

DISTRIBUTION AND RELATIVE DENSITY OF THE RED WOLF IN TEXAS *

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ABSTRACT

Summer and winter transects were run throughout the range of the red wolf (*Canis rufus*) along the Texas Gulf Coast utilizing a hand-cranked siren to elicit howling. The red wolf could be distinguished from the coyote (*C. latrans*) by its patterns of vocalization. Slight confusion was caused by wolves which, located close to the siren barked like domestic dogs.

No significant differences were detected between the effectiveness of the technique in winter or summer or between two or four-mile spacings of the howling posts along transects. Heavy fog did cause a significant decrease in the number of responses and high winds probably limited the effectiveness of the technique.

Many areas thought to be occupied by red wolves were found to contain only coyotes. The coyote appears to be expanding its range into the marshes and coastal prairies which are the last stronghold of the red wolf. Isolated wolf populations were located in Harris and Brazoria Counties along with the major population grouping in Liberty, Chambers and Jefferson Counties. Highest densities of wolves are found on the prairie. There appears to be no genetic linkage between Texas and Louisiana populations because of a canid-free zone surrounding Lake Sabine.

Populations of wolves appear to be rapidly disappearing and without rapid protection and aid it is likely that the species will become extinct in the wild within the decade.

INTRODUCTION

The red wolf once ranged throughout the entire southeastern United States from Florida to central Texas (Young and Goldman 1944). Little concern accompanied its decline because the animal was replaced by large coyote-like canids throughout the western half of its range. Perhaps it would have passed out of existence unnoticed had McCarley (1962) not become concerned over his inability to find "good" red wolf skulls from areas where the animal was considered abundant. Unfortunately, McCarley's paper was not widely read and Cahalane (1964), on the basis of questionnaire replies from southeastern state game and fish personnel, estimated that "several thousand" red wolves remained in Texas, Louisiana and Arkansas. This confusion was no doubt due to the replacement of red wolves with coyote-like canids.

McCarley's paper came to the attention of two Canadians, Pimlott and Joslin, who were experienced workers with grey wolves (*C. lupus*). Subsequently, these investigators conducted a status survey of the red wolf using their howl-response technique which had been developed for use on grey wolves. Pimlott and Joslin (1968) positively identified red wolves only on Pitman and Davis Islands along the Mississippi River, and in one area in north-central Louisiana, and in Jefferson, Chambers and Liberty Counties in Texas. As a result of this survey, the red wolf was placed in the Red Data Book of the International Union for the Conservation of Nature and Natural Resources and on the endangered species list of the U. S. Fish and Wildlife Service.

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The Texas Parks and Wildlife Department, using a modified howl-response technique, instigated a status survey of the red wolf in Texas in 1970. The aim was to establish the distribution and relative density of this species in a way that would enable the monitoring of future changes in the populations. This is a report of that survey.

The remaining red wolf range in Texas may be broken into three broad habitat types: marshlands, prairie grasslands, and woodlands (Fig. 1). Marshlands grade from salt marshes generally found within 5 miles of the coast to completely fresh marshes inland as far as 15 miles. Vegetation correspondingly grades from cordgrass (*Spartina* spp.), seepweed (*Suaeda* sp.), and sea-oxeye (*Borrichia* sp.) in the more saline areas, through saltgrass (*Distichlis* sp.) brackish marshes into bullrush (*Scirpus* sp.), cattail (*Typha agustifolia*), and sloughgrass (*Beckmannia syzigachne*) in completely fresh marshes. Most of the areas are exposed to light cattle grazing, but their primary values stem from waterfowl hunting and fur trapping.

A large portion of the upper Texas coast consists of rice farms and the prairie grasslands to which these farms revert when allowed to lie fallow. Characteristic vegetation includes the bluestems (*Andropogon* sp.) and Indian grass (*Sorghastrum nutans*), broadly interspersed with hackberry (*Celtis laevigata*) and oak (*Quercus* sp.) in the east and mesquite (*Prosopis* sp.) and pricklypear (*Opuntia* sp.) to the south and west. Waterfowl abound in the winter ponds of the area. The chief agricultural pursuit is alternate pasturage and rice farming wherein any given piece of land is allowed to lie fallow 2 or 3 years following a rice crop. Much of the land has been converted to housing and industrial developments, and the trend is steadily increasing.

