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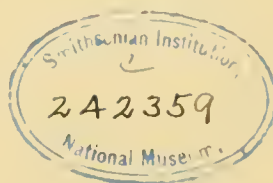
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A MONOGRAPH  
OF THE  
FOSSIL  
MALACOSTRACOUS CRUSTACEA  
OF  
GREAT BRITAIN.

I, II.—LONDON CLAY, GAULT, AND GREENSAND.

BY  
THOMAS BELL, F.R.S., F.G.S.



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BY  
PROFESSOR BELL, F.R.S., F.G.S., ETC.  
PRESIDENT OF THE LINNEAN SOCIETY.

PART I.  
CRUSTACEA OF THE LONDON CLAY.

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## INTRODUCTION.

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IN examining the zoological characters of the Crustacea which existed during the Eocene period, it is impossible not to be struck by the fact, that notwithstanding the obvious relation in most of them to the members of recent groups, amounting often to an almost typical representation of a family, there is at the same time, probably without exception, such a discrepancy as forbids their association under the same generic formula. In some few cases, indeed, it has been difficult, in consequence of that general destruction of the minute but very important organs about the oral, antennary, and ophthalmic regions, which too often prohibits any very correct appreciation of the relations of the species, to assign to the extinct form its true place amongst its recent allies. But ordinarily there have been, amongst the numerous specimens which I have been so fortunate as to have placed at my disposal, some which have sufficed to indicate their affinities with great probability, if not with absolute precision; and these have led me to adopt the conclusion above stated, which is somewhat at variance with the recognised relation between the Eocene and more recent forms of most other classes of animals, of which representatives are found even in that early member of the tertiary series.

In making the necessary comparisons, and in endeavouring to assign to the different characters and structures their absolute or relative importance, I have found it requisite to investigate with some care the homologies of the different regions and subordinate portions of the carapace, as it happens too often that we are driven to that part, almost exclusively, as the basis of our diagnosis. I will, therefore, make a few remarks on this important element in our generalization, before I enter upon the detailed application of these data to the determination and description of the objects themselves.

The first distinct attempt at an anatomical division of the carapace into "regions," on the basis of their presumed relation to the viscera which they respectively cover, was made by Professor Desmarest, in his portion of the '*Histoire Naturelle des Crustacés*'

Fossiles,' in which he was associated with Alex. Brongniart. It is unnecessary now to enter into any detailed correction of this system, which, although possessing great merit as containing the groundwork of a sound nomenclature and many valuable suggestions, is still in some respects erroneous and overladen with terms which are too circumscribed, and in some instances referred to organs with which they have no very obvious relation.

Professor Milne Edwards, in his great work, the '*Histoire Naturelle des Crustacés*,' improved upon Desmarest's division of the carapace, but it still wanted that simplicity and generalization which are so important in all systems of nomenclature. Dana, whose knowledge of the subject and enlarged general views entitle his opinions to great respect, proposed a plan of the regions of the carapace, founded only on their position on the carapace and in relation to each other; but it appears to me that the memory is greatly aided and the true relation of the regions more nearly approached, by assigning to each its appropriate function, so to speak, as the protecting covering of the subjacent viscus. Still keeping this principle in view, Dr. Milne Edwards has, in a more recent work, his admirable treatise on the homologies of the organs of Crustacea, presented a less complicated nomenclature, which, with some modifications, I shall adopt in the descriptions of genera and species in the present work.

In following the classification of these parts, as given by this distinguished naturalist, I cannot, however, conceal from myself that there are some points on which, as it appears to me, he is in error. The hepatic region, for example, is one of the smallest of the whole, although the organ to which it nominally stands in relation is of enormous development in the whole of the sub-class with which we have to do, and the region to which the name is given is, by its position, related to only a very small fragment of it. The divisions of the branchial region may, I think, be improved by apportioning a much smaller area to what the author calls the meso-branchial lobe, a limit which is, in very many cases, indicated by a natural line of demarcation. This alteration I propose to adopt. I should have been disposed to change the names of these, and, perhaps, of some other subdivisions of the carapace, but from a disinclination to interfere with a nomenclature already established by so sound an authority, and thus to create confusion by the multiplication of synonyms in terminology.

This is not the place to discuss the theory of the homologies of the two primary divisions of the carapace. Much yet remains to be done in this intricate question, and it has recently undergone the investigation of a very competent observer, Mr. Huxley, who has taken the only sure basis for a satisfactory conclusion, that founded upon development. The division, however, into two distinct elements, limited theoretically, and, in many forms, actually, by a definite line of demarcation, is so entirely borne out by facts, that I shall assume it as proved, and found my descriptions upon that principle. This division is most obvious in the *Macrura*, and some of the *Anomura*; but it is by no means rare in the *Brachyura*, although in these the boundary furrow is less distinguished from the subordinate regional grooves. The sulcus by which it is indicated is termed

by M'Coy the nuchal furrow, and by Milne Edwards "le sillon cervical." It passes in a very uneven line behind the hepatic region, backwards by the side of the metagastric lobe and across behind the urogastric. Thus the anterior portion to which Professor Edwards gives the name of cephalic arch ("arceau cephalique") consists of the frontal, the orbital, the gastric, and hepatic regions; and the posterior portion, the scapular arch ("arceau scapulaire"), is formed of the branchial and cardiac.

I take the normal form of the Brachyurous carapace (to which for the present I confine my attention) to be that in which the regions and their secondary divisions or lobes are more or less distinctly marked by furrows, and the latero-anterior margin furnished with five processes, including the extra-orbital process, in the form of spines, teeth, or tubercles. This will be sufficient for my present purpose, and it would only be involving an unnecessary and ambiguous discussion to enter, in this place, into a more intricate subdivision of the regions.

In the normal form of the Brachyurous carapace there are, according to the system which I here adopt, nine regions. Of these three are single, placed on the median line, and three pairs, which occupy the lateral portions of the carapace. The azygos regions are the frontal, the gastric, and the cardiac; the pairs are the orbital, the hepatic, and the branchial. The frontal region is placed at the anterior margin, and is generally very small in the typical Brachyura; but in the Oxyrynchi and in most of the Macrura and several of the Anomura, it is developed into a more or less projecting rostrum. It is circumscribed behind and above by the gastric, and laterally by the orbital regions, and beneath it ordinarily joins a projection of the epistome, and covers the antennules or internal antennæ, forming the upper vault of the antennary fossæ. The orbital region on each side is also small, and occupies the anterior margin of the carapace from the frontal to the hepatic regions, and it is bounded behind by the broad anterior margin of the gastric, from which it is generally distinguished by a slight elevation. It is often armed with a spine or tooth or tubercle on its inner and outer angle, the latter forming the first of the five normal projections of the latero-anterior margin of the carapace. The gastric region occupies, in most cases, a very extensive portion of the anterior half of the carapace, extending at its anterior margin along the whole breadth of the frontal and orbital regions: it is bounded laterally by the hepatic and branchial, and posteriorly by the anterior (epicardiac) lobe of the cardiac. It is divided into lobes which are more or less distinct and prominent, in some cases being almost as strongly distinguished from each other by grooves as the regions themselves, in others altogether confluent, and scarcely recognizable by slight elevations. The anterior pair (epigastric), which are in contact with the frontal, and in some cases extending to the orbital regions, are very small and ordinarily inconspicuous; the next which are termed protogastric are very large, and occupy the greater part of the area of the gastric region; the union of this pair of lobes is often interrupted by an elongated projection of the next lobe, the mesogastric, which is placed in the mesial line, and is identical with what was formerly called the genital

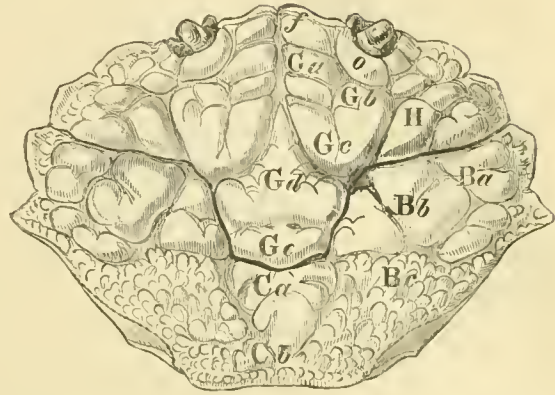
region; the metagastric lobes are placed behind those hitherto mentioned, and generally meet on the mesial line, behind the mesogastric, becoming confluent; the posterior lobe of this region is called the urogastric, and often consists of a mere narrow, transverse line, sometimes confounded with the anterior, although, in other cases, it is as long as it is broad, and quite readily distinguished. The hepatic region is somewhat triangular, and occupies externally the anterior part of the latero-anterior margin, from the orbital to the branchial; it is bounded on its inner side by the protogastric lobes, and behind by the epibranchial; in those cases in which the margin is furnished with the normal number (five) of processes, the hepatic region has the second and third allotted to it. This region is, in many instances, confluent with the gastric and branchial, but in others the limiting furrow is sharp and distinct, and constitutes a portion of the *sulcus cervicalis*, which divides the cephalic from the scapular arch, as before described. The cardiac is the posterior mesial region, and answers to the cardiac and intestinal regions of Professor Milne Edwards's former arrangement, and to the "cordiale" and "hepatique postérieure" of Desmarest. It is bounded anteriorly by the urogastric lobe, laterally by the metabranchial, and posteriorly forms the posterior margin of the carapace. It is composed of two portions, named by M. Edwards the anterior and posterior lobes, but for which I propose the names respectively of epi- and meta-cardiac. The branchial regions are very large, occupying in most cases the moiety of the area of the carapace; and in some, particularly of the triangular forms, even much more. Externally, it forms the posterior half of the latero-anterior and the whole of the latero-posterior margin of the carapace. Its anterior boundary is the hepato-branchial portion of the cervical furrow, and the inner the gastro-branchial and cardi-branchial furrow. It is divided into three tolerably distinct parts, termed the epi-, the meso-, and the meta-branchial lobes. The first of these extends across the lateral portion of the carapace from the lateral margin, the fourth process of which, when it exists, essentially appertains to it; the inner margin usually coincides with the meta- and uro-gastric lobes. The meso-branchial lobe I propose to limit to a much smaller area than has been assigned to it; an area which is in many genera so clearly defined as to involve, I think, no ambiguity. It is commonly a triangular or rhomboidal space, embracing the fifth marginal tooth, and extending but a short space inwards between the epi- and meta-branchial lobes. The latter is a broad space, forming nearly half of the whole branchial region, and it frequently presents a surface of so different a character from the rest of the carapace as to be readily distinguishable. This will be found very strongly marked in the genus *Dromilites*, and particularly in that species to which Desmarest gave the name of *Inachus Lamarckii*.\*

Such appear to me to be the essential divisions of the carapace in the Brachyurous

\* So striking is their structure in the species in question, that Mr. M'Coy considered it as the principal character on which he founded his genus *Basinotopus* (now referred to *Dromilites*), which also suggested the name. He, however, appears to have failed to ascertain its true character as the modified meta-branchial lobe.



and Anomurous Crustacea, distinguished so far as is necessary for my present purpose. Their modifications in the Macrura will be readily understood by reference to the different forms of that group. The example I have here selected for the illustration of this structure is *Zozymus æneus*,\* which, although exhibiting many still subordinate divisions or lobules, which need not here be designated, demonstrates with remarkable clearness those points which I have thought it requisite to describe, and is, perhaps, as nearly normal as any one I could have chosen. It is scarcely necessary to state that the foregoing descriptions are to be considered as belonging to the normal form, and that there are to be found in be different species, variations of every part to the greatest imaginable extent, always, however, preserving their mutual relations.



When it is considered how numerous are the Crustacean fossils which exist in the London Clay, and how plentifully many of the species are distributed, and the interest which attaches to this class of animals, both on account of their general structure and particularly of the relation in which they stand to the different formations in which they are found, it is remarkable that so little attention has hitherto been paid to them, and that so few species have ever been described. The crustacean inhabitants of the earliest seas, indeed, have not been subject to this neglect, for the Trilobites have long since been thoroughly studied, and have been made the subject of much philosophical research and of many elaborate publications. The Chalk Crustacea of Great Britain have also received a fair share of attention; but those of the Eocene period have been almost wholly neglected. In Professor Morris's 'Catalogue,' published in 1843, there are only three species of Malacostracous Crustacea recorded as belonging to this formation, and for the announcement and description of two of these we are indebted to a French naturalist. Since that period there has been scarcely a record of an additional species, until a paper by Professor M'Coy appeared in the 'Annals of Natural History,' in the year 1849,† in which five additional species are described from the London Clay, preserved in the Woodwardian Museum at Cambridge, and other collections.

\* In the figure, the following letters indicate the regions and principal lobes: *f*, the frontal region; *o*, the orbital; *H*, the hepatic; *G*, the gastric region; *Ga*, the epigastric lobe; *Gb*, the protogastric; *Gc*, the mesogastric; *Gd*, the metagastric; *Ge*, the urogastric. *B*, the branchial region; *Ba*, the epibranchial lobe; *Bb*, the mesogastric; *Bc*, the metagastric. *C*, the cardiac region; *Ca*, the epigastric lobe; *Cb*, the metagastric.

† On the Classification of some British Fossil Crustacea, with notices of some new forms in the University collection at Cambridge, 'Ann. Nat. Hist.' 1849, pp. 181, 330, 392.

It will probably be thought by many that in the descriptions of the species, and, perhaps also, in the generic diagnostic phrases, I have entered into needless minutiae of detail; and that it would have been as well if I had limited myself to those characters which are found sufficient in the descriptions of recent forms. But when it is recollected that most of the specimens occur in a more or less fragmentary condition, and that it often happens that a small portion only of an individual is preserved, it will be obvious that unless the description includes every part which remains (and this is often too little for accurate or certain determination), there would be no means of ascertaining the identity of newly-found specimens with the type of the previous description. I have, therefore, notwithstanding this apparent tediousness, given the fullest detail in my power of the different parts which still remain, so that, as far as possible, there may be some grounds for future satisfactory comparison. In the description of recent forms this minuteness of detail is obviously unnecessary, as it may be fairly expected that the object to be compared will be nearly or quite perfect and unmutilated. With all possible care, however, it must still often happen that characters of great importance both in distinguishing species, and (which is of even more frequent occurrence, and more important with reference to the higher views of zoological science), in ascertaining the relations of genera, are absolutely wanting, or so defective as to be scarcely available.

Amongst the remains of an earlier period which are found in the Suffolk Crag, are several species of the Crustacea peculiar to the London Clay, and I may particularize two species of *Xanthopsis*, *Xantholites Bowerbankii*, *Dromilites Lamarckii*, and two species of *Macrura*; all the specimens which have come under my observation have been much rolled and worn.

It is unnecessary to urge upon those who are accustomed to the study of Crustacea, the necessity of great caution lest the same species at different ages should be described as distinct; and if this be the case with respect to these animals in the perfect condition in which the recent species are obtained, and where all the organs are consequently submitted to examination, it is far more so when fragments only are obtainable, or, at best, where many of the organs most important in the discrimination of species are lost. Hence, we may presume, has arisen the mistake which has become public by the printed statement of Professor Morris, in the preface to his admirable 'Catalogue,' that in the collection of Mr. Bowerbank alone, there are not less than thirty species of Crustacea from the London Clay. I have most carefully examined that admirable collection, the equally numerous one of Mr. Wetherell, that of the British Museum, of the College of Surgeons, and of the Woodwardian Museum at Cambridge; and these, with the addition of my own and one or two other small collections, have afforded in the whole, not more than nineteen species. Of these ten belong to the Brachyura, three to the Anomura, and six to the Macrura.

Of these species, the greater number of the Brachyura are found in the greatest

abundance in the first or Sheppey zone of Mr. Prestwich. This is the case even with those species which are common to most of the districts of the London Clay, particularly the two most common species of *Xanthopsis*. The genera *Mithracia*, *Xanthilites*, *Plagiolophus*, *Portunites*, *Edisoma*, *Campylostoma*, and *Goniochele*, and the Macrurous genus *Scyllaridia* are, as far as I have observed, confined to this zone. There is one species, *Cyclocoryster pulchellus*, which has hitherto occurred only in the third zone, a single specimen having been found at Holloway. *Hoploparia gammaroides* is far more numerous at Sheppey than in either of the other localities, but it also occurs in the Highgate and Holloway districts. *Hoploparia Bellii*, on the contrary, is far more numerous in the North London than in the Sheppey zone, and appears to be equally common to both the second and third zones of Mr. Prestwich. Finally, *Archæocarabus Bowerbankii* is principally, but not exclusively, a Sheppey species; a few specimens from Holloway existing in Mr. Wetherell's collection. I subjoin a list of the species described in the present work, with the localities in which they occur.

Species.	Sheppey, Herne Bay, and Southend.	Highgate.	Whetstone, Holloway, Hornsey, &c.	Alum Bay.	Bognor.
<i>Mithracia libinioides</i> . . . . .	—				
<i>Xanthopsis Leachii</i> . . . . .	—	—	—	—	—
<i>bispinosa</i> . . . . .	—	—	—		
<i>unispinosa</i> . . . . .	—	—			
<i>Xanthilites Bowerbankii</i> . . . . .	—				
<i>Plagiolophus Wetherellii</i> . . . . .	—				
<i>Portunites incerta</i> . . . . .	—				
<i>Edisoma ambiguum</i> . . . . .	—				
<i>Campylostoma matutiforme</i> . . . . .	—				
<i>Cyclocorystes pulchellus</i> . . . . .			—		
<i>Goniochele angulata</i> . . . . .	—				
<i>Dromilites Lamarekii</i> . . . . .	—	—	?		
<i>Bucklandii</i> . . . . .	—	—			
<i>Hoploparia gammaroides</i> . . . . .	—	—	—		
<i>Bellii</i> . . . . .	—	—	—		—
<i>Trachysoma scabrum</i> . . . . .		—			
<i>Thenops scyllariformis</i> . . . . .	—	—	—		
<i>Scyllaridia Koenigii</i> . . . . .	—				
<i>Archæocarabus Bowerbankii</i> . . . . .	—	?	—		

The other districts in which the London Clay exists have not been hitherto examined with any degree of care and diligence; and it is probable that there are yet several species which have not been discovered, and which will reward the researches of some future investigator.

There are, in the Hunterian Collection of the Royal College of Surgeons, a considerable number of fossil Crustacea from the London Clay, belonging to the following species: *Xanthopsis Leachii*, *X. bispinosa* (?), *Xanthilites Bowerbankii*, *Goniochele angulata*, *Dromilites Lamarckii*, *Thenops Scyllariformis*, *Hoploparia Gammaroides*, *H. Bellii*, *Archaocarabus Bowerbankii*. These are all from Sheppey, and constitute part of a collection of fossils formed principally by Hunter himself, and now in the course of arrangement in the museum under the care of Professor Morris. It is very interesting to find that, amongst the immense riches belonging to the recent creation, collected by our greatest comparative anatomist and physiologist, there are so many examples of the "organic remains of a former world," most of which have since been, as it were, re-discovered and described, without the least suspicion that even these ancient beings had not escaped the grasp of that universal mind.

To those gentlemen who have with the most unrestricted liberality and kindness placed their treasures at my service, and especially to Mr. Bowerbank and Mr. Wetherell, whose unrivalled collections have formed the basis of this work, my thanks are cordially rendered. To Professor Sedgwick and Mr. Barrett, of Cambridge, to Mr. Woodward, of the British Museum, to Professor Morris, to Mr. Prestwich, and other friends, I am also greatly indebted; and the imperfections of this monograph can urge no claim to indulgence from the want of the kindest sympathy and assistance from those who had the opportunity of rendering it.

MONOGRAPH  
OF THE  
FOSSIL MALACOSTRACOUS CRUSTACEA  
OF  
GREAT BRITAIN.

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PART I.—OF THOSE FOUND IN THE LONDON CLAY.

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ORDER—*BRACHYURA*.

Sub-Order—*OXYRHYNCHI*.

*Family*—*MAIADÆ*.

*Genus*—*MITHRACIA*, *Bell*.

*Char. Gen.* *Testa* subglobosa, tumida, rostro integro, supra sulcato. *Orbitæ* ovatæ, supra bifissæ. *Antennæ* ad basin rostri insertæ. *Pedipalpi externi* caule interiore sulco longitudinali diviso, caule exteriori lineari. *Abdomen* MARIS —? FEMINÆ ovatum, segmentis omnibus separatis.

Species unica. *MITHRACIA LIBINIOIDES*, *miki*. Plate V, figs. 10—12.

*Descr.* Carapace tumid, nearly globular, as broad across the branchial region as it is long, exclusive of the rostrum, covered uniformly with small tubercles; regions elevated, distinct, the separating furrows narrow and smooth; rostrum moderately projecting, entire, with a small sulcus or depression above; gastric region with distinct lobes; the two proto-gastric meeting at the median line and confluent; the mesogastric triangular, and separated by a distinct furrow from the two metogastric, which are rather distinctly marked; the urogastric twice as broad as it is long; cardiac region gibbous in the centre; hepatic region rounded, raised and projecting at the margin; the branchial very large, rounded, and tumid; orbits oval, slightly divided at the bottom into two portions by a small, transverse line; antennæ inserted beneath the base of the rostrum; external footjaws with the inner stalk

longitudinally divided by a furrow, outer stalk linear; female abdomen oval, the sixth segment as long as the fourth and fifth together, the seventh triangular.

Length and breadth of the carapace 0·9 inch.

*Obs.* The above description is taken from several specimens in Mr. Bowerbank's collection, and in the British Museum. In none of them are there any remains of the limbs. In one only, a female, is the abdomen existing, and in another the body is sufficiently perfect to give the form of the rostrum, and the above imperfect details of the antennæ, orbits and external footjaws. These data are sufficient to indicate a marked affinity to several genera of the family Maiadæ, to which the fossil evidently belongs; and whilst in some respects the structure appears to point to a near relation to *Mithrax*, in others it appears to approximate to *Libinia*.

This is the only instance known of any fossil representative of the extensive tribe of the Oxyrhynchi; and this circumstance renders it one of the most interesting additions we have made to our knowledge of extinct Crustacea. Professor Milne Edwards has the following observation on this subject.\* “Jusqu' ici nous ne connaissons aucun Crustacé fossile que l'on puisse regarder, avec quelque certitude, comme appartenant à la famille des Oxyrhynques.” The species referred by Desmarest to the genus *Inachus*, is, as will be shown, a species of the Anomurus group, and is nearly allied to *Dromia*. It will be found described under the name of *Dromilites Lamarckii*, and is the *Basinotopus* of M'Coy. It has no relation whatever to the present family, and thus, until the present instance, the observation of Edwards remained unexceptional.†

All the specimens known are from the Isle of Sheppey.

#### Sub-Order—CYCLOMETOPA.

#### Family—CANCERIDÆ.

#### Genus—XANTHOPSIS, M'Coy.

*Char. Gen.* *Testa* ovata, supra nodosa, fronte quadrilobo. *Orbitæ* latæ, angulis lateralibus et inferiore prominentibus. *Fossæ antennariæ* ovatæ, apertæ. *Antennæ externæ* articulo basali bis longiore quam latiore, lateribus parallelis: *internæ* articulo basali latè triangulari, anticè truncato, ad frontem attingente. *Pedipalpi externi* caule

\* ‘Hist. Nat. des Crust.,’ tome i, p. 271.

† Since the above was written, Mr. Woodward has pointed out to me in the British Museum a small specimen (a Crustacean) from the Gault, which appears to belong to the Oxyrhynchi, and which would constitute a second exception. I have also been favoured with two specimens from the collection of M. Edwards, one from Colwell Bay, in the Isle of Wight, the other from Brockenhurst, Hants, which may possibly prove to belong to the Oxyrhynchi, but which require further examination. These will be further considered at a future time.

exteriore antrorsúm sensim angustiore, caulis interioris articulo secundo quadrato, articulo tertio ad angulum antico-interiorem truncato. *Pedes antici* inequales, robusti, manu margine superiore tuberculato-cristatâ: *reliqui* graciles, simplicissimi, subcylindrici. *Abdomen* MARIS articulis a tertio ad quintum coalitis; FEMINÆ omnibus disjunctis.

The carapace, in all the species of this genus, is more or less convex, particularly from the front backwards, and considerably so from side to side, and in every part almost uniformly and deeply punctate. The nodules or elevations on the carapace vary in height in the different species, but they occupy the same situations in all. There is one of a depressed form on each protogastric lobe, one on the mesogastric, one more raised on the metogastric, two on the cardiac region, and four on the branchial—namely, two on the epibranchial lobe, and two on the metabranchial; the one towards the centre being elongate, and often appearing like two united. The latero-anterior margin has indications of the normal number of processes, namely, five, but they vary greatly in their development in the different species. The front has four distinct and strongly marked obtuse teeth, including that on each side formed by the inner angle of the orbit. The outer angle also forms a rounded projection, constituting the first latero-anterior process, and the inferior a more acute one. The orbits are nearly round, and without fissures. The hiatus is entirely filled by the basal joint of the external antennæ, which is quadrate, about twice as long as it is broad, and extends forwards to the front, with which it is in contact. The second joint is somewhat pyriform, and lies within the orbit. The antennary fossæ are large and open, broadly oval, and, to the extent of two thirds, filled by the basal joint of the internal antennæ, which is broadly triangular, the outer margin being in contact with the external antenna throughout its length, the anterior angle touching the front, and the posterior margin supported by the anterior margin of the epistome. The epistome is three times as long as it is broad, the central projection touching the under surface of the front, and the lateral portions extending on each side to the base of the external antennæ. The pterygostomian processes are deep, and very slightly hollowed; the anterior margin of the sternum forms an obtuse angle, and is mucronate. The abdomen in the male very much resembles that in the genus *Xantho*. The first and second joints very broad and short; the third, fourth, and fifth united, with a slight groove between each, indicating the line of union; it is the broadest at the part answering to the third segment, and gradually narrows to the anterior part of the fifth; the sixth is of the same breadth, quadrate, a little broader than it is long; the seventh forms an equilateral triangle. The abdomen in the female is broadly oval; the segments increase regularly both in length and breadth from the first, which is very small and linear, to the fifth; the sixth much longer than the former, and rather more than twice as broad as it is long; the seventh is broadly triangular, the posterior angles being obliquely truncate in some individuals. The anterior legs are very large and robust: they are unequal, the right being ordinarily the larger: the first four joints are smooth;

the hand with a tuberculated crest on the upper margin, and with three, four, or five tubercles on the outer side; the fingers are furnished with a few strong tubercular teeth. The ambulatory legs are all smooth, rounded, slightly compressed, and without any armature or projections of any kind.

Such are the characters which exist in all the species at present known of this genus; and the characters of the species consist rather of variations in degree than in any marked and distinct deviation from the normal form.

The genus *Xanthopsis*, especially *X. Leachii*, is found in larger numbers than any other Crustacean in the London Clay. It was founded by Professor M'Coy\* upon the well-known *Cancer Leachii* of Desmarest. The latter distinguished naturalist had received specimens, as he informs us, from Dr. Leach, to whom he dedicates the species known to him, and which was most probably *X. nodosa* of M'Coy. Desmarest considered it as belonging to the genus *Xantho* of Leach, which he evidently looked upon as only sub-generically distinguished from *Cancer*, which latter name he consequently applied to it.

Professor Milne Edwards† places it amongst those fossil species which appear to belong to his genus *Cancer*; but this mistake arose, doubtless, from the want of access to more perfect specimens. The following observations of Professor M'Coy‡ show the view which that gentleman took of its affinities. "It is nearer to *Zantho* by its tuberculated carapace, few tubercles on its latero-anterior margins, and position of the external antennæ at the inner canthi of the eyes, instead of between these and the front; but it differs in the great convexity of the carapace, and materially from both those genera in both sexes having seven separate joints in the tail, showing in this a closer relationship to *Pilumnus*, from which, however, the strong nodulation of the hind part of the carapace, and its oval, vaulted form, as well as the quadrilobed front and great extent of the gastric region, distinguish it." The ground upon which this supposed relation to *Pilumnus* rests, even were it correct, would be of little comparative value. The number of united segments of the abdomen varies considerably even in the different species of certain genera. In some, as in *Leucosia*, for instance, a perfectly natural and circumscribed genus, some species have the whole of the joints of the abdomen united; others the third with the fourth, and the fifth with the sixth; but it is very remarkable that Professor M'Coy is entirely mistaken as to the structure of the male abdomen in *Xanthopsis*. It is absolutely identical with that in *Xantho*. The third, fourth, and fifth segments are as completely united in the former as in the latter form. In examining a considerable number of specimens in which the abdomen is perfect, I found them all in the condition I have just mentioned. There is, in all cases, a slight transverse groove indicating the

\* 'Annals of Nat. Hist.,' 1849, p. 162.

† 'Hist. nat. des Crust.,' vol. i, p. 380.

‡ Loc. cit., p. 163.



junction, but in no case is there any separation between the segments in question, whilst the first from the second, the second from the third, the fifth from the sixth, and the sixth from the seventh, are, in every instance, unmistakeably disjoined. The only possible relation of *Xanthopsis* to *Pilumnus* is thus removed, and its affinity to *Xantho* strengthened.

There is, however, another affinity, and that, as it appears to me, a very near one, which has not been alluded to by any former writer. I mean that indicated by many points of its structure to the genus *Carpilius*. In the general form of the carapace, and particularly the extraordinary curve from the front to the back, as well as a considerable arch from side to side, it differs essentially and strikingly from *Xantho*, and perfectly resembles *Carpilius*. The incurved and quadrid front, which is found in every species of both genera, is no less obvious; and in the arrangement and form of the external and internal antennæ, the orbits, and the external footjaws, the structure approximates much more nearly the corresponding organs in *Carpilius* than in *Xantho* or any other existing genus; and in the simple rounded form of the ambulatory legs it possesses the only important character which distinguishes *Carpilius* from *Platypodia* (*Cancer* of M. Edwards). In fact, with the exception of the remarkable nodosities upon the different regions of the carapace, the existence of four more or less obvious tubercles on the latero-anterior margin, and the slight difference in the male abdomen—which in *Carpilius* has only the fourth and fifth segments united, whilst in *Xanthopsis* the third is also united to these—there are scarcely any striking characters separating the two genera. It is thus extremely probable that in any complete natural arrangement of the *Canceridæ*, the genus *Xanthopsis* would occupy an intermediate and osculant position between *Xantho* and *Carpilius*.

The principal sources of my information on this genus, as in all the Crustacea of the London Clay, have been the British Museum, the splendid collections of Mr. Bowerbank and Mr. Wetherell, with a considerable number in the collection of Mr. Prestwich, and in my own. I have also had the opportunity of examining the specimens in the Cambridge Museum, which contains the identical specimens described by Professor M'Coy. These altogether amount, probably, to two or three hundred of the present genus. They of course vary greatly in their condition, and in the preservation of the different organs; but the whole have enabled me to ascertain and describe with great certainty and exactitude most of the minuter parts of structure on which the generic character mainly depends, and which are essential to the true understanding of the affinities. Thus the orbits, the eyes, the whole antennal region, with the basal portion of the external and internal antennæ, and at least two joints of the filament of the former, the external footjaws, the carapace with its regional prominences, the margin with its tubercles or spines, the abdomen of each sex, the entire chelæ and several joints of the ambulatory feet, have all been before me in a sufficiently perfect condition to enable me to ascertain their structure, and to restore, as it were, to its original

form, two at least of the species of the genus; the number and variety of the specimens fully making up for their individual fragmentary condition. I may state that it was by carefully clearing a beautiful specimen of Mr. Wetherell's and one in my own collection, that I have been able to demonstrate the minute and rarely preserved parts about the antennal, the orbital, and oral regions, of which I have given a diagram.\*

XANTHOPSIS LEACHII, sp., *Desmarest*. Plate I, figs. 1—4.

Testâ valdè convexâ, tuberculis magnis, prominentibus, margine antico-laterali tuberculis tribus obtusis; fronte incurvo.

CANCER LEACHII, *Desmarest*. Crust. foss., p. 95, t. viii, figs. 5, 6.

XANTHOPSIS NODOSA, *M'Coy*. Ann. Nat. Hist., 1849, p. 163.

*Descr.* Carapace not more than from one sixth to one fifth wider than it is long; much elevated in the middle, so that its height, from a line drawn horizontally from the posterior margin to the front, is not less than three sevenths of its length; it slopes gradually to the sides, more considerably to the posterior margin, and almost abruptly to the front, which becomes nearly vertical; frontal lobes rounded and thick; latero-anterior margin with three obtuse rounded tubercles, diminishing in size and prominence forwards, the posterior one being on a line with the urogastric lobes; tubercles of the carapace large and rounded; the metagastric tubercle often longitudinally divided by a very shallow depression; those of the branchial region prominent, the posterior one extending forwards in a low, rounded ridge: the puncta on the surface considerably smaller than in *X. bispinosa*, particularly towards the anterior portion, where they are extremely small and shallow; the interspaces between the puncta studded with extremely minute granulations, which, in particular lights, are easily detected with a lens: chelæ of the male somewhat larger than those of the female, the right being ordinarily the larger; the superior margin forming a ridge which on the larger hand has ordinarily seven, and on the smaller four tubercles: there are also three distinct elongated tubercles not far from the junction with the wrist, one near the base of the immoveable finger, and a slight elevation near the moveable one. The fingers each furnished with about two strong tubercular teeth; abdomen of the male hastate, as given in the description of the genus; that of the female, broad oval.

