Journal of the Arkansas Academy of Science

Volume 39 Article 22

1985

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ANALYSIS OF ARKANSAS FUR HARVEST RECORDS - 1942-1984: III. HARVEST - PRICE RELATIONSHIPS

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ABSTRACT

Correlation and linear regression analyses between mean annual pelt price and total harvest of 13 Arkansas furbearer species between 1965 and 1983 were performed for state and regions (Ozark Mountains, Ouachita Mountains, Gulf Coastal Plain, and Mississippi Delta). Statewide, strong correlations ($r \geq 0.80$) were identified for bobcat *(Felis rufus)*, coyote *(Canis latrans)*, gray fox *(Urocyon cinereoargenteus)*, mink *(Mustela vison)*, nutria *(Myocastor coypus)*, opossum *(Didelphis virginiana)*, and raccoon *(Procyon lotor)*. Moderate correlations ($r = 0.55 - 0.79$) were identified for eastern spotted skunk *(Spilogale putorius)*, muskrat *(Ondatra zibethicus)*, river otter *(Lutra canadensis)*, and striped skunk *(Mephitis mephitis)*. Nonsignificant correlations ($r < 0.468$) were shown for beaver *(Castor canadensis)* and long-tailed weasel *(Mustela frenata)*. Regional differences were noted for each species.

INTRODUCTION

Furbearer management problems 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 certain endangered species regulations and treaties, 3) a major decline in upland wildlife hunting opportunities, and 4) growing antihunting and antitrapping sentiment (Hubert, 1982). In Arkansas, these problems are coupled with reduction in optimal habitat for many species. Thus, harvest management programs, now and in the future, require a greater understanding of the variables which ultimately determine the size of furbearer populations and of subsequent expected harvests (Erickson, 1981, 1982; Hubert, 1982).

Arkansas and other Midsouth states have traditionally used fur harvest data as a primary source of information for estimating the condition of furbearer populations and subsequent management schemes (McArdle, 1979; Tumlison et al., 1981; Erickson, 1982; Hubert, 1982; Heidt et al., 1984). However, in Arkansas, as in many states, fur harvest data still exists in either raw, unsummarized form or is scattered in various unpublished reports and Game and Fish Commission internal memos. Wildlife biologists are thus required to sort out and extract information needed for management decisions. It is the purpose of this series of papers to summarize and interpret the raw fur harvest data that has been compiled by personnel of the Arkansas Game and Fish Commission since 1942 and present it in a form that can easily be used for further analyses. The present paper addresses the importance of mean annual pelt price in relation to total harvest for 13 furbearers in Arkansas since 1965.

METHODS AND MATERIALS

Fur harvest records used in this study were compiled annually by personnel of the Arkansas Game and Fish Commission. In the case of the 1979 season, unavailable mean annual pelt values were extrapolated from Missouri furbearer pelt prices. No correction factors were applied to the data to correct for out-of-state sales of Arkansas fur. Following Erickson and Sampson (1978), dollar values were uncorrected for inflation. Other potential variables, such as population densities, trapping season length, and trapper effort will be examined in subsequent papers.

The data were analysed using a statistical program (Statpak by Northwest Analytic, Inc.) on an Epson QX-10 microcomputer. Linear regression equations relating the variable of mean annual pelt price (MPV) to the number of pelts harvested/sold (TH) were calculated for the state harvest and each of the four regional harvests (Ozark Mountains, Ouachita Mountains, Gulf Coastal Plain, and Mississippi Delta). Correlation coefficients were tested at the 0.01 and 0.05 levels for significance (Table 25, Rohlf and Sokal, 1981).

Table 1. Magnitude of changes in annual mean pelt value ($) from 1965 to 1984 for Arkansas furbearers, ranked according to decreasing range in price.

