45. *On the* Decapod Crustaceans *of the* Oxford Clay. By James Carter, Esq., F.G.S., F.R.C.S., &c. (Read June 23, 1886.)

[Plate XVI.]

The communication which I have the honour to offer to the Society relates to the Decapod Crustaceans of the Oxford Clay. It would appear that the investigation of this class of fossils, as represented in the British Middle Jurassic rocks, has been very incompletely carried out. The number of species which have been recorded as occurring in this country is very small, and scarcely any of those which are known to occur have been figured or described in sufficient detail for specific determination. Moreover, the bibliography of the subject is extremely limited. As regards the Oxford Clay in particular, the only species mentioned in the 'Catalogue of British Fossils,' published by the late Professor Morris in 1854, as belonging to that formation is *Mecochirus Pearcei*, and the same species is the sole representative contained in the very valuable special 'Catalogue of British Fossil Crustacea,' published in 1877 by Dr. Woodward, to whose persistent researches and numerous publications so large a portion of all that is known on the subject is justly attributable. Since the publication of his Catalogue, Dr. Woodward has described and figured two new species, *Mecochirus Peytoni* and *Callianassa isochela*, both from the Kimmeridge Clay; but I am not aware that either of these forms has hitherto been found in the Oxford Clay. In the recent most valuable edition of Phillips's 'Geology,' Mr. Etheridge states that *Glyphea leptomana*, *G. Stricklandi*, and *Mecochirus Pearcei* constitute the Macrurous Crustacean fauna of the Oxford Clay; and this statement is repeated and confirmed in the works of most authors, with scarcely any additional facts or information. Moreover, I have found most of the collections which I have had the opportunity of consulting to be completely barren of examples.

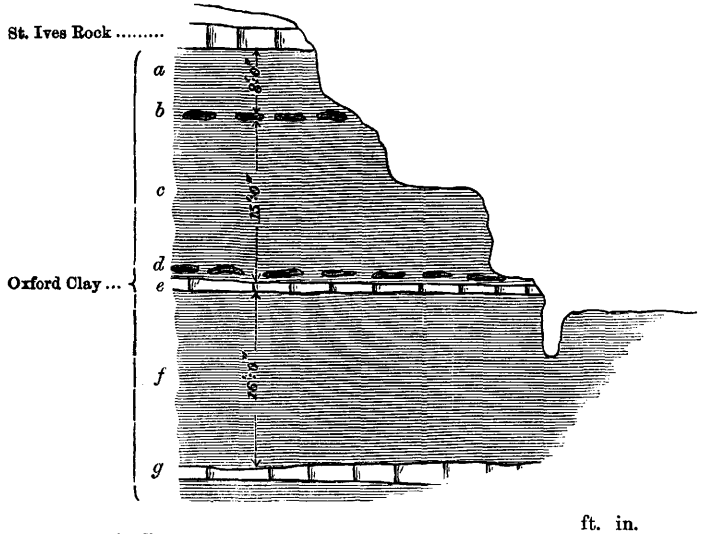
From this paucity of evidence, and this general absence of specimens from collections, it may be inferred that the remains of Oxfordian Crustaceans are generally of rare occurrence. The discovery, however, of a considerable number and variety of forms in one locality of limited area proves that decapod crustaceans actually did exist, and were somewhat abundantly represented during the Oxford Clay period, and at the same time suggests the probability that the absence of specimens in other localities has resulted from non-preservation. The locality to which I refer is St. Ives, Huntingdonshire. Mr. Thomas George, F.G.S., who is at present engaged in most useful work in the Museum of Northampton, has carefully investigated the geology and assiduously collected the fossils of the Oxford Clay as it occurs in that district, where it is quarried for the purpose of brickmaking. He has obtained an extensive series of specimens of Crustaceans which he has most liberally placed at my disposal for description; and these, together with the examples in the National, the Woodwardian, the Oxford, and other Museums,

which I have very courteously been allowed to consult, collectively form materials for a more complete knowledge of the Oxfordian Crustaceans than has hitherto been possible.

I will first allude to the forms which have been obtained from St. Ives, and afterwards briefly notice those from other localities.

The consideration of a group of fossil forms found associated in any one particular horizon has always a special interest, both biological, palæontological, and geological; and the degree of interest depends in great measure upon the precision with which such stratigraphical position can be defined. Therefore, before describing the fossils, I will point out the horizon from which they were obtained. I am able to do this definitely by the kindness of Mr. Roberts, F.G.S., of the Woodwardian Museum, who has recently critically examined the district of St. Ives, and has embodied the results of his observations in the yet unpublished essay which has secured to him the honour of the Sedgwick Prize. Mr. Roberts states that —"The fossil Crustacea found at St. Ives come from the large clay-pit which lies immediately to the west of that town. The pit is opened in the Oxford Clay, and, at the present time, shows the following section:—

Section in Clay-pit west of St. Ives.



		ft.	in.
St. Ives Rock		3	0
Oxford Clay.	(*a*) Dark blue clay	8	0
	(*b*) Calcareous nodules		9
	(*c*) Dark blue clay	15	0
	(*d*) Calcareous nodules	9 to 10 inches.	
	(*e*) Argillaceous limestone	1	0
	(*f*) Blue clay, which at one time was worked to a depth of	16	0
	(*g*) Limestone	(thin bed)	

"The clay is of a dark blue colour throughout, and its upper part contains a considerable quantity of small selenite crystals. The limestone is of greyish colour and very impure, and occurs in the form of nodular bands or regularly bedded; the beds, however, are not constant.

"The Oxford Clay is overlain by a bed, 3 feet thick, of brown ferruginous limestone, locally known as the St. Ives rock, now seen only in a small exposure near the western boundary of the brickyard. There has been some difference of opinion as to the geological horizon to which this limestone belongs. Professor Seeley maintains that it lies about 130 feet down in the Oxford Clay, whilst it is mapped by the Geological Survey as Lower Calcareous Grit; and further, Messrs. Blake and Hudleston are of opinion that it belongs to some part of the age of the Lower Calcareous Grit, or even higher. I have elsewhere shown (Sedgwick Essay for 1886) that, from a consideration of its fossils, and also on stratigraphical grounds, the St. Ives Rock must be placed on the horizon of the Lower Calcareous Grit. The following fossils, among others, occur in the St. Ives Rock, all of which are characteristic of the Lower Calcareous Grit of other areas:—*Amm. perarmatus*, *Modiola bipartita*, *Waldheimia bucculenta*, *W. Hudlestoni*, *Collyrites bicordata*.

