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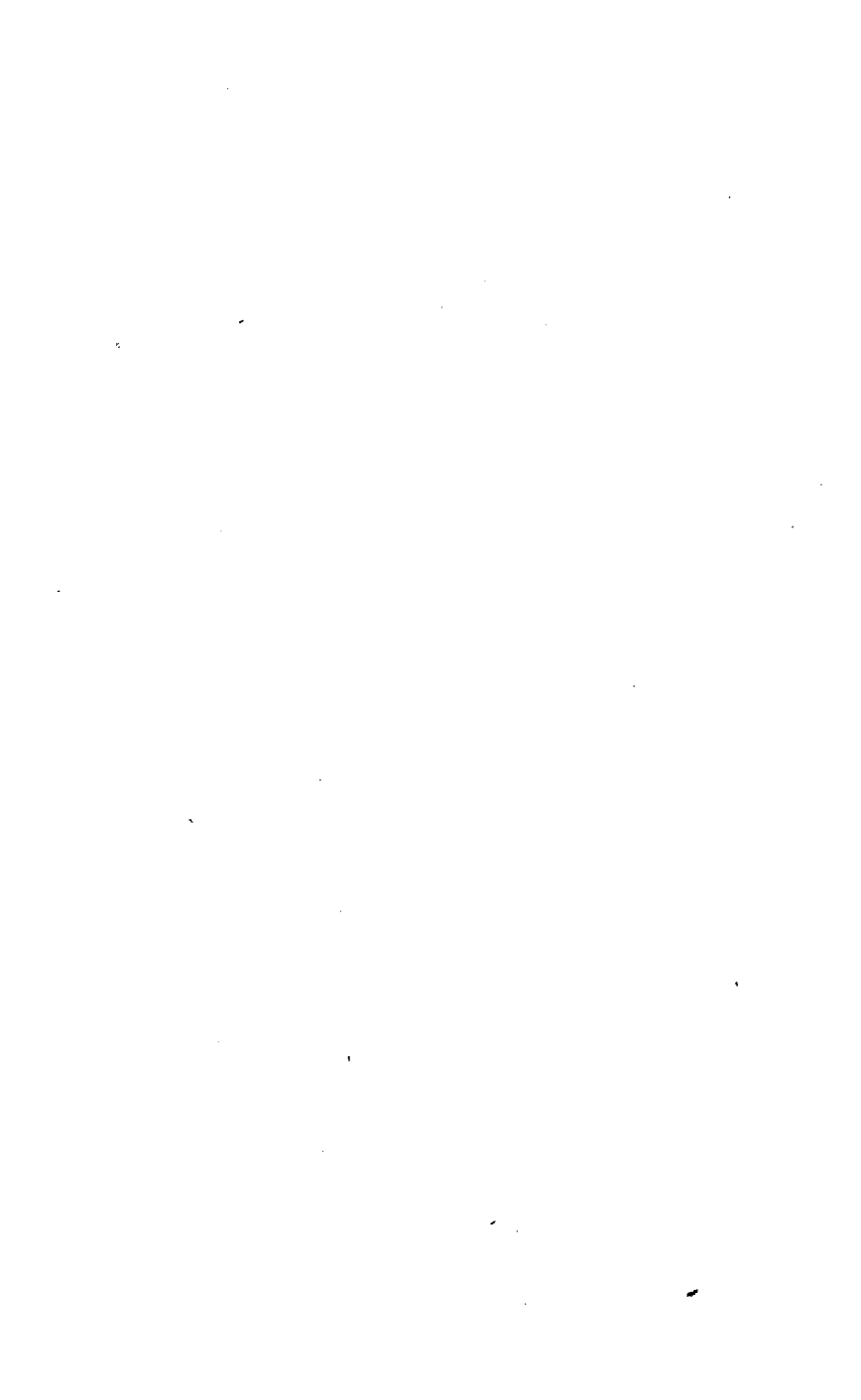
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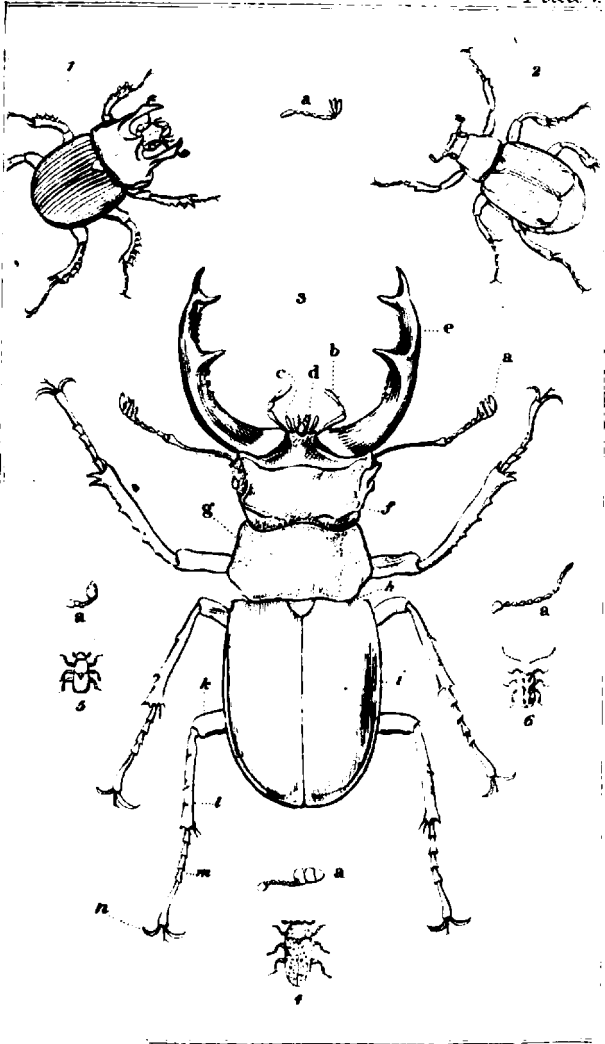


(Samuel)

QIX







THE
E N T O M O L O G I S T ' S
Useful Compendium; *60*

OR
AN INTRODUCTION TO THE KNOWLEDGE
OF
BRITISH INSECTS,

COMPRISING
THE BEST MEANS OF OBTAINING AND PRESERVING THEM, AND
A DESCRIPTION OF THE APPARATUS GENERALLY USED;

TOGETHER WITH

THE GENERA OF LINNÉ,

AND

The Modern Method of arranging the Classes Crustacea, Myriapoda,
Spiders, Mites and Insects, from their Affinities and
Structure, according to the views of DR. LEACH.

ALSO

AN EXPLANATION OF THE TERMS USED IN ENTOMOLOGY;
A CALENDAR OF THE TIMES OF APPEARANCE AND USUAL SITUATIONS
OF NEAR 3,000 SPECIES OF BRITISH INSECTS;

WITH

INSTRUCTIONS FOR COLLECTING AND FITTING UP OBJECTS
FOR THE MICROSCOPE.

Illustrated with Twelve Plates.

BY **GEORGE SAMOUELLE,**
ASSOCIATE OF THE LINNEAN SOCIETY OF LONDON.

LONDON:

PRINTED FOR THOMAS BOYS, NO. 7, LUDGATE HILL.
(FROM NO. 3, PATERNOSTER ROW.)

1819.

Printed by R. and A. Taylor, Shog-lane,

TO
DR. W. E. LEACH, F.R.S. &c. &c.

SIR,

I may justly dedicate the following pages to you, being indebted for the most valuable part of their contents to your kindness and liberality. I am happy in thus having it in my power to acknowledge my sense of the many obligations which I lie under to you: and at the same time I trust the present work will be the means of aiding you in the very praiseworthy cause in which you are engaged. It is also to be hoped that in England, ere long, Entomology will stand on the same ground with Botany, Chemistry, or Mineralogy; and that your labours will eventually be as duly appreciated in this country as they are now on the Continent.

I remain, Sir, with the greatest respect,

Your most obliged and obedient servant,

GEORGE SAMOUELLE.

Blackfriars Road,
March 1819.



P R E F A C E.

IT must be acknowledged that the very rapid progress which every science for some years past has made in this country, is greatly to be attributed to Elementary works, and at the same time it is to be regretted that as yet none has appeared on the practical part of Entomology, by which I mean the method of collecting and preserving insects; the elements of the science, &c. It is true such a work is announced, and it is hoped will shortly appear; I allude to the completion of Messrs. Kirby and Spence's Introduction to Entomology.— From the profound knowledge of the subject which these excellent authors possess, we certainly may expect a most complete work; yet its extent, and the necessary expense of at least four octavo volumes, must exclude many from purchasing it, and especially young persons to whom the study of Entomology is particularly adapted.

From this consideration I was induced more than twelve months ago to begin a work, the mere outline of the present, and which was intended to comprise little more than the Linnean Genera, with a slight notice of the more natural Genera which had been separated from them, with references to the best essays or papers that had been published on the subject, and directions for collecting, &c. This was to have been published in duodecimo, and would have made but a thin

volume. On the return of Dr. Leach from the continent in May I consulted him on the subject, when he most liberally promised me every assistance, with the free use of his books and manuscripts, if I would extend the work. This was a kindness which I certainly did not expect, although I knew his zeal and ardour in the promotion of science: it was also an offer I could not withstand, and which no lover of science will regret. It has been my wish in no instance to omit acknowledging what has been derived from his valuable assistance: should this however have been in any case neglected, I trust that Dr. L. will pardon the oversight.

To experienced scientific Entomologists this work cannot be expected to afford much additional information: their good sense will however admit its necessity and utility, since a publication on such a plan has long been a great desideratum; yet even to these it is presumed it will not be altogether useless, since it contains the characters of many genera lately established by the most celebrated Entomologists on the continent, and never before printed in this country.

The Genera of Linné I have been obliged to give according to my former plan, as the plates were engraved previous to the alteration. The Modern System is nearly the same as that given in the Supplement to Encyclopædia Britannica, article Crustaceology, and Dr. Brewster's Edinburgh Encyclopædia, article Entomology, with the exception of the foreign Genera and the alteration of Tribes to Families terminating in *idæ*.

The introduction of *Objects for the Microscope* may by some be considered as rather foreign to the subject of Entomology; but this I cannot altogether accede to, since the assistance of this instrument is so often required, and many who possess a microscope might be induced to extend their views

to Entomology if they were acquainted with the method of collecting insects, and were furnished with some work to give them an insight into their distribution and arrangement.

The utility of the *Calendar* must be obvious to every one, as containing extensive and substantial information such as the Tyro will require. Those who reside at a distance from the metropolis have a great advantage, as by carefully examining such places as are referred to in the *Calendar* they may not only meet with the species enumerated, but are likely to capture new insects, at least undescribed, for as yet very little is known of the Entomology of Britain.

I cannot omit returning my thanks to that acute and excellent Entomologist J. F. Stephens, Esq. F.L.S. whose extensive knowledge of the subject and the readiness with which he has always assisted me deserve my warmest acknowledgement. To Mr. Sowerby also I am indebted for many personal favours.

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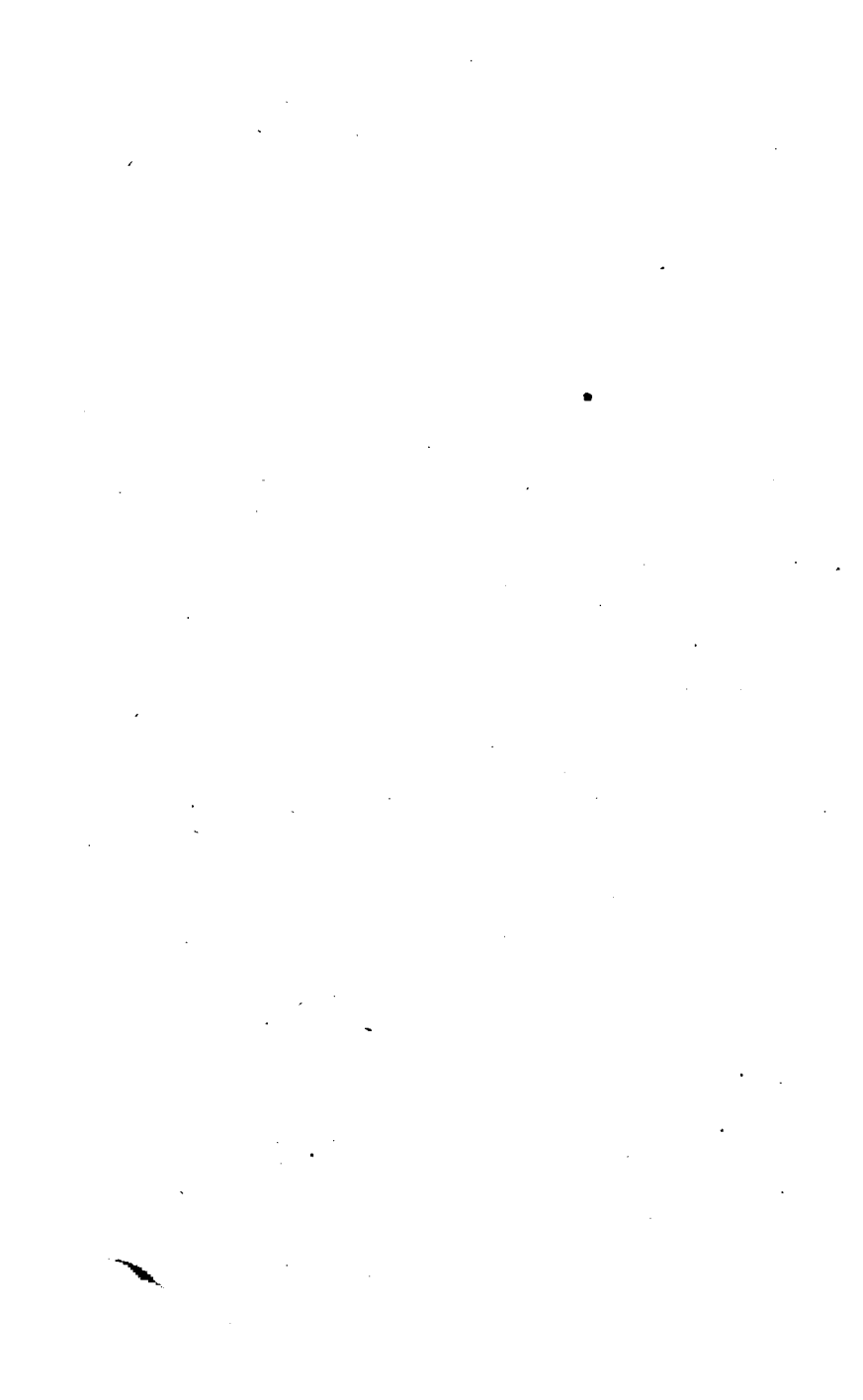
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THE
ENTOMOLOGIST'S
Useful Compendium.

INTRODUCTION.

ENTOMOLOGY is a study which may be considered as in its infancy. So prone is man to look with contempt on those parts of the creation which are diminutive, that insects have been almost overlooked in his researches after knowledge. His ignorance, the consequence of this contemptuous neglect, has led him to consider the whole class as of small importance, and to arraign the Creator for forming an useless, and in many cases offensive and injurious tribe of beings. Such can be the language only of "haughty ignorance;" the modest observer of Nature, although he may have learned little of the habits, œconomy, and uses of insects, will acknowledge that they have been created with design, and will not doubt but the design was benevolent.

The insect race constitute by far the most considerable portion of animated beings;—in this view the science of Entomology becomes one of the most important and interesting that can engage the mind of the natural philosopher. He who neglects the study of insects, or thinks it beneath his notice, cannot deserve respect as a general observer of nature, nor be considered a scientific naturalist. The views of such a man will be partial, and his inquiries circumscribed: he regards only an inconsiderable portion of animated nature; and he confines his remarks to such as from their size and distinctness of character present the least obstacle to investigation. In the study of Entomology, the man of science will find abundant scope for the exercise of his zeal. The amazing number of species; their curious forms, so infinitely varied, and yet so nearly and gradually approximating through an endless series of transitions from one species to another; the diversity of structure observable in those parts which afford generic characters, added to the wonderful changes in form which they undergo, with their surprising œconomy,—are circumstances which contribute to render them objects of most curious speculation to the philosopher. The study of

every class of animals is most indisputably attended with peculiar advantages: yet I will venture to affirm, that it is from a knowledge of the characters and metamorphoses of these little animals, and the various modes of life which they are destined to pursue, that he will obtain a more intimate acquaintance with the great laws of nature, and veneration for the Great Creator of all, than can be derived from the contemplation of any other class in nature. The beauty of insects in general, renders them engaging to many who have neither time nor inclination for studying their more complicated structure; and the gaiety of their colours, often combined with the most graceful forms, displays a beauty, splendour and vivacity, greater than that bestowed by the hand of Nature on any of her other works. One defect in appearance must indeed be conceded; and this may be regarded, in point of beauty, a material deficiency indeed,—they are not always so considerable in magnitude as to become, even with these embellishments, strikingly attractive. Were they equal in size to the smallest birds, their elegance would render them more inviting to the eyes of mankind in general; but, even amongst the minor species, when examined with a microscope, we find their beauty and elegance far superior to that of any other class of animals in the creation. “After a minute and attentive examination,” says Swammerdam, “of the nature and structure of the smaller as well as the larger animals, I cannot but allow an equal, if not superior, degree of dignity to the former. If, whilst we dissect with care the larger animals, we are filled with wonder at the elegant disposition of parts, to what a height is our astonishment raised when we discover their parts arranged in the least in the same regular manner!”

Insects may be divided into two kinds; those which are immediately or remotely beneficial or injurious to mankind. Many insects indeed seem not to affect us in any manner; others, and by far the greater number, most assuredly fall under one or the other denomination, and on this account demand our most serious attention. But, lest the alleged utility of some insects should seem hypothetical to the superficial observer, whilst the noxious effects of others are too obvious to admit of doubt, I shall be more explicit upon this subject. The depredations of insects upon vegetable bodies are often detrimental; but it must be remembered, that in these ravages they often repay the injury they commit. Locusts, the most destructive of all insects, whose numbers spread desolation through the vegetable world, are not (except on some occasions when their multiplication exceeds all bounds) unproductive of advantage. Although they deprive mankind of a certain portion of vegetable food, yet, in return, their bodies afford nutriment of a wholesome and palatable kind, and in much greater abundance. The various species of locusts are the common food on which the inhabitants of several parts of the world sub-

sist at particular seasons. The honey of bees, in many warm climates, constitutes another primary article of food. The caterpillars of several moths furnish materials for the silken raiment so universally worn by all ranks in the eastern parts of the world; and hence in these countries the silky produce of these industrious little animals is of as much use as the fleecy coat of the sheep is to us. As an object of traffic, silk is one of the utmost importance in China and Tartary; and in those parts paper is manufactured from the refuse of the same material. The extensive use of wax in all ages is well known. Some insects are used with success in medicine; and many others (the cochineal for instance) are rendered useful in the arts: and greater numbers might perhaps be employed for the same purpose. These few, out of a vast many instances, are sufficient to prove the absurdity of an opinion very prevalent, "that insects are too insignificant to deserve the attention of the philosopher." But allowing these benefits to be unknown, and that the study of Entomology is not productive of any substantial advantages, how absurd would it still be to treat such an extensive portion of the creation with neglect! The objection, that they are in nowise conducive to our interests (even if founded in truth), would be no evidence of the frivolity of the science; unless we are to conclude, that the only inquiries which merit our rational attention are those which tend to the gratification of selfishness. If this be admitted as an objection, how many objects of philosophical investigation must be rejected as frivolous! From the earliest period in which the light of natural knowledge dawned, this class of animals has obtained a certain portion of attention: and although the study has not at all times been cultivated with equal ardour, yet it has not been utterly neglected, but has engaged the study of men endowed with talents as splendid, and judgement as refined, as the most exalted of those who affect to treat it with contempt.

ELEMENTS

OF

ENTOMOLOGY.

SO great is the number of natural bodies on the face of our earth, that on a general view the mind recoils at the attempt to investigate them as impossible. But the invention of systems has facilitated the task; and every natural object can be traced by certain characters to its place in the system, whether natural or artificial.

Those who with a philosophical eye have contemplated the productions of Nature, have all by common consent divided them into three great groups; namely, the Animal, the Vegetable, and the Mineral kingdoms.

ANIMALS are distinguished by being organized bodies, which have life, sensation, and are capable of voluntary motion.

VEGETABLES are organized bodies, which are endowed with a living principle but want sensation.

MINERALS are unorganized, without life or sensation.

Zoology, or the study of Animals, is not only the amplest and most difficult, but the most pleasant and profitable part of Natural History. The following is the system of the celebrated Linné.

Division 1. *A heart with two auricles and two ventricles; warm and red blood.*

Class I. MAMMALIA. Viviparous animals, or such as suckle their young.

Class II. AVES. Oviparous animals. Birds.

Division 2. *Heart with one auricle and one ventricle; cold and red blood.*

Class III. AMPHIBIA. Animals breathing arbitrarily through lungs.

Class IV. PISCES. Animals with gills. Fishes.

Division 3. *Heart with one ventricle, no auricle; white and cold blood.*

Class V. INSECTA. With antennæ, and undergoing transformations.
Insects.

Class VI. VERMES. With tentacula, and undergoing no change. Worms.

DEFINITION OF INSECTS.

INSECTS are so called because they are divided into numerous segments; and not from their being almost separated into two parts, which are merely attached to each other by a slender thread, as is generally supposed.

All genuine insects have six legs; a head distinct from their body, and furnished with two antennæ or horns; and have pores conducting to tracheæ arranged along their sides for respiration: they are all produced from eggs. Some undergo no metamorphosis, others but a partial change, whilst the remainder pass through three stages of existence, after being hatched from the egg.

PARTS OF INSECTS.

An insect may be divided into four parts.

1. CAPUT. 2. TRUNCUS. 3. ABDOMEN. 4. ARTUS.

CAPUT, the *Head*, which is distinguished in most insects, is furnished with *Eyes*, *Antennæ*, and a *Mouth*.

EYES. Many insects have two crescents or immoveable caps, composing the greatest part of their head, and containing a prodigious number of little hexagonal protuberances, placed with the utmost regularity and exactness in lines crossing each other and resembling lattice-work: these are termed compound eyes.

Leeuwenhoek reckons in each eye of the *Libellula*, or Dragon-fly, 12,544 lenses, or in both 25,088; the pictures of objects painted thereon must be millions of times less than the images of them pictured on the human eye. There is no doubt that insects still smaller have eyes adapted to discern objects some thousands of times less than themselves; for so the minute particles they feed on must certainly be. Besides these larger eyes, many insects have three small spherical bodies placed triangularly on the crown of the head, called *ocelli* or *stemmata* (*Pl. 10. fig. 11. b*). They are simple, and made for viewing large and distinct objects; the other eyes for small and near ones.

ANTENNÆ. The antennæ are two articulated moveable processes placed on the head: they are subject to great variety, and were the parts from whence Linné formed his genera: they are called

Setaceous, when they gradually taper towards their extremity;

Clavated, when they grow gradually thicker from their base;

Filiform, of an equal thickness throughout the whole of their length;

Moniliform, formed of a series of knots, resembling a string of beads;

Capitate, when they terminate in a knob;

Fissile, with the knob divided longitudinally into laminae or plates;

Perfoliate, having the knob divided horizontally;

Pectinate, having a longitudinal series of hairs or processes projecting from them in form of a comb;

Furcate, or forked, having the last joint divided into parts.

Nothing has been the source of greater speculation than the *use of the antennæ*: nor is this surprising, considering the variety constantly exhibited in their structure, occupation, and appearance. Some insects seem to keep them in continual employment; in others they are preserved in a quiescent state. Those of the ichneumon show an incessant tremulous vibratory motion, anxiously searching into every crevice; while those of the carrion-fly scarcely appear endowed with flexibility. They have successively been considered as the organs of hearing, feeling, smell, and taste, or of an unknown and indefinite sense.

Bonnet seems to think the antennæ the organ of smell. "Different insects," he observes, "have an exquisite sense of smelling, the organ of which is yet undiscovered. May it not reside in the antennæ?" Lehmann, from the result of experiments on this subject, denies that the antennæ are the olfactory organ. He made an opening an inch wide in the side of a glass vessel, and surrounded the edge with wax, so that a close covering could be applied. An aperture was made in this covering, through which either the whole head, or the antennæ only of an insect could be introduced. By means of a tube the glass was filled with penetrating odours, vapours, or heated air; but neither the fumes of sulphur nor burnt feathers produced the smallest effect on butterflies, bees, or beetles, whose antennæ were exposed to them. He judges that the olfactory organ must be sought in the spiracula; "for what else," says he, "is the sense of the particles inspired than smelling?"

Bonsdorf, in discussing whether the antennæ may be the seat of hearing, mentions an experiment where a species of beetle, whose peculiar property it is to fold in the antennæ when alarmed, did so on a loud noise being suddenly made, and fell to the ground, according to the nature of the species. But, notwithstanding that the animal previously reposed in a tranquil state, his experiment cannot be considered altogether conclusive. Butterflies are seen to erect their antennæ on any sudden noise, and many *Coleoptera* to depress them; which may equally arise from the sudden shock or vibration of the air. Spiders also, which want antennæ, are extremely sensible of sound. Lehmann relates that, on observing one descend from the roof by its thread in quest of a female, while he was reading, he began to read aloud: the animal, alarmed at the noise, retreated upwards; he was silent, and it returned; on again reading aloud, it testified alarm and ascended its thread; nor was its apprehension of danger dispelled, until familiarized with the sound or conquered by the object of its

pursuit. The same author deprived crickets, which are animals noted for acuteness of hearing, of the antennæ; yet they were equally sensible of sound as before. Lehmann concludes on the whole, that as the antennæ are not the organs of either smell or hearing, their principal though not sole office is feeling. But they are also endowed with an unknown sense, which he denominates *aeroscepsin*, and conjectures that in certain species they may contribute to the defence of the head.

Huber, well known for his ingenious and acute observations on bees, has made several most interesting experiments on the subject. Amputating one of the antennæ of a queen he found was not attended with any perceptible effect. Privation of both antennæ, however, produced very singular consequences. M. Huber cut them from a queen whose fecundation had been retarded, so that she laid none but the eggs of males. From that moment a marked alteration in her conduct was seen; she traversed the combs with extraordinary rapidity, scarcely had the workers time to recede before her; and, instead of the care which a perfect queen displays in depositing her eggs in those places alone suitable for their exclusion, she dropped them at random without selecting proper cells: she retired to the most solitary parts of the hive, seeming to avoid the bees, and long remained motionless. Several workers, however, followed her there, and treated her with the most evident respect. She seldom required honey from them; but when that was the case, she directed her trunk with a kind of uncertain feeling, sometimes on the head and sometimes on the limbs of the workers; and if she did reach their mouths it was by chance. Queens leave their hive but once in their whole lives, which is for the purpose of obtaining impregnation; they remain voluntary prisoners ever afterwards, unless in leading out a swarm. This queen, however, seemed eager to escape; she rushed towards the opening of the hive, but finding it too small for her exit she returned after fruitless exertion. Notwithstanding the symptoms of delirium by which she was agitated, the workers never ceased to pay her the same attention as they invariably do their queens, though she received it with indifference.

Apprehensive that the queen's instinct might be impaired, from her organization suffering by retarded fecundation, M. Huber deprived another female of the antennæ, and introduced her into the hive. She was quite in the natural state, and had already proved of great fertility; but now she exhibited exactly the same symptoms of agitation and delirium that the other had done. Perfect queens, possessing all their organs, testify the most violent animosity against each other; they fight repeatedly; the workers seem to incite them to combat, until one at length falls, while the other survives to preserve and perpetuate the colony. Mutilated of the antennæ, however, they testify no reci-

procal aversion; in traversing the hive they meet without showing the smallest indications of resentment. If a perfect stranger queen is introduced, either when one already exists in a hive or within a few hours after she is lost, that stranger is immediately surrounded, and so closely hemmed in by the bees that she sometimes dies. But here the mutilated stranger was quite well received; her arrival created no discontents in the hive, and the workers paid the same homage to her as to their own. "Was it," asks M. Huber, "because after losing the antennæ these queens no longer retained any characteristic which distinguished the one from the other? I am the more inclined to adopt this conjecture, from the bad reception experienced by a third perfect queen introduced into the same hive: it is probably because they observe the same sensations from those two females, and want the means of distinguishing them from each other." Bees never abandon their queen; her presence seems almost indispensable to their existence; and, as before observed, the queen never forsakes her hive. If she does so to found a new colony, the bees accompany her in her flight. Here, as both the mutilated queens constantly endeavoured to escape, the first and third were removed, and the entrance of the hive enlarged; the fertile mutilated one therefore left it, but none of the workers followed her; she was allowed to depart alone. The wise provisions of nature are amply illustrated by these facts. It is fortunate that a queen deprived of the antennæ is thus impelled to leave the hive: while she remains, the bees incessantly attend her, and never think of procuring another. The secret which the workers possess, of converting a common worm into one, which will become a queen, must be exercised within the first three days of its existence; therefore if the queen remained, this limited term would elapse. Neither can her presence contribute to preserve the hive; for mutilation of the antennæ deprives her of the power of discriminating the different kind of cells adapted to receive the various species of eggs which she lays. M. Huber considers the antennæ as the organs of touch or smell, though he declines affirming which of these senses resides in them; and thinks it possible that they may be so organized as to fulfil both functions at once.

