

Hesperiidæ.

35. *Pamphila venata*.

Hesperia venata, Bremer & Grey, Schmett. N.-China's, p. 10. (1853).

Pamphila venata, Ménétries, Cat. Mus. Petr. Lep. i. pl. v. fig. 7 (1855).

♂, Posiette Bay, Corea, and Yokohama; ♂ ♀, Hakodaté.

36. *Pamphila sylvatica*.

Pamphila sylvatica, Bremer, Bull. Acad. Pét. iii. p. 474 (1861); Lep. Ost-Sibir. p. 34, pl. iii. fig. 10 (1864).

Posiette Bay, Corea.

HETEROCERA.

Chalcosiidæ.

37. *Pidorus atratus*.

Pidorus atratus, Butler, Ann. & Mag. Nat. Hist. ser. 4, vol. xx. p. 402 (1877); Ill. Typ. Lep. Het. ii. p. 9, pl. xxiii. fig. 9 (1878).

Yokohama, in August.

Lithosiidæ.

38. *Setina micans*.

Setina micans, Bremer & Grey, Schmett. N.-China's, p. 15 (1853).

Posiette Bay, N.E. Corea.

The description by Bremer does not give a good idea of the general colouring of the upper surface; he speaks of it thus, "Corpore et alis ex flavo albido-micantibus," and later on as "shining yellowish white," whereas the primaries are shining white, with pale buff borders, and the secondaries pale buff; the thorax is also white; the head, collar, and abdomen buff. Notwithstanding this incorrect or, at least, imperfect description of the ground-colour, every thing else in the description is so exact that I cannot doubt that the species before me is Bremer's insect. We have a large female ($1\frac{3}{4}$ inch in expanse) from Pekin.

III.—On certain remarkable Modifications of the Avicularium in a Species of Polyzoön; and on the Relation of the Vibraculum to the Avicularium. By the Rev. THOMAS HINCKS, B.A., F.R.S.

THE homology between the curious avicularian appendage which is present on so many of the Cheilostomata and the

zoecium with its contained zooid has been amply demonstrated and is now generally admitted. Indeed the rudimentary or primary forms of the organ exhibit so slight an amount of divergence from the ordinary cells, that we have no difficulty in recognizing the morphological relationship between the two; and from this starting-point a series of transitional forms conducts us to the most highly specialized term, in which the zoecial type is effectually masked. The true "bird's-head," with its elaborate prehensile apparatus, its delicate tactile organ, and its half-rhythmical movement, is confined to a few genera; but between it and the earliest stage of the transformation (a slight modification of the oral valve) is interposed a multitude of forms, exhibiting a wonderful variety of structure, and discharging the important function of defence in many diverse ways. The morphological line which leads up to the articulated and movable "bird's-head" is flanked by a host of branch lines, in which the development assumes many directions and culminates in very different structures. In a large proportion of these structures the prehensile faculty is very feebly manifested, if at all. The mandibular portion, which is the representative of the oral valve of the cell, is little fitted to seize intruders or to hold them in its grasp. In very many cases the hooked extremity, which distinguishes the "bird's-head" is altogether absent; the mandible is rounded or spatulate, and works more like the lid of a box than as a seizing-organ. In such cases the defensive action must be limited, it would seem, to the opening and closing of the mandible, which may have a deterrent effect on unwelcome visitors. As the appendages are often developed in immense numbers over the colony, it is quite conceivable that the safety and comfort of the polypides may be largely promoted by their movements.

On the other hand, where only a single avicularium is present (as often happens), or the size is very diminutive, and the action of the mandible proportionately feeble and inconspicuous, it is difficult to understand what useful office it can discharge.

In a considerable number of cases the mandible assumes a form which is still less compatible with any prehensile function. The pointed extremity is more or less elongated into a spine-like process, which projects beyond the fixed beak on which the movable jaw works. In some species (e. g. *Schizoporella vulgaris*, Moll) this modification is carried to a great extent, and the result is a long and slender setiform appendage, which may help, as it sways to and fro, to keep off creatures or substances that would be injurious to the polypide. Occa-

sionally this structure is varied by the development of a chitinous expansion along each side of the spine, by which it is converted into a kind of flapper.

