

1984

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### Recommended Citation

Heidt, Gary A.; Peck, James H.; and Johnston, Lew (1984) "Analysis of Gray Fox (*Urocyon cinereoargenteus*) Fur Harvests in Arkansas," *Journal of the Arkansas Academy of Science*: Vol. 38, Article 14.

Available at: <https://scholarworks.uark.edu/jaas/vol38/iss1/14>

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# AN ANALYSIS OF GRAY FOX (*UROCYON CINEREOARGENTEUS*) FUR HARVESTS IN ARKANSAS

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## ABSTRACT

An investigation was conducted on gray fox (*Urocyon cinereoargenteus*) fur harvest in Arkansas. Data were gathered from a mail survey of Arkansas trappers and from Arkansas Game and Fish Commission fur harvest records from 1939 to 1983. Analyses of these data demonstrated: 1) gray fox were abundant statewide with lower levels in the Delta region; 2) there was a need for fox trappers to keep better records on their trapping efforts, success and composition of catch, including sex and age data; 3) market price:harvest correlation was high ( $r = 0.956$ ,  $p < .001$ ); 4) over the past 10 years, the Ozark Mountain region provided the greatest contribution to annual fox harvests, the Ouachita Mountain and Gulf Coastal Plain regions were similar to each other, but lower than the Ozarks, and the Delta region contributed the least, but with a generally stable harvest.

## INTRODUCTION

Arkansas falls well within the geographic range of the gray fox (*Urocyon cinereoargenteus*) (Hall, 1981). These relatively secretive carnivores have long been an important wildlife resource in the United States, both as a valuable furbearer and as a recreational sport animal. For example, in Arkansas, the gray fox is the sixth most harvested species (2% of total pelts) and is the third highest in total value (6% of total furbearer harvest value) (McArdle, 1983). In spite of this importance, our knowledge of gray fox biology is limited in the Southeastern United States (Carey, 1982; Hensley and Fisher, 1975; Nicholson, 1982; Spencer, 1982; Sullivan, 1956; Sumner and Hill, 1981; and Wood et al., 1958) and is almost non-existent in Arkansas (Fooks, 1961; King, 1981; and McArdle 1979, 1983).

The management problems presented by furbearers, in general, have increased in number, scope and intensity during the past decade in response to 1) rapidly growing demands for furbearers and their products, 2) enactment of endangered species regulations and treaties, 3) major decline in upland wildlife hunting opportunities and 4) growing antihunting and antitrapping sentiment (Hubert, 1982). Thus harvest management remains the principle focus of most furbearer management programs. The mechanics of harvest management programs, however, are not clearly understood. The success of management programs, now and in the future, requires an understanding of the variables which ultimately determine the size of furbearer populations and of subsequent expected harvests (Erickson, 1981, 1982; Hubert, 1982).

The numerous variables which influence furbearer harvests must be identified and evaluated for each furbearer species. The same factor may have a different importance value for a different species in the same state and may differ in its importance from state to state (Erickson, 1981; Hubert, 1982).

Erickson (1981) examined a number of variables (mean pelt value, population indices, harvest efforts, season lengths, weather and pelt values) of four furbearers (beaver, muskrat, raccoon and coyote) in Missouri. Of these variables, he found that mean pelt value correlated with total harvest for all four species and that exceptionally high correlations existed between mean annual pelt value and total harvest of the two carnivore species, raccoon and coyote. Market price played an important role in the harvest of otter and bobcat in Arkansas (Tumilson et al., 1981; McArdle, 1982).

Fur harvest data have traditionally been used as the primary source of data for analysis of the condition of furbearer populations and subsequent management (Erickson, 1982; Hubert, 1982). Arkansas, along with other states in the Midsouth and Midwest, has relied heavily on these data (McArdle, 1979, 1983). In an effort to determine the accuracy of fur dealer records in Arkansas, Tumilson et al. (1981) compared the

number of fur buyers licensed in each county with the number of otter pelts attributed to the harvest from each county. In many counties with large harvests, there were no resident, licensed furbuyers; whereas, few otters were reported from some counties with many resident furbuyers. Since furbuyers usually listed counties other than their own as sources for pelts, the harvest data with respect to county of origin of the pelt were considered sufficiently accurate to allow for an analysis of harvest by region.

