

be confined solely to the identification of what animals eat, however deficient our knowledge may still be even in that respect. Our knowledge of the general food habits of lower vertebrates is inadequate for immediate needs, and this is also true for many birds and mammals of obvious economic importance.

General food habits studies constitute a necessary groundwork for the more specialized research that may profitably follow. The most useful single technique for extensive investigation at present seems to be that of stomach examination, supplemented by, or combined with, whatever field observations and fecal or pellet analyses may be advantageous. Frequently emphasis may be placed upon one of the minor techniques in the attack of specific problems, such as pellet analyses for the study of some owls.³

Great as may be our immediate need for vastly more general food habits data, probably greater needs may be served by diversification and intensification of food habits investigations. The realization of these potentialities should be of extreme significance to the progress of ecological science as a whole, as well as to that particular branch known as wild life management.

In planning management of any species, not only do we need to know what it eats, but also what foods it has access to, especially under changing conditions. We need to know more about what determines availability of foods; more about the influence of adaptations, experience, preferences and physiological demands on feeding tendencies of animals; and about what foods are essential to the existence of a species and what are incidental or conceivably detrimental.

The sound administration of a waterfowl or shorebird or any other sort of wild life refuge is dependent on adequate information on these points. The refuge may provide proper food for the desired species, but it may not. Perhaps something may reasonably be done to correct food deficiencies, perhaps not. At any rate, the wild life administrator is not likely to find it to his disadvantage to know something about what he is trying to do; and on many subjects he can know only through the research of others.

Understanding of the basic problem of predation, of which we have very great need, involves intensive research on food habits and on factors governing food habits of predatory species. Stimulation of local research would be particularly in keeping with the growing trend in conservation thought toward the conclusion that enlightened and truly effective predator control should attempt far more than at present to make game, poultry, etc., difficult for predators to get rather than to attempt great reduction in numbers by

drastic campaigning against the predatory species themselves.

Here, too, we need to know much more than what a species may eat. What are the adaptations of a predatory species for capturing and handling prey and what are the adaptations of the prey for defense or escape? What factors importantly affect the relative security or vulnerability of prey? What difference does predation actually make to the prey species, anyway? The fact that a species suffers a certain amount of predation—even conspicuous or heavy predation—does not necessarily mean that it is controlled or that its population levels are appreciably affected thereby.⁴

Work in this general direction is gradually gaining headway through the activities of a number of colleges and universities, some of the more advanced state fish and game departments and other private or public agencies. Agricultural colleges have recently displayed increasing recognition of the opportunities for constructive programs centering about local researches on specific wild life problems and in several instances have been making adjustments as rapidly as their budgets have permitted.

The Division of Food Habits Research of the U. S. Biological Survey has participated creditably in practically every substantial movement of consequence to wild life management in the country, despite its small staff and limited funds. It seems more than a little ironical that this division with its highly trained personnel, its unmatched reference collections and its strategic possibilities as an ecological clearing house should be the perennial target of crippling economies, with occasionally its very existence threatened.

In short, from the standpoint of one interested in wild life management and foreseeing the great development that will surely occur, it is apparent that the necessary supporting researches into the food habits of organisms are barely entering the tremendous field of significant endeavor that awaits. Continued progress may call for refinement and elaboration of techniques and for a greater breadth of vision on the part of the workers, but not less for greater understanding and appreciation on the part of the public. The intrinsic value and promise of the science alike are boundless, and support for it should be forthcoming in generous measure.

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MASTODON AND OTHER REMAINS AT AURORA, ILLINOIS

FINDING of mastodon parts and other material during recent months will contribute items of interest

³ Paul L. Errington, *The Condor*, 34: 75-86, 1932.

⁴ Paul L. Errington, *Ecology*, 15: 2, 110-127, 1934.

regarding the life of this vicinity in early post-glacial times. The finds were made by CWA workers while digging for an artificial lake in a swamp in Phillip's Park, which is located in the southeast part of Aurora, Illinois.

