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Correlation of Raccoon Pelt Qualities with Age, Sex, and Physical Condition[1]

RH: Raccoon pelt quality

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Fur harvesters and fur buyers have many intuitive ideas about how raccoons' pelt qualities differ due to age, sex, or physical condition. We tried to demonstrate correlations between age classes (juvenile and adult), sex, and physical condition and the quality of raccoon pelts. Quality of pelts was described in three objective ways: size of the pelt, density of the pelage (primeness), and color of the pelage. Physical condition was measured by kidney fat index (KFI) and skin fat index (SFI). Size of the pelts was correlated with age, sex, and both measures of physical condition. Primeness of the pelts was correlated with age and both measures of physical condition but not with sex. Color of the pelts was not significantly correlated with age, sex, or either physical condition index.
INDEX DESCRIPTORS: Age, Kidney Fat Index, Pelt Quality, Physical Condition, *Procyon lotor,* Raccoon, Skin Fat Index

Raccoons are Iowa's most important harvested furbearer. More than 250,000 raccoons annually have been harvested in Iowa since 1973. During the 1986-87 harvest season, over 390,000 raccoons were taken, the pelts of which had a market value of $7.1 million (R. Andrews, Iowa Dep. Nat. Resour., Clear Lake, pers. commun.). Raccoon pelts composed nearly 70% of the total fur market share in Iowa.

The value of an individual raccoon pelt is determined by a combination of its size, skin quality and density of pelage (referred to as primeness), and color of the pelage (Obbard 1987). Fashion preferences for different species or pelt characteristics, to which the fur industry responds, cause changes in the value of pelts.

Pelts are graded by fur buyers according to size, primeness, and color of the pelage to determine their value. Pelt length is measured from the nose to the base of the tail, and size classes range from Small (under 48 cm) to XXXLarge (over 81 cm). Primeness is determined from skin color after the pelt is stretched and dried, combined with pelage density. Primeness classes range from 1 (best) to 4, with half steps within each class. Pelage color classes range from A (best) to D, with half steps between each letter. Obbard (1987) describes fur grading in detail.

Fur harvesters and buyers often have intuitive ideas about how individuals within the population differ in pelt qualities. One of the most widespread beliefs is that the larger adult raccoons reach primeness before the young of the year. Many people also believe that females have better pelts with superior pelage texture and color. Despite these beliefs, there are few data to support them.

It is generally accepted that wild animals with larger fat reserves are in better physical condtion than those with less fat. Wildlife biologists have developed various methods to measure condition (Bailey 1984), and one of the most widely-used methods is kidney fat index (KFI, Riney 1982). It has also been shown that condition is generally related to an animal's sex, age, and reproductive and nutritional status.

Much is known about the extent and pattern of harvest of raccoons in the Midwest, and it is clear that sex, age, and other groups within populations are harvested differentially (Sanderson and Hubert 1981, Clark et al. 1989). Clark et al. (1989) found that 78% of all raccoon mortalities in Guthrie County, Iowa, were caused by fur harvesters. Additionally, most raccoons are harvested during the first 2 to 3 weeks of the harvest season (Glueck 1985). Of 2,285 raccoon carcasses collected from central Iowa fur harvesters and buyers during a 6-year period, 65% were juveniles and 50% were males, although the percentages varied among years (J. Hasbrouck, Iowa State Univ., Ames, pers. commun.). Sanderson and Hubert (1981) observed fluctuations up to 20% in sex and age composition of raccoon harvests in Illinois over a 29-year period.

Knowledge of these harvest patterns could enable managers to manipulate harvest by altering timing of seasons. We believe that questions relating harvested raccoons, pelt characteristics, and population groups should be addressed to improve management of the fur resource. Our objectives were to answer the following questions:

1. Do adults have more valuable pelts than juveniles; particularly, do adults have more prime pelts than juveniles during the typical harvest period?
2. Do females have more valuable pelts than males; particularly, do females have better color pelage than males?
3. Do raccoons with high indices of physical condition have more valuable pelts than raccoons with low indices?
4. Is there a reliable index of physical condition that will be useful to the managers of the furbearer resource?

METHODS

Seventy-nine raccoons were trapped in November and December, 1987, in Jackson and Harrison townships, Boone County, Iowa. Sixty-nine of the raccoons were captured from 8 November through 22 November. Foothold traps, snares, and body-gripping traps were used to capture the raccoons. Date of capture, sex, and total weight (± 5 g) were recorded for each raccoon.

