

of the clockwork. The tail of the snake was to a certain extent fixed by my holding the snake with my hand in the region in front of the anus. After much trouble I succeeded in bringing the needle in a suitable manner into contact with the strip of paper, and in obtaining curves of vibration, from which the number of the vibrations per minute (the rapidity of the progression of the strip of paper being known) could be calculated with a fair degree of accuracy. In this manner it was found that the movements of the rattle are composed of great vibrations of the entire tail itself and of smaller vibrations of the actual rattle, in such a way that the tail makes seventy-five and the rattle, on the other hand, one hundred and ten vibrations per minute. These are approximate average numbers, since I was able to obtain only faulty curves, because the rattle does not perform its vibrations precisely in one plane. Movements kept up for hours with rapidity like this are absolutely amazing. When observed with the naked eye, only a blurred image is seen of the rattle moving at this rate *.

BIBLIOGRAPHICAL NOTICES.

Catalogue of Eastern and Australian Lepidoptera Heterocera in the Collection of the Oxford University Museum.—Part I. *Sphinges and Bombyces*. By Col. C. SWINHOE, F.L.S. &c. Oxford: Clarendon Press, 1892.

FOR the production of this volume and the arrangement of the moths in the Oxford Museum so that they have become available for useful study we are indebted to the entomological zeal of Col. Swinhoe, his many years of study of the moths of the Indian region having rendered him well fitted for the work he has volunteered to do and so ably begun, a fact evidently appreciated by the University of Oxford, as testified by the honorary degree they have just conferred on him.

The volume includes all the Sphinges and Bombyces from the Oriental and Australian regions in the collection of the late W. W. Saunders, which was acquired by Prof. Westwood for the Oxford

* The following authors have written upon the structure of the rattle:—Lacépède, 'Histoire des Serpens,' vol. ii. pp. 390–420, pl. xvii., 1789; Leuckart, 'Anatom.-physiologische Uebersicht des Thierreiches,' 1855; Czermak, "Ueber den schallerzeugenden Apparat von *Crotalus*," Zeitschr. f. wiss. Zoologie, Bd. viii. pp. 294 et seqq., 1857; Wymann, "The Mode of Formation of the Rattle of the Rattlesnake," Proceedings of the Boston Society of Natural History, vol. viii. p. 121, 1861–62; Garman, "The Rattle of the Rattlesnake," Bulletin of the Museum of Comparative Zoology at Harvard College, vol. xiii. No. 10, 1888.

Museum about the year 1877; and it is a matter for the greatest regret that the species from America and Africa, which would not have swelled the volume to any great extent, could not have been included at the same time, so as to make it complete in itself.

The collection was originally arranged and described, whilst still in Mr. Saunders's possession, by the late Francis Walker, his descriptions being published in the British Museum Catalogue which he was then engaged on; and here, as in all his other entomological work, he fully exhibited his well-known propensities towards describing the same species over and over again and placing them in the most incongruous families and genera, so as to render his description entirely unintelligible without inspection of his types.

In this state of chaos and almost entirely neglected by entomologists the collection has been left till Col. Swinhoe took it in hand little more than a year ago; and it has been his task to bring it to London bit by bit and compare it with Walker's types in the British Museum and with the types of later authors, so that the correct synonymy of the species might be arrived at; this has been most carefully done, and little is left to be desired in this direction.

The not less arduous task of reducing the species to their proper families and genera has also been ably carried out, though there are some species still out of place; thus *Balataea* belongs to the Zygænidæ, not the Ægeriidæ, and *Bonia* probably to the Tinægeriidæ, whilst the affinities of the Epicopeinæ are with the Uraniidæ, not the Chalcosiinæ, and *Duga* belongs to the Geometridæ, not the Lithosiidæ. With regard to the genera, as much has been done as is well possible taking into consideration the state of utter confusion in which the genera of tropical Heterocera are at present involved, and many years must elapse before a comparative analysis of the whole can reduce them to order. The drawing of the neuraction of new genera will be found useful, though that of one, *Chalioides*, is not very correct, and in another, *Platyzygæna*, the internal veins of the fore wing have been omitted; whilst the eight coloured plates will enable many of Walker's species to be identified. For the species the system has been adopted of describing the races from each different district or island as distinct, as indeed is usual, though we believe that in the near future this system will be entirely abandoned and all these slight races be reduced to the rank of subspecies; and not till this is done will it be possible to see at a glance the value of the names in any faunistic list or to deal with the vast numbers of insects in such a manner as to give a comprehensive and intelligible classification of the whole of them; then perhaps the 2,000,000 species, at which the number of existing insects has been estimated by several of the late presidents of the Entomological Society, may be reduced to some 400,000, or about double those at present known, which seems the only chance for systematists of avoiding a general migration to the lunatic asylums of the country!

G. F. HAMPSON.



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