# Foodniche of Coyotes in the Rolling Plains of Texas

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**Highlight:** *Coyote diets were determined from scat and stomach analyses over a two-year period in an area centered in the Rolling Plains region of Texas. Fruit from 9 species of native plants were the most important food for coyotes, making up 46% of the annual diet. Honey mesquite pods alone contributed 15.6% of the annual diet. Rodents contributed 24.5% of the coyote's annual diet, while leporids made up just 10.5%. The foodniche of coyotes varied seasonally as well as annually. The coyote's role as an agent of seed dispersal appears minimal since digestion of some seeds by coyotes significantly reduces percent germination. Late evening and pre-dawn hours seem the normal feeding period for most coyotes, and moon phase did not affect the timing of this activity. In this study there was no evidence of coyote predation on cattle.*

The coyote (*Canis latrans*) (Fig. 1) has been the subject of conflicting interests between farmers, ranchers, sportsmen, and government agencies for many years. Predation by coyotes is often considered the most important factor determining profit or loss on sheep, goat, poultry, and even cattle ranches in the western United States. Knowlton (1972) stated that satisfactory predator management can be achieved only through a better understanding of the entire spectrum of species values, more intimate biological knowledge of the predator, and more precise techniques for control. Gier (1968) and Hawthorne (1972) have surveyed the literature on coyote food habit studies in the United States. This study was initiated to provide factual data on the yearlong food habits of coyotes in a cattle-producing region of Texas to ascertain present or potential threat to cattle ranching in this specific region.

## Methods and Materials

This study was conducted over the 25-month period from June, 1971 through June, 1973 within a 25-mile radius of Benjamin, Texas, in Knox and King counties. This area lies in the center of the Rolling Plains of Texas and is predominately native rangeland with some cultivated small grains, mainly winter wheat. Cattle are grazed on these ranges, mostly as cow-calf operations on large ranches. Some ranchers also run stocker yearlings during the fall and winter.

The average annual precipitation is 63 cm, which comes mainly as rainfall in May and September. There is usually a dry summer period with extremely high temperatures and evaporation, while the winters are relatively mild. The elevation is approximately 550 m above sea level. Steep rocky hills occur along the South Fork of the Wichita and Brazos Rivers while flat to gently rolling topography occurs away from the rivers. Honey mesquite (*Prosopis glandulosa* Torr. var. *glandulosa*), tobosagrass (*Hilaria mutica*), and buffalograss (*Buchloe dactyloides*) are dominants on the deep hardland and heavy clay range sites, while redberry juniper (*Juniperus pinchotii*), sideoats grama (*Bouteloua curtipendula*), and mesquite dominate in the rough breaks. Pricklypear (*Opuntia engelmannii*) is abundant throughout the study area while lotebush (*Condalia obtusifolia*) occurs regularly in deep hardland and heavy clay range sites, and elbowbush (*Forestiera pubescens*) occurs regularly in the rough breaks.

Estimates of coyote diets were determined monthly by examination of coyote stomach contents and fresh coyote scat. Coyotes were collected by a rifleman through calling with

**Fig. 1.** *Coyote seeking food in the rough breaks of the Rolling Plains of Texas. The complexity of the biota in this ecosystem permits the coyote to be omnivorous in its feeding habits.*

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predator calls, spotlighting at night, and by hunting from ranch roads. Each coyote was weighed, sexed, aged by tooth-wear (Taber, 1971), and time and moon phase of each kill were recorded. Stomachs were removed from dead coyotes, emptied, the contents were weighed (during the last year of the study), and then placed in a shallow 20 x 30 cm pan for examination. During the first year of the study, the percent volume that each food item contributed to the stomach sample was estimated visually. During the second year, percent volume was estimated and then frequency of food items in the samples were determined using a point method (Brown, 1968). One hundred points were recorded for each sample. Reference samples of all available foods in the study area were used to identify individual food items in stomach samples. An average of 7.1 coyotes were killed each month during the first year of the study while an average of 5.5/month were killed during the second year. Chi-square tests (Li, 1964) were used to determine if empty coyote stomachs occurred more often in forenoon kills or afternoon kills, and to determine if moon phase affected the incidence of empty coyote stomachs.

