

*The Habits of Certain Tortoises.* H. H. NEWMAN. Jr. of Comp. Neurol. and Psychol., 1906, XVI., 126-152.

This valuable study of the instinctive life of the five principal forms of tortoises to be found in Lake Maxinkuckee, in northern Indiana, does not lend itself to a detailed review. The main features of the paper, however, can be briefly presented.

Newman shows that the 'interesting,' and apparently more intelligent forms of tortoises, cannot be kept in captivity and introduced to the various forms of 'problem boxes' now so common in the studies of animal behavior. The only other method left for studying these animals is the more laborious one of watching them 'in their daily rounds and occupations.' If one does this for a long enough period of time one becomes able, so the writer assures us, 'to diagnose their dispositions and comparative intelligence.'

Newman shows that each of the five varieties studied has a definite 'species character.' He shows also that there is not only a species character but a sex and an individual character as well.

Certain traits and habits, however, are common to all five of the species under investigation. These common characteristics of che-lonian behavior may be summarized as follows:

"1. The love of warmth and repose seems to be one of the few dominant factors in tortoise life. In some cases they seek warmth to their injury. On the other hand, lack of heat is more apt to cause death than any other factor.

"2. Extreme wariness when basking is noticeable in all species that habitually bask.

"3. There is a marked variation in the degree of fierceness or timidity exhibited by different species. These characters seem to run parallel with an aquatic or a terrestrial habitat, aquatic species being fiercer than those with a tendency toward a terrestrial life.

"4. Naturally enough, it is possible to domesticate the less fierce and less sullen species, while captivity inhibits normal activities in the fiercer and more sullen species."

The reviewer cannot refrain from mentioning one specific observation made by Newman in the course of this investigation. It concerns the question of 'distant orientation.' He mentions the fact that the females of *Graptemys* at times lay their eggs in soft earth far away from the body of water in which they live. "The eggs hatch, as a rule, late in August or early in September, the young burrowing to the surface through the sand. When they emerge they are covered with sand that adheres for some time. Their *instinct* [*italics mine*] directs

them unerringly toward the water and they frequently have to travel almost incredible distances before reaching the lake or a tributary stream. On two occasions I have found recently hatched *Graptemys* at a distance of about a quarter of a mile from the water, traveling steadily and in an approximately correct direction toward the lake. At the observed rate of progress they would reach the lake in about two days." Evidently there is a good opportunity here to investigate the factors entering into this 'instinct.' These little animals could hardly be said to have developed a 'topographical memory,' and certainly if there happened to be a hill in the way — or even a good-sized log — they could not have 'directly perceived the end.' What is it that turns them 'unerringly' to the water? Smell? We are sorry that Newman's notes are not more complete at this point. He tells us, however, that the present study is only a preliminary one. We hope that when he continues these investigations he will, if possible, introduce some control experiments looking to the analysis of the factors at work in chelonian orientation.

On the whole, Newman has done his difficult and trying task with a great deal of thought and care. This investigation gives us a mass of useful data on the habits and instincts of the most important forms of tortoises.

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*The Establishment of an Association Involving Color-Discrimination in the Creek Chub, Semotilus atromaculatus.* MARGARET F. WASHBURN and I. MADISON BENTLEY, Jr. of Compar. Neurol. and Psychol., 1906, XVI., 113-125.

The work reported in this article extended from July 31 to August 18, presumably of last year. The subject used was a female of the common species of creek chub (*Semotilus atromaculatus*). Throughout the experiment the fish was kept in a circular glass tank 50 cm. in diameter and 45 cm. deep. The apparatus for feeding 'consisted of two like pairs of dissecting forceps which were faced on the outer surfaces with four-cornered strips of wood 5 × 5 mm. across and 70 mm. long.' These strips were fastened to the forceps by means of small rubber bands, and projected about 5 to 10 mm. beyond the metallic points.

The method adopted was designed 'to test color-discrimination by establishing, if possible, an association between a certain color and food.' The general method is worked out under two sub-methods:

I. *The Method of Inhibition.*—The colors of the strips in this test were dark red on one of the pairs of forceps and a brighter green