A SURVEY ON THE STATUS OF THE COYOTE (*Canis latrans*) IN GEORGIA

by

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INTRODUCTION

During the past 40 years, the coyote (Canis latrans), usually found only in the western area of North America, has moved east to establish a population in Georgia. By 1970, nine counties in south-central Georgia registered reports of damage to livestock and crops and several additional counties reported coyote sightings and vocalizations. With the increase of reported damages and sightings over wide areas, there was serious concern that the coyote was spreading and may soon represent a threat to the agricultural industry. Because of this destructive aspect of the coyote, studies are of vital interest to wildlife managers, livestock operators, farmers, and the public in general.

To determine distribution of the coyote population, the geographic limits and the approximate density must be known. Starting in 1975, simulated coyote howl surveys were conducted in the four major physiographic regions, and another census study was conducted in five transect areas in south central Georgia in the spring of 1976. Specimens were also collected for weights, body measurements, and skeletal characteristics in an effort to describe the form or race of coyotes or coyote-like canines inhabiting Georgia. Damage data were collected from a questionnaire survey sent to all County Agriculture Extension Chairmen. Additional prey loss information was taken from the Florida-Georgia (Flaga) Sheep Producers Association survey and field notes. A report of this study follows.

LITERATURE REVIEW

The coyote (Canis latrans) is not considered to be native to Georgia. The historic range of the coyote given by Hall and Kelson (1959:843) is the states west of the Mississippi and the mid-western states of Wisconsin, Michigan, Illinois, and Indiana. They listed few records in the eastern states. Young and Jackson (1951:14), Hamilton (1963:178), and Caras (1967:80), noted the coyote occurring sporadically in nearly every eastern state. Silver and Silver (1969:35) reported the eastern coyote (Canis latrans var.) in New Hampshire which is larger and heavier than the typical western coyote. Populations of animals fitting the general description of the eastern coyote were reported in Maine by Rickens and Hughie (1974) and in New York by Severinghaus (1974). Probably the coyotes of the northeastern states are a result of the natural expansion of the range of the species (Paradiso 1969:130). It is also speculated that the coyote extended its range eastward when the forest habitat was broken by farmland and other man-made openings which produced a habitat more favorable to the coyote (Pimlott and Joslin 1966; Krefting 1969).

Pimlott and Joslin (1966) noted the presence of coyotes in Louisiana was officially recorded in 1959. Trammel (1974, personal communication) reported that coyotes were present in Mississippi in fair numbers while the population is smaller in Alabama.

The history of coyotes in Georgia is incomplete due to lack of factual information. Some investigators believe that the coyote was imported into Georgia and other eastern states as pets, only to escape, or by sportsmen (Schultz 1955: Golley 1962:172). Canup (1967, unpublished report,

U.S. Fish and Wildl. Serv., Athens, Georgia) reported that three coyotes were released by two groups of fox hunters in the late 1930's.

Accurate estimates of the Georgia coyote population are not available. Golley (1962:172) listed four counties in Georgia for which coyote records existed since 1929. The coyote has therefore been present in Georgia for over 40 years, although in few numbers. In early 1967, the District Supervisor for the U.S. Fish and Wildlife Service reported that coyote damage reports were initially reported in October, 1958 and subsequently 36 coyotes were trapped or killed in 5 counties (Canup 1967, unpublished report, U.S. Fish and Wildl. Ser., Athens, Georgia). Past analyses made of Fish and Wildlife Service Annual Reports concerning the rabies control program conducted in 69 Georgia counties from 1946-1965 indicated that only eight coyotes were taken during this control program. These kills were reported in 1959 and 1960 and the records suggest that the coyote population and distribution during this period was limited. It was noted in 1968 that the population had apparently increased and spread to establish breeding populations in 10 counties (Wohlgemuth 1968).

This spread suggests that the range of the coyote is extending rapidly. Robinson and Cummings (1951) reported that coyotes migrate an average of 39.5 km (24.7 miles) with a maximum of 152 km (95 miles). Rickens and Hughie (1974) documented the expansion rate of the eastern coyote as 1,867 km^2/year (718 sq.mi.). Rapid growth and expansion of the coyote population is bound to increase predator pressure in areas devoted to heavy livestock industry.

Currently there is no reliable method for inventorying the state-

wide coyote population. The secretive nature and evasiveness of the coyote and their usual habitat preference makes population estimates difficult, and investigation of the coyote in Georgia has been limited.

Coyote research efforts have been greater in the western United States and have been directed primarily to control methods. The most recent population dynamics study is being conducted in 17 western states through the use of scent stations established on 354 survey lines. This technique reports relative indices of predator abundance, including coyote (Linhart 1972, Preliminary report, relative indices of predator abundance in western United States, U.S. Fish and Wildl. Serv., Washington, DC). Knowlton (1972) modeled a coyote population in Texas with results obtained from a standardized "coyote-getter" line. Clark (1972) presented density indices of coyote populations derived from a modified Peterson Index, a minimum count method and a subjective estimate. A technique that involved a simulated coyote howl followed by a listening period during which time the number of coyotes responding were counted was successful in 1943 (Alcorn 1946).

Population estimates of the endangered red wolf (Canis rufus) were made by using tape recordings and sirens to elicit responses from this species (Pimlott and Joslin 1966; Russell and Shaw 1971). These investigators reported that this procedure was also effective in locating and determining population densities of timber wolves (Canis lupus) and coyotes. Questionnaires were used by Schultz (1955) in determining the status of coyotes and other canids in Tennessee.

The limited physical data on specimens collected or observed in

Georgia apparently do not differ from the description of coyotes as previosuly reported in literature. However, there exist a possibility that a new form may be developing due to cross-breeding of the various subspecies of coyotes that have been imported or naturally migrated to Georgia. Canup (1967, unpublished report, U.S. Fish and Wildl. Serv., Athens, Georgia) was of the opinion that coyotes were imported to Georgia from the King Ranch in Texas. Wohlgemuth (1968) reported that fox hunters imported and released coyotes from Missouri. Biologist Bill Cooper (1974, personal communication) of the Georgia Game and Fish Commission has had reports that coyotes from Montana may have been released in Georgia. These points of origin when compared to the normal distribution of the coyote as presented by Hall and Kelson (1959:843) indicate that 5 subspecies may be involved. These subspecies are: C.l. frustror, C.l. mearnsi, C. l. latrans, C.l. lestes and C.l. texensis. This subspeciation suggests that skeletal and physical analysis be attempted to reveal the origin or evidence of cross-breeding.

Paradiso and Nowak (1971) examined canid skulls from widely seperated areas and developed measurements, ratios, and dental variations that can be used in species and subspecies classification. The taxonomic status of coyotes and other canids in relation to the red wolf has also been reported by McCarley (1962) and Lawrence and Bossert (1967). Lawrence and Bossert applied the technique of linear discrimination to distinguish wolves, New England wild canids, and dogs, by use of tooth and skull characteristics. A means to distinguish coyote skulls from domestic dogs was documented by Howard (1949).

Historically coyotes have been involved in predation of domestic livestock. Incidences of coyotes preying on sheep, pigs, calves and turkeys and obliterating watermelon patches in Georgia have become more frequent in recent years. Although scientific evaluation of coyote predation has been limited, a recent report by Walker (1974, unpublished report, U.S. Fish and Wildl. Serv., Athens, Georgia) documented the loss of 50 head of sheep and 5 calves in Mitchell County. In 1966, the Irwin County Extension Agent reported that farmers in his county lost 123 pigs, 16 calves and 6 goats to coyotes (Brannen 1966, unpublished report, Georgia Coop. Ext. Serv., Athens, Georgia). However, because the number of individuals and various state and federal agencies exercising predator control programs, determination of the actual intensity of coyote predation is fragmentary.

The measurement of the magnitude of coyote depredation on domestic animals has been attempted by several investigators and organizations in the west where the coyote is more prevalent and abundant. The Advisory Committee on Predator Control (1972:24) examined studies made by five independent sources and concluded that these studies were only indications of the general magnitude of loss. Shelton and Klindt (1974) explored the magnitude of the problem of coyote predation in the unique environment of the Edwards Plateau of Texas. This study concluded that as a general principle, coyote predation was a function of the relative density and degree of interface between the predator and prey species. If this is the case, it raises some concern about the coyotes impact on potential prey species and magnitude of loss. There are currently only 3800 sheep

and lambs being raised in Georgia (Georgia Crop Reporting Service 1975: 61) while hogs and cattle comprise only 12.4 percent of the cash receipts from farm marketing (Georgia Department of Agriculture 1975). These reports give some insight into the possible economic impact of coyotes upon the livestock industry.

Another consideration on the potential of coyote predation in Georgia is that no coyote food habits study has ever shown livestock to be a major part of the diet. Sperry (1941:8) found the following percentages of food items in the diet of the coyote: rabbits, carrion and rodents 76%, insects and miscellaneous mammals 1%, plant food 2%, sheep and goats 13%. calves, cattle, and pigs 1%, poultry 1%, deer 4%, and birds 2%. Gier (1957) reported that rabbits, carrion and rodents constituted the most frequently observed food items in the 1190 coyote stomachs examined in Kansas; no livestock or deer remains were found. Wilson (1967) reported similiar food items in Louisiana coyotes stomachs. Gipson (1975) found the following occurrence of food items in 168 coyote stomachs in Arkansas: poultry 34%, persimmons 23%, insects 11%, rodents 9%, songbirds 8%, cattle 7%, rabbits 7%, deer 5%, woodchucks 4%, goats 4%, and watermelon 4%.

While rabbits, rodents and carrion make up the major portion of the diet reported by these investigators, deer did represent a food item of some importance in the studies conducted by Sperry (1941:8) and Gipson (1975). Murie (1940:62) reported that the highest mortality caused by predators was among fawn and old animals. Mech (1970:274) in his study of wolf-moose relationships on Isle Royal in Lake Michigan also recognized

that predators were a factor in the natural regulation of prey species. In light of these studies, some authorities feel that the coyote and other predators exercise a culling effect when the young, weak and diseased animals are removed which makes for a healthy and viable prey population. Information regarding coyote predation on deer and upland game birds in Georgia is not available. It is believed to occur, but under present conditions is considered to be of little significance to the game species population. (Cooper 1974, personal communication).