Mr. Kirby, in speaking of the *Eucera* (or long-horned bee), says: "A singular circumstance distinguishes their antennæ, which, to the best of my knowledge, has never before been noticed, and which may possibly lead to the discovery of the use of these organs. Placed under a powerful magnifier, the last ten joints appear to be composed of innumerable hexagons, similar to those of which the eyes of these insects consist. If we reason from analogy, this remarkable circumstance will lead us to conjecture, that the sense of which this part so essential to insects is the organ, may bear some relation to that conveyed by the eyes. As they are furnished with no instrument for

receiving and communicating the impressions of sound, similar to the ear, that deficiency may be supplied by extraordinary means of vision. That the *stemmata* are of this description seems very probable; and the antennæ may, in some degree, answer a similar purpose: the circumstance just mentioned, furnishes a strong presumption that they do this, at least in the case of these males; else why do they exhibit that peculiar structure which distinguishes the real eyes?"

Mr. Marsham observed the *Ichneumon Manifestator*, in June 1787, on the top of a post in Kensington Gardens. It moved rapidly along, having its antennæ bent in the form of an arch; and, with a strong vibratory motion in them, felt about until it came to a hole made by some insect, into which it thrust them quite to the head. It remained about a minute in this situation apparently very busy, and then, drawing its antennæ out, came round to the opposite side of the hole, and again thrust them in, and remained nearly the same time. It next proceeded to one side of the hole, and repeated the same operation there. Having now again withdrawn its antennæ it turned about, and, dexterously measuring a proper distance, threw back its abdomen over its head and thorax, and projected the long and delicate tube at its tail into the hole. After remaining near two minutes in this position, it drew out the tube, turned round, and again applied its antennæ to the hole for nearly the same time as before, and then again inserted its tube. This operation was repeated three times; but Mr. Marsham approaching too near, in order if possible to observe with a glass what was passing in the tube, he frightened the insect entirely away.

About a week afterwards Mr. Marsham was in Kensington Gardens, and saw several of these ichneumons at work. They appeared to pierce the solid wood with their tubes, which they forced in even to half their length, constantly passing them between the hinder thighs, which they closed in order to keep the tubes straight, when over resistance would otherwise have forced them to bend. It appeared truly surprising to see an instrument, apparently weak and slender, able, with the strength of so small an animal, to pierce solid wood half or three-quarters of an inch deep; but, on particular attention, it was discovered, that all those that appeared to pierce the solid wood, did it through the centre of a small white spot resembling mold or mildew, which on minute examination was found to be fine white sand, delicately closing up a hole made by the *Apis maxillosa*, and where, no doubt, there were young bees deposited.

In deep holes that were not closed, the insect not only thrust in the whole tube, but in some cases the whole of the abdomen and posterior legs, leaving out only the two fore feet and wings, which it placed in contrary directions, like arms. The two cases of the tube were also projected up the back, with the ends appearing above the head out of the hole.

From Mr. Marsham's account it appears that these insects do not adopt any hole indiscriminately as a situation for their eggs; for in many instances he saw them thrust their antennæ into holes and crevices from which they almost immediately withdrew them, and proceeded in search of others. As the whole of the ichneumons deposit their eggs in the body of some other creature as a nidus, it appears probable that in these instances they found the holes empty, and that they went on in search of those in which the young of the *Apis marilosa* were deposited.

From these remarks may we not infer that the antennæ may be the organs of smelling? for the antennæ of the *Ichneumon Manifestator* (Pl. 8. fig. 4.) are not so long as the tube from which the eggs are excluded, and consequently could not have touched the animal in which it afterwards deposited its eggs. In many species of *Lepidoptera* the females are destitute of wings: the males in general have pectinated antennæ, and are so extremely eager after the female, that they have been known to enter the pocket of an entomologist who had one secured in a box.

These experiments are in some measure corroborated by the observations of Latreille, who supposes the antennæ to be the olfactory organs. In the twelfth number of the Edinburgh Review is a critique (on the *Nouveau Dictionnaire d'Histoire Naturelle*, 24 tom. 8vo. Paris, 1803-4.): the following extract I here insert, hoping it will produce a further inquiry.

“That insects possess the faculty of smelling is clearly demonstrated. It is the most perfect of all their senses. Beetles, of various sorts, *Nitidula*, the different species of *Dermestes*, *Sylphæ*, *Flies*, &c., perceive, at a very considerable distance, the smell of ordure and dead bodies, and resort in swarms to the situations in which they occur, either for the purpose of procuring food or depositing their eggs. The blue flesh-fly, deceived by the cadaverous odour of a species of *Arum*, alights on its flower. But though we can thus easily prove the presence of the sense of smell among insects, it is much more difficult to discover the seat of that particular sense. Several naturalists have supposed that it resides in the antennæ. Duméril, in a dissertation published in 1799, attempts to prove that it must be situated about the entrance of the stigmata or respiratory organs, as Baster had previously supposed. His arguments, however, did not induce Latreille to relinquish the former opinion, which places it in the antennæ. The following are the reasons which he assigns for his belief.

“1. The exercise of smell consists only in the action of air, impregnated with odoriferous particles, on the nervous or olfactory membrane, which transmits the sensation.

“If insects be endowed with an organ furnished with similar nerves, and with which air, charged with odoriferous particles, comes in con-

tact, such an organ may be regarded as that of smell. Should the antenna present a tissue of many nerves, what inconvenience can result from supposing that this tissue is capable of transmitting odour? Would not this hypothesis, on the contrary, be more simple and more consonant to anatomical principles, than that which fixes the seat of smell at the entrance of the stigmata? Besides, this last mode of explanation will not, I presume, suit the crustaceous animals, which so nearly approach to insects.

“ 2. Many male insects have their antennæ more developed than the females; a fact easily explained, if we admit that these organs are the seat of smell.

“ 3. It is certain that most of those insects which live or deposit their eggs on putrid animal or vegetable matters, stagnant waters, or any substance, in short, which, for a time, affects peculiar localities, are almost uniformly distinguished by a greater development of the antennæ. Such, for example, are the *Scarabæus*, *Dermestes*, *Silpha*, *Clerus*, *Tenebrio*, *Tipula*, *Bibio*, &c. These require a more perfect sense of smell, and are organized accordingly.

“ 4. A great many insects which are entirely predaceous have simple antennæ; and those which are characterized by similar manners, and which are sedentary, have none at all; as, for instance, the *Acari*, and a considerable portion of Lamarck's *Arachnide*.

“ 5. Insects discover their habitation and food by the sense of smell. I have deprived several insects of their antennæ, when they instantly fell into a state of stupor or derangement, and seemed to be incapable of recognising their haunts or their food, though just beside them. Such experiments deserve to be prosecuted. I would recommend, for example, the varnishing or covering the antennæ of dung beetles, and placing them near animal excrements, of which they are particularly fond, to observe if they would repair to them as usual.

“ 6. The nerves terminate at the antennæ; and their articulations, though externally covered with a pretty thick membrane, are hollow, lined within by a soft substance, which is often of a watery consistency, and whose extremity, when opposed to the air, may receive its impressions.”

Os, the *Mouth*. In order to afford some idea of the amazing difference that prevails in the structure of the several parts or organs which constitute the mouth, it will be only requisite to observe, that the classification of all insects in the Fabrician system is founded on this character. There are ten principal parts of which the mouth consists; and it is from the relative proportion of each, from the dissimilarity in the form, position, variation in number, or occasional peculiarities, that the most permanent characters are deduced. These parts have one disadvantage; they are generally small, and from this circumstance have not been so universally adopted in the arrangement

of insects as they would otherwise have been. Without, however, bestowing some little attention on these organs, it is impossible to distribute insects into their natural order with any great degree of certainty. In the works of Latreille, Leach, and most other modern writers on Entomology, the essential characters are established chiefly on the peculiarities of these organs.

The ten principal parts of which the Mouth consists are the following.

LABRUM, OR LABIUM, SUPERIUS, the *Upper Lip*: a transverse, soft, moveable piece, of a coriaceous or membranaceous nature, known from its situation at the anterior or upper part of the mouth. This part is very distinct in many of the *Coleoptera*, and in *Gryllus*, *Apis*, and some other genera. Linné sometimes confounds the upper lip with the *clypeus* or shield of the head; and similar instances occur in the works of Fabricius. These two parts may be distinguished by one invariable character; the *clypeus* is fixed, and forms a portion of the head; the upper lip is moveable, and is placed more forward.

LABRUM, OR LABIUM, INFERIUS, the piece which terminates the mouth beneath, and which is sometimes lengthened so as to form the instrument called *ligula*. It is often bifid, and has the posterior pair of feelers placed at the base.

MANDIBULÆ, Mandibles: (*Pl. 10. fig. 1. d.*) two hard pieces, in substance resembling horn, which are placed one at each side of the mouth, below the upper lip. These have a lateral motion, while the upper and lower lip move up and down, as in other animals. These differ from the *maxillæ*, with which they are sometimes confounded, by not having any of the *palpi* or feelers attached to them. In rapacious insects these are longer than in those which perforate wood; and the latter again have stronger mandibles than insects which feed only on herbage or leaves.

MAXILLÆ (*Pl. 10. fig. 1. c.—fig. 2. a. the same magnified*): two small pieces generally of a somewhat membranaceous consistency, and in figure different from the mandibles. These are commonly indented at the extremity, and nearly all ciliated at the inner edge. They are placed under the mandibles, and above the lower lip; their motion is lateral. In those insects which have more than two pair of feelers, the posterior ones take their origin from the sides of the maxillæ. (*fig. 2. b. c.*)

GALEÆ, Shields of the Mouth: two membranaceous appendages, usually of a large size and cylindrical form, placed one on each side, at the exterior part of the jaw, and which cover and protect the organs of the mouth conjointly with the lips. The *galeæ* are inserted at the back of the jaws, as is well exemplified in the *Gryllus* tribe.

LIGULA. This is the part considered by many authors as the lower lip: its situation is immediately under the jaws; and it consists of a single piece, which is generally of a soft texture, often bifid, and, if at

tentively examined at the base, will be frequently found of a horny substance.

In the *Coleoptera*, and in some of the *Hemiptera* (as in *Blatta*, *Gryllus*, &c.), this appendage terminates at the point in a membranaceous substance:—its form is extremely various in the different genera. The *Hymenoptera* and some *Neuroptera* have the *ligula* situated in the same manner; but it is in these concave, and is frequently prolonged into a sort of *proboscis*, which sometimes exceeds the length of the whole body. It is membranaceous, but of a soft and spongy texture, and well suited for receiving the impressions of taste. This kind of process is extremely well exemplified in the bee.

LINGUA, the *Tongue*: an involuted tubular organ, which constitutes the whole mouth in lepidopterous insects. This is of a setaceous form, and either very long, as in the *Papilio* and *Sphinx* genera; or short, as in most of the *Bombyces* and other moths. It consists of two filamentous pieces, which are externally convex, concave within, and connected longitudinally by a suture along the middle above and beneath. These, in uniting, form a cylinder, through which the nectareous juices of the flowers on which these insects subsist are drawn up with facility. These two pieces are not very closely united, and may be separated by means of a needle point. When the insect takes its food, this tube is exerted; at other times it is rolled up spirally between the *palpi*.

ROSTRUM, or *Beak*: the part which forms the mouth in many of the hemipterous order of insects. This instrument is moveable, articulated, and bent under the breast. Within, this beak is hollow, and contains, as in a sheath, three or more very fine and delicate bristles, the points of which these insects introduce into the body of the animal, or substance of the plants, from which they draw nourishment. The rostrum is conspicuous in the genera *Cicada*, *Nepa*, and *Cimex*.

PROBOSCIS, the *Trunk*: inserted in the place of the mouth in most dipterous insects. It is rather fleshy, retractile, of a single piece, and often cylindrical; the end forming two lips, which are of a soft substance, and from the delicacy of their teguments must possess the faculty of taste in a very high degree. Example in the House-fly.

Lingua, *rostrum*, and *proboscis*, are Linnean terms; and are adopted according to the definition of that author. *Ligula* is a Fabrician expression, indicating a process of the lower lip.

HAUSTELLUM: formed of two or more very small and delicate filaments, inclosed in a sheath of two valves.

PALPI, *Feelers*. These are the small, moveable, filiform organs or appendages, placed at each side of the mouth in the generality of insects. In some respects they resemble the antennæ, but are more distinctly articulated. They vary in number in different insects, being either two, four, or six, (*Pl. 10. fig. 1. f. f. and g.*) and are commonly inserted at each side the exterior part of the jaw. In those which have

only one pair, they are usually situated on the upper lip; when two or more, the posterior ones are generally on the lower lip; and in some insects furnished with a sucking trunk, they are oftentimes found inserted at each side of that organ. These feelers are composed of several joints, the number of which vary. Like the antennæ, to which they bear analogy, they are endowed with powers of motion; but still more extensively. They also serve, like the antennæ, as an essential character in the construction of genera; and from their situation, the number of joints, termination, and relative proportion and size, are exceedingly useful for that purpose.

FRONS, the *Front*: the anterior or fore part of the head, the space between the eyes and the mouth.

CLYPEUS, *Shield of the head* in coleopterous insects: the part corresponding with the front of the head in the other orders. In the beetle kind it is advanced more or less upon or over the mouth, and in some forms a sort of cap, the rim of which extends so far over the head as to conceal the mouth beneath. The anterior edge of the *clypeus* is sometimes mistaken for the upper lip.

VERTEX, the *Crown or summit of the Head*.

GULA, that part which is opposed to the front of the head, usually called the *Throat*.

TRUNCUS, the *Trunk*: the second principal division of which an insect consists, comprehending that portion which is situated between the head and the abdomen. The trunk includes the *Thorax*, *Collar*, *Sternum*, and *Scutel*.

THORAX: a term indefinitely applied sometimes to the whole trunk, the scutel excepted: in a stricter sense it implies only the dorsal part of the trunk, and may be considered as expressive of that portion of the superior surface which lies between the head and the base of the wings. The appropriation of suitable terms, by which a thorax consisting of one or of several pieces may be discriminated from each other, is desirable. In some the thorax is of a single piece, as in the orders *Coleoptera* and *Hemiptera*; in that of *Lepidoptera* it comprehends several segments, and a similar structure is still more conspicuous to view in the order *Hymenoptera*. The first or *anterior segment* of the thorax, in those consisting of several pieces, has been sometimes called the collar; but in admitting this, the coleopterous and hemipterous orders of insects can have no thorax. This will be rendered plain, when we consider that in the latter kinds of insects the first pair of legs arises from what is usually understood by the lower surface of the thorax; the interior segment, in hymenopterous insects, corresponds with the whole thorax in the former, for the first pair of legs arises from it in exactly the same manner. In the former, the thorax of a single piece is immediately succeeded behind by a *scutel*, while in

the *Hymenoptera* and *Lepidoptera* a large plane of one or more joints intervenes between the true thorax and the scutel; and it is to this last-mentioned dorsal space that the term *thorax* is assigned. Hence it is evident that the language of Entomology in this point is not altogether consistent; because what we denominate the collar in *Hymenoptera*, is the thorax in *Coleoptera*; and in *Coleoptera* we find nothing analogous to the *thorax* of the other order, except the collar.

The thorax in those insects which have that part consisting of a single piece, or the first segment in such as are of a compound nature, has the first pair of legs arising from the lower surface, and it is in this part that the muscles which move the head as well as this pair of legs are said to be contained. The thorax in different kinds of insects varies considerably in form, and affords very excellent generic and specific distinctions. Some are armed with spines, others denticulated, marginated, &c.

PECTUS, the *Breast*, is the third segment of the body, or that to which the four posterior feet are attached, and which is longitudinally divided at the anterior part of the *sternum*. The wings in lepidopterous and most other insects have their origin or base in the superior part of the breast. The wings and elytra in the *Coleoptera* and *Hemiptera* deviate a little from this, as they are placed more immediately on the back than in a lateral position; the breast contains the muscles that move the wings and give action to the four posterior legs. This part is capable of being compressed and dilated, the alternate motion of which is very evident in some insects of the butterfly or moth kind when held between the fingers. The power of compression and dilatation is supposed to arise from the action of some very strong muscles, being reddish yellow, and extremely loose. It has been conjectured that these muscles may assist the motions of the organs of flight.

STERNUM, or *Breast-bone*. By this term entomologists define that portion of the middle part of the breast which is situated between the base of the four posterior legs. This piece terminates in some insects anteriorly in a somewhat acute point; in others it appears rather bilobate; and in the far greater number ends obtusely or in an obtuse lobe. There are few insects in which the *sternum* is remarkable, either from its magnitude or figure. In some of the coleopterous tribes, as in the *Hydrophili* and *Dytici*, this part is most conspicuous.

SCUTELLUM (Linné), the *Scutel* or *Escutcheon*: the lobe-like process situated immediately at the posterior part of the thorax in the scutellate insects. The *scutel* is not of the same form in all insects, yet its general tendency is towards a sub-triangular figure. In the coleopterous tribes it approaches nearest to this form; its deviations incline more or less to heart-shaped, with the tip pointing backwards. The same figure prevails in some of the *Hemiptera*. In the *Nearoptera*, *Hymenoptera*, and

Diptera, the triangular contour is still more observable under various modifications, and most commonly with the posterior tip rounded off. Sometimes, as in several of the hymenopterous insects, the posterior end is armed with spines or denticulations; this is, however, not usual. The *scutel* in the far greater number of insects, whether terminating in a point or rounded, is commonly unarmed. In point of size the *scutel* is more variable than in figure: in some it is so small as almost to escape notice, merely forming a point at the extremity of the thorax, as we observe in certain kinds of the beetle tribe; in others it is very conspicuous, being sometimes so large as to cover the middle of the back; and in others, as the scutellate kinds of *Cimices* and a few of the genus *Acridium*, it expands over the back, entirely concealing the wings and wing-cases, and covering the margin of the abdomen.

ABDOMEN. The third principal division, or posterior part of the body, is connected with the breast, either closely or at a distance, by means of a fillet. The abdomen is composed of annular joints or segments, the number of which vary in different insects. The upper part of the abdomen is called by entomologists, *tergum*; the inferior or belly, *venter*. The opening at the posterior part of the abdomen is the vent; and the extremity in most insects contains the organs of generation: there are exceptions to the latter.

The total movement of the abdomen is not very obvious, except in insects which have that portion of the body pediculated, as in many of the hymenopterous genera. It has then a real joint, in which the first annulation is indented above, and receives a projecting process from the breast, on which it moves. This joint is rendered secure by elastic ligaments, which have a considerable degree of force. Some muscles which arise within the breast are inserted into the first ring, and determine the extent of its motions. The partial motion of the ring is produced by very simple muscles, consisting of fibres which extend from the anterior edge of one ring to the posterior edge of that which immediately precedes it. When the dorsal fibres contract, the superior part of the abdomen being shortened, it turns up towards the back; but when the contraction takes place in the ventral or lateral fibres, the abdomen is inflected towards the belly, or directed towards one of the sides. The extent of the motion, however, depends on the number of the rings and their mode of junction. In the *Coleoptera*, for example, the rings only touch each other by their edges, and the motion is very limited; but in the *Hymenoptera* they are so many small hoops, which are incased one into another like the tubes of a telescope, so that scarcely half, and sometimes not above one-third, of their extent appears visible externally.

The form, connexion, proportion, and appearance, of the surface of the annulations of the abdomen, afford numberless specific distinc-

tions; and so likewise do the appendices at the extremity of the abdomen.

The abdomen contains the intestines, the ovary, and part of the organs of respiration: it is affixed to the thorax, and in most insects distinct from it, forming the posterior part of the body.

CAUDA, the *Tail*. An appendage of any kind terminating the abdomen is usually denominated the tail. These appendages vary in figure considerably in different insects, and many tribes are totally destitute of them. They are supposed to be destined to direct the motion of the insect in flight, to serve for its defence, and for the deposition of its eggs. In some insects this tail is simple, and yet capable of being extended and withdrawn at pleasure; in others elongated. Some are setaceous or bristle-shaped, as in the *Raphidia*. Those termed *trisetæ* have three bristle-shaped appendices, as in the *Ephemera*. In some it is forked, as in *Podura*. When it terminates in a pair of forceps it is called *forcipata*. In the *Blatta* and others it is *foliosa*, or resembling a leaf. In the *Panorpa* it is furnished with a sting, and is called *telifera*: this last may be more properly referred to the next.

ACULEUS, the *Sting*: an instrument with which insects wound and instil a poison. The sting generally proceeds from the under part of the last ring of the belly: in some it is sharp and pointed, in others serrated or barbed. It is used by many insects both as an offensive and defensive weapon: by others it is used only to pierce wood, or the bodies of animals, in order to deposit their eggs. In wasps and bees the sting is known to be retractile. In some insects it exists in the male only, and in others nature has provided the female alone with this instrument: it is not frequently met with in both sexes of the same species, and the far greater number of insects have no such organ.

ARTUS, the *Members*.

PEDES, the *Legs*. In all insects the legs amount to six, and never exceed that number; and the same is observable of the true feet in the larvæ of those insects; the latter have spurious feet to a greater amount, but the true feet do not exceed six.

The leg of an insect may be divided into four, or more correctly into five, parts: *Coxa*, the first joint or haunch, at the base; *Femur*, the thigh; *Tibia*, the shank; *Tarsus*, the foot; and *Unguis*, the claw. Each of these parts is enveloped in a hard case of a horny substance, and varies in shape in different insects, the form of the feet in all the kinds being admirably adapted to their mode of life and convenience of their motion. From the different conformations of these limbs it is easy to recognise, even in the dead insect, the mode of life which the species is destined by nature to pursue. Those which have the legs adapted for running or walking have them long and cylindrical: the thighs of the

leapers are remarkably large and thick, with the shank long and commonly arched, by which means they possess great strength and power for leaping: the legs are broad, serrated; and sharp at the edges, in those accustomed to dig in the earth; and such as are of the aquatic kind have the legs, especially the posterior pair, long, flat, and ciliated, or fringed at the edge with hair. The leapers are well exemplified in the saltatorial kinds of *Curculio* and *Chrysomela*; and the swimmers, in the genera *Hydrophilus* and *Dyticus*.

The COXA, a small joint at the base, connects the thigh to the body, and moves in a corresponding cavity of the collar or thorax in the first pair, or breast in the two posterior ones. This part varies in form: in the *Cerambyces*, *Coccinella*, and other insects in which the feet serve for walking only, its shape is globular: such as require that the feet should have a lateral motion, and which is necessary to those that dig into the earth, have the coxa broad and flat; this is also observable in some of the aquatic beetles: in the *Dytici* the coxa of the posterior legs is imbedded in the trunk, and in the *Blatta*, *Lepisma*, and others which walk very rapidly, it is compressed into a lamellate form.

FEMUR, the *Thigh*. There is more diversity in the form of the thigh than the coxa to which it is united. The articulation of these two parts is internal, and is produced in such a manner that when the animal is in a state of repose it is parallel to the inferior surface of the body. It is limited to a forward and backward motion with respect to the first piece. The nature and extent of the motions of the thigh appear to determine its form. In those insects which walk much and fly little, as in the *Carabus*, &c. the thigh has two little prominences at the base called *trochanters*, which appear to be intended for removing the muscles from the axis of the articulation. Those which require strong muscles adapted for leaping, have the thigh not only thick but generally elongated; as in the *Gryllus* and *Locusta* tribes, the *Pulices* or fleas, &c. And in the *Aphodius*, *Geotrupes*, &c. (*Scarabæi* Linn.), and also the mole cricket, (all which burrow in the earth,) the thigh is moved with much force, and has an articulated surface corresponding to the flat part of the coxa on which it rests. This part is sometimes spinous.

TIBIA, or *Shank*, is the third joint of the legs, and moves in an angle according to the direction of the thighs. The figure of this part depends essentially on the uses to which the habits of the insect require it to be applied: in the natatorial kinds it is usually flat and ciliated—at least the *tibia* of the posterior pair; and in many others, as in a variety of the burrowing kinds of beetles, it is serrated. The shank is more frequently serrated or spinous than the thighs.

The TARSUS, or *Foot*, is the fourth joint or last portion of the leg except the claw. This part consists in general of five joints: this is usually the number in the *Coleoptera*, *Hymenoptera*, and *Diptera*. In some of these, however, and also in the *Hemiptera*, there are only four

articulations in this part of the leg, as we observe in *Cerambyx*, *Gryllus*, and others: in *Libellula*, *Forficula*, &c. three: in the anterior feet of *Nepa* only one. The figure of the tarsus is more variable than any other portion of the leg, and is in a most singular manner adapted to the insect's mode of life. The articulations in such as walk on the surface of the earth are slender; those which burrow have them more robust. Many of those which inhabit waters have them flat and ciliated at the edges, as in the *Hydrous*. Others are furnished with bristly tufts or vascular fleshy tubercles, which enable them to move with security on smooth and slippery bodies in any direction: an admirable example presents itself in the common house-fly, which "treads the ceiling, an inverted floor," with the same facility that other insects walk on the surface of the ground. An occasional difference in the number and form of the joints of the tarsus is sometimes observed in the two sexes of the same species. The motion of each joint of the tarsus is performed in a single plane, and is directed by two muscles in each joint, one of which is small and placed on the dorsal surface, the other larger and situated beneath.

UNGUIS, or *Claw*, the termination of the tarsus. In the greater number of insects there are two claws attached to each tarsus: some have only one; and in others furnished with two there is an intermediate process, forming by this means three. An appearance similar to this is seen in the legs of the *Lucanus*; but this on minute examination is found to be a distinct joint also, armed with a pair of claws precisely resembling those which more obviously, from their size, appear to terminate the tarsi. It is considerably smaller, but is perfectly well defined.

ALÆ, or *Wings*: the organs appropriated to flight. These are either two or four, and are attached to the lateral part of the breast close to the lower margin of the thorax. They are placed to an equal amount and in a corresponding situation on both sides of the insect, whether the number be two or four. Those insects which are furnished with only one pair of wings have in these organs both an uniform appearance and size. Such as have two pair most frequently differ, the first being larger than those behind: there is also a difference in shape, and very commonly a considerable variation in the spots, markings, and other particulars, notwithstanding the prevailing hues in all the wings may be the same. In general the posterior pair is paler, and the marks obscure.

