

COMPARING THREE TECHNIQUES OF AGE DETERMINATION
IN A HUNTED POPULATION OF FOX AND GRAY SQUIRRELS

by

Diana L. Hadley

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Dr. Clark E. Adams

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ABSTRACT

Comparing Three Techniques of Age Determination in a Hunted Population of Fox and Gray Squirrels. (April 1984)

Diana L. Hadley, Texas A&M University

Faculty Advisor: Dr. Clark E. Adams

Several techniques of age determination have been used on hunted squirrels to determine age distribution in the populations. These techniques include morphological characters, lens weight, and cementum annuli. The purpose of this study was to compare these three techniques, and to examine the field reliability of the morphological techniques.

The eyeballs and lower jaws were removed from harvested squirrels on the Engeling Wildlife Management Area in Anderson County, Texas on 2 weekends in October 1981, 1982, and 1983. Lens weights were determined and cementum annuli were scored to estimate age. Coefficients of correlation were determined for the variables, and the frequency of harvest in each age category was compared to actual harvest on the area. No correlation was found between cementum annuli and body weight or lens weight, but a positive correlation existed between lens weight and body weight. A positive relationship existed between harvest and age which indicated that the majority of squirrels harvested were from subadult

and adult age categories. These results indicate that the cementum annuli technique needs further work to test its reliability, and that body weight can be used accurately in the field as a determination of age.

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INTRODUCTION

With the increasing popularity of squirrel hunting today, much attention has been focused on squirrel populations in hunted areas. These populations are generally studied in terms of the distribution of age classes and the hunting pressure on these different age classes. Several types of age determination techniques have been used with varying degrees of reliability.

External morphological characters have been used extensively. These characters include body weight, tail pelage, color, and sexual development, but according to Fisher and Perry (1970), none of these have proven to be particularly reliable.

Another popular method is that of lens weight. Beale (1962) and Fisher and Perry (1970), have found this aging technique useful in separating juveniles from adults and even summer born from spring born juveniles. This method does not aid in determining the ages of individuals at specific age intervals.

One technique that has been found satisfactory in determining discrete age classes is counting cementum annuli in the teeth.

The format and citations herein follow the style of the Journal of Wildlife Management.

This technique was reported as a fast, practical method for aging squirrels accurately to individual year classes (Fogl and Mosby 1978).

The purpose of this study was to compare the above techniques of age determination. The intent of these comparisons was to examine the field reliability of using a morphological feature, like body weight, as a dependable measure of age categories. Wildlife managers were usually unable to utilize lens weight or cementum annuli techniques in the field. However, if a morphological characteristic could be found to be a reliable correlate with lens weight and cementum annuli tested in known age squirrels, then the field determination of age groups could be more easily gathered.

STUDY AREA

This study was conducted on the Gus A. Engeling Wildlife Management Area, which is located approximately 30 km northwest of Palestine, Anderson County, Texas. This area was acquired for the purpose of conducting long term wildlife management research (Davis 1983).

There is a tributary of the Trinity River, Catfish Creek, which bisects the management area from north to south. The climate is subtropical with plenty of rainfall but droughts do occur in the summer months.

Two major habitat types exist on the area, uplands and bottomlands. Davis (1983) reports that the vegetation has been described as oak-hickory forest, post oak savannah, and prairie parkland.

The gray squirrels (Sciurus carolinensis) seemed to prefer areas with closed canopy with dense understory, while fox squirrels (S. niger) tended to prefer more open forests with sparse understory.

METHODS

The eyes and lower jaws of the fox and gray squirrels were collected at Engeling Wildlife Management Area in October 1981, 1982, and 1983. They were removed and placed in small vials containing 10% formalin. Each was assigned a number and the species, sex, and weight were recorded for each one. Approximately 10% of the squirrels harvested during each year were used in this study.

To determine age through lens weight, the lens was extracted from the eyeball, placed in alcohol for 3-5 minutes, air-dried, and placed in a hot air oven at 80°C for 48 hours. Lenses were weighed on an analytical balance to the nearest 1/10 mg (Fisher and Perry 1970).

The cementum annuli were counted in the M3 tooth of each specimen. The tooth was decalcified for 120 hours in a mixture containing equal amounts of the 2 following solutions:

Solution A

Sodium citrate	50.0 gm
Distilled water	250.0 ml

Solution B

Formic acid, 90%	125.0 ml
Distilled water	125.0 ml

The tooth was rinsed in water and sectioned with a single-edge razor blade through the largest root.

The first several sections were placed in a series of staining solutions suggested by Fogl and Mosby (1978). However, this staining procedure proved unreliable in staining the cementum annuli. Therefore, the remaining sections were stained with 0.1% Toluodine Blue-0 (Thomas (1977) for 1-2 minutes, then examined under a compound microscope in order to score the number of cementum annuli.

