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VII.—On *Parthenogenesis in Spiders*.

By N. DAMIN\*.

FOR the preservation of the species the union of two separate sexes of the species is necessary. At the same time, however, multiplication without a union of the sexes, that is to say, an asexual reproduction, has been proved to take place in the vegetable and animal kingdoms.

To the latter class of phenomena belongs the *virgin* reproduction, or *parthenogenesis*, which occurs also among higher animals. In such cases the egg-cells are capable of developing into embryos without previous impregnation.

Parthenogenesis is met with especially in the great phylum Arthropoda. It has been observed in the case of bees, wasps, and gall-flies (Cynipidæ), in the silkworm-moth and in Psychidæ, in Tineidæ, midges, Aphidæ, and Coccidæ, as well as in the Phyllopoda and Ostracoda among the Crustacea. Considering the frequency of parthenogenesis among Arthropods, the question arises whether the phenomenon does not also occur among spiders, which belong to the same division of the animal kingdom. Hitherto, however, no case of parthenogenesis in these animals has become known †.

After having observed living spiders for many years, I am now in the happy position of being able to establish an instance of parthenogenesis among the Araneina also.

In the spring of 1891 I placed two living specimens of *Filistata testacea*, Latr. ‡, in separate glass tubes, in order to observe them from day to day. One of these spiders, of which I shall speak, twice underwent ecdysis in the course of the summer of 1891, and in the spring of 1892 once again—a proof that when I shut it up it was still immature, *i. e.*, according to the previous state of our knowledge, incapable of reproduction. On the 8th of July, 1892, this female spun on the side of the tube an egg-sac shaped like a tobacco-pouch, similar to that of *Micrommata*. I was not surprised at this, since I had frequently noticed that spiders spin a cocoon and lay eggs without ever having had intercourse with a male. After a few days, however, the eggs in such envelopes were

\* Translated from the 'Verhandlungen der k.-k. zoologisch-botanischen Gesellschaft in Wien,' Jahrg. 1893, xliii. Bd., II. Quartal (Wien, 1893), pp. 204-206.

† [An instance of probable parthenogenetic reproduction in the case of *Tegenaria Guyonii*, Guér., was recorded by Mr. F. M. Campbell (Journ. Linn. Soc. xvi. pp. 536-538) in 1882.—TRANSL.]

‡ *Filistata bicolor*, Luc. ('Exploration de l'Algérie'), and *Teratodes attalicus*, C. Koch ('Die Arachniden,' v.), are synonyms of this species.

always already shrivelled and dry, since they were unfertilized. Nineteen days afterwards (consequently on the 27th of July), during which time, in the case of fertilized ova, the young are wont to emerge, I opened the cocoon, and saw in this instance, contrary to all expectation, developed young ones. The egg-membranes had already burst. I counted sixty-seven young spiders.

Under the microscope the egg-membrane presented the appearance of a delicate glassy substance; it was smooth and destitute of a coating of hairs. The young had arrived at the stage at which a distinct movement of the little blunt legs is recognizable. The cephalothorax was glistening white, the legs were blackish, and the abdomen dark-coloured. To discover the reason of these shades of hue I placed first one of these young spiders entire, and afterwards various separated portions of the body, beneath the microscope, when I saw the coat of hair in process of origin beneath the integument; the little hairs stood almost parallel one to another, and closer together upon the legs than upon the abdomen; the former consequently appeared darker in colour than the latter. It is not until the young spider has undergone yet another ecdysis that it appears capable of leading an independent existence. I removed these young ones: the old female remained in good health and lively, and continued to feed and to spin.

Two days later, that is on the 29th of July, I opened the box in which I had placed them, and found that all the young ones had emerged. Beside them now lay the second skin, so that, as I have observed in the case of other spiders also, they had moulted after a couple of days; by this time they were also recognizable as specimens of *Filistata* both in form and colour. They ran about readily, and, after a few days, were already able to lie in wait for their prey\*.

I likewise examined these skins under the microscope, and found that I was not deceived on the first occasion; these membranes had no hairs upon them, while the cuticle of the young spiders is thickly clothed with hair, which could now be seen standing up.

These young *Filistata* are still living, and have already successfully accomplished one ecdysis outside the cocoon.