A skeleton of nervures, (which are considered in the light of bones by Dr. Leach, who has named them *Pterigostia* or *Wing-bones*, and are parts more or less numerous and differing exceedingly in disposition,) placed between two thin and closely united membranes, constitutes the true wing in insects. This conformation is very

clearly exemplified in that description of wings which is usually termed transparent, as in the common house-fly and the bee. The true wing, by means of which the insect is enabled to fly, is always constructed in this manner, whatever may be its appearance externally, arising from a superficial covering of down, feathers, hair, or any other cause. The variety in the form and structure of the wings, in the number, figure, and disposition of the nervures, or the colours with which they are adorned, is infinite. The diversity in the disposition of the nervure is evident from a comparison of the simply constructed wing of the common house-fly with the complex wing of the *Panorpa* or the *Ephemera*, or the wings of an earwig, which consists of a series of single nervure, with the elaborately wrought lattice-work of the wing of the *Libellula*. The whole of the lepidopterous order exhibit the superficial coating of feathers, down, or hairs; and upon the removal of these the wings are found constructed in the same manner as the transparent wings of the other orders. A variation in the form of the wing as well as its texture is manifest throughout all insects of the winged kind. Those of the *Coleoptera* have two membranaceous wings, which fold upon each other, forming a plait or double at their external margin, which fold is accommodated by a peculiar joint in the main rib of the wing, and the disposition of the nervures in the middle of the wing contiguous. In the *Hemiptera* the wings generally fold longitudinally, without any transverse double; so that in expansion these parts open somewhat like a fan. The anterior wings of the *Lepidoptera* are neither doubled across nor folded longitudinally; they are entirely flat, and are but little capable of contraction and dilatation. In the genus *Papilio* they are endowed with the power of erection, which is rarely the case in the *Phalana*, though occasionally observed among the *Sphinxes*; the *Phalana* have the lower wings concealed under the anterior pair, the latter being laid in a flat position over them. The wings of the *Lepidoptera* are downy, and often decorated with very beautiful colours disposed in the most pleasing and varied manner. The *Neuroptera* in general have the wings flat; this is not invariable; they are constantly membranaceous, and reticulated with nervures. In the *Hymenoptera* the wings are membranaceous, generally flat, but sometimes folded when the insect settles, as in the wasp genus. The *Dipterous* order cannot be confounded with the preceding, as they have only two wings: they are membranaceous as in the former.

In all insects of the winged kind these organs present the greatest diversity, and afford characters both for genera and species less liable to fluctuation than common observers would conceive. The number, figure, construction, proportion, consistence, and texture of the wings have enabled naturalists to distribute insects into principal groups with considerable precision. Linné derived much assistance from an

attention to these parts; later writers have in many instances regarded them more closely; and in the further progress of the science these parts will be consulted with still greater advantage.

ELYTRA, or *Wing-cases*, appertain to the coleopterous order. These are two in number, of a substance resembling leather; for the most part moveable, and opening by a longitudinal suture along the middle of the back. These wing-cases or sheaths are often confounded with the wings; but they are really not wings from their structure or substance, nor do they answer the purpose of flight; they merely open to afford the true wing, concealed beneath, the power of expansion and motion, and close down upon the wing when the insect is at rest, to preserve it from injury. Some *Coleoptera* have the elytra united.

The superior surface of the elytra is more or less convex, and the lower surface correspondently concave: the texture in some, as in many of the *Curculiones* and *Cerambyces*, is so hard that it is pierced with difficulty by means of a strong pin; in others so flexible that they spring into their proper form immediately after being bent double. The proportions of the elytra compared with the body are various; their form dissimilar; and the diversity of their surface—arising from dots raised or depressed, protuberances, flutings, colours, and other circumstances—endless. These differences in the elytra furnish some excellent generic distinctions, and are still more extensively useful in constituting the characters of species.

HALTERES, *Poisers*, or balancers: appendages peculiar to insects of the dipterous order, and which, with sufficient reason, are deemed an essential character of that group. These poisers are two short, moveable, clavated filaments, placed one contiguous to the origin of each wing. They seldom exceed one-tenth the length of the wing, though in certain genera they are rather longer. The capital, or head, in which the filament terminates, is either roundish, oval, truncated at the end, or compressed at the sides: in some insects its situation is directly under a small, arched, filmy scale, which also varies in size and form; and in several families is apparently wanting.

The exact purpose to which nature has destined these organs has not been hitherto ascertained in a very satisfactory manner. The most prevalent, and perhaps in some measure the most consistent, opinion seems to be, that they balance or counterpoise with the action of the wings, when the insect is in flight, in the same manner as ropedancers exercise a pole to preserve their equilibrium. The diminutiveness of their size is a plausible objection to this idea. Others consider these as the organs of that vibratory sound which dipterous insects emit in flight: they compare the filmy scale to a kind of tambour, and liken the balancer to a drum-stick, which striking repeatedly upon it, they conceive, must occasion this noise. It is apprehended the sound they emit in flight cannot be traced to this cause; for the best of all possible

reasons, that this buzzing sound is observable in a vast number of insects which have no poisers or balancers, such as wasps and bees. The two genera *Asilus* and *Bombylius* have no scale, and yet the noise perceptible in their flight is louder than in most of those which have both scale and poisers, as in the *Musca*. Nor does this noise issue from the poiser, either by striking on the scale or by any other means, since it is known that if the poisers, or both poisers and scales, be cut off, the same sound continues to be heard from the mutilated insects as before.

There are many terms at present in use, to discriminate with greater precision the parts I have here described, and which should be understood by the student in entomology. I have thought it therefore best to insert them in alphabetical order at the end of the work.

THE ECONOMY OF INSECTS.

Most animals retain during life the form which they receive at their birth. Insects are distinguished from these by the wonderful changes they undergo. The existence of an insect partakes of two, three, or four distinct states; and in each of these differs most essentially in appearance, organization, and manners of living.

The changes through which the greater number of insects pass are, from the Egg to the Larva, from the Larva to the Pupa, and from the Pupa to the Imago or perfect state. Exceptions occur to this: for some insects are viviparous; but the number of these is not considerable.

Of the EGG state. The egg, containing the insect in its smallest size, is expelled from the ovary as in other oviparous animals. They are contained and arranged in the body of the insect, in vessels which vary in number and figure in different species. The same variety is found in the eggs: some are round, others oval, and some cylindrical. The shells of some are hard and smooth, while others are soft and flexible.

The eggs of insects are of various colours: some are found of almost every shade of yellow, green, and brown, a few are red, and others black. Green and greenish are not unusual, and they are sometimes speckled with darker colours, like those of birds. Some are smooth, and others beset in a pleasing manner with raised dots.

Insects are instructed by nature to deposit their eggs in situations where their young ones will find the nourishment most convenient for them. Some deposit their eggs in the oak-leaf, producing there the red gall; others choose the leaf of the poplar, which swells into a red bladder: and to a similar cause may be assigned the knob which is often seen on the leaf of the willow. The *Lasiocampa neustrii* glues its eggs

with great symmetry in rings round the smaller twigs of trees; others affix them to the surface of leaves; and again, others lodge them in the crevices of trees.

The *Ephemera*, *Phryganea*, *Libellula*, and Gnat, hover over the water all the day to drop their eggs: these hatch in the water, and continue there while in the larva and pupa form, quitting the water only when they attain the winged state. The mass formed by the eggs of the gnat resembles a little vessel, and floats on the surface. This insect is said to deposit only one egg at a time; the first is retained by means of the legs, when dropped, till a second is deposited next to it, then a third, fourth, and further number, till the mass becomes capable, from its symmetry, to support itself upright. Many moths cover their eggs with a thick bed of hair or down, collected from their own body; others cover them with a glutinous substance, which when hard protects them from the ill effects of moisture, rain, and cold. The solitary bees and wasps prepare nests in the earth, hollow trees, or cavities in old walls, wherein they place a quantity of food for the support of the young brood when they break from the egg. The ants are known to construct nests in the earth, in which their eggs are placed with the utmost care. Some deposit their eggs in the larva of other insects, chiefly those of the moth and butterfly kind; and having passed through all their changes in their bodies, become what is termed the ichneumon-fly. The *Gasterophilus Equi* (bot-fly) deposits its eggs on the bodies of horses in the following remarkable manner. When the female has been impregnated, and the eggs sufficiently matured, she seeks among the horses a subject for her purpose; and approaching him on the wing, she carries her body nearly upright in the air, and her tail, which is lengthened for the purpose, curved inwards and upwards: in this way she approaches the part where she designs to deposit the egg; and suspending herself for a few seconds before it, suddenly darts upon it, and leaves the egg adhering to the hair; she hardly appears to settle, but merely touches the hair with the egg held out on the projected point of the abdomen. The egg is made to adhere by means of a glutinous liquor secreted with it. She then leaves the horse at a small distance and prepares a second egg, and, poising herself before the part, deposits it in the same way. The liquor dries, and the egg becomes firmly glued to the hair; this is repeated by these flies till four or five hundred eggs are sometimes placed on one horse.

The inside of the knee is the part on which these flies are most fond of depositing their eggs, and next to this on the side and back part of the shoulder, and less frequently on the extreme ends of the mane. But it is a fact worthy of attention, that the fly does not place them promiscuously about the body, but constantly on those parts which are most likely to be licked with the tongue; and the ova, therefore, are always scrupulously placed within its reach.

Of the LARVA, or *Caterpillar* state. All caterpillars are hatched from the egg, and when they first proceed from it are generally small and feeble, but grow in strength as they increase in size. The body of the caterpillar consists of twelve rings; the head is connected with the first, and is hard and crustaceous. No caterpillar of the moth or butterfly has less than eight, or more than sixteen, feet; those which have more than sixteen belong to some other order of insects. The six anterior feet, or those next the head, are hard and scaly, pointed and fixed to the first three rings of the body, and are in number and texture the same in all Lepidopterous larvæ. The posterior feet are soft, flexible, or membranaceous; they vary both in figure and number, and are observable only in the caterpillar state, the perfect insect having only six feet, the rudiments of which are the six anterior scaly feet before mentioned. These spurious feet are either smooth or hairy, soft to the touch, or hard like shagreen. On each side of the body are nine small oval apertures, which are the spiracles or organs of respiration.

The caterpillar, whose life is one continued succession of changes, often moults its skin before it attains its full growth. These changes are the more singular, because when it moults it is not simply the skin that is changed; for we find in the exuvizæ the jaws, and all the exterior parts, both scaly and membranaceous.

The change in the caterpillar is effected by the creature's withdrawing itself from the outer skin as from a sheath, when it finds itself incommoded from being confined within a narrow compass. But to accomplish this change is the work of some labour and time. Those caterpillars which live in society, and have a nest or habitation, retire there to change their skin, fixing the hooks of the feet, during the operation, firmly in the web of their nest. Some of the solitary species spin at this time a slender web, to which they affix themselves. A day or two before the critical moment approaches, the insect ceases to eat, and loses its usual activity; in proportion as the time of its change approaches, the colour of the caterpillar declines in vigour, the skin hardens and becomes withered, and is soon incapable of receiving those circulating juices by which it was heretofore nourished and supported. The insect is now seen at intervals with its back elevated, or with the body stretched to the utmost extent: sometimes raising its head, moving it from one side to another, and then letting it fall again. Near the change the second and third rings are seen considerably swollen. By these internal efforts the old parts are stretched and distended as much as possible, an operation attended with difficulty, as the new parts are all weak and tender. However, by repeated exertions, all the vessels which conveyed nourishment to the exterior skin are disengaged, and cease to act, and a slit is made on the back, generally beginning at the second or third ring. The new skin may now be just perceived, being distinguished by its freshness and brightness of colour. The caterpillar then

presses the body like a wedge into this opening, by which means it is soon torn down from the first to the fourth ring: this renders it large enough for the caterpillar to pass through.

The caterpillar generally fasts a whole day after each moulting; for it is necessary that the parts should acquire a certain degree of consistency before its organs can perform their ordinary functions. Many perish under this operation. The caterpillar always appears much larger after it has quitted the exuviae than before; for the body had grown under the old skin till it had become too large for it, and the parts being soft they were much compressed; but as soon as this skin is cast off, the parts distend, and with them the new skin, which is yet of a flexible and tender texture, so that their increase in size at each moulting is considerable. Some caterpillars in changing their skin alter very much in colour and appearance; sometimes the skin from being smooth becomes covered with hair, spines, or tubercles; and others that are in one stage hairy, have the skin smooth in the next. No sex is developed in the caterpillar state.

Of the PUPA state. By this term, as understood in the very extensive sense Linné proposes, is signified that state of an insect which succeeds the larva, without any regard to the particular appearance it assumes in this stage of transformation. From this latitude of meaning it includes therefore, with equal precision and no less propriety, states of the most discordant character. It alike implies the uncouth grub incased in its shelly repository and immured in the earth, sluggish, almost destitute of motion or the appearance of any animal function, with the lively half-winged locust, or the *Cicada*, animals sporting in the full enjoyment of life. The bot imprisoned in its oval covering, without the least external sign of animation, is termed a *pupa*. The moth, quiescent and absent for months, concealed in its shelly covering in the earth, or suspended aloft in its silky envelope to the branch of a tree, is a *pupa*; and we denominate those *pupa* also which have the wings only half expanded; though, like the nimble-footed *Cimex*, they are perpetually roving, and deriving sustenance from the blood of other animals; and so also the restless *Libellula*, which is continually traversing the watery element with the facility of fishes in search of prey. Modern writers have therefore considered this state as essential in the formation of Orders, and have even laid down certain rules, which taken in conjunction with the characters of the perfect insect, are often of great use in ascertaining the order to which any genus belongs. In my account of the Larva I have given that of the lepidopterous order, and shall therefore describe the Pupa of the same.

The length of time an insect remains in this form varies much in different species. As soon as the inclosed animal acquires sufficient strength to break the bonds of its confinement, it makes a powerful effort to escape.

The opening through which they pass is always at the same part of the skin, a little above the trunk, between the wings and a small piece which covers the head: different fissures are generally made in the same direction. When the operation begins, there seems to be a violent agitation in the humours contained in the little animal; the fluids being driven with rapidity through all the vessels, the limbs and various parts of the body are put in motion, and by repeated efforts it breaks through the brittle skin that envelopes it. Those inclosed in cones or cases, after bursting through the pupa covering, have another difficulty to overcome, that of piercing through the inclosure, which in many instances is of a stronger texture than the case of the pupa. For the accomplishment of this, most insects are provided with a liquor, which they discharge from the mouth upon that part of the cone through which they intend to escape; and this so moistens and weakens it, that after a short time they force their passage through with some facility. Some insects not provided with this fluid leave one end of their cone weaker than the rest, and close it only with a few threads, so that a slight effort of the head enables the insect to burst from its prison.

The butterfly or moth on emerging from the pupa is moist, the abdomen swollen, the antennæ bent down, and the wings crumpled, small, and shapeless. These parts are gradually unfolded, and assume their destined form. The wings, which at one instant are small and like four little buds at the sides of the thorax, in a few minutes after acquire their full size; and the fibres, which were at first flexible, become hard and rigid like bone. In proportion as the fibres lose their flexibility, the fluids which circulate within them extend, and the wings cease to act; so that, if any extraneous circumstance arrests the progress of this fluid through the fibres at the first instant of the moth's escape, the wings immediately become crippled, and never afterwards assume any other form. Most insects, soon after they have attained their perfect state, void an excrementitious substance, which in some places, where the insects were abundant, has produced reports of showers of blood.

Of the IMAGO or *Perfect State*. As the present work is not intended to enter into all the particulars relative to the *habitations, food, modes of life, &c.* I must refer the student to *Messrs. Kirby and Spence's* popular *Introduction*, in which much information on these points will be found collected together.

OBSERVATIONS
ON THE DIFFERENT SYSTEMS OF
ENTOMOLOGY.

THE simplicity of the arrangement adopted by Linné, the celebrity of his name, and the princely patronage under which he wrote, conspired with other favourable circumstances to render this science more universally cultivated, admired, and respected about his time, than it had probably been at any former period. The credit due to this naturalist for his labours in entomology is great. This must be allowed. But let us also remember, that he is not alone entitled to our commendation for the arrangement proposed in his work. We must in candour acknowledge the merits of many among his predecessors, who wrote under circumstances of less encouragement, and have nevertheless excelled in this science; men to whom the writings of Linné stand in a very high degree indebted, and without the aid of which it is impossible to imagine the system, which now commands our admiration, could have been produced, at least in its present state of purity.

In the works of Aristotle and Pliny, in those of Agricola, Aldrovandus, Franzius, Mouffet, Swammerdam, Ray, Willughby, Lister, Vallisneri, and various others, we distinctly perceive, with some occasional variation, the outline of the superstructure raised in the "SYSTEMA NATURÆ."

These valuable sources of information furnished him with abundant materials, which he selected with profound judgement, and interwove with ability, industry, and success. Linné was in this respect commendable: he did not suffer his mind to swerve on this occasion, from any ambitious or innovating motives; and so far as he deemed it consistent with his plan, he appears to have adhered to the examples of his predecessors. The characters of his *Ordines* are to be found in several publications earlier than his own, and so likewise are most of his *Genera*, and the far greater number of his *Species*. But these he remoulded throughout with so much skill, that this "Systema" constitutes the central point in which the scattered rays of natural science are concentrated with more precision than they really appear in the original authors to whose industry he stands indebted. It was in the concise and very expressive style which Linné

adopts in all his works, and which was almost peculiar to himself, that he excelled.

The following are the definitions of the several Orders established by this eminent naturalist.

Order I. COLEOPTERA (derived from the Greek words for a *sheath* and a *wing*) comprise those insects which have crustaceous elytra or shells, which shut together and form a longitudinal suture down the back, as in *beetles*.

Order II. HEMIPTERA (from *half* and a *wing*). Insects having their upper wings half crustaceous and half membranaceous, not divided by a longitudinal suture, but incumbent on each other, as in *grasshoppers*, &c.

Order III. LEPIDOPTERA (from a *scale* and a *wing*). Insects with four wings covered with fine scales in the form of powder or meal, as in the *butterfly* and *moth*.

Order IV. NEUROPTERA (from a *nerve* and a *wing*). In this order the wings are four; membranaceous, transparent, and naked, reticulated with veins or nerves; the tail is without a sting, as in the *Libellula* or *Dragon-fly*.

Order V. HYMENOPTERA (from a *membrane* and a *wing*). The insects of this order have also four wings, and the tail furnished with a sting for various purposes, as in *wasps*, *bees*, &c.

Order VI. DIPTERA (from *two* and a *wing*). Those insects with two wings only, and poisers or balancers, as in the common *Housc-fly*.

Order VII. APTERA (from *without* and a *wing*). In this order Linné placed the spider, crab, scorpions, &c. As these are now universally rejected from insects, and referred to a class named *Crustacea*, I shall hereafter speak of them when mentioning the system proposed by Dr. Leach.

Fabricius distributes all insects into thirteen Classes, the characters of which are as follow:

Class I. ELEUTHERATA. *Jaws* bare, free, and bearing feelers.

Class II. ULONATA. *Jaws* covered by an obtuse mouth-piece.

Class III. SYNISTATA. *Jaws* elbowed near the base, and connected to the lower lip.

Class IV. PIEZATA. *Jaws* horny, compressed, and usually elongated.

Class V. ODONATA. *Jaws* horny, dentated; *palpi* two.

Class VI. MITOSATA. *Jaws* horny, vaulted; no *palpi*.

Class VII. UNOGATA. *Jaws* horny, unguiculated.

Class VIII. POLYGONATA. *Jaws* several (usually two), within the lip.

Class IX. KLEISTAGNATHA. *Jaws* several outside the lip.

Class X. EXOCHNATA. *Jaws* several, outside the lip, and covered by the *palpi*.

Class XI. GLOSSATA. *Mouth* composed of a spiral tongue, situated between two *palpi*.

Class XII. RHYNQOTA. *Mouth* composed of a beak or articulated sheath.

Class XIII. ANTLIATA. *Mouth* composed of a sucker, not articulated.

In the Edinburgh Encyclopædia, edited by Dr. Brewster, several valuable papers have appeared from the pen of that excellent and distinguished naturalist, Dr. W. E. Leach, the present Zoologist to the British Museum. The well-known abilities of this gentleman, his sound judgement, his great caution, and extensive correspondence with the most distinguished naturalists of Europe, will, I trust, fully justify me in adopting his system in the present work, as there is no doubt that when it is duly studied it will be universally followed: yet I must confess much still remains incomplete, and many errors no doubt will require future correction. An observation of Mr. Kirby I shall here quote, as it is valuable, and should be strongly impressed upon the mind of every naturalist, and must fully convince every liberal-minded entomologist how far the system proposed by Dr. Leach is consonant to the views of one of the first of entomologists.

“An account of any genus, perfect and elaborate in all its parts, must be the work of him who is versed in the history and œconomy of every individual that belongs to it; he, and he only can go upon sure grounds, for no other person can in all cases with certainty distinguish the species from the variety, and unite each sex to its legitimate partner. But so much knowledge, even with respect to a single genus where the species are numerous, is not to be expected from one man: nor should the naturalist attempt, like the spider, to weave his web from materials derived solely from within himself; but rather let him copy the industrious bee, and draw genuine treasures from those flowers of science which have been reared by other hands, and combining these with his own discoveries let him endeavour to concentrate all in one harmonious system, with parts curiously formed, arranged, and adapted to each other, and to the whole; and calculated to preserve the sweets of true wisdom pure and unsophisticated.”

It would appear that the system of Dr. Leach, or at least the numerous genera into which it is divided, has not met with the approbation of every entomologist; since the Doctor in his *Zoological Miscellany*, vol. 3, in an account of two species of the Fabrician genus *Geotrupes*, has made the following observation: “I am a warm advocate for generic divisions (founded on the consideration of every character), being fully satisfied that such exist in nature, and, when distinguished with judgement, tend materially to the advancement of science. Those entomologists of the Linnæan school, who, by dilating the characters either of their genera or species so as to admit of almost any thing, bend nature to the artificial system of their master, would do well to consider whether they do not show greater veneration for it than for nature, and not upbraid those who hold a different opinion from themselves.”

In the present work, the genera of Linné are given, not with a wish

that the student should confine himself to that system, but merely to introduce him to a knowledge of the Families, for in this term the genera of Linné may certainly be applied in most cases, and which every entomologist will readily admit. Mr. Spence has observed, in his excellent Monograph of the Genus *CHOLEVA* in the XIth vol. of the *Transactions of the Linnaean Society*: "It is contrary both to analogy and experience to suppose the Creator has formed fewer of those groupes into which we divide the vast tribes of nature by the name of genera in one department than in another. Now in Botany, in which not more than about 20,000 species have been described, we have upwards of 2000 genera. In Entomology at least as many species are already described; and when we combine the circumstances, that in Britain not fewer than 8000 species of insects are to be found, while we have about 3000 plants; and these are probably not one half of the European insects, while we know that every other quarter of the globe is still more prolific in species wholly different; and lastly, that every kind of plant probably affords nutriment on the average to three or four species of insects, there can be little doubt that the insect is vastly more populous than the vegetable world. Is it likely then that the number of genera should be much fewer than in botany; or at any rate that it should not very greatly exceed its present amount? We need not fear that the science will be rendered more difficult by an augmentation of its genera. This cannot happen, if a proper system be adopted. If two or three insects, or even a single one, be strikingly characterized by peculiarity of habit, they certainly ought in any system to be distinguished at least as sections of the genera under which they are placed. And will it increase the difficulty of investigation if they be established as genera upon the same characters, and distinguished by a name? Clearly not. On the contrary, the science can be effectually promoted in no other way; for names have an important influence upon the clearness of our ideas, and it will be impossible for us ever to gain correct views of the philosophy of our science while genera essentially distinct are jumbled together under one title.

"Entomology, therefore, is under the greatest obligations to Illiger in Germany, Latreille in France," (Kirby, Leach, and Spence in England); "who having had the good sense to reject the useless while they retain the valuable parts of the Fabrician system, are labouring, by the institution of new genera built upon firm and intelligible characters, to extricate the science from the chaos into which that author has unwittingly reduced it. Fabricius's system has now had a fair trial of upwards of thirty years, and it was at one time universally followed on the continent; yet so far is experience from having confirmed the assertion of its author, that the Linnaean system is only calculated to introduce confusion into the science, that the very system professing to dissipate that confusion is even now fast sinking into oblivion, while

the Linnæan orders and generic characters, with such improvements as reason and analogy suggest, and as Linné himself would have approved, are reverted to by the most acute and learned entomologists of the age."

ORDERS AND GENERA OF LINNÉ.

Order I. COLEOPTERA.

The insects of this Order form a very natural division. They have hard cases to their wings, with a longitudinal suture; these in some are united, and therefore such insects can have no wings; but the wings in most are two. The mouth in general is furnished with *two, four, and sometimes six palpi, two mandibles, and two maxilla*; the *mouth* is covered above with the clypeus, and closed below with the lips: they have all six feet in their perfect state; in the antennæ there is the greatest diversity of shape and form, in this system the principal character of the genera: they have a hard horny skin; on each side they have nine spiracula, one on the thorax, and eight on the abdomen. The females lay their eggs in the earth, dung, plants, wood, &c. and from these proceed the larvæ.

The larvæ have six feet near the head, which differs in form and size in the different genera; jaws at the mouth; two eyes; often short antennæ; and on each side nine spiracula. Those that feed on plants and their roots move but slowly; those which live on dead animals are more active; others, as the *Carabidæ, Dyticidæ, and Staphylinidæ*, which feed on living animals, are very rapid in their motions. The larvæ state, during which insects change their skins, endures in most species for a year; in the larger species longer, sometimes three or four years. When the larva arrives at its appointed time, it draws itself together, and changes for the most part into a *pupa incompleta*, which, sometimes below the earth or in rotten wood, reposes for several weeks or months. Afterwards the skin of the pupa bursts, and the perfect insect appears. It is now fit for the propagation of its species.

Genus 1. SCARABÆUS.

Antenna clavated; the *club* lamellated (*Pl. 1. fig. 1. a.*): *palpi* four: *mandibles* horny, in general without teeth: the *tibia* or second joint of the foremost pair of feet generally dentated.

Species 1. *Sc. Typhaeus*. Three horns on the thorax, the middle one the smallest; the other two extending forwards and of the same length with the head, which has no horns. (*Pl. 1. fig. 1.*)

Inhabits Europe.

This species burrows in cow-dung and under the earth, digging deep holes; and is found plentiful on heaths and commons during April and May. Mr. Marsham in his *Entomologia Britannica* has described 80 species of *Scarabæi* found in this country.

Genus 2. LUCANUS.

Antennæ clavated; *club* perfoliate: *maxillæ* prominent and dentated: *body* oblong: *anterior tibiæ* dentated.

Sp. 1. *L. Cervus*, the Stag-beetle. With a scutellum; the *maxillæ* projecting, bifurcated at the apex, with many teeth on the internal edge. (*Pl. 1. fig. 3.*)

This is the largest of the British *Coleoptera*; the larva is white, and lives on putrid wood, particularly oak; its head and feet are of a rust colour. The perfect insect varies in size and colour; in general it is dark brown or blackish; the jaws are very large, about one third of the length of the whole insect, and have a distant resemblance to the horns of a stag; Mr. Marsham's *inermis* is only the female of this species.

Sp. 2. *L. parallelipedus* is considerably smaller, and may be obtained in June and July in the neighbourhood of willows.

Obs. *L. caraboides* has not yet occurred in Britain, at least no British specimen is known.

Genus 3. DERMESTES.

Antennæ clavated; the *club* perfoliated (*Pl. 1. fig. 4. a.*); the three terminating articulations larger than the rest: *thorax* convex, with scarcely any margin: *head* inflected, and partly hid under the thorax. The larvæ of the insects of this genus feed on decayed animal substances, and are exceedingly injurious to the meat in larders, skins, furs, and books.

Sp. 1. *D. murinus*. Oblong; downy clouded with black and white; abdomen covered with fine white down or hair.

Inhabits Europe; and may frequently be found in the dead moles hung up on the hedges by countrymen. (*Pl. 1. fig. 4.*)

Sp. 2. *D. Scolytus*. Elytra truncate, blackish and striate: abdomen re-tuse: front downy and of an ash colour. (*Pl. 1. fig. 5.*)

The insects of this genus are very prolific; both the larvæ and perfect insect eat the roots and wood of trees, and are sometimes very destructive to woods. The following account, from Mr. Kirby's Introduction to Entomology, of *Bostrichus Typographus* Fabr., will further illustrate the habits and manners of this genus: "This insect in its preparatory state feeds upon the soft inner bark only: but it attacks this important part in such vast numbers, 80,000 being sometimes found in a single

tree, that it is infinitely more noxious than any of those that bore into the wood: and such is its vitality, that though the bark be battered and the trees plunged into water or laid upon the ice or snow, it remains alive and unhurt. The leaves of the trees infested by these insects first become yellow; the trees themselves then die at the top, and soon entirely perish. Their ravages have long been known in Germany under the name of *Wurm trökniss* (decay caused by worms); and in the old liturgies of that country the animal itself is formally mentioned under its vulgar appellation of 'The Turk.' This pest was particularly prevalent and caused incalculable mischief about the year 1665. In the beginning of the last century it again showed itself in the Hartz forests;—it reappeared in 1757, redoubled its injuries in 1769, and arrived at its height in 1783, when the number of trees destroyed by it in the above forests alone was calculated at a million and a half, and the inhabitants were threatened with a total suspension of the working of their mines, and consequent ruin. At this period these *Bostrichi* were arrived at their perfect state, and migrated in swarms like bees in Suabia and Franconia. At length, between the years 1784 and 1789, in consequence of a succession of cold and moist seasons, the numbers of this scourge were sensibly diminished. It appeared again however in 1790, and so late as 1796 there was great reason to fear for the few fir-trees that were left."

