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STAFF
ARTICLES

Sex and Age Determination of the Pine Marten Based on Skull and Baculum Measurements

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ABSTRACT

The purpose of this research was to develop a method to accurately and inexpensively sex and age marten skulls. Bacula lengths were also examined to ascertain if they could be used as accurate age determiners. One hundred-thirteen pine marten (*Martes americana*) skulls and bacula were collected from trappers in central Idaho during the winter of 1976-1977. Nine measurements were taken from the skulls and correlated to the sex of the individual. Discriminant analysis yielded an accurate and quick method to determine the sex of the skull: a combination of total length and zygomatic breadth measurements allowed a 96 percent separation of marten skulls by sex. Several morphological characters of the skull were examined to separate age classes: suture condition and sagittal crest length could be used to separate skulls into two broad age classes. This research will enable future investigators to assess the structure of wild marten populations by examination of trapped marten carcasses.

INTRODUCTION

The pine marten (*Martes americana*), although listed as "status undetermined" by the Department of the Interior in the Endangered Species Act of 1973 (Koehler et al. 1975), is a relatively common furbearer in the mountainous areas of the

northwestern United States, western Canada and southern Alaska (Davis 1939, Marshall 1951, Hagmeier 1956). In Idaho the pine marten inhabits virtually all large tracts of heavily-forested land. The annual harvest of this animal, as reported by returns of Idaho trappers (Williams 1968-1974), shows that it is a valuable fur resource in the state. Also, the marten is invaluable as an aesthetic resource for backpackers and outdoorsmen.

Pine martens are classed as furbearers in Idaho, and thus their take is regulated through seasons set by the Idaho Department of Fish and Game (1976). Because the marten requires climax stands of timber for livelihood (Hawley and Newby 1937, Koehler et al. 1975), the need for frequent management reviews of the marten's status may become increasingly evident when additional logging or other development activities endanger those vegetative types.

OBJECTIVES

The goal of this study was to increase our knowledge of the present marten status in Idaho. More important, the proposed method of age and sex determination examined in this report may enable investigators to more easily ascertain marten age and sex classes without tooth sectioning or other complicated procedures (Stoneberg and Jonkel 1966).

METHODS

One hundred-thirteen pine marten carcasses harvested during the winter of 1976-1977 were collected from trappers in central Idaho. Brassard and Bernard (1939) and Ashbrook (1930) have reported that martens attain adult weight at about 3 months, and since martens are born sometime in early spring, no extremely young individuals (less than 3 months old) are represented in the data. The skulls and bacula were cleaned by boiling, air-dried, and measured with standard dial calipers (Fowler Instrument Company) to the nearest 0.01 mm. Nine skull measurements and one baculum measurement were taken.

These data were subjected to a standard discriminant analysis¹ to ascertain the best measurement or combination of measurements for use in determining characters associated with sex.

Tooth development and wear, suture characters and sagittal crest morphology and length were examined to determine if they could be used for ascertaining age classes of martens.

RESULTS AND DISCUSSION

Aging

Of the various cranial measurements that I investigated, none was determined to be acceptable as an accurate age determinant. Tooth morphology and wear were investigated; wear was apparent in suspected old individuals, and the wear was absent in suspected young individuals, but the degree of accuracy of separation was highly subjective. I have rejected this criterion as an accurate age indicator simply because of inherent bias.

Skull sutures, especially in the nasal region, were examined as possible age indicators. Grinnell et al (1937) stated that suture closure is not a reliable aging criterion for

marten, and my findings tended to substantiate this. However, in work done on mink (*Mustela vison*), young-of-the-year members could be distinguished from older-aged individuals on the basis of suture closure.

Morphology of the sagittal crests was probably the most reliable indicator of age classes. I noticed a distinction between male and female skulls regarding this character. Males tended to possess sagittal crests (rather than temporal crests) when they were yearlings, whereas females retained temporal crests (the temporal crests did not converge into a single sagittal crest) until they were older than yearlings.