Fresh coyote scats were collected monthly along ranch roads and known coyote trails. Scat samples were air dried, then analyzed by the same technique used for stomach samples. An average of 20.3 scat samples were analyzed each month of the first year of the study, while an average of 24.3/month were analyzed during the second year. Correlation and regression techniques were used to compare diets of coyotes as determined by stomach analyses and scat analyses as well as to compare volume and frequency data.

Seeds of honey mesquite, Engelmann's pricklypear, lotebush and elbowbush were removed from fresh coyote scat and control groups of seeds from these plants were collected during the summer of 1972 to determine the effect of digestion by coyotes on seed germaintion. Seeds were vernalized (-4° C) for 72 hr and then air dried for 12 hr. Two hundred digested seeds and 200 control seeds of each species were placed in a Master® germinator on moist filter paper at 33° C. Emergence of the radicle was used as the criterion for germination. Germination was recorded twice each week for one month.

Confidence limits (95%) were calculated for mean values where appropriate.

## Results and Discussion

We found that coyote diets varied seasonally as well as between years. The coyotes sampled fed on local, native plants and animals and did not kill livestock for food. Thirty-three different identifiable food items were discovered in scat samples while 38 were found in stomach samples. Scat and stomach analyses revealed slightly different diets (Table 1 and 2). The number of coyote stomachs examined each month was relatively small compared to the number of scat samples analyzed each month, and this could account for the difference. Some food items may have lost considerable volume as well as identity in scat samples as compared to stomach samples. We feel that, although both techniques utilized are valuable indices of coyote food habits, the scat analysis provides a more explicit picture of the coyote diets since these samples represent more coyotes.

Scat analyses revealed that rodents, honey mesquite pods, leporids, juniper berries, and *Opuntia* fruit collectively contributed 69% of the volume of food consumed. These five foods, together with lotebush berries, carrion, and insects accounted for 86.3% of the diets of coyotes over the 2-year period. Stomach analyses revealed that 71% of the volume of food was carrion, rodents, insects, leporids, and honey mesquite pods. These five foods along with *Opuntia* fruit, miscellaneous birds and bird eggs, and juniper berries made up 83.2% of the volume.

**Table 1. Mean percent volume of food items in coyote diets from June, 1971, through May, 1973, as determined by examination of scat samples.**

| Food items | June,1971-May, 1972[1] | June, 1972-May, 1973[2] | Mean diet | Rank |
|---|---|---|---|---|
| Plants | | | | |
| Mesquite pods | 18.3 | 12.9 | 15.6 | 2 |
| Juniper berries | 2.3 | 18.1 | 10.2 | 4 |
| Opuntia fruit | 9.4 | 6.9 | 8.2 | 5 |
| Lotebush berries | 9.8 | 4.3 | 7.0 | 6 |
| Ironwood berries | 6.8 | 0 | 3.4 | 9 |
| Plums | 0.4 | 2.1 | 1.2 | 13 |
| Elbowbush berries | 0 | 0.7 | 0.4 | 15 |
| Silverleaf nightshade berries | 0.1 | 0 | t | 17 |
| Grass and leaves | 1.7 | 3.2 | 2.5 | 11 |
| Carrion | 5.4 | 6.6 | 6.0 | 7 |
| Rodents | 20.9 | 28.0 | 24.5 | 1 |
| Leporids | 10.6 | 10.4 | 10.5 | 3 |
| Opossum | t | 0 | t | 17 |
| Skunk | 0.1 | 0.3 | 0.2 | 15 |
| Snake | 0 | 0.2 | 0.1 | 16 |
| Quail | 0.4 | 0 | 0.2 | 15 |
| Other birds | 0.6 | 0.8 | 0.7 | 14 |
| Bird eggs | t | 0.4 | 0.2 | 15 |
| Insects | 5.6 | 3.0 | 4.3 | 8 |
| Cottonseed cake | 3.0 | 0 | 1.5 | 12 |
| Unidentifiable material | 4.7 | 2.4 | 3.5 | 10 |

[1] Does not include January, 1972. A total of 223 scat samples were analyzed.
[2] A total of 291 scat samples were analyzed.