Genus 4. PTINUS.

Antennæ filiform (*Pl. 1. fig. 6. a.*); the last articulations the largest: *thorax* nearly round, not margined, receiving the head under it.

Sp. 1. *Pt. imperialis*. Brown: *thorax* subcarinate: *elytra* elegantly varied with white hair. (*Pl. 1. fig. 6.*)

Inhabits Europe, in decayed trees.

Genus 5. HISTER.

Antennæ clavated (*Pl. 2. fig. 1. a.*); the *club* solid; the lowest *articulation* compressed and bent: *head* retractile within the body: *elytra* shorter than the body: the *fore-tibiae* dentated.

The insects of this genus are generally found in dung, in spring, summer, and a great part of the year. Like the *Dermestides* and *Byrrhi*, they contract their antennæ and legs when touched, and counterfeit death.

Sp. 1. *Hist. semipunctatus*. Brassy-black, polished: shells obliquely striate at the base. (*Pl. 2. fig. 1.*)

Inhabits dung, and is very common in this country.

Genus 6. GYRINUS.

Antennæ cylindrical, and very short (*Pl. 2. fig. 2. a.*): *marilla* horny and very acute: *eyes* divide, so as to appear as four: the *four hinder feet* compressed, and formed for swimming. (*Pl. 2. fig. 2. b.*)

Sp. 1. *Gyr. Natator*. Oval: elytra with punctured striæ: the inflected margin testaceous. (*Pl. 2. fig. 2.*)

Inhabits stagnant waters, running swiftly in circles on the surface, and when it dives carrying along with it a bubble of air which appears like quicksilver. These insects live in society, and often in their brisk motions strike against one another. In the evenings they betake themselves to still places under bridges, or under the roots of trees which grow at the water's edge.

Genus 7. BYRRHUS.

Antennæ a little shorter than the thorax, with the four or five terminal joints gradually thicker, compressed (*Pl. 2. fig. 3. a.*): *palpi* short, the last joint longest; thick, somewhat ovate: *body* somewhat ovate, very convex above: *scutellum* minute.

When touched, they apply their antennæ and feet so close to the body, remaining at the same time motionless, that they resemble a seed more than an animated being. They are found in sand-pits and roadways in the spring months, and are very common.

Sp. 1. *Byr. Pilula*. Brown; the elytra with black interrupted striæ. (*Pl. 2. fig. 3.*)

Genus 8. ANTHRENUS, Fabricius.

Antennæ shorter than the thorax, with the club solid (*Pl. 2. fig. 4. a.*): *palpi* filiform, short: *body* orbiculate, ovate: *scutellum* very minute: *maxillæ* and *lip* bifid.

These insects are found on flowers; they are small, but in general prettily coloured. They contract on the appearance of danger, and appear as if dead. Their larvæ are found in carcasses, skins, and dried animal substances. They pass nearly a year in that state before changing into a pupa; the perfect insects are found chiefly in spring.

Sp. 1. *Anth. Scrophulariæ*. Black; sides of the thorax and three transverse bands on the elytra, grey; suture and external margin of the elytra and hinder margin of the thorax, red-lutescent. (*Pl. 2. fig. 4.*)

Genus 9. SILPHA.

Antennæ gradually thickening towards their extremities (*Pl. 2. fig. 7. a.*), or terminated by a solid or perfoliated club (*fig. 6. a.*): *elytra* covering the greater portion of the abdomen and marginated: *head* projecting: *thorax* flattish and margined: *body* oval or parallelopiped.

The *Silphæ* feed on dead carcasses and the excrements of animals; they have generally a fetid smell, and when taken they discharge by the mouth or the anus a drop of black liquor of a very disgusting odour; this liquor serves to accelerate the putrefaction of the matters on which they feed. The larvæ live in the earth in dung-hills and dead carcasses; they have six short feet; the head is small, armed with strong jaws; they undergo their transformations underground.

Sp. 1. *Silpha Vespillo*. (Pl. 2. fig. 6.) Oblong and black: the clypeus orbicular and unequal: the elytra marked with two ferruginous fasciæ.

This species is subject to great variety in size. It is infested with *Acari*; it flies very swiftly with its elytra erect. The elytra are shorter than the abdomen. It feeds on carrion, and a small dead animal is soon visited by a number of this species, which join in burying it after they have deposited their eggs in its body. Thus a mole or a mouse is often buried by the industry of four or five of them in the space of four-and-twenty hours. They scoop out the earth all round and below the animal, which gradually sinks down; and while the agents are invisible, we see the effect by the disappearance of the cartase.

Sp. 2. *Silpha quadripunctata*. (Pl. 2. fig. 7.) Black: elytra and thorax yellow, with two black spots on each elytron: head, antennæ and legs black.

Found at the roots of oak trees in the winter, and in the foliage in the months of May, June, and July.

Genus 10. NITIDULA, Fabr.

Antennæ clavated: the club solid: *elytra* marginated: *head* prominent: *thorax* flattish and marginated.

In the former editions of the *Systema Nature* the insects of this genus were included in the genus *Silpha*, the habits of which they greatly resemble, being found in decayed animal substances, under the bark of trees, bones, &c.

Sp. 1. *Nit. discoidea*. Black: the thorax marginated: the disk of the elytra ferruginous: length $1\frac{1}{2}$ lin. (Pl. 2. fig. 5.)

The species of this genus are numerous, subject to great variety, and require a minute examination.

Genus 11. OPATRUM, Fabr.

Antennæ moniliform, growing thicker at the end: *elytra* marginated: *head* prominent: *thorax* flattish and marginated.

The insects of this genus are found in sandy situations in May, June, and July.—They were arranged with the *Silphæ* by Linné.

Sp. 1. *Opat. sabulosum*. Brown: thorax emarginate: elytra dentated, with three elevated lines. (Pl. 2. fig. 3. a. antennæ magnified.)

Genus 12. TRITOMA, Fabr.

Antennæ clavated: club perfoliated (Pl. 2. fig. 9. a.): *lip* emarginate: *anterior palpi* securiform: *body* much elevated: *thorax* flat.

Of this genus we have but one species at present known in this country, which inhabits fungi: I once took them in profusion at Coombe Wood in the month of March.

Sp. 1. *Trit. bipustulatum*. Black: the elytra with a scarlet spot on the shoulder, in which is a small black dot. (Pl. 2. fig. 9.)

Genus 13. CASSIDA.

Antenna moniliform: *thorax* and *elytra* margined: *head* concealed under the thorax: *body* above gibbous, beneath flat and margined.

Of this genus we have several species, some of which are very brilliant in colours, which disappear when the insect dies, but are said to revive when put in warm water.

The larvæ of these insects are found under the leaves of the plants on which they feed: by means of the lateral spines and bristle at the end of the tail they form a kind of parasol with their own excrements to shelter themselves from the sun and rain, and probably to screen themselves from their enemies.

Sp. 1. *Cass. maculata*. The *elytra* vary in colour, the young state of the insect being green, and as it advances in age gradually approaching to red spotted with black: black on the under side. *C. murrea* of Marsham is only a variety of this. (*Pl. 2. fig. 10.*)

Genus 14. COCCINELLA.

Antenna clavated: the *club* solid: *maxillary palpi* terminated by a large securiform joint: *body* hemispherical: *thorax* and *elytra* margined: *abdomen* flat.

The insects of this genus are commonly called in England Lady-cows, or Lady-birds. The larvæ feed chiefly on the *Aphides* or plant-lice, and are very serviceable in clearing vegetables of the myriads with which they are often infested. Mr. Marsham in his *Entomologia Britannica* has described 50 species, two-thirds of which only are genuine. So great is the variety in the species of this genus, that by a close examination scarcely two specimens will be found alike: this shows the necessity of collecting varieties, for by this means species may be decided upon; I should therefore strongly recommend the young entomologist never to disregard them, as they tend greatly to the advancement of the science, and certainly enrich a collection. Mr. Stephens (the author of the continuation to the ornithological part of Shaw's *Zoology*, and a most excellent entomologist,) for some years past has paid great attention to this genus of insects; and it his intention to lay his observations before the Linnean Society.

Sp. 1. *Cocc. 14-guttata*. *Elytra* red: with fourteen white dots: *antennæ* and *eyes* black: the spots on the *elytra* form four lines; the first line contains two spots, the second six, the third four, and the last two. Inhabits willows. (*Pl. 2. fig. 11.*)

Genus 15. CHRYSOMELA.

Antennæ moniliform: *palpi* six, thickest at their extremity: *thorax* margined, but not the *elytra*: *body* for the most part ovate.

The insects of this genus are in general adorned with shining and splendid colours. They live on leaves, but do not eat the nervures.

Their larvæ are in general of an oval shape, somewhat elongated and soft, with six feet near the head. The last joint of their feet or tarsi consists of four articulations, which in most cases serve for sexual distinctions, the tarsi of the fore feet being considerably broader in the males than in the females. This numerous and beautiful tribe is found in almost every situation: their motion is slow; and some of them when caught emit an oily liquor of a disagreeable smell.

In this genus of Linné we find many insects that differ widely from the generic character given above, which form many natural families consisting of numerous genera, the characters of which will be given in the system proposed by Dr. Leach.

Sp. 1. *Chrys. coriaria*. Apterous, oval; varies in colour from a dark blue to a black. It is a very common species, and may be found on heaths from April to June in abundance. (*Pl. 2. fig. 12.*)

Sp. 2. *Chrys. Tanaceti*. Black and punctured: the antennæ and feet black. (*Pl. 2. fig. 13.*) *Galeruca Tanaceti*, *Geoffroy*, *Latreille*, *Fabricius*, *Olivier*, and *Leach*.

Sp. 3. *Chrys. merdigera*. (*Pl. 2. fig. 14.*) *Auchenia merdigera*, *Marsham*. Inhabits the white lily.

GENUS 16. CRYPTOCEPHALUS, *Fabr.*

Antennæ filiform: *palpi* four: *thorax* margined, but not the elytra: *body* nearly cylindrical.

The insects of this genus in some of the sections into which it has been divided by Gmelin resemble the preceding in form and manners, and were accordingly in the former editions of the *Systema Naturæ* arranged with *Chrysomelæ*. Mr. Marsham's *Auchenia*, *Crioceris*, and *Tillus*, are separated from this genus.

Sp. 1. *Crypt. Lineola*. Body black: elytra red, with a black line on each. (*Pl. 2. fig. 15.*)

GENUS 17. HISPA.

Antennæ cylindrical, approximate at the base and seated between the eyes: *palpi* fusiform: *thorax* and *elytra* often spinous or toothed.

Sp. 1. *Hispa mutica*. (*Pl. 2. fig. 16.*) *Orthocerus muticus*, *Latr.* Inhabits sandy situations.

GENUS 18. BRUCHUS.

Antennæ filiform: *palpi* equal and filiform: *lip* acuminate.

Sp. 1. *Bruchus Pisi*. Elytra black, with white spots; the extremity white, with two black dots. (*Pl. 2. fig. 17.*)

Inhabits Europe, and is very destructive to fields of peas.

Genus 19. CURCULIO.

Antennæ clavated, situated on the rostrum: *palpi* four, filiform.

The insects of this genus are very numerous, and subject to great diversity in form and colours. Mr. Marsham has described 234 species in his *Entomologia Britannica*, some of which are but varieties. Many species have been discovered since his work was written, and the number is probably doubled.

Sp. 1. *Curc. nitens*. Oblong, dark-violet: thorax and elytra of a blueish green. (*Pl. 2. fig. 18.*)

Inhabits Europe; is found in England on the white-thorn in woods in the month of May.

Sp. 2. *Curc. Pyri*. Bronzed with a changeable colour of yellow, red, and green: legs rufous. (*Pl. 2. fig. 19.*)

Inhabits the nut-tree, but is very local.

Sp. 3. *Curc. Nucum*. Grey-brown; rostrum as long as the body.

Inhabits the nut-tree; the larva is frequently found in the hazel nut. (*Pl. 2. fig. 20.*)

Sp. 4. *Curc. Scrophulariæ*. The coleoptera with two black spots on the back. (*Pl. 2. fig. 21.*)

Inhabits the *Scrophularia* in marshes.

Genus 20. ATTELABUS.

Antennæ moniliform; thickest towards the apex: *head* inclined, and acuminate behind.

Sp. 1. *Att. Coryli*. Black; elytra red and reticulated. (*Pl. 2. fig. 22.*)

Inhabits Europe: is found on the hazel; the leaves of which the larva rolls up into a cylinder, close at both ends. The form of the head in this insect is remarkable: it is shaped like a long triangle; the acute angle attached to the thorax, the eyes in the other two angles, and from the base the rostrum arises.

Genus 21. NOTOXUS, Fabr. MELOE, Linn. LYTTA, Marsh.

Antennæ filiform; *palpi* four, securiform: *maxilla* with one dent or tooth.

Sp. 1. *Not. monoceros*. The thorax projecting like a horn over the head. (*Pl. 2. fig. 23. a. head, thorax, and antennæ magnified.*)

Inhabits sand-pits, is rare near London. This species has been taken in profusion on the sandy sea shores of South Wales.

Genus 22. CERAMBYX.

Antennæ setaceous: *palpi* four: *thorax* spinous or gibbous: *elytra* linear.

This is a numerous genus: it has therefore been divided into several

genera by later writers. Few of them are natives of Britain. Their larvæ live in wood, which they perforate and consume. They are the favourite food of the woodpecker. They have shorter feet than the larvæ of most other *Coleoptera*. The antennæ are often longer than the whole body, being in some species four times its length.

Sp. 1. *Cer. moschatus*.

Inhabits Europe. In England it frequently occurs on willow-trees in June.

Sp. 2. *Cer. Textor*.

Inhabits Europe. This is esteemed a very rare British insect; it occurs on willows at the Efford Mills, near Lymington in Hampshire, and near Bristol. (*Pl. 2. fig. 24.*)

Sp. 3. *Cer. arcuatus*. The elytra with four yellow fasciæ; the first interrupted, the others arched backwards. (*Pl. 2. fig. 25.*)

Inhabits Europe. Is found on the trunks of trees, but is rare in Britain.

GENUS 23. LEPTURA.

Antenna setaceous: palpi four, filiform: elytra attenuated towards the apex: thorax somewhat cylindrical.

Sp. 1. *Lept. quadrijasciata*. Black; elytra testaceous with four black fasciæ. (*Pl. 2. fig. 26.*)

Inhabits Europe. In Britain it is found in the woods of Kent on umbelliferous plants.

Sp. 2. *Lept. Nymphææ*. Hind thighs toothed: thorax and elytra coppery: body cinereous, downy.

Inhabits Europe. May frequently be found in ditches on the leaves of *Nymphæa alba* in the month of May. (*Pl. 2. fig. 27.*)

GENUS 24. NECYDALIS.

Antenna setaceous or filiform: palpi four, filiform: elytra smaller than the wings.

Sp. 1. *Necyd. cerulea*. Elytra subulate: abdomen blue: hind thighs of the male clavate, arcuate; those of the female simple. (*Pl. 2. fig. 28.*)

Inhabits flowers in woods and chalk-pits.

GENUS 25. LAMPYRIS.

Antennæ filiform: (Pl. 3. fig. 1. a.) palpi four: elytra flexible: thorax flat, semiorbicular, concealing and surrounding the head: the sides of the abdomen with papillary folds: the females for the most part are destitute of wings and elytra, and resemble herbivorous larvæ.

Sp. 1. *Lamp. noctiluca*, Glow-worm. Oblong and brown; the thorax ash-coloured. (*Pl. 3. fig. 1. male, fig. 2. female.*)

Inhabits woods, heaths, and grassy banks in the months of June and July; the female alone is luminous. The light, which is phos-

phoric, proceeds from the last segment but one of the abdomen, and seems intended to attract the male. *Lampyris splendidula* is said to inhabit this country, but I have not yet seen any British specimen: I should therefore advise those entomologists residing at a distance from London to collect all the specimens they can obtain, and carefully examine them: the males may be taken in profusion in the evenings of the above months, if a few females be put in the entomologist's folding-net as he walks in the above places of an evening.

Genus 26. PYROCHROA, *Fabr. Gmel.*

Antennæ pectinate: *thorax* orbicular: *body* elongate, depressed. The prevailing colour in this genus is red and black.

Sp. 1. *Pyroch. coccinea*. Black: *thorax* and *elytra* of a bright scarlet red: the *antennæ* strongly pectinate.

Inhabits the woods of Kent in the months of June and July. (*Pl. 3. fig. 3.*)

Sp. 2. *Pyroch. rubens*. Black: *thorax* and *elytra* of a duller red than the preceding species.

A very common insect in the months of May and June, and may be found in most hedges where white-thorn grows.

Genus 27. CANTHARIS.

Antennæ filiform; *thorax* (in most species) marginated; *elytra* flexible: the sides of the abdomen with papillary folds.

This is an extremely rapacious genus, preying upon other insects, and even its own tribe.

Sp. 1. *Canth. fusca*. *Thorax* red, with a black spot; *elytra* brown. (*Pl. 3. fig. 4.*)

This is a numerous tribe, and forms several natural genera of modern authors.

Sp. 2. *Canth. biguttata*. *Thorax* black in the middle: *elytra* greenish-bronze; red at the apex. (*Pl. 3. fig. 5.*)

This insect is furnished with two red obtuse vesicles at the base of the abdomen, and two at the apex of the thorax, which are raised and depressed alternately. Common on various plants in woods in the months of May and June.

Genus 28. ELATER.

Antennæ filiform: *palpi* four, securiform: *mandibles* notched, or bifid at their extremities.

Many of the coleopterous insects have a great difficulty in restoring themselves when laid on their back; the apparatus with which the insects of this genus are provided for that purpose is singular and curious. An elastic spring or spine projects from the hinder extremity of the breast, and there is a groove or cavity in the anterior part of the ab-

domen. When laid on its back, the insect raises and sustains itself on the anterior part of the head and the extremity of the body, by which means the spine is removed from the groove where it is lodged when in its natural position; then suddenly bending its body, the spine is struck with force across a small ridge or elevation, into the cavity from whence it was withdrawn, by which shock, the parts of the body before sustained in the air are so forcibly beat against whatever the insect is laid on, as to cause it to spring or rebound to a considerable distance. The antennæ are lodged in a cavity scooped out of the under side of the head and thorax, probably to preserve them from injury when the insect falls, after its singular leap. The larvæ reside in decayed wood.

Sp. 1. *Elat. sanguineus*. Black; thorax smooth and shining: elytra of a blood red colour. (Pl. 3. fig. 6.)

Inhabits decayed oaks, and has been found in abundance under the bark of trees in June, in the New Forest of Hampshire, which is a most excellent and fertile county for insects.

Sp. 2. *Elat. cyaneus*. Blue, varying from a purple to a greenish hue: elytra striated and finely punctured. (Pl. 3. fig. 7.)

Inhabits gravel-pits in the months of May and June, under stones, clods of earth and conglomerated masses, by turning up of which the entomologist will frequently find other insects equally rare.

Genus 29. CICINDELA.

Antennæ setaceous: *palpi* six, filiform; the posterior ones hairy: *mandibles* projecting with many dents: *eyes* prominent: *thorax* rounded and marginated.

This is in general a very beautiful tribe of insects; they are found in dry sandy places, and prey with the most ravenous ferocity upon all weaker insects which come in their way. The larva is soft and white, with six feet, and two tubercles on its back which assist it in retreating with its prey; the head is brown and scaly, and armed with a pair of large jaws. It lurks in a round perpendicular hole in the ground, with its head at the entrance, to draw in and devour whatever insects may come near or fall into it.

Sp. 1. *Cicind. campestris*. Green; the elytra with five white dots.

Inhabits sand-pits and other hot and dry places from April to July.

Sp. 2. *Cicind. sylvatica*. (Pl. 3. fig. 8.)

Genus 30. BUPRESTIS.

Antennæ filiform, serrated; the length of the thorax: *palpi* four, filiform; the last articulation obtuse and truncated: *head* partly retracted within the thorax. (Pl. 3. fig. 9.)

Few of this numerous genus are natives of Britain. Many of the exotic species are remarkable for their rich metallic colours, having fre-

quently the appearance of the most highly polished gold or copper: the larvæ live in wood.

Sp. 1. *Bupr. biguttata*. Green above, blue-green beneath; scutellum transversely impressed; apex of the elytra serrated; a white villose spot on each side of the suture, and three on the sides of the abdomen.

In England it is rather rare, but was once observed in very great abundance, by Dr. Latham, in Darent-wood, Kent.

Genus 31. *HYDROPHILUS*, Fabr. *DYTISCUS*, Linn.

Antennæ clavated, club perfoliate: *palpi* four, filiform: *hinder feet* ciliated and formed for swimming, with minute claws.

The insects of this genus live in water and moist places. They may be seen in ponds during the summer and calm mild days in winter, frequently rising to the surface for fresh air; they swim well, and when laid on their backs restore themselves by whirling round; they rest in the shade, keep in the water during the day, come abroad in the evening, and are sometimes found sitting on the plants by the edge; they fly by night; after having been long out of the water they cannot dive but with difficulty: the foremost feet of the males have a hemispherical appendage. The larvæ always live in the water, and are the crocodiles of their class, killing not only aquatic insects but even fishes.

Sp. 1. *Hydroph. piceus*. Black; the sternum channelled and spiny behind.

Hydrous piceus. Leach, from the Linnean MSS.

This is the largest British species of the genus. The larva lives in still waters and ponds; is about an inch and a half in length; black; its head smooth and chesnut-coloured; with six short slender feet, which are actually placed on the back, and a tapering tail through which it respire.—In the month of July it is said to attain its utmost size, and leaving the water, creeps upon the dry ground to a heap of dung, (cow-dung if it be near,) and makes a hole under it pretty deep, and so wide that it can lie in it rolled up in a circle, and there it changes into its pupa state. About the middle of August the perfect insect appears. Like most of the aquatic insects it lives through the winter, diving deep into the mud in the most inclement weather.

Sp. 2. *Hydroph. caraboides*. (Pl. 3. fig. 16.)

Genus 32. *DYTISCUS*.

Antennæ setaceous; *palpi* six, filiform: *hind feet* villous, formed for swimming, with the claws very minute. (Pl. 3. fig. 13, 14 & 15.)

The insects of this genus are very numerous, and are well deserving the attention of the entomologist. In Dr. Leach's system they are divided into several very natural genera: they are found in almost every

pond, ditch, and rivulet, but many of the species are very local: they may be obtained in the above-mentioned situations at all seasons of the year.

Genus 33. CARABUS.

Antennæ filiform; *palpi* six, the last articulation obtuse and truncated: *thorax* obcordate, truncated at the apex, and marginated: *elytra* marginated.

Mr. Marsham has described 109 British species of this genus: the generality of them are found on the ground, under stones, in sand-pits &c. a few are found in trees, feeding on the larvæ of *Lepidoptera*. The whole of this tribe are very voracious, preying on all insects which they can overcome; they discharge, when taken, a brown caustic and fetid liquor: many of them want wings; though their *elytra* in general are separate and moveable: their larvæ live in putrid wood, among mosses, in the earth, &c.

Pl. 3. fig. 17, 18, 19, & 20, belong to this genus of Linné. They are types of so many genera, the characters of which are given in the system of Dr. Leach.

Genus 34. TENEBRIO.

Antennæ moniliform; the last articulation nearly round: *thorax* with a small degree of convexity, and marginated: *head* standing out: *elytra* somewhat rigid.

Sp. 1. *Teneb. Molitor*. Brownish-black; the anterior thighs the thickest. (*Pl. 4. fig. 1.*)

The larvæ of this insect are called *Meal-worms*, and are found in meal, bakers' ovens, dry bread, &c. They are of a pale colour, smooth, with thirteen segments, soft; and are the favourite food of nightingales, and other *Motacilla*.

Genus 35. BLAPS, Fabr., Marsh. TENEBRIO, Linn.

Antennæ filiform; *palpi* four: *thorax* with a small degree of convexity, and marginated: *head* standing out: *elytra* somewhat rigid: *wings* (in most species) wanting.

Sp. 1. *Bl. mortisaga*. Black; *coleoptra* ending in a point, and smooth; the *antennæ* moniliform at the apex.

This species wants the wings: it walks slowly, and is therefore called the slow-legged beetle: when taken it emits a certain colourless but very fetid liquor.

Genus 36. LYTTA, Fabr. MELOE, Linn.

Antennæ filiform: *palpi* four, unequal, the hind ones clavated: *thorax* somewhat round: *head* inflected and gibbous: *elytra* soft and flexible.

Sp. 1. *Lytta vesicatoria*. Green; the *antennæ* black. (*Pl. 4. fig. 5.*)
Inhabits the south of Europe, and is occasionally found in Britain.

This is the common Spanish fly: it is found on the privet, the ash, the elder, the poplar, &c. It is so light when dried that fifty of them scarcely weigh a dram.

Genus 37. MELOE.

Antennæ moniliform: *thorax* nearly round: *elytra* soft, flexible, and shorter than the abdomen: *head* inflected, gibbous. (*Pl. 4. fig. 7.*)
 Sp. 1. *Mel. Proscarabæus*. Of a violet colour.

Found in spring, particularly in open sandy fields, feeding on the different species of *Ranunculus*, &c.; its ova have an agreeable smell; when touched, there issues from it a very limpid yellowish oil, which is exceedingly diuretic, and when mixed with honey or oil has been recommended in cases of hydrophobia.

Genus 38. MORDELLA.

Antennæ moniliform or pectinated: *palpi* four, the anterior ones clavated, the hinder filiform: when frightened, it hides its head beneath the thorax: *elytra* narrower towards the apex, and slightly curved: before the thighs a broad plate at the base of the abdomen. The insects of this genus inhabit flowers.

Sp. 1. *Mord. fasciata*. (*Pl. 4. fig. 8.*)

Genus 39. STAPHYLINUS.

I shall omit the generic character of Linné, and refer the student to those genera given in Dr. Leach's system. Mr. Marsham has described only 87 species of this very extensive family: 500 species at least are found to be natives of this country, many of which are exceedingly minute, but very interesting. (*Pl. 4. fig. 10, 11, 12, 13 & 14.*)

Genus 40. FORFICULA.

Antennæ setaceous: *palpi* unequal and filiform: *elytra* truncated and shorter than the abdomen, the extremity of which is armed with forceps.

Sp. 1. *Forf. auricularia*, Earwig.

Order II. HEMIPTERA.

Many of the insects of this Order are furnished with a rostrum which is inflected and bent inwards towards the breast. Their wing-cases are *hemelytrata*, or of a substance less hard than those of the preceding order; they do not meet together and form a longitudinal suture, but have some part of their anterior margins crossed or laid one over the other.

Genus 41. BLATTA.

Head inflected: *antennæ* setaceous: *palpi* unequal, filiform: *elytra* and *wings* flat, and nearly coriaceous: *thorax* nearly flat, orbicular, and margined: *feet* formed for running: *two horns* above the tail in most species. (*Pl. 4. fig. 17.*)

Sp. 1. *Bl. orientalis*, Black-beetle or Cock-roach.

This insect was originally a native of South America, but is now very generally spread throughout Europe. It cannot be considered a British insect, though it frequents kitchens, ovens, and warm places, and devours meal, bread, and other provisions, shoes, &c. It conceals itself during the day, and comes abroad in the night; it runs quickly, and is very tenacious of life. They are killed by red wafers.

Genus 42. GRYLLUS.

Head inflected, furnished with maxillæ and filiform *palpi*: *antennæ* setaceous or filiform: *wings* four, deflected and convoluted; the under ones folded: *hind legs* formed for leaping: *two claws* on all the feet.

Sp. 1. *Gr. flavipes*. (*Pl. 4. fig. 19.*)

Inhabits marshes, but is very local in Britain.

Genus 43. CICADA.

Rostrum inflected: *antennæ* setaceous: *wings* four, membranaceous and deflected: *feet* formed for leaping. (*Pl. 5. fig. 1 & 2.*)

Sp. 1. *Cic. viridis*. Elytra green: head yellow, with black dots.

Inhabits aquatic plants in ditches.