*Obs.* This may with great propriety be considered as the type of *Xanthopsis*, as all the characters by which the genus is distinguished are developed in it, to the greatest degree.

\* Plate I, fig. 7.

Such are particularly the convexity of the carapace, its tuberosities, the curvature of the front, and the development of the processes of the latero-anterior margin. The general minutely granulated surface of the interspaces between the puncta is peculiar to it, as, in the others, it only exists in an almost imperceptible degree, and that only in the neighbourhood of the marginal tubercles. The remarkable difference in the convexity of the carapace will be found detailed in the account of the next species, *X. bispinosa*.

I have thought it proper to restore the name of "*Leachii*" to this species, as I think there can be little doubt that this was the type to which Desmarest applied the term; and it is but fair, both to the giver and the object of the honour, not to change it unnecessarily. It is, however, with great reluctance that I venture to alter anything which has the sanction of Professor M'Coy's authority in this department of natural history, to which he has given a stimulus, and on which he has afforded us so much valuable information.

Numerous specimens of this species exist in the British and Cambridge Museums, in the collections of Mr. Bowerbank, Mr. Wetherell, Mr. Prestwich, in my own, and in every collection of London Clay fossils, derived from various localities—from the northern suburbs of London, from the Isle of Sheppey, and the opposite shore of Essex, and one, somewhat different from the normal form, from Alum Bay in the Isle of Wight, and which is figured in Plate I, fig. 10.

XANTHOPSIS BISPINOSA, *M'Coy*. Plate I, figs. 5, 6.

Testâ modicé convexâ, tuberculis depressis; fronte feré horizontali; margine antio-laterali spinis duobus depressis, posteriore majore.

XANTHOPSIS BISPINOSA, *M'Coy*. Ann. Nat. Hist., 1849, p. 164.

*Descr.* Carapace nearly one third broader than long, transversely oval, moderately convex, sloping gently to the sides, more decidedly to the posterior margin than to the front, which is moderately inclined; the frontal lobes rather flattened; latero-anterior margin having only the posterior two tubercles, which are modified into depressed subacute spines, of which the hinder one is the longer, and is slightly recurved; the place of the anterior tubercle marked by a slight projection, which, however, varies in degree in different individuals. I have one in my collection in which it is so conspicuous as to have led me at first to consider it as specifically distinct. Tubercles of the carapace much less prominent than in *X. Leachii*, the puncta of the surface rather large, nearly as much so on the anterior portion as on the rest, and not obsolete in the grooves between the tubercles; chelæ as in *X. Leachii*; the tubercles of the crest of the band being, however, less prominent, and one or two of those towards the finger nearly obsolete; abdomen

in both sexes as in the former species, excepting that in the female the sixth and seventh segments are larger in proportion.

Length of carapace, 1·8 inch; breadth, 2·5 inch; Height, 0·6 inch; thickness of the animal, 1·1 inch.

*Ols.* The distinctions between this and the former species consist rather in the proportion of the various parts, than in any strongly marked exclusive characters. It is wider and flatter in proportion; the height, taken from a horizontal line extending from the posterior margin to the front, being only one third of the length, whilst in *X. Leachii* it is nearly half. The whole of the tubercles are much less prominent, the carapace less convex—the front being nearly horizontal; the puncta of the carapace are larger, and almost as conspicuous towards the front and in the grooves between the tubercles as in the other parts, and there are scarcely any perceptible granulations on the interspaces between them. The difference in the number of tubercles on the crest of the hand, referred to by Professor M'Coy, is more apparent than real, arising only from the union of the two anterior ones. The tubercles on the outer face of the hand are exactly similar to those of *X. Leachii*.

It is found with the former species in the Island of Sheppey, at Southend, and in the northern suburbs of London, from which localities there are several specimens in the collections of Mr. Bowerbank, Mr. Wetherell, in my own, in that of the University of Cambridge, and in the British Museum.

*XANTHOPSIS UNISPINOSA*, *M'Coy*. Plate II, fig. 1.

Testâ, sextâ parte tantum latiore quam longiore, æquè convexâ, tuberculis regionum fere obsoletis.

*XANTHOPSIS UNISPINOSA*, *M'Coy*. Ann. Nat. Hist., 1849, p. 164.

*Descr.* The carapace in this species is not more than one sixth broader than it is long; almost uniformly convex from front to back, and not much less so from side to side; the puncta on the surface more distant than in *X. Leachii*; the tubercles of the different regions very depressed or almost obsolete, though occupying the same places as in the other species; the posterior lateral process short, flattened, triangular, and sharp pointed; the penultimate one smaller, and the two anterior obsolete.

It is distinguished from *X. Leachii* by the less degree of deflexion of the front, by the very slight elevation of the tubercles on the posterior region, by the character of the lateral processes, and the more coarse punctation of the surface; and from *X. bispinosa* by the relative proportions of the length and breadth of the carapace, and by its more considerable and regular convexity.

After careful consideration, and the examination of several specimens, I have come

to the conclusion that this is a distinct species. Its name, *unispinosa*, is, however, a very incorrect one, for although the hindermost of the lateral processes is considerably larger than the one before it, this is not more the case than in many specimens of *X. bispinosa*. It has been obtained at Sheppey, and I believe also at Highgate, and exists in the British Museum, in the collections of the University of Cambridge, of Mr. Bowerbank, of Mr. Wetherell, of Mr. H. Gould, and of Mr. Searles Wood.

Length of carapace, 1·7 inch; breadth, 2 inches.

A somewhat mutilated specimen in Mr. Bowerbank's collection is considerably larger, but of similar proportions.

In Mr. Bowerbank's collection there is a specimen of a *Xanthopsis* which resembles in its general form *X. Leachii*; its proportions, with regard to height, length, and width, are similar, the tubercles are nearly as prominent as in ordinary specimens of that species; but instead of three rounded tubercles on the latero-anterior margin, there are two rather sharp but short spines, the posterior being the larger. These spines differ from those of *X. bispinosa* in not being depressed, in being considerably shorter, and not in the slightest degree reflexed. I believe it to be a variety only of *X. Leachii*; but it appears desirable to call attention to it, as it comes from Alum Bay, in the Isle of Wight, a locality so remote from that in which the species just named is usually found. I have given a figure of it,\* for the sake of future identification.

Genus—XANTHILITES, *mih*.

*Char. Gen.* Testa pauló latior quam longior, margine latero-anteriore brevi, quadridentato; regionibus distinctis. Fossæ antennariæ obliquæ. Antennæ internæ articulo basali, unà cum illo antennarum externarum, hiatum orbitæ claudente. Pedes antici magni, robusti, digitis acutis, ferè inermibus; reliqui subcylindrici, læves. Abdomen MARIS ———? FEMINÆ ellipticum, articulis omnibus separatis.

Sp. unica. XANTHILITES BOWERBANKII, *mih*. Plate II, figs. 2—6.

*Descr.* Carapace almost as long as it is broad; nearly horizontal from side to side, the anterior third considerably curved downwards; the front somewhat projecting, obscurely bilobed; latero-anterior margin very short, having four processes, of which the anterior two are very short and somewhat quadrate, the posterior obtusely triangular and more projecting; latero-posterior margin very short, obliquely truncate; posterior margin with an elevated border, which is separated from the rest of the carapace by a distinct groove; regions very distinct, and coarsely granulated, the furrows rather

\* Plate I, fig. 10.

deep and quite smooth; epigastric lobes small, and scarcely distinct from the protogastric, which are large, and separated by the long, narrow process of the mesogastric; this is of a general pentagonal form, and is divided from the metagastric by an arched furrow; the urogastric lobe is not distinguishable from the metagastric; cardiac region pentagonal; hepatic region with a rounded elevation, the hepaticobran- chial furrow very broad and distinct; branchial region large, the gastro-bran- chial furrow very deep at the junction of the gastric and cardiac regions; the epibranchial lobe elevated, with a distinct lobule adjoining the urogastric; mesobran- chial very small and distinct; metabran- chial obliquely truncated at its outer margin; orbits of moderate size, directed outwards, the hiatus filled jointly by the basal articulation of the external and the outer edge of that of the internal antennæ, the latter large and triangular, the former small and quadrate; epistome with a triangular process joining the front, and thus, as usual, separating the two antennary fossæ; external footjaws with the inner stalk elongate, straight, and narrow. As all the specimens which have come under my observation were much broken at this part, I have been unable to ascertain any further particulars of the structure of these important organs. Anterior legs very large, unequal; the wrist and hand partially granulated; the fingers of moderate strength, slightly grooved longitudinally, and with scarcely any tubercles on the opposing edges; they have strikingly the appearance of having been of a different colour from the rest of the body, a peculiarity which obtains in the recent genus *Xantho*, and which affords an interesting collateral indication of the relation of the two genera. The ambulatory feet rounded, and without any armature. Abdomen in the female elliptical, with a longitudinal furrow on each side; all the segments separate. All the specimens which I have seen being females, I can give no account of the male abdomen.

Length of the carapace, 1·5 inch; breadth, 1·8 inch.

*Obs.* The most obvious relation of this genus is to *Xantho*;\* and its affinities to this genus are much more considerable than are those of *Xanthopsis*. It differs, however, from that form in some particulars, which appear quite sufficient to justify its generic distinction. The carapace is much longer in proportion to its breadth, and although equally flat from side to side, the anterior part is much more curved downwards; the external footjaws are proportionally much narrower, and the hiatus of the orbits, instead of being closed exclusively by the basal joint of the external antennæ, are partially closed also by that of the internal.

The specimens are numerous in the collections of Mr. Bowerbank and Mr. Wetherell, and there are a few in the British Museum. These are, I believe, exclusively, from the Isle of Sheppey; and I have seen some mutilated and worn specimens from Southend, in the collection of Mr. Prestwich.

\* The species of *Xantho* to which it is most nearly allied appears to me to be *X. affinis* of De Haan, 'Faun. Japon. Crust.,' t. xiii, fig. 8.

This is the only known species of the genus, and I have the pleasure of dedicating it to my friend Mr. Bowerbank, to whom I am indebted for having, with his accustomed liberality, placed the whole of his fine collection of these fossils at my disposal.

*Genus*—PLAGIOLOPHUS, *Bell.*

*Char. Gen. Testa* transversa, ovata, regionibus distinctis, fronte prominente. *Oculi* subdistantes. *Orbitæ* suprâ bifissæ, usque ad medium regionis hepaticæ extendentes. *Antennæ externæ* minimæ, articulo basali hiatum orbitæ claudente; *internæ* articulo basali triangulo, gibbo. *Pedipalpi externi* longitudinaliter bi-sulcati. *Pedes antici* mediocres, manu triquetrâ, digitis elongatis, digito immobili tuberculo armato, altero incrim. *Abdomen* MARIS articulis à tertio ad quintum unitis; FEMINÆ ———?

Species unica. PLAGIOLOPHUS WETHERELLI, *niki*. Plate II, figs. 7—13.

*Descr.* Carapace about one fifth or one sixth broader than long, widest at about one third from the front; latero-anterior margin very short, with five processes, of which the orbital is inconspicuous, the first hepatic very small, the second hepatic a little larger, flattened and triangular; the epibranchial the largest of all, conical; and the mesobranchial of similar form to this, but much less prominent and more distant from the former than any of the others; front somewhat projecting, rounded, with a longitudinal groove; the regions of the carapace and their lobes very distinct, each with a considerable elevation, which is strongly and closely granulated, the intervening furrows broad and perfectly smooth; gastric region of the usual size and form in the Canceridæ; the epigastric lobes small, but conspicuous, and close to the front; the protogastric rounded and very broad, and separated from each other by an elongated process of the mesogastric, which reaches nearly to the front; the mesogastric distinguished from the metogastric only by a slight notch on each side; cardiac region with a transverse ridge; hepatic region rather large, gibbous in the centre; branchial regions with two transverse elevations, the first across the epibranchial lobe, curved downwards towards the cardiac region, the second across the metabranchial, and forming, with the raised band of the epicardiac lobe, a continuous ridge extending almost across the carapace; mesobranchial lobe extremely small; posterior margin of the carapace with a raised border; orbits opening directly forwards, and extending outwards as far as the middle of the hepatic region; the superior ridge granulated, and with two fissures; the antennal region is more or less mutilated in all the specimens I have seen, but enough has remained to afford a probable conjecture as to the direction and relations of the antennæ; the basal joint of the antennules is perfect on each side in one specimen, and is of an elongate (transverse) triangular figure, and

gibbous on the surface; the external antennæ are not sufficiently perfect in any specimen to enable me to say more than that the basal joint probably fills the hiatus of the orbit; epistome rhomboidal; external footjaws twice as long as broad, and deeply grooved longitudinally; the abdomen exists in only one specimen, a male; it has the usual hastate form, and the third, fourth, and fifth joints are united; it is broadest at the junction of the third and fourth joints; anterior legs twice and a half the length of the carapace, smooth and polished; the wrist pentagonal, the hand somewhat carinated above, the fingers nearly as long as the hand, the immoveable one with a single projecting tooth or tubercle on the opposing edge, the moveable one without any armature; remaining feet quite simple and smooth.

Dimensions of largest specimen: length of carapace, 0·9 inch; breadth, 1·1 inch.

*Obs.* I have found considerable difficulty in satisfying myself respecting the affinities of this remarkable form. In most respects, however, and those especially which are to be regarded as the most important indications of relationship, it approaches the typical *Canceridæ*. The structure of the antennal region, the form of the external footjaws, the figure of the carapace, and the arrangement of the abdominal segments of the male, are similar to those of that family; but the distance of the orbits, extending as they do on each side as far as the middle of the hepatic region, indicate a marked approximation to the tribe of the "CATAMETOPA" of Milne Edwards. Perhaps its nearest affinity is to *Eriphia*, and between this genus and the Thelphusadæ. The mutilated state of the antennary organs, however, forbids my stating this with certainty.

Numerous specimens exist in the collections of Mr. Bowerbank, of Mr. Wetherell, of Mr. Prestwich, and in my own; and there is a beautiful series in the British Museum. They are all, as far as I have ascertained, from Sheppey and Southend. Numbers of them are very small, and highly pyritic, some even having throughout a metallic lustre.

*Family*—PORTUNIDÆ.

*Genus*—PORTUNITES, *Bell.*

*Char. Gen.* *Testa* dimidio latior quam longior, depressa, margine latero-anteriore quinque-dentato, dente posteriore reliquis longiore. *Orbitæ* suprâ bifissæ. *Pedipalpi externi* longitudinalitèr sulcati. *Pedes antici* breves, robusti, inermes, digitis tuberculatis; *reliqui* graciles, leves (*par quintum*, anne ad natandum formatum?). *Abdomen* MARIIS hastatum, articulis a tertio ad quintum unitis; FEMINE ovatum, articulis omnibus separatis.



Species unica. PORTUNITES INCERTA, *miki*. Plate III, figs. 1—5.

*Descr.* Carapace broader than it is long, in the proportion of three to two, much flattened in the adult state, more elevated when young; the surface granulated; the regions distinct, the separating furrows rather broad and generally free from granulations; gastric region with the lobes very distinct; epigastric small and inconspicuous; protogastric considerably raised, rounded, and separated from each other by a narrow process of the mesogastric which extends forwards nearly to the front; mesogastric and metagastric lobes continuous with each other, and forming together an elongated pentagon; urogastric short, separated from the former by a slight depression; cardiac region with a broad but low elevation on the anterior lobe; hepatic regions rather large, with a slight transverse elevation; branchial regions with the epibranchial lobe curved, narrow, and somewhat raised, extending from the metagastric to the lateral margin; the metabranchial portion traversed by a straight longitudinal ridge, against the outer side of which the fifth leg rests when turned over the back; a smooth depression just within the posterior margin, front entire; latero-anterior margin with the normal number of teeth (five), of which the fifth is the longest, triangular and pointed; orbits oval, extending outwards as far as the middle of the hepatic region, with two fissures above, and apparently none beneath; epistome rhomboidal; external footjaws longitudinally furrowed; anterior legs short and robust; the arm smooth, the wrist with a strong tubercle on the inner anterior angle, the hand slightly rugose, the outer margin slightly bicarinated, and with another inconspicuous carina on the upper side; fingers strong, longitudinally grooved, with tubercles on the opposed edges; the remaining legs slender, smooth, the terminal joint lost in all the specimens observed; male abdomen hastate, with the third, fourth, and fifth joints united; the female abdomen oval, with the whole of the joints separated.

Length of carapace, 1·2 inch; breadth, 0·9 inch.

*Obs.* I have ventured to consider as nearly allied to *Portunus* a species, a considerable number of specimens of which are in the British Museum, and in the collections of Mr. Bowerbank and Mr. Wetherell, and in my own, all of which I believe are from the Isle of Sheppey. They are too much mutilated or otherwise imperfect to enable me with any absolute certainty to pronounce upon its generic relations, but the resemblance to *Portunus* is sufficiently obvious to warrant its location in the same family, and in no very remote situation from the typical forms. The absence of the terminal joint of the fifth pair of legs in all the specimens observed, prevents our ascertaining how far the natatorial habits indicated by the general organization would be borne out by the structure of that essential element. The whole of the posterior pairs of legs, as far as

regards those joints which remain, are all simple and somewhat rounded, having no appearance of the flattened, paddle-shaped form, which is an obvious feature in most of the Portunidæ. The flatness of the carapace, its form and sculpture, and the number of marginal processes are, however, in perfect coincidence with the structure of that family; and there is another incidental peculiarity which confirms this view, the habit, namely, of turning the hinder leg over the back when not employed, as is seen in the figure;\* and this habit is, as it were, provided for by a longitudinal ridge running the whole length of the metabranchial lobe, against which the third or principal joint of the leg rests; a peculiarity which I do not remember to have seen in any recent form.

Sub-Order—CATAMETOPA.

Family—THELPHUSADÆ?

Genus—ÆDISOMA, *Bell.*

Species unica. ÆDISOMA AMBIGUUM, *mili.* Plate III, figs. 6, 7.

*Descr.* The only certain specimen I have seen of this singular little Crustacean is in the collection of Mr. Bowerbank, from Sheppey, and consists of a tolerably perfect body, but without limbs or abdomen. The carapace is perfectly smooth, its general form ovoid, the latero-anterior and latero-posterior margin smooth, rounded, and without armature; the gastric region distinct, the protogastric lobes rounded, the meso- and meta-gastric undistinguished, and forming together an elongate pentagon; cardiac region somewhat rhomboidal; hepatic region extremely small; branchial very largely developed and tumid. Orbits large, oval, opening directly forwards, and extending laterally to within a fourth of the half breadth of the carapace on each side; the epistome is regularly rhomboidal; the external footjaws appear to have been sculptured, but the worn state of the specimen prevents the details or even the general form of these parts from being made out. The remains of the basal portion of the antennæ only indicate that these organs were of large size, and that they closed the hiatus of the orbit.

Length of carapace, 0·3 inch; breadth, 0·5 inch nearly.

*Obs.* These are the meagre data on which I have ventured to found the present genus. The little specimen certainly belongs to no known generic form, and even its family affinities are not very obvious. I have, however, ventured to give it a provisional place among the Thelphusadæ, which the occurrence of more perfect specimens may at some future time either correct or confirm.

\* Plate II, fig. 1.

*Family*—CALAPPADÆ.*Genus*—CAMPYLOSTOMA, *Bell.*

Species unica. CAMPYLOSTOMA MATUTIFORME, *mihl.* Plate III, figs. 8—10.

*Descr.* Carapace somewhat broader than it is long; the surface uniformly and finely granulated; the front with two teeth, the upper margin of the orbit with three, the inner one placed just above the frontal, a rather deep notch between this and the second, the third or external-angular rather small, forming the first of the five latero-anterior series; the second, third, and fourth of these are triangular, of nearly equal size, and with equal interspaces; the fifth much longer than the others, and probably produced into a long spine, the extremity of which is broken off in all the specimens examined.\* The latero-posterior margin oblique, very slightly curved; the posterior margin a little hollowed at the middle; the regions of the carapace are rather indistinct; there are twelve tubercles on the surface, many of which become obsolete by age; of these there are five in a straight line across the anterior part of the carapace, *au niveau* with the third latero-anterior tooth; a large one on the mesogastric lobe, a smaller one on each side of it on the metagastric, a small one on the urogastric, the largest of all on the epicardiac, and a small one on the metacardiac: there is also a distinct one just within the latero-posterior margin on the metabranchial; a rounded, longitudinal ridge on each side, extends nearly the whole length of the carapace, and a groove lies between these and the central ridge on which the median tubercles are placed. The orbits are rather long, and somewhat open upwards; the pterygostomian process is broad, irregularly granulated, and has a broad, prominent ridge within the outer margin, and an inner parallel ridge with an intervening sulcus; the footjaws are wholly wanting in all the specimens I have seen excepting one, and in this only the second joint of the inner footstalk remains; this is elongate, linear, and straight; the buccal opening is narrowed forwards in a curved line, each side forming the segment of a circle; thus the opening is not triangular and pointed as in those forms to which this species appears to be most nearly allied.

Length of carapace, 1·3 inch; breadth, 1·7 inch.

*Obs.* All the parts, excepting those above described, are destroyed in all the specimens which I have had an opportunity of observing; and, from this circumstance, I have found considerable difficulty in coming to any satisfactory conclusion respecting the affinities of this species, and the defective state of the specimens has also prevented

\* In one individual, of which I have given a figure, this part is evidently unnaturally developed. See Plate III, fig. 9.

me from giving any detailed generic character. I was led, however, from the general form of the carapace, the great similarity of its granulations, the identity of the tubercles on the surface, and of the teeth on the latero-anterior margin, and the form and direction of the orbits, to believe that it must be nearly related to the recent genus *Matula*.

It differs, however, from that genus in the structure of the outer footjaws, which in the recent form are acutely triangular, being broad at the base, and extending forwards to an acute apex, of which figure the second joint forms a continuous part; whilst in the fossil genus, this, the only remaining portion of those organs, is linear, elongate, and rounded; in this character it also deviates from the group to which *Matula* belongs. Notwithstanding this discrepancy, however, the narrowing of the buccal opening forwards, in an outline which as far as it is perfect in the specimen is sufficiently similar to that in *Matula*, indicates a close approach to the family type, and in the unfortunate absence of all other parts, particularly of the limbs, which in this group are so characteristic, I felt justified in giving it conditionally a station amongst the OXYSTOMATA, and in the matutiform section of the family Calappadæ.

Specimens of this species are in the British Museum, and in the collections of Mr. Bowerbank and Mr. Wetherell, and are all from the Isle of Sheppey.

#### Sub-Order—OXYSTOMATA.

#### *Family*—CORYSTIDÆ.

#### *Genus*—CYCLOCORYSTES, *Bell*.

Species unica. CYCLOCORYSTES PULCHELLUS, *mih*i. Plate IV, figs. 1, 2.

*Descr.* Carapace nearly circular, somewhat contracted posteriorly; front advanced, horizontal, broad, slightly waved and minutely emarginate, without any armature; latero-anterior margin with a few very small, irregular, granulated teeth; latero-posterior margin rounded (posterior margin broken away in the only specimen known); regions flattened, distinctly and evenly granulated, the separating furrows smooth, and a round smooth patch between the hepatic and branchial regions, and another between the epibranchial and metabranchial lobes; frontal and orbital margins, and the pterygostomial processes granulated; gastric region separated by a broad, smooth furrow from the front. Protogastric lobes separated from each other by a long, linear, granulated process of the mesogastric; cardiac region pentagonal. Orbits nearly round, open above, without any fissure, the margins even and simple, the hiatus at the inner angle small, and probably filled by the basal joint of the external antennæ; antennary fossæ transverse, the roof even

and straight, formed by the projecting front; basal joint of the internal antennæ pear-shaped, gibbous, and granulated.

Length of carapace, 0·7 inch nearly; breadth, 0·7 inch.

*Obs.* The only specimen known of this beautiful species is in the collection of Mr. Wetherell, and was found at Holloway. The carapace only remains, but this is perfect excepting the extreme posterior margin. Of the important orbital and antennary regions there exist only the orbits, the antennary fossæ (imperfect), and the basal joint of the internal antennæ. The affinities of this form, as far as indicated by the character of the carapace, is clearly to the family of Corystidæ, and it is probably not far remote from *Atelecyclus*; but it differs from that genus, and from all others of the family in several particulars; in the more circular and circumscribed orbit, indicating short ocular peduncles, a narrower hiatus of the orbit, probably filled by the basal joint of the external antennæ; transverse antennary fossæ, with a distinct, short, solid, basal joint of the antennules, and a horizontal, plain, and unarmed front. The latter part, in every known species of *Atelecyclus*, the genus to which the present form appears, *primâ facie*, to be most nearly allied, is quinque-dentate, the three middle teeth being the most prominent. The orbits too, are, in the recent form, much less entire, and the fissures both above and below are large and deep. These characters indicate an approach to some of the Canceridæ, and especially remind us of some of the more circular forms of *Xantho*, as, for example, *X. integer* of De Haan, to which, however, its relation is more apparent than real.

The above observations on the affinities of this fossil, must be taken as merely provisional, and the discovery of more perfect specimens may require them to be corrected.

ORDER—*ANOMURA* ?

Sub-Order—*APTERURA* ?

*Family*— (?)

*Genus*—*GONIOCHELE*, *Bell.*

*Char. Gen.* *Testa* hexagona, latior quam longior. *Orbitæ* latæ, apertæ, suprâ dentatæ, margine inferiore integerrimo, semicirculari. *Pedes antici* validi, manu compressâ, obtrigonâ, digito mobili contra marginem anteriorem obliquè truncatum, apposito; *reliqui* graciles; posteriores parvi, supra dorsum retroversi. *Abdomen* in utroque sexu segmentis omnibus separatis; *MARIS* lineare, *FÆMINÆ* ovale.

Species unica. *GONIOCHELE ANGULATA, miki*. Plate IV, figs. 3—9.

*Descr.* The carapace of this ambiguous and anomalous species is irregularly hexagonal, rather flat, very deep, broader than it is long, the surface uniformly covered with distinct granulations; the regions distinct and elevated; the front projecting, toothed; the upper margin of the orbit furnished with three teeth, exclusive of that of the exterior angle (or first latero-anterior); between the first and second orbital teeth is a deep notch; the orbit is broad and open, smooth and polished within, the inferior margin entire, semicircular, and terminating outwards in a strong tooth; latero-anterior margin straight, and furnished with the normal number of teeth; the first (external orbital) triangular, projecting; the second and third (the two hepatic) very small and inconspicuous; the fourth (epibranchial) much larger than the foregoing, but not so large as the fifth, which forms a broad triangular spine, from which the latero-posterior margin extends in a straight line, to meet the posterior margin, which is somewhat waved, and forms a raised border; lobes of the gastric region very distinct and raised; the mesogastric somewhat hastate, and extending anteriorly in a narrow process to the front; the urogastric transverse, slightly curved, and longitudinally striated; the cardiac region raised towards the middle, the epicardiac lobe with a distinct, rounded, and conspicuous tubercle on each side, by which this species may be at once distinguished from every other; the metacardiac lobe with a double tubercle on the anterior portion, and a single one behind; hepatic region elevated on the centre; the branchial with a broad, longitudinal, raised portion, almost continuous with the raised epigastric, crossed near the middle of the carapace by a transverse ridge. The pterygostomian process and lateral portion of the carapace are perpendicular and very deep, with a broad, smooth, longitudinal furrow on the upper portion, and a granulated area beneath; the oral opening nearly square. The eyes, antennæ, and footjaws are absent in every specimen I have seen. The abdomen in the male is narrow, linear, the joints all separate, and each segment gibbous in the middle. In the female it is oval, all the segments separate, and raised in the middle. The most remarkable structure is that of the anterior legs, and particularly that of the chela. The whole limb is considerably compressed; the arm much broader anteriorly, tuberculated, with a smooth, longitudinal furrow near the outer margin, which is evenly curved and armed with four or five teeth; the wrist tuberculated; furrowed, and the margin marked with four conspicuous angles; the hand triangular, as broad at the anterior margin as it is long, the outer margin with ten teeth, the upper face with a large, smooth, concave, triangular surface, bordered interiorly by a longitudinal, double, granulated carina; the anterior margin very long, oblique, toothed, and opposed throughout its length to the moveable finger, which is narrow, somewhat falcate and toothed at both edges. From the few fragments which exist of the remaining feet, it appears that they

diminish in size pretty regularly from the second to the fifth pairs, that they are generally slender and smooth, and that the fifth pair are turned upwards over the back, as in so many of the Anomurous forms.

Length of carapace 1·7 inch; breadth, 2 inches.

*Obs.* It has been very difficult to assign to this species its relation to any of the known families of Crustacea, nor is it even certain whether I am right in placing it amongst the *Anomura*. I have been led to this opinion, however, by several points in its structure which approximate to those found in many forms of that group; particularly the large open orbits and the small size and dorsal direction of the posterior pair of feet. This latter character is implied from the first joint only of the feet, the situation of which in the two specimens in which I have seen them, is unequivocal.\* The remarkable structure of the hand is, as far as I know, without any parallel in the whole class. The hand is so produced on its lower side towards the anterior part, as to occupy the position and to bear the function, also, of that process which is commonly called the immoveable finger, and it is opposed the whole length of its anterior margin to the finger which is bent down so as to meet it. The nearest approach to this structure in a recent form with which I am acquainted, is in the *Ranina*, in which, however, this abnormal condition is much less considerable. There is also an approach to a similar structure in the Eocene *Archæocarabus*.

There are numerous specimens both in Mr. Bowerbank's and Mr. Wetherell's collection, as well as some fine ones in the British Museum, derived, I believe, wholly from Sheppey.

ORDER—*ANOMURA*.

Sub-Order—*APTERURA*.

*Family*—*DROMIADÆ*.

*Genus*—*DROMILITES*, *Edwards*.

*Char. Gen.* *Testa* suborbicularis, posticè latior, fronte incurvo; regionibus distinctis, branchiali maximâ, in partes duas sulco et carinâ transversè divisâ, quarum posterior rugosa, ad mediam testam ferè extendens. *Pedipalpi externi* oris aperturam implentes, caule exteriori subulato, plano; caulis interioris articulo secundo paulò longiore quam latiore, tertio æquè quadrato. *Pedes antici* equales, testâ longiores, digito immobili apicem versus digitato; *pedes quartus et quintus* reliquis minores, supra dorsum reversi. *Abdomen* in utroque sexu segmentis omnibus separatis, segmento sexto apud angulum antico-exteriorem appendicè instructo.

\* See figs. 4, 5.

I had ventured, in the absence of any very satisfactory evidence, to consider one of the species about to be described as identical with the *Dromilites* of Professor Milne Edwards; and Professor M'Coy, in his account of his "*Basinotopus Lamarekii*," has the following note.\* "On recognizing at first the anomymous nature of this fossil, I thought it might be the generic type named *Dromilites* by Dr. Milne Edwards, in the number of 'l'Institut' for August 1837, from Sheppey; but having lately had the pleasure of showing him the specimen, I find that though clearly allied, they are yet distinct." Finding in the various collections which I have examined, numerous specimens of a Crustacean, answering so far the indication of Professor M'Coy, and whose evident affinity to the recent genus *Dromia* led me to believe that it must be identical with *Dromilites* of Dr. Edwards, and probably, also, with *Dromia Bucklandii* of the same author,† I wrote to that gentleman, and have been favoured by him with the loan of a beautiful drawing of his specimen, and am thus enabled to confirm my previous views as to the identity of the species with my own. I shall, therefore, be enabled for the first time to offer a full description of this interesting form; and I am also compelled to include M'Coy's *Basinotopus* in the same genus, which I am confident he would have done, had he had the opportunity of examining the specimens now before me.

The full description of the two known species of this genus will show that there can be no doubt whatever that it is a truly anomymous form. This is shown not only by the condition and situation of the fourth and fifth pairs of legs, but also by the existence of the two small intercalary pieces forming the appendages to the sixth segment of the abdomen, which, in their development, constitute the lateral elements of the caudal organ in the *Macrura*, and in those aberrant forms of *Anomura* which approach them, such as *Porcellana* and allied genera.

Its relation to the recent genus *Dromia* is also very obvious and highly interesting. The essential characters are, indeed, as far as can be judged by the specimens under observation, so similar, as to indicate a very close affinity, and to justify its being placed not only within the family Dromiade, but in close approximation to the typical genus. The general form of the carapace (with the exception that in the recent genus the anterior portion is the broader, whilst in the fossil form the reverse is the case), the direction and termination of the front, the structure of the footjaws, that of the legs, even to the denticulation of the claw, and that of the abdomen in each sex, exhibit this close relation; and there is another fact which confirms it in a very interesting manner, and that is the minute puncta which, in both species, are found to pervade every part of the surface of the body and limbs, excepting the extremities of the claws, proving that both the species of this extinct genus, like every known species of *Dromia*, was covered with hair, and that of a similar character. The appearance of these puncta is absolutely

\* 'Ann. Nat. Hist.,' 1849, p. 167.