Woodlands of the region range from cypress (*Taxodium* sp.) swamps with water oak (*Q. nigra*), palmetto (*Sabal* sp.), and sweetbay (*Magnolia virginiana*) through mesophytic hardwoods into well-drained uplands of loblolly (*Pinus taeda*) and shortleaf (*P. echinata*) pines, hickory (*Carya* sp.) and various oaks. Local but limited operations for commercial firewood, pulpwood, and timber exist, and most woodlands are subjected to moderate grazing.

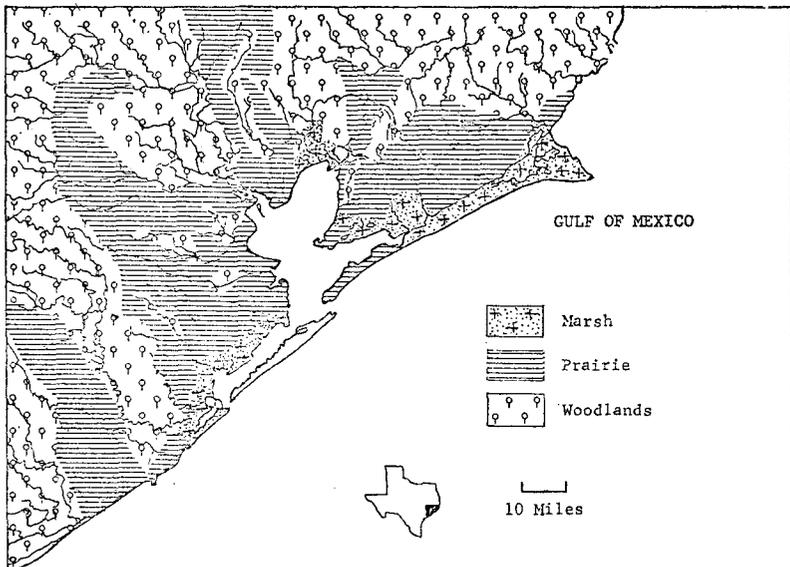


FIGURE 1. Habitat types found within the range of the red wolf in Texas.

METHODS AND MATERIALS

Three methods were considered for eliciting howling responses: human vocal imitations, tape-recorded howls, and hand-cranked air-raid sirens. Problems immediately arose with human vocal imitations. Serious straining of the vocal cords resulted, and neither of the authors was particularly successful in evoking responses from wild canids. With the right talent, this technique might be suitable for locating populations, but because of the variations in the skills of different investigators, it cannot be standardized.

Consideration was given to the use of tape-recorded howls which could be easily standardized. However, Joslin (pers. comm.) recommended that recordings not be used since they did not appear to be as effective as human vocal imitations. This technique was, therefore, discarded.

After preliminary tests, we decided that the hand-cranked air-raid siren would give a reasonably high level of success and could be easily standardized, thus permitting follow-up censuses to be carried out by other workers, regardless of their skill. Sirens used were military models producing a high-pitched wail of approximately 600 cycles per second and a maximum volume approaching 105 decibels at 100 RPM crank speed. At each stop, a siren was cranked for exactly 30 seconds and the investigator would then wait 2 minutes for responses. We believe that the 30-second siren blast will elicit maximum responses, yet will not obscure early responding howls as longer operational periods might.

Census strips were laid out along state highways, farm-to-market roads, and county and private shell roads throughout the area to be censused. The only condition for utilization of a given road was that it lie at least 4 miles from the next census strip. Along each strip the siren was sounded at 2-mile intervals during the summer and 2-and 4-mile intervals during the winter census. The investigator would then record howls, if any, as to number, direction and species. Surveys were always carried out between sunset and sunrise, not so much because of wolf activity, but because of reduced disturbance from passing vehicles.