Species	Annual Mean Pelt Value (MPV) High	Low	Range	Mean ± SD
Bobcat	74.99	1.00	73.99	25.55 ± 23.60
Gray Fox	45.89	0.85	45.04	16.85 ± 15.48
River Otter	47.07	12.00	35.07	23.95 ± 10.90
Coyote	20.01	0.75	19.26	8.56 ± 6.11
Raccoon	18.17	1.04	17.13	7.60 ± 6.17
Mink	17.88	3.36	14.52	9.16 ± 4.64
Spotted Skunk	10.54	0.98	9.56	3.49 ± 3.08
Beaver	8.47	3.50	4.97	5.59 ± 1.59
Muskrat	4.79	0.72	4.05	2.23 ± 1.44
Nutria	4.49	0.99	3.50	1.89 ± 1.02
Striped Skunk	3.89	0.72	3.17	1.84 ± 1.15
Opossum	3.04	0.39	2.65	1.20 ± 0.81
Long-tailed Weasel	1.50	0.30	1.20	0.69 ± 0.26

RESULTS

Mean annual pelt prices have repeatedly been shown to dramatically affect the numbers of pelts harvested for a number of furbearer species (Erickson and Sampson, 1978; Erickson, 1981, 1982; Heidt et al., 1984; Heidt et al., 1985). It follows that, over the long term, changes in the magnitude of pelt prices becomes an important component of the total correlation between mean annual pelt prices and total harvest. Table 1 summarizes the magnitude of changes in the annual mean pelt value from 1965 to 1984 for 13 Arkansas furbearers. In all cases, the overall differences between the high and low values are, with the exception of beaver (2x), at least three to four times the low value. However, the most dramatic changes are found in the bobcat (75x), gray fox (54x),

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Table 2. Linear regression equations, coefficient of determinations and correlation coefficients for the variables of annual Mean Pelt Value (MPV) and Total Harvest size (TH) of Arkansas furbearers from 1965-1983.

Species	Region	TH=A+(B*MPV) (A)	(B)	r^2	r
Gray Fox	OZ	620	87	0.789	0.888**
	OU	-8	39	0.896	0.947**
	GCP	-29	35	0.954	0.977**
	MD	98	14	0.494	0.703**
	AR	663	175	0.911	0.954**
Bobcat	OZ	101	11	0.624	0.790**
	OU	-69	13	0.819	0.905**
	GCP	-21	11	0.857	0.925**
	MD	2	10	0.765	0.874**
	AR	13	45	0.900	0.949**
Raccoon	OZ	6056	1532	0.817	0.904**
	OU	2502	1154	0.719	0.848**
	GCP	2182	1670	0.712	0.844**
	MD	6182	2035	0.807	0.898**
	AR	16922	6391	0.807	0.898**
Nutria	OZ	-5	16	0.114	0.337ns
	OU	-75	55	0.807	0.898**
	GCP	-242	301	0.643	0.802**
	MD	-230	216	0.669	0.817**
	AR	515	564	0.759	0.871**
Opossum	OZ	553	11045	0.687	0.828**
	OU	-2021	7914	0.776	0.881**
	GCP	-2378	7265	0.656	0.810**
	MD	-2192	12777	0.761	0.873**
	AR	-6045	38994	0.746	0.864**
Coyote	OZ	-13	52	0.747	0.864**
	OU	-64	33	0.735	0.857**
	GCP	-46	30	0.645	0.803**
	MD	-141	54	0.676	0.822**
	AR	-264	170	0.744	0.863**
Mink	OZ	934	118	0.219	0.468*
	OU	1	140	0.470	0.685**
	GCP	29	108	0.387	0.622**
	MD	-1147	734	0.706	0.840**
	AR	-148	1095	0.651	0.807**
Spotted Skunk	OZ	82	49	0.560	0.748**
	OU	-3	17	0.606	0.778**
	GCP	-1	2	0.345	0.588*
	MD	9	1	0.012	0.109ns
	AR	87	68	0.643	0.802**
Muskrat	OZ	2421	713	0.138	0.372ns
	OU	-217	1026	0.646	0.804**
	GCP	85	47	0.017	0.129ns
	MD	7804	3937	0.295	0.543*
	AR	8278	6232	0.422	0.650**
River Otter	OZ	-10	1	0.345	0.588*
	OU	-85	6	0.710	0.843**
	GCP	7	6	0.123	0.351ns
	MD	-56	5	0.444	0.666**
	AR	-95	15	0.328	0.573*
Striped Skunk	OZ	1315	1089	0.165	0.406ns
	OU	256	428	0.336	0.579*
	GCP	2	24	0.360	0.600**
	MD	1097	3239	0.327	0.572*
	AR	2670	6833	0.303	0.550*
Long-tailed Weasel	OZ	12	-3	0.004	-0.065ns
	OU	-10	17	0.653	0.808**
	GCP	-5	9	0.683	0.827**
	MD	3	2	0.024	0.154ns
	AR	-4	27	0.207	0.454ns
Beaver	OZ	-736	262	0.391	0.625**
	OU	-971	283	0.221	0.470*
	GCP	237	71	0.051	0.226ns
	MD	-371	282	0.092	0.303ns
	AR	-1841	898	0.175	0.418ns