Are we not entitled to regard this case as a proof that parthenogenesis occurs in *Filistata testacea* and, perhaps, in other spiders also? There can here be no question of any mistake. *Filistata* is very common in the Croatian littoral; it lives in holes in old walls, and is recognizable by the star-

\* To lie in wait—because *Filistata* spins a peculiarly sticky web, to which everything adheres.

shaped web which it spins, after the manner of *Segestria* and *Amaurobius*, at the entrance to its abode. It is abundantly represented in my collection; but what has struck me very forcibly in this connexion is the fact that there is not a single male among my specimens, and that I have never yet met with a male, either alive or dead: I do not know the male at all. Does not this very absence of the male constitute an indirect testimony in favour of the parthenogenesis of *Filistata*?

It may here be remarked, further, that neither Thorell, in his two memoirs \*, nor C. Koch † says anything about a male of *Filistata testacea*. In response to my inquiries I learn from the well-known arachnologists Dr. C. Chyzer, of Ujhely, and Prof. W. Kulczynski, of Cracow, that, with the exception of a single male received by the latter from Madeira, they, too, have not met with a male specimen of *Filistata*. It is, however, not my intention to imply that males of *Filistata* never occur; I would merely remind the reader of the males of *Psyche helix*, so long missing, and first discovered by C. Claus. It is, indeed, well known that among other creatures also, especially insects, where parthenogenesis is met with, the males, at least at one period, are rare or entirely wanting.

It is self-evident that further observation is still necessary in order to prove whether parthenogenesis in *Filistata* is accidental, as, for instance, in the case of *Bombyx mori* and certain butterflies, or actually a phenomenon of regular occurrence, as in *Psyche*, *Solenobia*, &c. Moreover, it is reserved for subsequent investigations to decide whether parthenogenesis does not occur in other spiders also.

Another noteworthy point may be alluded to. We are aware that it is not until they have undergone their last ecdysis that spiders are mature or capable of reproduction. After copulation or the first deposition of eggs, as the case may be, spiders change their skin no more.

It was quite contrary to my expectation therefore when the parthenogenetic female that I have been observing moulted on the 29th of September of last year, consequently two months after it had spun its virgin cocoon. This led me to the following reflection: either a kind of pædogenesis occurs in *Filistata*—that is, parthenogenesis is here relegated to a stage in life at which sexual reproduction does not otherwise take place, as we meet with it in the case of midges, and in this event it is possible that differences from the fully

\* T. Thorell, 'On European Spiders,' 'Remarks on Synonyms.'

† C. L. Koch, 'Die Arachniden,' i.-xviii. (Nürnberg).

developed form may also be shown to exist,—or spiders, although it may be only a few species, have the power of changing their skins in the adult condition, which has not been observed hitherto.

I therefore examined one or two females from my collection which, according to external appearances, were mature. In none of them did I find an epigyne near the pulmonary opercula. On the 20th of October I again examined a *Filistata*, which apparently died during (the last?) ecdysis. This likewise had no epigyne at the usual place; but I discovered on the lower half of the ventral side of the abdomen, towards the spinnerets, a horizontal suture ("Fuge"), which was almost entirely covered by close-lying hairs. As I attempted to introduce a needle beneath the suture, which I had no difficulty in doing, the spider moved its legs (it was consequently not yet dead), and a drop of clear viscid fluid showed itself at the suture, receded again, and again issued forth when I exerted a little pressure. Can this have been a mass of germ-cells from the ovary? I have not examined the parthenogenetic female, since it is valuable to me for further observations, and I was afraid of injuring it; it is still alive at the present moment (February 1893).

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VIII.—*On a Medusa observed by Dr. Tautain in the River Niger at Bamakou (French Soudan).* By M. JULES DE GUERNE\*.

THE Société Zoologique is indebted to M. Gaston Tissandier for the first intelligence of the interesting circumstance detailed below.

In consequence of an article, accompanied by three figures and giving a *résumé* of R. T. Günther's paper on the Medusa of Lake Tanganyika†, published by me in 'La Nature'‡, the courteous editor of that journal received a letter from Nouka-Hiva (Marquesas Islands), which he hastened to communicate to me. The letter bears the signature of

\* Translated from the 'Bulletin de la Société Zoologique de France,' t. xviii. (séance du 28 novembre, 1893) pp. 225-230: from a separate impression communicated by the Author.

† R. T. Günther, "Preliminary Account of the Freshwater Medusa of Lake Tanganyika," Ann. & Mag. Nat. Hist. ser. 6, vol. xi. pp. 269-275, pls. xiii. and xiv.

‡ J. de Guerne, "La Méduse du lac Tanganyika," La Nature, June 24, 1893.