Genus 44. NOTONECTA.

Rostrum inflected: *antennæ* shorter than the thorax: *wings* four, folded together crosswise; coriaceous at the base: *hinder feet* ciliated, formed for swimming.

The insects of this and the following genus live in water, feeding on aquatic animalcula; the larva and pupa have each six feet; they are active, and swim like the perfect insect; the former wants wings, the latter has the rudiments of them. (*Pl. 5. fig. 3.*)

Sp. 1. *Not. minutissima*. Grey; the head brown: the *elytra* truncated. Inhabits ponds.

Genus 45. NEPA.

Rostrum inflected: *antennæ* short: *wings* four, folded crosswise, the anterior part of them coriaceous: the *two fore feet* cheliform; the others formed for walking.

Sp. 1. *Nepa cinerea*. Of an ash colour: the thorax unequal: the body oblong, ovate. (*Pl. 5. fig. 4.*)

Inhabits ponds and ditches; is very common in Britain throughout the year.

Genus 46. CIMEX.

Rostrum inflected: *antennæ* longer than the thorax: *wings* four, folded crosswise; the upper ones coriaceous in the anterior part: *back* flat: *thorax* marginated: *feet* formed for running. (*Pl. 5. fig. 6, 7, 8.*)

The insects of this genus, whether as larvæ or in the perfect state, feed for the most part on the juices of plants; some on the larvæ of other animals: they have in general a very disagreeable smell. The larvæ and pupæ have six feet; they are active, and walk about like the perfect insect: the former has no wings, the latter has the rudiments of them. A great number of species are found in Britain.

Sp. 1. *Cimex lectularius*. Without wings.

Inhabits Europe.

This insect (the bed-bug) is unhappily but too well known, and was an inhabitant of Europe prior to the Christian æra; at least it is mentioned by Aristophanes and other Greek writers. Southall says it was hardly known in London before 1670; but there is good authority for asserting that it was common enough there before the great fire in 1666. It is a nocturnal animal, very fetid; seldom, though sometimes, found with wings; easily killed when taken alive. Bugs are said to be expelled in a variety of ways, viz. by charcoal and oil of turpentine, soft soap, or hard pomatum.

Genus 47. APHIS.

Rostrum inflected: the *vagina* with five articulations and a single seta: *antennæ* setaceous, longer than the thorax: *wings* four, erect, or none: *feet* formed for walking: the *abdomen* generally armed with two horns. (*Pl. 5. fig. 9.*)

The insects of this genus are small and defenceless; but very noxious animals, and most remarkable for the singularities in their history and manners. They seldom appear before autumn, when the males impregnate their females, which soon thereafter lay eggs or rather a sort of capsule in which the young *Aphides* lie already perfectly formed, but do not break their shell till the following spring. When they appear, it is very remarkable that they are almost wholly females, with hardly a male to be seen during the whole spring and summer. Notwithstanding this, all these female *Aphides* without any communication with a male are able to propagate their species, and seem to have received the genial influence not merely for themselves alone but for their posterity to the ninth generation. During the whole summer they are viviparous; and if a young *Aphis* be taken immediately upon exclusion from the mother, and kept apart, it will produce young; which young, if also kept apart, will likewise produce, and so on, without the presence of a male. Towards autumn, however, this singular fructification begins to lose its wonderful effects; the *Aphides* cease to bring

forth females only; males likewise are produced, which immediately celebrate their nuptial rite, that is to communicate fertility to the whole female posterity of the following summer.

Genus 48. CHERMES.

The *rostrum* rising from the breast with a vagina and three inflected setæ: *antenna* cylindrical, longer than the thorax: *wings* four, deflexed; *thorax* gibbous: *feet* formed for leaping. (*Pl. 5. fig. 10.*)

The larvæ of the insects of this genus are furnished with feet and generally covered with down. In the perfect state they greatly resemble the *Aphides*.

Genus 49. COCCUS.

Antenna filiform: *abdomen* furnished with two setæ: *rostrum* rising from the breast with a vagina and setæ: *two erect wings* in the males; none in the females. (*Pl. 5. fig. 11.*)

Sp. 1. *Coccus Cacti*.

This insect, so useful when properly prepared to painters and dyers, is a native of South America, where it is found on several species of *Cactus*, particularly the *Cactus Opuntia* or Prickly-pear. The insects are collected in a wooden bowl, thickly spread from thence upon a flat dish of earthenware, and placed alive over a charcoal fire, where they are slowly roasted until the downy covering disappears and the aqueous juices of the animal are totally evaporated. During this operation the insects are continually stirred about with a tin ladle, and sometimes water is sprinkled upon them to prevent absolute torrefaction, which would destroy the colour and reduce the insect to a coal; but a little habit teaches when to remove them from the fire. They then appear like so many dark, round, reddish grains, and take the name of Cochineal, preserving so little the original form of the insect that this precious dye was long known and sought in Europe before naturalists had determined whether it was animal, vegetable, or a mineral substance.

Genus 50. THRIPS.

Rostrum indistinct: *antennæ* filiform, of the length of the thorax: *body* linear: *abdomen* curved upwards: *wings* four, straight, lying upon the back; longitudinal, narrow, and somewhat crossed. (*Pl. 5. fig. 12.*)

The insects of this genus are small, and are found on the flowers of various plants.

Order III. LEPIDOPTERA. (GLOSSATA, *Fabr.*)

The insects of this order contain the butterflies, moths, and hawk-moths; have all four wings covered with scales or a sort of farina: they have a mouth (the jaws of which have lately been discovered, de-

scribed and figured by Savigny in his *Mémoires sur les Animaux sans Vertèbres*, Paris, 1816.), with palpi, a spiral tongue; the body covered with hair. The scales resemble feathers: they lie over one another in an imbricated manner, the shaft towards the body of the insect and the expansion towards the end of the wing, reflecting the most brilliant colours.

Genus 51. PAPILIO.

Antennæ clavate, gradually thickening towards their extremity: *wings* when at rest erect and meeting upwards. All the insects of this genus fly in the day-time.

Linné in a peculiar and instructive manner divided this beautiful and numerous tribe into sections, instituted from the habit or general appearance, and in some degree from the distribution of the colour of the wings.

Sp. 1. *Pap. Machaon*.

This is an insect of great beauty, and may be considered as the only British species of *Papilio*. It is well known to collectors by the title of the Swallow-tailed butterfly, and is of a beautiful yellow, with black spots or patches along the upper edge of the superior wings; all the wings are bordered with a deep edging of black, decorated by a double row of crescent-shaped spots, of which the upper row is blue and the lower yellow. The under wings are tailed, and are marked at the inner angle or tip with a round red spot bordered with blue and black. The larva of this species feeds on fennel and other umbelliferous plants. It is of a green colour encircled with numerous black bands spotted with red, and is furnished on the top of the head with a pair of short tentacula of a red colour. In the month of July it changes into the chrysalis or pupa state, fixed to some part of the plant on which it feeds, and in the month of August the perfect insect appears. It frequently happens that two broods of this butterfly are produced in the same summer; one in May, having been in the pupa state all the winter, the other in August from the pupa of July. (*Pl. 6. fig. 1.*)

Genus 52. SPHINX.

Antennæ attenuated at each end: *tongue* in most species stretched out: *palpi* two: *wings* deflected.

Some of the species of this genus are the largest of lepidopterous insects. They fly very swift, for the most part early in the morning and late in the evening, some of the smaller species during the day.

Sp. 1. *Sphinx Elpenor*, Elephant Hawk. (*Pl. 6. fig. 2.*)

Genus 53. PHALÆNA.

Antennæ setaceous, and gradually tapering from the base to the tip: *tongue* spiral: the *wings* when at rest are generally deflected.

Moths fly abroad only in the evening and during the night, and obtain their food from the nectar of flowers. The larva is active and quick in motion, and preys voraciously on the leaves of plants.

Sp. 1. *P. Quercus*. Bombyx Quercus, Fabr. (Pl. 6. fig. 3.)

Order IV. NEUROPTERA.

The insects of this Order have four membranaceous wings, generally transparent with strong nervures. At the tail they have often an appendage like pincers, but no sting.

Genus 54. LIBELLULA, Dragon-fly.

Mouth armed with jaws, more than two: *lip* trifid: *antennæ* shorter than the thorax; very slender and filiform: *wings* extended: the *tail* of the male is furnished with a hooked forceps.

The insects of this genus are well known; they are remarkable for a long slender body and wings standing out at right angles. The larvæ have six feet, and move with great activity in the water: at the mouth they are furnished with an articulated forceps: they are very voracious, and are the crocodiles of aquatic insects. The larvæ and pupæ are not very different; the latter have the rudiments of wings: in a fine day in June, a person standing by a pond may observe them approach the bank for the purpose of changing their element. Having crawled up a blade of grass or bit of dry wood, the skin of the pupa grows parched and splits at the upper part of the thorax. The insect issues forth gradually, throws off its slough, in a few minutes expands its wings, flutters, and then flies off. The sexual parts in the male are placed under the thorax; in the female at the extremity of the body.

Sp. 1. *L. quadrimaculata*. (Pl. 7. fig. 1.)

Inhabits the banks of ponds, but is not common.

Genus 55. EPHEMERA.

Mouth without mandibles: *palpi* four, very short, and filiform: *maxilla* short, membranaceous, cylindrical, connected with the lip: *antennæ* short, and subulated: *two large stemmata* above the eyes: *wings* erect, the hind ones very small: *setæ* at the tail.

Sp. 1. *E. vulgata*. (Pl. 7. fig. 2.)

This is the largest of the British species. In the evenings in the month of June it assembles in vast numbers under trees near waters, and seems to divert itself for hours together, ascending and descending in the air as if dancing. In the neighbourhood of Luz, in Carniola, these insects are produced in such quantities, that when they die they are gathered to manure the land by the country-people, who think they have been unsuccessful if each does not procure twenty cart-loads of them for that purpose. Their larvæ are the favourite food of fresh-

water fishes, as are also the flies: they are more numerous in running than in standing waters.

Genus 56. PHRYGANEÆ.

Mouth with a horny, short, arched, acute mandible, without teeth; and a membranaceous maxilla: *palpi* four: *stemmata* three: *antennæ* setaceous, longer than the thorax: *wings* incumbent; the hinder ones folded. (*Pl. 7. fig. 3.*)

Genus 57. HEMEROBIUS.

Mouth with a straight horny mandible: a cylindrical, straight, cleft *maxilla*: *lip* stretched forward and entire: four projecting, unequal, filiform *palpi*: no *stemmata*: *wings* deflected, not folded: *antennæ* setaceous, projecting, and longer than the thorax, which is convex.

The species of this genus in all their stages feed upon small insects, especially the *Aphides*; their larvæ have six feet; in most species they are oval and hairy; the pupæ are inactive, and inclosed in a case. The eggs are deposited on leaves in the midst of *Aphides*; they are supported on small pedicles and set in the form of bunches. The larvæ attain their growth in fifteen or sixteen days, and the *pupa incompleta* remains for three weeks before the fly comes forth.

Sp. 1. *H. Chrysops*. (*Pl. 7. fig. 4.*) *Chrysops maculata*, *Leach*.

Genus 58. PANORPA.

Mouth stretched out into a cylindrical horny rostrum: the *mandible* is without teeth: *maxillæ* bifid at the apex: *lip* elongated, and covering the whole mouth: *palpi* four, nearly equal: *stemmata* three: *antennæ* filiform: the *tail* of the male armed with a chela, that of the female unarmed.

Sp. 1. *P. communis*. (*Pl. 7. fig. 5. a. chela magnified.*)

Genus 59. RAPHDIA.

Mouth with an arched, dentated, horny *mandible*: a cylindrical, obtuse horny *maxilla*: a rounded, entire, and horny *lip*: *palpi* four, very short, nearly equal, and filiform: *stemmata* three: *wings* deflected: *antennæ* filiform, of the length of the thorax; elongated before, and cylindrical: *tail* of the female with a lax recurved seta. (*Pl. 7. fig. 6.*)

Order V. HYMENOPTERA.

Wings four, membranaceous: *mouth* with *maxillæ*, and some of them likewise a tongue. Between the large eyes they have generally three *stemmata*. At the extremity of the abdomen the females of several of the genera have an aculeus or sting, that lies concealed within the abdomen, which is used as a weapon, and instils into the wound an acid poison: those which want the sting, are furnished with an oviduct, that

is often exerted, and with which the eggs are deposited either in the bodies of the caterpillars of other insects, or in wood. From these eggs the larvæ are produced, which in some have no feet; in others more than sixteen. They change to *pupæ incompletæ*, which are inclosed in cases. Some of the insects of this Order live in societies, others are solitary.

Genus 60. CYNIPS.

Mouth with a short membranaceous maxilla with one dent: an arched horny mandible cleft at the apex: a short, cylindrical, entire, horny lip: four short unequal palpi: antennæ moniliform, aculeus spiral, and in general hidden within the body.

The *Cynipes* pierce the leaves, &c. of plants with their sting, and deposit their eggs in the wound; the extravasated juices rise round it and form a gall, which becomes hard, and in this the larva lives and feeds, and changes to a pupa.

Sp. 1. *C. Quercus folii*. (Pl. 8. fig. 1.)

The larva is found in galls, adhering to the under side of oak leaves, of the size of hazel-nuts.

Genus 61. TENTHREDO.

Mouth with a horny arched mandible, dentated within: maxillæ obtuse at the apex: lip cylindrical and trifid: palpi four, unequal, and filiform.

The larvæ of the insects of this genus have from sixteen to twenty-eight feet; a round head: when touched they roll themselves together. They feed on the leaves of plants. When full-grown, they make, sometimes in the earth and sometimes between the leaves of the plant on which they feed, a net-work case, and within it change to a *pupa incompleta*, which for the most part remains during the winter in the earth. The species are very numerous, and consist of many natural genera.

Sp. 1. *T. Scrophulariæ*. (Pl. 8. fig. 2.)

Inhabits the Water Betony.

Genus 62: SIREX:

Mouth with a thick, horny mandible, truncated at the apex, and denticulated: an incurved, acuminate, cylindrical, ciliated maxilla, and a lip, both of them membranaceous and entire; the whole short: palpi four, the hind ones the longest, increasing towards their apex: antennæ filiform, with more than twenty-four equal articulations: oviduct exerted, stiff, and serrated: abdomen sessile, terminating in a point or spine: wings lanceolated, and not folded.

Sp. 1. *S. Gigas*. (Pl. 8. fig 3.)

Genus 63. ICHNEUMON.

Mouth with a straight membranaceous, bifid maxilla, rounded at the apex, dilated, ciliated, and horny: an arched, acute, horny mandible,

without teeth: *lip* cylindrical, emarginated, horny, and membranaceous at the apex: *palpi* four, unequal, filiform: *antennæ* setaceous.

The insects of this genus lay their eggs in the bodies of caterpillars or pupæ, which are there hatched: the larvæ have no feet; they are soft and cylindrical, and feed on the substance of the caterpillar; this last continues to feed, and even to undergo its change into a chrysalis, but never turns to a perfect insect: when the larvæ of the ichneumon are full grown they issue forth, spin themselves a silky web, and change into a *pupa incompleta*, and in a few days the fly appears. The genus is very numerous, upwards of 800 species are found in this country,
Sp. 1. *I. Manifestator*. (Pl. 8. fig. 4.)

Genus 64. SPHEX.

Mouth with an entire maxilla: a horny, incurved, dentated mandible: a horny *lip*, membranaceous at the apex: *palpi* four: *antennæ* filiform: the *aculeus* or *sting* concealed within the abdomen.

The insects of this genus form their cells in sand-banks, and they are occasionally found on umbelliferous plants; the larva is soft, without feet, and lives in the bodies of dead insects in which the mother had previously deposited her eggs.

Sp. 1. *S. sabulosa*. (Pl. 8. fig. 5.)

Inhabits sand-banks: is common in Norfolk, Suffolk, and the Hampshire coast, in June and July.

Genus 65. CHRYSIS.

Mouth horny and porrected: the *maxilla* linear, much longer than the *lip* which is emarginated: *palpi* four, unequal and filiform: *antennæ* filiform, the first articulation the longest, the remainder short: *body* shining and finely punctured, the abdomen arched underneath; the extremity, in most species, dentated: the *sting* somewhat exerted: *wings* not folded.

The species of this genus inhabit sand-banks, old walls, or decayed wood. They rarely appear but in the middle of the day, and then only when the sun shines.

Sp. 1. *C. bidentata*. (Pl. 8. fig. 7.)

Genus 66. VESPA, Wasp.

Mouth horny; *maxilla* compressed; *palpi* four, unequal and filiform; *antennæ* filiform, the first articulation the longest, and cylindrical; *eyes* shaped like a crescent; *body* smooth; the *sting* hid within the abdomen; the upper *wings* folded in both sexes.

The insects of this genus live in society; they prey on insects that have naked wings, particularly bees and flies; the larva is soft and without feet; the pupa is motionless. Wasps make a hive of a substance like paper formed of wood reduced to a paste; the combs are horizontal,

and have only one row of hexagonal cells, flat at bottom, the mouth turned downwards, which serve only for holding the young. Every hive is begun by a mother, who at first deposits a few eggs, from which neuters are produced, or working wasps, who assist her in increasing her work and in feeding the young afterwards produced. Neither males nor females are produced till towards the month of September. Before that time there are none in the nest but the female and the neuters she has engendered. The females remain in the nest. The males do no work. Wasps feed their larvæ with insects, meat, and the fragments of fruits. Towards autumn they are said to kill such of the larvæ and pupæ as cannot come to perfection before the month of November. The males and neuters perish themselves during winter, and none remain but a few impregnated females to perpetuate the species.

Sp. 1. *V. Crabro*, the Hornet Wasp. (Pl. 8. fig. 8.)

Inhabits Europe, generally forming its nest in the trunks of trees.

Some little caution is necessary in taking the insects of this species, as without care the entomologist is subject to be stung by them. I have found that the bag net (Pl. 11. fig. 4.) is the best means of taking them. The insects when secured in the net should be gently trodden upon, not sufficiently to injure, but merely to numb them; a pin should then be passed through the thorax, and the insect placed in the pocket box.

Genus 67. APIS, Bee.

Mouth horny: *maxillæ* and *labium* membranaceous at the apex: *tongue* inflected: *palpi* four, unequal and filiform: *antennæ* filiform: *wings* not folded: *aculeus* in the females and neuters concealed in the abdomen.

Sp. 1. *A. retusa*, Linn. (female) *pennipes*, (male) (Pl. 8. fig. 9. male.)

Mr. Kirby has described upwards of 200 indigenous species of this genus in his admirable work entitled *Monographia Apum Angliæ*, 2 vols. 8vo. This work is indispensable in the library of every entomologist.

Genus 68. FORMICA, Ant.

Palpi four, unequal, with cylindrical articulations, seated on a sub-membranaceous cylindrical lip: *antennæ* filiform; between the thorax and the abdomen a small erect scale: the *sting* concealed in the abdomen, and possessed only by the females and neuters. The males and females only have wings.

All the species of this genus are of three sorts, males, females, and neuters. The neuters alone labour; they form the ant-hill, bring in the provisions, feed the young, bring them to the air during the day, carry them back at night, defend them against attacks, &c. The females are said to be retained merely for laying eggs, and as soon as that is accomplished they are unmercifully discarded. The males and females perish with the first cold; the neuters lie torpid in their nest.

Sp. 1. *F. heerculanæa*. (Pl. 8. fig. 10.)

Genus 69. MUTILLA.

Mouth horny, without a tongue: *maxilla* membranaceous at the apex, the lip projecting, obconical, bearing on its apex four unequal *palpi* with obconical articulations: *antennæ* filiform. In general the males are winged, and the females are apterous: *body* pubescent: *sting* concealed.

Sp. 1. *Mutilla europæa*. (Pl. 3. fig. 11. male.)

Order VI. DIPTERA.

This Order includes all those insects that have but two wings, and behind, or below them, two globular bodies, supported on slender pedicles called *Halteres* or poisers. At the mouth they have a proboscis, sometimes contained in a vagina, and sometimes furnished at its sides with two palpi but no maxilla. Their eyes are reticulated and large. The females, in general, lay eggs, but some are viviparous; the larvæ of the insects of this order are as various in their appearance as the places in which they are bred. In general they do not cast their skins, but change into a pupa state.

Genus 70. OESTRUS, Gad-fly.

Haustellum retracted within the lips, which are tumid and grown together with a small pore and no palpi; the *vagina* is membranaceous, cylindrical, obtuse, including three membranaceous *setæ*, which are flexible, short, and reflected; *antennæ* short and setaceous.

The insects of this genus lay their eggs in the nostrils or in the skins of horses, oxen, rein-deer, goats, and sheep; their larva is bred, and feeds on the fat of these animals, or on the matter which is generated in the wound. It is soft and without feet; in some species it has at the extremity two hooks, which it uses to assist it in walking. These hooks are wanting in the larvæ which reside in the skins of oxen and rein-deer. When full grown the larvæ let themselves fall on the ground, they enter the earth and change into an oval hard pupa. The perfect insect takes no food. [Mr. Bracy Clark has written an excellent paper on the insects of this genus, published in the third volume of the *Transactions of the Linnean Society*; which has been re-published with additional remarks, and entitled an *Essay on the Bots of Horses, &c.* 4to, 1815.]

Sp. 1. *O. Bovis*. (Pl. 9. fig. 1.)

Genus 71. TIPULA.

Mouth furnished with a very short proboscis, membranaceous, grooved on the back, and receiving a bristle; a short *haustellum* without a *vagina*; two incurved *palpi*, equal, filiform, and longer than the head; *antennæ* in most species filiform.

The insects of this genus live on garbage; the larvæ have no feet, they are cylindrical and soft; they feed on the roots of plants under which they live; the pupæ are motionless and cylindrical, with two horns before, dentated behind. Some species live in the water, and either swim or roll themselves up in a case.

Sp. 1. *T. oleracea*. (Pl. 9. fig. 2.)

Genus 72. MUSCA.

Mouth with a fleshy exerted proboscis; two equal *lips* and a *haustellum* furnished with setæ, and two short *palpi*; *antennæ* in most species short.

Sp. 1. *M. inanis*. (Pl. 9. fig. 3.)

Genus 73. TABANUS.

Mouth with a straight exerted membranaceous proboscis, ending in an ovate capitulum or knob; with two equal *lips*; *haustellum* projecting, exerted, and received into a groove in the back of the proboscis; *vagina* univalve, with five *setæ* and two equal *palpi*, the last articulation of which is thicker than the rest; *antennæ* short, approximate, cylindrical, with seven articulations; the third generally largest, and armed with a lateral dent.

The insects of this genus suck the blood of animals. They are of a dull plain appearance, but their large eyes are in general beautifully coloured—these colours fade after they are dead.

Sp. 1. *T. tropicus*. (Pl. 9. fig. 4.)

Genus 74. CULEX, the *Gnat*.

With an exerted, univalve, flexible *vagina*; five *setæ*; *palpi* two, consisting of three articulations; *antennæ* filiform.

Sp. 1. *C. pipiens*. (Pl. 9. fig. 5.)

Inhabits Europe and the northern parts of Asia and America.

This insect is frequent in the neighbourhood of waters and marshy places. In southern regions there is a larger species which is known by the name of *Musquetoe*. Its bite is painful, raising a considerable degree of inflammation, and its continual piping note is exceedingly irksome where it abounds, especially during the night. When it settles to inflict the wound and draw the blood, it raises its hind pair of feet. In Lapland, the injuries the inhabitants sustain from it are amply repaid by the vast numbers of water-fowl and wild-fowl which it attracts, as it forms the favourite food of their young.

Genus 75. EMPIS.

Haustrillum inflected; *vagina* univalve, with three setæ and a proboscis; *palpi* short and filiform; *antennæ* setaceous.

The changes of these insects are unknown; they are common on

flowers and in gardens; their head is small and round, the thorax gibbous, the feet long, the proboscis small and inflected.

Sp. 1. *E. pennipes*. (Pl. 9. fig. 6.)

Genus 76. CONOPS.

Mouth with a porrected, geniculated rostrum; *antennæ* clavated; the *clava* acuminated.

Sp. 1. *C. macrocephala*. (Pl. 9. fig. 8.)

Genus 77. ASILUS.

Mouth with a straight, horny, bivalve *haustellum*, which is gibbous at the base; *antennæ* filiform.

The insects of this genus live by preying on those of the Dipterous and Lepidopterous orders. When they are at rest, their wings in general are incumbent on the abdomen, which is long and small, often hairy, particularly the feet, and these end in small claws. Their larvæ feed in the earth, on the roots of plants: they change into a *pupa coarctata*, beset with setæ.

Sp. 1. *A. crabroniformis*. (Pl. 9. fig. 9.)

Genus 78. BOMBYLIUS.

Mouth with a very long setaceous, straight, bivalve *haustellum*; the valves unequal, with three setæ; *two short hairy palpi*; *antennæ* subulated, united at the base.

The insects of this genus, while they fly, suck the nectareous juices of flowers.

Sp. 1. *B. major*. (Pl. 9. fig. 10.)

Genus 79. HIPPOBOSCA.

Mouth with a short, cylindrical, bivalve *haustellum*; the valves equal; *antennæ* filiform; *feet* with several claws.

The insects of this genus live by sucking the blood of animals; and stick so fast to their skins, that they must be torn before they can be taken off.

Sp. 1. *H. equina*. (Pl. 9. fig. 11.)

Order VII. APTERA.

In this Order Linné arranged (if we except the Flea, Louse, and Lepisma,) animals widely different from genuine insects: I shall only enumerate the names of Linné, and the Classes they constitute. The characters of the numerous tribes and genera into which they are distributed, are fully detailed in the article "*Annulosa*" in the Supplement to *Encyc. Brit.* vol. 1. part 2.

The following genera belong to the Class *Insecta*, the characters of

which will be found in Dr. Leach's System, viz. LEPISMA, PODURA, PEDICULUS, PULEX, and TERMES. Genera ACARUS, PHALANGIUM, ARANEA, and SCORPIO, belong to the Class *Arachnoidea*. Genera CANOER, MONOCULUS, and ONISCUS, to the Class *Crustacea*: SCOLOPENDRA and JULUS, to the *Myriapoda*. The characters of the above enumerated Classes will be given hereafter.

It should be observed that those of the above genera, to which are affixed the names of other authors, are not to be found in the writings of Linné, but have been adopted in the various translations and editions since the twelfth of the *Systema Naturæ*; and are generally received by those who adhere to that system. The following synoptical view from the 12th edition of the *Systema Naturæ*, will show the extent of Entomology as left by Linné himself.

Order I. COLEOPTERA.

* *Antennæ clavated or gradually incresing.*

SCARABÆUS, LUCANUS, DERMESTES, HISTER, BYRRHUS, GYRINUS, ATTELABUS, CURCULIO, SILPHA, COCCINELLA.

** *Antennæ filiform.*

BRUCHUS, CASSIDA, PTINUS, CHRYSOMELA, HISPA, MELOE, TENEBRIO, LAMPYRIS, MORDELLA, STAPHYLINUS.

*** *Antennæ setaceous.*

CERAMBYX, LEPTURA, CANTHARIS, ELATER, CICINDELA, BUPRESTES, DYTISCUS, CARABUS, NECYDALIS, FORFICULA.

Order II. HEMIPTERA.

BLATTA, GRYLLUS, CICADA, NOTONECTA, NEPA, CIMEX, APHIS, CHERMES, COCCUS, THRIPS.

Order III. LEPIDOPTERA.

PAPILIO, SPHINX, PHALÆNA.

Order IV. NEUROPTERA.

LIBELLULA, EPHEMERA, PHRYGANEA, HEMEROBIUS, PANORPA, RAPIDIA.

Order V. HYMENOPTERA.

CYNIPS, TENTHREDO, SIREX, ICHNEUMON, SPHEX, CHRYSIS, VESPA, APIS, FORMICA, MUTILLA.

Order VI. DIPTERA.

CESTRUS, TIPULA, MUSCA, TABANUS, CULEX, EMPIS, CONOPS, ASILUS, BOMBYLIUS, HIPPOBOSCA.

Order VII. APTERA.

The genera of the animals of this Order are already enumerated; any further observation will therefore be unnecessary.

ON THE

DIVISION OF ANIMALS FROM THEIR ORGANIZATION.