Although canines are highly susceptible to rabies, the Communicable Disease Center in Atlanta has had no reports of rabies occurring in coyotes in Georgia. Wildlife species suggested as possible reservoirs of rabies in Georgia include the raccoon (Procyon lotor), skunks (Mephitis mephitis or Spilogale putorius) and bats (Chiroptera spp.).

TECHNIQUES AND PROCEDURES

Study Area

The initial study area was the state of Georgia because the distribution of the coyote has not been definitely determined and the main objective was to present an overall picture of the coyote situation in the state. For convenience and statistical purposes, the state was divided into four areas which in general correspond to the major physiographic regions of Georgia (Fig. 1). The relatively small tier of counties contained in the Lookout Plateau, Appalachian Valley, and Appalachian Mountains were consolidated into one study area called the Northern Highlands. All study areas constituted a fairly uniform ecological entity.

To secure more reasonable population estimates, an area was selected for a more intensive survey in 1976. This area included nine south central counties of Georgia known to be inhabited by coyotes (Fig. 1).

Statewide Survey

All known written sources and more than 30 field cooperators were consulted to determine the distribution of coyotes in Georgia. These records were plotted on a state map. The distribution was sporadic, being absent or few in some regions and highly concentrated in others. For best results, a stratified random sample was conducted (Cochran 1963:80).

The sampling units corresponded to the major physiographic regions of Georgia. Each region was censused in proportion to the size of the study area. Of the 100 sampling points, 8 were in the Northern Highlands, 32 in the Piedmont, 35 in the Upper Coastal Plain, and 25 in the Lower Coastal Plain. Randomly chosen counties were selected from each of these

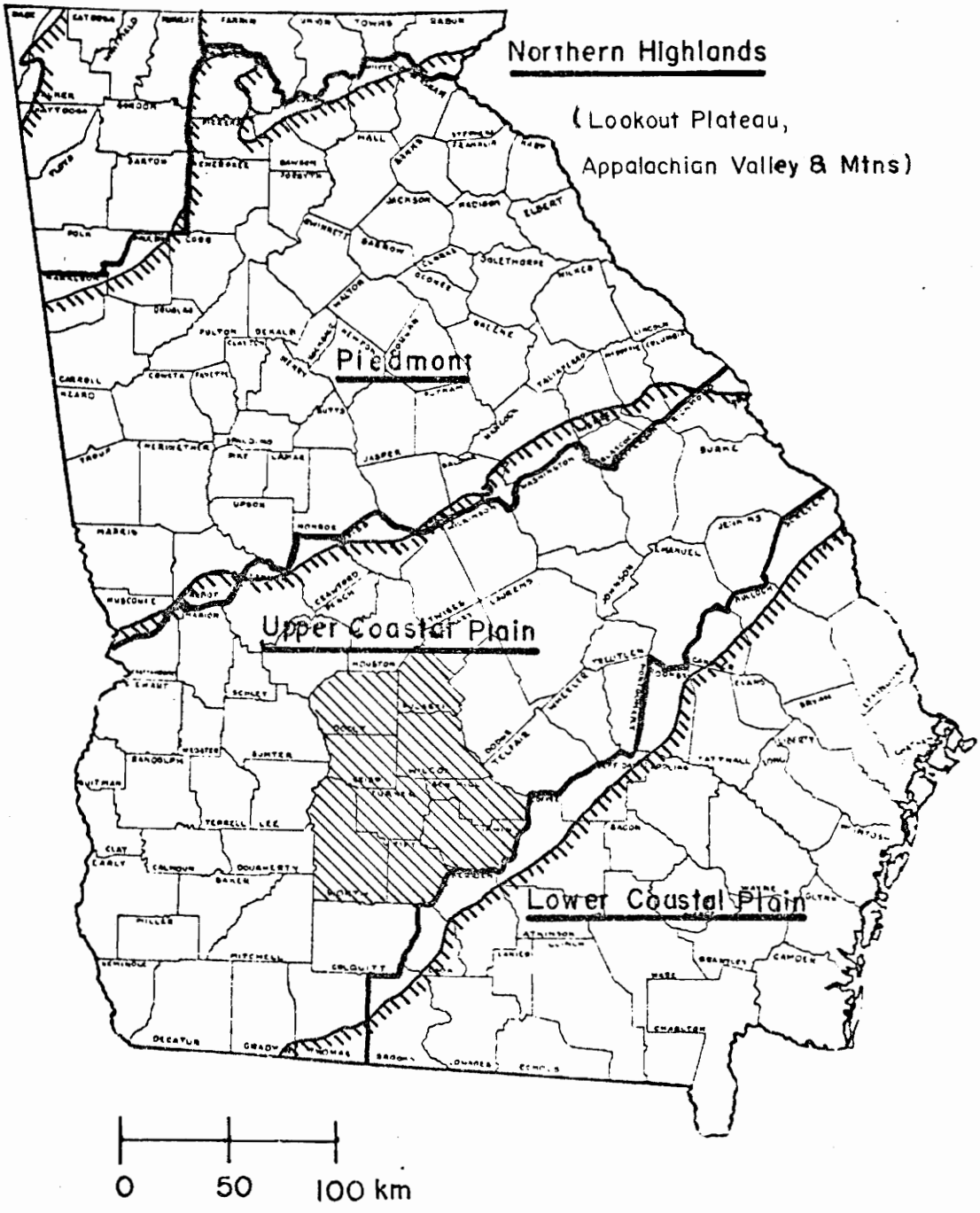


Fig. 1. Study areas, showing major physiographic regions surveyed in 1975 and the intensive study area in south central Georgia surveyed in 1976.

sampling units as starting points. Road routes were selected arbitrarily and run at night time. These road routes were principally secondary or dirt-gravel roads. Stops, or listening points were selected 3.2-8.0 km apart with the variation being due to proximity to homes and other areas considered to be noise sensitive. It took a section of road 36 km long for the Northern Highlands survey; 119 km long for the Piedmont survey; 150 km long for the Upper Coastal Plain; and 92 km long for the Lower Coastal Plain.

After reveiwing numerous census methods, sufficient information was reported to show that the elicited howling response is one of the best and most economical ways to estimate coyote populations (Alcorn 1946; Pimlott and Joslin 1961; Russell and Shaw 1971). To evoke this response, a Burnham Brothers tape cassette of coyotes barking and howling was used with a Sony TC-124 tape recorder-25 watt Amplivox speaker. By stationing a listener at various distances from the howling stop, it was determined that the taped howl could be normally heard for 1.12 km. Each howling station, therefore, would survey an area of 4 km^2. At each stop, the electronic caller was sounded for 20 seconds followed by a listening period of 40 seconds, another 20 second simulated howl and another listening period. The coyotes that answer were recorded on a coyote survey form (Appendix I). A Sony C-101 portable tape recorder with a built-in microphone was used to record the coyote responses but was discontinued due to its insensitivity. Censuses were conducted in March-April, July, and September, 1975 when weather conditions were suitable.

Survey of South Central Georgia

A howler survey was made in April, 1976 in south central Georgia to indicate relative densities of coyotes and the approximate distribution of the population in this region. This survey was conducted like the previous statewide survey except that this simulated howl survey involved five transects, each with 20 stops, in nine counties known to be inhabited by coyotes. Counties were randomly selected as starting points. Routes were arbitrarily selected to provide uniform coverage of this area. These routes were approximately 72 km in length.

Body and Skull Measurements

Twenty-seven specimens were obtained by trapping, shooting, or contribution during the period of this study. The age of the specimens were estimated by examination of wear on the incisors and canine teeth (Gier 1968:54) and cranial suture development (Young and Jackson 1951:250).

Weights and body measurements were made according to the methods of Young and Jackson (1951:235) or Riley and McBride (1972:13). Body weights were taken with a 22.7 kg (50 lb) hanging scale. A measuring tape was used to take total length: distance from tip of nose to end of terminal tail vertebra; length of tail: base of tail at bend on back to end of tail vertebra; hind foot length: posterior border of heel to apex of longest claw; ear length: notch at bottom of ear to distalmost border of the ear.

The skulls were cleaned by parboiling them in a water-ammonia-detergent solution. To facilitate drying, they were soaked in alcohol to remove the water. After drying, 15 skull measurements were made to the nearest 0.1 mm with dial calipers. These measurements were total length:

greatest length of skull distance from the posteriormost projection of the sagittal crest to the anterior tip of the premaxillary; condylobasal length: the distance from the anterior border of the median incisor alveoli to the posterior border of occipital condyle; palatal length: the distance from the anterior border of the median incisor alveoli to the posterior border of the palate; squamosal breadth: the diameter across the squamosals at the least constriction of squamosal shelf posterior to the zygomata; interorbital breadth: the least lateral diameter between orbits at top of skull; zygomata breadth: the greatest width across the zygomata; maxillary tooth row: the distance from the anterior border of the canines to posterior of the second upper molar; molar tooth row: the distance from the anterior edge of the first premolar to the posterior edge of the second upper molar; upper carnassial length: the distance from the anterior cingulum to the posterior alveoli; first upper molar length: the distance from the anterior cingulum, between the fourth premolar and first upper molar, to the posterior at outerside of contact between the first and second upper molars; first upper molar breadth: greatest lateral diameter of the first upper molar; lower carnassial length: the distance from the anterior tip to posterior side of contact with the first lower molar; width across upper carnassials: the width across the outer edges of the alveoli of the anterior lobes; second upper molar breadth: the greatest width of the second upper molar measured diagonally; palatal width: the distance across the inner margin of the alveoli of the upper first premolars. These measurements were the same used by Young and Jackson (1951:255) and Nowak (1973:15). After examining skulls, six

specimens were selected as representatives of the population and sent to the United States National Museum of Natural History for indentification.

Damage Survey

This survey was conducted on a county basis in conjunction with the University of Georgia Cooperative Extension Service and others. Questionnaires were distributed to the 156 organized County Extension Offices and to members of the Florida-Georgia (Flaga) Sheep Producers Association to determine the extent of coyote depredation (Appendix II). Additional information on losses was secured by personal field investigations.

Statistical Procedures

Most data collected in this study were transferred to machine punch cards. The computations were performed on the IBM 360 computer at the University of Georgia. Programs used were biomedical (BMD) programs from Dixon (1970) and the Statistical Analysis System (SAS) developed by Barr and Goodnight (1972). Simple data description (BMD01D) computed basic statistics such as means and variances. From these statistics, analysis of variances (BMD07D) and t-tests (BMD13D) were computed and significant differences noted.