We determined coefficients of correlation (r probability) between lens weight and cementum annuli, lens weight and body weight, and cementum annuli and body weight. We also determined the relationship between age distribution and frequency of harvest for each age category of juvenile, subadult, and adult. Our sample was then compared to actual harvest recorded on the Engeling Wildlife Management Area.

RESULTS AND DISCUSSION

No significant correlation between cementum annuli and body weight or lens weight was found (Table 1). Perhaps this comparison was inappropriate. It takes approximately 1.5 years for a cementum annulus to clearly appear in a squirrel tooth (Fogl and Mosby 1978). Therefore, a squirrel could be classified as a subadult or adult based on lens weight or body weight characters. However, the comparison between lens weight and body weight demonstrated a positive correlation ($p < .05$). These variables can be appropriately compared. Although both lens weight and body weight are dependent on the nutritional status of the animal, sufficient sample sizes negated concern for the variable. Lens weight was shown to delineate specific age classes (Beale 1962, Fisher and Perry 1970) on known age squirrels. The present study indicated that ages of fox and gray squirrels can be estimated by use of body weight. The population age structure analysis is comparable using lens weight or body weight.

The relevancy of determining the age structure of the hunted population is to provide age related impacts of the hunt. A negative slope on the age vs. number harvested graph exists when the younger population members or the surplus of the population are being harvested. The alternative positive slope (Figs. 1-3) may indicate harvest pressure on older age groups or the reproducing component

of the population. Wildlife managers can utilize such information to monitor present and future status of squirrel populations and adjust management techniques accordingly.

Table 1. Correlations (r) between the number of cementum annuli (CA), lens weight (LW), and body weight (BW) as age determinants in fox and gray squirrels.

VARIABLES	r-VALUE			
	1981	1982	1983	cummul.
CA vs. LW	0.41	-0.06	0.32	0.16
CA vs. BW	0.21	-0.12	0.24	0.09
LW vs. BW	0.80	0.30	0.67	0.61
N	62	92	97	251

VARIABLES	r-VALUE					
	FOX			GRAY		
	1981	1982	1983	1981	1982	1983
CA vs. LW	0.26	-0.03	0.45	0.56	-0.08	0.20
CA vs. BW	0.08	-0.13	0.29	0.51	-0.05	-0.02
LW vs. BW	0.76	0.40	0.78	0.85	0.68	0.73
N	21	49	25	41	43	72