The objectives of this study were: 1) to assess trapper work effort in harvesting gray fox; 2) to assess the character of the gray fox fur harvest in Arkansas; and 3) to assess the correlation between the market price (mean pelt value) and harvest size for gray fox in Arkansas.

## METHODS AND MATERIALS

A questionnaire for fur trappers was prepared in accordance with standard methods for wildlife opinion surveys (Filion, 1980). The survey examined trapping effort, trapping success, and composition of the fur harvest over the past three trapping seasons (1980-81, 1981-82 and 1982-83). Only data on gray fox were used for analysis. The questionnaires were mailed to the 1200 members of the Arkansas Trappers Association (ATA) on 14 June 1983. The members of the ATA represented 25% of an estimated population of 4800 Arkansas fur trappers (P. Dozier, *pers. comm.*). Unforeseen time limitations necessitated that all responses be returned by 30 June 1983. A total of 235 respondents replied (19.6%). A total of 230 questionnaires were used for data analysis, as five were physically damaged and unuseable. The 230 ATA respondents represented 5% of the estimated trapper population in Arkansas.

Fur harvest records used in this study were compiled since 1939 by the Arkansas Game and Fish Commission (AGFC). Data were available for mean annual pelt value, total gray fox harvested, and regional contribution of harvest for all but a few years. For purposes of analyses, years with missing data were generally omitted from consideration. In the case of missing mean annual pelt values, a value was extrapolated for Arkansas based on mean annual pelt prices in Missouri. No correction factors were applied to the data to correct for out-of-state sales of Arkansas fur. Furthermore, dollar values were uncorrected for inflation.

The data were statistically analyzed using a microcomputer statistical program (STATPAK by Northwest Analytic, Inc.) on an Epson QX-10 microcomputer. A linear regression equation relating the variable of mean annual pelt price to the number of pelts sold was formulated; a correlation coefficient and a coefficient of determination was calculated. The correlation coefficient was tested for significance with

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a single tailed t test at the .001 level of significance.

## RESULTS AND DISCUSSION

## Trapper Survey

The 230 ATA respondents reflected a statewide distribution with residency in all but nine of 75 Arkansas counties (Boone, Chicot, Crittenden, Jackson, Lafayette, Lee, Newton, Phillips and Prairie). The accountability and comparability of the data provided by the respondents was considered to be high, as 1) 85% of the respondents signed their name to the questionnaire form, 2) 73% of the respondents indicated that they specifically trap for fox, and 3) 40% of the respondents indicated that they hunted as well as trapped fox. Altogether, the respondents indicated that they had trapped or hunted for fox in all Arkansas counties except three (Boone, Lee and Newton), and that they had searched for fox in all 75 counties.

Gray fox observations by the respondents were well distributed across the state. Positive sightings were reported in all counties except two (Lee and Lincoln). McArdle (1979, 1983) previously rated Arkansas gray fox as abundant based on an index of relative density with *rare* being defined as positive sightings being reported by fewer than 25% of observers, *occasional* being reported by 26-50%, *common* being 51-75%, and *abundant* being 76-100%. As 91% of the respondents reported positive sightings, gray fox was rated as being abundant in terms of relative density across the state.

Table 1. Mean work effort, mean trap success, and composition of the gray fox harvest by trappers in Arkansas over the past three seasons (1980-81, 1981-82, 1982-83). Calculated values were rounded to nearest whole integer.