Multivariate procedures were performed with the stepwise discriminant analysis (BMD07M) and the SAS DISCRIM procedure. These two procedures compute the probability of each specimen coming from each group in the analysis. The square of the mahalanobis generalized distance (D^2) relative to all groups in the analysis is also computed. These two statistics are used in constructing a classification matrix, which allocates the specimens to groups. The Student-Newman-Keuls test was used to detect

non-significant subsets of variables between the Georgia specimens and the previously established characteristics of known subspecies (Sokal and Rohlf 1969:686). This was used because only the basic statistics of the reference groups could be obtained.

RESULTS

Preliminary Survey

Information on the early history of coyotes in Georgia is scanty. Prior to 1962, coyote records existed only in Habersham, Troup, Turner, and Ware counties (Golley, 1962:172). Information assembled from Canup (1967, unpublished report, U.S. Fish and Wildl. Serv., Athens, Georgia) and Wohlgemuth (1968) expanded the coyotes range to 14 counties. Subsequently, all known written sources, museum records, and reports from more than 30 field cooperators were reviewed to determine the distribution of coyotes in Georgia. Based on these data, the coyote now occurs in 28 counties (Fig. 2).

From this preliminary survey it was evident that coyotes are scattered widely over the state. The primary portion of the coyote range appears to be in the central Upper Coastal Plain. This population is centered in the triangle of land bounded by the Flint and Ocmulgee Rivers. Because of low summer stream flows and the many shoals and bridges, these rivers are not considered to be a formidable barrier to range expansion from this area of concentration.

Statewide Survey

Census results for the four routes in 1975, shown diagramatically as straight lines on Fig. 3, are given in Table 1. It is apparent from these data that the coyote is not uniformly distributed through the state. The population is centered in the Upper Coastal Plain, broadly coincident with the reconstructed population, and was absent from the Piedmont northward. Only one call was heard in the Lower Coastal Plain which was

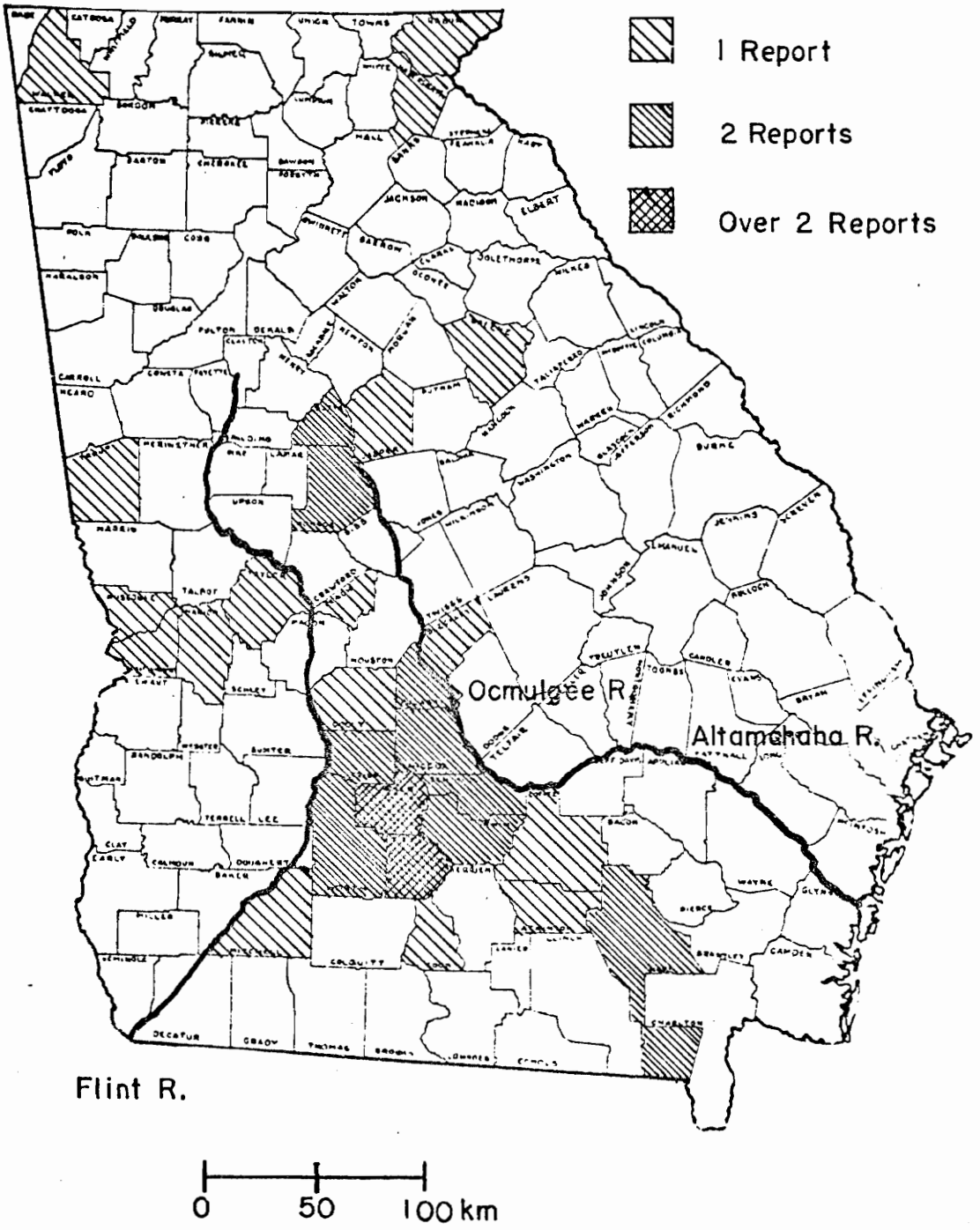


Fig. 2. Coyote distribution in Georgia, based on known records and verified reports.

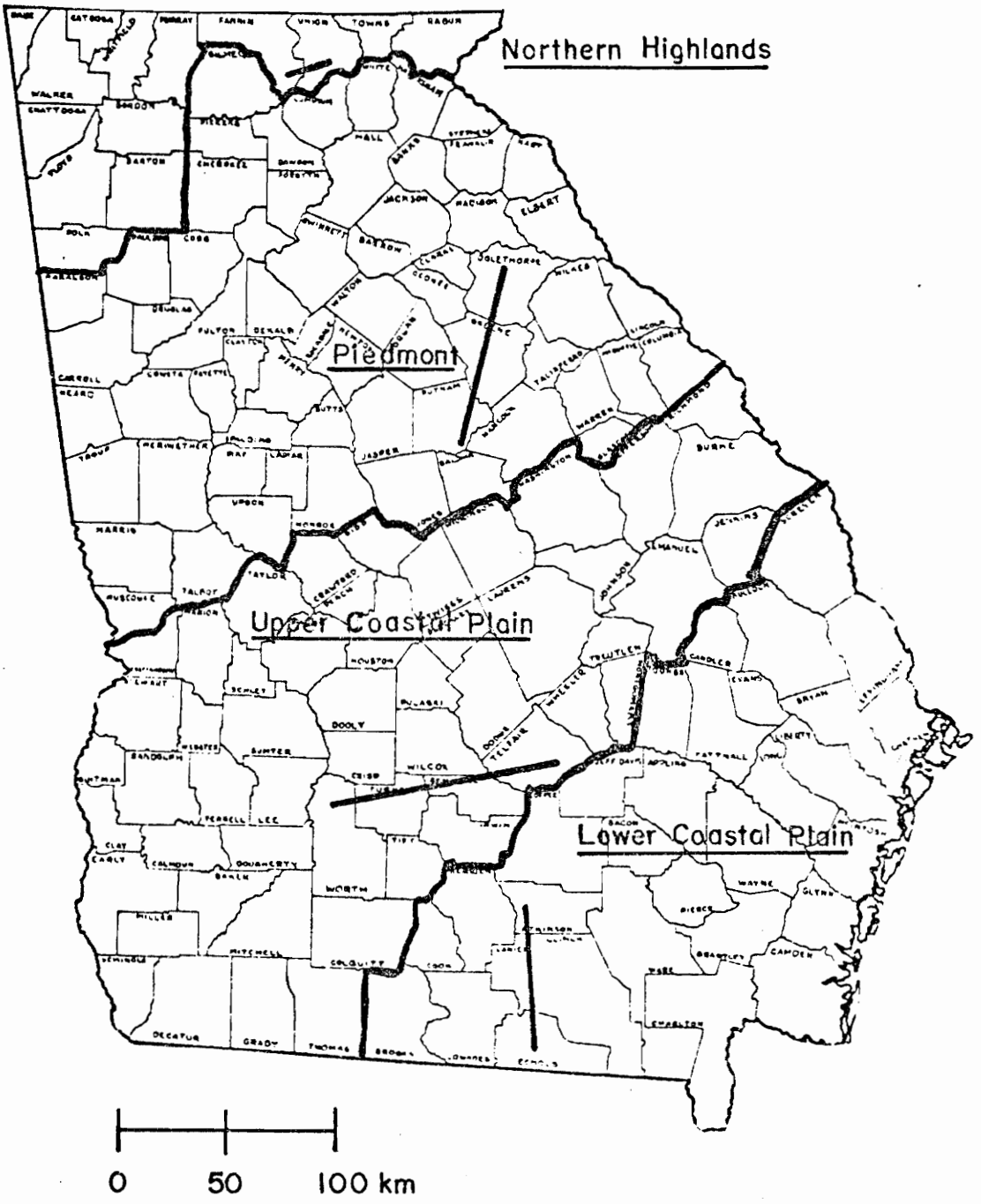


Fig. 3. Approximate location of 4 howler census routes (shown diagramatically as straight lines) to obtain estimates of coyote populations in Georgia, 1975.

TABLE 1. Summary of statewide coyote howl census, 1975

Dates	Number of coyotes heard				
	Northern Highlands	Piedmont	Upper Coastal Plain	Lower Coastal Plain	Total
Mar-Apr 1975	0	0	2.00	1.00	3.00
July	0	0	2.00	0	2.00
Sept-Oct 1975	0	0	3.00	0	3.00
Sum:	0	0	7.00	1.00	8.00
Average:	0	0	2.30	0.30	0.67
Variance:	0	0	2.00	0.30	1.23

near the Clinch-Atkinson county line. The large value for the variance relative to the survey mean indicates that the population is distributed non-randomly throughout the state.

