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NOTES ON THE SEX RATIO AND BREEDING OF THE BEAVER IN MICHIGAN

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THE examination of 137 carcasses of beaver (*Castor canadensis michiganensis*) trapped in Michigan in the spring of 1935 has furnished data of interest and value concerning this important fur-bearer. The beaver were trapped during the recent open season (March 16 to 31 in the Lower Peninsula and April 1 to 15 in the Upper Peninsula) declared by the Michigan Department of Conservation.

In opening a spring trapping season on beaver, the Department of Conservation acted upon a preliminary report and recommendations, published later, by J. Clark Salyer,[1] who had been engaged in a study of the beaver-trout relationship in Michigan streams for the Institute of Fisheries Research of the University of Michigan. The study begun by Salyer, is now being continued by G. W. Bradt of Michigan State College under the supervision of H. D. Ruhl, head of the Game Division of the Department of Conservation. I am indebted to Mr. Bradt and to Mr. Ruhl for permission to publish these notes, which were obtained during the study.

[1] "A Preliminary Report on the Beaver-Trout Investigation," *American Game*, 24, (1) 1935: 6, 13–15; "A Program of Beaver Management," *ibid.*, 24, (3) 1935: 9, 47–48; "A Program of Beaver Management, II," *ibid.*, 24, (4) 1935: 55, 62–64.

There is a widespread belief of trappers that among the beavers trapped in the spring the males greatly outnumber females. Indeed, the ratio generally given is 9 males to 1 female. In his published report Salyer[2] also states his belief in the likelihood that more males than females will be caught if trapping is not done at the lodges and dams. He cites the experience of "the few old-time qualified beaver trappers in Michigan" in substantiation of this idea. In order to ascertain the sex ratio of the beavers actually trapped, and to obtain information on other points, the Game Division obtained as many beaver carcasses as possible by offering the trappers fifty cents for each carcass received. Attempts were made to obtain data concerning the place and date of capture for each specimen. The carcasses were sent to the Museum of Zoology, University of Michigan, and to the Department of Zoology, Michigan State College, for examination. This report deals with only the 137 carcasses sent to the Museum of Zoology which were examined by me.

The 107 beaver from the Lower Peninsula were trapped in Cheboygan, Clare, Crawford, Gladwin, Iosco, Montmorency, Oscoda, Otsego, Presque Isle, and Roscommon counties. Most of the 30 beaver from the Upper Peninsula were not definitely labeled as to locality. Those that were came from Marquette County and the Tahquamenon River. The specimens were weighed, linear measurements taken, and the body cavity then opened to determine the sex. Embryos, when present, were removed from the foetal membranes, measured, and preserved. Unbroken skulls and skeletons were preserved as study specimens.

Sex Ratio

Of the 137 beaver sexed 71 or 51.8 per cent were females, 66 or 48.2 per cent were males. Of yearling beaver, 81 in number, 44 or 54.3 per cent were males, 37 or 45.7 per cent were females. Of the 56 two-year-olds and adults, 34 or 60.7 per cent were females, 22 or 39.3 per cent were males. These results appear to controvert the belief that 90 per cent of spring-caught beaver

[2] *Ibid.* (3): 47.

are males. Indeed, it should be noted that in the adult class females outnumbered males three to two, although with such small numbers this is probably not significant.

It is probable that the idea that males outnumber the females arises from a misidentification of the castors and oil glands for testicles. Because it is difficult to ascertain the sex of beavers except by close examination or by dissection, the identification of sex in beaver by the ordinary trapper cannot be depended on. I examined one lot of 10 specimens which had been sexed as males by a trapper and found that 6 were actually females. It was quite evident in this instance that the large castors and oil glands had been mistaken for testicles.

Age Classes

By plotting the measurements and weights it was found that the beaver tended to fall into two groups; one group was evidently a yearling class, the other, two-year-olds and adults. The plotted weights (Fig. 1) revealed a more distinct grouping than did the plotted linear measurements. There was some indication of a two-year-old class, but so much overlapping in characters occurred between two-year-olds and adults that it was not possible definitely to separate the two. It may be possible to separate them, however, when cleaned skulls are available for examination. Yearlings constituted 59.1 per cent of the total catch. I should guess that about 25 per cent were two-year-olds and the remaining 15 per cent were three-year-olds or older.