** = highly significant correlation (P<0.01)
* = significant correlation (P<0.05)
ns = correlation nonsignificant (P>0.05)

coyote (27x), and raccoon (17x). These four species represent long-hair fur which showed dramatic increases in value during the 1970's (P. Dozhier, Director, American Fur Resources Institute, *pers. comm.*).

Table 2 summarizes the state and regional linear regression equations, coefficient of determination, and correlation coefficients for the 13 furbearers examined in this study. Analysis of mean pelt price and annual state harvests have been previously discussed for the gray fox (Heidt et al., 1984). However, with respect to all of the other species of furbearers in the state, gray fox harvests have the highest correlation between MPV and TH (0.954). All four physiographic regional harvests have a high correlation between MPV and TH; the Mississippi Delta has the lowest (0.703). The relationship between MPV and TH for the bobcat was almost identical to that for gray fox (0.949). Harvest of furbearers from the Ozark Mountains had the weakest correlation (0.790) with pelt value.

The correlations between MPV and TH for raccoon, opossum, and coyote were high statewide and for all regions. Correlations between MPV and TH of the nutria were strong statewide and for all regions except the Ozarks (0.337). This is to be expected since nutria are almost nonexistant in the Ozarks (Bailey and Heidt, 1978). Correlations between MPV and TH of mink show considerable variation, being strong in the Mississippi Delta (0.840), moderate in the Ouachita Mountains and Gulf Coastal Plain (0.685 and 0.622 respectively) and low in the Ozark Mountains (0.468).

Striped skunk, spotted skunk (civet), muskrat, and river otter had moderate statewide correlations (0.55-0.79). The statewide association between MPV and TH for beaver and long-tailed weasel are considered to be nonsignificant ($r < 0.468$, Table 2).

DISCUSSION

The general statewide trend is for high value species to exhibit the highest correlations between MPV and TH. The lack of a strong correlation between the MPV and TH of the river otter may reflect unquantified interactions with beaver, both ecologically and in terms of trapper dynamics. Several relatively low value species exhibited high correlation coefficients (i.e., nutria, oppossum, coyote). In general, the results presented in this paper agree with the correlation coefficients found by Erickson and Sampson (1978) for Missouri furbearers.

We also found that strong correlations exist within the four major physiographic regions of Arkansas. However, inter-regional differences were noted (Table 2). This suggests that price may differentially influence harvest dynamics for certain high value species in a particular region and for most low value species in all regions. Obviously, a variety of other factors potentially operated to influence harvest dynamics at the state level or at the regional level where correlation coefficients were nonsignificant.

An example of a factor other than price that affected the TH of an Arkansas furbearer is illustrated by the correlations for striped and spotted skunks. Harvest of these species have been impacted by epizootics of rabies at times when pelt prices were relatively high (Heidt et al., 1982; Peck et al., 1985).

CONCLUSIONS

This study demonstrates the importance of price in Arkansas fur harvest dynamics. The regression equations, statewide and regional, provide a base from which models will be constructed to aid in analyses of fur harvest data (e.g., Peck and Heidt, 1985). The weakness of the correlations for some species indicate the influence of other variables. In the future, we plan to identify and quantify many of these possible variables to see what effect they may have on Arkansas fur harvest dynamics.

ACKNOWLEDGMENTS

The authors express their appreciation to Parker L. Dozhier, Chairman, American Fur Resources Institute, for his valuable comments and advice. This project was sponsored, in part, by the UALR College of Science's Office of Research, Science, and Technology.

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