An analysis of variance was computed to test the differences among and within routes and seasons (Table 2). No significant differences were found at the 5 percent level of significance. A difference among routes is detectable, however, at the 10 percent level of significance. As with Knowlton's model, the population appeared stable during the period of the survey (Knowlton, 1972).

The cumulative percent of coyotes responding are graphed for the Upper Coastal Plain (Fig. 4). Several features are apparent in the graph: where the slope of the cumulative percent is relatively constant a uniform distribution occurs and where the slope is flat, coyotes were not present or did not respond to the taped call. By using such an empirical approach, it should be possible to predict where populations of coyotes exist. In this survey, a coyote population was found in the area between Ashburn and Bowens Mill.

Based on responding coyotes a relative index can be used as a measure of comparison. The density of the Upper Coastal Plain population is estimated at 1 coyote/60.9 km^2. The estimate in the Lower Coastal Plain shows a density of 1 coyote/333.3 km^2. A comparison of these indices shows that the Upper Coastal Plain population is about 5.5 times larger than the Lower Coastal Plain.

The estimates of the population density are presented without any attempt to correct for coyote behavior and other factors such as moon-

TABLE 2. ANOVA among and within routes and seasons, 1975

Source of variation	D.F.	SS	MS	F
Subgroups	11	0.313	0.0285	0.783
Routes	3	0.267	0.0890	2.445
Seasons	2	0.007	0.0035	0.096
Interactions	6	0.039	0.0065	0.179
Within Subgroups	288	10.474	0.0364	
TOTAL	299	11.100		

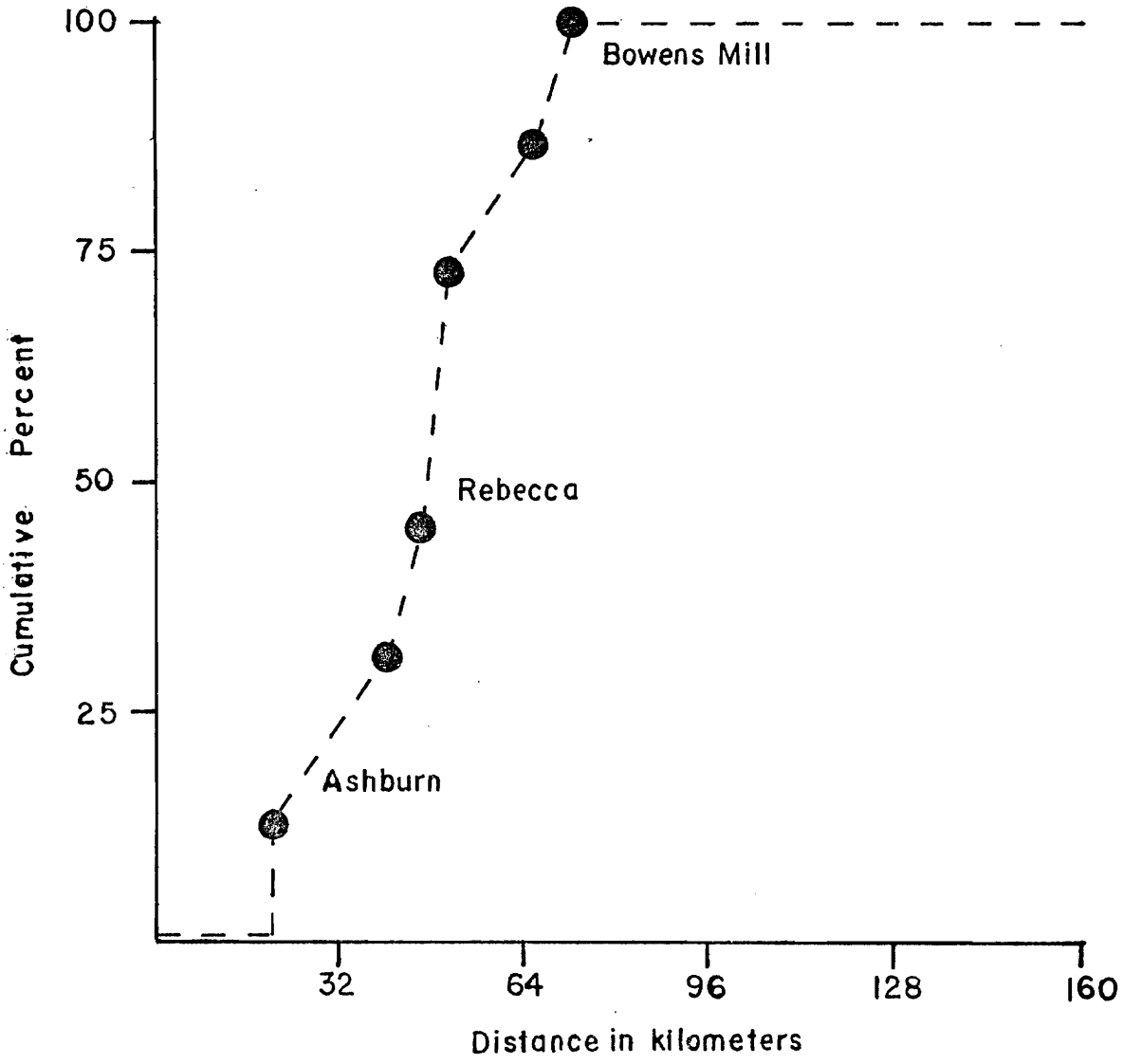


Fig. 4. Plot of cumulative percent of coyotes responding to simulated howls, Upper Coastal Plain, 1975.

light, wind speed and direction, density of vegetation, temperature, and other factors that have an effect on whether the coyote would respond and the hearing of that response. Only once were 2 coyotes recorded howling at one station. It is not known if the second response was triggered by the simulated howl, the first coyote, or both. Never were coyote vocalizations recorded between 0100 and 0300.

The coyote population of the Upper Coastal Plain should be monitered closely since this area could contribute significantly to the expansion of coyotes through the state.

Survey of South Central Georgia

Since the Upper Coastal Plain harbored the only major population of coyotes, a concentrated census effort was conducted from 21-24 April, 1976. Census routes are shown in Figure 5 and the results are listed in Table 3. An ANOVA (Table 4) shows that there was no significant variability in the routes censused. On this survey the coyote population was distributed in a general north-south direction. The northern-most coyote was detected southeast of Pitts, Wilcox county and the southern-most coyote south of Brookfield, Tift county. The remaining three coyote responses were detected near Rebecca, Turner county and in Irwin county, 3 miles west of Fitzgerald. It was at this latter location where two coyotes responded. As in the statewide survey, no calls were heard after midnight until approximately two hours before dawn.

This orientation of the population is different from that observed during the statewide census where it generally ran east-west. Route 4 duplicated the statewide census route and only produced one calling

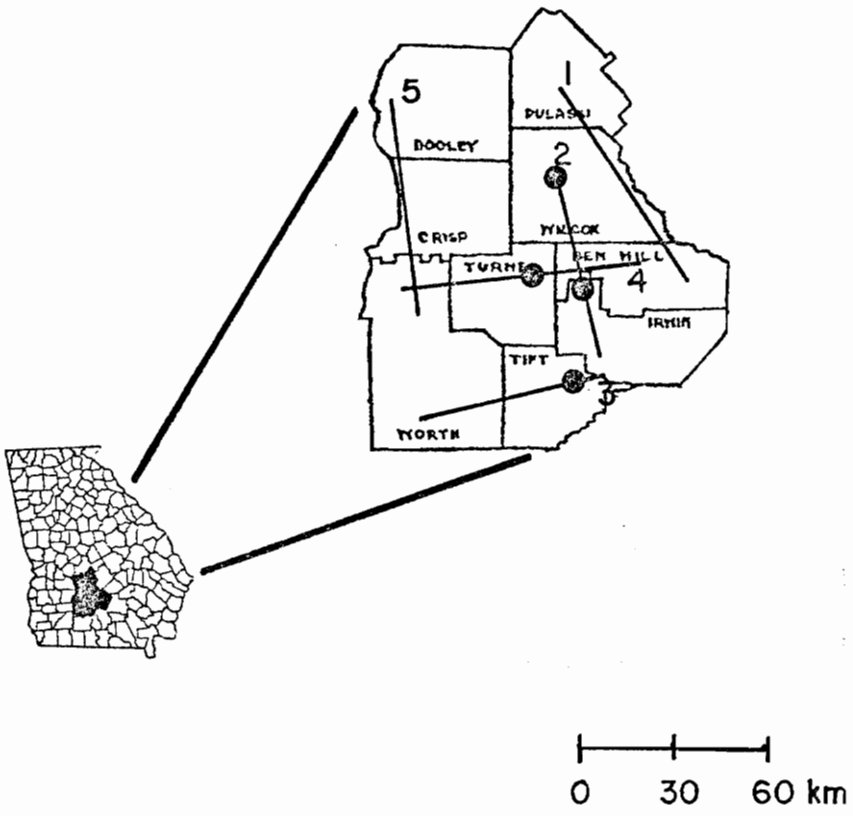


Fig. 5. Location of census routes and location where coyotes were censused, south-central Georgia, 1976.

TABLE 3. Summary of south central Georgia coyote howl census, 1976

Census route*	Census date	Number of coyotes**	Area censured in km^2	Number per km^2
1. Ben Hill, Wilcox, & Pulaski Cos.	April 21	0	80.0	0.000
2. Wilcox, Ben Hill, & Irwin Cos.	April 21-22	3	80.0	0.0375
3. Tift & Worth Cos.	April 22	1	80.0	0.0125
4. Ben Hill, Turner, & Worth Cos.	April 23	1	80.0	0.0125
5. Dooley, Crisp, & Worth Cos.	April 23-24	0	80.0	0.000
TOTAL		5	400.0	0.0125

* Numbers of census routes correspond to those shown in Figure 5.

** Number of coyotes correspond to circled locations in Figure 5.

TABLE 4. ANOVA for census routes from south central Georgia, 1976

Source of variation	DF	SS	MS	F
Among routes	4	0.50	0.125	1.84
Within routes	95	6.45	0.068	
TOTAL	99	6.95		

coyote where normally 2-3 were detected. A probable source of this difference was the mobility and behavior traits of this relatively low density of coyotes.

The density of the coyotes, 0.0125/km^2 did not indicate any major change from the average density of 1/60.9 km^2, or 0.0164 coyotes/km^2(X^2=.001,1df). This spring count was believed to be a fairly close approximation of the breeding population. The densities presented are minimums based on the numbers of coyotes that answer a simulated howl. Lack of information on the percentage of coyotes that respond to the simulated howl illustrates the uncertainties of these estimates. Nevertheless, periodic use of this technique should provide relative indices of population density which may be compared on a seasonally or annual basis.

