

There are two subjects which every one appears to think can be done by nature. One is editing a newspaper and the other is classifying. Any one who has had any experience in either will feel differently.

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SHORTER ARTICLES.

NOTES ON THE LIFE HISTORY OF ANOPHELES PUNCTIPENNIS AND ON THE EGG-LAYING OF CULEX PIFIENS.

SOME time during the latter part of May, 1901, a ditch about four feet in depth was dug for the water main to the new textile building on the campus. The ditch was dug in sections, one of which ran down a considerable slope just at the end of the photographic building. This section of the ditch soon became partly full of rain water. At the lower end the water was two and a half feet deep, but the water did not extend more than a third of the length of the ditch up the slope. At the upper and shallower end of the body of water, it soon became covered with a thin green slime, which upon examination proved to be wholly of *Protococcus*. In this shallow, slimy water on June 4 the writer discovered an abundance of larvæ of *Anopheles punctipennis*. They were recognized at a glance as larvæ of *Anopheles* from Dr. Howard's excellent drawings and descriptions of the larvæ of *Anopheles maculipennis*. Glass jars were immediately called into requisition, and many larvæ were carried to the laboratory, from a study of which the following notes were made. It might be of interest to say just here that there was also an abundance of larvæ of *Culex pipiens* in the same water in company with *Anopheles*.

Eggs.—It was with some surprise and a good deal of pleasure that a number of eggs were found on the surface of the water in the jars. Like *maculipennis*, they are laid at random on the water, but naturally run together and cohere in loose irregular groups or strings of from three to a score or more. Some were found floating on their sides, but the greater number seemed to be floating with the convex side, or 'back,' up and the concave side down. They differ somewhat from the eggs of *maculipennis* in shape. These eggs resemble an Indian canoe in shape,

hence a cross section would be more or less triangular in outline. Seen from the side they are strongly convex above and concave below. One end is larger and blunter, while the other, as seen from the side, curves strongly downward, is smaller and more pointed. Above and on the sides the eggs are marked with a reticulate hexagonal sculpturing similar to *maculipennis*. Below, on the concave side is a dark wide line or band, extending nearly the length of the egg. It widens at each end into a club-like expansion. The writer could not be sure whether this was simply a band or a groove. Near the blunt end of the egg a transparent line runs from each side of the dark band obliquely down the sides of the egg. When the egg bursts, it breaks along these lines. At each end of the band are several dark, circular spots. The eggs varied from .45 mm. to .47 mm. in length. They hatched in 24 to 48 hours after being brought in, but no record was obtained as to the actual time of hatching after being laid, as none of the females laid eggs in captivity. It is probably safe to say, however, that they accord in this particular very closely with *maculipennis*.

Larvæ.—When first hatched the larvæ present a mottled appearance, owing to alternate dark and light transverse markings on the body. This appearance certainly suggests the spotted wings of the adult, although there perhaps can be no reason for thinking that the one in any way foreshadows the other. The larvæ retain this appearance up to the last molt, although it seems to grow less distinct with age. They lie in a nearly horizontal position just beneath the surface film of water, and when only slightly disturbed wriggle in a horizontal direction across the water instead of downward as *Culex*. When violently disturbed they wriggle downward. The more mature larvæ are more inclined to wriggle downward than the young larvæ, when disturbed. The feeding habits are almost identical with those of *maculipennis*, so fully described by Dr. Howard. The same rotary motion of the head with the under side uppermost in feeding was characteristic. There were no such differences between the larvæ of *punctipennis* and *maculipennis* as there were between the eggs of the

two species. Perhaps the mottled, or more properly the streaked, appearance of the larvæ of *punctipennis* is a distinguishing feature. Dr. Howard, we believe, mentions nothing of the kind in regard to *maculipennis*.

The duration of the larval stage, under normal conditions with plenty of food, varied from twelve to fourteen days.

On June 5 three larvæ were placed in a jar containing very little food. What food there was lay among some sand at the bottom. Two of them were very young, while the third could not have been more than half grown. These larvæ remained there until June 29, when the two younger died. These two did not go to the bottom after food and probably starved. The third and more mature one did go to the bottom after food and remained alive until July 3, when it was transferred to water containing an abundance of food. In a few days it transformed to a pupa. In this case the larval stage was over a month and could doubtless have been prolonged.

Pupæ.—The pupæ of *Anopheles* are not strikingly different from those of *Culex pipiens* to the unaided eye. A close observer, however, can learn to distinguish the two with the eye by the difference in length of the respiratory siphons. Those of *Anopheles* are much shorter. Under the microscope they are also seen to be of quite a different shape from those of *Culex*. The thorax and body of *A. punctipennis* differ quite markedly in shape from those of *C. pipiens*, when seen from above. Like the larvæ, the pupæ tend to wriggle in a horizontal direction when disturbed. They are not as active as those of *C. pipiens*, which fact is brought out very forcibly when one attempts to make a camera lucida drawing of the living pupæ of both in their natural position in the water.

The pupal stage of both males and females lasted with great regularity just about two days. At least it could not have varied more than a few hours from this, as the adults were found in every case on the second morning subsequent to the morning on which the pupæ were found.

Egg-laying of Culex Pipiens.—On July 17, in the back yard of a hotel at Magnolia, Mississippi, the writer found a pig trough five feet long,

containing water to the depth of about six inches. On the surface of this water by actual count there were 257 masses of eggs of *C. pipiens*. Since there were less than five square feet of surface, one can imagine the density of egg population. It was noticed that about a dozen of the egg masses were white, or yellowish white, in appearance. This led to a more careful examination, which resulted in the discovery of a female about to finish laying a batch of eggs. Time, 6 a. m. She was so busily engaged that we could watch her with a hand lens. She rested on the surface with the abdomen at a slight angle, because the caudal end was nearly touching the surface. The mosquito stood at one end of the mass, with her head away from it. As the eggs were deposited the mass was gradually pushed away from her. The end of the abdomen was slowly carried from side to side, so that the eggs might be placed across the end and the whole mass filled out and completed as she progressed. The process may be compared with the action of the hand as a bobbin is wound with thread. The eggs always came forth with the small end first. This end, since the abdomen was held closely to the mass, would strike the other eggs and appear to be slipped along the perpendicular sides of the others, and thus be brought to an upright position. However, the tip of the abdomen was curled slightly upward, so that the egg was directed upward and very likely would have been deposited in an upright position in any case. It would have been interesting to have seen the first egg deposited. There was an appreciable interval between the deposition of each egg, perhaps two seconds, although we did not time it.

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RECENT ZOO-PALEONTOLOGY.

A MARSUPIAL EVOLUTION.

In the April *Naturalist* * is an important paper by Mr. B. Arthur Bensley upon the origin of the Australian Marsupialia. The evolution of the Marsupials is compared with that of the Pla-

* 'A Theory of the Origin and Evolution of the Australian Marsupialia,' *The American Naturalist*, Vol. XXXV., No. 492, pp. 245-269, April, 1901.