Sagittal crests seem to grow continuously in length and mass throughout life (Fig. 1). This is reflected in the wide variation in crest lengths. Those male skulls with sagittal crests greater than 30 mm were judged to be mature, while males with crests less than 30 mm were judged to be young-of-the-year. Female skulls, because of their short or completely absent sagittal crests, were not subjected to this testing criterion.

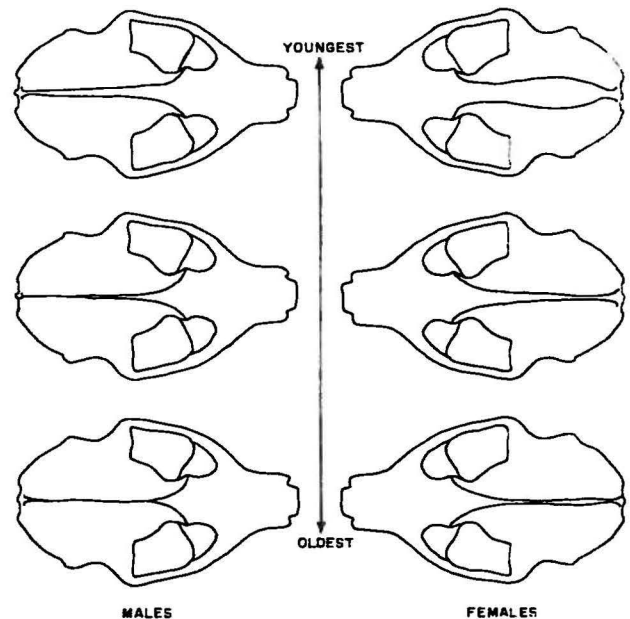


Fig. 1. Variations in sagittal crests of marten skulls, related to sex and age.

¹ BMDP7M - Stepwise Discriminant Analysis, Health Sciences Computing Facility, University of California, Los Angeles, August 1976.