Description of Georgia Coyotes

Information on Georgia coyote body measurements, weights, and skeletal characteristics is generally lacking. The only documented data available at the start of this survey were the skins and skeletal material of two specimens at the University of Georgia. Data on coloration, sex ratio and taxonomic characteristics were gathered to describe the species or mixture of canine species involved in Georgia.

A total of 27 specimens were examined during this study. These specimens were contributed by cooperators or collected in the field. All desired information was not obtainable from each specimen. Skulls were damaged or destroyed or carcasses could not be preserved due to lack of cold storage facilities. Each animal was first superficially examined to distinguish it as a coyote from other canids. This consisted of checking

the molar tooth row-palatal width ratio as described by Howard (1949) and the banding of the guard hairs (Spence 1963,P-R Proj. Rep., Proj.FW-3-R-10, Univ. of Wyoming, Laramie). The United States National Museum of Natural History examined and confirmed several skulls as Canis latrans. (Bogan 1976, personal communication).

Coloration

Color patterns of coyotes are varied. The only consistant coloration was the area of white around the lips and the black tip of the tail. The muzzle ranged from a tawny to cinnamon color. In contrast, the back was tawny to grayish mixed with black-tipped hairs. Some animals were heavily grizzled with these black-tipped guard hairs whereas others had the black limited to the general area of the mid-line of the back. The underparts and outside of the legs were similiar in color to the muzzle. Two animals had a fairly pronounced black-stripe on the foreleg.

These coloration patterns were compared with those described for the coyote subspecies in Young and Jackson (1951:257) without success. This agrees with the views of Paradiso and Nowak (1971) that color patterns are not distinctive.

Sex Ratio

There were 14 males and 13 females examined during this study, which does not differ significantly from a 100:100 sex ratio.

Age Ratio

A breakdown of coyotes into age classes was obtained by making a general estimate of age by tooth wear (Gier 1957:44) and closure of sutures (Young and Jackson 1951:250). It was estimated that 9 animals were

approximately 1 year old, 6 were assigned to the 2 year old class, and 3 were in the 3 year old class.

These age estimates are not considered reliable because several specimens showed an excessive amount of wear on the lower incisors, which are critical in aging the first two age groups. Three animals had canines that did not extend below the anterior mental foramina. These animals were aged as yearlings and according to Young and Jackson (1951:240) the canines are not fully erupted, which may account for this departure from the norm. Studies of tooth cementum layers were started, but the effort was initiated too late in this study to be of value.

Weights and Body Measurements

Table 5 presents a comparison between sexes of weights and body measurements. The average coyote weighed 11.6 kg, weights of the males ranged from 10.7 to 15.9 kg (average 13.3 kg), and those of females ranged from 7.7 to 12.2 kg (average 10.3 kg). A highly significant difference was noted between sexes in weights and all other external measurements.

These observations of weight and measurements were considerably smaller than Texas coyotes reported by Riley and McBride (1972:13). Nowak (1976, personal communication) also noted that these coyotes were proportionally smaller than those he observed in Arkansas and Louisiana.

Skull Measurements

All specimens had skull ratios over 3.1, which is typical of coyotes (Howard 1949). Table 6 presents the measurement data of 8 male and 10 female skulls from which a complete set of measurements could be obtained.

TABLE 5. A comparison between sexes of body weights and body measurements of Georgia coyotes

Sex	No	Mean	S. E.	Range	T Value
Body Weight (kg)					
Males	11	13.3	0.5	10.7-15.9	6.4**
Females	13	10.3	0.8	7.7-12.2	
Totals	24	11.6	0.5	7.7-15.9	
Total Length (mm)					
Males	11	1136.6	15.3	1060.5-1219.9	1.86*
Females	13	1042.0	27.1	838.1-1200.2	
Totals	24	1085.4	18.7	838.1-1212.9	
Tail Length (mm)					
Males	10	336.6	8.6	307.3-388.1	2.55*
Females	8	314.7	10.7	260.4-349.3	
Totals	18	326.7	7.0	260.4-388.1	
Hind Foot Length (mm)					
Males	10	180.4	4.7	152.4-193.7	2.34*
Females	8	169.4	4.6	155.8-190.5	
Totals	18	175.6	3.5	152.4-193.7	
Ear Length (mm)					
Males	10	108.5	2.9	88.9-120.7	4.55**
Females	8	95.3	1.6	88.9-101-6	
Totals	18	102.6	3.4	88.9-120.7	

* $P < 0.05$ ** $P < 0.01$

TABLE 6. Skull measurements of Georgia coyotes*

Measurement	Male (8) Mean	SE	Range	Female (10) Mean	SE	Range
Total Length	197.3	1.5	191.6-205.3	190.4	2.8	171.4-203.3
Condylobsal length	185.5	1.2	180.4-190.1	179.2	2.7	158.2-189.2
Palatal length	97.3	1.2	91.7-101.3	93.3	1.4	84.2-99.3
Squamosal breadth	58.8	0.6	58.4-60.9	58.6	0.4	58.6-60.6
Interorbital breadth	34.3	0.4	32.7-35.7	31.8	0.6	29.2-36.3
Zygomatic breadth	99.4	1.1	96.3-105.2	95.0	1.3	85.3-100.7
Maxillary tooth row	86.1	0.5	83.6-88.7	83.4	1.3	75.6-88.9
Molar tooth row	70.6	0.6	66.6-72.3	70.6	1.0	64.2-75.0
Upper carnassial length	20.1	0.3	18.8-20.9	18.6	0.3	16.6-20.7
First upper molar length	12.6	0.4	10.8-13.6	10.1	0.2	9.6-11.4
First upper molar breadth	17.2	0.2	15.7-17.7	16.8	0.2	15.6-17.8
Lower carnassial length	22.3	0.2	21.7-24.1	20.4	0.3	19.4-22.5
Width across U. carnassials	50.6	0.6	47.8-54.1	48.8	0.6	44.6-51.1
Second upper molar breadth	12.3	0.2	11.2-13.3	11.8	0.2	10.7-12.6
Palatal width	20.0	0.4	18.5-21.6	19.4	0.4	17.4-21.9

* All measurements in millimeters

Males averaged larger in each measurement except molar tooth row and a t-test showed a significant difference between the males and females in all measurements except squamosal breadth, palatal width, and molar tooth row. The BMDO7M and DISCRIM programs using the original data effectively distinguished the sexes and correctly assigned each individual skull (Dixon 1973:233; Barr and Goodnight 1972:190). An analysis based on principal components misassigned 1 male and 1 female. Therefore, it is reasonable to consider these specimens as distinct populations.

Lack of definitive skull measurements on the recognized subspecies of coyotes precluded attempts to correlate the sample of Georgia coyotes to the subspecies level by multivariate analysis techniques. Only the means of 10 skull measurements (Young and Jackson 1951:265) and the means, extremes, standard deviations, and coeffecients of variation of 15 measurements (Nowak 1973:Appendix A) were available. These were utilized to determine the relationships, if any, of the Georgia coyote to recognized subspecies of the coyote and the domestic dog.

A test for differences between the Georgia sample and data reported by Young and Jackson revealed no significant differences in males when compared with C.l. lestes, C.l. mearnsi, and C.l. texensis. The males differed significantly in the length of tooth row with C.l. frustror and C.l. latrans and in condylobsal length with C.l. frustror. The females were significantly different with all five subspecies in the length of the first upper molar. The females also differed with C.l. latrans in the length of the lower carnasseral and with C.l. mearnsi in the breadth of the squamosal.

The Student-Newman-Keuls test was used to compare the Georgia coyote to the previously compiled statistics on domestic dogs and coyotes by Nowak (1973:Appendix A). The males showed morphological similarity in seven skull measurements whereas females were similar in only five measurements. The relationships among males are shown in Table 7 and among females in Table 8. The male skulls approach C.l. latrans and C.l. lestes more than any other subspecies of coyote. The similiarity with domestic dogs in the squamosal breadth and tooth row indicates that a limited amount of hybridization may have occurred. The females demonstrate predominently coyote-like characteristics with the exception of the molar tooth row. It is apparent that, with these few exceptions, there has been no large shift in skull characteristics in the direction of the domestic dog and the present wild population is of predominantly coyote ancestry.

It is important to recognize that such comparison has few, if any direct taxonomic implications. The real value to this comparison is that it shows the uncertainty of the taxonomic status of these animals. Obviously, considerably more statistical data are needed to make a specific distinction of the Georgia form of coyote, if this is possible at all.

Damage Survey

One hundred and forty-four replies (92 percent) were received to the Coyote Damage Questionnaire. Of the 144 replies, 16 county agents (11 percent) reported coyote damage. An additional 13 respondents (9 percent) reported suspected losses but had no losses officially recorded. Five of these 13 county extension agents reported coyotes killed in their area which could have involved predation. Only one of the 28 Flaga Sheep

TABLE 7. Agreement of skull measurements of male Georgia coyotes with data taken from a study of North American Canis (Nowak, 1973). Vertical lines connect non-significant subsets at the 0.05 level as determined by the Student-Newman-Keuls testing procedure.