RESULTS

Pimlot and Joslin (1968) determined that the answering call of the red wolf was similar to that of the grey wolf. The sonogram in Figure 2 is representative of the beginning of a red wolf howl. Although it resembles closely the sonograms of grey wolves (see Theberge and Falls 1967); it differs somewhat in that the pitch of the second and higher harmonics is slightly higher at the beginning and becomes higher throughout the call. One sudden drop in pitch is shown in Figure 2

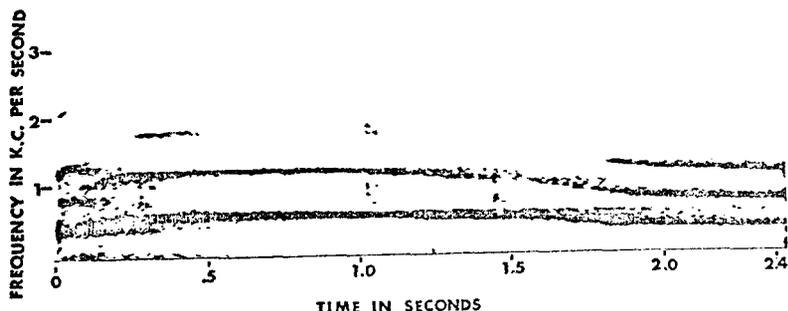


FIGURE 2. Sonogram of the beginning of the howl of a red wolf. Note the pitch change which occurs at intervals throughout the calls. Six harmonics are readily visible in this sonogram and more can be detected in others.

and there may be up to four such drops and rises with each full call of 4 to 16 seconds duration.

Coyote howls are generally higher pitched than those of either the red wolf or the grey wolf and are generally easily distinguished from wolf howls by their frequent sharp rises in pitch (yaps) that occur at 3 to 5 second intervals. The coyote, grey wolf, red wolf and dog (*C. familiaris*) are all known to bark. Barking in red wolves was noted only when the animals happened to be in close proximity to the siren and this may represent an alarm reaction rather than a "normal" response. Dogs, on the other hand, almost always combined their howling with barking. Often we were able to check for dogs by the location of farm houses and many times actually saw the dogs that had been barking. Thus, we were able to check ourselves until we felt certain that we could distinguish between the response of the wolf and that of the dog. In some cases, coyotes ended their yodeling sessions with sharp barking, readily discernible from wolf and dog vocalizations.

A portion of Chambers County was surveyed three times during the summer of 1970 and three times during the winter of 1970-1971. Results of this survey are shown in Table 1.

TABLE 1. Distribution of returns on 6 replicates of survey lines in southern Chambers County taken in summer of 1970 and in winter of 1970-1971.

No. Responding	Summer Replicate				No. Responding	Winter Replicate			
	1	2	3	Total		1	2	3	Total
0	52	53	51	156	0	54	52	51	157
1	6	4	8	18	4	2	5	7	14
2	2	3	1	6	2	3	3	1	7
3	1	1	1	3	3	1	1	2	4
4	0	0	0	0	4	1	0	0	1

Grouped into an overall distribution the data were fitted to a negative binomial distribution (Bliss 1953) and tested by a X^2 goodness of fit ($X^2=100$, $df=1$, $P>.25$).

The transformation $y:\log(X_i + K/2)$ from Moyle and Lound (1960) was used to normalize the residuals for analysis of variance. An analysis of variance table for nested classifications (Snedecor and Cochran 1967) is as follows:

Source of Variation	df	SS	MS	F
Seasons	1	0.00390824	0.00390824	5.65
Counts in Seasons	4	0.00276647	0.000691670	0.06
Stops in Counts	360	3.94769505	0.010965819	...
Total	365	3.95436976

Therefore, it appears that the technique will give uniform results when used over standardized transect routes regardless of the season if a stable population is assumed.

A similar portion of Brazoria County was censused twice with intervals between stops being 2 and 4 miles, respectively. The change in spacing did not cause a significant difference in the number of animals located. A compensating factor may have functioned in the spacing change, however, because once a wolf has answered it cannot be coaxed into howling again for some time. This means that when approached along a transect, the wolf may answer at too great a distance for the

investigator to hear and will not respond again when the investigator moves closer. A Labrador retriever belonging to the senior author frequently was able to hear canids before his master could detect them and sometimes appeared to hear canids never detected.

High wind and fog appeared to limit severely the effectiveness of this technique. It seems only logical that high winds would greatly hamper the hearing of both wolves and investigators. Fog seriously limits howling responses and may prevent them altogether. No howls were recorded during heavy fog even though special efforts were made to locate animals on several such nights.