**Table 2. Mean percent volume of food items in coyote diets from July, 1971, through June, 1973, as determined by examination of stomach contents.**

| Food items | July, 1971-Apr., 1972[1] | July, 1972-June, 1973[2] | Mean diet | Rank |
|---|---|---|---|---|
| Plants | | | | |
| Mesquite pods | 11.3 | 3.2 | 7.2 | 5 |
| Juniper berries | 0.9 | 4.6 | 2.8 | 8 |
| Opuntia fruit | 5.5 | 6.4 | 6.0 | 6 |
| Lotebush berries | 0 | 1.0 | 0.5 | 13 |
| Ironwood berries | 0.6 | 0 | 0.3 | 15 |
| Plums | 0 | 1.9 | 1.0 | 10 |
| Elbowbush berries | 0 | 1.5 | 0.8 | 11 |
| Unknown berry | 0 | 0.2 | 0.1 | 15 |
| Wheat | 0 | 0.2 | 0.1 | 15 |
| Grass and leaves | 1.4 | 2.0 | 1.7 | 9 |
| Rodents | 11.4 | 28.9 | 20.2 | 2 |
| Leporids | 11.5 | 10.1 | 10.8 | 4 |
| Moles | 0 | 0.8 | 0.4 | 14 |
| Deer | 0.6 | 0 | 0.3 | 15 |
| Carrion | 21.0 | 21.3 | 21.1 | 1 |
| Insects | 12.7 | 10.8 | 11.7 | 3 |
| Turtle | 0.1 | 0 | t | 16 |
| Salamander | 0.1 | 0 | t | 16 |
| Unknown bones | 1.2 | 0 | 0.6 | 12 |
| Quail and quail eggs | 1.1 | 0.4 | 0.8 | 11 |
| Dove and dove eggs | 0 | 0.6 | 0.3 | 15 |
| Other birds and eggs | 2.7 | 4.1 | 3.4 | 7 |
| Unidentifiable material | 1.6 | 0 | 0.8 | 11 |
| Calf manure | 9.9 | 2.1 | 6.0 | 6 |
| Cottonseed cake | 5.0 | 0 | 2.5 | 9 |
| Miscellaneous | 1.2 | 0 | 0.6 | 12 |

[1] No samples were taken during May or June, 1972. A total of 71 coyotes were killed of which 32 had empty stomachs.
[2] A total of 66 coyotes were killed of which 11 had empty stomachs.