† 'Hist. nat. des Crust.,' ii, pp. 178-9.



identical in the fossil and recent forms, and they constitute, in both, the obvious means of attachment of the hairy clothing.

It differs from *Dromia* in the shape of the carapace, which in *Dromilites* is nearly orbicular, or rather broader posteriorly, whilst in *Dromia* it becomes abruptly narrowed from the latero-anterior margin backwards. The surface is more nodulated than in the recent form, and the marginal inequalities and projections are very different. The abdomen is much less broad in each sex. But the most remarkable distinction consists in the existence of the broad rugose posterior portion of the branchial region, which is strikingly dissimilar from the anterior portion, and distinctly separated from it. It will be seen in the description of *D. Lamarckii*, that this peculiarity is, in that species, carried to an extreme, and that this singular structure extends quite across the carapace, occupying continuously nearly its posterior half. Professor M'Coy states in one part of his description of *Basinotopus Lamarckii*, that this rugose area is situated behind all the other regions of the body. It consists, however, undoubtedly, of only the metabranchial lobes, which are developed to an extraordinary extent.

DROMILITES LAMARCKII. Plate V, figs. 1—9.

Testâ rugoso-scabrâ, paulò longiore quam latiore, regione cardiacâ bituberculatâ.

INACHUS LAMARCKII, *Desmarest*. Crust. foss., t. ix, figs. 15, 16, p. 116.

BASINOTOPUS LAMARCKII, *M'Coy*. Ann. Nat. Hist., 1849, p. 168.

*Descr.* Carapace everywhere rugose, and almost scabrous, a little longer than it is broad, moderately convex, in the male subdepressed; front with a short, triangular rostrum, somewhat inflected and channeled, with a small tooth above on each side, and a tubercle forming the inner angle of the orbit, another at its outer angle, the upper edge of the orbit slightly elevated; lateral margin with five rather long spines, including the extra-orbital, the fifth being rather more distant from the fourth than the anterior ones from each other; gastric region occupying nearly half the length of the carapace, tuberculated. The epi- and proto-gastric lobes with three tubercles on each side, forming a line which diverges backwards, thus bordering a triangle formed by the union of the mesogastric and metogastric, which extends forwards to the base of the rostrum; the mesogastric with several small tubercles, and the metogastric with two larger ones; the urogastric forming a narrow, transverse ridge, which extends laterally the whole breadth of the cardiac region; the latter is prominent, and has two strong tubercles in its anterior lobe, and the posterior is scarcely distinguishable from it, and becomes blended with the rugose portion of the branchial region; hepatic region small, circumscribed at its margin by the two anterior marginal spines, and bearing one or two small tubercles. The branchial regions very large, each divided transversely by a broad sulcus, and a prominent ridge extending

in a curved line from behind the cardiac region to the posterior lateral spine; the anterior portion, consisting of the epibranchial and mesobranchial lobes, is somewhat rugous, and bears two tubercles, of which the hinder one is the larger; the posterior portion, or metabranchial lobe, which is considerably the larger, is everywhere rough, but without tubercles, and that of each side meets the opposite so as to form a peculiar, large, rugous area, occupying the whole breadth of at least the posterior third of the carapace; the posterior margin is broadly emarginate, and slightly elevated. The pterygostomian processes are deep, tumid, and irregularly mammillated. In all the specimens I have seen, the parts about the antennary and oral regions are too much mutilated to afford any accurate indication of the structure of these parts; but from the fragments which exist, there is little doubt that they resemble essentially those in the *D. Bucklandi*. The anterior legs are equal, somewhat longer in proportion than in the other species, being nearly twice as long as the carapace, generally smooth, although less so than in *D. Bucklandi*. The wrist in the male is one third longer than it is broad; in other respects the proportions are nearly the same, and the remaining pairs of legs do not differ from it in any important respect. The abdomen in both sexes has all the segments separate; in the male it is of nearly equal breadth throughout its whole length, with a rounded, longitudinal ridge along the centre, and a sulcus on each side of it, which is also the case with that of the female, in which the segments are more nearly of equal breadth than in *D. Bucklandi*. The puncta of the surface both of the carapace and members, are no less universal and numerous than in that species, although from the greater roughness of the surface generally, they are much less conspicuous, and in some specimens and parts of others, very difficult to be detected. There can be no doubt, however, that this species, as well as the other, was, like their existing congeners, covered with hair.

Length of carapace, 1·4 inch; breadth, 1·2 inch.

This species is found in considerable abundance in Sheppey, as well as in other parts of the London Clay, particularly about Highgate, near Chalk Farm, &c. It appears to be one of the most generally distributed species found in the London Clay.

The location of this Crustacean in the genus *Inachus* by Desmarest, requires no observation. Its true position amongst the Anomura has been already shown by Professor McCoy, and its generic relation to *Dromilites* is now, it is hoped, shown to be no less certain. It is an interesting fact, that there existed at the period of the deposit of the Eocene beds, such distinct representatives of one of the most remarkable types of the anomurous decapods, which are, at the same time, unmistakably distinct in their generic characters. It is also worthy of notice, that the species now described shows a certain remote approach to the genus *Homola*, especially to the deep sea Mediterranean species *H. Cuvieri*, first described by Roux.\*

\* 'Crust. de la Mediter.,' t. vii.

DROMILITES BUCKLANDI, *Edwards*. Plate VI, figs. 1—11.

Testâ suborbiculatâ, anticè glabrâ, æquè longâ ac latâ ; regione cardiacâ convexâ, non tuberculatâ.

DROMIA BUCKLANDI, *Edwards*. Hist. nat. des Crust., t. ii, p. 178.

*Descr. Adult.* Carapace suborbicular, as long as it is broad, considerably convex, minutely punctated, the front very much inflated, triangular, pointed, with two small projecting teeth above, and a sulcus between them ; orbits directed obliquely backwards and outwards, the margin slightly raised ; latero-anterior margin with two flattened, bidentate projections, one on the hepatic region, the other on the mesobranchial lobe, and a strong tooth with a smaller one behind it on the metabranchial, the whole constituting the normal number (five) of lateral teeth ; gastric region very large, with two slight elevations on the protogastric lobes, one on each side the median line, and two larger rounded tubercles on the mesogastric, these four constituting the remaining elevations of the eight, which are found on this region in the young animal. Urogastric lobe very short, forming an almost linear, transverse piece, with slight indications of the small tubercles which occupy this part in the young state ; cardiac region irregularly pentagonal, evenly raised towards the centre, sometimes with a slight depression on the raised portion ; the posterior lobe very small, scarcely distinguishable from the metabranchial ; hepatic region small, smooth, continuous with the gastric, without any line of demarcation ; branchial region very large ; the metabranchial distinctly separated from the anterior portion by a groove, which extends in a curve backwards between it and the cardiac region ; the epibranchial lobe has two tubercles, and the mesobranchial is slightly raised ; the metabranchial rugose, very broad, extending on each side towards the mesial line, where the two approximate so much as scarcely to be distinguishable one from the other, or from the small posterior cardiac lobe, which becomes, as it were, amalgamated with them. I have seen this remarkable approximation of the posterior portion of the two branchial regions carried in *D. Lamarckii* to a still greater extent ; as, in that species, they unite intimately for their whole length, so as to form a continuous area, occupying nearly half of the whole carapace.

The whole of the specimens which have come under my observation have been mutilated, so that I have not had an opportunity of ascertaining the form of the under margin of the orbits, of the eyes, or of any portion of the antennary region ; the external pedipalps, judging from a specimen in which this organ is tolerably perfect, has almost exactly the same form as in *Dromia*. The basal joint is narrow, of an irregular form, wider at the inner extremity ; the outer stalk flattened, awl-shaped, and as long as the inner ; the first joint of the inner stalk quadrate, rather longer than broad, the second quadrate ; all quite smooth and polished. The anterior pair of legs equal, very smooth

and polished, and, like the rest of the crust in all parts, minutely punctate. The arm half as long again as it is broad, with a tubercle on its antero-interior angle, and a series of very small tubercles on the upper and under margin; the wrist as long as it is broad, with three prominent, sharp, flattened, triangular spines on the anterior margin, of which the inner one is the smallest; the hand smooth, convex, with a small tubercle near the articulation of the moveable finger; the immoveable finger becomes broader towards the extremity, where it is obliquely truncate, and very evenly seven-toothed; the moveable one toothless, curved, and pointed, the curved extremity meeting the oblique, toothed portion of the other; the hand is marked with very regular, minute marblings, in longitudinal lines, which are of two distinct hues, the lines and transverse markings being pale, the interspaces darker brown, and where a portion of the crust has been broken, the subjacent cast, probably covered still with fossilized colouring membrane, exhibits a similar pattern. The remaining feet, as far as can be ascertained from the specimens before me, are of moderate length, smooth, somewhat triedral; and the posterior two pairs smaller; these were, doubtless, reverted over the back when living, as in the recent allied forms. Abdomen in both sexes with all the segments distinct and separate; that of the male rather narrow, broader at the base, the first six segments broader than long, in a diminishing ratio forwards; the seventh nearly twice as long as broad, rounded at the anterior margin; the sixth segment with a small intercalary piece on each side at the anterior angle. In the female the abdomen is twice as broad as in the male, and the intercalary appendages to the sixth segment larger; the terminal joint semi-oval, as broad as it is long.

Length and breadth of carapace, 1·5 inch.

The young state of this species differs so much from the adult, that, but for the comparison of a series of specimens exhibiting its consecutive conditions, it might readily be taken for a distinct species. Many of the tuberosities which are distinct, and even prominent in the young animal, are lowered, expanded, and some of them even lost, in the adult. The gastric region has eight distinct elevations, of which only the anterior and posterior pairs (the epi- and meta-gastric), are conspicuous in the adult. The six principal ones form a transverse hexagon, the two posterior being considerably larger and more prominent than the others. The trogastric lobe consists of a linear, transverse series of five small tubercles, which ultimately become nearly obsolete; the tubercles of the anterior portion of the branchial are two pairs, the posterior ones being the larger; and the epicardiac is wholly occupied by one large, rounded elevation; the posterior rugose portion of the branchial is also more regularly elevated transversely, and the sulcus separating this from the anterior is less deep and distinct than in the adult; the metacardiac lobe is small, slightly elevated posteriorly, and polished.

There is a single specimen of this species in the British Museum, and they are numerous in the collections of Mr. Bowerbank and Mr. Wetherell. I have given figures of specimens of various ages, for the purpose of comparison.

ORDER—*MACRURA*.Sub-Order—*CATAPHRACTA*.*Family*—*SCYLLARIDÆ*.*Genus*—*THENOPS*, *Bell.*

*Char. Gen. Testa* depressa, sinu cervicali profundo in partes inæquales divisa, margine anteriore quinque-lobato, rostro prominente, e dentibus binis, conicis, fortibus formato. *Antennæ externæ* planæ, margine exteriori fortiter dentato. *Pedipalpi externi* graciles, filiformes. *Abdomen* triedrum, carinatum.

Species unica. *THENOPS SCYLLARIFORMIS*, *miki*. Plate VII, figs. 1—8.

*Descr.* Carapace flattened, the surface coarsely granulated, divided at about one third from the front by the cervical furrow, which is very deep, strongly curved forwards; the anterior portion or cephalic arch with a short, central, longitudinal furrow, commencing at the cervical sulcus, and circumscribed by two carinæ, which converge forwards into a short carina which is bordered by two others; on each side a strong curved ridge runs from the anterior margin backwards to the cervical furrow. The central portion of the margin is furnished with four or five large flattened lobes, the exterior portion denticulate, and terminating outwards in an acute angle; the rostrum arises immediately under and in front of the median lobes of the carapace, and consists of two very strong, conical, acute, slightly divaricating teeth; the lateral margin thick, strongly granulated, and toothed; the post-cervical portion or scapular arch is flat, and has three carinæ, one central, the others marginal; the granulations of the surface coarser than those of the anterior portion, and almost squamiform. The external antennæ have the remarkable conformation peculiar to the family Scyllaridæ, being broad and much flattened, the external margin strongly toothed; the abdomen is carinated and tectiform, the segments coarsely punctate, and each with an obtusely triangular, transverse ridge; the epimera denticulate on the margin. The caudal appendages are either wholly wanting, or in too mutilated a state, in all the specimens I have seen, to admit of any description. The legs are compressed, the anterior ones considerably the largest; the external pedipalps slender, filiform, and curved inwards towards the extremity; the thorax forms an acute triangle, and there are a pair of deep depressions at the junction of the different segments.

Length of the whole animal, 7 to 8 inches; length of carapace, 3 inches; breadth of carapace,  $1\frac{1}{2}$  inch.

*Obs.* There can be no possible doubt of the relation of this very interesting fossil. It possesses all the distinctive characters of the family Scyllaridæ, as represented by the three recent genera *Scyllarus*, *Thenus*, and *Ibacus*. In especial, it resembles them in that peculiarity in the structure of the external antennæ, which constitutes one of the most interesting examples of morphology in the whole class. These organs, instead of being developed, as in all the other groups of the order, into long, slender, multi-articulate filaments, to which the basal joints serve only as strong supports and means of attachment, are in the present family deprived of the terminal filament altogether, and the basal joints are developed into very broad, flat implements, which doubtless serve the purpose of shovels, to enable the animal to scuttle under the sand or mud in which they probably pass the greater portion of their time. Although in all the numerous specimens of the present species which I have seen, these organs are incomplete, there are sufficient fragments to enable me to confirm the decided impression of its true relations which I first received from the examination of other portions of the animal.

Of the three recent genera of Scyllaridæ the present fossil most resembles the genus *Scyllarus* in its general proportions, and particularly in the nearly parallel sides of the abdomen; but approaches more nearly to *Thenus* in the very strong, conical, prominent, and slightly divaricating teeth of the rostrum. It differs strikingly from all the recent forms in the distinctness, depth, and situation of the cervical sulcus of the carapace, which is comparatively indistinct in all the recent species, but in this constitutes a very marked character, and is so deep as to occasion the carapace to be often found broken across at that part. The joints of the external antennæ resemble those of *Scyllarus* in their extension forwards, in which respect they greatly exceed those of both *Ibacus* and *Thenus*. I have not been able to discover the eyes, nor the place for them, in any of the specimens I have seen, and as the anterior margin has been very completely examined, I presume that they are placed at the extreme external angle, as in *Thenus*, and not just within the angle, as in *Scyllarus*, and still less probably midway between it and the rostrum, as in *Ibacus*. In either of the latter cases they could not have escaped observation.

The specimens, both from the Isle of Sheppey, and the northern suburbs of London, and especially from the latter locality, are very numerous in the British Museum, and in the collections of Mr. Bowerbank and Mr. Wetherell; there are also two fragments in the Hunterian collection in the museum of the Royal College of Surgeons, and Monsieur le Capitaine le Hon has lately shown me a specimen consisting of a few segments of an abdomen, which I instantly recognised as belonging to this species. It was from the "Sable" of the neighbourhood of Brussels.

*Genus*—SCYLLARIDIA, *Bell.*

*Char. Gen.* *Testa* æquè longa ac lata, sulco cervicali profundo, rostro dilatato, bidentato. *Oculi* prope angulum antico-lateralem positi. *Abdomen* medio elevatum, haud carinatum.

Species unica. SCYLLARIDIA KOENIGII, *mili.* Plate VIII, figs. 1—3.

CANCER (SCYLLARUS?) TUBERCULATUS, *König.* Icon. Foss. Sect., fig. 54.

XANTHOPSIS TUBERCULATUS, *Morris.* Cat. Brit. Foss., 1854, p. 116.

*Descr.* Carapace very nearly as broad as long, coarsely granulated; frontal margin nearly straight, denticulated; the rostrum flattened, somewhat expanded, bidentate; orbits placed near the external angle, but not at the extremity as in *Thenus*; upper and inner orbital margin elevated; cervical furrow deep, smooth, commencing on the lateral margin, about one fourth from the anterior angle, and passing obliquely backwards to about the middle of the carapace; gastric region with an elevated ridge on the centre having two angular projections, of which the posterior is the more prominent, and a small tubercle on each side; cardiac region with a strong ridge similar to that of the gastric, terminating abruptly at the cervical furrow; branchial region with two slightly tuberculated ridges, the outer one marginal. Basal joints of the external antennæ broad and flattened, as in the other genera of this family; abdomen rounded, raised in the centre, but not carinated; the segments granulated, excepting on that portion of each which passes under the one in front of it.

In all the specimens yet discovered, the abdomen is bent under the thorax.

Length of carapace, 1·4 inch; breadth, 1·4 inch nearly.

*Obs.* All the specimens hitherto obtained of this species are from Sheppey. The original one, to which further allusion will presently be made, is in the British Museum. There are four in the collection of Mr. Bowerbank, and one in that of Mr. Wetherell. In all of these the limbs and the caudal extremity of the abdomen are either wholly wanting or existing only in unavailable fragments. There are, however, sufficiently perfect remains of other parts, to afford data for its association with *Thenops* in the family Scyllaridæ, and for its generic distinction from that and from the recent forms of the family. Its nearest approximation is to the recent genus *Scyllarus*, from which it is sufficiently distinct by the form of the rostrum, the depth and distinctness of the cervical furrow, and the rounded form of the abdomen. Its relation to that genus is, however,

very obvious in the position of the eyes, in which it differs from the other two recent genera of the family.

The literary history, if it may be so termed, of this species, is somewhat curious. A single specimen only was known to be in existence, until those above referred to were found to be contained in the rich collections of Mr. Bowerbank and Mr. Wetherell. That specimen is now, and has been for very many years, in the British Museum. It formed the subject of a description with a figure by the late M. König in his 'Icones Fossilium Sectiles,' under the name of *Scyllarus* (?) *tuberculatus*. This proves, on examination, as was first pointed out to me by Mr. Woodward, to be artificially made up; the whole surface of the carapace is fictitious, and the very tubercles\* on which the name was founded exist only in obedience to the skill and trickery of the artist. All the distinctive characters, even of the family to which it belongs, are thus lost, but Mr. König with great acumen recognised its affinities from its general form, and named it as above. In Professor Morris's most useful and elaborate 'Catalogue' it is mistakenly referred to the Brachyurous genus *Xanthopsis*, as a synonym of *Z. nodosus*, of M'Coy, simply, as I presume, from its specific name *tuberculatus*; and this oversight probably arose from the specimen not having been seen, and the figure itself having been forgotten by the learned author.

The specific name, having been founded on an error, must be changed; and I have great pleasure in the opportunity afforded me of naming it after my old friend Mr. König, who first distinguished it, and appreciated its relations.

*Family*—ASTACIDÆ.

*Genus*—HOPILOPARIA, M'Coy.

*Char. Gen. Testa* subcompressa, lateribus latis; sulco cervicali profundo, latera versus abbreviato; sulco hepatico bifurcato, λ-formi; rostro subulato; processu supra-antennali semicylindraceo, basin squamæ antennæ externæ tegente. *Pedes antici* inæquales; *major* robustus, digitis fortiter tuberculatis; *alter* gracilis, digitis denticulis numerosis, subæqualibus, armatis: *pedes reliqui* gracillimi. *Abdomen* subcylindraceum, epimeris faleatis, acuminatis.

The very close affinity of this genus to *Homarus*, as exemplified in the common lobster, *H. vulgaris*, might lead the naturalist at first sight to consider the fossil species as scarcely generically distinct from the recent one; and the late Mr. George Sowerby has accordingly named and described one from the Greensand of Lyme Regis, as a true *Astacus*, from

\* Mr. König's words are, "tubercula in utroque thoracis latere, duo."



which genus, at that time, *Homarus* was not considered distinct. This similarity is particularly striking in the larger London Clay species *Hoploparia gammaroides*, in which the anterior legs and the abdomen are almost identical in form with *Homarus*. A closer examination, however, will fully justify Professor M'Coy's separation of these fossils from all the recent forms of Astacidæ. The principal and most obvious distinctions are the following. The simple, awl-shaped rostrum, differing from that of *Homarus* and *Nephrops* in its not having any armature, and from that of *Astacus* in its form, which, in the latter, is rather broadly triangular; the deep cervical furrow terminating abruptly at its internal extremity, without reaching the margin of the carapace. A distinct, bifurcate furrow, called by Professor M'Coy the "λ-like check-furrow," but to which I have given the name of hepatic from its situation, and which does not exist in any recent species of Astacidæ that I have seen, excepting, in a much less conspicuous state, in *Nephrops Norvegicus*, and, as a mere indication, in an undescribed species of *Astacus* from Australia. The arched process immediately over the base of the external antennæ, the scale of which emerges immediately from beneath it, on which Professor M'Coy so much depended for its distinctive character, is scarcely different in any essential point from the same part in the recent genus *Nephrops*, as will be seen by referring to the figure of that part which I have given in Plate X, fig. 10. The armature, also, of the same part, upon which the generic name was founded, is equally similar. The extremities of the four pairs of ambulatory feet are wanting in every specimen I have seen of the different fossil species, so that it is impossible to determine whether or not the second and third pairs are didactyle, as in every recent species of the family. The fragments of the antennæ, which exist in several specimens in the collections of Mr. Bowerbank and Mr. Wetherell, exhibit a perfect resemblance to those of *Homarus*.

There are probably four species of this genus known. One described by Mr. George Sowerby as *Astacus longimanus*,\* from the lowest Greensand of Lyme Regis; another, *Hoploparia prismatica*,† described by Professor M'Coy, from the Speeton Clay of Speeton, in Yorkshire; and two, also described by the same author, from the London Clay, *H. gammaroides*, and *H. Belli*.‡ I have not had an opportunity of comparing either the species from Lyme Regis, or that from Speeton, with those of the London Clay, but hope to be able to do so before the completion of the future portion of this work. Mr. Sowerby's figure of the former exceedingly resembles *H. Belli*, but is certainly not identical.

\* 'Zool. Journ.,' ii, p. 493, t. xvii.

† 'Ann. Nat. Hist.,' l. c.

‡ Ibid.

HOPLOPARIA GAMMAROIDES, *M'Coy*. Plate VIII, figs. 4—6; Plate IX.

Pedibus anticis ferè æqualibus, digitis utriusque tuberculis dentiformibus inæqualibus armatis. “Squille pétrifié, pyritcuse d’Angleterre.” (Davila, Cat., vol. iii, p. 203, pl. v, K.)

HOPLOPARIA GAMMAROIDES, *M'Coy*. Ann. Nat. Hist., l. c. Morris, Cat. Brit. Foss., 2d edit., 1854, p. 109. Cat. Foss. Invert., Mus. Roy. Col. Surg., 1856, p. 176.

*Descr.* Carapace everywhere irregularly granulated, the granulations on the gastric region larger and somewhat equamiform, strongly granulated on the sides towards the fore part of the lateral margin; cervical furrow deep, extending only about half way towards the lateral margin, and situated somewhat further back than in the former species; hepatic furrow deep; rostrum deeply grooved and strongly bicarinate, with an elongated tubercle on each side of its base, and one small tubercle on each side below the first pair, near the edge of the orbit. “From a little behind the level of the orbit the cheek is elevated into a strong keel, with about three large spinous tubercles; cheeks prolonged as a semi-cylindrical sheath to the outer antennæ half the length of the rostrum.”\* Abdomen rounded, the segments smooth, but not polished, as in *H. Belli*, finely punctate, the first rather more strongly than the other; the epimeral plates broadly falcate, and formed as in *H. Belli*; the middle plate of the tail nearly as broad at the base as it is long, rounded posteriorly; the surface granulated and somewhat squamose, with a transverse elevation near the base, and two slightly diverging branches from it directed backwards. The first pair of legs very robust, one more so than the other, but the difference is much less than in *H. Belli*, and scarcely so much so as in the common lobster; the arm is elongate, rhomboidal, furnished with a strong spine at the outer anterior angle, and with three flattened ones on the inner margin; the wrist has three or four strong tubercles on the outer and upper surface, and a triangular spine on the inner margin; the hand is nearly smooth, and has three or four similar spines on the inner margin, and two strong tubercles near the base of the moveable finger. The fingers are in both the hands armed with several strong teeth on the opposing edges, together with many smaller ones, and in this respect the two claws are similar to each other, whilst in the former species, the armature of the two claws is totally different, as has been described. The rest of the legs are rather slender, smooth, somewhat compressed, but the terminal joints are wanting in all the specimens I have seen.

This is pre-eminently, but by no means exclusively, a Sheppey species. It is found very commonly in that locality, and numerous specimens exist in the collections in the British Museum, in that of Cambridge, in those of Mr. Bowerbank and Mr. Wetherell,

\* *M'Coy*, l. c. [I have not observed this structure in any specimen I have examined.—T. B.]

and a remarkably beautiful one in the Hunterian Collection. The fine claws figured in Plate IX are in Mr. Wetherell's collection, and from Copenhagen Fields. It is about twice the dimensions of *H. Belli*, and more nearly approximates the common lobster than does that species. It is probable that it would form a very distinct section of the genus, if not actually generically distinct from the last-mentioned species, associated with *H. longimana* from the Greensand. It is remarkable that the first notice and figure of this species should have occurred in the Catalogue of a Frenchman's collection published nearly a century ago, and that it should have remained wholly undescribed in this country until the year 1849.

HOPLOPARIA BELLI, *M'Coy*. Plate X, figs. 1—9.

Pedibus anticis lævibus, gracilibus, minore filiformi, digitis minuté denticulatis. Abdomine polito.

HOPLOPARIA BELLI, *M'Coy*. Mag. Nat. Hist., 1849, p. 178. Morris, Cat. Brit. Foss., 2d edit., 1854, p. 109. Cat. Foss. Invert., Mus. Roy. Col. Surg., 1854, p. 177.

*Descr.* The carapace in this species is somewhat compressed, slightly incurved at the inferior margin, the outline of which forms nearly an accurate arc of a circle; the rostrum is awlshaped, acute, about one fourth the length of the carapace, with a slight groove, which at the base is interrupted by a small carina or elongated tubercle; there are two tubercles on each side of the anterior part of the carapace, just behind the upper margin of the orbits, and another on the process which covers the base of the antennal scale; this process is arched, minutely granulated at the margin, and partly embraces the origin of the antennal scale; this structure I have with much care and some difficulty cleared away in several specimens, sufficiently to show that in its general form and character it bears a considerable resemblance to the same part in *Homarus* and *Nephrops*, and none whatever to the ideal figure given by Professor M'Coy, in his paper already referred to, which is so incorrect as to be calculated to mislead as to the true organization and relations of the animal. The surface of the carapace is covered with very regular granulations of two sizes intermixed, the larger being the more numerous; towards the dorsal portion they become less prominent, and less regular in form, and are accompanied each by a depressed punctum; the cervical furrow is deep and smooth, and extends downwards to within a line of the margin; the hepatic sulcus is deep, narrow, of somewhat the shape of the Greek  $\lambda$ ; the upper limb commencing at about one third from the centre of the back, and continuing nearly straight downwards, the anterior limb stretching forwards, slightly curved, and terminating near the root of the supra-antennal

process. Abdomen somewhat compressed, evenly rounded on the back part, and without any carina or other inequality of the surface; the segments polished and everywhere punctate, excepting that portion of each which slides under the margin of the one before it, which part is more highly polished, and almost wholly without puncta; the first segment is the narrowest, the second has the lateral or epimeral piece broad, nearly quadrate, with a sharp, triangular, hooked process at the posterior angle; the epimera of the third, fourth, and fifth segments are triangular, falcate, the inferior angle directed backwards, the sixth is very broad, and deeply notched for the attachment of the base of the appendages, forming the external portions of the tail; the seventh segment or central portion of the tail is semi-elliptical, evenly rounded at the posterior margin, with two slight ridges diverging forwards; the outer member of the tail curved, and divided transversely at about one third from the extremity, and with a slight longitudinal ridge; the inner member as broad as it is long, rounded, the posterior margin truncate, with a longitudinal ridge; anterior pair of legs unequal; both much more slender and less robust than in *II. gammaroides*. The arm is long, triquetrous, enlarging forwards, the wrist also elongate, with two or three tubercles near the anterior margin; the hand of the larger claw with a few triangular teeth on the inferior margin, the upper face with an even and obtuse ridge, extending its whole length, and continued along the immoveable finger to its extremity; the fingers of the larger claw are furnished with several strong tubercles, and numerous smaller ones; the smaller hand resembles the other in its general characters, but it is much more slender, less curved at the margins, and the fingers are armed only with numerous minute, nearly equal denticuli, without any larger tubercles; the remaining legs appear, from the fragments which have been observed, to be very slender, quite smooth, and polished.

*Obs.* In its proportions, the species appears to resemble *II. longimana* (Sp. Sowerby) of the Lower Greensand, before alluded to, much more nearly than its neighbour of the London Clay, *II. gammaroides*, which is, in all its proportions, more robust and solid than either of the others.

The polished surface of the abdomen, the regularly granulated carapace, and the general elegance of its form, render this species one of the most beautiful of the known fossil Crustacea. It is more frequently found in the northern suburbs of London, where it is very numerous, than in other localities, although there are several specimens both in Mr. Bowerbank's and Mr. Wetherell's collections from Sheppey. It is observable that the specimens obtained from the former locality are, almost universally, cleaner and more polished than those from the latter.

There is a specimen in Mr. Wetherell's collection, of which I give a figure in Plate X, fig. 9, which differs in some respects from the normal character of *II. Belli*,

the carapace being altogether more tumid, the granulations on the surface less regular and universal in their distribution, the cervical furrow deeper, and extending nearer to the margin of the carapace, and the hepatic furrow of a somewhat different form. As only a mutilated carapace of this character exists, I do not presume to treat it as a distinct species, and most probably it is, after all, only an accidentally abnormal condition of *H. Belli*.

*Genus*—TRACHYSOMA, *Bell*.

TRACHYSOMA SCABRUM, *mih*. Plate X, fig. 11.

I have found it necessary to assign a distinct generic position to a form which differs from all others that I have seen, although, unfortunately, the only example of it yet discovered is a single specimen in Mr. Wetherell's collection, which consists exclusively of a broken and imperfect carapace, and a few undistinguishable fragments of the limbs. From these scanty data I can only give slight and provisional characters, which, however, with the figure, may be sufficient to enable future observers to identify the species, and more fully to describe it from more perfect specimens.

The carapace is long, apparently flattened at the sides (though this appearance may possibly arise from pressure, of which there are other unmistakable indications), and the whole surface highly scabrous; the cervical furrow is deep and strongly marked, and runs in almost a straight line directly across the carapace; the "cephalic arch" or portion anterior to the cervical furrow, comprising the gastric and hepatic regions, occupies about one third of the length of the carapace, and is longitudinally marked with strong ridges and intermediate furrows, the latter being smooth, whilst the ridges resemble the general surface in being very rough, with numerous small, sharp tubercles; the "scapular arch," formed of the cardiac and branchial regions, has a diagonal furrow, which separates these two regions; the posterior margin is waved, and, like the lateral, has a distinct, raised border. A considerable piece of the antennal scale remains, which shows that it partook of the scabrous and almost spinous character of the other parts; and there are some fragments of several of the thoracic members, one of which appears to be a portion of the arm, which is less rough than the carapace, and one piece, which is probably a portion of one of the ambulatory legs, is quite smooth and polished.

Length of carapace, 1·3 inch.

I do not presume, upon such an imperfect basis, to offer any present suggestions as to the affinities of this species. It differs in so many respects from every known form, either extinct or existing, that we must wait for further data before any satisfactory opinion can be adopted.

The specimen was found in the tunnel near Chalk Farm.

*Family*—CRANGONIDÆ?*Genus*—ARCHEOCARABUS, *M' Coy.*

*Char. Gen.* *Testa* antice depressa, plana, margine anteriore recto, denticulato, rostro parvo, bidentato; sinu cervicali profundo, lato; posticé subcylindrica, regionibus branchialibus latissimis. *Oculi* grandes, reniformes, pedunculis angustioribus. *Pedes antici* magni, subcheliformes, digito mobili longo, curvo, ad marginem anteriorem manûs opposito. *Pedes reliqui* filiformes, inermes, subtriedri. *Abdomen* semicirculare, glabrum. *Sternum* segmentis in medio bituberculatis.

Species unica. ARCHEOCARABUS BOWERBANKII, *M' Coy.* Plate XI, figs. 1—5.

ARCHEOCARABUS BOWERBANKII, *M' Coy.* Ann. Nat. Hist., l. c.