It is the object of comparative anatomy to point out the difference which each organ presents when considered in every animal: but this exposition would prove very tedious and intricate, were we obliged at every step to enumerate all the animals in which particular organs have a uniform structure. It is certainly much more convenient to indicate them all at once under the name of a class or genus which may comprehend the whole: but to enable us to form this arrangement, it is necessary that all the animals which compose a genus or a class, should possess some resemblance not only in one, but in all their organs.

Nature never oversteps the bounds which the necessary conditions of existence prescribe to her: but whenever she is unconfined by these conditions, she displays all her fertility and variety. Never departing from the small number of combinations that are possible between the essential modifications of important organs, she seems to sport with infinite caprice in all the accessory parts. In these there appears no necessity for a particular form or disposition. It even frequently happens that particular forms and dispositions are created without any apparent view to utility. It seems sufficient that they should be possible; that is to say, that they do not destroy the harmony of the whole.

Among these numerous combinations there are necessarily many which have common parts, and there are always a certain number which exhibit very few differences. By the comparison therefore of those which resemble each other, we may establish a kind of series which will appear to descend gradually from a primitive type. These considerations are the foundations of the ideas from which certain naturalists have formed a *scale of beings*, the object of which is to exhibit the most perfect, and terminating with the most simple kind of organization—with that which possesses the least numerous and most common properties; so that the mind passes from one link of the chain to the other, almost without perceiving any interval, and, as it were, by insensible shades.

The object of system is to reduce a science to its simplest terms; by reducing the propositions it comprehends to the greatest degree of generality of which they are susceptible. A good method in comparative anatomy must, therefore, be such as will enable us to assign to each class and to each of its subdivisions, some qualities common to the greater part of the organs. This object is to be attained by two different means, which may serve to prove or verify one another. The first, and that to which all men will naturally have recourse, is to proceed from the observations of species to uniting them in genera, and

to collecting them into a superior order, according as we find ourselves conducted to that classification by a view of the whole of their attributes. The second, and that which the greater part of modern naturalists have employed, is to fix beforehand upon certain bases of divisions, agreeably to which, beings, when observed, are arranged in their proper places.

The first mode cannot mislead us; but it is applicable only to those beings of which we have a perfect knowledge: the second is more generally practised, but it is subject to error. When the bases that have been adopted remain consistent with the combinations which observation discovers, and when the same foundations are again pointed out by the results deduced from observation, the two means are then in unison, and we may be certain that the method is good. On the anatomy of animals, science is most deeply indebted to the learned, acute, and indefatigable Cuvier, who has contributed more than all others, (save Hunter,) to our accurate knowledge of the characters on which the classes are founded. The whole animal kingdom is by Cuvier divided into four great types:—

1st. That of the animals which have their brain and the principal part of their nervous system inclosed within vertebræ, and their muscles attached to a bony skeleton. - - - - VERTEBROSA.

2dly. Those that have no skeleton; whose muscles are attached to their skin, and whose nervous system is irregular in its form and distribution. - - - - MOLLUSCA.

3dly. Those that have no skeleton; whose muscles are attached to their skin, which is hard, or to processes proceeding from it; and whose nervous system consists of a series of knots or ganglia, brought into communication by two longitudinal nervous cords. - ANNULATA.

4thly. Those whose bodies are radiated, and in whom no nervous system has been discovered, and who have but one opening for the reception and rejection of their food. - - RADIATA OR ZOOPHYTES.

The animals which come under my observations in this work, belong to the type *Annulata*, and the classes to which they belong may readily be distinguished by the following characters.

	<i>Classes.</i>
* <i>Gills for respiration.</i>	
Legs sixteen: antennæ two or four. - - -	1. CRUSTACEA.
** <i>Sacs for respiration.</i>	
Legs twelve: antennæ none: - - -	3. ARACHNÖIDEA.
*** <i>Tracheæ for respiration.</i>	
a. <i>No antennæ.</i>	4. ACARI.
b. <i>Two antennæ.</i>	
Six thoracic legs: abdomen also bearing legs: -	2. MYRIAPODA.
Six thoracic and no abdominal legs -	5. INSECTA.

Class I. CRUSTACEA.

HISTORY.—"All the *Crustacea*, as their name imports, are covered by integuments composed of crustaceous materials, more earthy than those which envelope the *Myriapoda*, the *Arachnöidea*, and *Insecta*. The greater portion of these animals live on putrid or decomposing animal substances, and in all the sexes are distinct."

To the kindness and liberality of my much respected friend Dr. Leach, I am indebted for the above passage and following review (which he has since published in the *eleventh volume of the Dictionnaire des Sciences Naturelles*) of the rise and progress of *Crustacea*; which is selected from his valuable manuscripts.

"The ancients were well acquainted with the *Malacostraca* (*Μαλακοστρακοί*), which they placed between the Mollusca and Fishes. Aristotle has dedicated a chapter to the species known to him; Athenæus has enumerated those used as food; and Hippocrates has made mention of such species as were considered to be useful in medicine. To the observations of Aristotle very little was added by Pliny; and from his time until that of Rondeletius, Belon, Gesner, Aldrovandus and Johnson, (who likewise placed them between the Mollusca and Fishes,) little or nothing was done that tends in any way to illustrate their natural history or structure: Linné, in the first (1735) and subsequent editions of his *Systema Naturæ*, placed all the *Crustacea* amongst the apterous insects, in the genera *Monoculus*, *Cancer*, and *Oniscus*.

"The *Crustacea* were arranged by Brisson (*Regnum Animale*) along with the *Myriapoda* and *Arachnöidea*, being placed between the Fishes and Insects, under the Class *Crustacea*.

"Fabricius in his *Systema Entomologiæ* (1775) distributed these animals into two Classes; 1. SYNGNATHA, comprehending *Monoculus* and *Oniscus*, which he associated with *Ephemera*, *Phryganea*, *Podura*, *Tentredo*, and other genuine Insects; 2. AGONATA, containing *Cancer*, *Pagurus*, *Scyllarus*, *Astacus*, and *Gammarus*, to which he also added *Scorpio*. The same author in his *Species* (1781) and *Mantissa Insectorum* (1787) maintained the same general distribution; adding in the former of those works the genus *Squilla*, and in the latter *Hippa*, removing in each work the genus *Scorpio* from the *Agonata*. In the second volume of his *Entomologia Systematica* (1793) his class *Syngnatha* contained only genuine Insects, the *Onisci* being removed to a new division named *Mitosata*, where they were associated with the *Myriapoda*; the rest he still placed with the *Agonata*, to which he added the genus *Limulus*, *Cymothoa* and *Galathea*.

"Latreille in his *Précis des Caractères des Insectes* (1796) (a work which commences a new æra in the science of Entomology, and in which, for the first time, the distribution of Insects into families is indicated), considered the *Crustacea* as forming three Classes or Orders

of Insects: 1. Les *Entomostracés* (of Müller): 2. Les *Crustacés*: 3. Les *Myriapodes*.

"In that excellent little work *Le Tableau Elementaire de l'Histoire Naturelle des Animaux*, par G. Cuvier (1797), the *Crustacea* are arranged with the *Insecta*, *Arachnoïdea*, and *Myriapoda*, under a division entitled '*Insectes pourvus de Mâchoires, et sans Ailes*,' where they are placed at the head of the Insects, in a limited and well defined section (A.), which he afterwards, in his *Leçons d'Anatomie Comparée*, established on anatomical principles, as a distinct class, named *Crustacés*.

"In 1798 Fabricius published a Supplement to his last work, in which, by the aid of the Baron de Daldorff, he established several new genera, and amended the arrangement of the whole.

"Lamarck in his *Système des Animaux sans Vertèbres* (1801) adopted the *Crustacea* as a peculiar class. This system was adopted by

"Bosc, who in the same year published his *Histoire Naturelle des Crustacés faisant Suite à l'édition de Buffon par Castel*, in which for the first time we are made acquainted with his interesting genus *Zöca*.

"Latreille in his *Histoire Naturelle des Crustacés et des Insectes*, tom. 3. (1802,) adopted the class *Crustacea*, and distributed the genera composing it into two subclasses: 1. *Entomostracés*: 2. *Malacostracés*: excluding however the *Tetracères*, (*Asellida*, and *Oniscida*,) which he referred to a sub-class of Insects.

"Duméril (*Zoologie Analytique*, 1806) arranged these animals into 1. *Entomostracés*, and 2. *Astacoides*, excluding *Oniscus*, *Armadillo*, &c. which he placed with the apterous insects.

"Latreille in the same year produced his celebrated *Genera Crustaceorum et Insectorum*, where they are divided into *Entomostraca* and *Malacostraca*, the *Tetracera* being referred to the Insects.

"The same author in his *Considerations Générales*, &c. (1810) followed the same divisions, referring however the *Tetracera* to the *Arachnoïdea*.

"In the seventh volume of the *Edinburgh Encyclopædia*, article '*Crustaceology*,' Dr. Leach distributed the *Crustacea* into three Orders: 1. *Entomostraca*: 2. *Malacostraca*: 3. *Myriapoda*: in which the *Tetracera* were included. In the Appendix, however, he divided the *Tetracera* from the *Myriapoda* (which he established as a distinct Class), and placed them with the *Malacostraca* in an Order named *Gasteruri*, where they were associated with the *Gammerida*, and considered the *Malacostraca* and *Entomostraca* as sub-classes. This opinion he has since maintained in a paper published in the eleventh volume of the *Transactions of the Linnean Society of London*, in the first volume of the Supplement to the *Encyclopædia Britannica*, and in the *Bulletin des Sciences* for 1816.

"Blainville in his *Prodrome d'une Nouvelle Distribution Systematique* (*Bull. des Sciences*, &c. 1816) has arranged the *Crustacea* into three Classes: 1. *Décapodes*: 2. *Heteropodes*: 3. *Tetradécapodes*."

Class I. CRUSTACEA.

CLASSIFICATION.—The *Crustacea* form two large groups or subclasses. The first of these, the *Malacostraca*, have a pair of mandibles and two pair of maxillæ bearing palpi, and eight pair of legs furnished with branchiæ at their bases: all the genera that do not present the above characters are referred to the artificial assemblage denominated *Entomostraca*.

Subclass 1. ENTOMOSTRACA.—*Legs* branchial, or furnished with appendages: *mandibles* wanting or generally simple: *eyes* sessile or pedunculated.

Subclass 2. MALACOSTRACA.—*Legs* simple, without appendages: *mandibles* palpi-gerous: *eyes* pedunculated or sessile.

Subclass 1. ENTOMOSTRACA.

The animals of this subclass are but little known, and consequently their arrangement is extremely imperfect. Some of the genera are parasitic, being found on the bodies of other animals, and some even undergo transformation during their growth.

The following arrangement is artificial, but is well calculated to enable the student to discover the Genera.

Division I.—*Body covered by a horizontal shield: eyes sessile.*

Subdivision 1.—*Shell composed of but one part.*

* *With jaws.*

Genus 1. APUS, *Cuvier, Latr., Leach. Apos, Scopoli.*

Shell crustaceous-membranaceous, orbiculate-ovate, behind deeply emarginate: the *back* (with the exception of the anterior part) carinated: *eyes* two, inserted at the anterior and middle part of the back; somewhat prominent, slightly lunate, approaching each other, especially anteriorly, where they touch each other: *antennæ* two, short, somewhat filiform, biarticulated, scarcely exerted, inserted behind the mandibles: *mandibulæ* two, corneous, somewhat cylindric, short, hollow within, points arcuated and compressed, the extreme apex straight and very much denticulated: *legs* branchial and very numerous.

The *Api* inhabit stagnant waters and ponds.

Sp. 1. *Ap. Montagu.* Carina of the shell produced into a point behind: anterior legs with articulated setæ: no lamella between the caudal setæ. *Encycl. Brit. Sup. i. Pl. 20.*

Inhabits England near Christchurch in Hampshire, where it was discovered by Montagu, and was named after him by Leach.

Apus productus of Latreille is synonymous with the Linnæan *Monoculus Apus*.

** *With a rostrum, but no jaws: antennæ two.*

Genus 2. CALIGUS, Müll., Latr., Bosc, Leach.

Shell coriaceous-membranaceous, bipartite; the anterior segment inversely cordiform, very deeply notched behind (the notch receiving the hinder segment, which is round), the anterior part subproduced, notched; the laciniae at their base externally bearing antennæ: *antennæ* biarticulate, the first joint thickest, the second with a simple seta at its extremity: *abdomen* narrower than the thorax, with its base contracted and bearing the hinder legs, its extremity on each side with a rounded process of the length of the body: *rostrum* rounded, rather more slender towards its apex, which is obtuse: *legs* fourteen, anterior; second and fourth pairs with a strong claw; the second pair short; the third slender, elongate, the last joint double, with unequal laciniae; the fifth, with the last joint on one side setose, the setæ ciliated on each side; the sixth with a double triarticulated tarsus, the last joints on each side setose, the setæ ciliated on each side; the seventh pair with its last joint trifid: the hinder segment of the *thorax* beneath, terminated by a large broad lamella, ciliated behind.

Sp. 1. *Cal. Mülleri*. Leach, *Encycl. Brit. Supp.*, vol. 1. Pl. 20.

Inhabits the common cod-fish.

Genus 3. PANDARUS, Leach. CALIGUS, Müll., Latr., Bosc.

Shell coriaceous-membranaceous, composed of but one part, deeply notched behind; the angles acute; the middle of the notch toothed; anteriorly narrower, rounded, with a process on each side externally bearing the antennæ: *antennæ* composed of two joints, the second joint terminated by several setæ: *abdomen* somewhat narrower than the shell, the base above with two transverse lamellæ, the first of which is four-lobed, the second bilobate: the *apex* notched, with two filaments longer than the body, with a lamella at their base above: *rostrum* elongate, attenuated, inserted behind the anterior legs: *legs* fourteen; anterior pair short, terminated by a short claw, and arising from beneath an ovate process; second pair with a double, unequal tarsus; third pair without any determinate form, without any claw; fourth pair bifid; fifth and six pairs bifid, their coxæ connected by a lamella; seventh pair bifid, the exterior lacinia longest, with a notch externally towards its apex.

Sp. 1. *Pand. bicolor*. Shell and the middle of the abdominal lamellæ black; tail with filaments double the length of the body.

Pandarus bicolor. Leach, *Encycl. Brit. Supp.* vol. 1. Pl. 20.

Inhabits the *Squalus galeus* of Linné.

Genus 4. ANTHOSOMA, Leach.

Shell coriaceous-membranaceous, unipartite, rounded before and behind; the anterior part as if uni-lobate, the lobe higher than the shell, behind on each side, bearing the antennæ: *antennæ* six-jointed: *abdo-*

men much narrower than the shell, on every side imbricated with membranaceous, foliaceous lamellæ, which surround or embrace it: two of the lamellæ are dorsal, the one being placed over the other; the other lamellæ are placed on the sides of the belly, three on each side; apex of the abdomen terminated by two very long filaments, and with two shorter filaments below them: *rostrum* elongato-cylindric, inserted behind the anterior legs, furnished at its extremity with two straight corneous mandibles: *legs* six; anterior pair three-jointed, the second joint near the apex above unidentate, the last terminated by a claw; second pair triarticulated, the last joint ovate, compressed; third pair biarticulate, the second joint very thick, internally dentated, armed at its extremity by a strong claw.

Sp. 1. *Anth. Smithii*. Leach, *Encycl. Brit. Supp.* vol. 1. *Pl.* 20.

This species was discovered sticking to a shark which was thrown ashore on the coast of Exmouth, in Devon, by T. Smith, esq.

Division II.—*Body covered by a bivalve shell: eyes sessile.*

Subdivision 1.—*Head porrected.*

Genus 5. DAPHNIA, *Müll., Latr., Bosc, Leach.*

Eye one only: *antennæ* two, branching.

Sp. 1. *Daph. Pulex*. Tail inflexed: shell mucronate behind.

Monoculus Pulex. *Linné, Fabr.*

Inhabits ponds and marshes.

Subdivision 2.—*Head concealed.*

Genus 6. CYPRIS, *Müll., Latr., Bosc, Leach.*

Antennæ terminated by a brush.

The animals of this genus inhabit pools and ditches containing pure water; they swim with very great rapidity, and whilst in motion conceal their whole body within their shell, which is truly bivalve.

Sp. 1. *Cyp. conchacea*. Shell ovate, tomentose.

Monoculus conchaceus. *Linn., Fabr.* *Cypris pubera*, *Müll.* *Cypris conchacea*, *Latr., Leach.*

Inhabits France, Germany, and England.

Genus 7. CYTHERE, *Müll., Latr., Bosc, Leach.*

Antennæ simply pilose.

This genus was first discovered and established by Müller, who first observed all the species described in his *Entomostraca*. It is distinguished from *Cypris* by the *antennæ*, which are not terminated by a pencil of hairs. The legs are eight in number, and are rarely drawn within the shell, which is really bivalve.

The *Cytheres* have no tail, and their *antennæ*, like those of the *Cyprides*, have their articulations pilose. They have but one eye. All the species inhabit the sea, and may be found among the *confervæ*

and corallines, which fill the pools left by the tide in most of the rocky coasts of Europe.

Sp. 1. *Cyth. viridis*. Shell reniform, velvety, and green.

Inhabits the European ocean. Is occasionally found on the shores of Scotland amongst *fuci* and *confervæ*.

Division III.—*Body covered neither by a bivalve shell nor shield. Eye one, sessile.*

Genus 8. CYCLOPS. Müll., Lam., Latr., Bosc, Leach.

Body ovate-conic, elongate: eye one, situate on the thorax: antennæ four, simple: legs eight.

All the animals of this genus inhabit fresh waters. The females carry their eggs in a pouch resembling a bunch of grapes on each side of the tail. The organs of generation of the male are placed in the antennæ; those of the female, beneath the belly, at the base of the tail, which is abruptly narrower than the abdomen. The antennæ are hairy at the base of their joints.

Sp. 1. *Cyc. Geoffroyii*. Tail straight and bifid; colour brownish.

Monoculus quadricornis. Linné, Fabr. *Cyclops quadricornis*. Müll., Latr., Bosc. *Cyclops Geoffroyii*. Leach.

Genus 9. POLYPHEMUS. Müll., Latr., Bosc, Leach. CEPHALOCULUS. Lamarck.

Eye one, forming the head: legs ten; two bifid, elongate, and extended horizontally.

Sp. 1. *Pol. Oculus*. Body luteous, with a few blue spots.

The only species known of this genus. It inhabits lakes and marshes; and is subject to very considerable variation in size and colour.

Division IV.—*Body covered by neither a bivalve shell nor shield. Eyes pedunculated.*

Genus 10. BRANCHIOPODA. Lam., Latr., Bosc, Leach.

Body filiform and very soft: head divided from the thorax by a very narrow but distinct neck: eyes two, lateral: antennæ two, short, two-jointed, capillary, inserted behind and above the eyes: front with two moveable processes (which are broader towards the apex in the male sex), that are notched, those of the female furnished with a papilla at their point. The organs of generation are situate at the base of the tail.

Sp. 1. *Br. stagnalis*. Body transparent, of a light brown colour, slightly tinged with green or blue, particularly on the head and legs.

Cancer stagnalis. Linné.—An interesting account of this species is given by the late Dr. Shaw in the *Transactions of the Linnean Society of London*, vol. i.

Subclass II. MALACOSTRACA.

A very valuable work is now publishing by Dr. Leach, in quarto, and illustrated with highly finished engravings, entitled, MALACOSTRACA PODOPHTHALMA BRITANNIÆ, in which the whole of the indigenous species hitherto discovered of this subclass are figured. It is necessary to state that this gentleman has spared neither pains nor expense to render the work complete, having with unexampled zeal and perseverance amassed together one of the finest collections ever formed, which is, with the remainder of his cabinet, consisting of insects, shells, &c. deposited in the British Museum, and, under certain restrictions, may always be consulted by students of Zoology.

Legion I. PODOPHTHALMA.

“The *Malacostraca Podophtalma* include those animals which, in common language, are denominated Crabs, Lobsters, Cray-fish, Prawns, Pandals, and Shrimps, all of which have the power of reproducing their claws when they are lost.”

Order I. BRACHYURA.

- A. *Abdomen of the male five-jointed, the middle joint longest; of the female seven-jointed. Anterior pair of legs didactyle. (Shell truncate behind. Two anterior legs of the male elongate, of the female moderate.)*

Fam. I. CORYSTIDÆ. Leach.

Antennæ long, ciliated on each side.

Genus 1. CORYSTES. Latr., Leach.

External antennæ longer than the body; the third segment composed of elongate, cylindric joints: *external double palpi* with the external foot-stalk narrow; the second joint largest, having its internal side deeply emarginate: *anterior pair of legs*, of the male twice the length of the body, subcylindric, the hand gradually somewhat thicker and somewhat compressed; of the female, of the length of the body, with a compressed hand: *other legs* with tibiæ and tarsi of equal length: *claws* elongate, straight, acute, and longitudinally sulcated: *abdomen*, of the male, with the first joint linear-transverse; the second longer, and produced on each side; third, nearly equally quadrate; the fourth transverse, and narrower than the third; the fifth narrower, nearly triangular, with the tip rounded; of the female, with six joints transverse, arcuated in front; seventh triangular, with the apex rounded: *shell* oblong-ovate, anteriorly slightly rostrated, behind margined:

eyes not thicker than their bending-backward peduncles: *orbits* above with one fissure.

Sp. 1. *Cor. cassivelaunus*. Shell granulated, crenulated behind; front bifid; the sides tridentate.

Cancer cassivelaunus. Penn. Brit. Zool. iv. 6. t. 7. male and female. *Herbst*, i. 195. t. 12. f. 72. male. *Cancer personatus*. *Herbst*, 193. t. 12. f. 71. female. *Alburnea dentata*. *Fabr. Supp. Ent. Syst.* 398. *Bosc, Hist. Nat. des Crust.* ii. 4. *Corystes dentatus*. *Latr.* *Corystes cassivelaunus*. *Leach, Malac. Podoph. Brit. t.* 1.

Inhabits most of the sandy shores of the European ocean, and is often thrown up after heavy gales of wind.

Genus 2. ATELECYCLUS. *Leach, Latreille.*

External antennæ half the length of the body; the third segment composed of elongate and cylindric joints: *external double palpi* with the second joint of the internal footstalk shortest, with the internal apex produced, and the internal side notched towards the joint: *anterior legs* of the male longer than the body, with a compressed hand: *other legs* with tibiae and tarsi of equal lengths, furnished with elongate, quadrate nails that are longitudinally sulcated, having their tips naked, rounded and sharp, the hinder ones obscurely subcompressed: *abdomen* of the male with the first joint transverse, linear, twice the length of the second; the third much elongated, narrower towards its extremity, the apex nearly straight; the fourth subquadrate, with the anterior angles produced; fifth flask-shaped, with a very sharp extremity; of the female, with the first five joints transverse quadrate, anteriorly notched; the last elongate, subtriangular behind, subproduced: *shell* subcircular, the sides gradually converging into an angle behind; hinder part truncate and granulate-margined: *eyes* narrower than their footstalks; *orbits* behind with two fissures, below, with one.

Sp. 1. *At. heterodon*. Shell granulated, the sides with seven serrulated teeth, and other smaller teeth between some of the other teeth: front with three serrulated teeth, the middle of which is the largest. *Leach, Malac. Podoph. Brit. tab.* 2.

This elegant crab was discovered by Montagu on the southern coast of Devon, where it is not an uncommon species in deep water. To the fishermen it is well known by the name of *Old Man's Face Crab*.

FAM. II. PORTUNIDÆ. *Leach.*

Antennæ moderate, simple: *hinder pair of legs* with compressed claws.

Genus 3. PORTUMNUS. *Leach.*

Eyes not thicker than their peduncles: *orbits* entire: *anterior pair of legs* equal: *other legs* with compressed claws, internally towards their base dilated: *fifth pair* with a compressed, foliaceous, lanceolate claw:

abdomen of the male with the fourth joint elongate: *shell* with the transverse and longitudinal diameters the same.

- Sp. 1. *Por. variegatus*. Shell obscurely granulated on each side, with five teeth, the second and third somewhat obsolete; front with three teeth; wrists internally with one tooth. *Leach, Malac. Podoph. Brit. t. 4. male and female. Cancer latipes. Penn. Brit. Zool. iv. 3. t. 1. f. 4. female.*

Planc first discovered this species on the shores of the Adriatic sea. It burrows beneath the sand, where it may be found by digging at low water, on most of our sandy shores.

When living it is most beautifully mottled, and the legs are of a luteous-orange colour.

Genus 4. CARCINUS. *Leach.*

Eyes narrower than their peduncles: *orbits* behind and beneath with one fissure: *anterior pair of legs* unequal, the hands externally smooth; *hinder pair* compressed, and slightly formed for swimming: *abdomen* of the male with the fourth joint transverse, and scarcely narrower than the third: *shell* with the transverse diameter greatest.

- Sp. 1. *Car. Mænas*. Shell with five teeth on each side; front with three rounded teeth or lobes: hands with one tooth, wrist with a spine.

Cancer Mænas of authors. Car. Mænas. Leach, Malac. Podoph. Brit. tab. 5.

This most common species inhabits all the shores and estuaries of Britain. It burrows under the sand, or conceals itself beneath fuci and stones. It is sent to London in immense quantities, and is eaten by the poor.

Genus 5. PORTUNUS. *Fabr., Latr., Bosc, Lam., Leach.*

Eyes much thicker than their peduncles; *orbits* behind, with two fissures, below with one fissure: *abdomen* of the male with the fourth joint transverse: *anterior pair of legs* somewhat unequal, the hands externally with elevated lines, arms generally unarmed; *hinder pair* compressed, foliaceous, and formed for swimming: *shell* with the transverse diameter greatest; the sides with five, rarely with six, teeth.

* *Hinder claws with an elevated longitudinal line; external double palpi with the second joint of their internal footstalk truncate at their internal apex.*

a. *Orbits at the insertion of the antennæ imperfect. Wrists bidentate.*

- Sp. 1. *Por. puber*. Antennæ half the length of the body: shell pubescent; front with many teeth.

Cancer puber. Linné. Cancer velutinus. Penn. Brit. Zool. iv. 8. pl. 4. fig. 8. Portunus puber. Leach, Mal. Podoph. Brit. tab. 6.

Inhabits the southern coasts of Devon. In France it is used as an article of food.

b. *Orbit internally slightly imperfect. Wrists unidentate.*

Sp. 2. *Por. corrugatus*. Shell convex, with transverse serrate-granulate ciliated lines, the side with five teeth on each side, the three hinder of which are more acute; front trilobate, the lobes subgranulate-serrate, the middle one largest; hands above, unidentate; hinder claws with sharp points.

Cancer corrugatus. Penn. Brit. Zool. iv. pl. 5. fig. 9. *Portunus corrugatus*. Leach, Trans. Linn. Soc. xi. 315.—Mal. Podoph. Brit. tab. 7. fig. 1 & 2.

Inhabits the British seas.

** *Hinder claws without the elevated line. External double palpi with the internal apex of the second joint of the internal footstalk emarginate. Orbits internally beneath the insertion of the antennæ imperfect.*

Sp. 3. *Por. marmoreus*. Shell convex, obsoletely and slightly granulated, with five nearly equal teeth on each side; front with three equal teeth, with rounded points; hands smooth, with one tooth above; hinder tarsi with acute points.

Cancer (pinnatus) marmoreus. Montagu's MSS. *Portunus marmoreus*. Leach, Malacost. Podoph. Brit. tab. 8.

This elegant species, which derives its name from its colour, was discovered by G. Montagu, esq. It is very common on the sandy shores of southern Devon, from Torcross to the mouth of the river Ex, and is frequently found entangled in the shore-nets of the fishermen, or thrown on the shore after storms.

FAM. III. CANCERIDÆ. Leach's MSS.

Antennæ simple, short; *four hinder pair of legs* simple.

Genus 6. CANCER of authors.

External antennæ short, inserted between the internal canthus of the eye and the front; *internal antennæ* placed in foveolæ in the middle of the clypeus, with their peduncle nearly lunate: *external double palpi* with the second joint of the internal footstalk notched at the internal apex: *shell* emarginate behind; *orbits* behind with one fissure, and externally with one fold: beneath with one fissure, and externally with one fold: *anterior pair of legs* unequal.

Sp. 1. *Can. Pagurus*. Shell granulated with nine folds on each side; front with three lobes.