Subspecies	n	Mean	S^2
		Total Length (mm)	
C. l. mearnsi	17	191.80	35.52
C. l. texenasis	11	192.60	78.50
C. l. latrans	24	196.50	42.77
Georgia	8	197.30	18.00
C. l. lestes	97	197.60	47.61
C. l. frustror	20	204.50	45.70
C. l. familiaris	50	217.20	953.57
		Squamosal Breadth (mm)	
C. l. tenensis	11	55.81	4.00
C. l. frustror	20	57.16	7.82
C. l. latrans	24	57.60	2.39
C. l. mearnsi	17	57.71	3.53
C. l. lestes	97	57.82	4.04
Georgia	8	58.80	2.88
C. l. familiaris	50	58.95	9.42
		Zygomatic Breadth (mm)	
C. l. mearnsi	17	96.20	12.96
C. l. texenasis	11	96.70	24.40
Georgia	8	99.40	9.68
C. l. latrans	24	99.70	10.96
C. l. lestes	97	99.80	13.99
C. l. frustror	20	100.70	8.53
C. l. familiaris	50	112.40	166.67
		Interorbital Breadth (mm)	
C. l. texensis	11	33.42	4.67
C. l. latrans	24	33.62	4.80
C. l. mearnsi	17	33.65	3.39
C. l. frustror	20	33.82	4.97
Georgia	8	34.30	1.28
C. l. lestes	97	34.33	4.45
C. l. familiaris	50	39.21	10.05

TABLE 7.- (Continued)

Subspecies	n	Mean	S^2
	Molar Tooth Row (mm)		
C.l. texensis	11	68.08	11.29
C.l. mearnsi	17	68.32	4.67
C.l. lestes	97	70.08	7.40
C.l. familiarsis	50	70.22	67.08
C.l. latrans	24	70.31	6.15
Georgia	8	70.60	2.88
C.l. frustror	20	71.96	7.90
	Upper Carnasseral Length (mm)		
C.l. familiarsis	50	19.28	2.76
C.l. mearnsi	17	19.52	6.44
C.l. texensis	11	20.05	1.49
Georgia	8	20.10	0.72
C.l. latrans	24	20.36	0.52
C.l. lestes	97	20.41	0.77
C.l. Frustror	20	20.78	0.88
	Palatal Width (mm)		
C.l. texensis	11	19.35	1.42
C.l. mearnsi	17	19.55	0.76
C.l. latrans	24	19.90	1.51
Georgia	8	20.00	1.28
C.l. Lestes	97	20.23	2.19
C.l. frustror	20	20.80	1.80
C.l. familiaris	50	29.76	24.60

TABLE 8. Agreement of skull measurements of female Georgia coyotes with data taken from a study of North American Canis (Nowak, 1973). Vertical lines connect non-significant subsets at the 0.05 level as determined by the Student-Newman-Keuls testing procedure.

Subspecies	n	Mean	S^2
		Total Length (mm)	
C. l. mearnsi	10	183.00	45.83
C. l. texensis	14	185.30	27.88
C. l. lestes	61	188.60	44.09
C. l. latrans	19	188.90	20.70
Georgia	10	190.40	78.40
C. l. frustror	15	194.30	19.21
C. l. familiaris	50	217.20	953.57
		Zygomatic Breadth (mm)	
C. l. mearnsi	10	92.70	12.46
C. l. texensis	14	93.50	11.02
Georgia	10	95.00	16.90
C. l. lestes	61	95.10	12.46
C. l. frustror	15	96.27	3.65
C. l. latrans	19	96.50	7.51
C. l. familiaris	50	112.40	166.67
		Molar Tooth Row (mm)	
C. l. mearnsi	10	66.23	8.88
C. l. texensis	14	66.56	4.52
C. l. lestes	61	67.08	6.35
C. l. latrans	19	68.28	3.17
C. l. frustror	15	69.01	5.34
C. l. familiaris	50	70.22	67.08
Georgia	10	70.60	10.00
		Palatal Width (mm)	
C. l. mearnsi	10	18.95	1.19
Georgia	10	19.40	1.60
C. l. texensis	14	19.46	1.04
C. l. lestes	61	19.49	1.46
C. l. frustror	15	19.55	1.99
C. l. latrans	19	19.56	0.86
C. l. familiaris	50	29.76	24.60

TABLE 8. - (Continued)

Subspecies	n	Mean	S^2
	Second Upper Molar Breadth (mm)		
C. l. familiaris	50	10.91	1.61
C. l. texensis	14	11.35	0.32
C. l. lestes	61	11.42	0.29
C. l. mearnsi	10	11.56	0.18
C. l. latrans	19	11.79	0.34
Georgia	10	11.80	0.40
C. l. frustror	15	11.86	0.37

Producers reported sheep losses to coyotes.

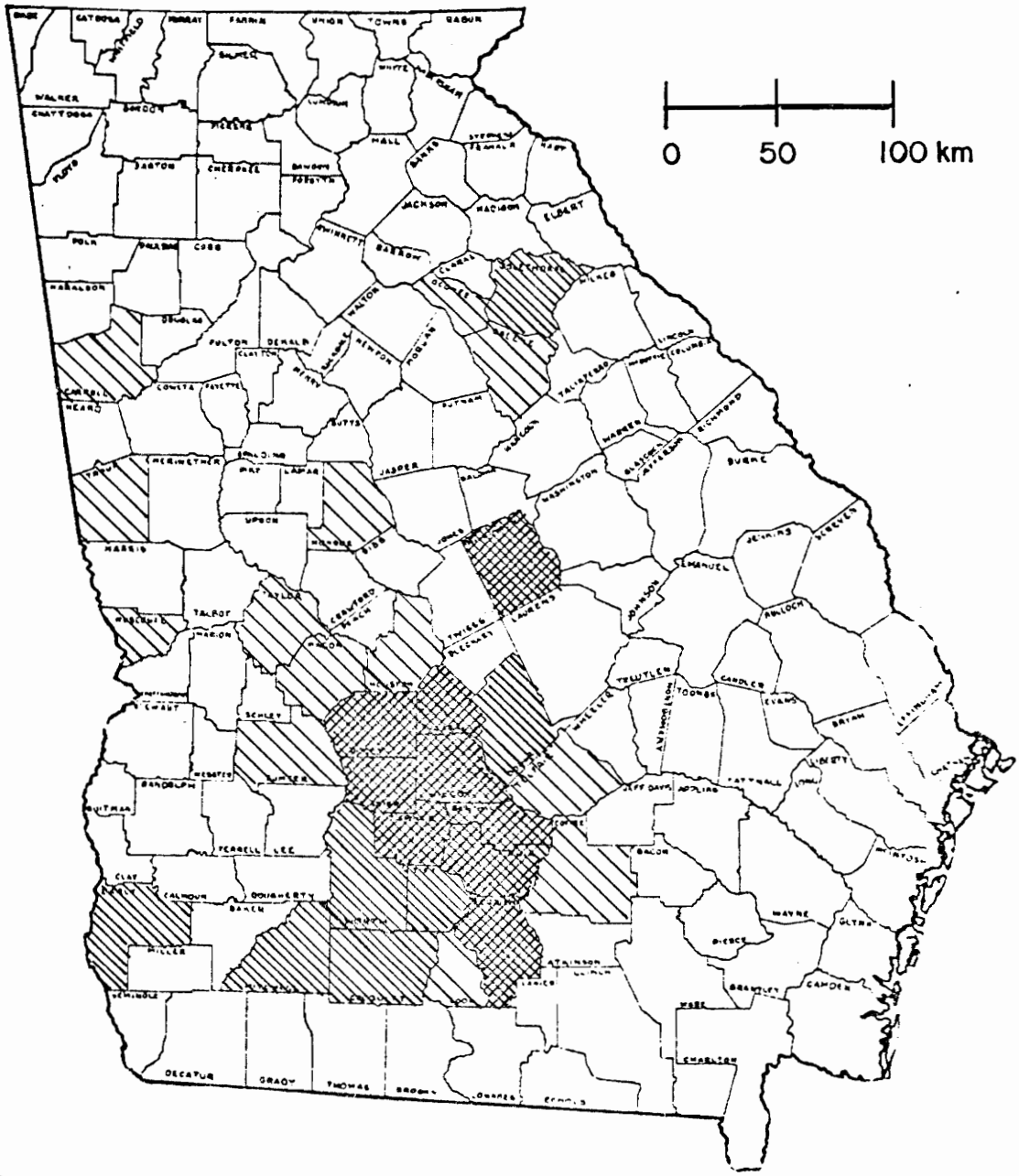
Degree of Damage

All 16 county agents that claimed coyote predation reported damages occurring after 1970. Of these, nine also reported damages before 1970. The remaining seven reported losses to coyotes starting after 1970, four of these did not encounter coyote damage until 1972-73. (Fig. 6).

These data suggest that damage is increasing and spreading in the vicinity of Sylvester, Worth Co. The sighting of coyotes and suspected damage as reported by 13 county agents shows a gradient of coyote expansion as they move away from the Dooley, Pulaski, Barrien, and Turner County area. Based on experience to date, there is no reason to believe that the coyotes would not adapt to the area and successfully establish themselves as a predator. As a result, farm incomes could be partially reduced by the presence of a small coyote population.

Most damages, based on county production and income, were reported as light to very light (Fig. 7). Only Turner County reported heavy damage, and this was confined to watermelon depredations. Coyote damage is often concentrated in small pockets and not uniformally spread over wide areas. The loss of 50 sheep and five calves by an individual rancher in Mitchell County and the subsequent trapping of over 30 coyotes on a 607 ha ranch is an example of high concentrations of coyotes (Walker 1974, unpublished report, U.S. Fish and Wildl. Serv., Athens, Georgia). In Kansas, Gier (1975:247) reported coyote densities of one/km^2 in a 50-75 km^2 area.

Two county agents that experienced light to very light damages stated



Damages in 1975 and before 1970

Damages in 1975 but none before 1970

Suspected damages in 1975

Fig. 6. Counties in Georgia reporting coyote damages, 1975.

