VIII. *On the external sexual apparatus of the males of the genus* Acentropus. By Robert M'Lachlan, F.L.S., Sec. Ent. Soc.

[Read 1st April, 1872.]

At the Meeting of this Society held on the 4th ultimo, my friend Mr. Dunning read a memoir (see preceding paper) on the genus *Acentropus*, which I propose to supplement by some remarks of my own, on points avowedly not investigated by him. Of the ordinal position of the genus I say nothing, except that I thoroughly agree with those entomologists who place it in the *Lepidoptera*, feeling sure that the few who appear to doubt the correctness of this opinion, can never have studied the characters, or, if they they have done so, maintain a factious opposition from pure affectation. As a Trichopterist, I assert that the attributes of the genus, its structure, larval characters, and, in fact, everything excepting its aquatic habits, are utterly opposed to its being Trichopterous, whereas there is nothing whatever incompatible with its ordinal position in the *Lepidoptera*.

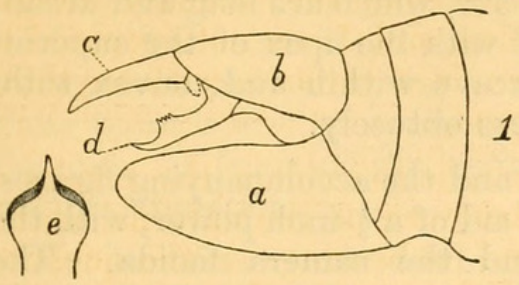
Before proceeding to the subject of this paper, I will remark, *en passant*, concerning Mr. Dunning's observations regarding the existence or non-existence of ocelli. Kolenati asserted the presence of two undoubted ocelli in the ordinary position on the front portion of the vertex. I have no hesitation in declaring these ocelli to be fictious. At a *séance* alluded to by Mr. Dunning (see p. 129) at which he, myself, and Mr. Douglas were present, we subjected several examples to minute microscopic investigation, after having carefully denuded the heads of every vestige of scaly clothing. The result proved that in the position assigned by Kolenati, there were no signs whatever of ocelli either developed or abortive. But, in a slight depression on the outer side (that next the eye) of the base of each basal joint of the

antennæ, there was seen a small rounded raised object, of polished texture, differing from the ordinary integument. If this be an ocellus, and I am not prepared to say it is not, then its position is at variance with anything yet recorded for these organs.

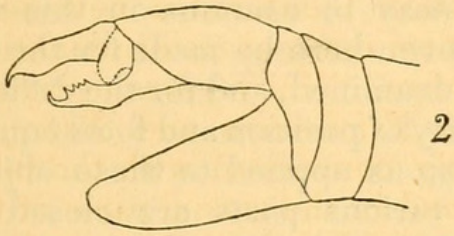
My principal object here, is to explain the results of an investigation of the structure of the external sexual apparatus in the males, and its bearings on the question of the supposed specific differences in the genus. And in making this investigation I entered a new field of enquiry, for this was my first essay at an examination of this apparatus in *Lepidoptera*. Many years occupied in analogous observations in *Trichoptera* and *Neuroptera*, have rendered me tolerably conversant with the infinite variety of forms to be found in the sexual parts of those insects, and have, probably, enabled me to form a tolerably correct idea of the amount of difference necessary to establish specific separation ; but it is very possible that the same differences are not always present in *Lepidoptera*, and I am aware that the few Lepidopterists who have attended to this much neglected, though essential, part of their studies, affirm that these characters are more of generic than of specific value in that Order. On this point I am not competent to form any opinion, but having had the curiosity to carry my examination a little beyond the genus more especially under consideration, I have been amazed at the complex and beautiful structure revealed by denuding the scales of the anal extremities of various Lepidopterous insects.