	Trapping Season		
	1980-81	1981-82	1982-83
Mean # Traps/trapper	22	22	19
Mean # Nights Trapped	31	29	27
% Season Length Used	50	41	45
Total Trap-nights per season	690	642	506
Mean # animals harvested per trapper	66	61	65
Mean # Gray Fox sold by each respondent	7	7	7
Total % Trap success	10	10	13
Total Harvest by all respondents	15,587	14,125	14,873
# Gray Fox harvested by all respondents	1,666	1,704	1,559
% Gray Fox of Total Harvest by all respondents	11	12	10
# Gray Fox pelts sold out-of-state by all respondents	208	251	207
% Gray Fox pelts sold out-of-state by all respondents	12	15	13
% Total Arkansas Gray Fox Harvest sold by respondents	23	34	30

The respondents were asked to provide data on their trapping effort, trap success and composition of their harvest, which was summarized in Table 1. In general, the respondents (71%) indicated that economic conditions have not significantly influenced their trapping efforts, consequently they reported trapping in essentially the same localities with equal effort each year. Over the past three seasons (1980-81, 1981-82, 1982-83), the respondents on the average set 21 traps on 29 nights (averaging 45% of the length of the legal season for fur taking). The respondents averaged 619 trap-nights, catching an average of 65 animals,

reflecting an 11% trap success. Altogether, the respondents harvested an average of 14,862 furbearers each season, with 11% of the season total harvest being gray fox. Altogether, the respondents trapped an average of 1643 gray fox. Although the respondents represent 5% of the Arkansas trappers, they accounted for an average of 29% of the reported state harvest of gray fox. The respondents sold, on the average, 222 pelts out-of-state each year, being approximately 13% of their harvest. If the other trappers in Arkansas market furs in a similar manner, then the reported state harvest may under estimate the number of gray fox harvested in Arkansas by approximately 13%.

The respondents indicated that weather negatively influenced the trapping of gray fox in Arkansas. Over the three seasons assessed, the respondents indicated that weather played "some" influence during the 1980-81 and 1981-82 seasons (37% and 49%, respectively), but that it played a "great deal" of influence in the 1982-83 season (68% of respondents), probably being reflected in the slight decline in number of traps and nights trapped in Table 1. Although this resulted in a reduced trap effort, the trap success actually increased (Table 1), as did the total harvest for the state. Weather probably influenced the Arkansas fur harvest, but the actual impact of weather on the harvest, apparently, can not be readily derived from trapper perceptions.

The quality and extent of suitable habitat can influence the population status of furbearers. In the case of gray fox in Arkansas, 91% of the respondents indicated that habitat in their area was staying the same or was actually improving for gray fox. Thus, the respondents did not feel that habitat quality or extent was limiting population size or harvest of Arkansas gray fox.

As to condition of the fur, the respondents noted that an average of 17% of the gray fox harvest was physically damaged before harvest, reducing the market value. The major problem reported was the presence of wounds with lead or shot under the skin (7% of the fox), scars from animal bites (5%), mange (4%) and missing limbs (1%). The incidence of mange, however, rose from 3% in 1980-81 season, to 4% in 1981-82, to 5% in 1982-83, suggesting that the extent of this disease in Arkansas gray fox needs to be monitored.

Respondents were also asked to provide age and sex data on the gray fox that they harvested over the three seasons. Based on their collective recollections, the respondents reported that from 30-51% of the last three harvests had to be classed as "unknown" with respect to sex. Similarly, with respect to age of fox, the respondents indicated that 60-64% of the three harvests had to be classed as "unknown". Consequently, it was impossible to derive any meaningful data concerning age or sex ratios. The high percentage of unknown responses probably reflected a lack of accurate recording at the time of harvest, rather than an inability by the fur taker to discern sex or age (adult/juvenile) of the fox. Considering the large number of furbearers taken by the respondents, if an organized method to record data would have been provided to them before the opening of the trapping season, valuable population data could have been readily obtained.

## Fur Harvest Analysis

The character of the Arkansas gray fox harvest from the 1939-40 season through the 1982-83 season was compiled (Heidt and Peck, 1983). These fur harvest data reflect over 40 years of data gathered from fur-buyers by the AGFC staff. Subsequent analyses and discussions were based upon these data (detailed data can be obtained from the authors).