The avicularium with more or less elongated mandible is a step towards the second of the appendicular organs with which the Cheilostomatous Polyzoa are furnished, the *vibraculum*. The latter, in its most highly specialized form, is the terminus of one of the branch lines before referred to. There can be no reasonable doubt that it is a derivative from the avicularium, and not an independent modification of the oral valve of the zoecium*; for the steps by which the one appendage passes into the other are easily traceable. The observations which I am about to record crown the evidence, by exhibiting within the history of a single species the leading stages of the transformation. They also illustrate in a very striking way the instability of avicularian structure, and the liability to variation which is one of its chief characteristics.

The criterion by which it has been proposed to distinguish the vibraculum from the avicularium (the absence of a beak) is, of course, a purely arbitrary one; for the mandible takes on the specifically vibracular function before the beak has vanished. In the highest form of vibraculum the beak is retained, but is so modified as to supply a deep terminal notch or cleft, in which the seta is suspended without hindrance to the freedom of its play. In this form the function is most specific and is clearly defined; planted close to the orifice of the cell, its seta sweeps energetically at intervals over the front and dorsal surfaces, and helps to secure freedom of egress and action to the polypide.

I come now to the observations which it is the chief object of this paper to record.

Amongst the species in which the avicularium is furnished with an elongated mandible is the ubiquitous *Microporella ciliata*, Pallas, which has well nigh accommodated itself to all climes and circumstances. It exhibits, however, this peculiarity, that the condition is not constant: in some cases the avicularium is of the ordinary type (woodcut, fig. 1); in others the mandible is more or less prolonged into a straight and slender spine (woodcut, fig. 2). The prolongation is usually moderate; and, so far as hitherto observed, it is an extension merely, without any further modification.

Fig. 1.



* Darwin, 'Origin of Species,' 6th edit. p. 194.

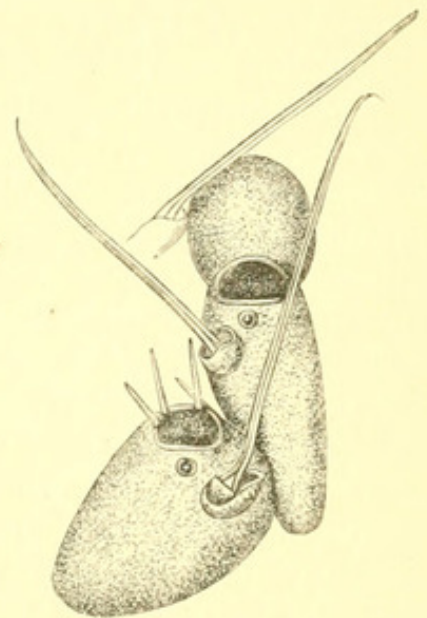
But in specimens from the Queen Charlotte Islands, which have been placed in my hands by Dr. G. M. Dawson, of the Canadian Geological Survey, the appendage occurs in a very different guise: so far as the mandibular portion is concerned, its appearance is completely changed, and it is at once evident that a very important structural modification has been effected. The mandible has altogether lost its lid-like character, and is now a very tall membrano-chitinous appendage, commonly exceeding in length the entire cell, broad at the base, and tapering off to a fine point above, where it is slightly curved (woodcut, fig. 3). The expanded triangular portion below, which represents the normal mandible,

Fig. 2.



has undergone little change; but its office now is to support the vibraculoid appendage which I have described. Just above the point where the extremity of the true mandible begins to expand into the *quasi*-vibraculum, there are two small spinous projections; these mark the commencement of a marginal extension of the vibraculum, which runs along each side from this point to the apex, diminishing in width as it approaches the top. This marginal increment curls upward, and gives a channelled appearance to the appendage. The whole structure is of a membranaceous character; and there is always a slight twist near the base of it.

Fig. 3.



When the transformed mandible is at rest on the fixed beak, the free portion of it occupies a suberect position.

The modification is not confined in this case to the mandible, but extends to other elements of the structure. In the first place, the rising on which the organ is placed is much larger and more prominent than in the normal form, and recalls the vibracular cell which supports the movable seta in *Mastigophora Hyndmanni*. The beak also has undergone a change which, though slight in itself, is significant.