Each raccoon was then skinned, leaving as much subcutaneous fat attached to the pelt as possible. Skin weight with attached subcutaneous fat was recorded (± 2.5 g).

Next, a local trapper scraped the subcutaneous fat from the skin, and stretched and dried the skins into the proper shape for sale. A local fur buyer then graded the pelts according to pelt size (0-5; 0 = small), pelt primeness (1-4; 1 = best), and pelage color (1-4; 1 = best). Pelt size classes were slightly different from standard size classes used in Canadian auction houses (Table 1, Obbard 1987). The stretched and dried pelts were weighed to the nearest 2.5 g.

Physical condition was determined by KFI and a skin fat index (SFI), which we developed. The KFI was slightly modified from the technique developed by Riney (1982). All fat associated with the kidney was excised from the point of attachment of the renal artery to

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the bladder. The weight of the kidney with fat was then divided by the weight of the kidney without fat to give the KFI. SFI was calculated by dividing the weight of the skin with attached subcutaneous fat by the weight of the stretched and dried pelt to indicate the amount of subcutaneous fat and water present.

Age was determined by examination of the canine tooth root foramen (Grau et. al. 1970). Raccoons whose teeth had open root tips were classified as juveniles; those with closed root tips were classified as adults.

Means of continuous variables (total weight, SFI, and KFI) were compared among groups by using t-tests. Categorical data (pelt size, primeness, and color) were analyzed by using Chi-square tests. Because the sample was relatively small, the half categories were pooled with the next lower grade so that the X^2 could be computed. Primeness 3 and 4 were pooled for computation, as were small, medium, and large (0-2) pelt sizes.

RESULTS

Some of the labels used for kidney and tooth identification were unreadable, resulting in nine raccoons having unmatchable KFI's and ages. Additionally, nine raccoons were skinned by another trapper, rather than the senior author. These nine raccoons had SFI's significantly different from the rest of the sample and, therefore, were not used.

Adults weighed more, had larger SFI's, larger pelts, and more prime pelts than juveniles (Table 2). No difference in KFI or color was observed. Males weighed more, had larger KFI's and larger pelts than females (Table 3). No difference in SFI, primeness, or color was observed. Raccoons with above-average SFI weighed more and had larger and more prime pelts than raccoons at or below average SFI (Table 4). No difference in color was observed. Raccoons with above-average KFI weighed more and had larger and more prime pelts than raccoons at or below average KFI (Table 5). Again, no difference in color was observed.

Table 1. Pelt size classes used by a central Iowa fur buyer as compared with standard pelt size classes presented in Obbard (1987).

Iowa fur buyer		Obbard	
Size Class	Length	Size Class	Length
XXXL	> 84 cm	XXXL	> 81 cm
XXL	79-84 cm	XXL	74-81 cm
XL	71-78 cm	XL	69-73 cm
L	63-70 cm	L	63-68 cm
M	53-62 cm	LM	56-62 cm
S	< 53 cm	M	48-55 cm
—	—	S	< 48 cm

Table 2. Characteristics ($\bar{x}$, SE) of adult and juvenile raccoons trapped in Boone County, Iowa, in 1987.

	Adults (n = 17)		Juveniles (n = 53)		
Characteristic	$\bar{x}$	SE	$\bar{x}$	SE	P
Total weight (kg)	9.19	0.27	6.36	0.17	<0.001[a]
Skin fat index	6.0	0.33	5.0	0.13	0.009[a]
Kidney fat index	2.7	0.11	2.6	0.11	0.64[a]
Pelt-size class	4.7	0.11	3.4	0.13	<0.001[b]
Primeness class	1.2	0.10	1.8	0.13	0.03[b]
Color class	2.2	0.14	2.5	0.12	0.29[b]

[a]Probability of a greater $\underline{t}$ statistic.

[b]Probability of a greater $\underline{X}^2$ statistic.

Table 3. Characteristics ($\bar{x}$, SE) of male and female raccoons trapped in Boone County, Iowa, in 1987.

	Males (n = 43)		Females (n = 35)		
Characteristic	$\bar{x}$	SE	$\bar{x}$	SE	P
Total weight (kg)	7.60	0.27	6.50	0.23	0.003[a]
Skin fat index	5.2	0.16	5.2	0.20	0.83[a]
Kidney fat index	2.5	0.10	2.8	0.14	0.05[a]
Pelt-size class	4.0	0.15	3.5	0.16	0.04[b]
Primeness class	1.5	0.13	1.7	0.15	0.62[b]
Color class	2.4	0.12	2.4	0.12	0.63[b]

[a]Probability of a greater $\underline{t}$ statistic.