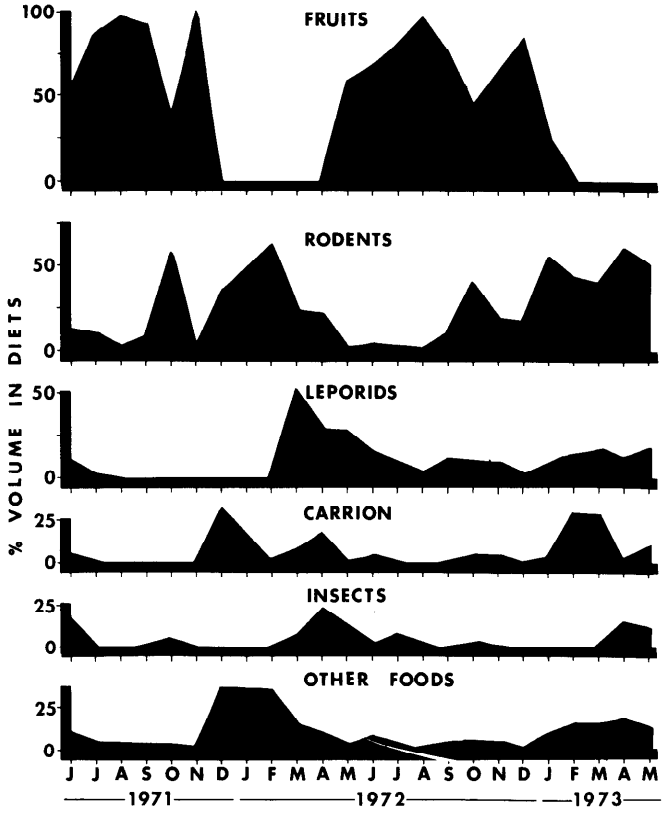


Fig. 2. *Major foods of coyotes in the Rolling Plains of Texas from June, 1971, through May, 1973, as determined by scat analyses.*

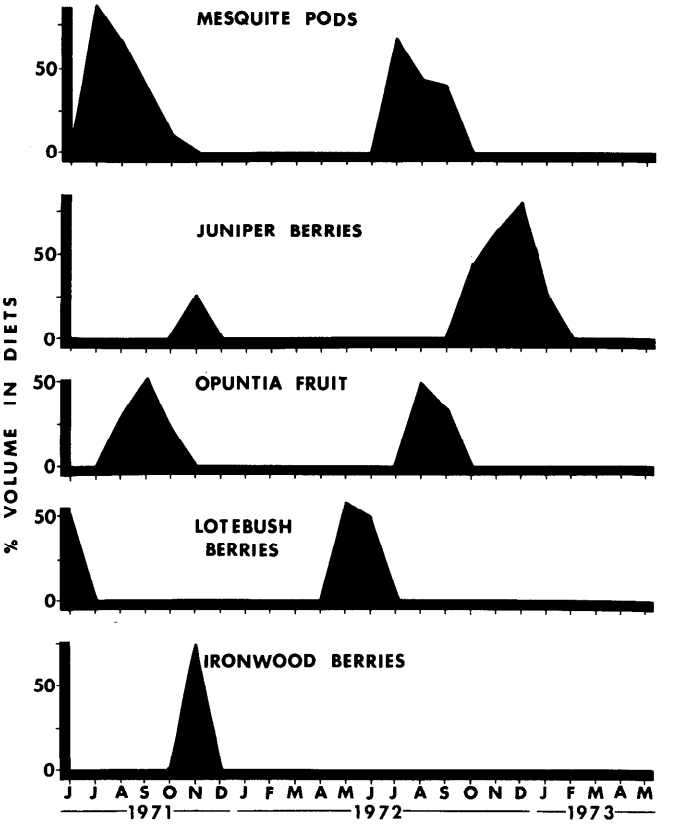


Fig. 3. *Contributions of various fruits to the seasonal diets of coyotes in the Rolling Plains of Texas from June, 1971, through May, 1973, as determined by scat analyses.*

### Fruits

Fruits from nine species of native plants, including honey mesquite, redberry juniper, pricklypear, lotebush, ironwood (*Bumelia lanuginosa*), wild plums (*Prunus angustifolia*), elbowbush, silverleaf nightshade (*Solanum elaeagnifolium*), and tasajillo (*Opuntia leptocaulis*) collectively contributed 46% of the mean annual diet (Table 1). Wheat seed (*Triticum vulgare*) and an unidentifiable berry were food items of minor importance (Table 2). Honey mesquite pods comprised 15.6% of the mean diet and ranked as the 2nd most important food item (Table 1). Juniper berries, *Opuntia* fruit, and lotebush berries ranked 4th, 5th, and 6th, respectively, in importance.