Table 2 shows the relative densities of red wolves in the three coastal habitat types. Highest densities were found along marsh edges and in the prairie and rice field land further inland (Figure 3). Few wolves could be located in the woodlands which, incidentally, harbor fairly abundant coyotes. The only wolves found in woodlands were those situated near Lake Houston in an area of oak savanna surrounded by pine uplands.

TABLE 2. Relative abundance of the red wolf in three habitat types along its range on the Texas Gulf Coast. (Summer and Winter surveys combined.)

	No. Stops	No. Responses	Responses/100 Stops	Acres in Habitat Type
Marsh	146	26	18	556,400
Prairie	470	107	23	984,020
Woodland	168	19	11	491,800

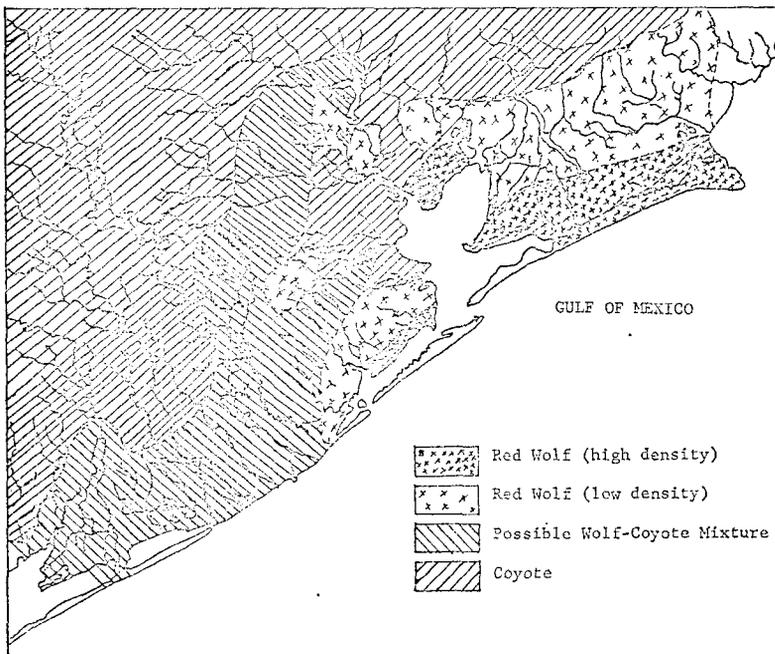


FIGURE 3. Range of the red wolf in Texas as determined by howling census with location of areas in which only coyotes were detected but which may have recently been wolf range.

Minimum densities based on winter counts alone range from one animal per some 12,300 acres in southern Chambers County to one animal per approximately 66,600 acres in eastern Jefferson County. This survey indicated a minimum red wolf population of approximately 92 animals for the State of Texas.

DISCUSSION

We have presented evidence elsewhere (Russell and Shaw 1971) that the red wolf ranged throughout much of east Texas as recently as 1940. Davis (1966) gave the range of this species in Texas as an area extending inland about 100 miles from Orange County on the Louisiana border into South Texas as far south as Kenedy County. No wolves were located in this study farther south than Brazoria County even though spot checks were made as far south as Aransas County. Within their remaining range, red wolves were not found more than 50 miles inland. Thus, we see that the range of the red wolf is still declining.

Population fluctuations have been apparent within the remaining range during the past few years. The high Jefferson County population experienced a severe decline in 1969, perhaps due to density-dependent parasites and diseases. This decline was accompanied by severe cases of sarcoptic mange (*Sarcoptes scabiei*) noted in several wolves (Riley pers. comm.). The Chambers County population, on the other hand, seems to have rallied since 1964 when a trapper took 46 wolves within a 30-day period (Russel Clapper pers. comm.).

The authors know of no recent verification of Pimlott and Joslin's reports of red wolves in certain parts of Louisiana. However, reliable sources have found red wolves on the Moore Ranch in Cameron Parish, Louisiana at densities comparable to those in southern Chambers County (Glynn Riley, pers. comm.). Because of the heavily industrialized and canid-free zone around Lake Sabine, no gene flow is thought to occur between Texas and Louisiana populations.

The threat that red wolf x coyote or red wolf x dog hybridization poses to the survival of the remaining red wolves has been outlined by several authors (McCarley 1962, Nowak 1970, Paradiso 1968). "Strange-looking canids and smaller animals" have recently been seen and trapped within the last stronghold of the red wolf (Glynn Riley, pers. comm.). Interestingly enough, we heard no intermediate or indistinguishable howls in all of our survey; all were distinctly coyote, red wolf or dog.