"Assuming, then, that this is the true positon of the St. Ives Rock, it necessarily follows that the clays in the St. Ives clay-pit which come below it must belong to the uppermost zone of the Oxford Clay; and this view is supported by the fact that the fossils found in the clay at St. Ives are precisely similar to those which occur in this horizon of the Oxford Clay in other parts of England.

"Subjoined is a list of the most common fossils from the clay of the St. Ives pit:—

"Ammonites athleta.
—— cordatus.
—— Mariæ.
—— Lamberti.
—— dentatus.
—— Eugenii.
—— Jason.
—— perarmatus (rare).
Belemnites Puzosianus.
Alaria trifida.
Nucula nuda.
Leda lacryma.
Cucullæa concinna.
Gryphæa dilatata (in abundance).
Waldheimia impressa.
Terebratula oxoniensis.
Acrosalenia, sp.
Serpula, sp."

Most of the Crustacean specimens are more or less mutilated, and correspondingly difficult of positive specific determination. In all cases, therefore, when in doubt whether a specimen was identifiable as a described species, I have thought it better to consider it with reference to its allied forms, than to regard it as a new species. Some of the species which I have to mention are indicated by the occurrence of their chelæ only. I have had considerable hesitation in deciding how far it was warrantable to regard the occurrence of detached limbs as sufficient evidence of the existence of a distinct form; but it seems probable that in some genera the carapace was so thin and fragile as scarcely to admit of preservation in a recognizable form, and that only the more solid portions of the test, the

chelæ &c., are preserved, and constitute the only evidence available. It therefore seems desirable, as affording a more complete knowledge of the Crustacean fauna of the period, to record the occurrence of these detached chelæ rather than pass them over unnoticed.

The Huntingdonshire specimens which have come under my observation I have ventured to refer to some 15 or 16 distinct species. So far as I have been able to ascertain, none of these have been described in any English publication, nor has their occurrence in Britain been previously recorded, with the exception of one species of *Eryma* (*E. Babeaui*) mentioned by Mr. Etheridge as having been found in the Kimmeridge Clay. I am of opinion that seven species can be identified as forms which have been described by foreign palæontologists, and seven I have been induced to regard as new to science.

The genus	*Eryon*	is represented by	1	species.
,,	*Eryma*	,,	5 or 6	,,
,,	*Glyphæa*	,,	2	,,
,,	*Magila*	,,	2 or 3	,,
,,	*Mecochirus*	,,	1	,,
,,	*Goniochirus*	,,	1	,,
,,	*Pseudastacus*?	,,	1	,,
,,	*Pagurus*?	,,	1	,,

ERYON SUBLEVIS, nov. sp. (Pl. XVI. fig. 1.)

Carapace about one fifth wider than long, strongly arched transversely; interorbital portion of frontal border widely emarginate, beaded by an edge of small tubercles (antero-lateral border broken); that of the postero-lateral region gradually inclining inwards posteriorly, and fringed by a series of acute, slender, marginal spines. Cervical sulcus narrow, crossing the central dorsal ridge about midway between the frontal and the posterior border; gastric regions rather intumescent. The surface of the cephalic portion bears numerous, small, round tubercles, regular in size, but irregular in disposition; a strong lens renders visible minute puncta between the tubercles; similar but more scattered tubercles occur on the outer portions of the scapular regions, but the spaces between the central and the lateral branchial ridges are smooth; the metabranchial regions are strongly deflected laterally. A strong, central, longitudinal ridge, crowded with tubercles, extends from the posterior border of the carapace, crosses the cervical sulcus, but does not reach the frontal border; and on each side of it, about one fifth nearer to it than to the postero-lateral border, is a similar, nearly straight, lateral, scapular ridge. These lateral carinæ interrupt the cervical sulcus, but are not distinctly traceable in front of it (posterior border of carapace imperfect). First pair of chelæ of moderate size; basal portion of propodite (hand) about half the length of the carapace, smooth; fingers slender, equal; carpodite half as long as the hand.

Compass-measurement. Carapace $2\frac{5}{8}$ inches wide and 2 inches

long; distance between inner angles of orbits $\frac{3}{4}$ of an inch; length of hand $\frac{7}{8}$ of an inch; width one third of the length.

Oxford Clay, St. Ives.

Coll. Woodwardian Museum; collected by Mr. Keeping.

I have not been able to identify this fine species with any described form. It resembles *E. barrovensis*, M'Coy, from which, however, it is distinguished by the highly vaulted form of the carapace, by the greater comparative width of the interorbital portion of the frontal border, by having shorter lateral scapular ridges, and by the absence of surface tubercles in the spaces between these and the central dorsal ridge, also by having the dorsal surface of the propodite of the first pair of chelæ smooth instead of granulated. The smoothness of the mid-scapular region and the existence of a sharply defined cervical sulcus will distinguish this species from *E. arctiformis*, Schloth. It is allied to *E. calvadosii*, Morière, and also to *E. Edwardsii*, Mor., from the Upper Lias (Calvados), figured and described by M. Morière (Bull. de la Soc. Linn. de Normandie, sér. 3, t. vii. et viii.). It is distinguishable from both those species by the smoothness of the mid-branchial region, and, so far as can be determined by the single imperfect specimen from St. Ives, by the form of the carapace; the postero-lateral borders are straighter and slightly sigmoidal, and bear longer and fewer marginal spines.

In the only specimen I have seen, the carapace is so imbedded in the pyritous matrix that the outline of the antero-lateral border cannot be determined. The specific name applies to the smoothness of the mid-branchial region.

ERYMA MANDELSLOHI, Meyer, sp. (Pl. XVI. fig. 2.)

Klytia Mandelslohi, Meyer, Neue Gatt. foss. Krebse, p. 21, tab. 4. fig. 30.

Eryma Mandelslohi, Oppel, Pal. Mitth., tab. 5. fig. 3; Etallon, Notes sur les Cr. Jur. d. Bass. du Jura, pl. viii. fig. 8 *d*.