### Mammals

Rodents, mainly the hispid cotton rat (*Sigmodon hispidus*) and the southern plains wood rat (*Neotoma micropus*), made up 24.5% of the mean annual diet of coyotes (Table 1). The black-tailed jackrabbit (*Lepus californicus*) and desert cottontail (*Sylvilagus auduboni*) comprised 10.5% of the coyote diets over the two-year period and these leporids ranked as the 3rd most important food (Table 1). Skunk (*Mephitis mephitis*), white-tailed deer (*Odocoileus virginianus*), eastern mole (*Scalopus aquaticus*), and Virginia opossum (*Didelphis virginiana*) occurred in the diets in trace amounts.

### Birds

Bobwhite quail (*Colinus virginianus*), mourning dove (*Zenaidura macroura*), meadowlark (*Sturnella neglecta*), roadrunner (*Geococcyx californianus*), red-wing blackbird (*Agelaius phoeniceus*), unidentifiable birds, and bird eggs occurred in stomach and fecal samples in trace amounts. Birds and bird eggs comprised only 1.1% of the coyote diets by scat analysis (Table 1) and 4.5% of the diets by stomach analysis (Table 2). Coyotes probably feed mainly on dead, sick, wounded, or young birds.

### Arthropods

Insects ranked 8th in importance (4.3% volume) in scats and 3rd (11.7% volume) in importance in stomach contents (Tables 1 and 2). Insects eaten included June beetles (*Phyllophaga* sp.), long horned beetles (*Derobrachus* sp.), grasshoppers (mostly *Melanoplus* spp.), sulfur butterflies (*Colias eurytheme*), wasps (*Vespa* spp.), cicadas (Cicadidae), and millipedes (Diplopoda). Insects made up 21.9% of scats and 38.6% of stomach contents during spring and summer months.

### Carrion

Carrion ranked 7th in importance (6.0% volume) in scats and 1st in importance (21.1% volume) in stomach contents as foods of coyotes. The discrepancy between the two techniques is probably due to the loss of identity and volume of carrion during the digestion process and to difference in sample size. Carrion was usually easily identified in stomach samples due to the presence of fly larvae and pieces of dried animal skin but was difficult to recognize in coyote scat.

In almost every case where carrion was identified or suspected in stomach or scat samples, we found carcasses of

dead livestock in close proximity. Close liaison with local ranchers during the study was maintained, and no coyote kills of cattle or calves were reported. Most carrion was attributed to coyotes feeding on carcasses of yearling stocker cattle that had died of shipping fever or other diseases.

### Other Animals

Snake, turtle, salamander, and unidentifiable bones occurred in trace amounts in coyote scat and stomach samples but were relatively unimportant in coyote diets (Tables 1 and 2).

### Grasses and leaves

Grasses and leaves contributed 2.5% (scat analysis) and 1.7% (stomach analysis) of the diet. Tobosagrass was the major grass consumed, contributing as much as 14.3% (scat analysis) of the diet in February, 1973, and occurred in scat samples in 21 out of 24 months and in stomach samples in 11 of 22 months. Other researchers have suggested that grass is ingested by coyotes accidentally while capturing small prey (Hawthorne, 1972) or that it may serve a function as a tonic, source of vitamins, or vermicide (Gier, 1968). Leaves of wheat, rescuegrass (*Bromus unioloides*), bermudagrass (*Cynodon dactylon*), and mesquite also occurred in stomach and scat samples in trace amounts.

### Miscellaneous Items

Cottonseed cake contributed 1.5% and 2.5% of the coyote diets according to scat and stomach analyses, respectively (Tables 1 and 2). Calf manure contributed 6.0% of the diet by the stomach analyses (Table 2) but was not identified in scat samples. Some unidentifiable material in samples was in an advanced stage of digestion. Small quantities of straw and livestock mineral occurred in a few samples.

