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“COMMENTS . . .”

THE MOLAR FLUTING TECHNIQUE FOR AGING MUSKRATS: A CRITIQUE

Moses and Boutin (1986) found that the molar fluting technique for aging muskrats (*Ondatra zibethicus*) misclassified 28 of 44 (64%) adult muskrats taken in the fall, but correctly aged 102 juveniles. They suggested that limitations of the molar fluting technique had not been recognized in the past, then concluded that studies using this technique to calculate age ratios and incidence of precocial breeding should be interpreted with caution. The purpose of this paper is to respond to Moses and Boutin and to point out that earlier findings (e.g., McDonnell 1979, Proulx and Gilbert 1983, Proulx and Buckland 1985) from southern Ontario muskrat populations probably were not affected by limitations of the molar fluting technique reported by Moses and Boutin (1986).

Sather (1954) found that in 12 adults >18 months old, the end of the first fluting of the first upper molar was visible, while in 46 juveniles 4-9 months old, fluting ran deep into the alveolar socket, and the end of the fluting was not visible. Furthermore, with this molar fluting technique, he reported 100% accuracy in classifying 33 skulls of female adults. On the basis of this success, the molar fluting technique was used in southern Ontario (McDonnell 1979, Proulx and Gilbert 1983, Proulx and Buckland 1985) to age muskrats. However, because Olsen (1959) found that intermediate fluting patterns were present in muskrats averaging 10 months old, use of the molar fluting technique was restricted to fall muskrats, when juveniles are ≤ 9 months old. Furthermore, because of the possibility of encountering intermediate fluting patterns, skull examinations and complete autopsies of carcasses were done.

In 48 reproductive females examined by Proulx and Gilbert (1983), the degree of extrusion below the bone line of the most anterior buccal fluting on the first upper molar was as follows: 24 well below the bone line, 21 just emerged from the

bone line, and 3 not quite emerged, but with an obvious narrowing of space between the 2 ridges along the labial surface. Two of these 3 females with juvenile dentition were relatively large (>1,050 g skinned) and had ≥ 9 placental scars. The other female was smaller (797 g skinned), but had 17 placental scars (G. Proulx, unpubl. data). The examination of both skulls and carcasses ensured a correct classification of these animals.

One objective of other studies conducted on muskrat populations in southern Ontario was to verify a common belief among trappers that muskrats can reproduce during their own season of birth. While all skulls and carcasses were examined carefully, only 3 reproductive females had the typical pattern of juvenile dentition (Proulx and Buckland 1985). These 3 precocial breeders, along with the 3 adults that could have been classified as juveniles because their fluting had not quite emerged from the bone line, represent 2.7% of all reproductive females ($n = 223$) collected since 1978 (Table 1).

These proportions of reproductive females aged as juveniles with the molar fluting pattern are significantly lower than those reported by Moses and Boutin (1986). According to Boutin (Univ. of Alberta, pers. commun.), the adult population he studied consisted of animals livetrapped the previous year, some of them belonging to third and fourth litters most likely born in early August or later. With a mild winter and good habitat conditions, these animals survived until the following fall and were harvested as adults 13-16 months old. Because some adults were 2-5 months younger than those examined by Sather (1954), it is likely that the change from juvenile to adult dentition was not complete, explaining why the fluting was found at different levels in the bone socket. Moses and Boutin's (1986) study then supported Elder and Shank's (1962) findings that the

Table 1. Classification by the molar fluting technique of reproductive and non-reproductive female muskrats harvested in fall, in southern Ontario, 1978–1983.

Muskrats harvested						Source
Reproductive females			Non-reproductive females			
Total	AF ^a	JF	Total	AF	JF	
48	45	3 ^b	160	0	160	Luther Marsh (Proulx and Gilbert 1983)
54	54	0	192	0	192	Luther Marsh (Proulx et al. 1983 ^c)
60	59	1 ^d	235	0	235	Luther Marsh (Proulx et al. 1984 ^c)
61	59	2 ^d	209	0	209	Cambridge District ponds, ditches, creeks, and rivers (Proulx and Buckland 1984, ^c 1986)

^a AF = adult fluting, JF = juvenile fluting.
^b Classified as adults by carcass analysis.
^c Unpubl. rep., Ont. Minist. Nat. Resour., Cambridge.
^d Classified as breeding juveniles by Proulx and Buckland (1985).

molar fluting technique is not a reliable aging technique in muskrat approximately 15 months old.

On the other hand, in other southern Ontario populations (Table 1), females produced an average of 2 litters/year (Proulx and Gilbert 1983; Proulx et al., unpubl. rep., Ont. Minist. Nat. Resour., 1983, 1984; Proulx and Buckland 1986), and most females completed breeding by 15 July (Proulx 1981). Therefore, adult muskrats usually are 16 months or older when harvested in fall. Obviously, the lack of reproductive females with a juvenile fluting pattern in fall harvests (Proulx and Buckland 1985) suggests that an adult molar fluting pattern is commonly present in females that are >16 months old. However, the large proportion of adults with fluting just emerged from the bone line suggests that in 16-month-old muskrats, the change from a juvenile to an adult molar fluting pattern may be recent. It is not likely that Moses and Boutin’s (1986) findings would alter the juvenile/adult ratios reported by Proulx and Gilbert (1983) and Proulx et al. (unpubl. rep. 1983, 1984), which were based on thorough examinations of skulls and carcasses where almost all reproductive females had a definite adult molar fluting pattern.

We agree with Moses and Boutin (1986) that the molar fluting technique should not be used to age muskrats from populations that have females extending their breeding well after August. Where breeding is late, the pelt primeness technique should be adopted. However, in areas where most young are born by mid-July, the molar fluting technique appears to be a quick and efficient way of obtaining information on age structures of muskrat populations. Molar fluting should be used, along with carcass analyses, in fall only.

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