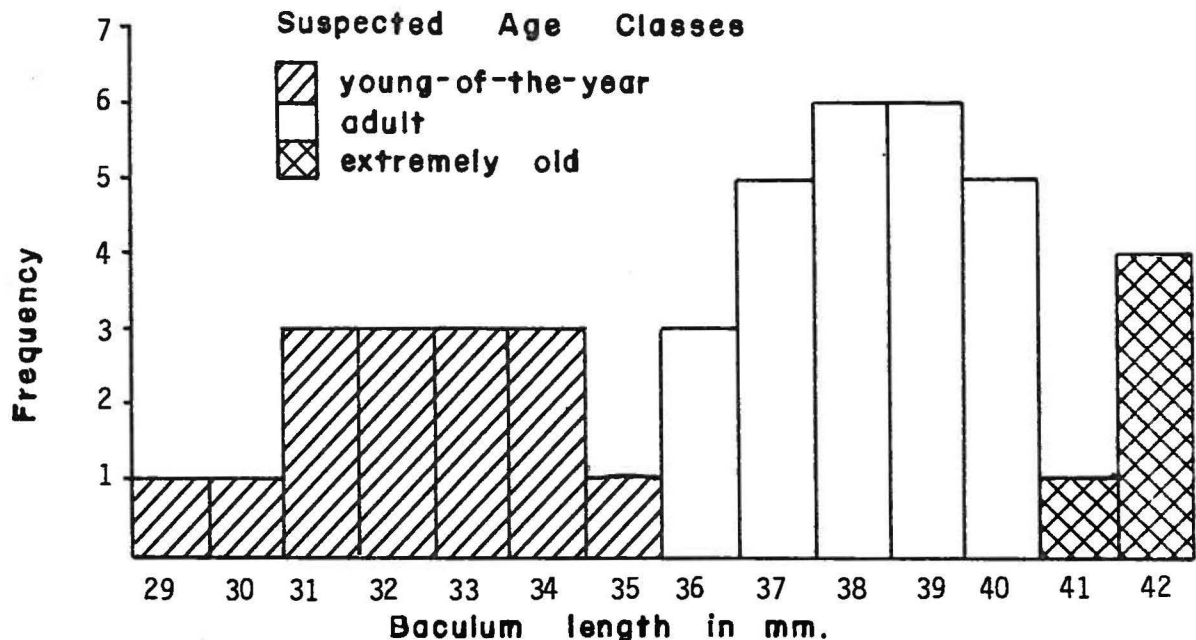


Fig. 2. Frequency distribution of bacula lengths of marten and their suspected age classes.

Bacula of the males were measured for total length and correlated to age. Marshall (1951) reported that marten bacula measurements are unreliable as an aging criterion. For absolute ages, I believe this is true, but for broad age classes, I believe they are an acceptable criterion (Fig. 2).

As mentioned earlier, skulls from males that had sagittal crest lengths less than 30 mm long were judged to be young. There were 15 male marten skulls that had no discernible crests. It is reasonable to assume that, if crest length is related to age, skulls without crests are young-of-the-year. All 15 of these skulls had corresponding bacula that measured less than 35 mm. The ridges near the proximal end of the bacula (Fig. 3) were also absent, indicating young-of-the-year. I believe this is a good method for distinguishing old individuals from young in any marten population.

Sexing

After 9 measurements were taken on 113 marten crania (Fig. 4), I separated those skulls for which one or more measurements were lacking (because of breakage) and discarded them from the sample. This reduced the sample size to 83 (males - 40; females - 43). The best single measurement for discriminating male from female skulls was length (females < 79 mm < males): 95 percent and 93 percent of the male and female skulls, respectively, were categorized correctly. A combination of total length and zygomatic breadth (females < 45.5 mm < males) increased the combined correct male-female classification only to 95.2 percent.

CONCLUSIONS

From the 113 martens collected for this investigation, I concluded that male martens could be separated into probable

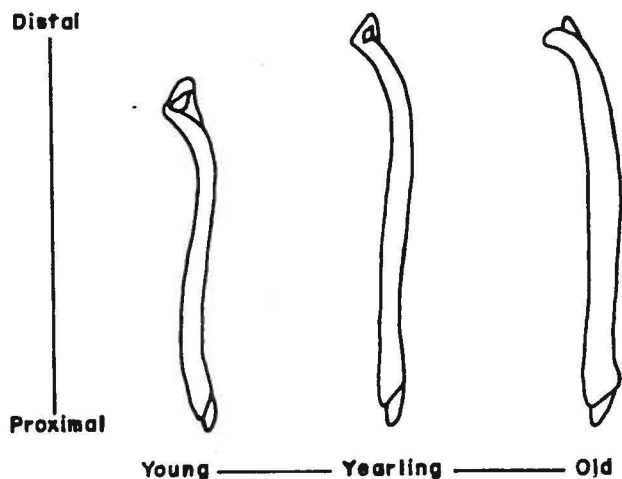


Fig. 3. Morphological differences in three age classes of marten bacula.

broad age classes—i.e., young-of-the-year, yearlings and adults—on the basis of bacula measurements and characteristics. Young-of-the-year animals had bacula less than 36 mm and had no bony ridges on the proximal ends. Probable yearling members had bacula measuring over 36 mm, but the ridges were poorly developed. Adult-class members had bacula with an extremely massive appearance and pronounced proximal ridges.

Cranial measurements of both males and females showed only the sagittal crest lengths to be accurate for aging the marten skulls into the three broad age categories. The larger size of male marten skulls is apparent throughout all measurements taken, but the most pronounced differences are with greatest length and zygomatic breadth.