Cephalothorax longer than high, in the proportion of 7 to 4; dorsal surface throughout impressed with rather large, deep punctations, which have irregular borders, and are so closely arranged as to produce a more or less reticulate appearance; small round tubercles are irregularly scattered over both the cephalic and scapular regions, some of which are placed at the posterior edge of a punctation, but others have no such definite relation. All the sulci are deep and wide; the epibranchial lobe is large, well defined, and approximately parallel-sided. Mesobranchial small; metabranchial more closely foveated than the other lobes. Chelæ of first pair large, of equal size, robust, rather longer than the cephalothorax; dorsal surface of the hand with a few small tubercles, and closely punctated, as also is the palmar side; fingers as long as or rather longer than the hand, both slightly incurved in a parallel direction, and distinctly foveated on both sides, the foveæ being larger than those on the hand; outer border rounded; inner margin with a series of small, dentary tubercles. These chelæ vary con-

siderably in size and form. Length of carapace 30 millim.; height of carapace 15; length of chelæ 30; width of propodite 14.

Oxford Clay, St. Ives.

Specimens exist in Mr. George's and my own collections, and in the British, Woodwardian, and Oxford Museums.

The St. Ives specimens are of larger size than those figured by Meyer and Oppel, and the cephalothorax is relatively less elongated in form; it also differs in that the tubercles on the anterior moiety are larger and more numerous.

The Oxford Clay carapace figured by Etallon (Cr. Jur. pl. viii. fig. 8 *d*) represents the Huntingdonshire form much more nearly than does that of Oppel from the Kellaways Rock. The latter author in his description (Pal. Mitth. p. 29) does not mention the occurrence of tubercles on the surface; but by the courtesy of Prof. von Zittel I have had the opportunity of examining the original figured specimen, and have ascertained that tubercles do exist, but are of relatively smaller size than on the St. Ives specimens. Etallon mentions this character as existing in specimens which have come under his observation. It seems not improbable that it may prove to be desirable to regard the Huntingdonshire form as a distinct species, by reason of the difference in the form of the carapace and in the character of the tuberculation. If so, I would suggest the specific name of *E. Etalloni* in honour of the distinguished palæontologist, who has contributed so largely to our knowledge of fossil Crustaceans. Specimens occur somewhat abundantly at St. Ives.

ERYMA VENTROSA, Meyer, sp.

Klytia ventrosa, Meyer, Neue Gatt. foss. Krebse, tab. 4. fig. 29.

Eryma ventrosa, Etallon, Notes sur les Cr. Jur. du Bass. du Jura.

I have seen two specimens of this species, each of them showing a nearly complete carapace, the characters of which correspond with those given by Meyer and Etallon, and also with those of a plaster cast of a specimen from Mailley, Haute Saône, for which I am indebted to the courtesy of Prof. von Zittel. They are of somewhat smaller size, and the carapace is not quite so long in proportion to the height—16 millim. by 30 millim.; the Mailley form 20 millim. by 40 millim. The tubercles also are more closely arranged in the St. Ives specimens, about 10 in a quarter-inch on the metabranchial region. In some portions of the carapace of one of the specimens a crescentic depression occurs in front of each tubercle; this is a character which Etallon (Cr. Jur.) assigns to *E. subventrosa*. A chela of the second (or third?) pair of limbs has the hand about three times as long as wide, with straight, subequal fingers half the length of the hand, each impressed by a series of rather large, setigerous pits.

Oxford Clay, St. Ives.

Coll. Mr. George, Northampton.

Two specimens examined.

Etallon gives a full analysis of the characters of this species, which appears to be a widely distributed form.

ERYMA VILLERSI, Mor. (Pl. XVI. fig. 3.)

Eryma Villersi, Morière, "Prem. Note sur les Cr. de l'Oxfordien trouvés dans le Calvados," Bull. Soc. Linn. Norm. sér. 3, t. vi. pl. i.

"Chelæ of first pair robust;" fingers long, slender, subequal in size, rendered slightly sinuous in outline by a gentle longitudinal double curvature; subcompressed laterally (oval in section); surface with depressed, small, regular tubercles, two or more diameters apart; outer border of both fingers broadly rounded; inner border of fixed finger with a series of denticles, of which a few are raised on a prominence near the proximal end; a series of smaller size occur between this prominence and a single large tooth about the middle of the finger, beyond which the series is continued to the distal end.

The inner margin of the dactylopodite bears a row of denticles unequal in size and rather larger than those on the fixed finger; those on the second proximal fifth of the dentary border are the largest, and are opposed to the small denticles of the fixed finger.

These chelæ so precisely agree in character with those of the specimen figured and described by M. Morière from the Oxford Clay of Calvados, that I do not hesitate to regard them as identical. M. Morière has figured a nearly perfect carapace with the first pair of limbs *in situ*; he also figures (fig. 5) a portion of a long slender-fingered chela which he is of opinion probably belonged to a different species; I have met with the same form amongst the St. Ives specimens, and also with chelæ almost identical with those represented by fig. 2 in M. Morière's plate. This distinguished palæontologist apparently hesitates to separate *E. Villersi* from *E. Babeaui*; both these forms occur at St. Ives, and I am inclined to regard the difference of character as fully sufficient to warrant specific distinction.

Length of dactylopodite nearly 3 inches; width of the distal end of hand about $\frac{7}{8}$ of an inch.

Oxford Clay, St. Ives.

Coll. Mr. George, Northampton, and my own.

Specimens examined 8.

ERYMA BABEAUI, Etal. Notes sur les Cr. Jur. tab. viii. fig. 1; Oppel, Pal. Mitth. tab. x. fig. 3.

Several imperfect specimens have come under my notice which so nearly resemble those of *E. Babeaui* that I provisionally refer them to that species, although they differ in some details from the figures and descriptions given by Etallon and by Oppel. One rather large specimen shows the distal end of the hand and the greater portion of both fingers, which latter are more robust, but have the graceful, falcate form expressed in the figure quoted. The tubercles on the distal portion of the hand and on the fixed finger are more crowded than in *E. Babeaui* as represented by Etallon and by Oppel, being scarcely more than one diameter apart, but are tolerably regular and uniform in size; those on the dactylopodite

are not uniform, but gradually increase in size as they approach the outer border, where they become more prominent, especially on the proximal portion; the tubercles are conical at the base, flat-topped, with a central mamilla on the summit.