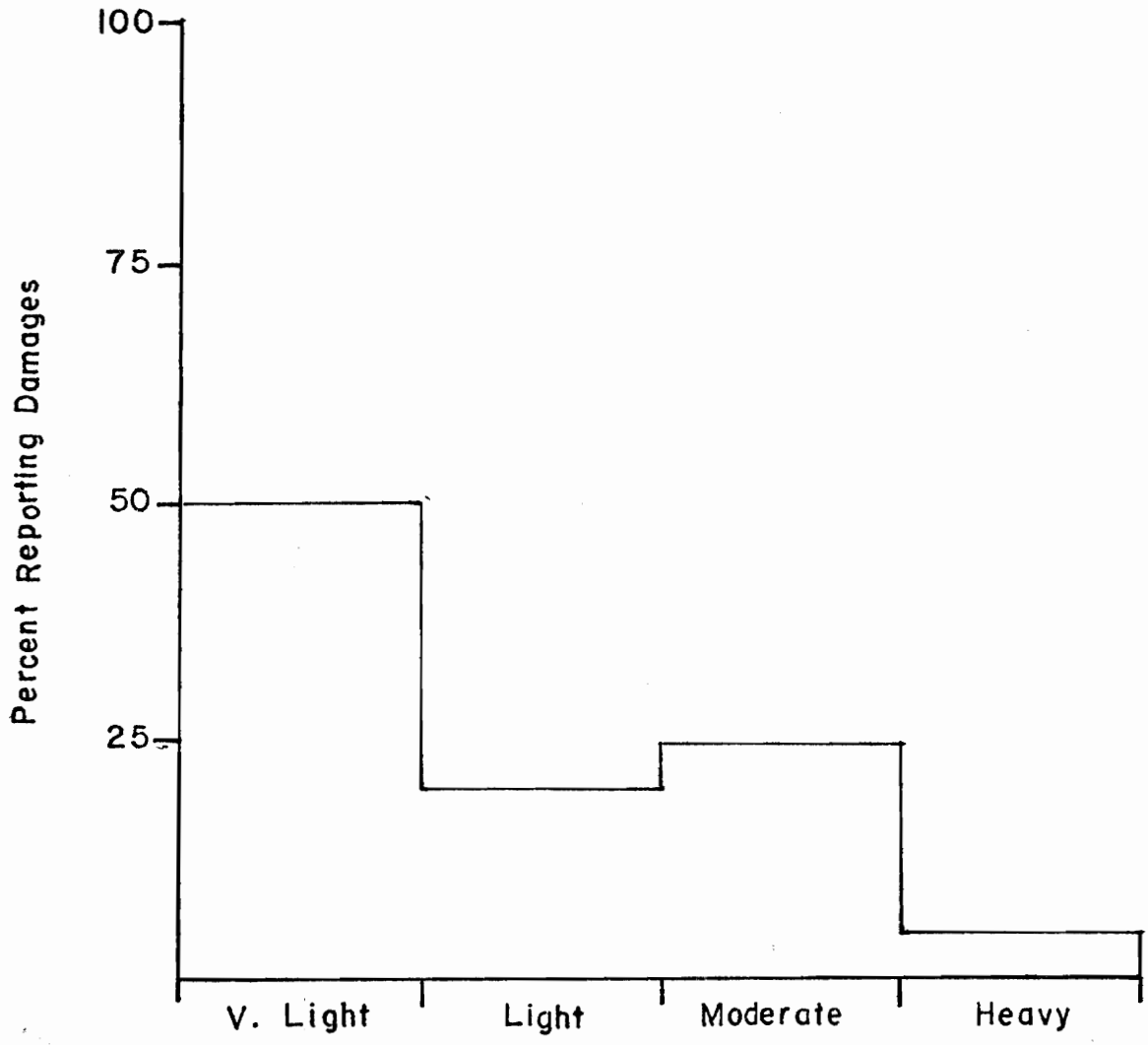


Fig. 7. Degree of coyote damage reported in the 16 counties reporting coyote depredation in Georgia, 1975.

that coyotes appeared to be more prevalent and abundant than previously and were causing increased economic loss.

In general, on the basis of these replies, coyote damage in Georgia can be considered to be concentrated in south central Georgia and light to insignificant at this time.

Livestock or Crops Damaged

Livestock and crops involved in coyote depredation were ranked according to the number of times they were reported (Fig. 8). Swine and cattle were the livestock most frequently reported. Swine and cattle losses were recorded by 12 and 9, respectively, of the 16 county agents reporting coyote damage. Goats, generally considered to be more subject to coyote predation than other livestock, ranked third in the frequency of reporting. A partial explanation for the reduced nymber of goat incidences is the absence or low numbers of goats in many of the affected counties. Sheep, also of low density, ranked fifth. The only crop reported damaged was watermelons which ranked fourth. Poultry losses were reported from only three county agents.

Estimate of Monatary Losses

According to this survey, the estimated total loss to farm producers in 1975 was $56,011 (Table 9). This monetary loss was computed by assuming a reasonable market value for livestock and poultry. The average yield and price received was used to determing the total value lost to the watermelon producers (Georgia Crop Reporting Service, 1975).

It is of interest to note that the watermelon loss is 65 percent of the total losses reported and represents 0.6 percent of the state water-

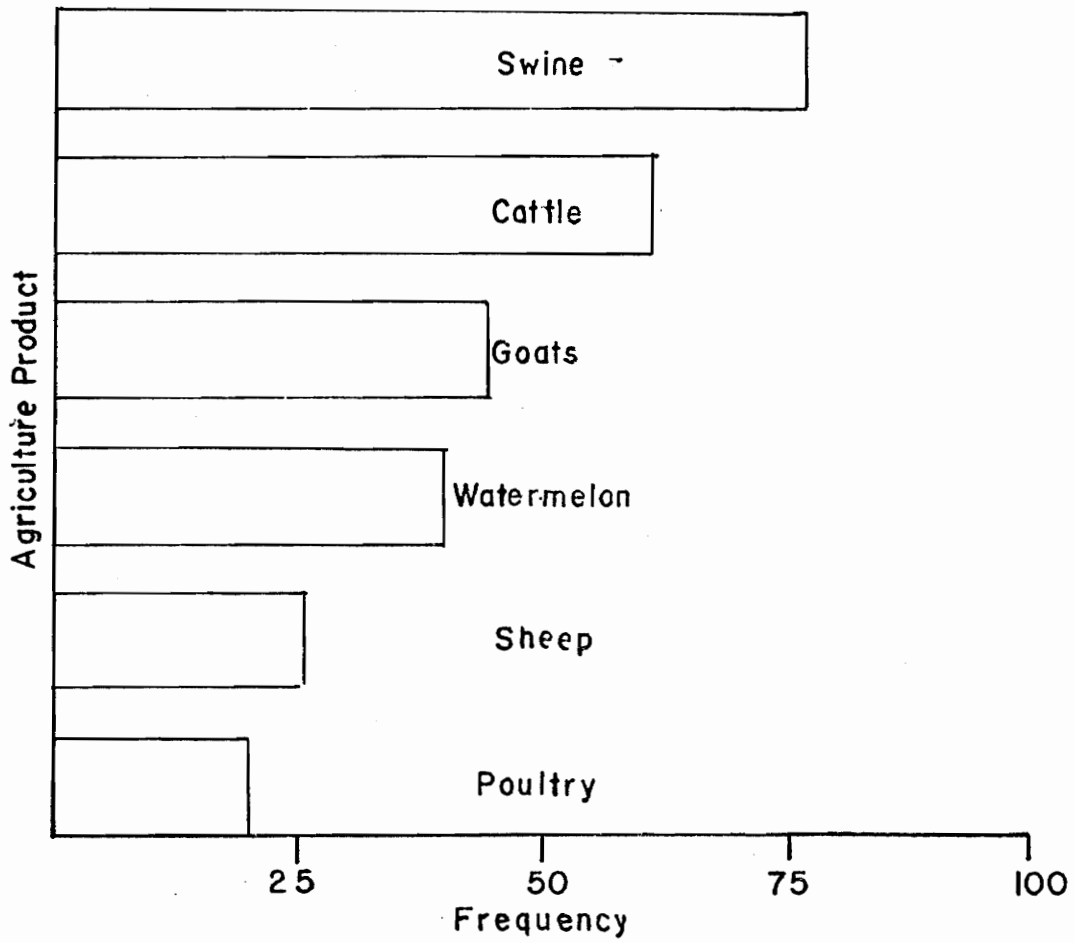


Fig. 8. Frequency of coyote damage reports, according to type of agriculture products damaged, Georgia, 1975.

TABLE 9. Coyote depredation losses reported in Georgia, 1975

Species	Losses (n)	Market Value ($)	Total Value ($)
Livestock			
Goats	169	10	1,690
Swine	156	40	6,240
Cattle	70	150	10,500
Sheep	56	20	1,120
Total Livestock	451		19,550
Poultry			
Chickens	1	1	1
Turkeys	15	5	75
Total Poultry	16		76
Fruit Crops (Acres)			
Watermelon	226	161	36,385
Total Fruit Crops	226	161	36,385
Total Value All Losses			56,011

melon production value. The effect of other losses is considered to be insignificant when based on a statewide percentage basis.

It should be recognized that these summaries of livestock and crop losses due to coyote predation are fragmentary and based to a large extent on reports by farmers and ranchers, some of whom may not have been contacted. On the other hand, losses may have been overestimated, as the domestic animals may have been lost to dogs or to natural causes such as disease, malnutrition, and old age. Therefore, these data should be considered as a relative trend of coyote damages.

Conditions Under Which Damage Occurred

Coyote damages are reported through the year with the greatest amount occurring in the October-December period (Fig. 9). Livestock damage was more evident in free ranging conditions as this is the typical type of livestock management in Georgia. Coyote predation is greatest during farrowing, calving, and lambing time. In season, watermelons provide a "buffer" to coyote predation on stock. Therefore, there appears to be a positive relation between intensity of predation and availability.

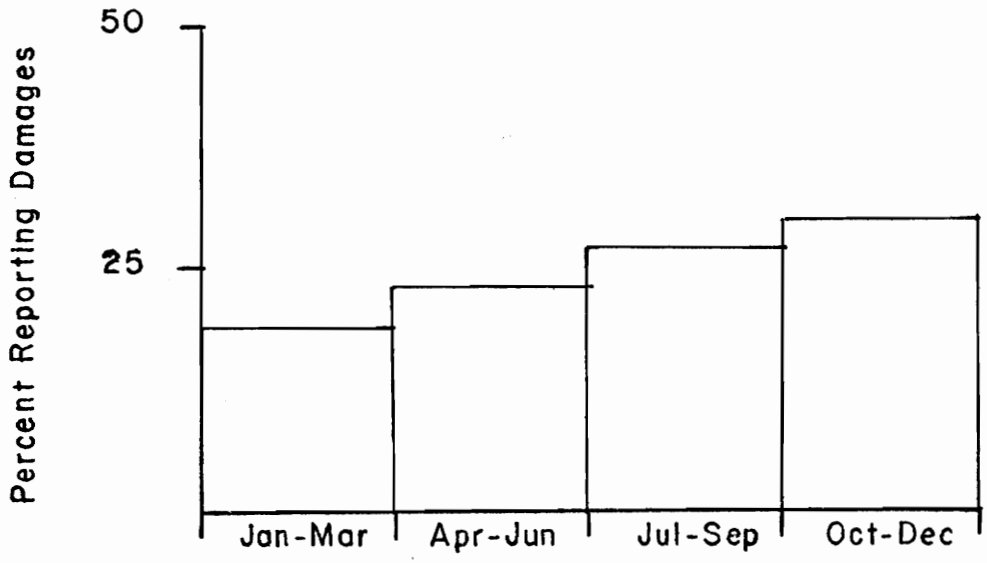


Fig. 9. Seasonal occurrence of coyote damage reports, Georgia, 1975.