The marten skulls I collected were not of known age. My speculations on the various bacula characters and sagittal crest lengths only separated the skulls into probable broad age classes. Positive aging techniques, based on skull morphology, need to be founded on a collection of known-aged martens. Any further investigations of marten along these lines should encompass these base-line collections.

Exact marten ages can be determined through the use of tooth sectioning/staining procedures. Then, with known-aged skulls, an investigation of various cranial measurements may result in a technique for rapid and accurate age-classing. This is beyond the scope of this paper, but should be undertaken. Valuable ecological data could be quickly and inexpensively gathered in this manner, once the cranial measurements have been checked on known-aged skulls.

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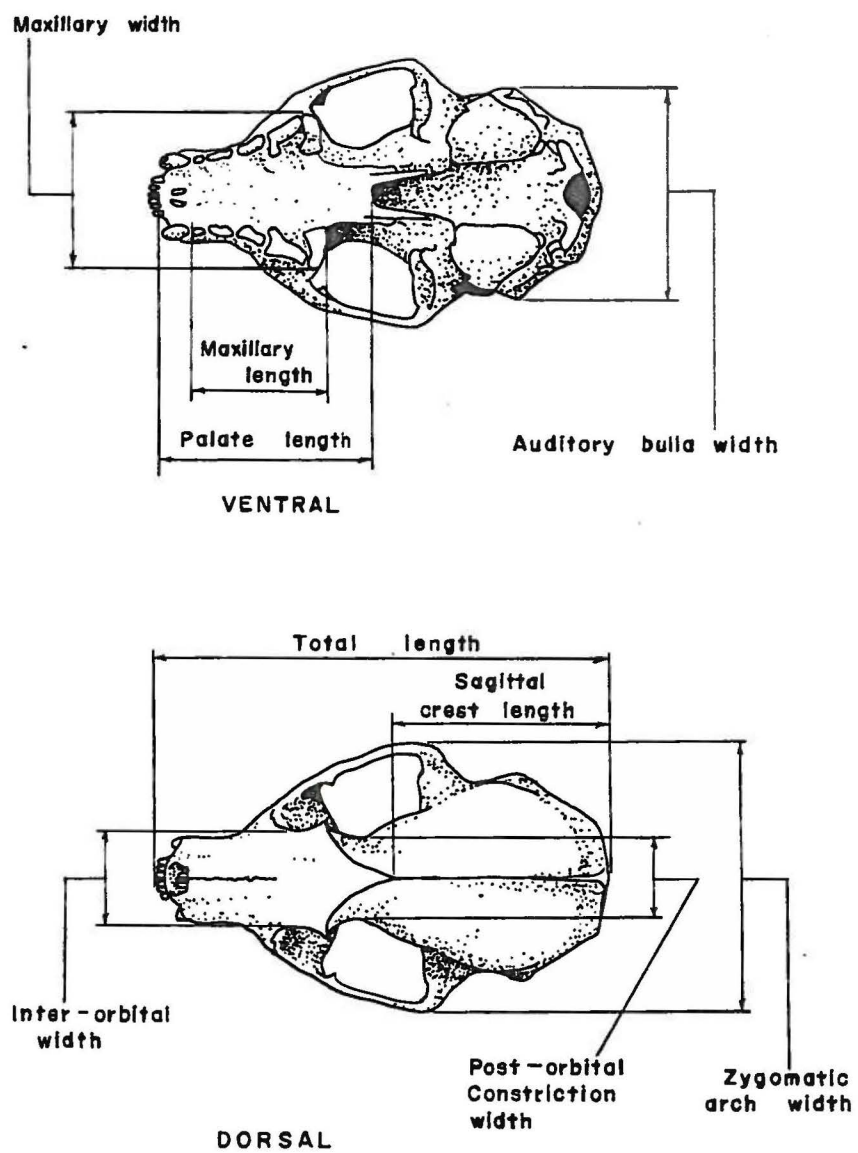


Fig. 4. Nine measurements taken on marten crania.

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