This species is the common crab of Britain. It is considered to be in season between Christmas and Easter, and about harvest, being much esteemed as an article of food. Its natural history is but little known. During the summer months it is very abundant on all our rocky coasts, especially where the water is deep. At low tide they are often found in holes of rocks in pairs, male and female; and if

the male be taken away, another will be found in the hole at the next recess of the tide. By knowing this fact, an experienced fisherman may twice aday take, with little trouble, a vast number of specimens, after having once discovered their haunts. In the winter they are supposed to burrow in the sand, or to retire to the deeper parts of the ocean. They are taken in wicker baskets, resembling mouse-traps, or in large nets with open meshes, which are placed at the bottom of the ocean and baited with garbage.

Genus 7. XANTHO. *Leach.*

External antennæ very short, inserted in the internal corner of the eye; *internal antennæ* received in a foveola under the prominent margin of the clypeus, the peduncle sublinear: *external double palpi*, with the second joint of the internal footstalk, notched at the internal apex: *shell* submargined behind: *orbits* entire above, below externally with one fissure: *anterior pair of legs* unequal.

Sp. 1. *Xan. florida*. Wrists above, with two tubercles: shell on each side with four obtuse teeth, the interstices cut out: fingers black.

Montagu, Trans. Linn. Soc. xi. 85. t. 2. f. 1. Cancer incisus. Leach, Edin. Encycl. vii. 391. Xantho incisus. Leach, Edin. Encycl. vii. 430. Xantho florida. Leach, Trans. Linn. Soc. xi. 320.—Suppl. to Encycl. Brit. —Mal. Podoph. Brit. tab. 11.

B. *Abdomen in both sexes seven-jointed. Two anterior legs didactyle.*

Division I. *Eight hinder legs simple, and alike in form.*

Fam. IV. PILUMNIDÆ. *Leach's MSS.*

Shell anteriorly arcuated, the sides converging to an angle: *two anterior legs* unequal.

Genus 8. PILUMNUS. *Leach.*

External double palpi with the second joint of the internal footstalk with the internal apex truncate emarginate: *claws* simple, with naked tips.

Sp. 1. *Pil. hirtellus*. Body and legs bristly: shell with five teeth on each side: claw somewhat muricated on the outside.

Cancer hirtellus. Linn., Penn., Leach, Edin. Encycl. Pilumnus hirtellus. Leach, Suppl. to Encycl. Brit. Leach, Mal. Podoph. Brit. tab. 12. Inhabits the south coast of Devonshire.

Fam. V. OCYPODAIDÆ. *Leach's MSS.*

Shell quadrate or subquadrate: *eyes* inserted in the front.

* *Shell quadrate. Eyes with a long peduncle.*

Genus 9. PINNOTERES. *Latr., Bosc, Leach. ALPHÆUS. Daldorff.*
Antennæ very short (the first three joints largest), inserted in the interior corner of the eyes: *external double palpi*; with the internal foot-

stalk, one-jointed: *anterior pair of legs* unequal: *eyes* thick: *shell* ovate-orbicular, orbiculate-quadrate, or transverse subquadrate.

All the species of this most interesting genus inhabit the bivalve shells of the acephalous *Mollusca*, and were supposed by the ancients to be consentaneous inmates with the animal, bound by mutual interest.

Aristotle supposed them to act as sentinels, and believed that they guarded the *Pinna* (the animal in whose shell they were first observed) from the attacks of its enemies. Rondeletius and some other naturalists held the same opinion.

Sp. 1. *Pin. Cranchii*. Shell orbiculate-subquadrate, soft, very smooth, with the sides dilated behind: front straight, obscurely subemarginate: hands oblong below, and the thighs above with a ciliated line: thumb subarcuate: abdomen very broad; the sides of the segment arcuate; the second and following ones distinctly notched; the fifth segment somewhat broader; the last narrower than the preceding segment. *Female*.

Pinnoteres Cranchii. *Leach, Mulacost. Podoph. Brit. tab. 14. fig. 4. 5.*

The male of this species, which was discovered by Mr. J. Cranch, whose name it bears, is unknown. It is distinguished from *P. Pisum* (the common species) by the form of the front of the shell, which is straight, and slightly notched; by the dilated hinder part of the shell, and by the abdomen, all the joints of which, excepting the first, are distinctly notched behind.

** *Shell quadrate. Eyes with a long peduncle.*

Genus 10. GONOPLAX. *Leach. Ocyпода. Bosc.*

Eyes terminating their peduncle: *anterior pair of legs* equal; of the male very long; of the female twice the length of the body: *antennæ* half the length of the body, inserted at the internal canthus of the eyes.

The animals of this genus inhabit the ocean, preferring such parts as have a slimy bottom. They burrow laterally in the clay or slime, making two entrances to their hole; entering by one and going out by the other.

Sp. 1. *Gon. bispinosa*. Shell on each side with two spines: arms above, and wrists internally, with one spine.

Cancer angulatus. *Penn. Brit. Zool. iv. t. 5. f. 10. Fabr. Suppl. Entom. Syst. 341. Ocyпода angulata. Bosc, Hist. Nat. des Crust. 1. 198.*

Gonoplax bispinosa. *Leach, Trans. Linn. Soc. xi. 323.—Edin. Encycl.—Supp. to Encycl. Brit.—Mal. Podoph. Brit. tab. 13.*

Inhabits the British sea. It is not uncommon at Salcombe and in Plymouth sound; and likewise occurs at Weymouth, and at Red Wharf in Anglesea.

Division II.—*Shell rostrated in front. Eight hinder legs alike, and simple.*

Fam. VI.—*MAIADÆ, Leach.*

Subdivision 1.—*Fingers deflexed.*

Genus 11. EURYNOME. *Leach.*

External antennæ rather long, with the first joint shorter than the second: *shell* verrucated, anteriorly terminated by a bifid rostrum with divaricating lacinia: *eyes* distant, thicker than their peduncle which is of moderate length: *external double palpi* with the interior point of the second joint of their internal footstalks truncate-emarginate: *anterior legs* equal; of the male, three times the length of the body; of the female, longer than the body.

Sp. 1. *Eur. aspera*. Anterior legs and thighs tuberculated: shell with eight tubercles on the back that are more elevated than the others, which are irregular and margined with hairs; the sides with four lamellæ; rostrum with simple acuminate lacinia.

Cancer aspera. *Penn. Brit. Zool.* iv. 8. *Eurynome aspera*. *Leach, Edin. Encycl.* vii. 431.—*Malac. Podoph. Brit.* tab. 17.—*Trans. Linn. Soc.* xi. 326.

Inhabits the British seas.

Subdivision 2.—*Fingers not deflexed. External antennæ with the first joint simple. Anterior pair of legs distinctly thicker than the rest.*

Genus 12. PISA. *Leach.* BLASTUS. *Leach, Edin. Encycl.*

External antennæ with clubbed hairs, the first joint longer than the second: *external double palpi* with the second joint of the internal footstalk with its internal apex truncate or emarginate: *claws* internally denticulated: *shell* villose; the lacinia of the rostrum divaricating: *orbis* behind with two, below with one fissure.

* *Shell densely villose, the sides on each side behind terminated with a spine.*

Sp. 1. *Pisa Gibbsii*. Rostrum descending: shell with a spine behind the eyes on each side; arms and thighs simple.

Cancer biaculeatus. *Montagu, Trans. Linn. Soc.* xi. 2. t. 1. f. 1. *Pisa biaculeata*. *Leach, Edin. Encycl.* vii. 431. *Pisa Gibbsii*. *Leach, Linn. Trans.* xi. 327.—*Mal. Podoph. Brit.* tab. 19.

Inhabits deep waters on the coasts of Devon and Cornwall,

** *Shell villose, with spiny sides.*

Sp. 2. *Pisa tetraodon*. Shell on each side with six spines; two small, the rest larger.

Cancer tetraodon. *Penn. Brit. Zool.* iv. 7. t. 8. f. 15. *Maja tetraodon*, *Bosc, Hist. Nat. des Crust.* 1. 254. *Blastus tetraodon*. *Leach, Edin. Encycl.* vii. 431. *Pisa tetraodon*. *Leach, Trans. Linn. Soc.*—*Supp. to Encycl. Brit.* i. 415.—*Mal. Podoph. Brit.* tab. 20.

Inhabits the south-west coast of England.

Subdivision 3.—*Fingers not deflexed. External antennæ with their first joint simple. Anterior pair of legs scarcely thicker than the others, which are moderately long.*

Genus 13. MAJA. *Lam., Latr., Bosc, Leach.*

External antennæ with the two first joints thickest, and of nearly equal length: shell convex ovate-subtriangular, very spiny: eyes not thicker than their elongate peduncle: external double palpi with the second joint of their internal footstalk deeply notched at its internal apex: claws with naked sharp points.

Sp. 1. *Maj. Squinado.* Shell fasciculate-pilose; orbit above, with one spine; the sides with five strong spines: clypeus beneath the front with a short spine excavated above.

Cancer Squinado. *Herbst*, iii. t. 56. (full grown.) *Id.* i. t. 14. f. 85. 84. junior. Cancer Maja. *Scopoli Entom. Carn.* 1126. *Sowerby's Brit. Miscell.* t. 39. Maja Squinado. *Latr. Gen. Crust. et Insect.* i. 37. *Bosc, Hist. Nat. des Crust.* i. 257. *Leach, Edin. Encycl.* vii. 394. 431. —*Trans. Linn. Soc.* xi. 326.—*Supp. to Encycl. Brit.* i. 415.—*Malac. Podoph. Brit.* tab. 18.

Inhabits the southern coasts of Devon and Cornwall. By the fishermen it is named Thornback or King-crab.

Subdivision 4.—*Fingers not deflexed. External antennæ with the first joint externally dilated.*

Genus 14, HYAS. *Leach, Supp. to Encycl. Brit.* i. 415.

Shell elongate-subtriangular, subtuberculated; the sides behind the eyes produced into a lanceolate projection: rostrum fissured, the lacinix approximating: external antennæ with the first joint dilated, larger than the second: external double palpi with the second joint emarginate at the internal apex.

Sp. 1. *Hyas araneus.* The lastiform process behind the eyes tuberculated behind.

Cancer araneus. *Linn. Syst. Nat.* 1044. Cancer Bufo. *Herbst*, i. 142. t. 17. f. 59. Hyas araneus. *Leach, Edin. Encycl.* vii. 437.—*Trans. Linn. Soc.* xi. 329.—*Mal. Podoph. Brit.* tab. 21. a.

Inhabits the Scottish sea in great plenty; on the English coast it is more rare.

Subdivision 5.—*Second, third, fourth, and fifth pair of legs alike and slender.*

Genus 15. INACHUS. *Fabr., Leach.*

Shell slightly spined, with a spine on each side protecting the eye when retracted: eyes distant, scarcely thicker than their peduncles: external double palpi with the second joint of the internal footstalk truncate at its internal point: external antennæ with the three first joints

thickest: *second pair of legs* thicker than the following ones: *claws* curved.

Sp. 1. *In. Dorsettensis*. Beak short, emarginate; the clypeus beneath produced into a spine: shell anteriorly, with four little tubercles placed transversely; then with three spines, the anterior one strongest; behind with three strong sharp spines, the middle one generally longest and strongest, forming a slightly recurved line; hinder margin with two distinct obsolete tubercles.

Cancer Dorsettensis. *Penn. Brit. Zool.* iv. 8. *pl.* 9. *fig.* 18. Cancer Scorpio. *Fabr. Sp. Inst.* i. 504. *Gmel. Syst. Nat.* i. 2078. *Herbst*, i. 237. 130. Inachus Scorpio. *Fabr. Ent. Syst. Supp.* 358. Macropus Scorpio. *Latr. Hist. Nat. des Crust. et des Insect.* vi. 109. Maja Scorpio. *Bosc, Hist. Nat. des Crust.* i. 252. Inachus Dorsettensis. *Leach, Edin. Encycl.* vii. 431.—*Mulac. Podoph. Brit. tab.* 22. *fig.* 1—6.—*Trans. Linn. Soc.* xi. 330.

Inhabits the British seas.

C. *Abdomen in both sexes six-jointed. Two anterior legs didactyle.*

Fam. VII. LITHODIADÆ. *Leach's MSS.*

Fifth pair of legs minute, spurious.

Genus 16. LITHODES. *Latreille, Leach.*

External double palpi with narrow cylindrical footstalks: *eyes* approximating at their base: *shell* very spiny, anteriorly rostrated.

Sp. 1. *Lith. Maja*. Legs and shell with sharp spines: beak spiny, with the tip bifurcate: fingers with tufts of hair.

Cancer Maja. *Linn. Syst. Nat.* 1046. Cancer horridus. *Penn. Brit. Zool.* iv. 7. *pl.* 7. *fig.* 14. Inachus Maja. *Fabr. Ent. Syst. Supp.* 358. Maja vulgaris. *Bosc, Hist. Nat. des Crust.* i. 251. Lithodes arctica. *Latr. Gen. Crust. et Insect.* i. 40. Lithodes Maja. *Leach, Edin. Encycl.* vii, 395.—*Trans. Linn. Soc.* xi. 332.—*Supp. to Encycl. Brit.* i. 416.—*Mulac. Podoph. Brit. tab.* 24.

Inhabits the Northern sea, and in our seas is very rare, or at least very local; occurring only on the rocky shores of Yorkshire and of Scotland.

Fam. VIII. MACROPODIADÆ.

Second, third, fourth, and fifth pair of legs alike and slender. *Eyes* not retractile.

Genus 17. MACROPODIA. *Leach. MACROPUS. Latr.*

Shell slightly spined; beak long and fissured: *eyes* distant, subreniform, much thicker than their peduncles: *external antennæ* half the length of the body; the second joint three times the length of the third: *external double palpi* slender; the internal footstalk with the two equal

joints: *palpi* very hairy, the middle joint shortest, the third a little longer than the first: *four anterior claws* with their tips bent: *four hinder ones* abruptly curved at their base.

Sp. 1. *Mac. Phalangium*. Beak acuminate, much shorter than the antennæ: shell behind the rostrum, with three tubercles placed in a triangle, the hinder tubercle largest: arms internally subscabrous and hirsute.

Cancer Phalangium. *Penn. Brit. Zool.* iv. 8. pl. 9. fig. 17. *Macropus longirostris*. *Latr. Gen. Crust. et Insect.* *Macropodia longirostris*. *Leach, Edin. Encycl.* vii.—*Zool. Misc.* ii. 18.—*Trans. Linn. Soc.* xi. 331.—*Mal. Podoph. Brit. tab.* 23.

Inhabits the mouths of rivers, and is very common in Great Britain.

D. *Abdomen of both sexes four-jointed. Two anterior legs didactyle.*

Fam. IX. LEUCOSTADÆ.

Genus 18. EBALIA. *Leach*.

Shell rhomboidal, produced in front; the sides entire: *anterior pair of legs* depressed, much larger than the rest; arms subangulated; fingers subdeflexed: *external pedipalpes* with their external footstalk linear: *abdomen* of the male with its last joint at its base furnished with a dentiform process.

Sp. 1. *Eb. Pennantii*. Shell granulated, with an irregular elevated cross: abdomen with 3—6 joints confluent.

Cancer tuberosus. *Penn. Orn. Zool.* iv. 8. t. 9. A. f. 19. *Ebalia Pennantii*, *Leach, Maluc. Podoph. Brit. t.* 25. f. 1—6. ♂ & ♀.

Order II. MACROURA.

This Order contains the Families *Pagurii*, *Palinurini*, *Astacini*, and *Squillares* of Latreille.

Division I.—*Tail on each side with simple appendices.*

Fam. I. PAGURIDÆ. *Leach*.

Legs ten; anterior pair largest and dactyle.

Genus 19. PAGURUS. *Fabr., Latr., Bosc, Leach*.

External antennæ with the second joint of their peduncle with a moveable spine affixed to the apex above: *abdomen* membranaceous: *tail* three-jointed, crustaceous; the second joint on each side appendiculated: *four hinder legs* spurious, short, didactyle.

The curious economy of the genus *Pagurus* attracted the attention of the ancients. One species is well described by Aristotle.

All the species are parasitical, and inhabit the cavities of turbinated univalves. They all change their habitation during their growth, first occupying the smallest shells, and latterly those of very

considerable dimensions. The abdomen is naked and slender, being covered merely with a skin of a delicate texture; but its extremity is furnished with appendages, by means of which it secures itself within the shell of which it makes choice. It is really astonishing with what facility these animals move, bearing at the same time the shell, which is destined to preserve the body from injury and to guard them from the attacks of fishes, which would otherwise devour them. All the species are termed indiscriminately Soldier-crabs and Hermit-crabs, from the idea of their living in a tent, or retiring to a cell.

Sp. 1. *Pag. Streblonyx* (common Soldier-crab). Arms hairy, muricated, the left largest; hands subcordate, fingers broad.

Cancer Bernhardus of Pennant and other English authors. *Pagurus Streblonyx*. *Mal. Podoph. Brit. tab. 26. fig. 1 & 4.*

Inhabits the European ocean, and is very abundant in the British seas, inhabiting various kinds of univalve shells, changing its habitation as it grows. *Pagurus araneiformis*, *Edinb. Encycl. vii. 396*, is merely the young of this species.

Division II.—*Tail on each side with foliaceous appendages, forming with the middle tail-process a fan-like fin.*

a. *Interior antennæ with very long footstalks.*

Fam. II. PALINURIDÆ. *Leach.*

External antennæ setaceous, and very long: legs ten, alike and simple.

Genus 20. PALINURUS. *Dald., Fabr., Lam., Latr., Bosc, Leach.*

The animals of this genus have the power of producing a sound by rubbing their exterior antennæ against the sides of the projecting clypeus.

Sp. 1. *Pal. vulgaris.*

Astacus homarus. *Penn. Brit. Zool. iv. 16. pl. 11, Leach, Mal. Podoph. Brit. tab. 30.*

Inhabits the European ocean. It is commonly eaten in London, and is sometimes denominated Spiny-lobster or Sea Cray-fish.

Fam. III. GALATEADÆ.

External antennæ very long and setaceous: legs ten, anterior pair didactyle, fifth pair spurious.

Genus 21. PORCELLANA. *Lam., Latr., Bosc, Leach.*

External double palpi with the first joint of the internal footstalk dilated internally: *shell orbiculate subquadrate.*

Sp. 1. *Por. platycheles*. Anterior margin of the shell with three entire teeth: claws very large and much depressed: wrists internally denticulated; hands externally deeply ciliated.

Cancer platycheles. *Penn. Brit. Zool. iv. 6. pl. 6. & 12. Porcellana platycheles. Latr. Leach, Edin. Encycl. vii.*

Inhabits the rocky shores of the southern and western coasts of Britain, concealing itself beneath stones, to the under side of which it adheres closely.

Genus 22. GALATEA. Leach. GALATHEA. Fabr., Latr., Lam., Bosc, Leach.

External double palpi with the internal edge of the first joint not dilated: shell ovate.

* *Rostrum acuminate, acute, with four spines on each side. Anterior legs compressed. Abdomen with the sides of the segments obtuse. Tail with the intermediate lamella triangular, the tip emarginate, the apex of the lacinia rounded. Interior antenna with the first joint of the peduncle trispinose.*

a. *Second joint of the internal footstalk of the external double palpi longer than the first.*

Sp. 1. *Gal. squamifera*. Anterior legs granulate-spinose: hands externally subserrated: wrists and arms internally spinose.

Galatea Fabricii. Leach, *Supp. to Encycl. Brit.* i. 419. pl. 21. *Galathea squamifera*. Leach, *Trans. Linn. Soc.* xi. 340.—*Mal. Podoph. Brit.* tab. 28. A.

b. *Second joint of the internal footstalk of the external double palpi shorter than the first.*

Sp. 2. *Gal. spinigera*. Anterior legs subgranulate squamose; above and on each side spinose: arms externally without spines.

Astacus strigosus. Penn. *Brit. Zool.* iv. 18. pl. 14. *Cancer (Astacus) strigosus*. Herbst, tab. 26. f. 2. *Galathea strigosa*. Fabr., Latr., Leach. *Galathea spinigera*. Leach, *Malac. Podoph. Brit.* tab. 28. B.

** *Rostrum elongate, spiniform; the base on each side bispinose. Anterior pair of legs subcylindric. Abdomen with the sides of the segments acute. Tail with the intermediate lamella transverse-quadrate; the apex subemarginate. Interior antenna with the first joint of the peduncle four-spined. (External double palpi with the first joint of the internal footstalk longer than the second.)*

Sp. 3. *Gal. rugosa*. Anterior legs spinose, especially internally: abdomen with the second segment anteriorly with six; the third with four spines.

Astacus Bamffius. Penn. *Brit. Zool.* iv. 17. pl. 27. *Galathea rugosa*. Fabr., Bosc, Latr. *Cancer rugosus*. Gmel. *Syst. Nat.* i. 2985. *Galathea longipeda*. Lam. *Syst. des Anim. sans Vert.* 158. *Galathea Bamffia*. Leach, *Edin. Encycl.* vii. 398. *Galathea rugosa*. Leach, *Malac. Podoph. Brit.* tab. 29.—*Trans. Linn. Soc.* xi. 341.

Inhabits the European ocean and Mediterranean sea. It is very rare in Britain, but has been found on the Bamffshire coast and in Plymouth sound.

b. *Interior antennæ with moderate footstalks.*Fam. IV. ASTACIDÆ. *Leach's MSS.*

Antennæ inserted in the same horizontal line, interior ones with two setæ, the exterior ones simple: *legs* for walking ten, anterior pair of these largest.

STIRPS 1.—*Exterior lamella* of the tail composed of one part.

Genus 23. GEBIA. *Leach.*

Two anterior legs equal, subdidactyle, with the thumb short: *interior antennæ* with an elongate peduncle; the second joint shortest, the third largest and cylindrical: *external double palpi* with the third joint of the internal footstalk shortest: *tail* with broad lamellæ; the exterior ones costated, the middle one quadrate.

Sp. 1. *Geb. Deltæura*. Abdomen with the back membranaceous: tail with the apex of the exterior lamella dilated and somewhat rounded; interior one truncate, and formed like the Greek delta.

Gebia deltaura. *Leach, Trans. Linn. Soc. xi. 342.*—*Mal. Podoph. Brit. tab. 31. fig. 9, 10.*

Inhabits beneath the sand on the southern coast of Devonshire, and is found by digging to the depth of two or three feet.

Genus 24. CALLIANASSA. *Leach.*

Four anterior legs didactyle; anterior pair largest, very unequal; second pair less; third pair monodactyle; fourth and fifth pairs spurious: internal antennæ with an elongate biarticulate peduncle, the second joint longest: *external double palpi* with the second joint of the internal footstalk largest and compressed: *tail* with broad lamellæ; the middle process elongate-triangular, with the apex rounded.

The thorax anteriorly abruptly subacuminate; the rostriform process divided from the shell by a suture: anterior pair of legs very much compressed, the hand articulated: the larger leg with the base of its wrist furnished with a curved process.

Sp. 1. *Cal. subterranea*. Shell with the rostriform process with one longitudinal ridge, the point rounded.

Cancer *Astacus subterraneus*. *Montagu, Trans. Linn. Soc. xi. Callianassa subterranea. Leach, Edin. Encycl. vii. 400.*—*Trans. Linn. Soc. xi. 343.*—*Supp. to Encycl. Brit. i. 420.*—*Malac. Podoph. Brit. tab. 32.*

This animal lives beneath the sand on the sea-shore. It was first described by Montagu, who found it by digging in a sand-bank in the estuary of Kingsbridge, on the southern coast of Devon.

Genus 25. AXIUS. *Leach.*

Four anterior legs didactyle; anterior pair largest, and somewhat unequal; third, fourth, and fifth pairs furnished with a compressed claw: *interior antennæ* with a three-jointed peduncle, the first joint longest: *external double palpi* with the two first joints somewhat large

and unequal: tail broad; the intermediate lamella elongate-triangular.

Sp. 1. *Ax. Stirynchus*. Rostrum margined, the middle carinated: thorax behind the rostrum, with two elevated abbreviated lines notched behind. *Axius Stirynchus*. Leach, *Trans. Linn. Soc.* xi. 343.—*Supp. to Encycl. Brit.* i. 420.—*Mal. Podoph. Brit. tab.* 33.

Inhabits the British sea.

STIRPS 2. *Exterior lamella* of the tail bipartite: *external antennæ* with a spine-shaped squame at the first joint of the peduncle: *anterior pair of legs* didactyle.

* *Eyes* subglobose, not thicker than their peduncles.

The coxæ of the third pair of legs of the female, of the fifth pair of the male, perforated. These perforations are for the passage of the semen and of the eggs; and although placed differently in other genera, yet they serve the same functions.

Genus 26. ASTACUS. Leach's MSS.

Abdomen with the sides of its segments obtuse: middle tail lamella composed of one piece.

Sp. 1. *Ast. Gammarus*. Rostrum on each side with four teeth, and with one on each side of its base.

Cancer *Gammarus*. *Linn. Syst. Nat.* i. 1050. *Astacus Gammarus*. *Penn. Brit. Zool.* iv. 9. pl. 10. *Astacus marinus*. *Fabr. Supp. Ent. Syst.* 406, *Latr. Gen. Crust. et Insect.* i. 51. *Astacus Gammarus*. Leach, *Edin. Encycl.* vii. 398.—*Trans. Linn. Soc.* xi. 344.—*Supp. to Encycl. Brit.* i. 420.

This species, which is the common lobster of our markets, inhabits deep clear water at the foot of rocks which hang over the sea. They breed during the early summer months, and are very prolific, Baxter having counted no less than 12,444 eggs under the abdomen. In warm weather they are very active; they have the power of springing backward in the water to a most astonishing distance into their holes in the rocks, as has been frequently observed by naturalists of credit. Their food consists of dead animal matter, and, it is said, also of sea-weed. The female is stated to deposit her eggs in the sand, but the young state is not known.

The common lobster inhabits the European ocean. It is found in very great abundance in the North of Scotland; but is much more common on the coast of Norway, from whence the London markets are for the most part supplied.

Genus 27. POTAMOBIOUS. Leach's MSS.

Abdomen with the sides of its segments sharp: middle tail lamella bipartite.

Sp. 1. *Pot. fluviatilis*. Rostrum laterally dentated, the base with one tooth on each side.

Cancer *Astacus*. *Linn. Syst. Nat.* 1. 1051. *Astacus astacus*. *Penn.*

Brit. Zool. iv. 14. pl. 15. fig. 27. *Astacus fluviatilis*. *Fabr., Latr., Leach.*

** *Eyes reniform, abruptly shorter than their peduncles.*

The *coræ* of the third pair of legs of the female, of the fifth pair of the male, perforated.

Genus 28. NEPHROPS. *Leach.*

External antennæ with the first joint of their peduncle furnished at its apex with a squama, which is produced beyond the apex of the peduncle.

Sp. 1. *Neph. Norwegicus*. Abdomen with hairy areolæ; shell somewhat spiny in front.

Cancer *Norwegicus*. *Linn. Syst. Nat.* i. 1053. *Astacus Norwegicus*. *Penn. Brit. Zool.* iv. 17. pl. 12. fig. 24. *Nephrops Norwegicus*. *Leach, Mal. Podoph. Brit. tab.* 36.

Inhabits the northern parts of Europe. It is found in the Frith of Forth during the summer months, often attaching itself to the lines of the fishermen: colour, when living, flesh red. Fabricius, Bosc, and Latreille, cannot have seen this animal, since they all describe it as having four instead of six didactyle legs.

FAM. V. PALÆMONIDÆ.

External antennæ with a large squama at their base.

STIRPS 1.—*External antennæ* inserted in the same horizontal line with the interior ones, which have two setæ: tail with the external lamella composed of but one part.

Genus 29. CRANGON. *Latr., Bosc, Leach.*

**Second pair of legs* didactyle, of the same length with the third pair: *pedipalpes* with their last joint obtuse at its point.

Sp. 1. *Cran. vulgaris*. Thorax behind the rostrum, and on each side, as well as the arms beneath with a spire.

Cancer *Crangon*. *Linné*. *Crangon vulgaris*. *Fabr., Leach, Mal. Pod. Br.* t. 37. B. Common Shrimp.

Genus 30. PONTOPHILUS. *Leach.*

Second pair of legs didactyle, much shorter than the third pair: *pedipalpes* with the last joint acuminate.

Sp. 1. *Pont. spinosus*. Thorax with five ranges of spines, disposed longitudinally; three ranges dorsal and one on each side.