DISCUSSION AND RECOMMENDATIONS

Discussion

Coyote populations in Georgia over the past forty years have increased and extended their range. At present, the greatest number occur in south central Georgia, although small numbers have been observed near the Alabama border and the Tennessee-North Carolina border. Results from the statewide howler survey show population and distribution trends similiar to changes in abundance reported in literature and direct observations.

The areas sampled by the howler survey in 1975 represent a small proportion of the total land area in each of the physiographic regions involved, and the data is a gross index of the coyote population in the survey areas. In 1976, a howler survey was conducted in nine counties in south central Georgia to obtain comparative data indicative of coyote population trends. The number of coyotes recorded did not reveal a change in abundance from the statewide survey.

This stability in population was comparable to that reported by Knowltow (1972), who showed that the coyote population is stable from March to November. This concept is acceptable where widespread control programs are in effect and where recruitment and immigration compensate for these losses. However this is not believed to be the case in Georgia.

The causes of the scarcity of coyotes and the inability to detect changes in the population are not known. Some of the most important variables affecting the use of howler surveys is that the precentage of coyotes answering the simulated howl is unknown and the area censused

varies according to vegetation, weather, and disturbances. The mobility of the coyote makes them difficult to census. Gipson and Sealander (1972) reported that the home range of coyotes is 8.2-20.5 km and therefore could be out of decoy and hearing range. In view of the results of this study, certain modifications of the survey technique would no doubt provide a more sensitive indication of coyote population trends.

Another probable cause that may hold the population in check is disease. Mange and heartworms are some of the diseases which may affect them. These diseases appeared to be fairly common in the specimens collected. Six had mange and ten had heartworms. This occurance suggests that disease may be a principal restraint on the growth of the coyote population.

There are many unknowns clouding the determination of the form of coyote that exists in Georgia. It may never be possible to establish the exact form of coyote due to the many years of interbreeding and the various crosses produced. The Georgia coyote is considerably smaller and lighter than the coyotes reported from Texas by Riley and McBride (1972:13). The skull desplayed obvious coyote-like characteristics but no significant trend to any one of the suspected subspecies that may be involved in the Georgia coyote population. The data suggest an intergradation of the coyote subspecies. Although skull measurements do not indicate any major shift to dog-like characteristics, hybridization with dogs is not completely ruled out. The number of specimens and variability in their skull characteristics make it difficult to determine which subspecies may have been responsible for the initial appearance of coyotes in Georgia. The

limited morphological and skull data collected lends support to the popular theory that coyotes were brought in and released.

The long range effect of coyote distribution and damage is not known. Coyotes have the potential of causing significant economic losses. South of the Piedmont, for example, there are about 1.7 million swine. This comprises 91 percent of the state's swine production. This industry along with those of cattle, sheep, and goats is vulnerable to damage by coyotes. However, the coyote is not completely carnivorious and damage to the multi-million dollar watermelon crop has occurred. Additional coyote expansion can be of considerable consequence to ranchers and farmers in the future.

Fall conditions appear to intensify predation activities on livestock, but damage occurs through the year. The rise in the incidence of coyote damages is difficult to interpret at this time, for they may signify a reduction in natural prey or a seasonal increase in predator activity. Knowlton (1972) found that coyotes became more active within their established range in September and October and that infiltration into new areas became important in November, increased until January and then decreased through March. These findings appear consistant with the results of this survey, but a final conclusion cannot be made until there is a better understanding of population trends and coyote predation.

Coyote control is frequently used in parts of south central Georgia in an effort to solve local depredation problems. Unfortunatley, these control actions are principally taken by farmers in retaliation against coyotes that have already caused damages. Hunting, with or without dogs,

has been used in the Ashburn area, and has shown utility for removing coyotes from specific areas. However, most coyotes are shot only incidentally and in conjunction with other work. Traps are also used. Toxicants, such as strychnine, have been used, however, it is not registered for coyote control in Georgia.

Some damage control has been undertaken by the Georgia Game and Fish Commission, Georgia Agriculture Extension Service, and the U.S. Fish and Wildlife Service. But these organizations are not now in a position from a budgetary and manpower standpoint to reduce effectively chronic damage problems. The only alternative is to encourage hunters and private trappers to harvest coyotes, and provide instruction to farmers or ranchers as how they can prevent losses and remove offending coyotes.

Recommendations

1. Censuses of this type should be repeated periodically with carefully selected routes. These routes should be run at 3 or 5 year intervals to secure long-term trends in coyote distribution and population density.

2. The survey should be expanded by adding new studies to determine movement, reproductive aspects, diseases, food habits, and taxonomic characteristics.

3. The potential for utilizing the Crop Reporting Service surveys should be explored for securing data on livestock and agricultural losses to coyotes. Data from these surveys can be used to evaluate such factors as area and value of livestock and crops affected, estimation of predator distribution, effort expanded in controlling the predator versus the

value lost. Data from this study could be correlated with data from the "howler" searches and other studies to build a more complete picture for the coyote population and the extent of its depredation.

SUMMARY

This survey has provided basic information about the coyote population in Georgia. This pilot census has shown that, in general, coyote populations are confined to the Upper Coastal Plain. Areas of relative high and low densities have been identified in the Upper Coastal Plain and the Lower Coastal Plain. Details are given on calling indices of coyotes on five road routes in nine south central Georgia counties in April, 1976. The numbers of coyotes detected per km^2 were compared with those based on the densities obtained in 1975 and were found to be approximately the same. In spite of frequent allegations that coyote populations are high, no evidence has been found to that effect. In some cases, high concentrations may be purely local phenomenon.

This study described the Georgia coyote as it appears today. Where data existed, a comparison was made to determine the animals' relationship with the species and subspecies. Weights and body measurements were shown to be smaller than those of coyotes from Texas. Without more definitive information, skull studies were severely limited and the form of coyote could not be distinguished.

In general, coyote damage is confined to the Upper Coastal Plain of Georgia. Coyote predation is more prevalent in the area bounded by Dooley, Pulaski, Barrien, and Turner County. In this area there appears to be an increasing incidence of damage, particularly to the south and west around Sylvester. Some isolated incidences have been reported in the Piedmont and Lower Coastal Plain. There is a conspicious absence of damage in the Northern Highlands. Through the damage region, the trend

appears to be for increasing damage to swine and watermelon production.

The economic value of coyote damage at this time is estimated around $50,000 annually. Much of this damage seems to be insignificant, particularly on a percentage basis of the income generated by these agricultural industries. However, to the individual farmer the losses are very severe. The probable trend appears to be for increased losses, but the size of the coyote population, the kinds of livestock and crops grown, the management practices, and types of control are important factors that must be considered before any conclusion could be made relative to the coyotes future impact.

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APPENDIX

APPENDIX I. coyote survey form

COYOTE SURVEY

County _____ Date _____

Physiographic Region _____

Weather: Wind Velocity _____
Temperature _____

Direction _____
% Sky Clouded _____

Stop No.	Mileage At Stop	Time At Stop	Coyotes Heard	Coyotes Seen	Remarks
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
Totals					

APPENDIX II. Coyote damage survey form

COYOTE DAMAGE SURVEY 1975

1. County _____.

2. Have you ever encountered coyote damage in your county? Yes____ No____.

   IF YES, ANSWER THE FOLLOWING:

3. Has there been reports of coyote damage this year? Yes____No____.

4. When were coyote damages first encountered in your county? Before 1970____ 1970____ 1971____ 1972____ 1973____ 1974____.

5. During what period of the year do coyote damages most frequently occur? Jan-Mar____ Apr-June____ July-Sept____ Oct-Dec____.

6. Please estimate, as accurate as possible, the number of coyote damage incidences to the following livestock and crops.

Sheep	_____	Turkey/chickens	_____
Goats	_____	Watermelons	_____
Hogs/pigs	_____	Others	_____
Cattle/calves	_____	(Please specify)	

7. How would you rate, on the basis of county production and income, the damage caused by coyotes? very light_____ light_____ moderate_____ heavy_____.

VITA

The author of this paper is a native of Reading, Pennsylvania. After graduating from Reading Senior High School in 1949 he enlisted in the United States Air Force. He retired in September, 1969, with the rank of Major, and entered Texas A & M University, being awarded the B.S. degree in Wildlife Science in 1971. While at Texas A & M he was a member of Gamma Sigma Delta, the National Honor Society for Agriculture.

He became a candidate for the Master's degree in Wildlife Management at Virginia Polytechnic Institute and State University in December 1971. He left this institution in 1972 for an assignment as a wildlife biologist with the U.S. Fish and Wildlife Service. He is currently the Assistant State Supervisor of the Georgia District for the Division of Wildlife Services.

He married the former Miss Janice Fay Gammons, of Edgewood, Texas on November 11, 1955.

ROBERT MELVIN FISHER

A SURVEY ON THE STATUS OF THE COYOTE (Canis latrans) IN GEORGIA

Robert M. Fisher

ABSTRACT

Coyotes (Canis latrans) are known to have caused damage to the agriculture industry of Georgia since 1958. Since that year that threat has grown as the population increased. To determine the magnitude of the coyote problem a study was begun in 1975. The objectives of this study was to determine the coyotes population and distribution, physical characteristics, and damage activity in Georgia.

In 1975-1976, coyote surveys were run throughout Georgia using tape-recorded howls to establish the distribution and relative density of this species. Minimum densities based on howling responses ranged from one coyote/60.9 km^2 in the Upper Coastal Plain to one coyote/333.3 km^2 in the Lower Coastal Plain. No coyotes were located from the Piedmont northward.

Weights, standard body and skull measurements were obtained from 27 coyotes in an effort to determine the form of Georgia coyotes. Males were significantly larger and heavier than females. The coyotes collected in Georgia were consistently lighter and smaller than coyotes reported from eastern Texas. Attempts to classify the skulls to the subspecies level was not feasible because of lack of comparative information. The analysis of skulls did show that specimens from Georgia seem more properly referable to coyotes, although some dental characteristics indicated a relationship to dogs.

One hundred and forty-four County Extension Offices replied to a

coyote damage questionnaire. Only 16 reported coyote damage in their counties. Analysis of the replies indicated that coyote damage was increasing. In general, damage was concentrated in south central Georgia and most was judged light to insignificant. Pigs and cattle were the livestock most frequently damaged and watermelons were the most damaged crop. The economic value of coyote damage is estimated to be $50,000 annually.