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XIII.—*The Oviposition and Cocoon-weaving of Agelena labyrinthica.* By C. WARBURTON.

[Plate X.]

THE various spinning-operations of spiders have received the close attention of many naturalists, and notably of McCook, whose important work * gives a comprehensive account of the result of observations in this field of natural history.

The subject is, however, by no means exhausted, and any contribution to the facts already collected may possess some interest.

As far as I am aware no accurate account has been published of the cocoon-weaving of *Agelena labyrinthica*, one of our largest and most abundant British species.

Every one is familiar with the sheet-like web of this spider, which is so common an object on the banks of ditches or at the foot of the hedgerows which bound our fields and country lanes. The extensive closely-woven sheet is continuous with a silken tube, in which the spider lurks, ready to rush out upon any insect which may alight upon its web.

Agelena labyrinthica is a species of spider which breeds freely in captivity. Moreover, it is not easily disturbed in its cocooning operations, which always take place by night,

* 'American Spiders and their Spinning Work,' by H. McCook.
Ann. & Mag. N. Hist. Ser. 6. Vol. viii.

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and I was able to observe the process of egg-laying and cocoon-construction by candle-light in the case of several examples confined in glass-fronted boxes. The mode of procedure was identical in each case, and the times occupied in the several operations closely corresponded, so that an accurate account of a single observation may be considered typical of the species.

Immediately after its capture the animal had constructed its characteristic sheet-web across the box, with a tubular retreat in one corner.

The silken threads of the Agelenidæ are exceedingly fine, so that it is difficult to see the commencement of any operation, the work gradually growing into view as it proceeds; but its movements indicate that the web-spinning is begun by stretching a number of foundation-lines across the box at the level of the future sheet. The spider then walks to and fro along these lines, strewing them with numerous simultaneous threads from its long, upturned, posterior spinnerets. This operation is carried on for a long time before its result becomes at all substantial, and for long after a serviceable web has been formed the creature spends odd moments in going over the ground until its filmy appearance merges into that of an almost opaque white sheet.

In this work the advantage of the long legs characteristic of the genus is very noticeable. They appear to take the place of the extreme mobility of the abdomen which the Epeiridæ possess in giving variety of motion to the spinnerets.

In *Agelena* the body is almost rigid, but is raised or depressed or moved from side to side by the action of the long legs. Thus, in strewing the fine silk of the posterior spinnerets, its gait is very peculiar. The spider takes a sinuous course, at the same time giving the posterior end of the body a wide lateral sweep, which is increased by the length and mobility of the spinnerets themselves.

The approaching oviposition was indicated several hours beforehand by the animal commencing to weave a hammock-like compartment from the roof of the box and above the sheet-like web. This chamber was about 4 inches long, and was built in precisely the same manner as the sheet, to which it was braced by lines from various points of its under surface. Its construction occupied the whole day previous to the laying of the eggs.

About midnight it was completed, and the spider, taking up its position within it, began to weave a small sheet, 1 inch long, near the roof of the cage, working diligently in an inverted position, ventral surface upwards. After a quarter

of an hour's labour it rested for an equal space, apparently exhausted by its prolonged efforts. An hour and three quarters intermittent work served to complete the sheet, the spider varying the monotony of its sinuous walk round this small area by occasionally walking over it and strengthening the lines which attached its angles to the roof.

A marked change now became observable in its manner of working. The animal abandoned its incessant to-and-fro walk, but began to jerk its body up towards the sheet, throwing silk strongly against it. At the same time the anterior spinnerets were actively rubbed together, and the long posterior spinnerets divaricated and brought together again with a scissor-like motion. The result of this performance, which lasted half an hour, was to invest the under surface of the small sheet with a coating of flossy silk quite unlike the ordinary web in texture. Its purpose soon became evident. Shortly after 2 A.M. the spider began to deposit its eggs *upwards* against this loose-textured silk, aiding the egg-mass to adhere by occasional upward jerks of the body.

The operation occupied between five and ten minutes, during which time the individual eggs were indistinguishable, but the white semi-fluid egg-mass appeared gradually to grow between the spider and the small sheet.

The oviposition accomplished, the under surface of the egg-mass was covered by a layer of flossy silk similar to that against which it was laid, the eggs being thus entirely enveloped in a coating of soft loose-textured material.

This was effected in three quarters of an hour, after which the spider resumed its customary manner of spinning, and covered in the under surface of the egg-mass with ordinary sheet-web.

The small sheet now presented with the egg-mass the appearance of a plano-convex lens, with the convex surface downwards.

