

VARIATION NOTES.

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THE SPINNING OF THE EGG-SAC IN LYCOSA.

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The habit of the female spinning a round, ball-like egg-sac and carrying this suspended from the spinners during the period of incubation, is, so far as I can determine, characteristic of the entire family of ground spiders, the *Lycosidae*, with the exception of the single genus *Dolomedes*. The process of the construction of the cocoon has been seldom observed, so far as I can determine from the literature. This is due to the difficulty attending such observation, since all of the species either tunnel more or less deeply into the ground or live in retreats under stones, boards, and the like. I had tried for a long time, without satisfactory results, to observe this until I finally hit upon a species *Lycosa* sp. that permitted me to make the observation very completely. The plan had been to place gravid females in glass jars half-filled with earth, and by moistening this next to the glass induce her to construct her burrow there and thus enable me to watch her actions through the glass. While I got several females thus to construct their burrows and spin their egg-sacs, I was not able to see sufficiently well through the glass, which always became pretty well besmeared with earth during the excavation. In the case under consideration, however, the whole process occurred above ground, so that I could see it step by step. This, briefly, ran as follows:

She first excavated a shallow hole in the middle of the jar about one-third greater in diameter than the length of her body. This she did with her mandibles and palpi, piling the excavated ground in a crescentic heap around one side of the hole. Then she spun a thin sheet over the hole, extending from the top of the crescentic heap to the opposite side, completely covering the hole. This sheet, thus, was not horizontal, but inclined, and in the instance observed about 25 degrees, the inclination, of course, being determined by the height of the crescentic embankment. Upon the center of this sheet a crescent-shaped pocket was constructed with the broad and open side directed toward the higher end of the incline. Into this the eggs were deposited immediately after its completion. The

eggs filled the pocket heaped full. The exposed surface of the eggs was then closely spun over so that they were completely enclosed in a slightly compressed spherical cocoon, suspended in the center of the sheet. The edges of the sheet were then cut loose from the ground, carefully rolled up with the mandibles and palpi and tucked up against the cocoon, being spun fast as the work proceeded. This appeared as a rather prominent equatorial band around the cocoon at the line of attachment of the sheet. The whole cocoon was strengthened by further spinning, and, when finished, was fastened to the spinners and carried away. The whole was completed in a little more than one-half hour.

I have examined the cocoons of over fifty different species of *Lycosidae* and all show their equatorial band more or less prominently, so that it would seem that all the species adopt in general this same plan of constructing their egg-sac.

EXPERIMENTS IN THE HYBRIDIZATION OF FISHES.

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[Abstract.]

During the past three years thirty-three different crosses were made among fishes. Most of these were between marine species; several were between fresh-water species, and three between marine and fresh-water species. In no combination was there a failure of impregnation. The per cent. of eggs impregnated was usually large—50 to 100 per cent.; in a few instances as low as 1 per cent. This per cent. bore no relation to the blood relationship of the species. In most of the cases there was either no polyspermy or the per cent. of polyspermy was small. In two crosses this was as great as 50 per cent. of the impregnated eggs. The degree of polyspermy bore no relation to the nearness of relationship.

In all cases of normal impregnation the earlier phases of development were passed through normally. All crosses except where *Batrachus tau* was used as the female, the development went beyond the segmentation stages, the embryonic shield being apparently perfectly formed. Many crosses went beyond this to the closure of the blastopore, but in these cases the embryo was varyingly shorter than the normals. Seven crosses developed into healthy fry. Some of these, however, showed abnormalities, usually in the caudal peduncle and the anal fin. These latter crosses were either between species of the same genus or nearly related genera.