### Annual and Seasonal Variation in Diet

Even though we have no data on population densities of rodents and leporids, it appears from our dietary data that coyotes commonly drop to the herbivore level of the trophic hierarchy in order to make use of available vegetational foods. Variations in the annual diets of coyotes (Tables 1 and 2) seem largely related to climatic forces and their effect on availability of animal prey and fruits. Honey mesquite pods appeared to be considerably more plentiful during the drier summer of 1971 than during the somewhat wetter summer of 1972; consequently, mesquite pods contributed almost 50% more to the coyote diets during the summer of 1971 than in the summer of 1972 (Table 1). Redberry juniper seemed to produce considerably more berries during the fall of 1972 than in the drier fall of 1971, and coyotes consumed almost seven times more juniper berries during the fall of 1972 (Table 1, Fig. 3). Lotebush berries contributed 57.5% to coyote diets during May, 1972, but a wet winter and late spring freeze in April, 1973, seemed to cause a failure of the lotebush berry crop for the year, resulting in the absence of this food in scat and stomach samples in May, 1973 (Fig. 3). Coyotes may have adjusted to this berry crop failure by consuming more rodents. Rodents contributed only 0.2% of the coyote's diet in May, 1972, as compared to 50.9% in May, 1973 (Fig. 2).

The fact that coyotes are opportunistic and select foods requisite to the least expenditure of energy is reflected in their seasonal food habits (Fig. 2). Fruits and insects are fed upon heavily by coyotes during seasons when they are plentiful (May through December), whereas the carnivorous and scavenger habit is assumed during periods of fruit and insect scarcity (December through April) (Fig. 2). During early fall (October), after the mesquite pod crop had been depleted, and before juniper berries had ripened, coyote predation on rodents increased dramatically (Fig. 2). Increased predation on rodents at this time may have coincided with peak fall population densities.

Fruits comprised over 50% of the coyote's diet for 12 months of this study and over 75% of the diet for 8 months (Fig. 2). The seasonal diets of coyotes reflected the periods of availability of various fruit crops (Fig. 3). Lotebush berries are usually an important coyote food during May and June. Mesquite pods are major foods in July, August, and September (Fig. 3). Englemann's pricklypear and tasajillo tunas are also available and eaten readily by coyotes during August and September, while redberry juniper berries are available between October and January (Fig. 3). Ironwood berries appear to compensate for juniper berries in autumns when juniper berry production is low (Fig. 3).

### Foodniche Diversity

The opportunistic feeding behavior of coyotes is reflected well in the seasonal variation in foodniche diversity (number of different kinds of food eaten). The foodniche of coyotes varies seasonally as well as annually (Fig. 4) as a function of food availability. The variety of foods available for coyotes is quite low during winter months and from three to eight different kinds of foods were eaten during December through February (Fig. 4). During the period March-May, coyotes fed on from 7 to 14 different kinds of food, while in June and July the number of different foods in the diet increased to 11 to 18 (Fig. 4). During August and September, coyotes relied mainly on mesquite pods and Engelmann's pricklypear tunas as staple foods, and the foodnich diversity decreased to 10 to 11. Foodnich diversity increased to 14 in midautumn (November) when a combination of fruits, prey, carrion, and other items was eaten (Fig. 4). The mean monthly foodnich diversity of coyotes over the 25-month period was 9.64 ± 1.53 (range 3-18). Mean foodniche diversity for fall, winter, spring, and summer was 11.5, 4.8, 10.0, and 11.9, respectively.

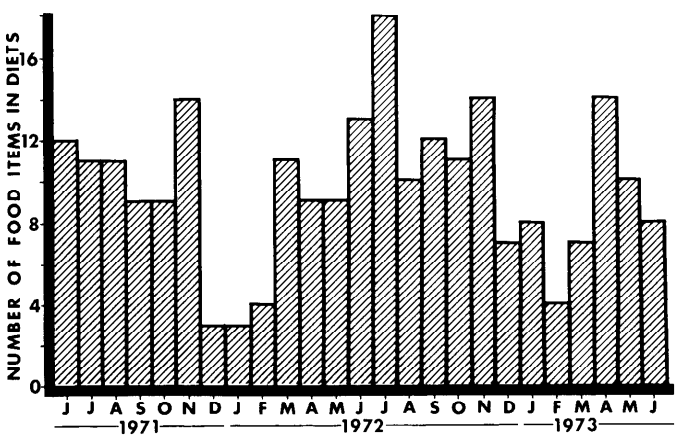


**Fig. 4.** *Seasonal foodniche diversity (number of different foods eaten) of coyotes in the Rolling Plains of Texas from June, 1971, through June, 1973, as determined by both scat and stomach analyses.*

