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ever upon which to base such a decision, and therefore, in spite of its affinity to the Angolan race of *T. evippe*, I am constrained to consider it a distinct species.

The argument on which Mr. Marshall bases his synonymy of *T. evippe* and *T. omphale*, which he regards as one variable species, is based upon the confusion which existed previous to its rearrangement in the drawers of those species in the Museum collection—a confusion largely due to the incorporation of accessions since the date of the first arrangement of the genus about the year 1876 or 1877. He says that in Eastern Africa *T. evippe* is “an intermediate seasonal form of *theogone-omphale*”; but this is certainly not the case, for *T. evippe* is essentially, in all its characters, a wet-season phase; nor does it appear to extend in the East further north than Natal.

[To be continued.]

LIV.—*Phenomena of Autotomy observed in the Nymphs of Monandroptera inuncans, Serv., and Rhaphiderus scabrosus, Serv.* By EDMOND BORDAGE*.

IN the month of September last year I succeeded in obtaining larvæ and nymphs of *Monandroptera inuncans* and *Rhaphiderus scabrosus*, in which I studied the phenomena of autotomy, in order to compare them with those that I had observed in the case of the adult insects.

These phenomena were exhibited very clearly by the very young larvæ. On pinching hard the distal extremity of the femur, I generally produced the separation of the limb. The interval that elapses between the stimulation of the nerve and the rupture of the limb varies from a few tenths of a second to three or four seconds. The same operation could be attempted successfully upon all six limbs.

In the case of the older larvæ and nymphs autotomy is sometimes produced still more easily; but it may happen that it becomes irregular and capricious—a feature that we have already pointed out in the adult Phasmids. We must also make mention of the increase in the time between the stimulus and the rupture. Although this increase is not manifested in an absolutely universal manner, it is of very

* From the ‘Comptes Rendus, t. cxxiv. no. 4 (Jan. 25, 1897), pp. 210–212: from a separate impression communicated by the Author.

frequent occurrence and may be expressed by a certain number of minutes.

It has happened that I have pinched, till I crushed them between the finger-nails, several limbs of a nymph, without succeeding in producing autotomy.

Quite tired out, I placed the insect upon a table: it moved along with difficulty, dragging its legs, which had been rendered useless; then, after four or five minutes (a quarter of an hour sometimes), the injured appendages broke off cleanly, not at the points where they were crushed, but always at the spot at which rupture by autotomy normally takes place. Only in a few cases have I seen the crushed limb not separate itself from the thorax. Judging by their lack of vigour and by a certain flaccidity of body, I am led to believe that I was then dealing with nymphs on the point of performing an ecdysis. Moreover, the experiments attempted upon them were followed shortly by the death of these insects.

The influence of thermic agents seldom gave me good results. A limb which I placed in contact with a lighted match sometimes detached itself after a few seconds; in other cases it allowed itself to be charred until reduced to a mere stump without becoming detached from the thorax.

The rapid section of the femur, at whatever point it be performed, does not always produce autotomy (nevertheless this process infallibly occasions the rupture of the great limbs of the grasshopper). Sometimes, after having thus amputated part of the limb in vain, I placed a lighted match in contact with the wound, and it was only in certain cases that this produced the spontaneous severance of the stump.

Since the effect of the bites of ants is identical with what we observed in the case of the adult insects, we will not revert to this point. We may mention, however, that we have never seen the ants succeed in producing the autotomy of all six limbs.

As we have already stated, the phenomena of autotomy are not exhibited in a regular manner in the Phasmidæ, at least in the species that we have studied. In spite of this our experiments, performed upon a large number of specimens of *Monandroptera* and *Rhaphiderus*, have enabled us to establish the fact that in the nymphs autotomy becomes increasingly difficult in proportion as these nymphs draw nearer to the final metamorphosis.

Since the month of September 1896 I have kept in captivity nymphs of *Rhaphiderus* and *Monandroptera*, a thing somewhat difficult to do, since these insects normally live at an altitude of upwards of 700 or 800 metres. They browse

on the leaves of the guava (*Psidium*) and the cassowary-tree (*Casuarina*), as well as on the foliage of *Agauria pyrifolia* *.

After having produced in the case of a few specimens amputation by autotomy, I have succeeded in observing the regeneration of the amputated limbs. A regenerated appendage is always distinguished from the corresponding limb of the same pair by its smaller dimensions and a slightly different coloration.

The difference in dimensions clearly attains its maximum when the victims of amputation are nymphs having to undergo but few moults before reaching the fully developed state. A very interesting point is that in a regenerated limb the tarsus always † has only four joints instead of five.

This fact undoubtedly affords the explanation of the following mistake on the part of Westwood:—

The entomologist in question, having been placed in possession of a specimen of *Monandroptera* (*Diapherodes*) *undulata*, wrote in the description that he gave of it:—"This fine insect is remarkable for having only four joints in the anterior tarsi, differing in this respect from all the known species of the family to which it belongs" ('Arcana Entomologica,' vol. i. p. 26). It is evident that Westwood was dealing with a specimen which, when a nymph, had lost by autotomy its two front limbs.

This is further proved by the following words:—"The anterior limbs are also relatively much shorter than the rest."

Neither did Ch. Coquerel, who had nevertheless studied the Phasmidæ of Bourbon, in this very island even, recognize the true cause of this curious fact. Criticizing the opinion of Westwood, he wrote:—"It was probably a case of structural imperfection peculiar to this individual, or perhaps Westwood had to deal with an insect which had been damaged and mended by an incompetent hand" (Ann. Soc. Entom. de France, 1861, p. 495).

In a subsequent paper I propose to study the process of regeneration of the limbs in the nymphs of Phasmidæ, as well as a number of anatomical peculiarities in these Orthoptera.

* *Agauria pyrifolia* is a shrub belonging to the family Ericaceæ. Its highly poisonous leaves have often been the cause of cases of poisoning among cattle. They do not produce any effect, however, upon the Phasmids under discussion, which eat them with avidity.

† [The word in the original is "souvent" (frequently); in the separate impression before me, however, the author has altered this into "toujours" (always).—TRANSL.]