In *Acentropus* I have endeavoured to make an examination of specimens from various localities. The only places in which I have personally found the genus are Hampstead near London, and on the Canal near Burton-on-Trent. Besides those, I have seen specimens from Ringwood in the New Forest, and from Cheshunt (taken by Mr. W. C. Boyd). Also individuals from Continental Europe sent by Dr. Staudinger to my friend Dr. Knaggs (to whom I express my obligation for the permission to make any use of the insects that I thought fit), consisting of two males (without female) sent as *A. niveus*, and a male (with amply-winged female) sent as *A. latipennis*. Of the English specimens all were accompanied by amply-winged females, excepting those from Ringwood, of which I have seen only males.

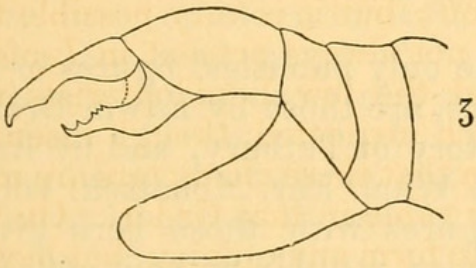
The general character of the anal appendages may be described as follows :— From the upper margin of the last segment proceeds a large boat-shaped lobe, which, however, when viewed from above, is longitudinally canaliculate in the middle, instead of being provided with a raised keel, hence the term 'boat-shaped' is only strictly applicable to its lateral aspect: this lobe is furnished with long scales proceeding mostly from its base. To the end of the lobe is attached a long, somewhat lanceolate, process, more or less pointed at its extremity, which is sometimes curved downward, and beneath, before the extremity, there is a tendency (not always appreciable) to a projection, in one specimen examined amounting to an actual tooth : on the base of the process there is possibly a membranous tooth-like structure, disappearing ordinarily by desiccation. The intromittent organ is attached to a membrane lying within, and connected with, the above-mentioned boat-shaped lobe. It is horny, and, viewed laterally, long and acuminate, the apex being acutely pointed and often mucronate. On the upper side, about the middle, there is a projection, or dilatation, furnished with more or less numerous, and more or less minute, teeth or serrations. Viewed from beneath, the apical portion of this organ expands, and is afterwards contracted and produced into a slender point. From the



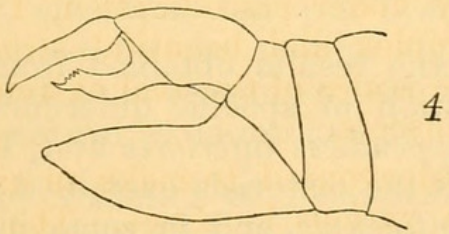
1



2



3



4

(*Vide p.* 162.)

lower part of each side of the last segment proceed the enormous *appendices inferiores*, which are long and broad, extending nearly to a level with the apex of the superior process, spoon-shaped, concave within and convex without, and ending more or less obtusely.

The above observations, and the accompanying figures, have all been made by the aid of a $\frac{2}{3}$-inch power, with the compound microscope, and the camera lucida. The various parts lying nearly on one plane, and simple in structure, were the more easy to examine in this way; but much allowance must even here be made for the fact, that dry-insects only were examined, and for the difficulty of obtaining precise similarity of position and focal equality in microscopic manipulation as applied to these objects. In some individuals the various parts are closed one upon the other, rendering their discrimination impossible; in others, the intromittent organ is concealed under the superior process.

So far as I am aware, the only published figures or descriptions of this apparatus, are those by Edwin Brown, in Moseley's 'Natural History of Tutbury,' and by Kolenati (copied by Brown) in Wien. Ent. Monatsch. vol. ii. A comparison of their figures with those here given, proves that they were drawn roughly without sufficient magnifying power, the details of structure not being represented.