The total value of gray fox harvest in Arkansas and the total number of pelts sold has varied considerably from 1939-1983 (Fig. 1). Gray fox harvest in Arkansas was stimulated from World War II through the Korean Conflict (1940's through the early 1950's). Similar trends have been seen for other furbearers such as red fox in the Midwest and Canada (Sargeant, 1982; Voight and Tinline, 1982). Mean pelt values, however, were less than \$1.00/pelt from the 1946-47 season through the 1965-66 season, while values of greater than \$20.00/pelt have existed since the 1975-76 season. The mean annual pelt value for the 1979-80 season was 20x the value of a pelt of the 1958-59 season. Figure 1 portrays a dramatic increase in fox harvest during the 1970's and into the 1980's. The equally dramatic increase in total value of harvest reflects the large financial impact which increases in mean annual pelt price have had on total harvest.

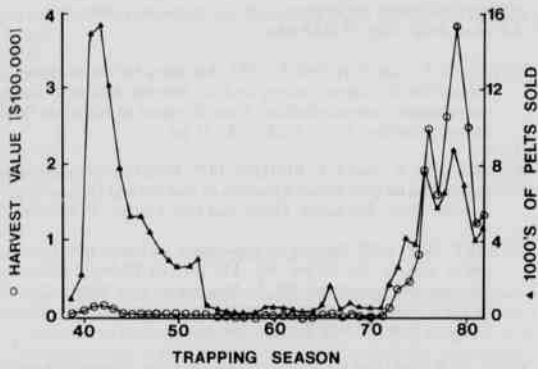


Figure 1. A comparison of the total value of Arkansas gray fox fur harvests from 1939-1982 with the total number of pelts sold at the conclusion of each season's harvest.

The magnitude of change in pelt values over the last 25 years was sufficiently large enough to influence the attitudes and efforts of fur-takers, suggesting that the market price might have influenced the magnitude of the Arkansas gray fox harvest. The mean values of pelts of Arkansas gray fox were plotted against the harvest size for each season since 1954 (Fig. 2). A linear regression equation was calculated to correlate the total harvest of Arkansas gray fox and the annual mean pelt

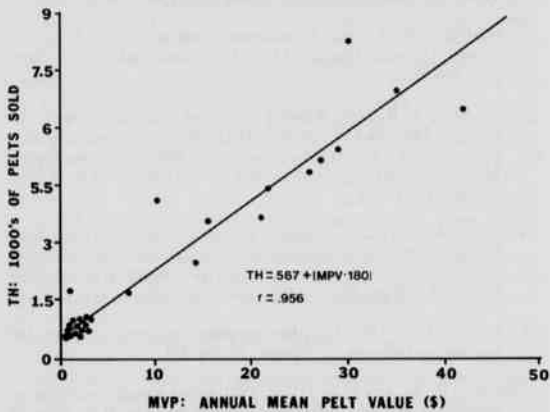


Figure 2. A scatter diagram, regression line and equation, and correlation coefficient ( $P < .001$ ) relating annual mean pelt value in dollars (MVP) to the number of pelts sold (TH) for the 1954-1982 Arkansas harvests of gray fox.

value. The correlation coefficient ( $r = 0.956$ ,  $p < .001$ ) indicated a high degree of relationship between total harvest and mean pelt value. Consequently, market price accounted for 93.3% ( $r^2$ ) of the variability in harvest size of gray fox in Arkansas.

The total fox harvest was also analyzed geographically, using the four major physiographic regions of the state (Ozark Mountains, Ouachita Mountains, Gulf Coastal Plain and Mississippi Delta). These regions were compared in terms of number of pelts sold (Fig. 3) and percent contribution to the total state harvest (Fig. 4). From Fig. 3, the declines from the large harvests during World War II were evident in each region,