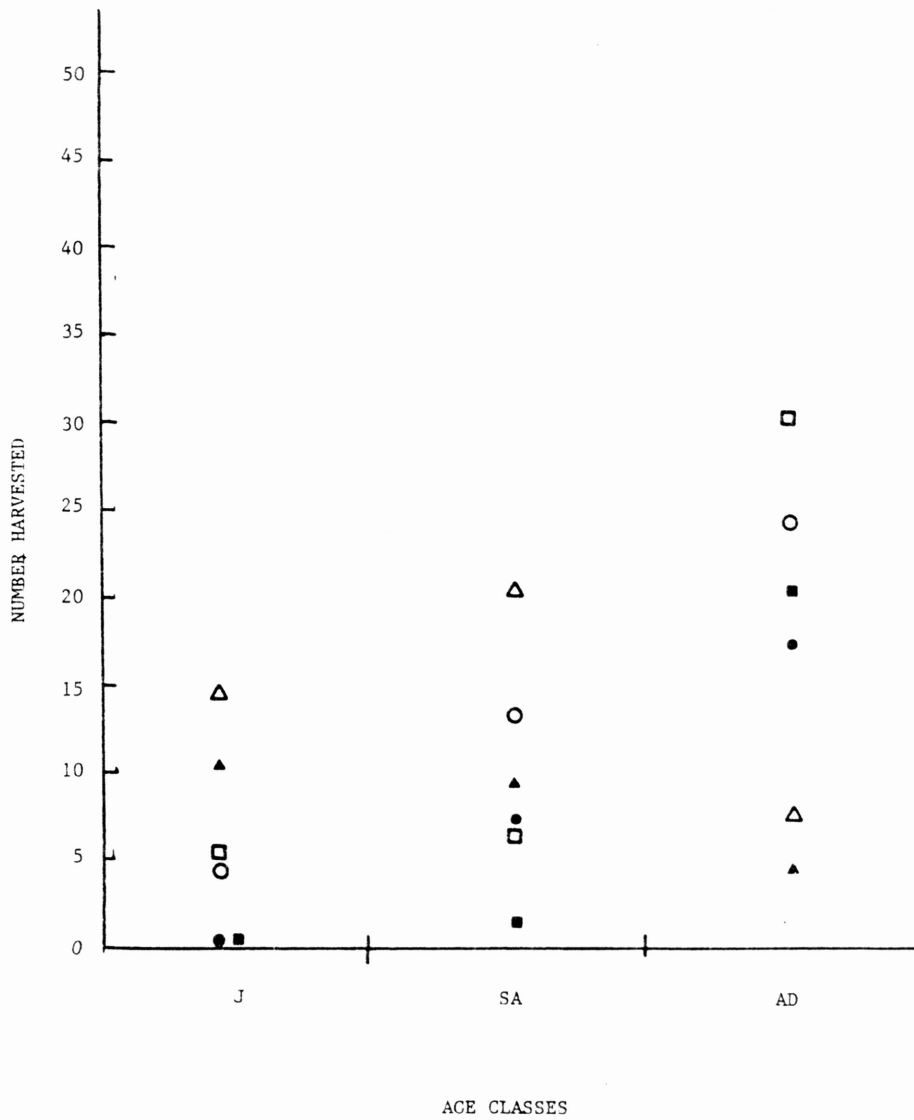


Fig. 1. Ages of fox (Sciurus niger) and gray (Sciurus carolinensis) squirrels based on body weights (circles), cementum annuli (triangles), and lens weight (squares) in relation to number harvested in 1981. Open symbols represent gray squirrels and solid symbols represent fox squirrels.

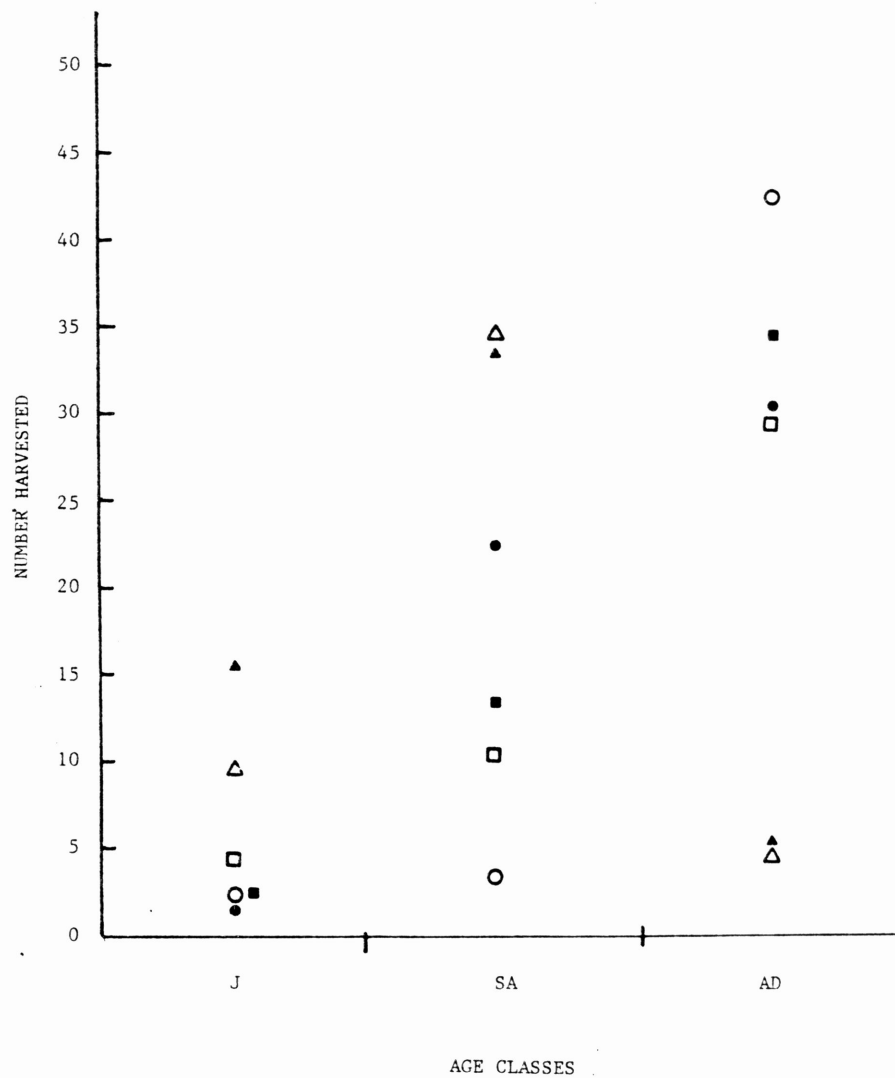


Fig. 2. Ages of fox (Sciurus niger) and gray (Sciurus carolinensis) squirrels based on body weights (circles), cementum annuli (triangles), and lens weight (squares) in relation to number harvested in 1982. Open symbols represent gray squirrels and solid symbols represent fox squirrels.