Measurements and Weights

There appeared to be no significant differences in measurements between the two sexes in the adults. In the yearling class the males averaged slightly larger than the females. Average and extreme linear measurements in centimeters and weights in kilograms for 22 adult males are: total length 104.7 (98–113), tail vertebrae 44.2 (38–53), hind foot 17.3 (16–19), weight 15.1 (12.5–20.0). For 34 adult females: total length 103.7 (95–114), tail vertebrae 44.3 (40–51), hind foot 17.5

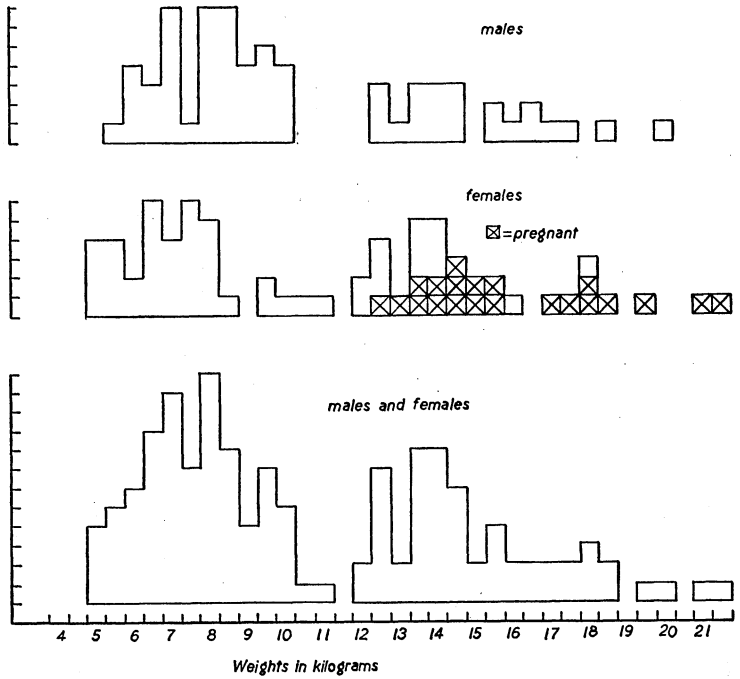

FIG. 1. Histograms showing variation in weight of skinned carcasses of beavers (*Castor canadensis michiganensis*) trapped in the period March 16 to April 15. The occurrence of pregnancy is likewise indicated. Note the distinctness of the yearling class and the high incidence of pregnacy among the larger females.

(15–19), weight 15.3 (12.3–21.5). For 44 yearling males: total length 88.2 (79–96), tail vertebrae 38.0 (32–44), hind foot 15.5 (14–17), weight 8.1 (5.5–10.3). For 38 yearling females: total length 86.4 (77–99), tail vertebrae 15.3 (13–17), weight 7.4 (5.0–10.9). Thus the average weight of skinned carcasses of adults was 15.2 kilograms (about 33 pounds), and that of yearlings was 7.7 kilograms (about 17 pounds). The heaviest carcass was that of a pregnant female weighing 21.5 kilograms (about 47 pounds). It should be noted that some of the carcasses lacked the feet and tail as well as the skin, so the weights stated must not be considered to represent the full body weights.

Breeding Data

None of the yearling females was pregnant, and the size and appearance of the uteri indicated that they do not breed. There is some indication also that some two-year-olds do not breed, or, if they do, it is later in the season than late March or early April. The evidence for this belief is that in the two-year-old and adult class, small, apparently inactive uteri were present only in the smaller females. Of the 34 adult females (including two-year-olds) 21 or 61.7 per cent contained embryos. Of the remaining 13, 4 had large, congested uteri as if in heat or in early pregnancy (because the uteri were not examined microscopically, ova or small embryos could not be detected if present), 1 had an enlarged uterus with placental scars, 3 had small, inactive uteri, 3 were recorded merely as containing no embryos, and for 2 no data were recorded.

The average number of embryos in the 21 females was 3.9. One beaver had 1 embryo, 3 had 2, 7 had 3, 2 had 4, 5 had 5, 1 had 6, 1 had 7, and 1 had 8. The embryos ranged from 50 mm. to 236 mm. in total length. The latter were obviously nearly full term. The embryos of females from the Upper Peninsula, where the open season was later, were on the average in a more advanced state than those from the Lower Peninsula, thus indicating that the breeding season is about the same in the two places.

It must be stressed that the period March 16 to April 15 is only a small part of a year, and therefore the data given here do not completely cover the breeding season. Nevertheless, the high percentage of pregnant females obtained and the presence of a distinct yearling class indicate that the breeding season is a restricted one and that most of the adult females were pregnant during the open season. There is but little doubt that had a larger number of females been available for examination, proportionately more would have been found which had already given birth to young. The single specimen with an enlarged, collapsed uterus with placental scars probably had given birth to a litter. The only reason that any doubt exists

about it is that the mammary glands, removed with the pelt, were not present as a check against the determination from the condition of the uterus.

Conclusions

Approximately equal numbers of males and females were present in 137 beaver trapped in March and April in Michigan and sexed in the laboratory. The commonly held idea that more males than females are trapped appears to be false. The belief probably rests upon the misidentification of the castors and oil glands for testicles.

The period March 16 to April 15 includes the time when most adult females are pregnant. There is evidence that some young are born during this period.

The breeding season for beaver is indicated to be about the same in the Upper Peninsula as in the Lower Peninsula.