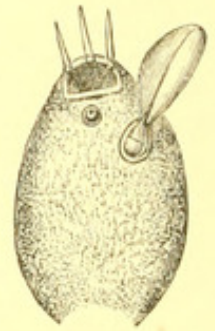
The anterior extremity, which in the normal condition is directed straight outwards, running to a point, is here more or less notched, and we have a distinct suggestion of the vibracular cleft in which the seta of the more highly specialized

forms is suspended. This modification, which is very slight in degree, secures to a corresponding extent a freer range of movement.

In this remarkable variety, then, the avicularium of the normal *M. ciliata* is replaced by a well-developed organ with vibracular function, which has made a considerable advance towards the structure of the most specialized vibracula. Placed as they are on the summit of a considerable rising, at a short distance below the orifice, the tall setæ command the whole of the oral tract; and their vigorous sweep must do much to prevent the accumulation of noxious matter within its bounds.

It should be mentioned that the ordinary forms of the species also occur somewhat abundantly on shells from the Queen Charlotte Islands. Another interesting modification occurs in the same species. On a large colony, obtained by Capt. Cawne Warren, probably from the coast of Ceylon or from Bass's Straits, the avicularium is furnished with the spinous prolongation of the mandible, and along each side of the spine a delicate membranous expansion is developed (woodcut, fig. 4), which completely alters its appearance and fits it for a new function or for the discharge of the old one in a different way. The avicularian jaws and the vibracular setæ are replaced in this variety by the *flapper*; and these varied modifications are embraced within the life-history of a single species.

Fig. 4.



We are already acquainted with the changes which occur in the radical fibres of the Polyzoa correspondent with diversities of habitat. When the sponge or other soft substance is the site of the colony, they develop a system of hooks, to act as grapnels; when the smooth, tough frond of the seaweed, they elaborate adhesive disks for attachment. It would seem that a like ready adaptability to changes of circumstance is also characteristic of the avicularian appendages.

These observations, besides their morphological interest as throwing a clear light on the genealogy of the vibraculum, bring out very forcibly the instability of avicularian structure, to which I have already referred; and in the presence of such facts as I have now adduced and others like them, I find myself unable to agree with those who assign a high value to the appendicular organs for purposes of classification.

Summary.

In the Polyzoön *Microporella ciliata*, Pallas, the following forms of the avicularian organ occur:—

1. Ordinary avicularium with pointed beak.
2. Avicularium with the mandible elongated into a spine.
3. Avicularium with the spinous mandible supporting a membranous flapper.
4. Vibraculoid structure with tall, well-developed seta and partially-modified beak.

IV.—*Notes on Coleoptera, with Descriptions of new Genera and Species**.—Part IV. By FRANCIS P. PASCOE, F.L.S. &c.

MOST of the species described below have been in my collection for many years. Haag-Rutenberg and Mr. F. Bates have during the time published many genera and species of Tenebrionidæ; but as the former is no longer amongst us and the latter has given up the study, I have resumed the task of making known some of the many unpublished forms in my possession; and to them I have added a few from other groups. Drs. Horn and Leconte have given us excellent accounts of the United-States species; but they sternly refuse to look at any other forms than their own. Dr. Horn finds fault with some of us for not studying the American species: but we cannot procure them; collections from the United States rarely or never come into the market; and American entomologists do not seem to care for any thing outside the States.

In this and former papers I have designedly avoided all recondite characters; they are often only to be obtained by dissection, involving perhaps the destruction of the specimen; and too often, to avoid this, characters which are found in one are *assumed* to exist in their near allies. To give a ready clue to the name of the species is, I consider, the great object of descriptions.

List of Genera and Species.

COLYDIIDÆ.

Gempylodes superans.

EUCNEMIDÆ.

Hylotastes terminatus.

ANTHRIBIDÆ.

Doticus (*n. g.*) palmaris.

TENEBRIONIDÆ.

OPATRINÆ.

Apostethus (*n. g.*) terrenus.

* For Part III., see 'Annals,' 1875, xv. p. 59.