With problems of range reduction, habitat loss, hunting and trapping pressure, and the possible infusion of foreign genes, the survival of the red wolf in Texas is in critical danger. The animal is totally unprotected and its endangered status is not generally known to the public, even in those areas in which it still occurs. Unless the serious plight of the red wolf is much better publicized, and unless some protective measures and management plans are instigated very soon, we believe that this species, once indigenous to the entire southeastern United States, will completely disappear within this decade.

ACKNOWLEDGMENTS

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LITERATURE CITED

- Bliss, C. I. and R. A. Fisher. 1953. Fitting the negative binomial distribution to biological data. *Biometrics* 9(2): 176-196.
- Cahalane, V. H. 1964. A preliminary study of distribution and numbers of cougar, grizzly and wolf in North America. *N. Y. Zool. Soc.* 12 pp.
- Davis, W. B. 1966. The mammals of Texas. Texas Parks and Wildlife Department. Austin. 112-113.

- McCarley, H. 1962. The taxonomic status of wild *Canis* (Canidae) in the south central United States. *S. W. Nat.* 7(3-4): 227-235.
- Moyle, J. B. and R. Lound. 1960. Confidence limits associated with means and medians of series of net catches. *Trans. Amer. Fish. Soc.* 89(1): 53-58.
- Nowak, R. M. 1970. Report on the red wolf. *Defenders of Wildlife News.* 45(1): 82-94.
- Paradiso, J. L. 1968. Canids recently collected in East Texas, with comments on the taxonomy of the red wolf. *S. W. Nat.* 80(2): 529-534.
- Pimlott, D. H. and P. W. Joslin. 1968. The status and distribution of the red wolf. *Trans. 33rd N. A. Wildl. and Nat. Res. Conf.* 373-389.
- Russell, D. N. and J. H. Shaw. 1971. Notes on the red wolf (*Canis rufus*) in the coastal marshes and prairies of eastern Texas. *Pres. Tex. Acad. Sci.* reprint available. 5 pp.
- Snedecor, G. W. and W. G. Cochran. 1967. *Statistical methods*, 6th Ed. Iowa St. Univ. Press, Ames. 593 pp.
- Theberge, J. B. and J. B. Falls. 1967. Howling as a means of communication in timber wolves. *Amer. Zool.* 7: 331-338.
- Young, S. P. and E. A. Goldman. 1944. *The wolves of North America.* American Wildlife Institute, Wash. 636 pp.

“DOVE” PROSO MILLET—NEW MOURNING DOVE FOOD?

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ABSTRACT

“Dove” proso millet (*Panicum miliaceum* L.), a new variety of proso millet, is being planted to attract doves in the Southeast. A food habit study was initiated to determine the desirability of dove proso as a mourning dove (*Zenaidura macroura*) food as compared with browntop millet (*Panicum ramosum* L.). Field trial plantings of equal acreages of dove proso and browntop millet were made in nine counties of South Carolina from 1966-1970. Crops of 152 mourning doves were collected and analyzed. Eighty-six of the crops were collected from a single trial field on Oakland Club, Berkeley County. Volumetrically, dove proso comprised 25.4 percent and browntop millet 13.4 percent of the total food consumed. The percent frequency of use was not significantly different. The frequencies of use of dove proso and browntop millet were 53.3 percent and 50.7 percent respectively. The method of planting dove proso is described, with some of the problems encountered with dove proso in dove fields.

INTRODUCTION

“Dove” proso millet, introduced from India by plant materials specialists of the Soil Conservation Service, is being planted in fields to attract mourning doves in the Southeast. This study compared dove proso with browntop millet to determine if dove proso is as choice a dove food as browntop millet. Mourning doves were collected from dove fields with approximately equal plantings of dove proso and browntop millet. A crop analysis was the method of making the comparison. Browntop millet is reported by Neely (1961) to be a choice food for attracting doves and produces successful dove fields that are economical. Dove proso seed is presently more expensive than browntop millet seed and if dove proso is not as choice a dove food as browntop millet, it would be uneconomical to continue to plant the dove proso.