On several small specimens of the dactylopodite the tubercles are more uniform in size and are less crowded. Etallon figures the denticles on the proximal portions of the dentary border of the fixed finger as being considerably longer than the rest, and Oppel states that this character occurs on the dactylopodite; but the St. Ives specimens do not exhibit this feature on either finger.

Width of distal end of hand $1\frac{1}{4}$ inch; length of dactylopodite $2\frac{3}{4}$ inches.

Oxford Clay, St. Ives.

Coll. Mr. George, Northampton.

Specimens examined 4.

Mr. Etheridge mentions (Phillips's Manual, part 2, p. 475) that *Eryma Babeaui* occurs in the Kimmeridge clay.

ERYMA GEORGII, nov. sp. (Pl. XVI. fig. 4.)

Carapace nearly twice as long as high; all the sulci large and so deep as to render the several lobes ventrose; the dorsal surface of all the regions bears rather large, conical, but not very prominent tubercles, which are uniform in size and regularly disposed, about one and a half diameter apart, and four or five in a quarter of an inch. (Frontal region imperfect.) Chelæ of first pair of limbs robust; the length of the hand is rather greater than the width of its distal end, and rather more than half the total length of the carapace; it bears regular tubercles which are rather smaller and more crowded than those on the carapace. The fingers are subequal in size, rather longer (?) than the hand, both slightly curved in the same direction, nearly smooth and punctated; outer border rounded; dentary margin with a series of small, depressed, dentary tubercles. Carpopodite two fifths of the length of the hand, and with a few tubercles; distal end of the meropodite with a stout spine. A chela of the second (or third?) pair, of small size, has straight, slender fingers, which are nearly as long as the hand, and both are impressed by several setigerous puncta.

Length of carapace from frontal to posterior border $1\frac{5}{8}$ inch; height of carapace nearly 1 inch.

Oxford Clay, St. Ives.

Coll. Mr. George, Northampton.

Specimens examined 3.

I have not been able to identify this form with any described species.

The deep regional sulci and the large size of the tubercles on the dorsal surface of the carapace distinguish it from its allies *E. ventrosa*, *E. propinqua*, *E. numismalis*, and *E. elegans*. It nearly resembles *E. Greppini*, Opp., from which, however, it differs in the conformation of the anterior portion of the carapace and the larger size of the surface-tubercles. The chelæ of this species bear no resem-

blance to the comparatively slender long-fingered claw figured by Etallon (Bull. de la Soc. Géol. de France, sér. 2, t. xvi. pl. vi. figs. 2, 3, 4) as presumably that of *E. ventrosa*. I dedicate the species to Mr. George, in recognition of the value of his palæontological labours.

In the specimen figured the carapace rests upon one of the chelæ.

ERYMA? PULCHELLA, nov. sp. (Pl. XVI. fig. 5.)

Chelæ of first pair of limbs 5 millim. in length; hand about as long as wide, moderately convex transversely; borders compressed into a blunt longitudinal keel or ridge; dorsal surface with small tubercles, regular in size and distribution, not quite a diameter apart. Fingers about as long as the hand, granulated on outer border; fixed finger slightly recurved at apex; both fingers carry a series of similar denticles on the dentary border. Carpopodite about half as long as the chela, granulated like the hand, as also is the meropodite. Portions of several of the posterior claws remain in the matrix; they are slender, smooth, and have a series of granules on their posterior border.

I provisionally refer these delicate little chelæ to a species of *Eryma*. Several forms of this genus, similarly small in size, occur in the Solenhofen beds, but *E. pulchella* appears to be quite a distinct species.

Oxford clay, St Ives.

Coll. Mr. George, Northampton.

Specimen examined 1.

GLYPHEA HISPIDA, nov. sp. (Pl. XVI. fig. 6.)

Length of cephalothorax nearly twice and a half the greatest height. Cephalic portion one fourth shorter than the scapular. A slight, sharp, longitudinal, central keel, the posterior half of which is closely subtended on each side by a series of tubercles, extends forwards from the cervical sulcus to the rostrum; three other stronger, equidistant ridges, each crested by a series of acutely pointed tubercles, occur in the space between the mid-dorsal keel and the antero-lateral border; the interspaces between these ridges are smooth, but a few tubercles occur on their proximal portion, especially on that nearest the antero-lateral border. A ridge, bearing a string of small round tubercles, follows the contour of the antero-lateral margin. Cervical sulcus very distinct. The surface of all the lobes of the scapular portion is uniformly covered by rather large tubercles scarcely a diameter apart, having apices which, in well-preserved specimens, are very acute and point forwards. The combined epibranchials form a large central lobe, rather acutely pointed posteriorly; mesobranchial lobe clavate, distinctly defined by a sulcus posteriorly, less so anteriorly; a well-defined small lobe occurs between the lower end of the mosobranchial and the hepatic lobes, the latter being separated from the metabranchial by a very faint sulcus. Metabranchials large. Numerous fragments of the limbs occur, which indicate that they were of considerable length:

propodite of the first pair about three fourths the length of the carapace, and three or four times as long as wide, subterete, with one side flattened; the rounded portion has several, 6–10, rows of pointed tubercles; the inner border is compressed, trenchant, and, as in some other species of *Glyphea*, bears an interrupted series of large and small teeth, the terminal one of which extends beyond the distal end and constitutes a rudimentary fixed finger. (Dactylopodite imperfect.) A specimen exhibiting a portion of one of the antennæ indicates that they were long and multiarticulate.

Carapace 24 millim. long; 11 millim. high.

Rare in the Oxford Clay, St. Ives.

Coll. Specimens are in the collections of Thomas George, Esq., and in my own; also in the Woodwardian Museum.