*Descr.* Carapace about twice as long as it is broad, covered with oval, subsquamiform, flattened tubercles, their blunt apices directed forwards; cervical furrow deep and broad; the cephalic arch, or portion anterior to the cervical furrow, flattened, with a high, abrupt carina on each side, which is polished, and armed with two strong spines; the scapular arch or posterior portion of the carapace, with the tubercles much larger than those on the anterior portion, those on the back being the largest of all; the cardiac region elevated, the branchial very broad, wholly lateral, and placed almost perpendicularly; the branchio-cardiac furrow distinct, smooth, and polished. Abdomen, including the caudal fin, nearly twice as long as the carapace, semi-cylindrical, smooth, slightly punctated; epimeral pieces abruptly narrowed, triangular, falcate, curved backwards, and acute at the apex; lateral plates of the tail nearly three times as long as they are broad, slightly curved, granulated; anterior feet broad, compressed; the hand very broad, expanded towards the anterior extremity, with a broad, longitudinal depression; the anterior margin truncate, toothed, the extreme joint or moveable finger curved, longer than the anterior truncated margin of the hand, to which it is opposed for prehension; the arm compressed, broad, longer than the hand; the remaining legs nearly triedral, smooth, and polished; sternum triangular, contracted at the anterior part, each segment having a double tubercle in the centre. Eyes very large, reniform; the peduncle very short, and not one third as broad as the eye.

Length of the carapace, about 3 inches.

*Obs.* This beautiful and curious species was first made known by Professor M'Coy, in his paper on 'British Fossil Crustacea,' so often quoted. With regard to its supposed affinities, he has the following observations. "In all the characters of generic importance which I have seen in these fossils, they approach the recent *Palinuri* or spiny lobsters;" and he applies to it a generic name in consonance with this supposed relation. What are the characters in which the author has discovered this relation he does not inform us: but I have failed to find any such relation in the characters which have offered themselves in the numerous specimens which I have had an opportunity of examining. In the general rounded form of the abdomen it resembles the *Palinuridæ*, in common with the *Astacidæ* and many other families, particularly the *Crangonidæ*, with which I shall presently show its relation; but in the most important points in which the recent *Palinuri* agree amongst themselves, and differ from other genera, the present fossil species does not exhibit any such affinity. The front of the carapace does not possess any indication of the peculiar structure of that part in the recent genus, and this is especially obvious in the total absence of the two strong, projecting, supra-rostral spines, which exist in every known species of that family. To set aside, however, all minor considerations, the form of the anterior feet, a character so important in all this class, presents the most striking discrepancy between the two forms; instead of the simple termination of these limbs in a single acute joint, not differing from the terminal portion of the other feet, which is seen in all the recent species, the fossil animal has the remarkable development of this part which characterises the genus *Crangon*, but in a still more marked degree; the anterior margin of the hand being truncated abruptly, and forming an opposing line to the moveable finger, which in prehension would be applied to it in its whole length. I have on this account considered it as probably belonging to the family *Crangonidæ*, to which, it appears to me, this important character, in the absence of any striking discrepancy in other organs, indicates an obvious affinity. The name *Archæocarabus*, applied to it by Professor M'Coy, was therefore, as I conceive, founded upon a misapprehension of its true relations; but I have not presumed to change it, a step which is only allowable under extreme circumstances.

This must be considered as pre-eminently a Sheppey fossil; for, although occasionally found in the northern suburbs of London, the great majority of the specimens which have come under my observation, have been found in the former locality. They exist in the British Museum, in the Woodwardian Museum at Cambridge, in the Hunterian Museum, and in Mr. Bowerbank's collection, but from the very fragile texture of the crust, they are all much broken.

## SUPPLEMENTARY NOTICES AND CORRECTIONS.

XANTHOPSIS.—Since the earlier sheets of this work have been printed, my attention has been recalled to a letter from Professor Milne Edwards to Mr. Wetherell, with which the latter gentleman favoured me some time ago, in which the following passage occurs—“The original specimen of *Cancer Leachii*, described by Desmarest, has been recently given to our museum, and I have thus been enabled to distinguish that species with certainty from all the other Canceridæ of the London Clay. It is not the *Xanthopsis nodosa* of M'Coy (= *C. Leachii* of your collection), but a species of which you have only one young specimen.” These observations, from such a source, would appear to wholly unsettle the conclusion to which I have come on the synonymy of these species; but the fact is that the two figures in M. Desmarest's plate are evidently taken from two very different specimens; and whilst I think the observations of Professor Milne Edwards are clearly applicable to the figure of the under side (see Desmarest, Plate VII, fig. 6), it is equally clear to me that the other figure in the same plate (fig. 5) is taken from a specimen of *X. nodosa* of M'Coy, which must, therefore, still be retained as a synonym of *X. Leachii*. The former figure I should consider as representing *X. bispinosa*, to which it bears an obvious resemblance in the form of the segments of the abdomen, and this is most probably taken from the specimen referred to by Professor Edwards; but it does not appear necessary further to modify the criticism I have already made on these species.

## ADDITIONS TO THE SYNONYMY.

## XANTHOPSIS LEACHII.

*Bronn.* Index Palæont., i, p. 212. *Morris.* Cat. Brit. Foss., 1854, p. 116; Cat. Invert. Mus. Roy. Coll. Surg., 1856, p. 174.

## PLAGIOLOPHUS WETHERELLII.

*Parkinson.* Organ Rem., vol. iii, pl. xvii, fig. 1.

## DROMILITES LAMARCKII.

*Parkinson.* Org. Rem., vol. iii, pl. xvii, fig. 7.

BASINOTOPUS LAMARCKII, *Morris.* Cat. Brit. Foss., 1854, p. 101; Cat. Invert. Mus. Roy. Coll. Surg., 1856, p. 176.

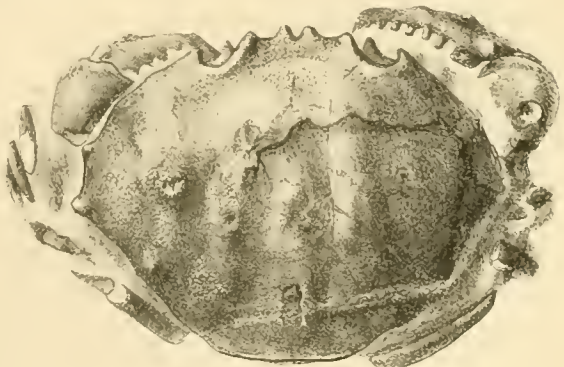
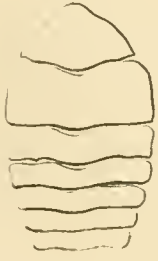
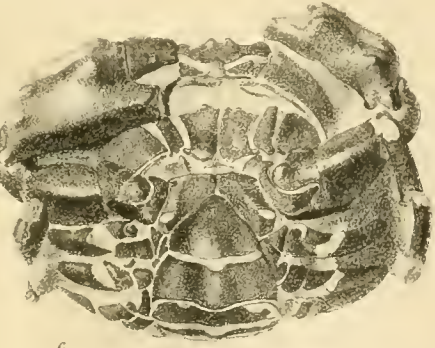
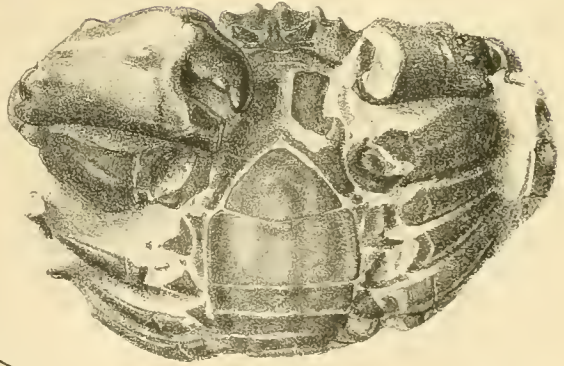
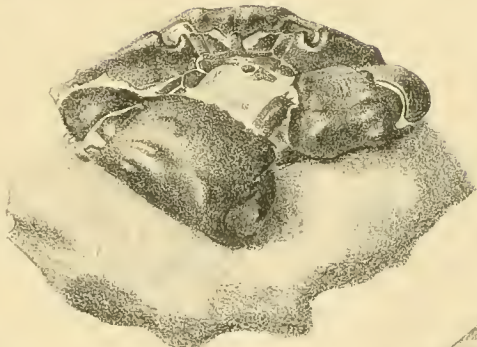
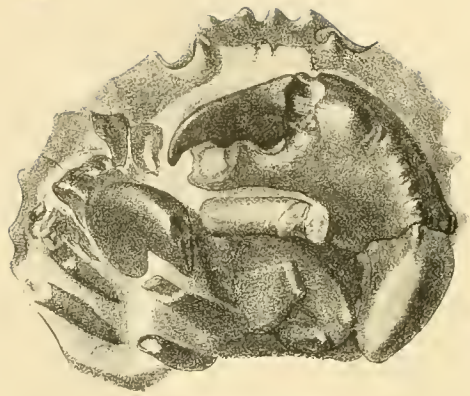




PLATE I.

Fig.

1. Upper side of male *Xanthopsis Leachii* (p. 14). In the collection of Mr. Wetherell. From the tunnel near Chalk Farm.
2. Under surface of the same specimen.
3. *Xanthopsis Leachii*; showing the upper surface of the claws, and the frontal and antennary regions. In the collection of Mr. Bowerbank. From the Isle of Sheppey.
4. Under side of female *Xanthopsis Leachii*. In Mr. Wetherell's collection. From Chalk Farm.
5. Upper surface of *Xanthopsis bispinosa* (p. 15). In Mr. Bowerbank's collection. From Sheppey.
6. Under side of the same.
7. Diagram showing the antennae and orbits of the genus *Xanthopsis*.
8. Male abdomen of *Xanthopsis*.
9. Female abdomen of ditto.
10. Variety (?) of *Xanthopsis Leachii*, with the anterior two marginal processes obsolete (p. 17). In the collection of Mr. Bowerbank. Sheppey.



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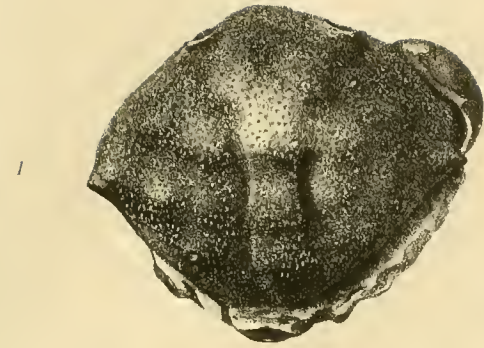




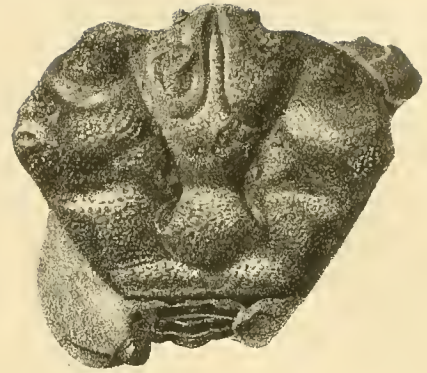
PLATE II.

Fig.

1. *Xanthopsis unispinosa* (p. 16). In Mr. H. Gould's collection.
2. *Xantholites Bowerbankii* (p. 17). In Mr. Wetherell's collection. Sheppey.
3. *Xantholites Bowerbankii*, showing the lateral processes. In Mr. Bowerbank's collection. Sheppey.
4. *Xantholites Bowerbankii*, showing the claws. In Mr. Bowerbank's collection. Sheppey.
5. Under side of the same, showing the antennæ and external footjaws. From the same collection.
6. Female abdomen of the same.
7. *Plagiolophus Wetherellii* (p. 19). In Mr. Bowerbank's collection. Sheppey.
8. Under side of the same specimen.
- 9, 10. Younger specimens of the same.
11. Orbits and front of the same.
12. Under side of a small specimen of the same species. In Mr. Bowerbank's collection. Sheppey. Magnified two diameters.
13. Male abdomen of *Plagiolophus Wetherellii*.



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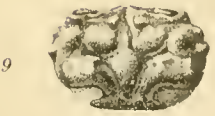
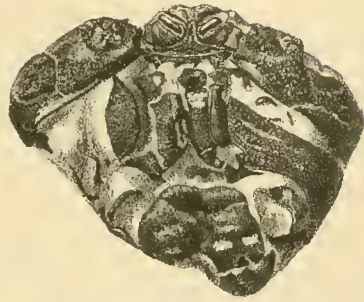
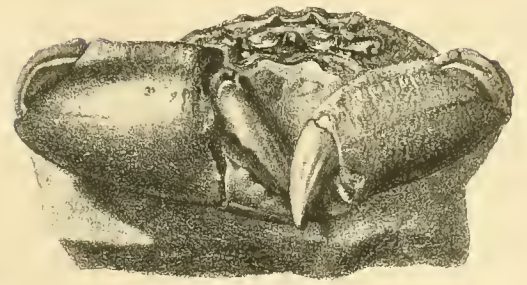
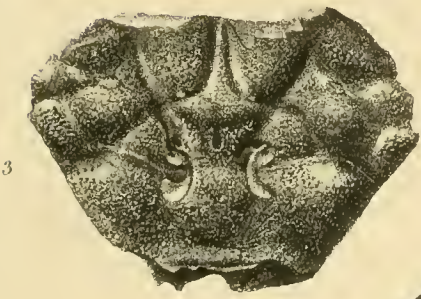








PLATE III.

Fig.

1. *Portunites incerta* (p. 21), showing on the left side the posterior leg turned over the back, and resting against the longitudinal elevation on the branchial region. In Mr. Wetherell's collection. Sheppey.
2. *Portunites incerta*, larger specimen, showing the orbits, &c. Mr. Wetherell's collection. Sheppey.
3. Under side of *Portunites incerta*, showing the claws and male abdomen. Mr. Bowerbank's collection. Sheppey.
- 4, 5. Upper and under side of a small pyritic specimen of *Portunites incerta*. Sheppey.
6. *Edisoma ambiguum* (p. 22). Mr. Bowerbank's collection. Sheppey.
7. Front view of the same, showing the orbits.
8. *Campylostoma matutiforme* (p. 23). Mr. Wetherell's collection. Sheppey.
9. Large specimen of *Campylostoma matutiforme*, with hypertrophied lateral spine. Mr. Wetherell's collection. Sheppey.
10. Specimen of the same species, showing the inner stalk of the external footjaws. Mr. Bowerbank's collection.

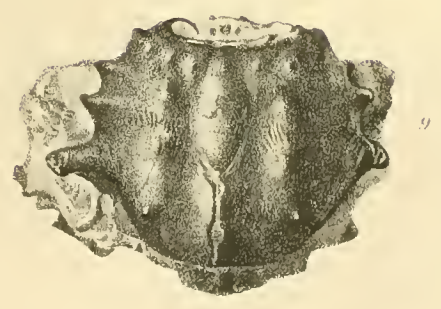
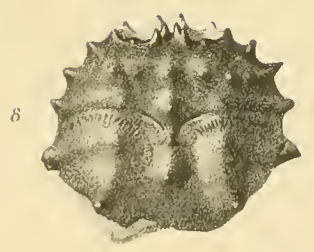
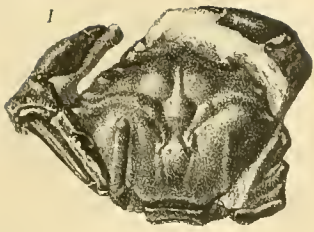






PLATE IV.

- Fig.  
1, 2. *Cyclocorystes pulchellus* (p. 24). Mr. Wetherell's collection. Holloway.  
3. *Goniochele angulata* (p. 26). Mr. Wetherell's collection. Sheppey.  
4. Old specimen of *Goniochele angulata*, showing the male abdomen, and the situation of the last two pairs of legs. Mr. Bowerbank's collection. Sheppey.  
5. Female *Goniochele angulata*, showing the relative position of the two legs, and the female abdomen. Mr. Wetherell's collection. Sheppey.  
6. Under side of fig. 1, showing the claw.  
7. Front view of the same specimen, showing the front, the orbits, &c.  
8, 9. Male and female abdomen of *Goniochele angulata*.

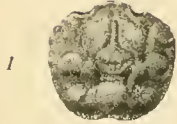
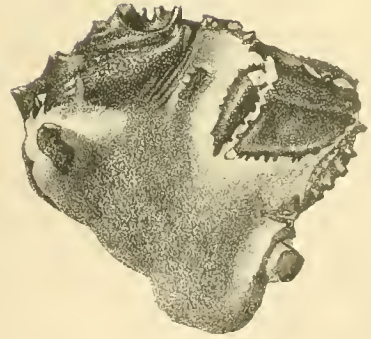
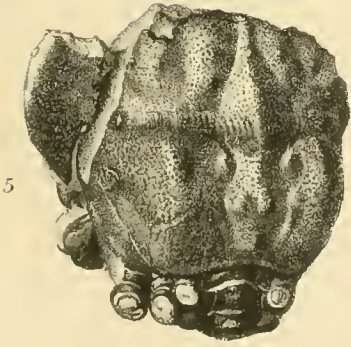
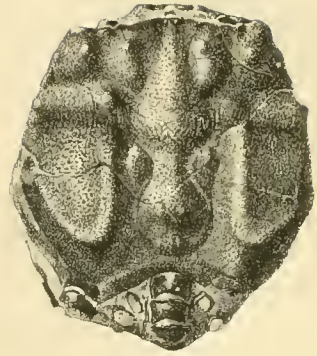
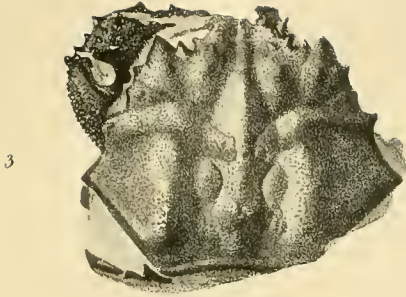








PLATE V.

Fig.

1. *Dromilites Lamarckii* (p. 29), male. In Mr. Bowerbank's collection.
2. Female of the same species. In the same collection.
3. The same, a male specimen, showing the length and position of the claws. In the same collection.
4. A younger specimen of the same, showing the marginal spines. In Mr. Wetherell's collection.
5. The hand of the same species. In Mr. Wetherell's collection.
6. Specimen showing the front and orbits.  
The whole of the above are from Sheppey.
8. The male,—and 9, the female abdomen of *Dromilites Lamarckii*.
10. *Mithracia Libinioides* (p. 9). From a specimen in the British Museum.
11. Upper,—and 12, under, side of the same; the latter showing the female abdomen.  
From a specimen in Mr. Bowerbank's collection, from Sheppey.

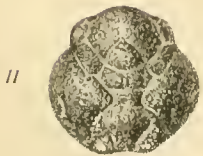
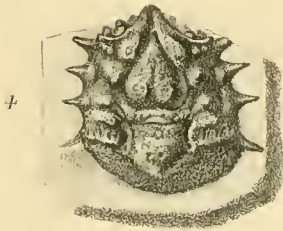
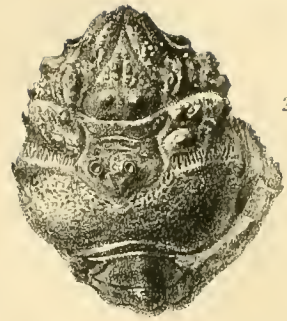
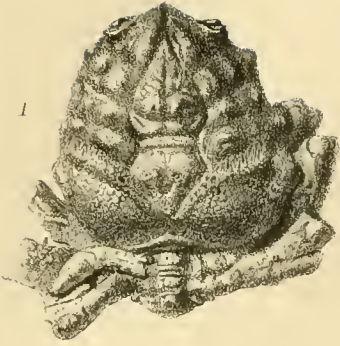






PLATE VI.

Fig.

1. Upper,—and 2, under, side of male *Dromilites Bucklandi* (p. 31).
- 3, 4. Similar views of a female specimen.
5. Front view, showing the orbits, and front.
- 6, 7. Specimens showing the claws.
- 8, 9, 10. Specimens of different ages, showing the changes in the form and sculpture produced by age.

The whole of the specimens are in Mr. Wetherell's collection, and are from Copenhagen Fields, and the neighbourhood.

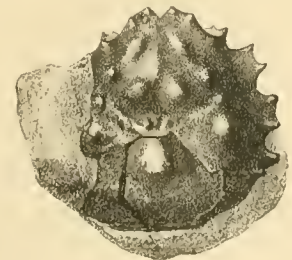
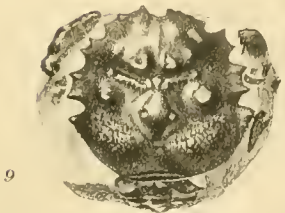
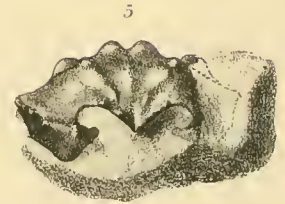
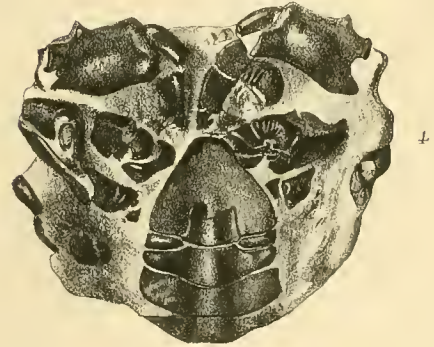
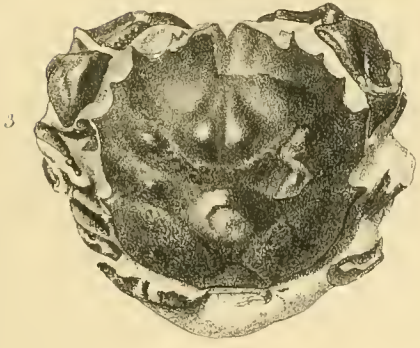
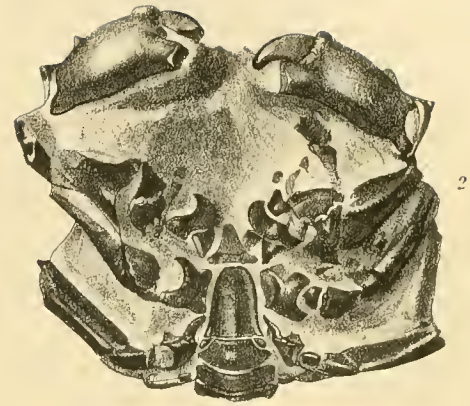
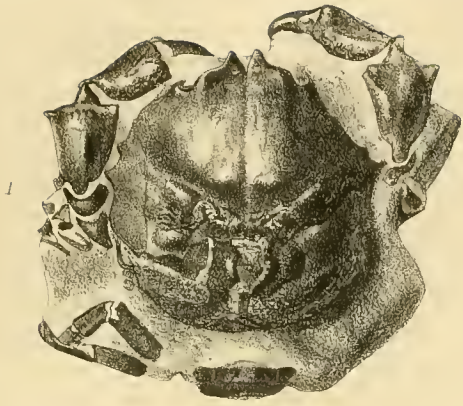








PLATE VII.

Fig.

1. *Thenops scyllariformis* (p. 33). From a specimen in the British Museum. From Herne Bay.
2. Carapace of a larger individual of the same species. From Chalk Farm. In Mr. Bowerbank's collection.
3. Fragment showing the rostrum, the anterior margin of the carapace on the right side, and the basal joint of the right external antenna. From the same locality, and Mr. Wetherell's collection.
4. The under side of the external antenna, from the same.
5. Thorax and portions of the first four pairs of legs. From a Sheppey specimen in Mr. Bowerbank's collection.
6. View of the abdomen and caudal plates.
7. Three segments of the abdomen.
8. Side view of the same. The last three specimens are from Highgate, and in Mr. Wetherell's collection.

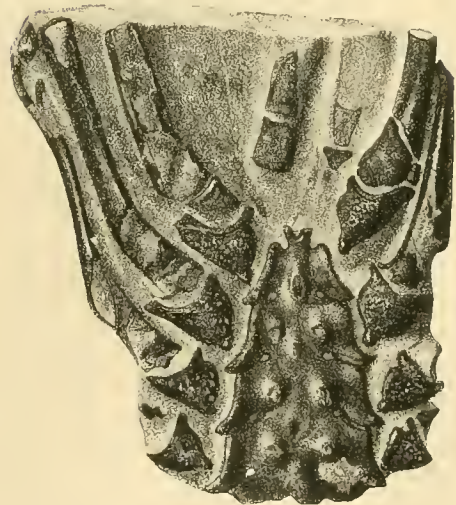
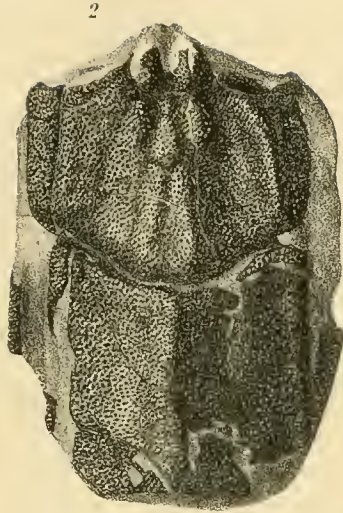
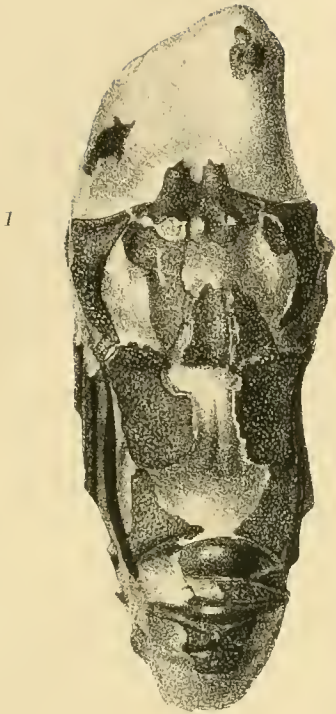






PLATE VIII.

Fig.

1. *Scyllaridia Koenigii* (p. 35), showing the general form of the carapace and abdomen, and the flat, scyllariform, external antennæ. From a specimen in Mr. Bowerbank's collection.
2. Another specimen showing the orbits and eyes. From Mr. Wetherell's collection.
3. Side view of the same. From Mr. Bowerbank's collection.
4. *Hoploparia gammaroides* (p. 38), back view. From a specimen in Mr. Bowerbank's collection.
5. Side view of the same species. Mr. Wetherell's collection.
6. Specimen of the same, showing the caudal plates. From the same collection.

The whole of the specimens of both species are from Sheppey.

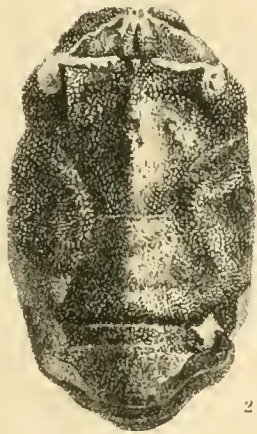
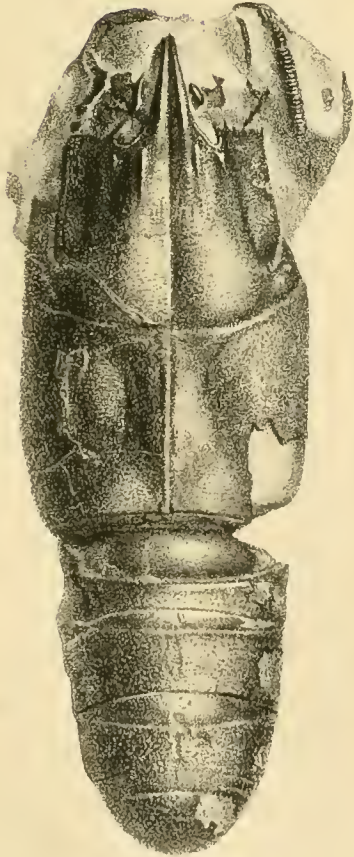
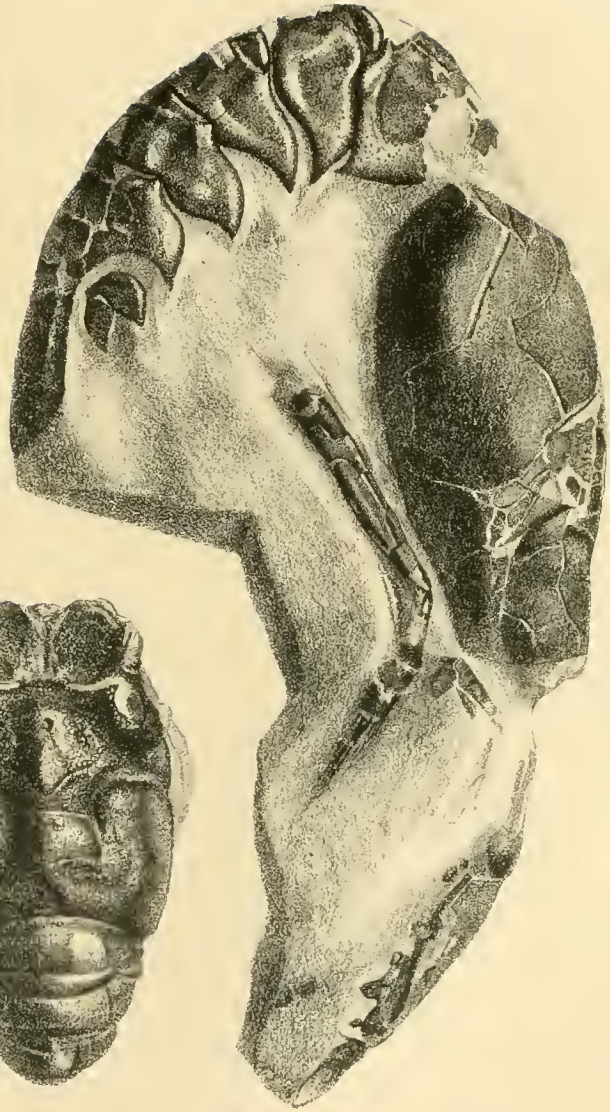
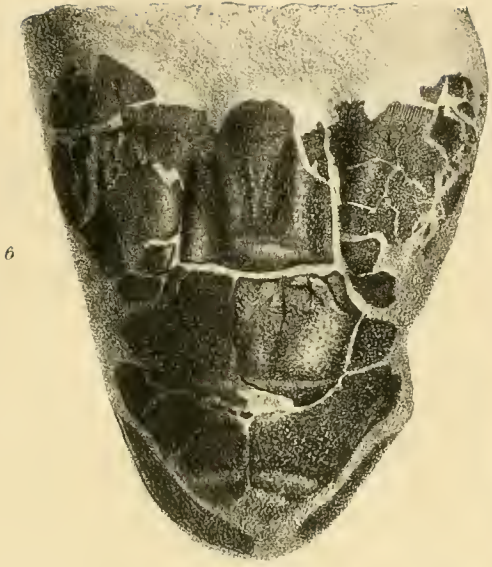








PLATE IX.

Upper and under sides of a specimen of the claws of *Hoploparia gammaroides*.

From near Copenhagen House. In Mr. Wetherell's collection.







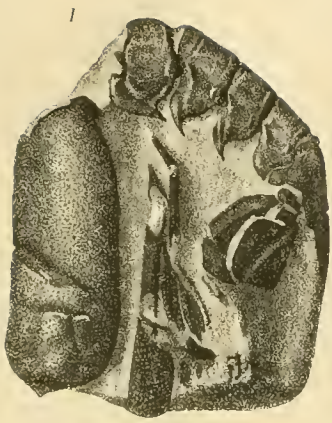
PLATE X.

Fig.

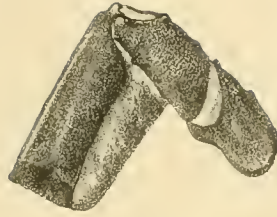
1. *Hoploparia Belli* (p. 39). Side view of carapace and abdomen.
2. The same, showing the supra-antennary process, and base of external antennæ.
3. Back of carapace of the same.
4. The caudal plates.
5. Larger claw ; and 6, smaller claw of *H. Belli*, being two views of one specimen.
7. The fingers of a specimen of the same species, more than usually curved.
8. Wrist, arm, and part of the hand of the same species.
9. An abnormal form of the carapace of *H. Belli*, or possibly a distinct species (p. 40).

The whole of the above are from Chalk Farm and the immediate neighbourhood,  
and in Mr. Wetherell's collection.

10. Base of the external antenna, with the scale and the supra-antennary process, of *Nephrops Norvegicus*, to show that in a recent astacoid, these parts are even more armed than in *Hoploparia*.
11. *Trachysoma scabrum* (p. 41). From a unique specimen in the possession of Mr. Wetherell. From the tunnel, near Chalk Farm.