### Seed Dispersal

Since fruits made up such a large proportion of the coyote diets in the Rolling Plains of Texas, it seems reasonable to assume that they may play an important role in seed dispersal. From our estimates of the contribution of the various fruits (% volume) to the monthly diets of coyotes, we calculated the biomass of fruits dispersed by coyotes. We assumed that daily food requirements of the coyote would approximate that established for the wolf (*Canis lupus*) in the summer season, 0.12 kg/kg body weight/day (Pimlott et al., 1967), disregarding slight differences in calculated metabolic requirements of the two species. We also assumed that coyote population density was similar to that reported for 1965-1968 in the Texas Panhandle by Knowlton (1972), 1.1 coyotes/mile.[2] Our calculations showed that the mean biomass of fruits of honey mesquite, juniper, pricklypear, lotebush, and elbowbush dispersed annually during this study was 0.29, 0.13, 0.13, 0.13, and 0.007 kg/ha/year. Biomass of actual seeds dispersed would be about ¼ to ½ of this amount.

In the laboratory, we found that germination of mesquite seeds was drastically reduced after they had passed through a coyote's digestive tract. Only 12% of the honey mesquite seeds from fresh coyote scat germinated compared to 85.5% in the control. After correcting the ratio between honey mesquite seed and pod biomass as well as seed viability, it appears that coyotes disperse only about 0.009 kg of viable honey mesquite seed/ha/year. Seeds of pricklypear, lotebush, and elbowbush from fresh coyote scat and the control group were not germinable.

### Comparison of Scat and Stomach Analyses

We found a very low correlation ($r = 0.35$) between percent frequency of food items in the coyote diets by the scat analysis and stomach analysis techniques for samples collected from July, 1972, through May, 1973. Correlation between data from the two methods was quite high in some months ($r = 0.87$ in February, 1973), but very low in others ($r = 0.03$ in May, 1973). Low negative correlation between the two methods occurred for November and December, 1972.

Discrepancies between the two methods could probably be overcome to some extent by increasing samples of both scats and stomachs. However, some variation should be expected since some food items will lose volume as well as identity as they are digested. Gier (1968) indicated there may be a disproportionate amount of undigestible material in a coyote's stomach 5 hours after it has fed, and the nondigestible material from one meal may be eliminated in 3 or 4 scats 24 to 35 hours after feeding.

### Comparison of Volume and Frequency Data

Frequency and percent volume estimates of food items in the coyote diets were highly correlated in both scat and stomach analyses. We found that percent frequency ($Y_1$) of a food item in coyote scat could be accurately predicted by the more rapidly and easily obtained estimation of percent volume ($X_1$) by the equation: $Y_1 = -0.065 + 1.001\ X_1$ ($r = 0.99$). Percent frequency ($Y_2$) of food items in coyote stomach samples could be accurately predicted from percent volume data ($X_2$) by the equation: $Y_2 = 0.413 + 0.988\ X_2$ ($r = 0.97$). In this study, all estimations of percent volume and determinations of frequency were done by a single researcher.