This species is allied to *G. pustulosa*, Meyer, *G. Etalloni*, Opp., and *G. Münsteri*, Voltz. From the two former it is distinguishable by the difference in the carination of the cephalic portion of the carapace, and in the form and proportions of the epibranchial lobe. The characters of the cephalothorax are very similar to those of *G. Münsteri* as figured by Meyer (Neue Gatt. Foss. Kr. tab. iii. fig. 23), but a difference appears to exist as to the cephalic carinæ, and Meyer's figure does not indicate the ridge of tubercles alongside the posterior portion of the central cephalic carina. The chelæ of the first pair of claws, which are fortunately preserved *in situ* in a St. Ives specimen, bear no resemblance whatever to those figured by Meyer (*l. c.* tab. iii. figs. 24, 25). Oppel's enlarged figures of *G. Münsteri* (Pal. Mitth. tab. xvii. figs. 4, 5) differ considerably from those of Meyer, and do not at all apply to the Huntingdonshire specimens. Much confusion exists, especially among continental palæontologists, as to *E. rostrata*, Phillips, which is, however, a well-marked and quite distinct species, as both Dr. Woodward and Professor M^{c}Coy have determined, and does not occur in the Oxford Clay, so far as I know.

GLYPHEA REGLEYANA, Meyer, Neue Gatt. Foss. Krebse, tab. iii. figs. 14–21; Etallon, Notes sur les Cr. Jur. tab. iii. figs. 11, 12; Oppel, Pal. Mitth. tab. xvii. figs. 2, 3.

A single specimen, consisting of a portion of the carapace, which exhibits the postero-lateral border and the metabranchial lobe, and also several segments of all the limbs of the left side, presents characters which so nearly agree with those of *Glyphea Regleyana* as fully to warrant provisional reference. The portions preserved do not afford any details in addition to those given in full by Meyer, Etallon, and Oppel, except that the meropodite of the anterior two or three pairs of limbs bears a row of acute spines on the posterior, and a series of smaller ones on the anterior border. The surface of the carapace is tuberculated, but is too much worn to determine whether it was also punctated.

M. Etallon observes that this species has a wide range, both geo-

logical and geographical, and Prof. Oppel quotes its occurrence at Malton, Yorkshire.

Length of carapace 1⅝ inch; length of meropodite of first pair 1 inch.

Oxford Clay, St. Ives.

Coll. Mr. George, Northampton.

MAGILA PICHLERI, Opp. Pal. Mitth. tab. xi. fig. 5.

Chelæ short; length of hand, from carpal to dactylar articulation, about equal to its width at the distal extremity; surface with minute, equal, round granules, those on the palmar side having a tendency to assume a definite reticulate arrangement; a few larger tubercles border the articulation for the dactylopodite; outer border of hand carinated by a ridge, which bears a few teeth and is continued as a sharp edge along the fixed finger, closely subtended by a series of puncta on the palmar surface. Fingers about as long as the hand, smooth, flat on the palmar, convex on the dorsal side; inner border of fixed finger gradually widening from apex to base, longitudinally grooved; a series of small, equal, denticles occur on the dorsal edge of the groove, which is sharply angulated near its distal end, giving the characteristic emarginate appearance to the finger. Dactylopodite nearly identical in character with the fixed finger, but rather longer, and the distal emargination is scarcely so distinctly marked.

Dr. Oppel has figured this species, but has not described it in detail.

Length of chela 18 millim.; width of hand 9 millim.

Oxford Clay, St. Ives.

Coll. Mr. George, Northampton; my own.

Specimens examined 5.

MAGILA LEVIMANA, nov. sp. (Pl. XVI. fig. 7.)

Chela of first pair—basal portion of propodite (hand) about two thirds as wide as long; dorsal surface slightly convex, smooth, margins broadly rounded. Fingers about as long as the hand, smooth, slender, oppositely curved, convergent at their tips. A slight angulation on the dentary border of the dactylopodite renders its distal half broadly emarginate. Portions of several segments of the abdomen accompany the chela, and indicate the macrurous form; the epimera are rounded, deeply punctated, and margined by a distinct ridge.

The broadly rounded borders of the hand will at once distinguish this species from *M. Pichleri*, Opp.

Length of chela 8 millim.; width of hand 4 millim.

Oxford Clay, St. Ives.

Coll. Mr. George, Northampton.

Specimen examined 1.

MAGILA DISSIMILIS, nov. sp. (Pl. XVI. fig. 8.)

Chelæ small, delicate, laterally depressed; propodite (imperfect

posteriorly), anterior portion with minute, round tubercles, two or more diameters apart, on both dorsal and palmar surfaces, most numerous near dorsal base of fixed finger; distal portion of outer border flattened, margined by distinct ribs, which extend along the fixed finger nearly to its apex; the proximal moiety of these ribs is delicately granulated; the border of the hand corresponding to the dactylopodite is rounded. Fingers longer than the hand, flattened laterally, cultriform; surfaces smooth, with a few setigerous puncta; outer edge flattened like that of the fixed finger, and separated from both the palmar and dorsal surfaces by a distinct ridge; the distal three fourths of the dentary border of the fixed finger bear 10 or 12 small subequal denticles; the proximal fourth is occupied by a single larger and longer denticle; the dentary border of the dactylopodite is trenchant, and divided into three nearly equal portions by two slightly prominent denticles or angulations.

I refer these elegant little chelæ provisionally to the genus *Magila*; the specific name indicates the dissimilarity of the dentary edge of the fingers.

Length of chela 16 millim.; width of hand 5 millim.

Oxford Clay, St. Ives.

Coll. Mr. George, Northampton; my own.

Specimens examined 2.

MECOCHIRUS SOCIALIS, Meyer, sp.

Eumorphia socialis, Meyer, Palæont. Bd. i. tab. x. figs. 2–10.
Mecochirus socialis, Oppel, Pal. Mitth. tab. xxii. figs. 2, 3.

Length of carapace from apex of rostrum to posterior border about twice and a half its greatest height; test thin and fragile; surface closely and rather coarsely punctated; puncta most numerous near the ventral border of the branchial lobes, gradually disappearing towards the dorsum; each in front of a minute tubercle. A sharp, narrow, cervical sulcus, extending obliquely forwards and downwards on each side from a point somewhat in front of the middle of the dorsum towards the antero-lateral angle, marks off the cephalic portion, which occupies scarcely more than a fourth of the total surface of the carapace; a slightly curved lateral cephalic ridge runs from a small blunt spine on the frontal border nearly to the cervical sulcus; between this ridge and the antero-lateral border a distinct cluster of tubercles occurs. None of the typical lobes of the scapular region are definitely recognizable, except that a sharp U-shaped sulcus, near the antero-inferior angle of the metabranchial, indicates the lower extremity of the mesobranchial lobe; in some specimens the posterior arm of the U is prolonged obliquely backwards and upwards as a faint posterior mesobranchial sulcus.