Pontophilus spinosus. *Leach, Mal. Pod. Brit. t.* 37. A.

Discovered by C. Prideaux, esq., amongst some rubbish from Plymouth Sound; a second specimen was afterwards taken off Falmouth by the late John Cranch, Zoologist to the Congo Expedition.

STIRPS 2.—*External antennæ* inserted below the interior ones: interior ones with two setæ inserted in the same horizontal line: *exterior lamella* of the tail bipartite.

Genus 31. *PROCESSA*. Leach. *NIKA*. Risso.

Anterior pair of legs, with one side didactyle, the other armed with a simple claw: second pair unequal, didactyle, slender; one very long, with the wrists and fore arm many-jointed; the other shorter, with the wrists many-jointed; other legs terminated by simple claws.

Sp. 1. *Pro. canaliculata*. Base of the rostrum with one tooth; intermediate lamella of the tail longitudinally canaliculated.

Processa canaliculata. Leach, *Mal. Podoph. Brit. tab. 41*.

The thighs of the third and fourth pairs of legs are spinulose beneath; at the base of the rostrum there is an elevation dividing it from the thorax.

The above species, which forms the type of the genus, was discovered at Torcross, on the southern coast of Devon, by Montagu.

STIRPS 3.—*External antennæ* inserted below the internal ones; interior ones with two setæ, one placed above the other. (*External lamella* of the tail composed but of one part.)

a. *Internal antennæ with the superior seta excavated below. Claws spinulose.*

Genus 32. *PANDALUS*. Leach.

Anterior pair of legs adactyle; second pair didactyle, unequal. *External double palpi* with the last joint of the internal footstalk longer than the preceding joint.

Sp. 1. *Pan. annulicornis*. Rostrum ascending, many-toothed, apex notched; inferior antennæ annulated with red, and internally spinulose.

Pandalus annulicornis. Leach, *Malac. Podoph. Brit. tab. 40.*—*Trans. Linn. Soc. xi. 346.*—*Suppl. to Encycl. Brit. i. 421.*

Genus 33. *HIPPOLYTE*. Leach.

Four anterior legs didactyle: *external double palpi* with the last joint of the internal footstalk shorter than the preceding joint.

Sp. 1. *Hip. varians*. Rostrum straight, with two teeth above and below; shell above and beneath the eyes with one spine.

Hippolyte varians. Leach, *Trans. Linn. Soc. xi. 347.*—*Suppl. to Encycl. Brit. i. 421.*—*Mal. Podoph. Brit. tab. 38. fig. 6—16.*

Inhabits the rocky shores of the south of Devon. It varies much in colour, being often found red, green, and blueish green.

b. *Internal antennæ with the superior seta not excavated. Claws simple.*

Genus 34. *PENÆUS*. Fabr., Latr., Bosc, Leach.

Six anterior legs didactyle: *external double palpi* with five exerted joints, the last of which is obtuse.

Sp. 1. *Pen. trisulcatus*. Thorax trisulcated behind; rostrum descending, multidentate above.

Penæus trisulcatus. Leach, *Trans. Linn. Soc.* xi. 347.—*Supp. to Encycl. Brit.* i. 421.—*Mal. Podoph. Brit. tab.* 42.

Inhabits the Welsh Sea.

STIRPS 4.—*External antenna* inserted below the internal; internal ones with three setæ. (*External lamella* of the tail composed of but one part.)

Genus 35. PALÆMON. *Fabr., Latr., Bosc, Leach.*

Four anterior legs didactyle: anterior pair smaller than the second pair: *external double palpi* with the last joint shorter than the preceding joint.

Sp. 1. *Pal. serratus* (*common Prawn*). Rostrum ascending above, with from six to eight teeth, the apex emarginate; below with from four to six teeth.

Astacus serratus. *Penn. Brit. Zool.* iv. 19. (*pl.* 16. *fig.* 28.) *Cancer (Astacus) Squilla*. *Herbst*, ii. 55. *tab.* 27. (*fig.* 1.) *Palæmon Squilla*. *Latr. Gen. Crust. et Insect.* i. 54. *Leach, Edin. Encycl.* vii. 401. *Palæmon serratus*. *Leach, Trans. Linn. Soc.* xi. 348.—*Supp. to Encycl. Brit.* i. 421.—*Mal. Podoph. Brit. tab.* 43. *fig.* 1—10.

Variety α . Rostrum with six teeth above.

Subvariety 1. Rostrum beneath with four teeth.

—————2. ————— five teeth.

Variety β . Rostrum above with seven teeth.

Subvariety 1. Rostrum beneath with four teeth.

—————2. ————— five teeth.

—————3. ————— six teeth.

Variety γ . Rostrum with eight teeth above.

Subvariety 1. Rostrum beneath with four teeth.

—————2. ————— five teeth.

—————3. ————— six teeth.

“Although all the above varieties are common, yet β occurs most frequently. In some may be seen the upper edge of the rostrum with ten, the lower with five teeth; and both edges with but three teeth. The apex is generally notched above, and in two specimens, which may be considered a rare occurrence, the point has been found entire. The situation of the teeth on the upper edge is variable, but in most instances the second tooth is at a greater distance from the first than the rest, which are generally equidistant, and rarely extend far beyond the middle, the rostrum from that part being edentate, with the exception of the emarginate apex.”

Herbst, Latreille, and Leach, formerly considered this species as *Cancer Squilla* of Linné; but Dr. L. has, since the publication of the error, met with the true *C. Squilla* of that author, and has de-

scribed it in the eleventh volume of the *Transactions of the Linnean Society*, p. 348.

"*Palamon serratus* of Fabricius is distinct, and, if his description be correct, it is not even referable to this genus; he having expressly given as its specific character '*Antennis posticis bifidis*,' (hinder antennæ bifid;) whereas, in his generic character, he has stated these organs to be trifid ('*Antennæ superiores trifidæ*.'")

Genus 36. ATHANAS. *Leach*.

Four anterior legs didactyle: anterior pair larger than the second pair: external double palpi with the last joint longer than the preceding joint.

Sp. 1. *Ath. nitescens*. Rostrum straight, and simple.

Cancer (*Astacus*) nitescens. *Montagu's MSS.* Athanas nitescens. *Leach, Trans. Linn. Soc.—Supp. to Encycl. Brit.—Mal. Podoph. Brit. tab. 44.*

Inhabits the southern coast of Devonshire.

STIRPS 5.—External antennæ inserted below the internal: interior ones with a large scale at their base. Legs for movement sixteen.

Genus 37. MYSIS. *Lutr., Leach.* PRAUNUS. *Leach*.

Legs bifid, the last joint of the four anterior pairs with the interior lacinia uniaarticulate, ovate, compressed; of the other pairs of legs multiarticulate: external double palpi with the middle joint of the internal footstalk longest, the first very short.

At the base of the abdomen of the female is situated the external uterus, composed of two valve-like membranes, in which the young ones, just excluded from the egg, live and grow until they become strong enough to take care of themselves.

The animals of this genus swim with their head uppermost, and with their eyes spreading, which gives them a singular and grotesque appearance.

* *Intermediate lamella of the tail emarginate.*

Sp. 1. *Mysis spinulosa*. Tail with the intermediate lamella externally spinulose; the apex acutely emarginate; exterior lamellæ acuminate, and very broadly ciliated.

Praunus flexuosus. *Leach, Edin. Encycl. vii. 401.* *Mysis spinulosa.* *Leach, Trans. Linn. Soc. xi. 350.—Supp. to Encycl. Brit. i. 422.*

Inhabits the Frith of Forth near Leith.

"Colour when alive, pellucid cinereous: eyes black, red at their base: lamina of the external antennæ with a black longitudinal line and spots. A clouded spot on each side of the hinder part of the thorax, and another above the legs. Every segment of the body most beautifully marked with a reddish-rust coloured spot, disposed in an arborescent form; tail fin spotted with the same colour, mixed with black: pouch of the female with two rows of fuscous-black spots: under side of the abdomen regularly mottled with rufous black."

It was observed with young from the middle of June to the middle of July. The females are one-third more abundant than the males.

Length an inch and a quarter.

** *Intermediate lamella of the tail entire.*

Sp. 2. *Mysis integra*.

Praunus integer. Leach, *Edin. Encycl.* vii. 401. *Mysis integra*. Leach, *Trans. Linn. Soc.* xi. 350.—*Supp. to Encycl. Brit.* i. 422.

Inhabits brackish pools of water, left by the tide at Lock Ranza in the Isle of Arran. Common in the month of August with young.

Length one third of an inch.

Females more abundant than the males. Colour whilst living pellucid cinereous, spotted with black and reddish brown.

Division III.—*Tail with two setæ, one on each side.*

Fam. VI. NEBALIADÆ. Leach.

Genus 38. NEBALIA. Leach.

Thorax anteriorly with a moveable rostrum: *anterior pair of legs* longest, simple; other pairs equal, approximate, with the last joint bifid: *antennæ* two, inserted above the eyes, the last joint bifid and multi-articulate.

Sp. 1. *Neb. Herbstii*. Gray or cinereous-yellowish; eyes black.

Cancer bipes. *Oth. Fabr. Fn. Grön.* no. 223. *fig. 2.* *Herbst*, ii. *tab. 24.*

fig. 7. *Mysis bipes*. *Latr: Hist. Nat. des Crust. et des Insect.* vi. 285.

Monoculus rostratus. *Montagu, Trans. Linn. Soc.* xi. 14. *tab. 2. fig. 5.*

Nebalia Herbstii. Leach, *Zool. Miscel.* i. 100. *tab. 44.*—*Trans. Linn.*

Soc. xi. 351.—*Supp. to Encycl. Brit.* i. 422.

Inhabits the European Ocean; it is common beneath stones lying on black mud, on the southern coast of Devon.

Genus of doubtful situation.

Genus 39. MEGALOPA, Leach.

The situation of this curious genus, which is figured in Dr. Leach's *Malacostraca Brit.* (*tab. 25.*), is still doubtful. It however decidedly belongs to the MACROURA, as Dr. L. has discovered to be the case, since the publication of the first volume of the *Supp. to Encycl. Brit.*

Legion II. EDRIOPHTHALMA.

The *Malacostraca Edriophthalma*, or at least a greater part of them, were placed amongst the MACROURA by Latreille, who considered them as forming a particular family of that order.

Section I.

Body laterally compressed.

Fam. I. PHRONYMADE. *Leach's MSS.*

Legs fourteen: *antennæ* two, inserted one on each side of the front of the head. (*Tail* furnished with styles.)

Genus 1. PHRONYMA. *Latr., Leach, Lamarck.*

Head large, nutant: *antennæ* biarticulate, the first joint small: *thorax* seven-jointed, all its segments bearing legs: *legs* compressed, *two anterior* pairs with the antepenultimate joint furnished at its point with a foliaceous process; the penultimate joint with the point bifid and terminated with a small claw: *third* and *fourth* pairs simple, longer, somewhat thicker, terminated by a bent claw: *fifth* pair large, very long, thicker, didactyle; the first joint gradually thickened towards its point; the second subtrigonal; the third ovate, and abruptly narrowed at its base; the last narrowed at its base; the fingers curved, and internally furnished each with one tooth: *sixth* and *seventh* pairs simple, terminated with a nearly straight claw: *abdomen* triarticulate, each segment, on each side, with a double appendice, placed on a peduncle: *tail* biarticulate, the first joint on each side furnished with a biarticulate process, terminated by two styles; second joint with four processes, each terminated by two styles; the inferior processes biarticulate, the superior triarticulate.

Sp. 1. *Phron. sedentaria*. Fifth pair of legs with the apex of the thumb and base of the fingers internally denticulated.

Cancer sedentarius. *Forsk. Fn. Arab.* 95. *Phronyma sedentaria.* *Latr. Gen. Crust. et Ins.* i. 57. *Leach, Edin. Encycl.* vii. 403—433.—*Trans. Linn. Soc.* xi. 355. **Cancer** (*Gammarellus*) *sedentarius.* *Herbst,* ii. 136. t. 37. fig. 8.

Inhabits the Mediterranean Sea and Zetland Sea, residing in a cell composed of a gelatinous substance, open at each extremity, where it sits in an incurved posture.

The only specimen of this most interesting, rare, and curious animal was taken by the Reverend Dr. J. Fleming, one of our most zealous naturalists, who found it on the 3d of November 1809, at Burray in Zetland, amongst rejectamenta of the sea, and communicated it to Dr Leach.

Fam. II. GAMMARIDE. *Leach's MSS.*

Body laterally compressed: *legs* fourteen, with lamelliform *coxæ*: *antennæ* four, inserted by pairs. (*Tail* furnished with styles.)

STIRPS 1.—*Antennæ* four-jointed, the last segment composed of many little joints; the upper ones very short.

Genus 2. TALITRUS. *Latr., Bosc, Leach.*

Four anterior legs in both sexes subequal, monodactyle: *upper antennæ*, shorter than the two first joints of the under ones.

Sp. 1. *Tal. Locusta*. Antennæ subtestaceous-rufous, of the male longer than the body, of the female shorter; body cinereous, varied with darker cinereous.

Oniscus *Locusta*. *Pallas?* *Talitrus Locusta*. *Latr., Bosc, Leach.* *As-tacus Locusta*. *Penn. Brit. Zool.* iv. 21. Cancer (*Gammarus*) *Saltator*, *Montagu, Trans. Linn. Soc.* xi. 94.

Inhabits the sandy shores of the European Ocean.

The specific name *Locusta* is probably derived from the form of its protruded mouth, which has a general resemblance to the same part in the GRYLLIDES.

It has never been observed in the water; it burrows in the sand, and leaps about on the shore. *Talitrus littoralis*, described in the seventh volume of the *Edinburgh Encyclopædia*, is merely the female of *T. Locusta*.

The use of this animal (which is generally denominated Sand-hopper) in the economy of nature, appears to be that of contributing to the dissolution of putrid animal and vegetable matter; serving in return as food to the shore birds, who devour it with avidity.

Genus 3. ORCHESTIA. *Leach.*

Four anterior legs of the male monodactyle; second pair with a compressed hand; of the female, with the anterior pair monodactyle, the second didactyle: upper antennæ not longer than the two first joints of the under ones.

Sp. 1. *Orc. littorea*.

Cancer *Gammarus littoreus*. *Montagu, Trans. Linn. Soc.* xi. 96. *Orchestra littorea*. *Leach, Edin. Encycl.* vii. 402. pl. 21. fig. 6.—*Trans. Linn. Soc.* xi. 356.—*Supp. to Encycl. Brit.* i. 424.

Inhabits many of our shores, and is found at the mouths of rivers, but has never been observed in the water. It resides under stones and fuci, and in the evening it leaps about and is devoured by birds.

STIRPS 2.—Antennæ four-jointed, the last joint composed of several little joints; upper ones rather shortest.

Genus 4. DEXAMINE. *Leach.*

Four anterior legs sub-equal, monodactyle, furnished with a filiform-subovate hand: antennæ with their first joint shortest: eyes oblong, not prominent, inserted behind the superior antennæ: tail on each side with three double styles, and above on each side with one moveable style.

Sp. 1. *Dex. spinosa*. Segments of the abdomen behind, produced into spines.

Cancer (*Gammarus*) *spinus*. *Montagu, Trans. Linn. Soc.* xi. 3. *Dexamine spinosa*. *Leach, Edin. Encycl.* vii. 433.—*Zool. Miscel.* ii. 24.—*Trans. Linn. Soc.* xi. 359.—*Supp. to Encycl. Brit.* i. 425.

Inhabits the sea of the western coasts of Britain.

Genus 5. LEUCOTHÖE. *Leach.*

Anterior pair of legs didactyle; the thumb biarticulate: *second pair* with a dilated and compressed hand, furnished with a crooked thumb.

Sp. 1. *Leu. articulosa.*

Cancer articulatus. *Montagu, Trans. Linn. Soc. vii. 71. t. 6. f. 6. Leucothöe articulosa. Leach, Edin. Encycl. vii. 403.—Trans. Linn. Soc. xi. 358.—Supp. to Encycl. Brit. i. 425.*

Inhabits the British sea, but is very rare.

STIRPS 3.—*Antennæ* four-jointed, the last segment composed of several little joints; upper ones longest.

Subdivision 1.—*Four anterior legs monodactyle, second pair with a much dilated compressed hand.*

Genus 6. MELITA. *Leach.*

Anterior pair of legs monodactyle; second pair with the thumb inflexed on the palm: *tail* on each side with an elongate foliaceous lamella.

Sp. 1. *Mel. palmata.* Body blackish: antennæ and legs annulated with pale colour.

Cancer palmatus. *Montagu, Trans. Linn. Soc. vii. 69. Melita palmata. Leach, Edin. Encycl. vii. 403.—Trans. Linn. Soc. xi. 358.—Supp. to Encycl. Brit. i. 425. pl. 21.*

Inhabits the sea shore on the Devonshire coast under stones.

Genus 7. MÆRA. *Leach.*

Four anterior legs didactyle; thumb of the second pair bent on the side of the hand: *tail* with no foliaceous appendices.

Sp. 1. *Mæ. grossimana.*

Cancer Gammarus grossimanus. *Montagu, Trans. Linn. Soc. ix. 97. t. 4. f. 5. Mæra grossimana. Leach, Edin. Encycl. vii. 403.—Trans. Linn. Soc. xi. 359.—Supp. to Encycl. Brit. i. 425.*

Inhabits the southern coast of Devonshire beneath stones.

Subdivision 2.—*Two anterior pair of legs monodactyle and alike.*

Genus 8. GAMMARUS. *Latr., Leach.*

Superior antennæ furnished at the base of the fourth joint with a little jointed seta: *tail* above with bundles of spines.

* *Tail with the superior double styles, having the upper style process very short.*

Sp. 1. *Gam. aquaticus.* Process between the antennæ rounded, obtuse. Gammarus Pulex. *Leach, Edin. Encycl. vii. 402—432. Gammarus aquaticus. Leach, Trans. Linn. Soc. xi. 359.—Supp. to Encycl. Brit. i. 425.*

Inhabits ponds, ditches, and springs in great plenty.

Sp. 2. *Gam. marinus.* Process between the antennæ subacuminate. Gammarus marinus. *Leach, Trans. Linn. Soc. xi. 359.—Supp. to Encycl. Brit. i. 425.*

Inhabits the sea on the southern coast of Devonshire in plenty.

** Tail with the superior double styles, having the style processes subequal.

Sp. 3. *Gam. Locusta*. Eyes lunate.

Cancer *Gammarus Locusta*. Montagu, *Trans. Linn. Soc.* ix. 92. *Gammarus Locusta*. Leach, *Edin. Encycl.* vii. 403.—*Trans. Linn. Soc.* xi. 359.—*Supp. to Encycl. Brit.* i. 425.

Inhabits the British sea.

Sp. 4. *Gam. Camptolops*. Eyes flexuous.

Gammarus Camptolops. Leach, *Edin. Encycl.* vii. 403.—*Trans. Linn. Soc.* xi. 360.—*Supp. to Encycl. Brit.* i. 425.

Inhabits the sea about Loch Ranza, in the Isle of Arran.

Genus 9. AMPITHÖE. Leach.

Superior antennæ with no seta at the base of their fourth joint: tail simple above: hands ovate.

Sp. 1. *Am. rubricata*.

Cancer *Gammarus rubricatus*. Montagu, *Trans. Linn. Soc.* ix. 99. *Gammarus rubricatus*. Leach, *Edin. Encycl.* vii. 402. *Ampithöe rubricata*. Leach, *Edin. Encycl.* vii. 432.—*Trans. Linn. Soc.* xi. 360.—*Supp. to Encycl. Brit.* i. 425.

Inhabits the sea of the southern coast of Devon.

Genus 10. PHERUSA. Leach.

Superior antennæ with no seta at the base of their fourth joint: tail simple above: hands filiform.

Sp. 1. *Phe. Fucicola*. Testaceous-cinereous or gray cinereous mottled with reddish.

Pherusa Fucicola. Leach, *Edin. Encycl.* vii. 432.—*Trans. Linn. Soc.* xi. 360.—*Supp. to Encycl. Brit.* i. 426. pl. 21.

Inhabits fuci on the southern coast of Devon.

STIRPS 4. *Antennæ* four-jointed; under ones longest, leg-shaped. (*Four anterior legs monodactyle*.)

Subdivision 1.—*Second pair of legs with a large hand*.

Genus 11. PODOCERUS. Leach.

Eyes prominent: *four anterior legs monodactyle*.

Sp. 1. *Pod. variegatus*. Body varied with red and white.

Podocerus variegatus. Leach, *Edin. Encycl.* vii. 433.—*Trans. Linn. Soc.* xi. 361.—*Supp. to Encycl. Brit.* i. 426.

Inhabits the southern coast of Devonshire, amongst confervæ and corallines.

Genus 12. JASSA. Leach.

Eyes not prominent: *four anterior legs monodactyle*, with oval hands; second pair with its internal edge dentated.

Sp. 1. *Jas. pulchella*. Thumb of the second pair of legs with its internal edge notched at the base; colour white painted with red.

Var. α . Hands of the second pair with an elongate obtuse tooth.

Var. β . Hands of the second pair with the internal edge tridentate.

Jassa pulchella. *Leach, Edin. Encycl.* vii. 433.—*Trans. Linn. Soc.* xi. 361.—*Supp. to Encycl. Brit.* i. 426.

Inhabits the sea of southern Devon amongst fuci.

Subdivision 2.—*Second pair of legs with a moderate-sized hand.*

Genus 13. COROPHIUM. *Latr., Leach.*

Sp. 1. *Cor. longicorne*.

Cancer grossipes. *Linn. Syst. Nat.* i. 1055. *Astacus grossipes*. *Penn. Brit. Zool.* iv. pl. 16. fig. 31. *Corophium longicorne*. *Latr. Gen. Crust. et Insect.* i. 59. *Leach, Edin. Encycl.* vii. 403—432.—*Trans. Linn. Soc.* xi. 662.—*Supp. to Encycl. Brit.* i. 426.

Inhabits the coast of the European ocean. At low tide it may be observed crawling amongst the mud. It is very common at the mouth of the river Medway, where it was first observed by J. Henslow, esq.

Section II.

Body depressed: antennæ four: legs fourteen.

A. *Tail without appendices.*

Fam. III. CAPRELLADE. *Leach,*

Body with all the segments bearing legs.

STIRPS 1. *Body linear.*

Genus 14. PROTO. *Leach.*

Second, third, and fourth pair of legs appendiculated at their bases.

To this genus belongs *Squilla pedata*, and probably also *ventricosa* of Müller, with *Cancer Gammurus pedatus* of Montagu, which is probably the same with *S. pedata* of Müller. See *Transactions of the Linnean Society*, vol. xi. p. 6. t. 11. f. 6.

Genus 15. CAPRELLA. *Lamarck, Latr., Bosc, Leach.*

Second, third, and fourth pairs of legs not appendiculated at their bases; the third and fourth pairs spurious, subgelatinous, and globose.

The animals composing this genus inhabit the sea, living amongst Sertulariæ and marine plants, moving geometrically like the larvæ of the *Phalanadæ*.

The specific character may be taken from the number and situation of the spines on the head and back, form of the second pair of legs, &c.

Sp. 1. *Cap. Phasma*. Hands of the second pair of legs narrow, their internal edge acutely notched backwards: back anteriorly with three spines, turning forwards.

Cancer Phasma. *Montagu, Trans. Linn. Soc. vii. 66. t. 6. f. 3. Leach, Supp. to Encycl. Brit. i. 426.*

Inhabits the southern coast of Devon.

Astacus atomos of Pennant and *Squilla lobata* of Müller belong to the genus *Caprella*, of which in the British Museum there are several undescribed species.

STIRPS 2. *Body broad.*

Genus 16. LARUNDA. *Leach. CYAMUS. Latr., Bosc. PANOPE. Leach.*

Antennæ four-jointed, upper ones longest: *legs* compressed, with strong claws; the third and fourth pairs elongate, spurious, cylindric, without claws; the two anterior pairs monodactyle.

External uterus, or pouch of the female, composed of four valves.

Sp. 1. *Lar. Ceti.* Bases of the third and fourth pairs of legs with processes resembling the figure 6; the hands of the second pair of legs anteriorly, with three obtuse teeth.

Oniscus Ceti. *Linn. Syst. Nat. i. 1060. Pall. Spec. Zool. ix. 4. f. 14.*

Squille de la Baleine. *De Geer, Mém. sur les Insect. vii. pl. 42. f. 6, 7.*

Pycrogonum Ceti. *Fabr. Supp. Ent. Syst. 570. Cyamus Ceti. Latr.*

Gen. Crust. et Insect. i. 60. Panope Ceti. Leach, Edin. Encycl. vii.

404. *Larunda Ceti. Leach, Trans. Linn. Soc. xi. 364.—Supp. to Encycl. Brit. i. 426. pl. 21.*

Inhabits whales, and according to Latreille it is also found on some species of the genus *Scomber*.

By the Greenland fishermen it is termed the Whale-louse.

Fam. IV. IDOTEADE. *Leach.*

Body with all the segments not bearing legs: (*ventral* appendages covered by two longitudinal plates.)

Genus 17. IDOTEA. *Fabr., Latr., Bosc, Leach. ASELLUS, Otho., Lamarck. ENTOMON. Klein.*

External antennæ half the length of the body, or less; the third and fourth joints equal: *body* ovate.

Sp. 1. *Id. pelagica.* *Body* linear-oval: tail rounded, the middle with a very obsolete tooth: *antennæ* one third of the length of the body.

Idotea pelagica. *Leach, Trans. Linn. Soc. xi. 365.—Supp. to Encycl. Brit. i. 426.*

Inhabits the Scottish seas.

Colour when alive ash-gray or fuscous, speckled with darker colour, and often variegated or mottled with white spots: *legs* pale.

The female seems to be very rare, as amongst 400 specimens of the animal, one only of that sex was found.

Length one inch and a quarter.

Genus 18. STENOSOMA. *Leach.*

External antennæ as long as the body, the third joint longer than the fourth: *body* linear.

Sp. 1. *St. lineare*. Last segment of the tail somewhat narrowed at its base, and dilated towards its apex, which is truncate and notched.

Oniscus linearis. *Penn. Brit. Zool.* iv. pl. 18. fig. 2. *Idotea hectica*. *Leach, Edin. Encycl.* vii. 404. *Stenosoma heticum*. *Leach, Edin. Encycl.* vii. 433. *Stenosoma lineare*. *Leach, Trans. Linn. Soc.* xi. 366. —*Supp. to Encycl. Brit.* i. 427.

Inhabits the European ocean. It sometimes occurs in the Firth of Forth, and amongst the Hebrides.

B. *Tail on each side, with one or two appendices.*

Fam. V. ANTHURADÆ. *Leach.*

Antennæ inserted in nearly the same horizontal line: ventral appendages closed by two longitudinal plates.

Genus 19. ANTHURA. *Leach.*

Antennæ short, subequal; inserted one after another in the same horizontal line, the internal ones a little longest: *body* linear: *tail* with the last joint but one very short; the last elongate, narrower, with two elongate lamellæ on each side.

Sp. 1. *An. gracilis*. Lateral processes of the tail obliquely truncated. *Oniscus gracilis*. *Montagu, Trans. Linn. Soc.* ix. tab. 5 & 6. *Anthura gracilis*. *Leach, Edin. Encycl.*—*Trans. Linn. Soc.*—*Supp. to Encycl. Brit.*

Fam. VI. CYMOTHOADÆ. *Leach.*

Antennæ inserted in pairs, one above the other.

STIRPS 1. *Tail* with one lamella on each side.

Genus 20. CAMPTECOPEA. *Leach.*

Tail with its last segment furnished on each side with a compressed, curved appendage: *body* six-jointed, the last joint of the same size with the others: *antennæ* setaceous, upper ones longest, their peduncle biarticulate, the space between the antennæ very great: *anterior claws* bifid.

Sp. 1. *Cam. hirsuta*. Brown; the last joint of the body with a few faint blueish spots.

Oniscus hirsutus. *Montagu, Trans. Linn. Soc.* vii. t. 6. f. 8. *Camp-tecopea hirsuta*. *Leach, Trans. Linn. Soc.* xi. 367.—*Edin. Encycl.* vii. 405. —*Supp. to Encycl. Brit.* i. 427.

Inhabits the southern coast of Devonshire, but is rather rare.

Length one eighth of an inch.