### Empty Coyote Stomachs

Of 137 coyotes collected for stomach analysis, 43 had empty stomachs. The mean weight (wet basis) of coyote stomach contents for July, 1972, through June, 1973, was 263 ± 59 g (range 10-1048) (includes only stomachs with at least 1 g of food). We do not know how this relates to mean daily food intake of the coyote but think they may consume 4-5 times this amount or more each day depending upon type of food and moisture content. The incidence of empty stomachs in coyotes killed in the morning (28.3%) was significantly greater ($P < 0.01$) than in those killed in the afternoon (5.6%). Gier (1968) reported substantial amounts of food materials were found only in stomachs of coyotes killed during the night or early morning hours, and it was unusual to find evidence of coyotes feeding during the day. This may be an adaptation to living in close proximity to man. Our studies indicate that those coyotes that did not seek food or which were unsuccessful in finding food in the late evening and morning hours continue to seek food, and by afternoon a greater proportion of these animals have fed.

Chi-square tests revealed that moon phase had no effect on the occurrence of coyotes with empty stomachs; thus, the time of day that coyotes feed does not appear to be a function of the moon phase.

### Coyote Sex, Age, and Weight

Of the 67 coyotes killed from June, 1972, through June, 1973, 53.7% (36) were males and 46.3% (31) were females. The mean weight of male coyotes was 10.87 ± 0.69 kg while the mean weight of females was 10.09 ± 0.69 kg. The percent of coyotes killed in the age classes 1, 1-2, 2-3, 3-4, 4-5, and 8-9 years were 25.4, 28.4, 32.8, 7.5, 4.5, and 1.5%, respectively. This indicates that all age groups were well represented in this dietary study.

## Conclusion

Dietary habits of coyotes in the Rolling Plains of Texas are complex, and diets vary seasonally as well as annually. The complexity of the biota in this ecosystem maximizes the foodniche diversity of the coyote and may allow the coyote to obtain its necessary food requirements with a lower expenditure of energy than in more simple ecosystems. Fruits of native shrubs, as a group, were the coyote's major dietary item in this ecosystem, whereas most coyote food habit studies in the Plains states, Intermountain region, and desert areas of California have shown that leporids are the major dietary item (Clark, 1972). The encroachment and increase in density of honey mesquite, redberry juniper, and other brush species have undoubtedly increased the food base of coyotes in this area. The impact of this vegetative change on other habitat requirements of the coyote is not known.

Since coyotes in this region of Texas rely so heavily upon foods other than rodents and leporids, it is doubtful that food-based density-dependent fluctuations in coyote and animal prey populations are as important as in other ecosystems (Clark, 1972). It is conceivable that long-range density of coyote populations in this ecosystem may at least partially be a function of density and fruit production of mesquite, redberry juniper, and other native plants.

Predation of coyotes on cattle or calves was not observed during this study but coyotes played an important role in the removal of carrion. It is conceivable that coyote predation on cattle or calves might be a problem in this area in years when high population density of coyotes coincided with years of low rodent and leporid populations and low fruit production of native plants.

## Literature Cited


**Brown, D. 1968.** *Methods of surveying and measuring vegetation.* Commonwealth Agr. Bur. Farnham Royal, Bucks, England, Bull. 48. 223 p.

**Clark, F. W. 1972.** Influence of jackrabbit density on coyote population change. J. Wildl. Manage. 36:343-356.

**Gier, H. T. 1968.** Coyotes in Kansas (revised). Kansas State Coll. Agr. Exp. Sta. Bull. 393. 118 p.

**Hawthorne, V. M. 1972.** Coyote food habits in Sagehen Creek basin, northeastern California. Calif. Fish and Game 58:4-12.

**Knowlton, F. F. 1972.** Preliminary interpretations of coyote population mechanics with some management implications. J. Wildl. Manage. 36:369-382.

**Li, J. C. R. 1964.** Statistical inference I. Edwards Bros., Inc., Ann Arbor, Michigan. 658 p.

**Pimlott, D. H., J. A. Shannon, and G. B. Kolenosky. 1967.** The interrelationships of wolves and deer in Algonquin Park. Trans. Northeast Wildl. Conf. 16 p.

**Taber, R. D. 1971.** Criteria of sex and age. p. 305-402. *In* R. H. Giles (ed.), Wildlife management techniques. Wildlife Soc., Washington, D. C.