Rostrum simple, rather short, rapidly widening posteriorly and longitudinally depressed in the mid-dorsal line. Abdomen about a third longer than the cephalothorax; the first segment is the shortest, and has in front a transverse ridge with a small lateral tubercle; a similar ridge crosses the posterior border; the second

is rather the largest of the segments. The epimera are somewhat elevated in the central portion, bear several tubercles, and have broadly rounded and flattened margins. Telson narrowing somewhat towards the posterior border, which is very slightly rounded; the caudal endo- and exopodite are similar in size and form, each has a strong longitudinal ridge; the exopodite is not transversely jointed, and bears a few tubercles.

The limbs from the first to the fifth pair become gradually shorter and more slender. The meropodite of the first pair is flattened, smooth, and has tubercles on the posterior border; the carpopodite is about half the length of the meropodite and carries a few tubercles: the propodite is about three times as long as the carpopodite; in form it is subterete; two rows of tubercles run along the border and unite at the base of the process which represents the fixed finger; a similar row runs from each of the condyles which serve for articulation with the dactylopodite and extends backwards for the distal two thirds of the joint; the space between these rows of tubercles is roughly rugose. Dactylopodite straight, slender, smooth, about half as long as the propodite; the outer edge is flattened, and has two longitudinal rows of minute punctures; sides flat, with similar rows of puncta; dentary border very finely serrate. As throughout the genus, all the limbs are monodactylous, the fixed finger being represented in the two anterior pairs by a short acute process upon which the dactylopodite can be closed. The propodite of the second pair is smooth, and has the widening of the distal end typical of the genus; in length it scarcely exceeds the carpopodite, and it supports a dactylopodite, which has rows of minute puncta and a minutely serrate dentary margin like the first pair.

Measurements. Length of cephalothorax from apex of rostrum to posterior margin 15 millim.; first pair of limbs—combined length of the three proximal joints about 5 millim., meropodite 9, carpopodite 5, propodite 16, dactylopodite 7. In some specimens the propodite is relatively shorter; this may be a sexual difference.

Oxford Clay, St. Ives.

Coll. Mr. George, Northampton, Woodwardian Mus., and my own.

Specimens examined, numerous.

This species is well figured and described by Herm. von Meyer (Palæontographica, Bd. i. p. 144, tab. xix.), also by Quenstedt (Württemb. naturwiss. Jahresh. 1850, Taf. ii.). It occurs aubndantly in the Oxford Clay of St. Ives, Huntingdonshire, but I am not aware that its occurrence in any other British locality has been previously recorded. By reason of the delicacy of the test the specimens invariably occur in an imperfect state. Von Meyer states that it is found in several localities in Germany (Württemberg), frequently associated with *Klytia* (*Eryma*) *Mandelslohi* and a species of *Glyphea*, probably *G. Münsteri*.

M. socialis is readily distinguishable from the other species of the genus by its size and relative proportions; it is most nearly

allied to *M. brevimanus*, Münst. (Solenhofen), but that species is a third larger, and the figure in Oppel (Pal. Mitth. tab. xxii. f. 5) appears to indicate three lateral cephalic ridges; and the propodite, in contradiction of its specific name, is relatively longer than in *M. socialis*. *M. Pearcei*, McCoy, is twice or three times as large, and I fully concur with Dr. Woodward in regarding it as a distinct species.

GONIOCHIRUS CRISTATUS, nov. sp. (Pl. XVI. fig. 9.)

Chelæ short, robust, basal portion of propodite (hand) wider than long; dorsal surface slightly more convex than the palmar; border corresponding with the fixed finger rounded, bearing tubercles, a few of which are scattered over the adjacent portion of both the palmar and dorsal surfaces; the border corresponding with the dactylopodite has a tuberculated "carinal expansion" (Etallon), subtended on each side by a narrow, longitudinal furrow; articular cavity for dactylopodite large, occupying more than half the distal extremity of the hand; carpal articulation large, very oblique. Fingers varying in length from a third to half the length of the hand, both deflected towards the palmar plane; outer border of both fingers flattened, and bearing a series of numerous, crowded, conical tubercles of various sizes; dentary border widening from apex to base, and bearing a row of 6–9 crushing-tubercles near the dorsal edge; palmar and dorsal surfaces of both fingers flattened, smooth (or with a few palmar tubercles), and impressed by large, oval pits for capillary tufts.

I refer these chelæ to a species of *Goniochirus* rather than to a form of the nearly allied genus *Orhomalus*, Etallon, by reason of the large size of the articulation for the dactylopodite, the great obliquity of the carpal articulation, as also the carinal expansion on the border corresponding to the dactylopodite, and the equal degree of convexity of the palmar and the dorsal surfaces of the hand. M. Etallon describes the palmar surface in *Orhomalus* as being flattened and capable of close apposition to the under surface of the carapace, as in the Cryptopods. The specific name applies to the crowded crest of tubercles on the outer borders of the fingers; this character will distinguish this from the only other described species—*G. Babeaui*, Etal., and *G. Jaccardi*, Etal. The only portions which I have been able to identify are the chelæ; these occur abundantly, but vary considerably in form and size.

Length of hand from carpal base to finger-tip from 20 to 30 millim.; width of hand from 15 to 25 millim.

Oxford Clay, St. Ives.

Coll. Woodwardian, Newcastle, Oxford, Mr. George, and my own. Specimens numerous.

M. Etallon classifies the genus *Goniochirus* among the Brachyura, but suggests the probability that it may be proved, by the discovery of other portions, to be an Anomurous form. If it should be definitely determined to be a true Brachyuran, it would acquire considerable interest as being one of the earliest representatives of that class.

In general form these chelæ resemble those of two Cretaceous

species, *Glyphea Couloni*, Trib., and *G. Meyeri*, Trib., figured and described by M. de Tribolet (Bull. de la Soc. Géol. de France, 3e sér. t. iii. pl. xv. figs. 2, 4); but the figures of neither of these species indicate the existence of the crest of crowded tubercles on the border of the hand corresponding to the fixed finger.

PSEUDASTACUS, sp. (Pl. XVI. fig. 10.)