[b]Probability of a greater $\underline{X}^2$ statistic.

Table 4. Characteristics ($\bar{x}$, SE) of raccoons with above- and below-average skin fat index (SFI) trapped in Boone County, Iowa, in 1987.

	Above $\overline{SFI}$ (n = 32)		Below $\overline{SFI}$ (n = 38)		
Characteristic	$\bar{x}$	SE	$\bar{x}$	SE	P
Total weight (kg)	8.10	0.25	6.38	0.22	<0.001[a]
Pelt-size class	4.1	0.14	3.5	0.15	0.04[b]
Primeness class	1.4	0.10	1.7	0.15	0.06[b]
Color class	2.4	0.12	2.4	0.13	0.28[b]

[a]Probability of a greater $\underline{t}$ statistic.

[b]Probability of a greater $\underline{X}^2$ statistic.

Table 5. Characteristics ($\bar{x}$, SE) of raccoons with above- and below-average kidney fat index (KFI) trapped in Boone County, Iowa, in 1987.

	Above $\overline{KFI}$ (n = 32)		Below $\overline{KFI}$ (n = 38)		
Characteristic	$\bar{x}$	SE	$\bar{x}$	SE	P
Total weight (kg)	7.56	0.25	6.49	0.30	<0.009[a]
Pelt-size class	3.9	0.14	3.4	0.20	0.05[b]
Primeness class	1.5	0.10	1.8	0.19	0.04[b]
Color class	2.3	0.12	2.4	0.16	0.53[b]

[a]Probability of a greater $\underline{t}$ statistic.

[b]Probability of a greater $\underline{X}^2$ statistic.

DISCUSSION

We began our investigation with specific questions, and we will structure our discussion by answering those four questions.

1. Do adults have more valuable pelts than juveniles? Yes, adults have larger, more prime and, therefore, more valuable pelts than do juveniles. Furthermore, adults generally reach an acceptable level of primeness earlier in a given year than juveniles (Obbard 1987).

2. Do females have more valuable pelts than males? No, our data showed that males have significantly larger pelts than females, but there is no difference in primeness or color.

3. Do raccoons with high indices of physical condition have more valuable pelts than raccoons with low indices of physical condition? Yes, individuals with above-average SFI and KFI are usually larger and more prime. Increased physical condition indices, size, and primeness could be related to habitat and weather, or could be related to other factors such as genetic characteristics.

4. Is there a reliable index of physical condition that will be useful to managers of the furbearer resource? Bailey (1984) listed some

characteristics of an ideal index of physical condition, and these points are useful in comparing our results.

First, an ideal index should be usable under realistic conditions. Mud was washed from the fur and fur was dried before any weight measurements were taken. Consistent handling of pelts is necessary to avoid very large fluctuations in SFI values. These problems could make it difficult to collect large samples of standardized SFI. Although collecting SFI samples would not be difficult for fur handlers, SFI values vary with different skinning techniques.

Alternatively, KFI could quite easily be integrated into a study of raccoons by taking data samples from skinned raccoon carcasses at fur-buying establishments. Once the kidneys are removed, they can be stored frozen until analysis is convenient. Convenience also implies greater accuracy because laboratory analysis can more easily be standardized than field measurements. Some of the raccoons in this study were frozen before being skinned, and some carcasses were left in the skinning shed for 24 hours before the kidneys were removed. These variations could affect the KFI. The major drawback of KFI is in increased potential for clerical errors when associating organ weights with pelt information.

An ideal index should not be related to differences among animals other than condition. On the basis of our results, if SFI were to be used, separate scales for adults and juveniles would have to be determined. Alternatively, if KFI were to be used, separate scales for males and females would have to be determined.

All these things considered, KFI has the most potential as a usuable index of physical condition for raccoons. KFI also has the potential of being useful for other species. Few other wild animals have enough subcutaneous fat to make SFI feasible, whereas many species have enough fat in the abdominal cavity to make KFI useful (Riney 1982).

We conclude that physical condition was related to pelt characteristics and fur value in this study. Although KFI was correlated with fur value, further research is needed to determine the causal relationships between physical condition and pelt characteristics. Harvest can keep populations at optimum levels of physical condition (Bailey 1984). Timing of the harvest could be manipulated to take different age and sex groups within populations (Clark et al. 1989). Because pelt characteristics are correlated with groups, harvest could potentially be used to maximize the economic, as well as recreational value, of furbearers.

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