The mastodon parts consist of three skulls, one of which includes the lower jaw, three tusks, a femur, an ulna, a scapula, a number of ribs, several vertebra and a number of foot bones. Most of the material is in excellent preservation. E. S. Riggs, paleontologist at the Field Museum of Natural History in Chicago, has identified the species as being *Mastodon americanus*. There were also found in the same formation as the mastodon material three pairs of bird humeri and a portion of breast, all of the same species of bird. Identification has not yet been made of the bird specimens, but they are being examined by Professor L. A. Adams, of the University of Illinois. The size suggests a bird possibly four feet in height.

The deposit in which the mastodon and bird material was found is a bed of gray marl enclosed on three sides by hills of glacial till, and situated a mile and a half east of the Fox River. Professor William E. Powers, of Northwestern University, has examined the geological features of the locality, and believes that the marl represents a post-glacial lake which probably once connected with the river. A series of borings made in a north and south line across the marl bed revealed a maximum thickness of thirty feet. Overlying the marl was a layer of peat varying in thickness from two to five feet and over this about two feet of black muck which comprised the bottom of the modern swamp. The mastodon and bird skeletal parts were found in the upper three feet of marl, with the exception of the scapula which was in clay at the margin of the marl bed. This was the first specimen found, and obscurity of reports as to exact locality do not justify definite conclusions as to whether it differs in age from the rest of the specimens.

A hemlock cone found in the cavity of one of the mastodon tusks has been identified by Dr. W. T. McLaughlin, of Northwestern University, as being of the species, *Tusga canadensis*. Several other cones found in the marl of the same vicinity, he considers to be of the same species. There were also found two cones which he considers to be apparently black spruce, *Picea mariana*.

Professor F. C. Baker, of the University of Illinois, has identified twenty-one species of shells in a sample of the marl sent to him by Professor Powers. Baker reports¹ that "it is, as far as climate is concerned, a cold-temperate fauna." He also states that it is

"quite like the marl fauna found a few years ago in the bottom of Green Lake, Wisconsin, which is certainly middle Wisconsin in age, not later." He considers the cones of hemlock and spruce as further indication of a cold-temperate climate.

Another find of interest was a right femur of the giant beaver, *Castoroides ohioensis*, the specimen being identified by Professor Adams. It was reported by workmen to have been found in the peat layer, but there is reason for believing that this may be an error and that the specimen was more likely in the marl.

In the peat layer quite a collection of mammal skeletal parts has been found and most of it examined by Professor Adams. Most frequently represented is the Virginia deer. A skull he has identified as that of a female elk. The most recent find in the peat layer is a skull apparently of a muskrat. This has not yet been studied in detail.

With the completion of the lake-digging project the finding of specimens has now come to an end. Much remains to be done in studying the specimens and the data which has been recorded, and plans are under way by which it is hoped that more detailed reports will later appear in the scientific literature. The city of Aurora is keeping the specimens on display in a museum at Phillip's Park.

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LONGEVITY IN THE BOX TURTLE

IN the summer of 1896 a box turtle (*Terrapene carolina*) was captured on my father's farm in Ohio. This specimen had a carapace $6\frac{1}{2}$ inches in length. There was a small round hole through edge of the shell about midway of the arc between the forefoot and the neck. On the back, slightly off the midline to the left, was an irregular scar approximately an inch in diameter, apparently produced by burning, as the contour of shell was not distorted, as would be the case if due to a blow or crushing. Partly merged with this were two letters, one an R, the other unidentifiable. These letters had evidently been carved, but at that time the markings had the appearance of stippling or pitting, the instrument cuts being almost completely obliterated.

There were two other sets of initials identifiable as those of two men of the neighborhood. Later it was recalled by others that these two men had been seen to carve their initials in the shell of a turtle 16 or 17 years before. Testimony differed on the exact time. One of these men had been dead nearly 16 years.

Comparison of these letters with the older ones would lead one to conclude that the latter must have been placed there many years earlier. The outline of

¹ Personal communication to William E. Powers.