Chelæ of first pair elongated; basal portion of propodite (hand) more than twice as long as wide, subcylindrical, surface with minute tubercles, in front of which is a minute depression. Fingers slender, smooth, subterete, probably shorter than the hand (imperfect). Carpopodite short, granulated like the propodite.

In general character these chelæ so closely resemble those of *Pseudastacus*, as figured by Professor Oppel (Pal. Mitth. tab. x. and xi.), that I provisionally refer them to that genus.

Length of hand 9 millim.; width of hand 4 millim.

Coll. Mr. George, Northampton.

Specimens examined 2.

PAGURUS, sp. (Pl. XVI. fig. 11.)

Chelæ of first pair; basal portion of propodite (hand) approximately quadrate in outline, rather longer than wide, dorsal surface slightly convex, smooth, with a few small scattered punctations; a slight longitudinal furrow runs from the base of the dactylopodite to the carpal articulation, which is nearly straight transversely. Palmar surface flattened, smooth. Fingers about as long as hand, nearly equal in size, both deeply pitted by large setigerous puncta, which are most numerous at the apex; dentary borders nearly straight, and bear a series of 6–8 equal-sized tubercles. Carpopodite distinctly tuberculated, and having an oblique longitudinal groove on the proximal moiety. Meropodite smooth laterally, posterior border roughened by tubercles.

Length of chela 14 millim.; width of hand 7 millim.

Coll. Woodwardian Museum.

Specimen examined 1.

PSEUDASTACUS? SERIALIS, nov. sp. (Pl. XVI. fig. 12.)

Propodite elongate, 15 millim. long and 6 millim. wide, subcompressed, ovoid in section; fixed finger about half the length of the hand; dorsal surface of hand with several (5 or 6) longitudinal rows of mamillated tubercles, which are surrounded by tubercles of a much smaller size; the palmar surface bears numerous irregularly disposed tubercles of various sizes, but all smaller than those of the dorsal rows.

Oxford Clay, Fletton, Hunts.

Coll. Alfred N. Leeds, Esq., and Mr. George.

I am unable to refer this pretty chela with certainty to any known genus; but the characters are so well marked as to render specific mention desirable. The name applies to the disposition of the tubercles on the dorsal surface of the hand.

Having described the Huntingdonshire forms, I will briefly notice the only other species which, so far as I am aware, have been recorded as occurring in the Oxford Clay at other localities in Britain :—

Mecochirus Pearcei, *M'Coy*.
Glyphea leptomana, *Phil.*
—— Stricklandi, *Phil.*

MECOCHIRUS PEARCEI, M'Coy, Ann. & Mag. N. H. 1849, ser. 2, vol. iv. p. 172. (Pl. XVI. fig. 13.)

I have not been able to ascertain that this species has ever been figured or described in specific detail, probably in consequence of the mutilated condition in which specimens occur, by reason of the delicacy of the test. The carapace is about 25 millim. long; the surface appears to be smooth, but under a strong lens numerous minute puncta are visible. The limbs are better preserved; the first pair, when fully extended, would be about equal to the combined length of the carapace and extended abdomen. In a well-preserved specimen in the Jermyn Street Museum the proximal joints measure 13 millim., meropodite 14 millim., carpopodite 13 millim., propodite 34 millim., dactylopodite 18 ? millim. The abdominal appendages appear to have been largely developed.

Oxford Clay, Chippenham, Christian Malford, Yorkshire (Morris's Cat.).

Coll. The British, Jermyn Street, Woodwardian, and other Museums.

Of this species I have seen perhaps as many as forty specimens, all of them so crushed as to efface most of the minor characters. In general size it is fully twice as large as *M. socialis*, and about equal to *M. Bajeri*, Germ., but considerably smaller than *M. longimanus*, Münst. The first pair of limbs may be distinguished from those of either of the species mentioned by the relative length of the meropodite: in *M. Pearcei* this segment is scarcely longer than the carpopodite; but in *M. Bajeri*, as also in *M. socialis*, it is twice as long, and in *M. longimanus* still longer.

The figure and description published in Mr. Lee's 'Note-book of an Amateur Geologist' (pp. 87, 88, pl. cciv.) as that of *Mecochirus Pearcei* do not apply to that species, but to *Meyeria vectensis*, Bell.

GLYPHEA LEPTOMANA, Phil.

GLYPHEA STRICKLANDI, Phil.

Both these species, mentioned in Mr. Etheridge's edition of Phillip's 'Manual of Geology' as occurring in the Oxford and Kimmeridge Clays, are omitted, and, I think, judiciously, by Dr. Woodward from his Catalogue of British Fossil Crustacea. Of the former species I have not been able to find any figure or description. By the kindness of Professor Prestwich I have examined the specimen of *G. Stricklandi* in the Oxford Museum, figured by Phillips. It consists of a didactylous chela, and cannot be referred

to the monodactylous genus *Glyphea* as at present defined; nor can I assign it with any degree of confidence to its proper genus.

The points of special interest to which I wish to direct attention are:—

1. That the decapod Crustaceans of the Oxford Clay are represented in this country by the occurrence of a larger number of species than had been previously determined. The comparative rarity of this class of fossils in the British rocks contrasts strikingly with their remarkable abundance in a formation of a somewhat later date, the Lithographic Slates of Solenhofen &c. The degree to which this absence implies previous non-existence scarcely admits of determination with our present knowledge of facts.

2. That the Oxford-Clay forms belong almost exclusively to the Macrurous type, the Anomura being very scantily represented, and the Brachyura still more so.