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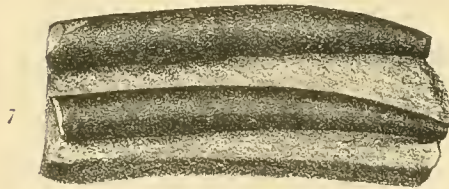
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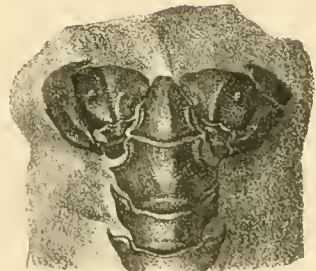
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1c



11



4





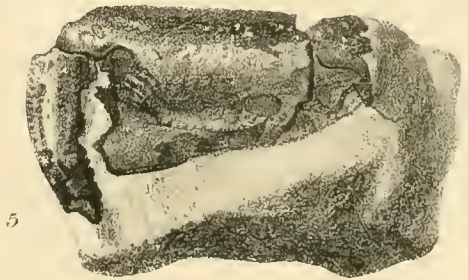
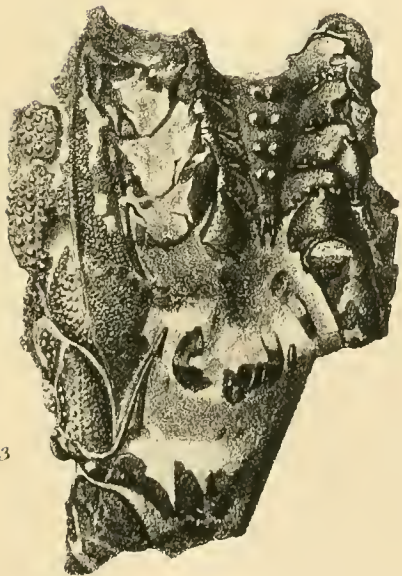
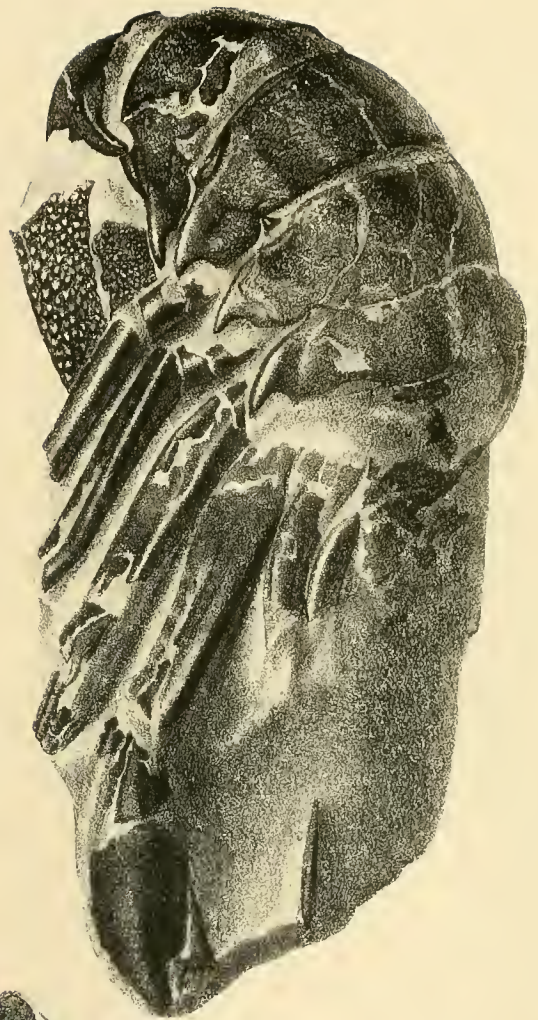


PLATE XI.

Fig.

1. *Archæocarabus Bowerbankii* (p. 42). From a specimen in the British Museum.
2. The same, showing the abdomen, and portions of the first four legs. In Mr. Bowerbank's collection.
3. Thorax of the same. In the British Museum.
- 4, 5. Claws of the same. From Mr. Bowerbank's collection.

The specimens are all from Sheppey.





A MONOGRAPH  
OF THE  
FOSSIL  
MALACOSTRACOUS CRUSTACEA  
OF  
GREAT BRITAIN.

BY  
PROFESSOR BELL, F.R.S., F.G.S., ETC.,  
LATE PRESIDENT OF THE LINNEAN SOCIETY.

PART II.  
CRUSTACEA OF THE GAULT AND GREENSAND.

LONDON:  
PRINTED FOR THE PALÆONTOGRAPHICAL SOCIETY.  
1862.



## P R E F A C E.

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THE Crustacea of the strata below the Chalk, which form the subject of the present portion of this work, present several remarkable peculiarities in their forms and affinities. One of the most interesting of these is the existence of analogous or, so to speak, representative species in these beds and in the London Clay, on the Crustacea of which I have already treated. In some cases this representation is shown in their specific distinction, with the most perfect generic identity, as in the case of *Hoploparia*, of which we have already seen two very distinct species in the later formation, and we have now described no fewer than six species in the earlier deposits. In no instance do any of these locally separated individuals belong respectively to the same species; in every one the specific distinctness is unambiguous, but the generic relation to each other is no less so. Another case, of nearly similar import, occurs in the anomurous family Dromiadae; the *Homolopsis* of the Greensand being represented in the London Clay, by two species of *Dromilites*, a very nearly allied form.

These examples are extremely interesting when associated with the fact that, as far as our present information extends, there is no form in the whole immense bed of the Chalk proper, which at all approximates those which are respectively found in the beds which it separates by such an incalculable epoch and such an enormous space.

Such facts as these are extremely suggestive, as bearing upon important questions

which have recently occupied anew the attention of naturalists, and they deserve to be well considered and compared with analogous examples, which doubtless present themselves in other formations and in other groups of organized beings.

The investigation of any fossil species is often met by a difficulty which demands some consideration, as showing how necessary it is that the inexperienced palæontologist should not be prejudiced by the striking discrepancy which is often found in the appearance of different specimens of the same species, from different localities. As the animals are ordinarily found in a very imperfect and often in a fragmentary condition, this caution becomes the more important; and in no group of animals is the difficulty greater than in the Crustacea, the specific, and even the generic characters of which are often so subtle or so minute, as to require the closest observation of a practised eye to appreciate them. The mineral character of the bed in which the specimens are found is so strongly impressed upon them, that a limb from one locality, an abdomen from another, and a carapace from a third, can scarcely be recognised by one unaccustomed to the work as even possibly belonging to an identical species. This is strikingly shown in *Hoploparia scabra*, which is found under extremely various aspects in the Gault, the Greensand of the neighbourhood of Cambridge, and that of Wiltshire.

In the present part I have the opportunity of describing a third species of the oxyrhynchous form, of which group, as before observed, not one was known in a fossil state when Professor Milne Edwards published his great work on the Crustacea. The first ever ascertained was the *Mithracia libinioides* of the former part of this work; Mr. Charles Gould afterwards described a second, *Mithracites vectensis*, found in the lower Greensand of the Isle of Wight; and the third, *Trachynotus sulcatus*, a very remarkable form from the upper Greensand of Wiltshire, is now for the first time described.<sup>1</sup>

In the various collections of the Crustacea of the Gault and Greensand, to which I have enjoyed the freest access, there is one circumstance which is extremely tantalising. This is the occurrence of numerous specimens of the limbs of these animals, often in a very perfect state, but found in situations so totally separated from any other important part that it is impossible to appropriate them to any hitherto known species, or to describe them with any certainty as belonging to any determinate genus. This is particularly the fact in Mr. Carter's fine collection of Cambridge Greensand Crustacea and in that of Mr.

<sup>1</sup> Page 2, pl. i, fig. 2.



Cunnington from Wiltshire. It is earnestly to be desired that these gentlemen, and all others who, with similar ardour and success, investigate the Crustacean remains of their respective localities, will endeavour to remedy as far as possible this lamentable deficiency, and I trust that I may thus be enabled, in a supplement to the third and concluding part of this work, to give a satisfactory description of various species, to which belong numerous beautiful specimens of limbs, which I have been obliged, most reluctantly, to return to their kind owners undescribed and unemployed.

I cannot close these few remarks without again offering my cordial acknowledgments to my friends who have most liberally aided me in this portion of my work, and especially to the two gentlemen above named, to Dr. Bowerbank, to the Messrs. Woodward, of the British Museum, to Mr. Norman, of Ventnor, to the Council of the York Museum, and to Mr. Dallas, the curator of that collection, who have, without reserve, placed their invaluable collections at my disposal, and thus contributed to the completion, or rather to the very existence of a work which, but for their kind assistance, could never have seen the light.

THE WAKES, SELBORNE ;  
*March 3, 1862.*

#### ERRATA IN PART I.

It is particularly requested that the following corrections be made with the pen at page v of the Introduction:—Foot-note, four lines from the bottom of the page, after B b, *instead of* “mesogastric,” *read* “mesobranchial;” after B c, *for* “metagastric,” *read* “metabranhial;” after C a, *for* “epigastric,” *read* “epicardiac;” after C b, *for* “metagastric,” *read* “metacardiac.”

Page vii, line 6, *for* “Cyclocoryster,” *read* “Cyclocorystes.”

Page 38, line 3, the quotation from Davila should be transferred to the synonyms.

Explanation of Plate VI, *add*—“11. Male abdomen of the same.”

MONOGRAPH  
OF THE  
FOSSIL MALACOSTRACOUS CRUSTACEA  
OF  
GREAT BRITAIN.

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PART II.—OF THOSE FOUND IN THE GREENSAND AND GAULT.

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ORDER—*BRACHYURA*.

Family—*MAIADÆ*.

Genus—*MITHRACITES*, *Gould*.

*Char. Gen.* *Testa* suborbicularis, anticè æquè arcuata, vix longior quam latior, regionibus distinctis; rostro æquè longo ac lato, anticè obtusè triangulari; *orbitæ* transversim suboblongæ; *oculorum peduncula* ad latera rostri inserta.

*MITHRACITES VECTENSIS*, *Gould*. Plate I, figs. 2, 3.

*Descr.* The carapace is suborbicular, of nearly equal length and breadth, including the rostrum; the anterior portion almost evenly arcuate, the latero-posterior margin somewhat bulging; the rostrum very distinct, projecting, of equal length and breadth, grooved in the middle, terminating in an obtuse triangle, with the anterior edge a little raised; the regions mostly distinct, and somewhat tumid, the nuchal and hepatico-branchial sulci rather deep; the whole surface minutely tuberculated, and having large, distinct tubercles on the different lobes of each region; of these there are about five on the median line and seven on each side, viz., one on each epigastric lobe immediately behind the rostrum, one on the mesogastric, one on the hepatic region, and four on the branchial.

Length and breadth of the carapace, 0·6 inch.

*Obs.* The above description is taken from two specimens, existing respectively in the British Museum and in Dr. Bowerbank's collection, in each of which the carapace alone remains. The difficulty which necessarily exists in obtaining good generic characters from such slight data is but too well known and too often felt by every palæontologist; and it is especially the case in the class of Crustacea, where the generic characters are ordinarily derived from parts which are most easily destroyed, and which, even when existing in a perfect condition, require the most acute discrimination to detect their essential structure and determine their physiological bearing and importance.

This species was first described by my friend, Mr. Charles Gould, in the 'Quarterly Journal of the Geological Society,' published in May, 1859, where he has the following observations:—"I regard the Crustacea, which I am about to describe, with peculiar interest, on account of its belonging to the group of the Brachyura, which comprehends the highest forms of the class, and of which hitherto but one species (*Mithracia libinioides*, Bell\*) has been described as occurring in the fossil state in Great Britain."

All the specimens hitherto known are from the lower Greensand in the Isle of Wight.

*Genus*—TRACHYNOTUS, *Bell*.

Species unica. TRACHYNOTUS SULCATUS. Plate I, fig. 1.

*Descr.* Carapace convex, subrhomboidal, with rounded angles, rather broader than long, the transverse diameter widest immediately behind the mesobranchial lobes; the portion anterior to the nuchal furrow occupying scarcely one third of the entire area; the surface is covered with small tubercles, which, for the most part, are irregularly arranged in rows upon transverse ridges, which are separated by strongly marked furrows; the nuchal furrow in its course across the carapace bends a little backwards, forming a very obtuse angle; a second furrow, parallel with it, extends entirely across the carapace, and a third, crossing the mesobranchial lobe, terminates by passing forwards into the one anterior to it, at some distance from the median line. The metagastric lobe forms a regular rhomb, its anterior process is linear and extends to the front; the latero-anterior margin is rounded and without teeth or other armature, the latero-posterior margin is hollowed, and the posterior has a narrow, slightly raised, border.

Length of carapace, 0·5 inch; breadth, 0·6 inch.

From the upper Greensand of Wiltshire.

*Obs.* Of this singular species I have seen but two specimens, one in the British

\* 'Monogr. Foss. Malac. Crust. Gr. Brit.,' Part I, "Crustacea of the London Clay," 1858, p. 9, pl. v, figs. 10—12.

Museum and the other in Mr. Cunningham's collection. The absence of all the parts upon which generic distinctions depend has necessitated my confining myself to a description of the carapace. Its nearest affinity to any recent form appears to be to the genus *Mithrax*, and particularly to that division of the genus which is represented by *Mithrax denticulatus* and *Mithrax sculptus*, both of which in form and general aspect it considerably resembles. Its principal interest consists in its being another of the few examples of the occurrence of a Maian form in a fossil state, the first, *Mithracia libinioides*, having been recorded in the first part of this work.

*Family*—CANCERIDÆ.

*Genus*—XANTHOSIA, *Bell.*

*Char. Gen.* *Testa* multo latior quam longior, fronte lato, undulato, emarginato; margine latero-anteriore quadridentato seu quadrilobato. *Orbitæ* distantes, magnæ, rotundo-ovatæ, suprâ atque infrâ obscure bifissæ.

XANTHOSIA GIBBOSA, *mih.* Plate I, figs. 4—6.

Margine latero-anteriore dentibus quatuor triangularibus.

*Descr.* Carapace nearly twice as broad as it is long, considerably convex, the anterior part granulated, the posterior punctate; front broad, waved, emarginate, depressed in the centre; latero-anterior margin with four triangular teeth; the anterior regions elevated, particularly the proto- and meso-gastric lobes; the nuchal furrow nearly transverse. Orbits distant, large, of a rounded oval form, without teeth or other armature, the margin slightly raised, and both above and beneath with two very small, indistinct fissures.

Length of carapace, 0·7 inch; breadth, 1·2 inch.

Three specimens are in Mr. Cunningham's collection, from the upper Greensand of Wiltshire.

*Obs.* In its general aspect this species so much resembles many of the genus *Xantho*, and especially that section of it which is represented by *Xantho florida* of our coasts, that at first sight I thought it might be considered as belonging to that genus. Notwithstanding, however, the absence, in all the specimens observed, of most of the parts on which generic characters depend, the greater breadth of the carapace in proportion to its length, the greater distance of the orbits from each other, their larger size and more simple structure, the greater

breadth of the front, and the more even transverse direction of the nuchal furrow, indicate a difference between the two forms which I consider sufficient to warrant a distinct generic place.

The resemblance is still so striking in the general form of the carapace, the existence of four triangular teeth on the latero-anterior margin, and the waved outline of the front, that I have thought it desirable to express the similarity in the name applied to it. The genus *Xanthosia* itself, as it was left by Prof. Milne Edwards, requires a complete revision, and ought probably to be considered as comprising three or four genera, an arrangement which that distinguished naturalist suggests by the sections which he has himself indicated.

*XANTHOSIA GRANULOSA*, sp., *M'Coy*. Plate I, fig. 13.

Margine latero-anteriore lobis quatuor obtusis.

*REUSSIA GRANULOSA*, *M'Coy*.

With some hesitation I have referred the species indicated, but neither figured nor described, by Prof. M'Coy, under the name of *Reussia granulosa*, to the present genus, instead of that to which the author had assigned it. The specimens which I have had an opportunity of observing are scarcely sufficient to supply me with any satisfactory characters, but such as exist lead me to consider the species as more nearly allied to *Xanthosia* than to *Reussia* of M'Coy. The general form of the carapace is very similar to that of the foregoing species, but the latero-anterior margin, instead of having four rather acute teeth, has that number of obsolete lobes; this margin also extends somewhat further back than in the former. The regions are very well marked, and are even more gibbous than in *X. gibbosa*. The carapace is evenly covered with minute and regular granulations.

Length of the carapace, 0.7 inch; breadth, 1.2 inch.

It has hitherto been found only in the upper Greensand of Cambridge, where it is very rare. The specimen figured, and from which the above imperfect description is taken, is in Mr. Carter's collection.

*Genus*—*ETYUS*, *Mantell*.

*Char. Gen.* *Testa* transversim elliptica, bis ferè latior quam longior, tuberculata, sulco nuchali transverso fere recto in medio divisa. *Orbitæ* oblongæ, approximatae, supra tuberculis tribus subtùs excavatis armatae. *Pedes* longi, gracilis.

Species unica. ETYUS MARTINI, *Mantell*. Plate I, figs. 7—12.

ETYUS MARTINI, *Mantell*. *Med. of Creat.*, p. 322, fig. 1. *Geol. S.E. of Engl.*, p. 169, fig. 1. *Morris, Cat.*, p. 58.

REUSSIA GRANOSA, *M'Coy*. *Ann. Nat. Hist.*, 1854. *Contr. to Brit. Pal.*, p. 271, fig. 4.

*Descr.* Carapace twice as broad as it is long, nearly plane from side to side, moderately convex from front to back; the anterior margin forming a perfect segment of a circle, and armed with three or four tubercles; the latero-posterior margin somewhat hollowed; the anterior portion of the carapace, including the gastric and hepatic regions and the metabranchial lobes, covered with small, sharp tubercles and granules of different sizes; the posterior portion simply granulated; a larger distinct tubercle exists on each mesogastric and one on each mesobranchial lobe. The nuchal furrow is almost directly transverse, dividing the carapace into two nearly equal portions. The proto-, epi-, and meso-gastric lobes are confused, and but slightly separated from the hepatic; metagastic lobe triangular, the anterior process extending forwards to the front; the urogastric rather large, without any tubercle, and but slightly distinguished from the cardiac region. The epibranchial lobe very distinct, gibbous, strongly tuberculated; the mesobranchial somewhat pear-shaped, with a single, strong tubercle on the anterior part; the metabranchial without tubercles; the branchial sulci distinct. Orbits transverse, oval, open to the antennary fossæ, and separated only by a thin septum, where the front descends to meet the narrow, triangular epistome; the upper margin of the orbits has three tubercles, which are excavated underneath in a very peculiar manner. Fragments of several of the legs remain in one specimen in my possession, which show that they were long, slender, and smooth.

Length of carapace, 0·4 inch; breadth, 0·8 inch.

Found plentifully in the Gault, at Folkestone, in Kent; at Ringmer, in Sussex; and rarely in the upper Greensand at Cambridge. Specimens exist in the British Museum, in those of the Geological Survey and Cambridge, and in Dr. Bowerbank's, my own, and other collections.

*Obs.* The affinities of this species cannot be very satisfactorily determined by the characters which are available in the imperfect specimens which have hitherto been observed. There is, however, no ground whatever for considering it as an anomurous form, as suggested, with a query, by Prof. Morris, in his 'Catalogue.' It is undoubtedly strictly brachyurous, and probably belongs to the great group of Canceridæ, according to the classification of our great carcinologist,\* but its nearer affinities require an examination of many organs which do not exist in any known specimens to be accurately determined.

\* Edw., 'Nat. Hist. Crust.', vol. i.

The history of the name which has been given to this genus is somewhat curious. On obtaining specimens of several species of Crustacea from the Gault, Mantell applied to Dr. Leach, as the highest authority on the subject, for information respecting their affinities. In the present case the naturalist, misled by a superficial resemblance, gave his inquirer the name of *Ethisus*, a well-known recent genus; and as caligraphy was not one of my distinguished friend's qualifications, Mantell doubtless read the word *Elyus*, published it as on Leach's authority in two, at least, of his works, and *Elyus* it became. I hesitated whether it was desirable to perpetuate a name which was only not erroneous because it was a blunder, but on consideration it appeared that it would be inconvenient to change a generic term which had become sanctioned by long use and frequent repetition.

This amusing mistake in nomenclature is, however, not the most important error which has occurred in relation to this species. On examining the collection of Gault and Greensand Crustacea at the Museum of Practical Geology, I was struck with the number of specimens which were marked *Reussia granosa* of M'Coy, the whole of which, including some from Cambridge, I found were specimens, more or less worn, of *Elyus Martini*. This circumstance led me to investigate more closely the description given by that author of the genus *Reussia* and of the species *granosa*, and I soon became perfectly satisfied that this genus has been founded upon a few worn specimens of the present species, and must, therefore, be reduced to a mere synonym. If it were wished to select an example of the extreme dissimilarity between different representations of the same subject, which so often occasions trouble and mistake to naturalists, and not unfrequently leads to glaring errors, it would be scarcely possible to select one more striking than is afforded by a comparison of the wretched woodcut in Mantell's 'Medals' of *Elyus Martini*, with the engraving of M'Coy's *Reussia granosa* in his 'Contributions to Palaeontology.' Nothing short of a critical examination of the specimens themselves could lead any one to suppose their identity.

There is in Mr. Carter's collection a fragment of a carapace which differs in some respects from the normal form of *E. Martini*. The latero-anterior margin has four lobes, which are not furnished with the sharp tubercles which are usually observed on this part. There are, however, similar tubercles on the anterior portion of the carapace, the distribution of which differs somewhat from their ordinary arrangement.

I give a figure of the specimen in Plate I, fig. 12.

*Genus*—*DIAULAX*, *Bell*.

*Species unica.* *DIAULAX CARTERIANA*, *mih*i. Plate I, figs. 14—16.

*Descr.* Carapace very minutely and uniformly granulated, somewhat broader than it is long, its greatest breadth immediately in front of the nuchal furrow; very convex from



before backwards, very slightly so from side to side; the regions very indistinctly marked, the protogastric lobes with a small, almost obsolete tubercle, the posterior median portion of the gastric and the cardiac region slightly raised. There are two parallel, shallow furrows extending nearly straight across the carapace; the boundary line of the anterior one, the nuchal furrow, forming a distinctly marked edge; the posterior furrow is in some specimens almost obsolete. At the lateral margins the sides of the carapace form a sharp angle with the upper surface; there is a small tubercle on the lateral margin immediately in front of the nuchal furrow, and a rather larger one behind it; the latero-anterior margin is somewhat curved, the latero-posterior nearly straight. The front is simple, somewhat incurved, depressed in the centre; the orbits oval, transverse, distant, being separated by a wide antennary fossa, which is open to the orbit. The upper margin of the orbit is entire; in the lower margin is a rather broad groove. The epistome is pentagonal, and the angles are much produced. The claw, of which only a fragment has been found, is extremely large in proportion, is robust and quite smooth; the hand round and gibbous, and as broad as it is long; the moveable finger carinated above. Of the ambulatory legs nothing remains but the basal portions, and from these it appears that the last pair are placed on a much higher level than the others. There are no remains in any of the specimens I have seen of footjaws, antennæ, or abdomen.

Length of carapace, 0·9 inch; breadth, 0·7 inch.

Found in the upper Greensand of Cambridge, from which there are specimens in Mr. Carter's collection and in my own.

*Obs.* The extremely imperfect state of all the specimens hitherto found of this species has deterred me from attempting to offer any formal generic character, and the same circumstance renders it very doubtful to what group of recent Crustacea it is most nearly allied. Mr. Carter has suggested to me its probable affinity to the Thelphusadæ, and, certainly, the general form of the carapace, the wide oval orbit, and the robust claw, would seem to sanction this opinion; but in the absence of all those organs by which the essential relations of a group are indicated, I can scarcely admit into a family, of which all the known species inhabit the banks of rivers in the interior of the countries where they are found, a species so entirely confined to a bed of strictly marine origin. I have, therefore, assigned to it a provisional place amongst the Canceridæ, without attempting, with our limited means of forming a judgment, to decide upon its more intimate relations. It is one of the rarest forms in the prolific bed of the Cambridge upper Greensand, there being but few specimens even in Mr. Carter's fine collection of fossil Crustaceans from this locality. I have dedicated it to that gentleman, to whom I am indebted for first bringing it to my notice, and for the loan of the specimens from which my description and figures are derived.

*Genus*—CYPHONOTUS, *Carter*, MS.

*Char. Gen.* *Testa* subglobosa, latior quam longior, fronte triangulari, depresso, incurvo, regionibus indistinctis, sulco nuchali triangulari, margine latero-posteriore obliquè truncato. *Orbitæ* oblongæ, obliquæ, supra integræ.

Species unica. CYPHONOTUS INCERTUS, *mihi*. Plate I, figs. 17—19.

*Descr.* Carapace subglobose, the anterior margin forming nearly a semicircle, the surface very even, covered with small granulations of various sizes; the regions undefined; front triangular, bent downwards, and somewhat incurved at the apex; latero-anterior margin with an acute edge, and with four or five slight indentations; latero-posterior margin obliquely truncated and tuberculated; nuchal furrow forming an obtuse-angled triangle; a second, inconspicuous furrow extends transversely across the branchial regions and between the gastric and cardiac, tending slightly forwards, so as nearly to meet the nuchal furrow on the median line. Orbits oblong, oblique, open to the antennary fossæ, each partially divided by a very slight ridge, both on the margin and on the inner surface, answering to the depression at the point where the eye joins its peduncle, when laid at rest within the orbit. The upper margin of the orbit entire.

Length of carapace, 1·3 inch; breadth, 1·0 inch.

In Mr. Cunnington's collection, from the upper Greensand of South Wiltshire, and in Mr. Carter's, from that of Cambridge.

*Obs.* The peculiarities of this species, and the imperfect condition of the few specimens hitherto found, are such as preclude any very certain appreciation of its affinities. The general *primâ facie* aspect of the carapace would lead to the impression that it belongs to the great group of the Cancridæ, and probably to that section of it of which the genus *Carpilius* is the type; but on a closer inspection the oblong form of the orbits, with their partial division and oblique direction, the strongly depressed, incurved, and triangular front, and some other characters, appear to forbid this view, and I am compelled to leave the question without any suggestion as to its true solution.

A tolerably perfect carapace exists in Mr. Cunnington's collection from the upper Greensand of the neighbourhood of Horningsham, in South Wiltshire, and several fragments from the Cambridge bed are in the possession of Mr. Carter. I have adopted the generic name assigned to it by the latter gentleman in his MS.

*Family*—PINNOTHERIDÆ.

*Genus*—PLAGIOPHTHALMUS, *Bell.*

*Char. Gen. Testa* oviformis, valdè convexa, lævis, margine omninò integerrimo. *Orbitæ* minimæ, elongatæ, obliquæ, intra testæ marginem positæ.

Species unica. PLAGIOPHTHALMUS OVIFORMIS, *mihi.* Plate II, figs. 1—3.

*Descr.* Carapace evenly egg-shaped, very convex, the height from the plane of the lateral margin being equal to nearly half of the length; the front slightly produced and bent downwards; the surface smooth; the nuchal furrow shallow, and a second furrow, nearly parallel with the former, extending across the carapace between the meso- and meta-branchial lobes and across the cardiac region; a small, bifurcate, impressed line passing backwards from the front for a short distance on the carapace. Orbits very small, elongate oval, placed obliquely within the margin, and appearing as if pierced in the substance of the carapace. In the two specimens observed there is nothing remaining but the carapace, which is tolerably complete in each.

Length of carapace, 0·6 inch; breadth, 0·5 inch.

There are two specimens from the upper Greensand of Wiltshire in the collection of Mr. Cunningham, and three in the British Museum from the same locality.

This is certainly one of the most interesting fossil species I have yet met with. Its form is very remarkable, being as nearly as possible that of half an egg, a figure which at once recalls that of *Remipes*, a resemblance, however, which is not borne out by any important characters. It is very unlike the figure of any species with which its essential characters would appear to associate it; but the uniformity and smoothness of the carapace, the slight indications which exist of regional distinctions, and, above all, the form, situation, and direction of the orbits, appear to me to indicate a near approach to certain forms of the Pinnotheridæ. The genera to which I consider it as most nearly allied are *Xenophthalmus* of White and my genus *Amorphopus*. In the last-named form the orbits are placed within the frontal margin of the carapace, but open forwards where the sides slightly approach each other anteriorly; in *Xenophthalmus* the orbits are extremely small, placed far within the margin, and the sides of the orbit completely close in front, so as to have given to the original describer of the genus, the idea that the orbits were actually pierced through the carapace. In the present equally remarkable form the orbits appear *primâ facie* to be absolutely excavated in the substance of the carapace.

*Family*—LEUCOSIADÆ.*Genus*—HEMIOÛN, *Bell.*

*Char. Gen. Testa* ovalis, elevata, lateribus declivibus, anticè producta, truncata. *Orbitæ* parvæ, cylindricæ, antrorsum apertæ. *Oris apertura* angustè ovata.

Species unica. HEMIOÛN CUNNINGTONII, *mih.* Plate II, figs. 4—7.

*Descr.* The carapace is of an elongate oval form, somewhat produced anteriorly, the front truncated, the sides sloping, very convex from side to side, nearly straight from before backwards; the surface very smooth, extremely minutely granulated, the regions very slightly indicated; the lateral margin forming a continuous and even curve. The orbits are placed on the outer side of the fronti-orbital opening, and are nearly cylindrical; and the eyes must have had a forward direction, as in the rest of the family. The oral aperture is very narrow, ovate, elongate, narrowing forwards, and open to the antennary fossa, without any intervening epistome. The Pterygostomian process obliquely sulcated. From the size of the basal joints of the legs which remain in a small specimen in my possession, it appears that the limbs must be somewhat robust. The abdomen in the male is narrow, linear, and the only segments which remain, the first four, are all separate.

Length of the carapace, 0·6 inch; breadth, 0·4 inch.

Two specimens exist in Mr. Cunningham's collections from the upper Greensand of Wiltshire, a very small one in that of Mr. Carter, of Cambridge, and one in my own; both these are from the upper Greensand of Cambridge.

*Obs.* The peculiar interest which attaches to the present species consists in its being the only example of a fossil Leucosian hitherto discovered in this country, if we except *Ebalia Bryeri*, a not uncommon living species inhabiting our coasts, of which Mr. Searles Wood found some remains in the Coralline Crag. Two species, belonging undoubtedly to the family Leucosiadæ, are described by Desmarest.\* Of the first of these, *Leucosia cranium*, the author says, "Le mode de conservation de cette fossile est le même que celui que présentent les espèces qui viennent des Indes orientales." This is the only indication given of its locality. Of the second species, *L. subrhomboidalis*, no locality is mentioned. There is a third species, described by the same author under the name *Leucosia Prevostiana*, which does not appear to belong to this family.

The form of the carapace is very peculiar, and differs from that of the Leucosiadæ in general in its proportions, being almost twice as long as it is broad, a proportion

\* 'Hist. Nat. des Crust. Foss.,' p. 112 et seq., pl. ix. figs. 10—13.

belonging only to one known recent species, *Myra elegans*;\* it is also, with the exception of the slightly projecting frontal and orbital regions, nearly of the form of half an egg, suggesting the generic name which I have given to it. The essential characters are, however, sufficient to establish its true affinities. The uninterrupted smoothness of the surface, the slight projection and truncation of the frontal portion, the small size, position and direction of the orbits, and the form of the oral aperture, all concur in supporting this view of its affinities.

I have named the species after Mr. Cunnington, of Devizes, whose papers on the geology of Wiltshire are well known, and to whose kindness I am indebted for the loan of the whole of his interesting collection of Crustacea from the upper Greensand of that county.

#### Sub-Order—OXYSTOMATA.

#### Family—CORYSTIDÆ.

#### Genus—PALÆOCORYSTES, *Edwards, Bell.*

*Char. Gen.* *Testa* longior quam latior, depressa, posticè gradatim angustior, margine latero-anteriore dentato, rostro brevi. *Orbitæ* latæ, ovales, mediocres, suprâ bifissæ. *Pedipalpi externi* caute exteriore lineari, apicem versus angustato; *caulis interioris articulo secundo* lineari, tertio bis longiore quam latiore. *Pedes antici* æquales; *posteriores* reliquis multo minores. *Abdomen* in utroque sexu segmentis omnibus separatis, quinque prioribus brevibus, sexto quadrato, septimo semiovali.

The carapace in all the species of this genus at present known is strikingly similar to that of the recent species *Corystes Cassivelaunus*, so common on most of our shores. It is considerably longer than it is broad; the front has a small rostrum; the orbits are of moderate size, and have two fissures in the upper margin. The oral opening is rather narrow, and extends forwards to near the point of the rostrum, where it terminates in an acute angle, and the epistome is extremely small. The external footjaws are narrow, both the stalks linear, and the external one pointed and slightly curved at the apex. The third joint of the internal stalk is inserted at the middle of the truncated extremity of the second, and is twice as long as it is broad. The legs are more or less robust, excepting the last pair, which are very much smaller than the preceding ones, and placed considerably above their level. The abdomen has parallel sides, the first five segments are short, the sixth quadrate, and the seventh semioval, approaching triangular. There are no intercalary pieces at the angles of the junction of the sixth and seventh segments.