I now proceed to apply the results obtained from my investigations to the question of specific differences in the genus. Taking the *appendices inferiores* first, I find remarkable similarity in all the materials examined: but in Staudinger's ♂ of *A. latipennis*, and in some individuals (of *A. niveus*) from Ringwood, these parts are decidedly more acuminate, and more produced and acute at the apex, and this is even not sufficiently indicated in my figure, for, in consequence of the apex being somewhat incurved, it is much fore-shortened under a high power. The boat-shaped lobe does not show any important variation. The process extending from this lobe differs to some extent in the contour of its lower edge, viewed laterally; and in one example from Ringwood, there was even an evident subapical tooth-like projection. In Staudinger's examples of *A. niveus*, and in my own examples from near Burton-on-Trent, the extreme apex is curved downwards, and more acute. The intromittent

organ presents decided, though small, differences in certain individuals. In Staudinger's examples of *A. niveus*, in those from near Burton-on-Trent, and from Ringwood, the apex is curved upwards into a small hook, and in these there is also an appearance of a larger tooth within the apex in front of the series of minute teeth on the median dilatation.

Mr. Dunning concluded his memoir by remarking, that he was inclined to the opinion, that there were not facts sufficient to justify us in considering that more than one species of *Acentropus* has been satisfactorily proved to exist, for which he retained the name '*niveus*.' The results of my examination of the genital apparatus, do not place me in a position to disagree with him. Certainly, there is nothing to justify the wholesale multiplication of species recently effected by Baron Von Nolcken. Yet I feel inclined to reserve any opinion on the matter when taken into consideration with the enormous discrepancy in the alar development of the females, about which there evidently exists some amount of mystery not yet unravelled. In the males, also, there is a very considerable difference in the form of the wings in individuals from different localities, though it may be that this difference may be better attributed to local than to specific influences. And, furthermore, I do not consider that sufficient attention has yet been paid to the characters presented by the genital apparatus in *Lepidoptera* to warrant us in assuming that in them, specific characters may always be as marked as they are in *Trichoptera*, &c.

The students of *Neuroptera*, using the term in its broad sense, have sometimes been twitted with the remark that they pay too much attention to these characters. This has never been said by a Neuropterist of a Neuropterist. In their Order each case is considered according to its merits. Large groups of species, *e. g.* the restricted family *Libellulina*, present scarcely any important differences in these characters in generic structure, and but slight specific difference; others show a constant specific difference in some portion of the apparatus; and there are, finally, many genera in which each species has an arrangement of parts totally different from that of its nearest allies. Thus wide specific difference may exist in other characters, combined with an inappreciable amount of it in these alone; but I have never yet found

an instance of differences sufficient to be considered specific in the anal apparatus, without corresponding general discrepancies, though these latter are often difficult to explain in words. Local variation sometimes exists in the same species, and so does individual variation, and occasionally to an extent, in large insects, that would throw the small differences exhibited in the appendages of the *Acentropi* into the shade; but, nevertheless, the fact remains unassailable, that the most important organs, those upon which the perpetuation of the species depends, are those in which, as a rule, the best characters are found: and this latter remark obtains equally with regard to sexual appendages not immediately connected with the genital apparatus, for, in insects, domestication has not had an opportunity of forcing these peculiarities into abnormal development, nor, by altering the conditions of existence, of rendering them useless, and consequently aborted. In almost all orders of insects, sexual characters have been applied to specific separation with the best and surest results. Lepidopterists (with few exceptions) continue to allow the eye to be attracted by beauty of colour, or variation in design of markings, leaving more subtle characters neglected, either designedly, or because their examination, by rendering necessary the removal of the scales, makes the specimens "imperfect" as they term it. I venture to predict that the day is not far distant when coloured plates of butterflies, without details of structure, will be valued only as pretty pictures, comparatively useless for scientific purposes.

Explanation of the figures on p. 159.

Fig. 1. Lateral view of appendages of a male from Hampstead; *a*, appendices inferiores; *b*, boat-shaped lobe; *c*, superior process; *d*, penis; * *e*, apex of penis from beneath, more enlarged.

2. Example from Burton-on-Trent.

3. „ „ *A. niveus* (Staudinger).

4. „ „ *A. latipennis* (Staudinger).

* The teeth are somewhat exaggerated in all the figures.