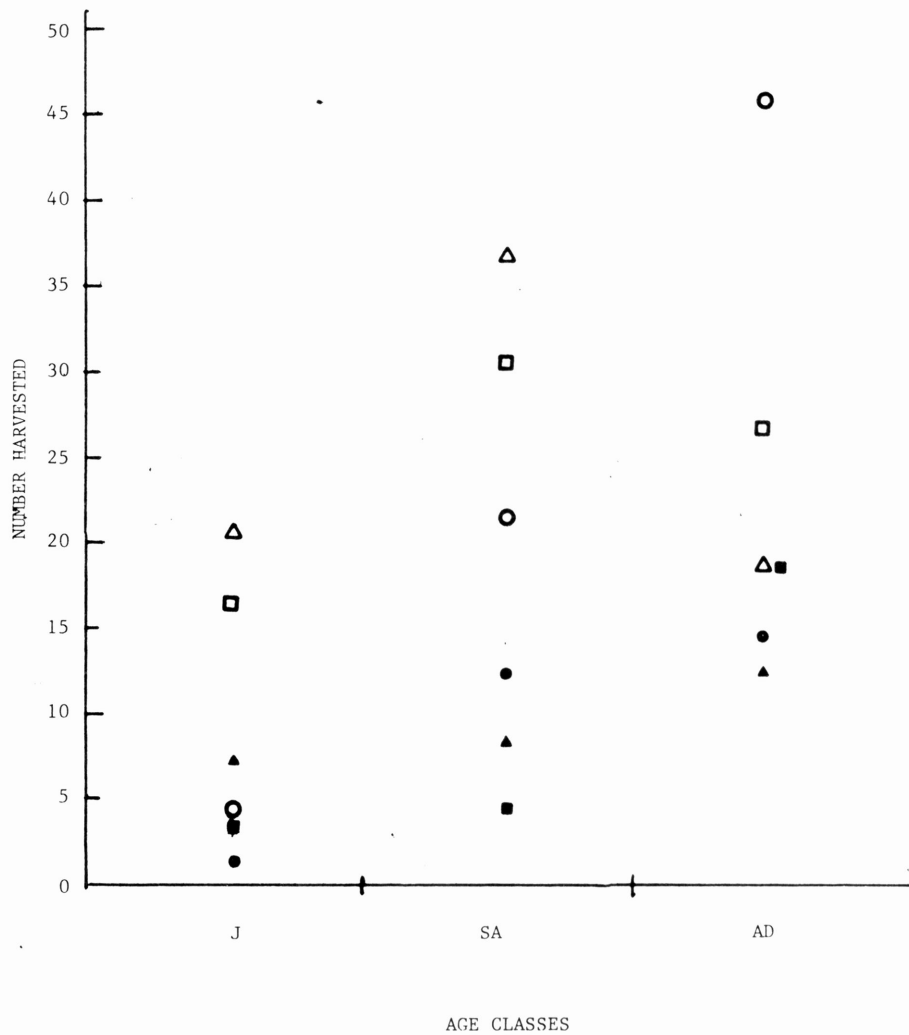


Fig. 3. Ages of fox (Sciurus niger) and gray (Sciurus carolinensis) squirrels based on body weights (circles), cementum annuli (triangles), and lens weight (squares) in relation to number harvested in 1983. Open symbols represent gray squirrels and solid symbols represent fox squirrels.

IMPLICATIONS

The use of cementum annuli as a determinant of age in squirrels still needs additional work. Available literature (Fogl and Mosby 1978) was found to be unrepeateable in both techniques and results. The reliability to our technique as applied to known age squirrels remains unknown.

The strong correlation between lens weight and body weight presented a useful field determination of age categories for wildlife managers. Since lens weight has been determined to be a relatively accurate measure of age in known age squirrels (Beale 1962, Fisher and Perry 1970), and correlates with body weight, then body weight techniques were considered as reliable a method for aging squirrels as was lens weight. This technique can be used in the field where lens weight cannot be determined. Therefore, the manager can use body weight and morphological characters associated with body weight to determine a relatively accurate age for squirrels harvested during the fall hunt.

The squirrel hunt on the Engeling Wildlife Management Area has been predominantly in the subadult and adult age categories. Although this may not have an effect on the population, by monitoring the age distribution of the hunted population, the manager has a means of forecasting the age status of future populations. If a majority of older squirrels are harvested year arter year, this could indicate that a

crash in population size may be eminent and that present management practices need to be altered. However, if the harvest continues to be primarily younger members of the population, this indicates a relatively stable population and present management practices are justifiable.

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