This genus, to which, from an erroneous notion of the structure of the posterior pair of

\* Bell, "Monogr. of the Leucosiadæ," 'Lin. Trans.,' xxi, p. 297, t. xxxii, fig. 4.

legs, Professor M'Coy gave the name of *Notopocorystes*,\* was long involved in considerable confusion, arising principally from the total ignorance of the structure of this class of animals on the part of the discoverer of two of the species of which it is composed. In the 'Illustrations of the Geology of Sussex,'† and subsequently in the 'Geology of the South-East of England,'‡ the late Dr. Mantell announced, and in the 'Medals of Creation'§ imperfectly described, a few Crustaceans occurring respectively in the Gault of Kent and Sussex and the upper Greensand of Lyme Regis and Cambridge. In the first instance he submitted the specimens to Dr. Leach, who stated their real or supposed affinity to existing genera. His very brief observations were accompanied in each case by a single phrase on the part of the author of the works above cited, which afforded not the slightest indication as to the true character of the species, the few details given being either nugatory or absurd;|| whilst the figures in the two earliest of the works mentioned are scarcely recognisable as representations of the creatures to which they refer. The true relation of Mantell's two species of Corystidæ was, however, at once seized upon by Leach, who considered one of them as "intimately related to the typical genus *Corystes*," and the other as "allied to a new Indian genus of the same family." I shall presently show how correct was this general conclusion.

Taking up the subject at this point, Professor M'Coy gave a full and correct description of *Corystes Stokesii* of Mantell under the name of *Notopocorystes Mantelli*. For what reason he changed the specific name does not appear, as Mantell's name was published four years before M'Coy's, and the latter suggests that they might be identical. The second species is not even alluded to in M'Coy's paper, and he erroneously considers as a species of this genus the *Orythia Bechei* of Deslongchamps, which is designated by Leach as "a new genus allied to *Arcania*," and named by Mantell *Arcania Bucklandii*.¶ There are no grounds for considering it as generically allied to M'Coy's *Notopocorystes*, and its relation to *Arcania* is obviously still more remote.

In the present work I have the opportunity of describing a third and very beautiful species of the genus now under consideration, *P. Normani*, from the Chalk Marl at Ventnor, in the Isle of Wight.

In the year 1854 Mr. M'Coy published in the 'Annals of Natural History' a description, with figures, of a very interesting Crustacean, which he referred to the same genus, under the name of *Notopocorystes Carteri*, but this I have found it necessary to consider as a new generic form, under the name *Eucorystes*.

\* "Etym., *νωτος dorsum*, *πους pes*, and *Corystes*." M'Coy, 'Ann. Nat. Hist.,' 1849, p. 169.

† T. xxxix, figs. 9, 10, 15, 16.

‡ P. 109, fig. 2.

§ P. 532, figs. 2, 3.

|| For instance, as one distinctive specific mark of a *Decapod* species, it is stated that "there are three or four legs on each side!"

¶ 'Medals of Creation,' p. 534. 'Geol. S.E. of Eng.,' p. 169, fig. 3. It is *Neocarcinus Bechei* of the present work.

The genus, then, as far as regards this country, consists of three species, and the structures which I have found common to them all, and which have been cognizable in the numerous specimens which I have examined, have enabled me to construct the above generic character.\*

I have a few observations to make with reference to the true relations of the genus, which, as I have before stated, appear to me to have been misunderstood.

Professor M'Coy—after stating that “in the general form of the carapace, of the rostrum, in the completeness and form of the orbits, with the two fissures in their upper edge, it so exactly resembles *Corystes* as to have even deceived Dr. Leach, the first crustaceologist of his day”—with the greatest confidence refers the genus to the order Anomura, on the single ground of the abruptly smaller size of the last pair of legs, and their being placed on a higher level than the others; whilst he acknowledges that he had not had an opportunity of ascertaining whether there are any supplementary pieces between the sixth and seventh segments of the abdomen, which is by far the more important character. In fact, the small size of the hinder pair of legs, and their elevated position, is a peculiarity which occurs in many other forms of undoubted Brachyura. In the whole family of the Dorippidæ, for example, it is as strongly marked as in any of the Anomura; and in the typical recent species of the present family, *Corystes Cassivelaunus*, this pair of legs is on nearly as high a level, with relation to the preceding ones, as in either of the fossil species. A specimen in the collection of Dr. Bowerbank, in which several joints of the posterior pair of legs exist, shows distinctly that they are not turned over the back at all. Whilst, therefore, I am thus enabled to place the genus in its true relation, I am at the same time compelled to change the name given to it by Professor M'Coy under a mistaken impression as to the structure of these feet. The non-existence in the present species of the intercalary pieces in the abdomen, which are so conspicuous in all the Dromiadae, including the extinct genus *Dromiolites*, described in the former part of this monograph, forms an additional proof, in the absence of all other anomurous characters, that Leach was not “deceived” when he referred the genus to the family Corystidæ, a view which is confirmed by the structure of the external footjaws and the form of the oral opening.

It is remarkable that the species of this genus are very subject to be infested by a parasite, probably nearly allied to *Bopyrus*, which occasions a large swelling on the branchial region, and doubtless occupied the branchial cavity. This is precisely the situation in which *Bopyrus* is found in several recent species of the Palæmonidæ and their allies, but I

\* Two species of this genus have been found on the Continent, both of which are specifically distinct from the British ones. One of these, *Notopocorystes Mulleri* of Count von Binkhorst, considerably resembles *Palæocorystes Broderipii*, and is from the Maestricht beds. The second is *P. Frigeri* of Professor Milne Edwards, which has many characters in common with that species, but is undoubtedly distinct. *Eumorphocorystes sculptus* of the former author has the peculiar sculpture on the carapace which distinguishes *Eucorystes Carteri*, but in the former the sculpture extends over the whole carapace, whilst in the latter it is confined to the anterior half.

do not remember to have seen the same circumstance in any of the existing Brachyura. I have figured a specimen thus infested in Plate III, fig. 3.

PALÆOCORYSTES BRODERIPII, sp., *Mantell*. Plate II, figs. 8—13.

*Char. Gen.* Testâ depressâ, lævi; margine latero-anterio-ro tridentato.

CORYSTES, sp., *Mantell*. *Geol. of Sussex*, t. xxix, figs. 9, 10. *Geol. of the S.E. of Eng.*, p. 170.

— BRODERIPII, *Id.* *Medals of the Creation*, p. 532, fig. 3.

NOTOPOCORYSTES BRODERIPII, *Morris*. *Cat.*, p. 111.

*Descr.* Carapace flattened, smooth, minutely granulated, about one fifth longer than it is broad, becoming gradually narrower backwards from the third lateral tooth; the regions very indistinct; the hepatic with two small depressed tubercles; nuchal furrow extremely shallow and small, placed very far forward on the carapace; the anterior process of the metagastric lobe very narrow and attenuated, extending forward to the base of the rostrum, with a thin sulcus on each side; branchial region occupying two thirds of the whole length of the carapace, separated from the cardiac by a curved furrow; front with a distinctly bidentate rostrum, which is depressed in the middle; orbits extending laterally to near the anterior angle of the carapace, with two fissures and a triangular tooth between them on the superior margin; latero-anterior margin with three strong triangular teeth, including the external orbital process, and a slight projection behind them, from which commences a sharp marginal ridge; the posterior margin hollowed; the pterygostomial processes tumid, sulcated, and with two carinæ, the superior of which has a line of small tubercles. The buccal opening twice as long as it is broad, narrowed forwards, and extending nearly to the base of the rostrum, the epistome being extremely small. External footjaws with the outer stalk slightly curved. The third joint of the inner stalk straight, linear, and flat. The anterior segment of the thorax terminating in three small, flattened processes. Legs similar to those of *P. Stokesii*: the anterior pair short and smooth, the fingers short and inflected, to a degree, however, which varies in different specimens, possibly dependent on sex; the ambulatory legs nearly cylindrical, the third joint with a series of small spines on the anterior side. The abdomen in the male narrower than in the female, carinated, the first segment rather longer than the four succeeding ones; the second, third, fourth, and fifth short, each with a small central spine or tubercle, the sixth forming a large quadrate piece, the seventh triangularly semi-oval.

Length of carapace, 1·4 inch; breadth, 1·2 inch.

It occurs in the Gault at Folkestone and Maidstone, in Kent, and at Ringmer, in Sussex, in considerable numbers.

*Obs.* This species was first figured by Dr. Mantell, in the 'Geology of Sussex,' and afterwards in the 'Medals of Creation.' The figures are very inferior, and taken from



very imperfect specimens. Professor M'Coy does not appear to have been aware of these figures, or of the names and description given by Mantell in the 'Medals,' as he makes no mention whatever of this species. It is found in considerable numbers in the Gault at Folkestone, and Dr. Mantell's specimens were from Maidstone, and from Ringmer in Sussex.

PALÆOCORYSTES STOKESII, *Mantell*, sp. Plate III, figs. 1—9.

Testâ tuberculatâ, carinatâ; margine latero-anteriori quadridentato; regionis cardiacæ margine anteriore tuberculo unico instructâ.

CORYSTES, sp., *Mantell*. Geol. Suss., t. xxix, figs. 15, 16. Geol. S.E. Engl., p. 169, fig. 3.

— STOKESII, *Id.* Medals of Creat., p. 532, fig. 2.

NOTOPOCORYSTES MANTELLI, *M'Coy*. Ann. Nat. Hist., 1849, p. 170.

— STOKESII, *Morris*. Cat., p. 111.

*Descr.* Carapace ovate, carinated, the surface minutely granulated; regions rather more distinct than in the former species, and beset with numerous tubercles, of which there is a regular series of seven or eight on the median carina, those on the cardiac region prominent and sharp, a single one being placed in the centre of its anterior margin; there are three or four conspicuous ones on the lateral lobes of the gastric and on the hepatic regions, and one on the mesobranchial lobe; nuchal furrow deeper than in *P. Broderipii*; the anterior process of the mesogastric lobe very narrow, extending to the base of the rostrum, with a thin sulcus on each side; front terminating in a small bidentate rostrum, which is depressed in the middle, and has two smaller teeth immediately above and behind the terminal ones; orbits of moderate size, not extending so far laterally as in the former species, with two shallow fissures above; latero-anterior margin with four strong, prominent teeth, curved forwards; latero-posterior margin regularly, but very slightly, curved; posterior margin less hollowed than in *P. Broderipii*; pterygostomial process tumid, deeply sulcate, the ridges with numerous tubercles; buccal opening narrower than in the former species. External footjaws with the outer stalk narrow, flat, slightly curved inwards; the inner stalk with the second joint a little wider anteriorly, and longitudinally grooved, the third joint nearly twice as long as it is broad, grooved, and widened forwards, inserted at the middle of the anterior margin of the second joint. The legs are of moderate size, rather long, and varying in thickness in different individuals, which may possibly be dependent upon sex. The claws are somewhat flattened, angular; the arm furnished with a few small tubercles on the outer and inner margin, and two or three near the distal extremity; the wrist is angular, carinated, and sparsely tuberculated; the hand has three distinctly tuberculated carinæ, the lower of which runs along the immovable finger. The abdomen is about half as broad again in the female as in the

male ; the segments are all separate ; an obtuse carina extends as far as the middle of the seventh segment, and each of the segments from the second to the fifth has a small tubercle in the centre, and a still smaller one on each side ; the sixth segment is nearly square, and the seventh semioval.

Length of carapace, 1·4 inch ; breadth, 1·2 inch.

Common in the Gault at Folkestone, Maidstone, &c., and still more so in the upper Greensand at Cambridge.

*Obs.* This species was first noticed by Mantell, who obtained it at Ringmer, in Sussex, and announced it first in the 'Geology of Sussex,' and afterwards in the 'Geology of the South-East Coast of England.' He subsequently described it, under the name of *Corystes Stokesii*, in the 'Medals of Creation,' in the year 1844. Professor M'Coy, in 1849, made it the type of his genus *Notopocorystes*, and gave a tolerably full description of it, as *N. Mantelli*, expressing at the same time his suspicion that it may be identical with Mantell's species.

It occurs very commonly in the Gault at Folkestone, and in innumerable quantities in the upper Greensand at Cambridge. There are numerous specimens from both these localities in every collection which contains fossils from these prolific beds.

PALEOCORYSTES NORMANI, *mihi*. Plate III, figs. 10—12.

Testâ ovatâ, valde convexâ, regione cardiacâ tuberculis tribus in serie longitudinali ; regione gastricâ in media lævi, ad latera utrinque tuberculis quatuor minoribus.

*Descr.* Carapace ovate, one fifth longer than it is broad, very convex, the height from the plane of the lowest part of the lateral margin to the highest point of the carapace being two fifths of the transverse diameter ; the margins almost evenly rounded ; the orbits and frontal region somewhat advanced, narrow, and truncate ; latero-anterior margin with three small teeth, latero-posterior margin granulated ; the surface of the carapace glabrous, excepting the posterior portion, which is slightly granulated ; tubercles few, three or four small ones on the lateral portion of the gastric region, and three on the median line on the cardiac ; orbits approximate, with two conspicuous fissures in the upper margin, and a small tooth at the outer angle.

Length of carapace, 1·4 inch ; breadth, 1 inch ; height, from the plane of the lateral margin, 0·4 inch.

A single specimen only has come under my observation ; it is from the Chalk Marl of Ventnor, in the Isle of Wight, and in Mr. Norman's collection, to whom I gladly take the opportunity of recording my obligations, for kindly placing his specimens at my disposal, by dedicating this species to him.

*Obs.* The distinctions between this and all the other species of the genus are well marked. In the number of tubercles on the carapace it is intermediate between *P. Broderipii* and *P. Stokesii*, having much fewer than the latter species. It is much more convex, the margin is more rounded than in either of the others, and the latero-posterior margin, instead of passing backwards to its junction with the posterior in almost a straight line, as in *P. Stokesii*, is gradually and evenly curved.

*Genus*—EUCORYSTES, *Bell.*

*Char. Gen. Testa* trapezoidea, depressa, dimidio anteriore sculpto in elevationibus contortis, linearibus, sulcis separatis; dimidio posteriore lævi, granulato; fronte lato. *Orbitæ* magnæ, latæ, margine elevato, usque ad angulos antico-laterales tendentes, suprâ bifissæ, infrâ unifissæ.

Species unica. EUCORYSTES CARTERI, sp., *M'Coy.* Plate II, figs. 14—17.

*Descr.* Carapace depressed, somewhat trapeziform, nearly as broad as it is long, not greatly narrowed either anteriorly or posteriorly; the anterior half curiously sculptured, the surface being divided by numerous, variously formed, nearly linear, flattened ridges, which are separated by sulci of about equal width. These ridges are minutely granulated, with a line of somewhat larger granules on their margin, some of which are insulated. The elevations are not, as Professor M'Coy would intimate, absolutely identical with the different regions or lobes of the regions, although they in some measure indicate them, and the metagastric lobe, in particular, forms a dagger-shaped elevation, of which the anterior process, extending forwards to the front, represents the blade; the other ridges are in pairs, excepting a broad median one on the urogastric lobe, extending far to each side, and they are all symmetrical; the posterior half of the carapace is slightly granulated; the latero-anterior margin has two obtuse processes besides the external angle of the orbit; the latero-posterior margin is nearly straight, and the posterior very broad, with the angles rounded. The rostrum is tridentate, the lateral teeth being longer than the central. The orbits are transverse, excessively large, each occupying about a third of the anterior margin of the carapace, and extending to the external angle, where there is a small, blunt tooth; they are about half as broad as they are long, oval, directed forwards, slightly contracted in the middle, and apparently open to the antennary fossæ; their margins are raised, simple, and there are two fissures on the upper, and one near the inner angle in the lower; the front occupies the middle third of the anterior margin of the carapace.

Length of carapace, 1·2 inch; breadth, 1 inch.

Found hitherto only in the upper Greensand of Cambridge.

*Obs.* A certain general resemblance to some of the species of *Palæocorystes* led Professor M'Coy to consider this species as belonging to that genus, which is identical with his *Notopocorystes*. Hitherto there has been no attempt to separate it from that genus. The several forms of the carapace certainly bear a not very remote resemblance to *P. Broderipii*; but, as it appears to me, the relation is only superficial and on closer examination the form and character of the carapace itself are essentially different, whilst in the far more important points, the structure and form of the orbit and of the frontal region, the diversity is so great as not to admit of any doubt as to their generic distinction. The following are the discrepancies to which I have referred. The carapace in the present species is much more square, the anterior and posterior portions being considerably less narrowed than in any of the species of *Palæocorystes*; the sculpture of the anterior half of the carapace is totally unlike any other species, not only of *Palæocorystes*, but of every other Crustacean form with which I am acquainted, with the exception of *Eumorphocorystes sculptus* of Count von Binkhorst, to which I shall again refer. But when we examine the orbital and frontal regions, which are of so much more importance as generic characters, the discrepancy is still more striking. The breadth of the front between the orbits, equalling the long diameter of each orbit, and especially the enormous size of these cavities, extending to the antero-external angle of the carapace, at once remove the species from a genus in which the front is of moderate size, and the comparatively small and round orbits do not even approach the external angle.

It is certainly remarkable that the peculiar sculpture of the carapace should also occur in a Continental species, to which I have just referred, and to which the excellent palæontologist above named has assigned a distinct generic position. The form and general character of *Eumorphocorystes* are, however, not only essentially distinct from the species now under consideration, but approximate it still more to *Palæocorystes*, although I consider Count von Binkhorst quite justified in the separation he has made.

Professor M'Coy alludes to the comparative rarity of this species. I believe it has hitherto been found only in the upper Greensand of Cambridge, and it was, with great propriety, dedicated to the gentleman in whose fine collection of the fossils of that locality the specimen occurred from which the first description was taken.

*Family*—CORYSTIDÆ?*Genus*—NECROCARCINUS.

*Char. Gen.* Testa suborbicularis, rostro triangulari, regionibus distinctis, tuberculis magnis instructis, margine latero-anteriore utriusque producto. Orbitæ rotundæ supernè apertæ, supra bifissæ. Apertura oris æquè longa ac lata, lateribus concavis.

In the 'Mémoires de la Soc. Lin. de Normandie,' of the date 1836, there occurs a description, by M. Deslongchamps, of a Crustacean from our Gault and Greensand, with the name *Orithyia La Bechei*, and in several of the late Dr. Mantell's works \* are notices of the same species from the Gault, which was considered by Dr. Leach, to whom Mantell referred it, as belonging to the Leucoriadæ, and as nearly allied to the recent genus *Arcania*. How our great carcinologist could have arrived at a conclusion so utterly without foundation is more surprising than that Dr. Mantell should have unhesitatingly adopted this hasty view, and published the species with the name *Arcania Bucklandii*. A careful examination of numerous specimens in my own collection, in that of Dr. Bowerbank, and in the British Museum, has not only satisfied me that such is not its true relation, but has led me rather to the opinion, not, however, without some doubt, that it belongs to the Corystidæ, to which family several other species found in the Gault of Folkestone and in the upper Greensand of Cambridge are undoubtedly to be referred. Having carefully compared the specimens of the present genus from Folkestone with those from Cambridge, I find that, notwithstanding their different aspect, they are all of the same species, and identical with the so-called *Arcania Bucklandii* of Mantell; and I have had the satisfaction to find two other species of the same generic form obtained from the upper Greensand of Warminster and Maiden Bradley, in Wiltshire. On searching further, I discovered in a collection of fossil Crustacea from the Isle of Wight belonging to Mr. Norman, of Ventnor, a large specimen of one of these species from the Chalk Marl capping the firestone at Atherfield; and I have since received from Mr. Cunningham, of Devizes, several specimens of the same species from the upper Greensand of Wiltshire. Several species of this genus have been found on the Continent, and I am informed by M. Adolphe Milne Edwards that a Prussian naturalist has given to one of them the generic name of *Necrocarcinus*, which I have adopted, although hitherto I have failed to obtain any clue to the place of its publication.

\* 'Med. of Creat.,' p. 534; 'Geol. Suss.,' t. xxix, figs. 7, 8, 14; 'S.E. of Engl.,' p. 159, fig. 3.

NECROCARCINUS BECHEI, sp., *Deslongchamps*. Plate IV, figs. 4—8.

Testâ suborbiculari, modicè convexâ, tuberculis quindecim instructâ, rostro incrmo.

ORITHYIA BECHEI, *Deslongch.* (1836). Mem. Soc. Lin. Norm., v, p. 40, t. i, figs. 7—9.

ARCANIA BUCKLANDII, *Mantell* (1844). Med. Cr., p. 534; Geol. Suss., t. xxix, figs. 7, 8, 14; S.E. Eng., p. 159, fig. 3.

NOTOPOCORYSTES BECHEI, *Morris*. Cat., p. 111.

*Descr.* The carapace in this species is of equal length and breadth, moderately convex, the height from the plane of the lateral margin being not more than one fourth of the diameter; the nuchal furrow deep and broad; the rostrum triangular, hollowed in the centre, and without teeth at the sides; the regions and lobes raised; there are, in all, fifteen large tubercles on the carapace, besides a few small ones on the latero-anterior margin, and an obsolete one immediately behind the rostrum; of these there are two on each proto-gastric lobe, one on the metagastric, one on the urogastric, one on the cardiac region, one on each epibranchial lobe, one on each mesobranchial, and two on each metabranchial. The posterior margin is hollowed, and immediately anterior to its raised edge is a rather deep depression. The orbits are nearly round, and there are two distinct fissures on the upper margin, with a small tooth between them. The oral aperture is about as broad as it is long, with the edges slightly curved.

Of this species I have never seen the footjaws, the abdomen, or the legs, nor even any portion of these parts, excepting a hand, figured in Plate V, fig. 3, which indicates a minutely granulated surface and a short, rounded, and robust form; the moveable finger bent down to meet the other, which is merely a small pointed process.

*Obs.* This species is not at all unfrequent in the Gault of Folkestone and in the upper Greensand in the neighbourhood of Cambridge, but I have not seen it from any other locality. The specimens from the two beds above named differ considerably in colour and surface, those from the Greensand being generally much more injured, both from abrasion and fracture, than the others. I have also observed that the single small tubercle at the base of the rostrum is ordinarily more conspicuous in the Cambridge than in the Folkestone specimens, being in the latter often scarcely discernible. These circumstances, however, are not sufficient to constitute specific distinctions.

NECROCARCINUS WOODWARDII, *Bell*. Plate IV, figs. 1—3.

Testâ orbiculari, subglobosâ, tuberculis circa viginti instructâ, rostro utrinque ad basin minutè unidentato.

*Descr.* The carapace in the present species is nearly orbicular; it is much more elevated than in the former, and in the young state nearly semiglobose; the regions separately are

rather less raised from the general surface, but the tubercles are somewhat more prominent, and in the young state acute at the apex. The rostrum is acutely triangular, longer than broad, and armed on each side at its base with a very small tooth. The tubercles are more numerous than in *N. Bechei*, being not fewer than twenty; the five additional ones are as follows:—the single one behind the rostrum, which in the former is obsolete, is here conspicuous; there is one on each side of the metagastric lobe in addition to the mesial one, and one on each hepatic region. The tubercles are mostly arranged in right lines; thus, besides those on the median line, the seven anterior ones form a perfectly straight line across the anterior part of the carapace, and there is an equally regular longitudinal series on each side. The middle portion of the nuchal furrow does not extend so far backwards as in the former species; the edge of the posterior margin is less raised, and the hollow immediately anterior to it not so deep. The orbits are round, as in *A. Bechei*, but the fissures are less marked, and there is no tooth between them.

Amongst the specimens in the British Museum and in Mr. Cunnington's collection there are several fragments of limbs which I can scarcely doubt belong to this species. Figs. 4 and 5 of Plate V represent the hand and arm probably belonging to the same individual. These are covered with tubercles; the hand is as broad as it is long, the finger short and stout; the arm about twice as long as it is broad. I am confirmed in the opinion that these belong to *Necrocarcinus* by the figure of the hand of *N. inflatus*, which I have received through the kindness of M. Adolphe Milne Edwards, which has the same general aspect; and they can only appertain to the present species. I conclude also that figs. 6 and 7 represent fragments of some of the ambulatory legs.

Length and breadth of the carapace in the largest specimen observed, 2 inches.

*Obs.* All the specimens I have yet seen, with one exception, are from the Upper Greensand of Warminster and Maiden Bradley, in Wiltshire, and they are somewhat numerous in the British Museum and in the collection of Mr. Cunnington, of Devizes. The exception to which I have alluded is a very large individual in the collection of Mr. Norman, of Ventnor, from the Chalk Marl capping the firestone at St. Lawrence, in the Isle of Wight. This is by far the largest I have seen, being two inches in diameter, whereas the largest from the other localities is not quite an inch and a half.

I have great pleasure in recording the obligations I am under to Mr. Henry and Mr. Woodward, of the British Museum, for their constant kindness and attention, and the great assistance they have afforded me in the preparation of this work, by dedicating to them the present interesting species.

NECROSCARCINUS TRICARINATUS, *mih.* Plate IV, figs. 9—11.

Testâ depressâ tuberculatâ, carinus tribus, longitudinalibus, quarum una in medio regionis cardiacæ, et altera utrinque in regione branchiali.

*Descr.* Carapace depressed, suborbicular, granulated, with about sixteen moderate-sized tubercles, the regions not very distinct; the curved sculptured line between the meso- and meta-branchial lobes strongly marked, and resembling impressed letters; a distinct, but not very elevated, carina on the median line, extending the whole length of the gastric region, and interrupting the nuchal furrow, and another carina on each branchial region, extending longitudinally on the middle of the metabranchial lobe, strongly granulated; the margin of the specimen described is much broken, so that we are left to speculate in some measure upon the exact figure of the carapace; but following the line indicated by the portions which remain entire, it appears to be less uniformly rounded than in *Necrocarcinus Woodwardii*. The orbits have two fissures in the superior margin, as in the other species.

Length of the carapace, 1·4 inch; breadth, 1·6 inch.

From the upper Greensand of Cambridge and of Wiltshire; it has also occurred in that of Lyme Regis, in Dorsetshire.

*Obs.* Specimens of this species occur in Mr. Carter's collection from the Cambridge Greensand and in that of Mr. Cunnington from Wiltshire. But probably the earliest notice of it is to be found in Sir Henry de la Beche's paper on "The Geology of the South Coast of England," in the 'Transactions of the Geological Society,' read as early as 1819. It is there mentioned only as "the back of a singular fossil crab," and as the only one he had seen. There is an unmistakable figure of it,\* although the teeth on the anterior margin are represented as far more prominent and acute than any which I have seen on actual specimens.

The distinctions between this and either of the other species of the genus, whether British or foreign, are very obvious. The depressed carapace, the smaller and fewer tubercles, and the distinct, although low, carina on the median line and on each branchial region, are so striking that it cannot be mistaken even for *N. Woodwardii*, which it approaches more nearly than *N. Bechei*.

ORDER—ANOMURA.

Family—HOMOLADÆ.

Genus—HOMOLOPSIS, *Carter*, MS.

*Char. Gen.* Testa longior quam latior, alta, quadrilatera, tuberculata, regionibus distinctis, branchiali maximâ triangulari. Orbitæ approximatae, subrotundæ, suprâ unifissæ; fossæ antennariæ ovals, transversæ; epistoma fortè pentagonum.

\* 'Trans. Geol. Soc.,' 2nd ser., vol. i, pl. iii, fig. 1, p. 42.



Species unica. HOMOLOPSIS EDWARDSII, *mih*i. Plate V, figs. 1, 2.

*Descr.* Carapace rather longer than it is broad, everywhere granulated; the regions and their lobes very distinct and strongly tuberculated; the gastric region broad, the anterior portion, comprehending the epi-, proto-, and meso-gastric lobes, forming on each side a nearly circular area, furnished with five tubercles, and separated from the metagastric by a well-marked furrow; the metagastric lobe has three tubercles disposed in an equilateral triangle; its anterior process extends to just behind the front; the hepatic region is very small on the upper surface, and has a single tubercle; the lateral portion extends broadly downwards to the pterygostomial process, where it has a strong, obtuse carina; the urogastric is linear, and has a few small, inconspicuous tubercles; the epibranchial lobe is very convex, and has a large, strong, and prominent tubercle standing outwards on the latero-anterior margin of the carapace; the mesobranchial has a single tubercle; the metabranchial lobes very large, roughly granulated, without tubercles, of a somewhat triangular figure, the lateral boundary extending forwards to half the length of the carapace; a very distinct sulcus separates each metabranchial from the anterior branchial lobes and from the gastric region, the two meeting in an angle at a short distance from the posterior margin. The gastric region regularly pentagonal, with a single tubercle. The nuchal furrow distinct and deep. The front is small, with a small tubercle on each side, and its apex incurved to meet the epistome. The orbits nearly round, open beneath, with a triangular fissure above near the external angle, exterior to which is a large, strong spine; the antennary fossæ small, oval; epistome large, irregularly pentagonal, with a strong, transverse carina. The broadest part of the carapace is at the anterior and lateral angle of the metabranchial lobes.

Length of the carapace, 0·10 inch; breadth, 0·9 inch.

From the Gault at Folkestone and the Greensand at Cambridge.

*Obs.* The affinity of this species to *Homola* was first noticed by Mr. Carter, of Cambridge, who had applied to it in his own cabinet the generic name which I have adopted. It bears a strong general resemblance to the genus *Dromilites*, described in the former part of this monograph; but its relation to the *Dromiadæ* is more apparent than real. Whether it may be considered as in any way osculant between these two families, or as, in some degree, confirmatory of an opinion which I have long entertained, that the distinction between the *Dromiadæ* and *Homoladæ* is not borne out by the natural relations of the genera composing the two groups, I must leave with this mere suggestion.

The remarkable breadth of the metabranchial lobes is the character which gives it the greatest *primâ facie* likeness to *Dromilites*; but its essential characters, and in particular the absence of all puncta for the insertion of hairs on the carapace, obviously remove it from that genus.

A beautiful specimen in the Museum of Practical Geology, a mutilated one in the British Museum, both from the Gault at Folkestone, and several in Mr. Carter's collection from the upper Greensand at Cambridge, have formed the basis of the above description; unfortunately, the carapace alone remains in all cases, without a vestige of limbs or of any other organs.

ORDER—*MACRURA*.

Family—*ASTACIDÆ*.

Genus—*HOPLOPARIA*, *M' Coy*.

The generic characters will be found in the first part of this monograph, p. 36.

#### ADDITIONAL OBSERVATIONS.

The extent, both in time and space, in which the different species of this genus occur in the deposits of seas of very remote epochs, is deserving of particular remark. In the London Clay two well-marked species have been found, and have been already described in this work; and as low as the Greensand at Lyme Regis the existence of a species was long since made known by the late Mr. George Sowerby. I have now to describe no less than two more from the Gault, besides two or three others found in different beds of Greensand in various localities. The generic characters first seized upon by Professor M' Coy cannot be mistaken, and they are equally appreciable in whatever strata the different species may occur. It would, in fact, be difficult to name a genus, either fossil or recent, of which the characters are more definite, and the different species of which are more clearly demonstrable. It is therefore the more remarkable that, with the immense interposition of the whole Chalk formation, the genus so distinctly marked as belonging to the Greensand and Gault is, as it were, reproduced in the London Clay, under only slight, although definite, specific modifications. This would surely indicate that the physical conditions necessary for the propagation and maintenance of this particular form of macrurous Crustacea existing in that early period when the older members of the cretaceous group were formed, should, after the incalculable interspace occupied by the great Chalk deposit, during which period we have no trace of the genus, have again prevailed, and favoured or permitted its development. How these facts are to be accounted for upon the hypothesis of "selection," or of the gradual transformation or development of species, appears to me inexplicable. Even were we to allow that the species in *each* of the different formations may possibly have resulted from variation of one original form, an opinion utterly at

variance, however, with the fact that they are in every case unmistakeably distinct, surely the reappearance of similar forms, under similar circumstances, at such remote periods, *without any intervening link*, cannot be so explained.

Of this genus, although, up to the present time, two species only had been found belonging to an epoch earlier than that of the London Clay, I have to make known four from the Gault, and the upper and lower Greensand. The various species occurring in all these beds—the London Clay, the Gault at Folkestone, and the Greensand of Lyme Regis, of Wiltshire, and of the Isle of Wight—have so many essential points of structure in common, that their generic relation to each other is indisputable, whilst their specific distinction is not less so; nor are the distinctions between any two species of the periods most remote from each other, of greater value or of a different kind from those of the species found in the same bed; and it is remarkable that the very character upon which M'Coy founded the genus, from species in the London Clay, are essentially identical with those which belong to all the more recently discovered species.

This peculiarity, which suggested to M'Coy the name *Hoploparia*, namely, the extraordinary elongation of the supra-orbital spine, is conspicuous also in the unusual development of the rostrum, which in *H. longimana* is not less than half as long as the carapace.

Upon the whole, seeing that all the rocks in which these Crustaceans are found are of marine origin, we may conclude that they rather represent the recent genus *Homarus*, to which the common lobster belongs, than *Astacus*, which is essentially a fluviatile genus.

