer integuments of their ancestors. The fishes of our present waters do not possess the scales adorned with tubercles, hollow dots, beaded striæ, &c. of the *Gyrodon*, the *Belonostomi*, the *Caturi*, &c. which lived in Jurassic waters. We are certainly justified in seeing in the slight elevations, the squamiform rugosities of the carapace of *Aræosternus*,

* The author here enters into a long digression upon the question whether the acquisition of additional parts constitutes an advance of organization, which we have not thought it desirable to reproduce.

indications or remains of the strongly marked tegumentary ornamentation of the more ancient *Pemphix* and *Glypheæ*.

The entire body of *Aræosternus* is covered with little tufts of yellow hairs, with here and there isolated longer hairs scattered among the tufts. The fossil *Glypheæ* present no hairs. It might be supposed that the tubercles of the surface of the carapace of these latter Crustacea were peduncles which at one time bore tufts of hairs, and that these hairs were lost during fossilization. There are, however, Crustaceans which lived in the same ages and in the same waters, side by side with the *Glypheæ*, such as the *Megachiri*, the *Microchiri*, and others, the remains of which, preserved in the Lithographic Limestone of Bavaria, still allow us to perceive a multitude of hairs, which are very visible along the antennæ, the anterior limbs, &c. of these animals. Why, if the *Glypheæ* were ornamented with hairs, should not their fossil remains show us hairs, preserved as perfectly as those of their contemporaries the *Megachiri*? We may therefore suppose that the *Glypheæ* were not furnished with hairs like *Aræosternus*. But no one will assert that an animal the skin of which is covered with hairs, cannot descend from another of which the skin is naked, or that a hairy animal could not have had an ancestor with a skin unfurnished with hairs. The elephant of the present day is completely destitute of hairs, while its ancestor, the mammoth, was provided with them; but no one doubts as to the degree of relationship which unites these two forms. No one will see a generic difference in the more or less hairy state of the outer integument of animals.

The limits of our investigation do not allow us to dwell further upon these interesting subjects. What we have said will suffice, we believe, to demonstrate that the genus *Glypheæ* existed as long ago as the Trias under the form of *Pemphix*, and that it will probably become extinct in the present epoch under the form of *Aræosternus*.

XXXI.—*List of Lepidoptera recently collected by Lieut. Alfred Carpenter at Yedo and Oö-Sima.* By ARTHUR G. BUTLER, F.L.S., F.Z.S., &c.

THE following species, collected by Lieut. Carpenter, of H.M.S. 'Magpie,' were received in two consignments, the first of which (collected in Porpoise Strait, Oö-Sima or Harbour Island, Lu-chu group, off China, during the month