About 3 o'clock the final part of the complicated structure was commenced. Carrying down perpendicular lines from the angles of the small sheet to the underlying floor of the hammock, the spider began to construct a closed box or case, with the egg-bearing sheet for its roof.

It was long before this became distinctly visible as a beautiful, filmy, transparent structure, within which the eggs were clearly to be seen, depending from its upper wall (Pl. X. fig. 6). By 9 o'clock the next morning it was of moderate strength and opacity, but labour was intermittently bestowed upon it for two or three days before it was entirely finished to the satisfaction of the spider.

When completed the animal takes up its position upon it or close at hand, and can with difficulty be frightened away, but clings to it tenaciously when interfered with.

The whole process of cocoon construction involves many hours of almost incessant work in the case of this species. The work, moreover, is very varied and perfectly regular in the sequence of its variations in the case of different individuals of the species. Of course each spider has no guide but its own instinctive urging in the performance of this complicated operation. A curious proof of its entire dependence upon instinct was furnished in the case of one spider from which the eggs were removed immediately after they had been laid. The creature nevertheless went through the whole operation, including the construction and subsequent guarding of the box or case described above, although the labour was, of course, entirely useless.

This fact recalls Fabre's remarkable experiments upon bees*. These insects construct cells, introduce a certain amount of honey and pollen, then insert the abdomen and lay an egg, and immediately afterwards seal up the orifice with a pellet of earth, which they hold in their jaws ready for the purpose during the act of oviposition. They thus secure to their larvæ a sufficiency of food, and at the same time take the utmost precaution to exclude any ichneumon or other injurious insect which might visit the cell were they to desert it for a moment after laying in order to seek material to plaster up the mouth. Nevertheless, when he made a hole in the lower part of the cell, perfectly obvious to the bee, and allowed the honey and even the egg to drop out under its very eyes, it proceeded to seal up the cell with all despatch, paying no attention to the breach which evidently nullified all its labour.

A hole made at the top of the cell it would repair, seeing, as Fabre thinks, but an imperfection in the work upon which it was then engaged; but to go back to its previous occupation of storing food, and to set right anything that might have gone wrong in that department, required an effort of recollection and reasoning quite beyond the insect's mental powers.

So the spider, in laying its eggs, bestows infinite pains in depositing them in a position of the greatest security; but when the time has come for building the cocoon the creature is absorbed in the elaborate details of its construction, and

* Fabre, 'Nouveaux Souvenirs entomologiques,' ch. x.

cannot concern itself with the question as to whether or not it happens to contain any eggs.

EXPLANATION OF PLATE X.

- Fig. 1.* *Agelena labyrinthica* ♀, somewhat enlarged.
Fig. 2. The spinning of the small sheet against which the eggs are deposited.
Fig. 3. The spider in the act of oviposition.
Fig. 4. The egg-mass depending from the small sheet.
Fig. 5. The same covered in with a layer of silk.
Fig. 6. The outer case of the cocoon, still transparent, and showing the silk-covered egg-mass depending from its roof.
Fig. 7. General view, showing the hammock-like compartment containing the cocoon.

XIV.—*Description of a new Vole from China.*

By OLDFIELD THOMAS.

THE type of the following description was taken from the stomach of a snake (*Trimeresurus Jerdoni*, Günth.) obtained by Mr. A. E. Pratt in West Sze-chuen at the same time that he collected the fine new horseshoe bat (*Hipposiderus Pratti*) described in the June number of the 'Annals.' I propose to call it

Microtus chinensis, sp. n.

About the size of *M. ratticeps* or *M. rufocanus*, but the tail very considerably longer.

Fur very long both above and below.

General colour dark coppery brown, not rufous, so far as can be made out from a specimen in spirit; the bases of the hairs dark slaty blue-grey.

Ears rounded, their tips just projecting beyond the fur of the head. Pollex with a distinct nail. Sole with six distinct pads, the region behind the last pad hairy, the rest quite naked. Tail unusually long, more than three times the length of the hind foot, thinly haired, the scales plainly visible, dark brown above, very slightly paler below. Mammæ 0—2=4, a formula which, combined with the presence of six foot-pads, appears to be unknown in the genus*.

Skull similar to that of *M. (Evotomys) rufocanus*, and with the peculiar structure of the posterior palatal region characteristic of *Evotomys*†.

* Lataste, Ann. Mus. Genov. (2) iv. pp. 271–274 (1887).

† See Coues, Mon. N. Am. Rod. p. 133 (1877).