HOPLOPARIA SULCIROSTRIS, *mihl.*. Plate V, figs. 8—10.

Testâ spinosâ, spinâ supra-orbitali rostrum equante, rostro bicarinato; digito immobili manûs majoris falciformi; abdomine punctato.

*Descr.* The carapace is nearly cylindrical, the anterior portion armed with several rows of spines directed forwards; a very slight furrow on the median line continued on to the posterior portion; the rostrum very long, with two sharp carinæ, and a deep sulcus between them; the supra-orbital spine as long as the rostrum, and very slender; the nuchal furrow deep, crossing the middle of the carapace in an even line; the posterior portion of the carapace minutely granulated; the abdomen smooth and polished; the epimeral plates slightly granulated; the exterior flap of the tail rounded, nearly as broad as it is long; the division of the two portions about one third from the extremity, the terminal portion forming nearly a semicircle; the anterior legs not more than twice as long as the carapace, exclusive of the rostrum, the wrist and arm together about as long as the hand; the claws of very unequal size and dissimilar form, although less considerably so than in *H. longimana*; the larger hand about half as broad as it is

long; the inner margin with a row of strong spines, directed forwards, the rest smooth and rounded; the fingers nearly as long as the hand, compressed, strongly tuberculated for half its length towards the extremity; the immoveable finger falcate; the smaller hand very slender, with a strong, rounded ridge on each side; the inner margin with a row of spines as in the larger hand; the fingers slender, linear, and nearly straight.

Length of the carapace 1·5 inch, of the rostrum 0·5 inch, of the legs about 3 inches.

Found in the Gault at Folkestone, from which locality there are several specimens in the British Museum, and in Mr. Carter's collection, as well as in the Woodwardian Museum at Cambridge, there are numerous fragments which appear to belong to this species.

*Obs.* This species is sufficiently distinguished from the others found in the Gault and Greensand by the remarkable spinous armature of the gastric region and of the inner margin of the hand, and by the falciform construction of the immoveable finger of the larger hand.

*HOPLOPARIA LONGIMANA*, sp., *Sowerby*. Plate VI.

Manibus inequalibus longissimis; alterâ gracili, digitis fere linearibus, manu longioribus; alterâ ovali, digitis curvis, manu brevioribus.

*ASTACUS LONGIMANUS*, *Sowerby*. Zool. Journ., ii, p. 493, t. xvii.

*HOPLOPARIA LONGIMANA*, *M'Coy*. Ann. Nat., 1849, p. 176.

— — *Morris*. Cat., p. 109.

*Descr.* The carapace is somewhat uneven, and everywhere granulated, more coarsely on the gastric region, very minutely on the branchial, without spines or other armature, excepting two tubercles on the hepatic region; the nuchal and branchial furrows conspicuous, but not deep; the rostrum half as long as the carapace, extremely slender and longitudinally sulcate; the supra-orbital spine nearly as long as the rostrum. The abdomen is smooth, sparsely and minutely punctate, the puncta becoming more frequent and conspicuous on the epimeral plates, which are marked with a shallow, even furrow within the margin; the exterior plate of the tail rounded at the extremity. The anterior pair of legs are of very unequal size and of dissimilar form; the arm is nearly as long as the hand, the wrist about half as long; the claws differ greatly; the larger hand is rather longer than the fingers, of a nearly oval form, obtusely carinated on the outer margin, the fingers curved and armed with strong tubercles on the opposing edges; the smaller hand is slender, shorter than the fingers, which are nearly linear, and furnished with a continuous series of small, sharp, triangular teeth.

Length of the carapace 2 inches; breadth, taking the curve from one margin to the

other, 2·5 inches; height 1 inch; length of rostrum 1·1 inch; length of larger hand 1·2 inch; of fingers of the same 1 inch; length of smaller hand 0·9 inch; of fingers of the same 1·9 inch.

Found in the Greensand at Lyme Regis, and at Atherfield, in the Isle of Wight, from both which localities there are numerous specimens in the British Museum, and in Dr. Bowerbank's collection.

*Obs.* In 1826 the late Mr. George Sowerby published in the 'Zoological Journal' an account of this species, to which he gave the name of *Astacus longimanus*. The specimens described were received through the late Sir Henry de la Beche from the Greensand of Lyme Regis. Since that time several other specimens have been obtained from the same locality, which have enabled me greatly to enlarge the description of the species. Prof. M'Coy very properly considered it as generically distinct from *Astacus*, and associated it with two species from the London Clay under the present name.

HOPLOPARIA PUNCTULATA, *mihî*. Plate V, figs. 11—13.

Testâ regionibus valdè distinctis; lobo epigastrico granuloso, scabriusculo; protogastrico fortè bituberculato; abdomine minutè punctato.

*Descr.* There are in the British Museum and in Dr. Bowerbank's collection, several specimens of a species of *Hoploparia* nearly allied to *H. longimana*, but possessing characters which, on very careful consideration, and after some hesitation, I have considered sufficient to determine its specific distinction. It agrees with that species in the general character of the surface of the legs and of the posterior portion of the carapace, as well as in the smoothness of the abdomen and in the important character of its punctate surface; but it differs considerably in the more scabrous surface of the anterior part of the carapace, in the much more distinct demarcation of the regions, in their greater comparative shortness, and in the existence of two very prominent tubercles on the protogastric lobe, which in *H. longimana* are replaced by a small carina; the hands, also, are more nearly of a size, shorter in proportion, and more rounded. This view of the distinctness of the species is strengthened by the fact of its having been found exclusively in the Gault, whilst the true *H. longimana* is found only in the Greensand of Lyme Regis and of Atherfield.

HOPLOPARIA GRANULOSA, *mihî*. Plate VII, figs. 1, 2.

Testâ cylindraceâ, omnino granulâtâ, scabriusculâ, sulco lineari continuo a rostro usque ad marginem posteriorem testæ.

In Mr. Cunnington's collection is a specimen consisting of a tolerably entire carapace, wanting, however, the rostrum and the anterior margin, and of three segments of the abdomen; there are also fragments of the anterior pair of legs, evidently belonging to the same individual, consisting of the arm and wrist, both imperfect. These materials are sufficient to indicate the genus, and to distinguish the species from all others.

The carapace is nearly cylindrical and evenly rounded, excepting that the sides are very slightly compressed. The whole surface is granulated, the anterior portion more coarsely, and almost scabrous, and the prominent granulations are directed somewhat forwards; there are indications of two converging carinæ passing to the rostrum, and of a smaller one on each side, as in *H. sulcirostris* and *H. Saabyi*, and there is a spine at the base of the supra-orbital process; the carapace is divided through its whole length by a thin, linear sulcus. The abdomen is cylindrical and granulated; the epimeral plates mucronate in the middle of the margin, the second very broad. The anterior legs are somewhat unequal, but less so than in *H. longimana* and some other species. The wrist is long, much compressed, and has four large tubercles at the distal margin.

Length of the carapace 2·1 inches; height 1·2 inch; measurement over the back, from one lateral margin to the other, 2·7 inches.

*Obs.* This fine species from the Greensand of Wiltshire has the almost circular carapace and abdomen which characterise the genus, the same even direction of the nuchal furrow, and the same peculiar form of the lambdoid furrow. The granular surface of the carapace, becoming almost scabrous at the anterior portion, and an obvious tendency to carination at that part, are equally characteristic of this numerous and widely extended genus, and are quite sufficient, notwithstanding the absence of the rostrum and of the supra-orbital spine in all the specimens observed, to justify the position I have assigned to this species. It has hitherto only been found in the locality mentioned, and exists, I believe exclusively in Mr. Cunnington's collection.

*HOPLOPARIA SCABRA, miki.* Plate VII, figs. 3—7.

Testâ maximâ, latâ, regionis branchialis parte posteriore granulis magnis, distinctis, elevatis scabrâ; parte anteriore ejusdem et regione gastricâ tuberculatis. [Brachio triquetro, carinis tuberculato-spinosis (?).]

*Descr.* The carapace is remarkably large, indicating an animal nearly twice the size of the majority of the species of the genus. The gastric region and the anterior part of the branchial are tuberculated, as is also the median line of the carapace; in the latter the tubercles are in two irregular rows, and almost spiniform; the broad metabranchial lobe is covered with large, regular granulations, which are sufficiently prominent to render the

surface somewhat scabrous; the nuchal furrow is open, but not deep. There is in the British Museum a specimen of an anterior leg (fig. 7), which, from a comparison with the fragment connected with the carapace (fig. 4), I am induced to consider as belonging to this species, although with some degree of doubt. It is of moderate length, the arm about as long as the hand and wrist together, or half as long again as the hand; it is of a triquetrous figure, and each angle is armed with irregular double or triple rows of tubercles; the wrist has several smaller ones; it is about half as long as the hand, or one third that of the arm; the hand, about twice as long as it is broad, has three or four strong spines at its proximal extremity; the outer side is smooth, the inner tuberculated; the fingers are wanting in the only specimen of this part I have seen, which evidently belonged to an individual of comparatively small size.

Length of the carapace about 4 inches, breadth 2 inches.

Found in the Gault at Folkestone, and in the upper Greensand of Cambridge and Wiltshire. There are three specimens in the British Museum from the former locality, two of the imperfect carapace, the third of the anterior leg above described, and there are numerous specimens from Cambridge in Mr. Carter's collection, and one in Mr. Cunningham's, from Wiltshire.

*Obs.* This is by far the largest species of the genus, if we may judge by the length and breadth of the carapace. Notwithstanding the fragmentary state of the specimens at present known—the whole of the anterior part of the carapace and the abdomen being absent—the form of the nuchal furrow and the general character of the carapace and of the leg clearly fix the genus to which the species belongs.

#### HOPOPARIA SAXBYI, *M'Coy*. Plate VIII.

Testâ granulosa, regione gastricâ scabrâ; carinis quatuor leviter tuberculatis, quarum utrinque una super marginem rostri producta; rostro late sulcato; manibus inequalibus, valde compressis, tuberculatis.

HOPOPARIA SAXBYI, *M'Coy*. Ann. Nat. Hist., 1854; Cont. Brit. Pal., p. 266, cum fig.

*Descr.* Carapace semicylindrical, roughly granulated, the anterior portion tuberculated and scabrous; there are two pairs of slightly tuberculated, converging carinæ, the inner two extending to the margins of the rostrum, becoming more elevated forwards, so as to produce a broad and deep sulcus through its entire length; a slight elevation arises from the posterior part of the hollow; the supra-orbital ridges are large and prominent, armed with a strong spine, and terminating in a long, slender, supra-orbital process; the

nuchal furrow strongly marked, and its lateral portion extending further forwards than in most of the species. Abdominal segments more finely and evenly granulated than the carapace. Professor M'Coy states that "the last segment and middle tail-flap have a much coarser, flattened, or squamous tuberculation; the transverse suture of the outer tail-flap strongly marked, from the great thickness of the basal portion;" of this I am unable to speak from my own observation, as in all the specimens I have seen these parts are wanting or imperfect. The anterior legs are very unequal, almost as much so as in *H. longimana*. The arm is tuberculated, with a row of a few large tubercles on the upper side; it is much widened towards the distal extremity, where it is about half as broad as it is long; both the hands are very much flattened, the larger twice as long as it is broad, tuberculated, and armed with a row of large tubercles along the inner edge; the fingers about as long as the hand, the immoveable finger almost falcate, depressed in the middle throughout its length; the prehensile margin strongly tuberculated; the immoveable finger broad and curved, but less so than the other, and armed with similar tubercles. The smaller hand roughly granulated, the inner edge with a series of tubercles as in the larger; the fingers twice as long as the hand, very slender, the immoveable one much flattened and slightly curved; the moveable one less flattened, smaller, and also slightly curved.

Length of the whole body 6·5 inches; length of the carapace, from the margin of the orbit, 2·5 inches; breadth 1·6 inch; length of rostrum 0·9 inch; length of larger hand and fingers 4·2 inches; breadth 1·5 inch; length of smaller hand, with the fingers, 5·2 inches, the fingers occupying more than two thirds of the length.

From the upper Greensand in the Isle of Wight, and near Devizes, in Wiltshire.

*Obs.* This fine species was first discovered by Mr. Saxby, in the upper Greensand at Bonchurch, in the Isle of Wight, and described in the 'Annals of Natural History' by Mr. M'Coy, who dedicated it to the discoverer. The large specimen figured in Plate VIII is in Mr. Cunningham's collection, and is from the Greensand of Wiltshire; and the hands represented in the same plate belong to another fine example, collected by Mr. Norman, of Ventnor, and now in the British Museum. With the exception of *H. scabra*, it is the largest species of the genus with which we are yet acquainted.

*Genus*—ASTACODES, *Bell.*

ASTACODES FALCIFER, sp., *Phillips.* Plate IX, figs. 1—6.

MYERIA FALCIFER, *Phill.*

Of this remarkable species scarcely sufficient data exist for a satisfactory description; yet the remains which have come into my hands indicate not merely the specific but the



generic distinction from all other forms hitherto discovered. The examination of a beautiful specimen of the last five segments of the abdomen, with the caudal appendages, formerly in the collection of Mr. Bean, of Scarborough, and now in the British Museum, and of several fragments in the museum at York, for the loan of which I have to acknowledge the courtesy of the council of that institution, has enabled me to arrive at the conclusion above stated. The carapace is large and rounded, everywhere coarsely granulated, the granulations being more rough and less frequent on the anterior portion; the nuchal furrow deep and sloping, bordered on each side by a small, granulated carina, and there are two or three longitudinal carinæ on the sides of the anterior part of the carapace; the abdomen is semi-cylindrical, very even, polished; and conspicuously punctate; the epimeral plates of the fourth, fifth, and sixth segments are prolonged into an elegant falciform process, with the points directed backwards, and the anterior margin of each regularly dentated. The seventh segment or central caudal plate is broad, and furnished with a few tubercles; the lateral caudal plates rather narrow, obsoletely carinated, and fimbriated at the extremity; the common basal point oval; the hand is remarkably robust, coarsely granulated, the fingers armed with strong tubercles on the prehensile edge.

Found in the Speeton Clay.

It appears that Prof. Phillips considers this species as belonging to the genus *Meyeria*; it does not, however, appear to me that this view is borne out by the structures above mentioned. The peculiar characters of that genus are wanting, and the whole aspect of the portions which have come under my observation is widely different. The even, polished, punctate abdomen, with its falciform lateral processes, and the robust, powerful claw, are utterly unlike those parts in the genus in question.

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There is in the British Museum a fragment consisting of three segments of the abdomen of a small macrurous species from the Speeton Clay, formerly in the collection of Mr. Bean, and named by that gentleman *Astacus multicavatus*. The surface is regularly, as it were, eroded by numerous conspicuous, impressed puncta; there is on each side a prominent carina; the epimeral processes are acutely triangular, and turned a little backwards.

There is also a specimen from the same locality of a pair of hands, which probably may have belonged to the same species. They are of equal size and similar form; evenly rounded, somewhat tumid, nearly oval, being contracted at each extremity; the fingers are slender; the surface is minutely but roughly granulated. In both cases the data are too scanty to afford any satisfactory suggestion as to the relation of the species.

The specimens are figured, somewhat enlarged, at Plate IX, figs. 7, 8.

Genus—MEYERIA, *M' Coy.*

*Char. Gen.* Testa compressa, alta, pluri-carinata, rostrata; sulco nuchali acutè angulari. Abdomen semicylindricum, sculptum, processu laterali segmenti secundi lato, rotundato. Caudæ flabellum exterius transversè divisum.

The genus *Meyeria* was established by Prof. M' Coy for the reception of two very beautiful species, one of which is peculiar to the Speeton Clay, the other occurring in great numbers in the lower Greensand of Atherfield, in the Isle of Wight. Its characters are strongly marked, and the general aspect very peculiar. The carapace in each of the species at present known is much compressed, very deep, and sharply and highly ridged along the middle of the back; it is marked with several distinct carinæ, those on the portion anterior to the nuchal furrow (the cephalic arch), most strongly so; the nuchal furrow is deep, and in the form of a V, each half meeting the opposite one on the median line in an acute angle; the sides of the posterior portion (the scapular arch), are very broad and flat; the rostrum is small and acute. The abdomen is in both species curiously but diversely sculptured; the epimeral plates are rather large, that of the second segment broad and rounded, the posterior ones trigonal and slightly curved. The exterior caudal piece is divided at about one third from the extremity by a transverse joint, as in the Astacidæ in general, which is marked by a thin carina. The legs, judging from the fragments which have hitherto been observed, are long and slender; but at present nothing is known as to the form of the terminal joint.

Professor M' Coy placed this genus in the family Thallassinadæ (*Thallasinians* of Milne Edwards), but, as I shall presently show, upon entirely mistaken grounds. The genus to which he supposes it to be most nearly allied is *Gebia*, a fossorial form, of which two species inhabit our coasts. The characters upon which M' Coy relies for the supposed relation are the size of the abdomen and the compressed form of the carapace. In the first place, however, these characters are by no means universal in the family in question, nor are they absent in several other families. The size of the carapace alone would at once put it out of the category, as in the fossorial group this is invariably small, and generally round; but there are other characters which positively associate it with the Astacidæ. The division across the exterior plate of the tail is an absolutely distinctive character of the latter family, never occurring in the others; the epimeral plates of the abdominal segments are large in the present genus; they do not exist in any of the Thallassinadæ. There can, therefore, be no doubt as to the association of *Meyeria* with the Astacoid group, and it is remarkable that hitherto we are unacquainted with a single Thallassinian form in our British rocks, although several well-marked species have been found on the Continent, and have formed the subject of a very interesting and well-elaborated paper by M. Adolphe Milne Edwards, which evinces a thorough knowledge of his subject, and a discrimination worthy of the distinguished name he bears.

MEYERIA ORNATA, sp., *Phillips*. Plate IX, figs. 9—11.

Segmentis abdominis seriebus quatuor vel quinque transversis granorum ornatis ; processibus lateralibus granulatis.

ASTACUS ORNATUS, *Phill.* Geol. York, t. iii, fig. 2.

MEYERIA ORNATA, *M'Coy*. Ann. Nat. Hist., 1849, p. 333 ; Contrib. to Brit. Palæont., p. 138.

— — *Morris*. Cat. Brit. Foss., p. 111.

*Descr.* Carapace scabrous, with even, sharp granulations ; the portion anterior to the nuchal furrow (the cephalic arch) with three or four denticulated carinæ ; the nuchal furrow deep, forming an acute angle on the mesial line of the back. The portion behind the furrow (the scapular arch) much larger than the former, compressed, scabrous, with rather distant granulations. The abdomen is semi-cylindrical ; each segment ornamented with four or five transverse, elevated rows of very distinct, rounded granulations, and similar ones are scattered over the epimeral plates, which are moderately large, those of the first and second segment broad and imperfectly quadrilateral, the remainder trigonal. The tail is rather short, the central plate rounded at the extremity, sulcated, and granulated ; the exterior plate is slightly curved, and has a longitudinal carina and furrow and a row of granulations.

Length of the carapace 1·3 inch, length of abdomen 2 inches.

This species has, I believe, been hitherto found only in the Speeton clay, where it occurs in oval nodules. Specimens exist in the British Museum, in the Woodwardian at Cambridge, the York Museum, and in Dr. Bowerbank's and other private collections.

MEYERIA VECTENSIS. Plate X.

Segmentis abdominis longitudinaliter tricarinatis ; carinis granulatis.

MEYERIA MAGNA, *M'Coy*. Ann. Nat. Hist., 1849, p. 334 ; Contrib. Brit. Palæont., p. 139.

— — *Morris*. Cat. Brit. Foss., p. 111.

*Descr.* The carapace in this species is very deep, much compressed, the lower part of the sides being nearly perpendicular ; the nuchal furrow is deep, and its angle is less acute than in *M. ornata* ; the cephalic portion is gradually narrowed forwards, terminated by a short, slender, acute rostrum, which is not more than one fourth the length of the

cephalic portion of the carapace ; there are on this part seven more or less distinct carinæ, three pairs and one on the median line ; the lowest is short, and extends backwards along the side of the scapular arch, being interrupted only by the nuchal furrow ; the next above it is strongly marked, acute, and, like the former, has a series of small tubercles ; it extends forwards to a minute superorbital spine ; the median carina extends from a short distance in front of the nuchal furrow nearly to the rostrum, and two others, converging regularly, terminate at its apex. The scapular arch or portion of the carapace behind the nuchal furrow has a strongly raised median carina, another on each side continuous with the second on the anterior portion, and between these is an awl-shaped elevation, passing backwards and upwards, and, like the former, tuberculated. The whole surface is granulated, though more sparsely than in *M. ornata*. The abdomen is more compressed than in that species ; the segments are somewhat longer, and have three small longitudinal carinæ, each of which is furnished with a series of a few granulations. The lateral or epimeral processes are irregularly sculptured, and have a few scattered granulations. The lateral pieces of the tail have each a longitudinal carina, and the exterior one shows very distinctly the transverse division which denotes its relation to the Astacoid group. The legs are long, slender, and compressed, and the first (?) pair, which is extremely long, is angular and carinated, and has several longitudinal rows of small spines. Judging from the fragments which I have had an opportunity of examining, this extraordinary development of the leg may depend on sex, as the portion which remains of this limb in some specimens appears to be much smaller than in others. The second pair is also much larger than the remaining ones. The latter are nearly smooth, and evenly compressed, without any angularity.

Length of carapace 2·5 inches, height 1·2 inch ; length of abdomen 3·5 inches.

From the Greensand at Atherfield, in the Isle of Wight, where it occurs in profusion, so as to have given to the beds where it is found the name of "Lobster beds"—M'Coy also gives "Specton clay of Specton" as another locality, but I have not met with any specimens from thence, and am doubtful of the correctness of this statement.

*Genus*—*PILYCTISOMA*, *Bell*.

*Char. Gen.* *Testa* tuberculata, lobo mesogastrico distincto, separato, lineari. *Abdomen* semicylindricum, epimeris elongatis, angustis. *Pedes* antici robusti, tumidi, tuberculati ; reliqui lævis, compressi.

PHLYCTISOMA TUBERCULATUM, *mihl.* Plate XI, figs. 1—8.

Testâ omnino tuberculatâ.

*Descr.* The carapace in this remarkable species is semi-cylindrical, covered in every part with tubercles, which are of dissimilar sizes; it is divided longitudinally by a narrow and deep mesial sulcus, which bifurcates at the anterior part of the carapace, to enclose the mesogastric lobe, which is thus completely insulated from the surrounding part of the gastric region; it is almost linear in form, terminating posteriorly in a point at a short distance from the nuchal furrow. The meso-branchial furrow is nearly parallel with the nuchal, and similar to it in breadth and depth; they are both rather deep, smooth, and polished. There is a short, curved, connecting furrow extending between them, near the margin of the carapace, separating the epibranchial lobe, and with the others enclosing the mesobranchial. The cardiac region is faintly indicated, it is of a triangular form, and is divided by the longitudinal mesial furrow; the posterior margin of the carapace is curved forwards, and has a distinct, raised edge, bounded by a deep furrow. The abdomen is semi-cylindrical, the segments somewhat tuberculated; the epimeral processes are long, narrow, and triangular, excepting the second, which is broad and quadrate, and hollowed in the middle. The caudal segment or central plate of the tail is broad, rounded, and curiously marked with sulci, ridges, and tubercles, and the margin is raised. The external caudal plates are wanting in all the specimens observed. The anterior legs are robust, timid, and covered with tubercles, similar to those of the carapace. Portions of the arm, wrist, and hand are figured in the plate. The portions of ambulatory legs hitherto obtained, show them to be compressed and quite smooth.

All the known specimens, and they are very numerous, are from the Greensand of Cambridge, and are principally in Mr. Carter's fine collection of Crustacea from those beds.

*Obs.* This genus is in several respects a remarkable one, and presents characters which forbid its being associated with any other. The general aspect of the carapace, its crowded tuberculation, uniform in all its parts in the present species, the breadth and direction of its sulci, give it a *primâ facie* resemblance to *Hoploparia scabra*, but this similarity only holds in unimportant characters, and even in these is more apparent than real. The tubercles are in this species spread over the whole surface, without the mesobranchial area which is so characteristic of *H. scabra*. The sulci also are different in their direction, although similar in depth and in the smoothness of their surface. The most striking peculiarity, however, and that by which it is distinguished from all other genera, recent or fossil, which have come under my notice, is the distinct insulation of the meto-gastric lobe, which is enclosed, as it were, by a bifurcation of the longitudinal mesial furrow. The

form of this separated piece is also altogether different from the element of which it is the homologue in every other genus. Another remarkable peculiarity is in the form of the epimeral plates, which are remarkably long and narrow.

The existence of a cardiac region, which appears to me to be certainly, although faintly, indicated, in conjunction with a median sulcus by which it is longitudinally divided into two portions, forms, if I am right in this appropriation, an exception to the law laid down in the elaborate and learned disquisition on the elements of the carapace by Prof. Milne Edwards,\* that when, as in the case of the common lobster, the carapace is divided along its whole length by a median furrow, it is at the expense of the cardiac region. In the case, also, of *Glyphæa*, the whole scapular portion of the carapace is thus divided, yet the cardiac region appears to me to be quite as distinct as in any other macrurous form, and more so than in most.

PHLYCTISOMA GRANULATUM, *mih*i. Plate XI, figs. 9, 10.

Lobis metabranchialibus granulatis, haud tuberculatis.

In Mr. Carter's collection are several fragments of a species distinct from the former, which on close examination I find to possess the remarkable peculiarity upon which I have found it necessary to constitute the present genus, namely, the insulation of the mesogastric lobe, of a linear form, by the bifurcation of the median furrow. In the present species the whole of the broad metabranchial lobe is covered with uniform granulations, instead of the distinct tubercles which cover this as well as every other part of the carapace in *Ph. tuberculatum*. The remaining portion of the carapace in this species is also tuberculated, but less thickly than in the former.

All the fragments which I have seen are too imperfect to allow of any further description, but the generic identity and the specific distinction of the two are equally certain.

It is found with the former in the upper Greensand of Cambridge.

\* 'Ann. des S. Nat.,' 1851, p. 247.

*Genus*—GLYPHÆA, *Meyer*.

GLYPHÆA CRETACEA, *M'Coy*. Plate XI, figs 11—13.

Arcâ cephalicâ testæ politâ, septem-carinatâ ; carinis granulatis.

GLYPHÆA CRETACEA, *M'Coy*. Ann. Nat. Hist., 1854, p. 118, pl. iv, fig. 2 ; Contrib. to Brit. Palæont., p. 268, fig. 2.

*Descr.* The carapace is nearly cylindrical, somewhat narrowed anteriorly ; the cephalic arch nearly as long as the scapular ; the ground surface of this part smooth and polished, having seven distinct carinæ, which are nearly parallel, and each, with the exception of the median one, formed of a single row of granulations ; the hepatic region granulated ; the nuchal furrow extends almost straight across the dorsal part of the carapace, excepting a slight angle forwards on the median line ; the scapular arch divided by a median longitudinal furrow ; the regions distinct ; the cardiac region broad, polished, and sparsely granulated ; the branchial uniformly more closely so, and with the lobes distinctly marked ; the epibranchial small, sending forward a narrow process, which extends to the side of the hepatic region ; the mesobranchial linear, narrow, and oblique ; the metabranchial very broad, and very uniformly covered with granulations. The only portion of the limbs which I have seen consists of the wrist and part of the hand, by which it appears that the former is very small and triangular, the latter remarkably long, slightly granulated, somewhat compressed, and having a very shallow, longitudinal groove near the lower margin.

Length of carapace 1·2 inch.

It has hitherto occurred only in the Greensand at Cambridge, and all the specimens I have seen are in Mr. Carter's collection.

*Obs.* It is very difficult to assign with any certainty to what family of recent Crustacea this genus either belongs or is more nearly related. The absence, in all the remains hitherto found, of any portion of the abdomen, and, indeed, of all those parts upon which naturalists usually depend for the generalisation of the species in Crustacea, precludes any definite opinion on this head. The structure of the scapular arch is perfectly consistent with its being an Astacoid form ; but the cephalic portion of the carapace is quite distinct from any other known genus. Professor M'Coy very truly observes that there is no "possible modification of Milne Edwards' nomenclature of the parts of Crustacea which would enable us to describe the ridges and sulci of the gastric\* region of a Glyphæa in terms indicating any homology with corresponding parts in other Decapoda."

\* Mr. M'Coy's word is *branchial* ; doubtless a slip of the pen.

This genus was first determined by Meyer. Three, if not four, species have been found in Britain, of which the present, and probably a new one, only belong to the cretaceous beds.

There are in Mr. Carter's collection of the Cambridge Greensand Crustacea two fragments of the carapace, which certainly appear to belong to a species of this genus, which differs from *G. cretacea* in having that portion of the carapace anterior to the nuchal furrow granulated as well as the branchial regions, instead of being polished, and the longitudinal ridges are similar in character. The fragments are too imperfect to form the subject of a satisfactory description. I propose to give it provisionally the name of *Glyphæa Carteri*. It is figured in Plate XI, fig. 14.



## A D D E N D A.

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ETYUS SIMILIS, *mihii*. Plate I, fig. 12 ; and XI, fig. 15.

At page 6 I referred to a supposed variety of *Etyus Martini*, of which also a figure, representing the orbits, is given in Plate I, fig. 12. The examination of two additional specimens with which I have been favoured by Mr. Carter, has, however, convinced me that these, with the former, belong to a distinct species, to which, from its great similarity to *E. Martini*, I have given the above name.

The ground of the carapace is more minutely granulated than in the former species. The tuberculation is considerably different, the whole portion anterior to the nuchal furrow being studded, somewhat irregularly, with distinct tubercles. The nuchal furrow is more waved in its course across the carapace, and it is deeper and broader ; the regions generally are more elevated ; the teeth of the latero-anterior margin are more regular and prominent, but without the distinct terminal tubercle which exists on each of the slight lateral projections in the former. All the specimens examined were imperfect at the posterior portion of the carapace, but it appears, from the proportions of the regions generally, that this species is somewhat broader in proportion to its length.

It occurs with the other species in the Cambridge Upper Greensand.

EUCORYSTES CARTERI, *var.* Plate XI, fig. 16.

Mr. Carter has favoured me with the opportunity of examining and figuring a very interesting variety of *Eucorystes Carteri*, in which the posterior half of the carapace corresponding with the scapular arch is sculptured in the same manner as the anterior half, as figured in Plate II, figs. 14 and 17. In this, the only existing specimen, there is, in addition to the sculpturing before described, a median longitudinal ridge, and one on each branchial region. These are linear, flattened, and granulated as the others. Whether this may be considered as the normal condition of the species or not it is difficult to determine,

but I have thought that in one or two specimens of the ordinary form I have detected a trace of the posterior median ridge.

The approximation of this genus to *Eumorphocorystes* of M. Binkhorst is apparently strengthened by the occurrence of this specimen.

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In Mr. Carter's rich collection of Crustacea from the Cambridge Greensand, to which I have been so largely indebted, are numerous specimens of fragments of limbs of the greatest interest and beauty. I cannot but hope that before this work is completed fresh investigations may enable us to appropriate some of these to species yet to be described, and in this hope I have refrained from figuring or further alluding to them.

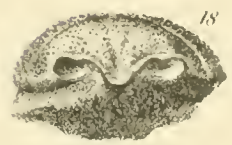
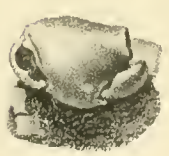
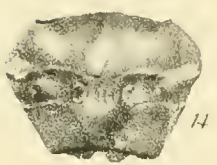
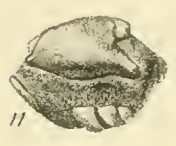
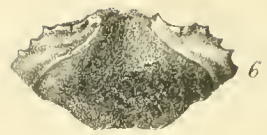
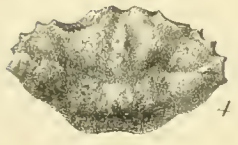


PLATE I.

Fig.

1. *Trachynotus sulcatus* (p. 2), from the Upper Greensand of Wiltshire. In Mr. Cunningham's collection.
- 2, 3. *Mithracites vectensis* (p. 1), from the Lower Greensand in the Isle of Wight. The former in the British Museum, the latter in Dr. Bowerbank's collection.
- 4—6. Three views of *Xanthosia gibbosa* (p. 3), from the Greensand of Wiltshire. In the collection of Mr. Cunningham.
7. *Elytus Martini* (p. 5), from the Gault at Folkestone; restored from specimens in the author's collection.
8. Under side of the same, from a specimen from the Greensand of Cambridge.
9. Abdomen, and
10. Footjaw of the same.
11. Hand of the same species, from the Greensand of Cambridge. In Mr. Carter's collection.
12. Front view of *Elytus similis* (p. 6 and 39), see Pl. XI, fig. 15.
13. *Xanthosia granulosa* (p. 4), from the Greensand of Cambridge. In Mr. Carter's collection.
14. *Diaulax Carteriana* (p. 6), from the Greensand of Cambridge. In Mr. Carter's collection.
15. Front view of the same, shewing the orbits.
16. Hand of the same.
17. *Cyphonotus incertus* (p. 8), from the Greensand of Wiltshire. In the collection of Mr. Cunningham.
18. Front view of the same specimen.
19. A larger individual from the Cambridge Greensand. In Mr. Carter's collection.