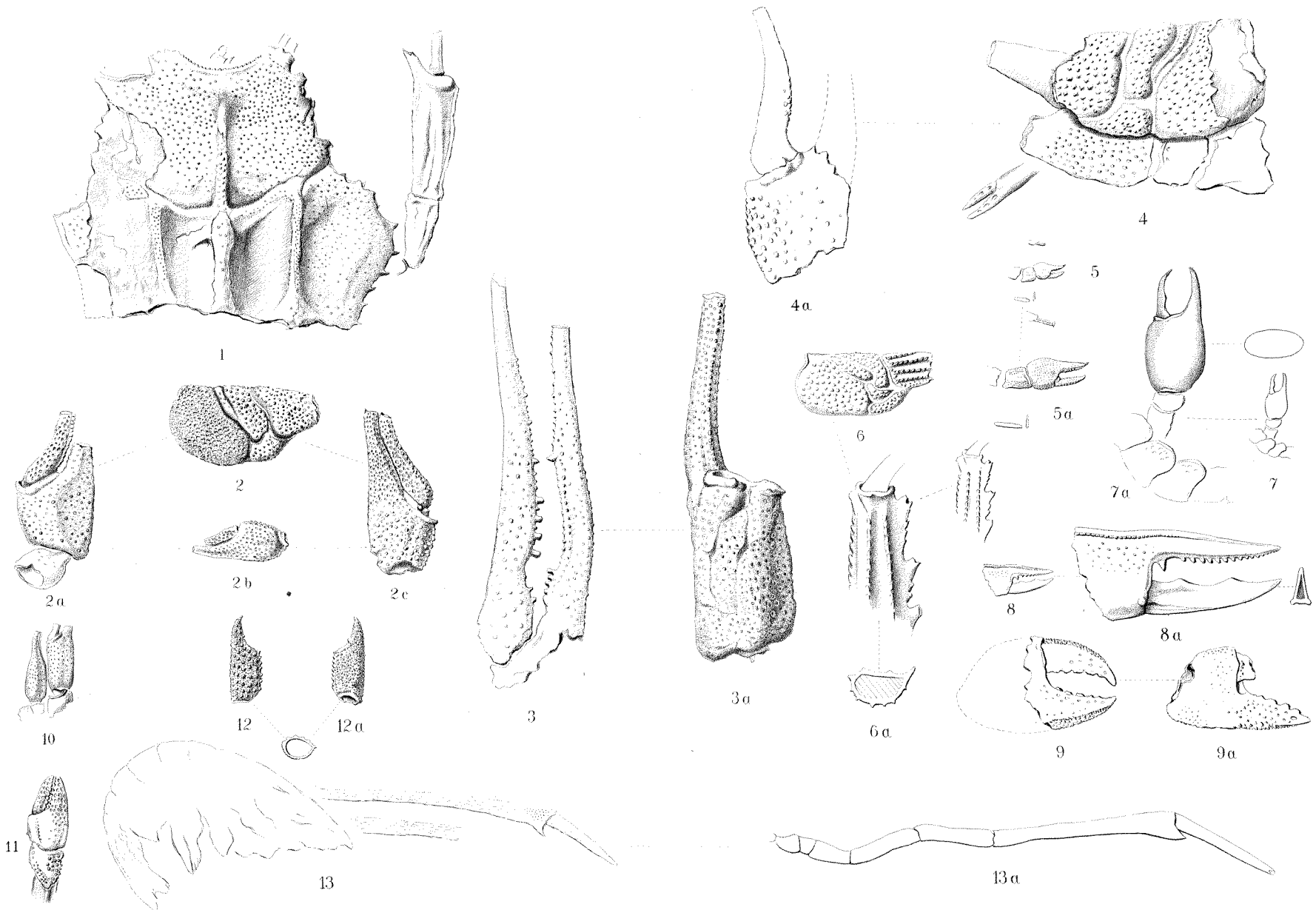
This fact is of biological interest as marking a progressive development from the lower to a higher type. The rarity of Brachyura during the Jurassic era contrasts with their preponderance over the Macrura during the Cretaceous period; and they probably outnumber the Macrura existing at the present time in the proportion of three to one. I believe they do not occur at all in the Solenhofen beds, so prolific of the Macrurous forms.

The only species described in this paper which can be referred to the Brachyura is *Goniochirus cristatus*; and M. Etallon suggests that this, as also the allied genus *Orhomalus*, may probably be proved to be Anomurous by the discovery of better-preserved specimens.

EXPLANATION OF PLATE XVI.

Fig. 1. *Eryon sublevis*, nov. sp. Natural size. St. Ives.
2. *Eryma Mandelslohi*, Meyer, sp. Nat. size. St. Ives.
2 *a*. —— ——. Chela found *in situ* with the carapace, fig. 2.
2 *b*, *c*. —— ——. Other forms of chelæ.
3. —— *Villersi*, Morière. St. Ives. Dactylopodite and portion of fixed finger of first pair of limbs.
3 *a*. —— ——. Propodite of another specimen.
4. —— *Georgii*, nov. sp. Nat. size. St. Ives. Carapace resting on the right first limb, of which the dactyl, propos, carpus, and a portion of the meros are recognizable.
4 *a*. —— ——. Chela of first pair. Nat. size.
5. —— *pulchella*, nov. sp. St. Ives. Propodite of first pair and portions of posterior limbs. Nat. size.
5 *a*. —— ——. Enlarged.
6. *Glyphea hispida*, nov. sp. Nat. size. St. Ives.
6 *a*. —— ——. Distal portion of propodite of first pair. Enlarged and transverse section.
7. *Magila levimana*, nov. sp. Nat. size. St. Ives.
7 *a*. —— ——. Portions of first pair of limbs and of abdominal segments. Enlarged.
8. —— *dissimilis*, nov. sp. Nat. size. St. Ives.
8 *a*. —— ——. Chela and transverse section of dactylopodite. Enlarged view.
9, 9 *a*. *Goniochirus cristatus*, nov. sp. St. Ives. Chelæ of first pair of limbs. Nat. size.

Fig. 10. *Pseudastacus*, sp. St. Ives. First pair of chelæ. Nat. size.
11. *Pagurus*, sp. St. Ives. Portion of first pair of limbs. Nat. size.
12. *Pseudastacus*? *serialis*, nov. sp. Fletton, Hunts. Propodite of first pair of limbs. Nat. size. (From cabinet of A. N. Leeds, Esq., Eyebury, Peterboro'.)
13. *Mecochirus Pearcei*, M'Coy, sp. Christian Malford. One of the specimens originally determined by Prof. M'Coy (Ann. Nat. Hist. 1849) and now in Woodwardian Museum.
13 *a*. —— ——. Limb of the first pair. (From a specimen in the Jermyn St. Museum.) Nat. size.



J. CARTER, DEL.

OXFORD CLAY CRUSTACEA.

CAMBRIDGE SCIENTIFIC INSTRUMENT COMPANY, LITH.