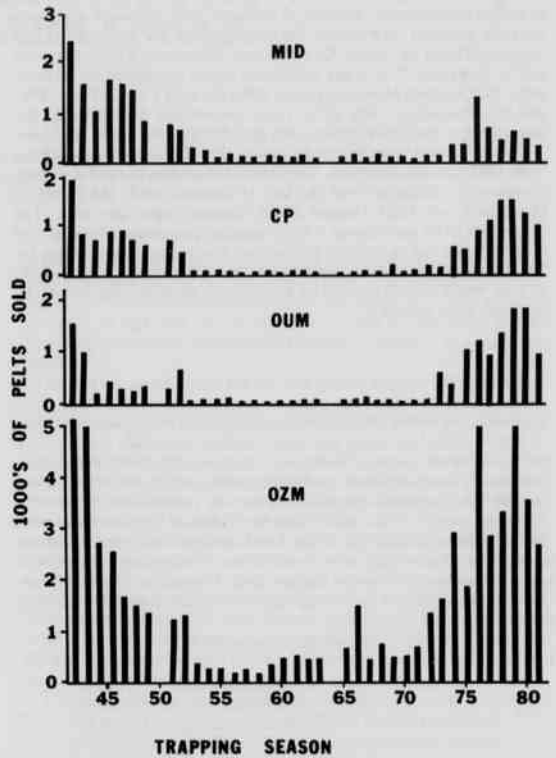


Figure 3. A comparison of the number of gray fox harvested from 1939-1982 from each of the four major physiographic regions of Arkansas: Ozark Mountains (OXM), Ouachita Mountains (OUM), Coastal Plain (CP), and Mississippi Delta (MID).

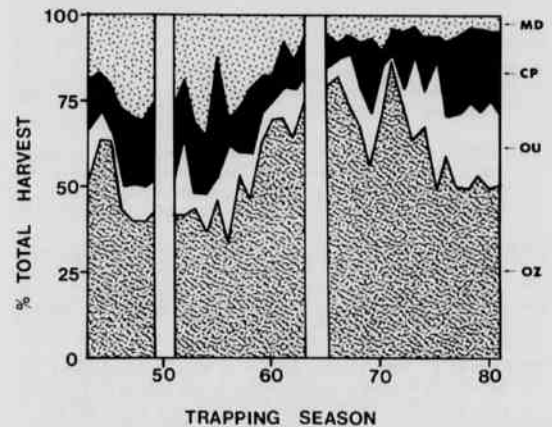


Figure 4. A comparison of the percent harvest of Arkansas gray fox from 1939-1982 from each of the four major physiographic regions of Arkansas: Ozark Mountains (OZ), Ouachita Mountains (OU), Coastal Plain (CP), and Mississippi Delta (MD).

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as well as the increasing harvests of fox since 1970. Although the trends were the same for each region, the magnitude of the response in total harvest differed by region. Over the past 10 seasons, 57,355 fox were sold in Arkansas. The Ozark Mountain region accounted for 52% of sales, the Ouachita Mountain region 20%, the Gulf Coastal Plain 18%, and the Mississippi Delta 10%. These percentages demonstrated the importance of the Ozark region to the gray fox state harvest in Arkansas.

The percentage contribution by region (Fig. 4) for each season from 1940-1982 was also analyzed. The Ozark Mountains showed a slightly decreased contribution over the last 10 seasons, while the Ouachita Mountains and Gulf Coastal Plain showed slight increases. The Mississippi Delta contributed a fairly constant percentage of the harvest in spite of decreasing optimal habitat and decreasing trapper effort for fox. Furtakers in the Mississippi Delta probably expended more effort to trap water-related species (e.g., beaver, muskrat, and mink) P. Dozhier, pers. comm.).

## CONCLUSIONS

Based on the trapper survey and fur harvest records, data from this study showed that gray fox populations are at good levels and occur statewide, but with probably fewer individuals in the Mississippi Delta. Trappers tended to utilize the same traplines and made similar work efforts from year to year. Fur harvest data indicated that economic considerations were extremely important in determining the total harvest of gray fox. Regional analysis of fur harvest records demonstrate the importance of the Ozark Mountains to the annual gray fox fur harvest and also demonstrated that while the Mississippi Delta contributes the least, it has been steady in its contribution. Finally, there is a definite need for better utilization of trapper data. Trappers should be encouraged to keep a log on their trapping efforts, success and composition of catch.

## ACKNOWLEDGMENTS

The authors would like to thank Parker L. Dozhier, Executive Secretary of the Arkansas Trappers Association, for valuable information concerning Arkansas fur harvests and trapper habits. Carol J. Peck and Marcia L. Heidt contributed to various aspects of manuscript preparation. The Arkansas Game and Fish Commission provided gray fox fur harvest data. This study was supported, in part, by the Arkansas Trappers Association and the UALR College of Science's Office of Research, Science and Technology.

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