Figs. 1, 7, 8, 14—18, are enlarged by one third.







## PLATE II.

Fig.

- 1—3. Back, front, and side views of *Plagiophthalmus oviformis* (p. 9), from the Greensand of Wiltshire. In Mr. Cunningham's collection.
- 4—6. Back, front, and side views of *Hemioön Cunninghamii* (p. 10), from the Greensand of Wiltshire. In Mr. Cunningham's collection.
7. Under view of a specimen of the same, from the Cambridge Bed. In the author's collection.
- 8—10. Upper, side, and under views of *Palæocorystes Broderipii* (p. 14), after specimens in Dr. Bowerbank's collection, from the Gault at Folkestone.
11. Specimen showing the anterior pair of legs, from the same locality. In the author's collection.
12. Under side of the same, showing the basal joint of the legs, and part of the footjaws.
13. Diagram of the abdomen, of the same species.
14. *Eucorystes Carteri* (p. 17), from the Greensand of Cambridge. In Mr. Carter's collection.
15. Under side of a small specimen of the same.
16. Front view of the same species, showing the large and distant orbits.
17. Restored view of the carapace of the same species.



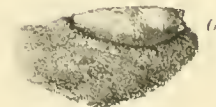
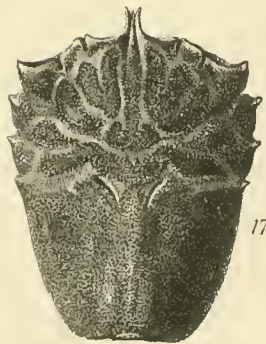
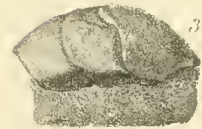
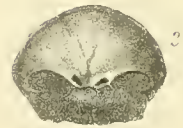
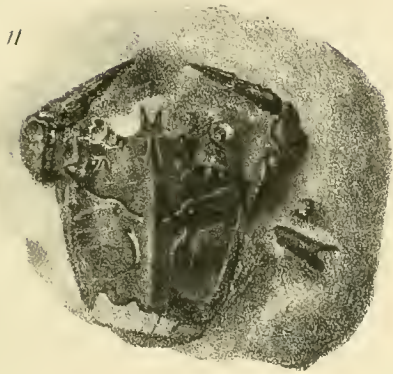
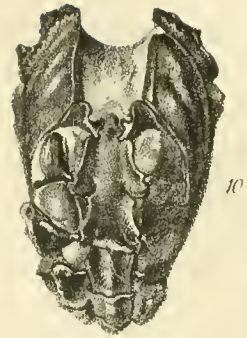






PLATE III.

Fig.

1. *Palæocorystes Stokesii* (p. 15).
2. The same, showing a portion of the abdomen.
3. Carapace of the same, infested with a bopyriform parasite, from the Cambridge Greensand.
4. The same, with the anterior leg.
- 5, 6. Specimens showing the basal joints of the legs and the footjaws.
7. Front view of a small specimen of the same species.
- 8, 9. Diagrams of the abdomen and footjaw.

The specimens are all in the collections of Dr. Bowerbank and the author, and with the exception of fig. 3, are from the Gault, at Folkestone.

- 10—12. Upper, side, and back views of *Palæocorystes Normani* (p. 16), from “The Chalk Marl, capping the fire-stone,” at Ventnor, in the Isle of Wight. In the collection of Mr. Norman, of that place.

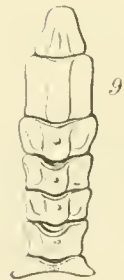
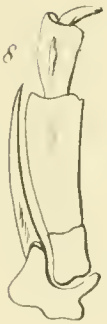
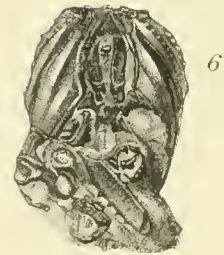
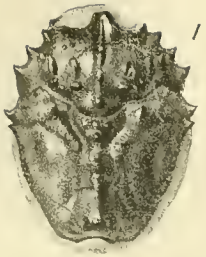






PLATE IV.

Fig.

1. *Necrocarcinus Woodwardii* (p. 20), from a fine specimen in Mr. Norman's collection, from "the Chalk Marl, capping the firestone," at St. Lawrence, in the Isle of Wight.
- 2, 3. Small specimens of the same, from the Greensand of Wiltshire. In the collection of Mr. Cunningham.
- 4—8. *Necrocarcinus Bechei* (p. 20), after specimens in the collections of Dr. Bowerbank and the author, from the Gault, at Folkestone, and the Greensand of Cambridge.
9. *Necrocarcinus tricarinatus* (p. 21), from Wiltshire. In Mr. Cunningham's collection.
- 10, 11. Smaller specimens of the same, from Cambridge. In the author's collection.



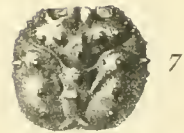
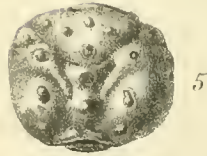
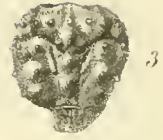
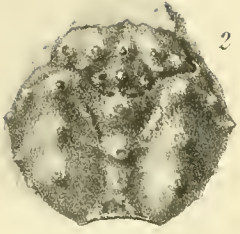






PLATE V.

Fig.

- 1, 2. Upper and under side of *Homolopsis Edwardsii* (p. 23), from a fine specimen in the Museum of Practical Geology, from the Gault, at Folkestone.
3. Hand of *Necrocarcinus Bechei*. In the collection of Mr. S. J. Mackie, from the Gault, at Folkestone.
- 4, 5. Hand and arm of *Necrocarcinus Woodwardii*.
- 6, 7. Portions of the legs, probably of the same species.

The last four specimens are in Mr. Cunnington's collection, from the Greensand of Wiltshire.

8. *Hoploparia sulcirostris* (p. 25).
9. Anterior portion of the carapace of the same, showing the rostrum.
10. Side view of the abdomen, of the same species.

The specimens are all from the Gault, at Folkestone. In the British Museum.

- 11-13. *Hoploparia punctulata* (p. 27), from the same locality, and also in the British Museum.
14. Portion of the carapace of an unknown Macrurous Crustacean. In the collection of Mr. Mackie.

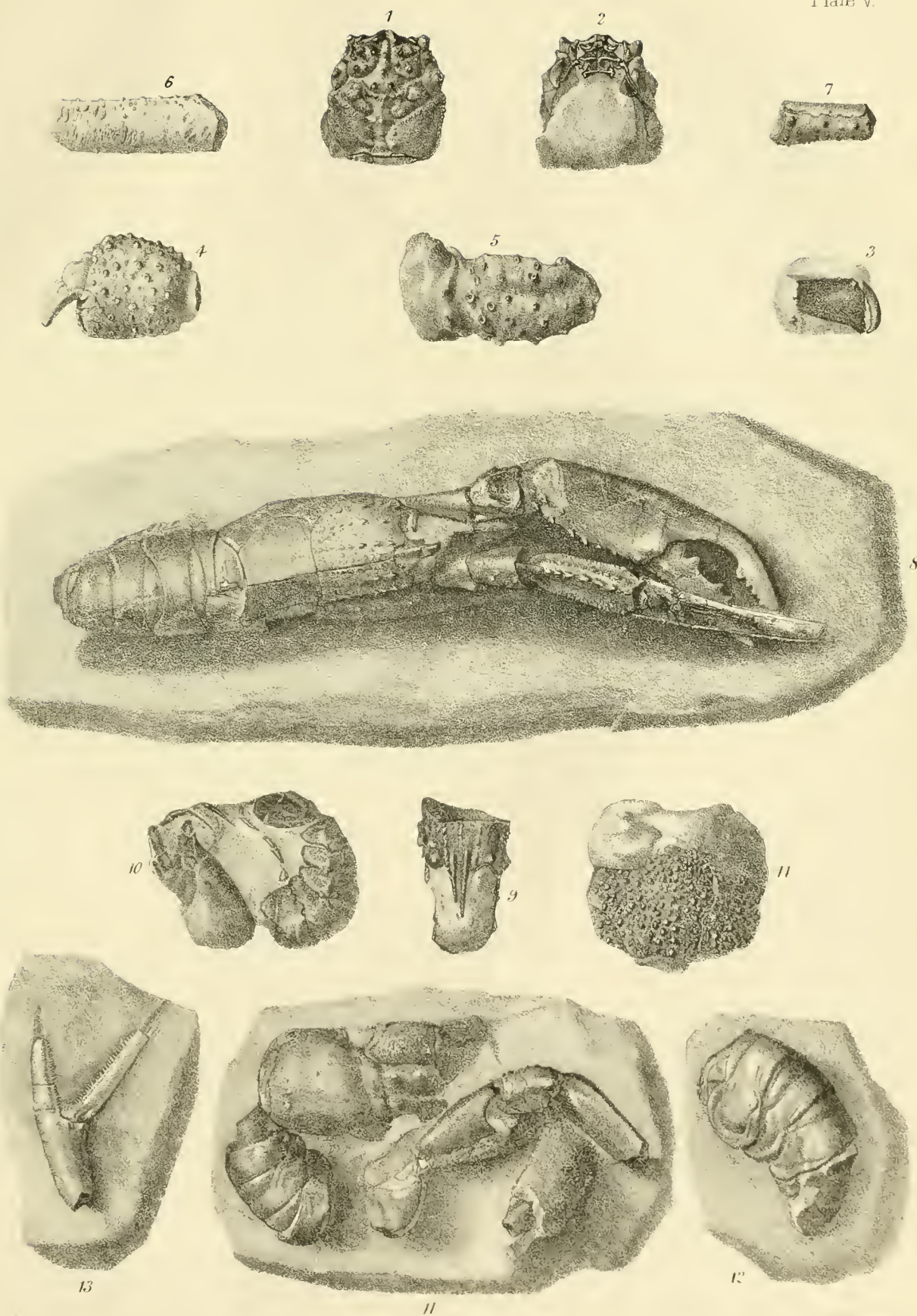






PLATE VI.

Fig.

1. *Hoploparia longimana* (p. 26), from the Greensand, at Lyme Regis. In the British Museum.
2. Copy of the original engraving of the same species, illustrating Mr. Sowerby's paper in the 'Zoological Journal,' vol. ii, p. 493, pl. xvii.
3. The claws of a remarkably large specimen of the same, from the Greensand, at Atherfield. In Dr. Bowerbank's collection.



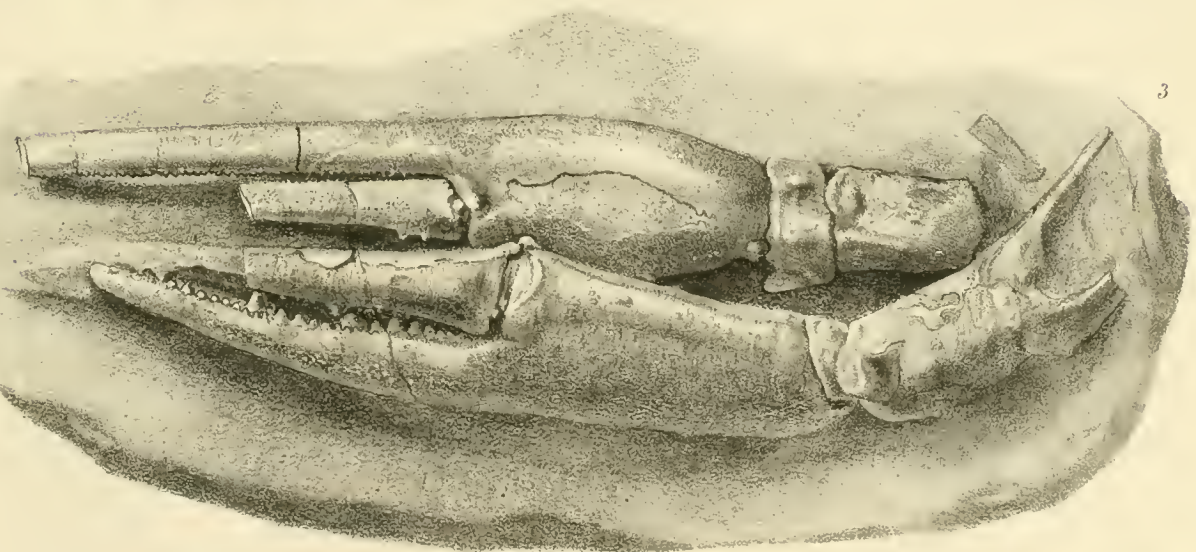
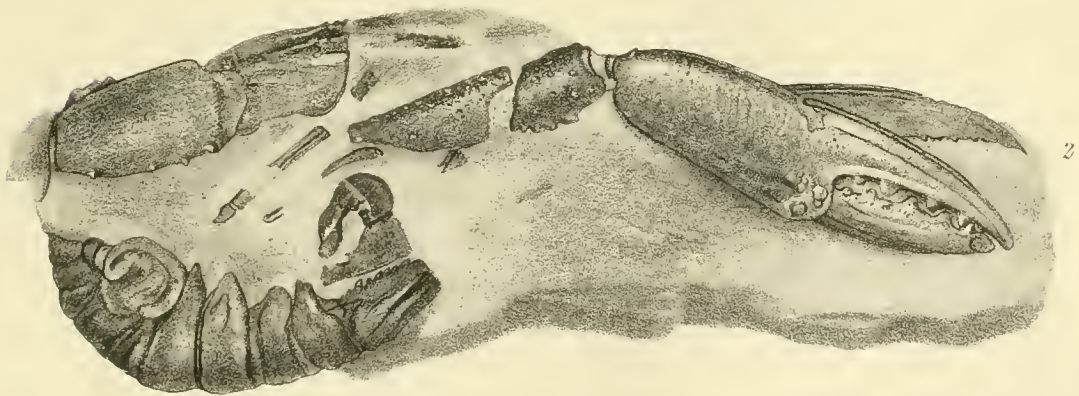
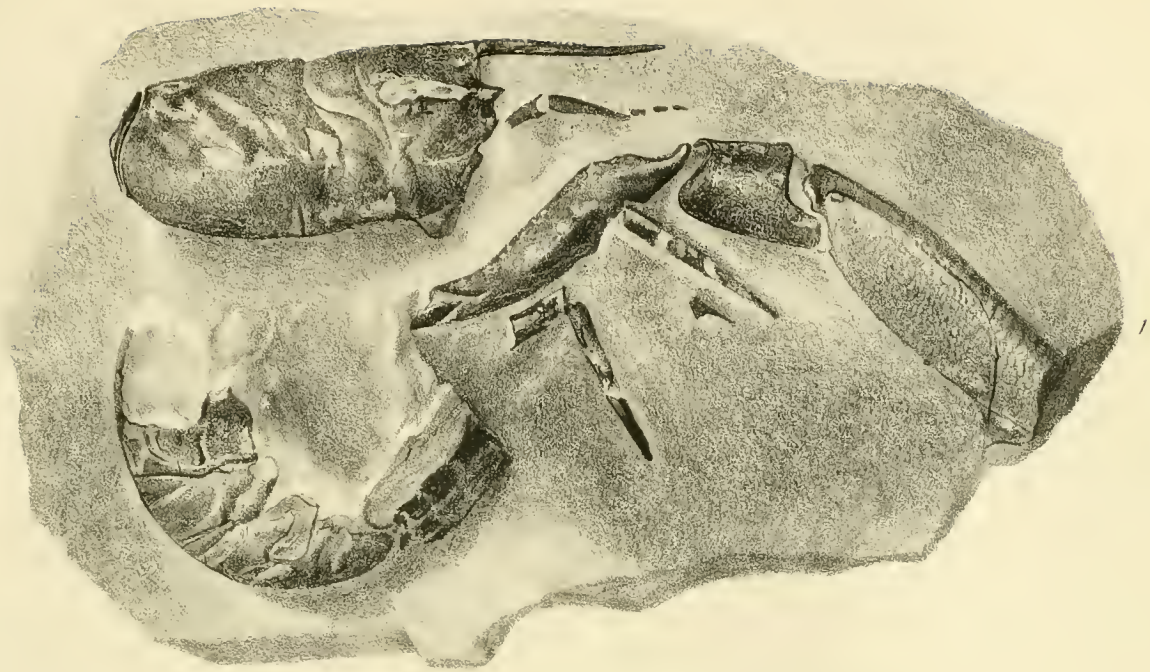






PLATE VII.

Fig.

- 1, 2. *Hoploparia granulosa* (p. 27), from the Upper Greensand of Wiltshire. In Mr. Cunnington's collection.
3. *Hoploparia scabra* (p. 28). One side of the carapace, showing the posterior granulated scabrous portion, the tuberculated area behind the nuchal furrow, and the tuberculated gastric region. The specimen is from the Gault, at Folkestone, and in the British Museum.
4. Right side of the carapace of the same species, from the same locality, and also in the British Museum.
5. The tuberculated portion of the carapace of the same.
6. Left side of the carapace of the same. This and the last, are from the Cambridge Greensand, and in Mr. Carter's collection.
7. Anterior leg, probably of the same species, from the Gault, at Folkestone. In the British Museum.

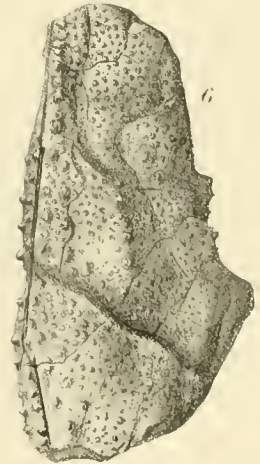
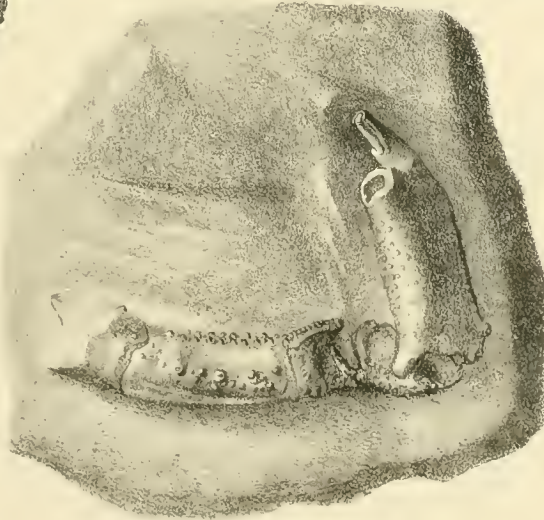
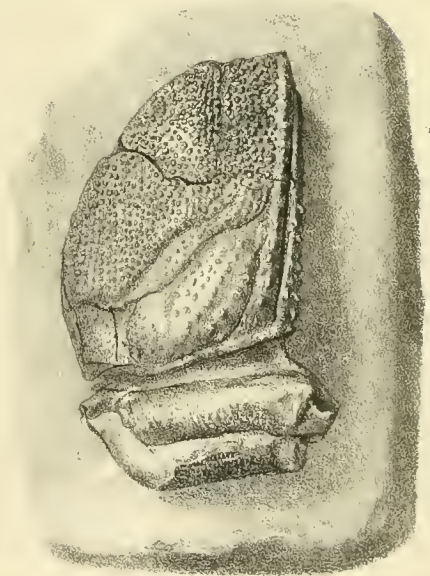
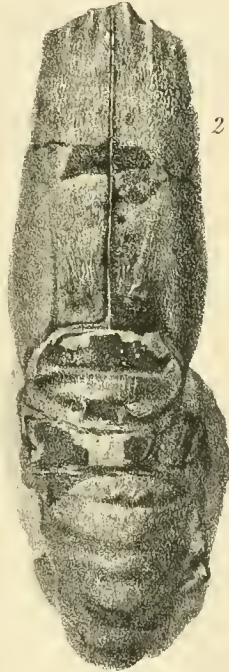
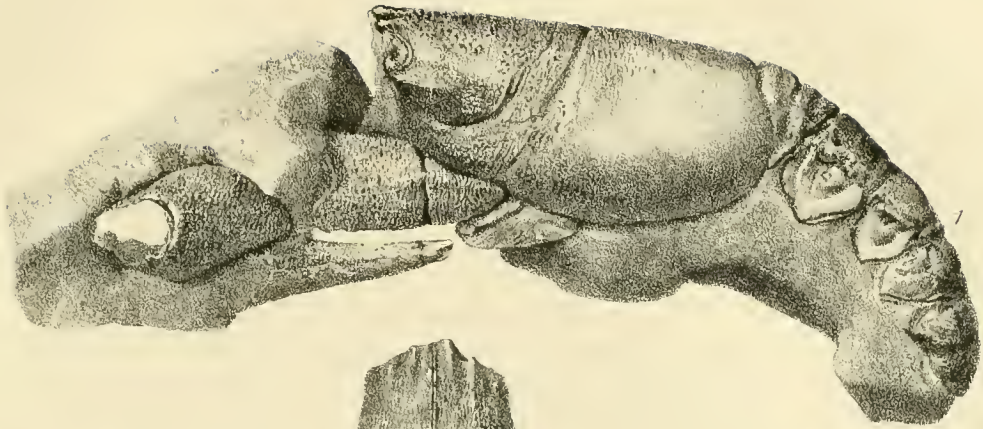






PLATE VIII.

Fig.

1. Carapace and abdomen of *Hoploparia Savbyi* (p. 29), from the Greensand of Wiltshire. In Mr. Cunnington's collection.
- 2, 3. Claws and hands of the same species, from Ventnor. In Mr. Norman's collection.



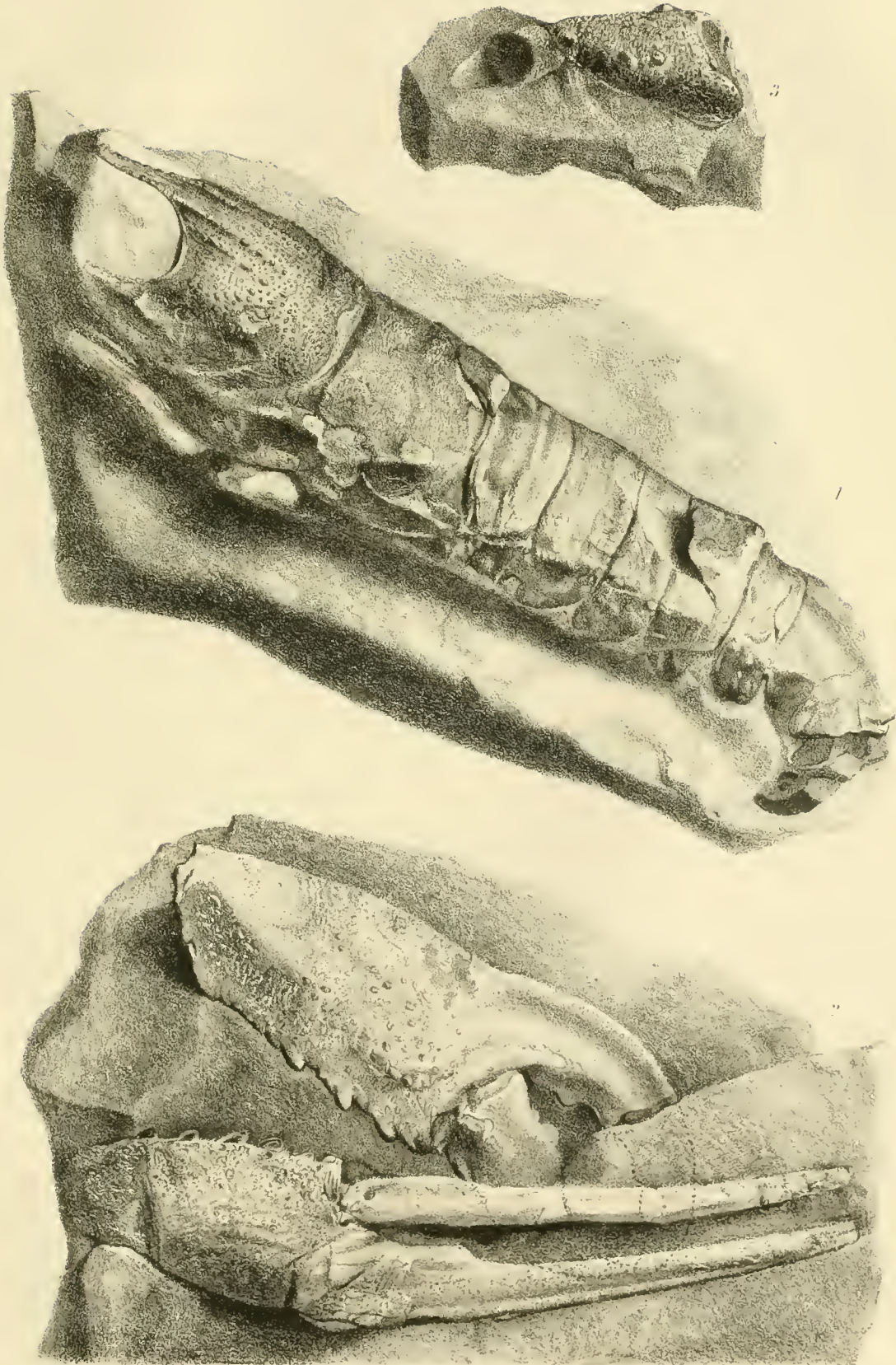




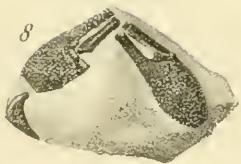
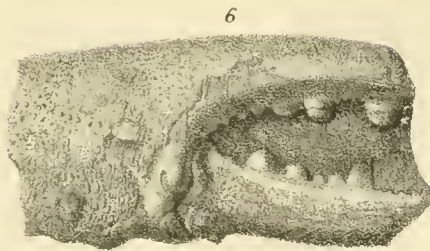
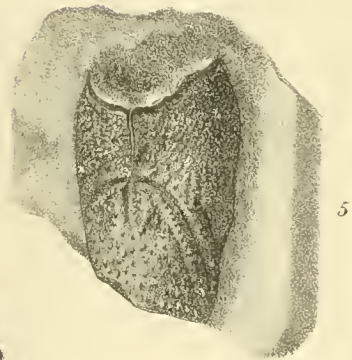
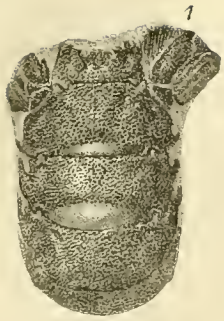


PLATE IX.

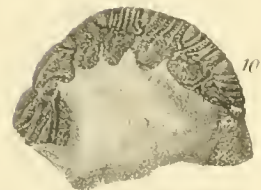
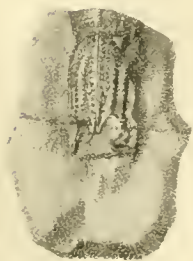
Fig.

- 1, 2. Abdomen of *Astacodes falcifer* (p. 30), from a specimen in the British Museum, formerly in Mr. Bean's collection.
- 3-5. Fragments of the carapace of the same. In the museum, at York.
6. A hand, in the same collection, marked, as belonging to this species, which is doubtful from its great size.
7. Portion of the abdomen, and 8, the hands of a species, named by Mr. Bean, "*Astacus multicostatus*" (p. 31). In the British Museum.
- 9, 10. Carapace and abdomen of *Meyeria ornata* (p. 33). In the museum, at York.
11. Anterior portion of the carapace of the same. In the British Museum.

All the specimens figured in this plate are from the Speeton Clay.



*2 nat. size*







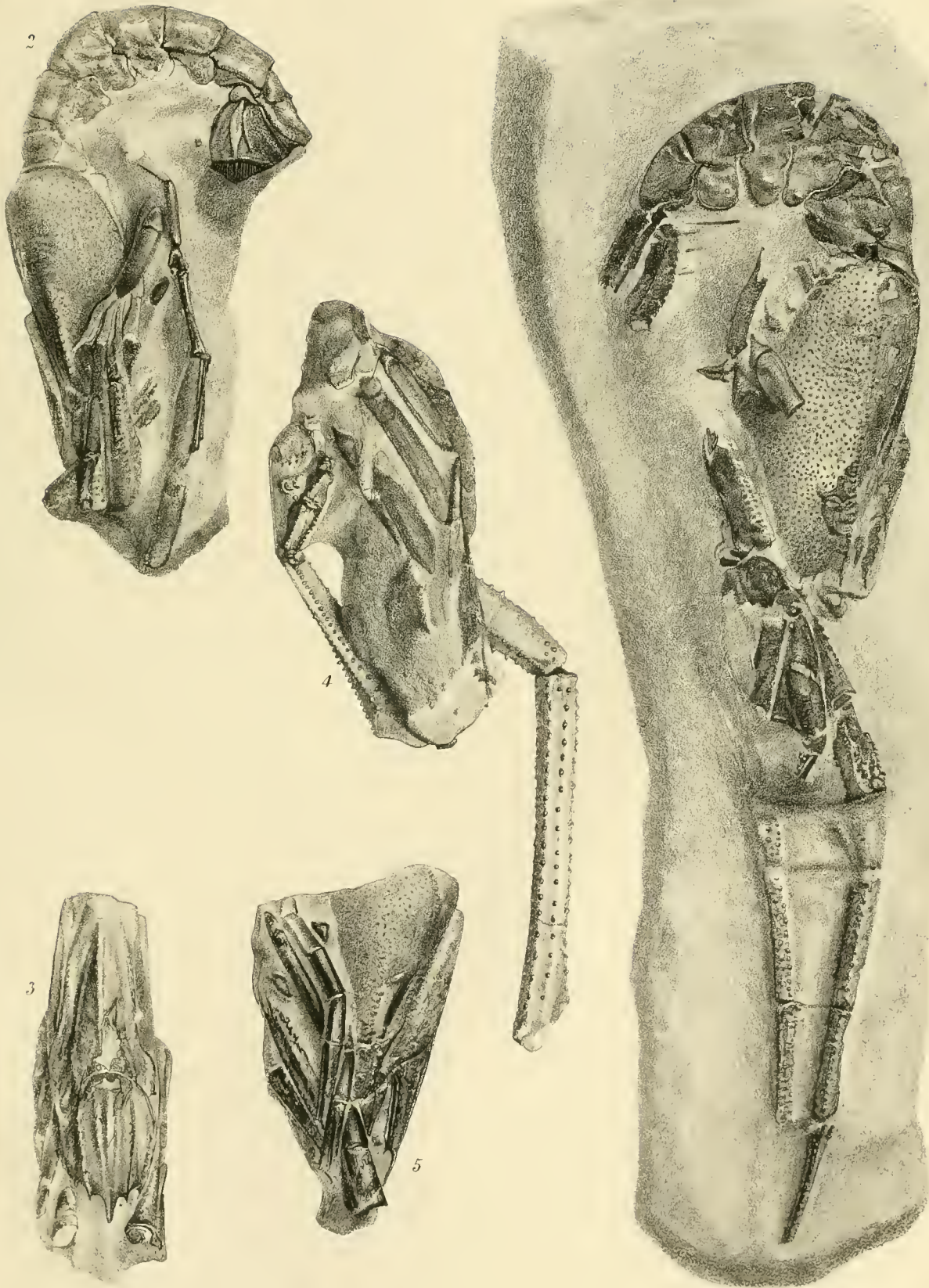
## PLATE X.

Fig.

1. *Meyeria vectensis* (p. 33). After a fine specimen, in Mr. Nornian's collection, from Atherfield.
2. The same species, from a specimen in the British Museum, showing, with other interesting details, the transverse articulation of the outer caudal plate, indicating the astacoid relation of the genus.
3. A beautiful example of the carapace of this species.
4. A specimen, showing the structure and great length of the anterior legs.
5. A fragment, with portions of the other legs.

The last three figures are from specimens in Dr. Bowerbank's collection, and are from Atherfield.









## PLATE XI.

Fig.

- 1—3. Dorsal views of *Phlyctisoma tuberculatum* (p. 33), showing the linear insulated mesogastric lobe.
- 4, 5. Side view of the carapace of the same.
6. Part of the carapace, and the abdomen of the same.
- 7, 8. Portions of the arms, wrist, and hand of the same.
- 9, 10. Dorsal view of *Phlyctisoma granulosum* (p. 36).
- 11, 12. Dorsal view of the carapace of *Glyphæa cretacea* (p. 37).
13. Portion of one of the legs of the same species.
14. Side view of the carapace of *Glyphæa Carteri* (p. 38).
15. *Elyus similis* (p. 39).
16. A remarkable variety of *Eucorystes Carteri* (p. 39).

The specimens in this Plate are all from the Upper Greensand at Cambridge, and in the collection of Mr. Carter.



2. B.  
M.L.

















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