

**Canids Recently Collected in East Texas, with Comments on the Taxonomy of the Red Wolf**



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## Notes and Discussion

### Canids Recently Collected in East Texas, with Comments on the Taxonomy of the Red Wolf

**ABSTRACT:** *Data on 279 canid skulls collected in east Texas after 1960 are presented and discussed. The skulls vary from those typical of the red wolf to those typical of the coyote, with every intermediate type represented. A possible interpretation of this wide variation is that various altered environmental factors are causing massive hybridization between red wolves and coyotes in east Texas, resulting in a single interbreeding population of great diversity. Possibly this interbreeding should be regarded merely as intergradation, which would imply only subspecific differentiation of red wolf and coyote. But proposal of such a taxonomic change is postponed until the completion of more detailed analyses that are now under way. The assignment of eastern races of red wolf to conspecific status with gray wolf is held to lack sufficient basis for acceptance. To avoid further complicating the taxonomy of North American canids, it is suggested that treatment of the red wolf as a full species be continued until further studies are completed that may throw more light on its relationships to the wolf and to the coyote.*

The Bureau of Sport Fisheries and Wildlife has accumulated at its Bird and Mammal Laboratories in the U. S. National Museum the skulls of 377 wild canids collected since 1962 in Arkansas, Oklahoma, and east Texas. Although a comprehensive study, now under way, of these skulls is incomplete, preliminary results are offered now because they conceivably could be useful in efforts to prevent the extinction of the red wolf.

All of the 98 newly collected skulls from Arkansas and Oklahoma are readily recognizable as those of coyotes. Many of the 279 skulls from as far west as Denton, Hamilton, and Bell counties in east Texas, on the other hand, are not clearly identifiable.

To identify these skulls, it was necessary to determine what cranial characters were diagnostic in separating coyotes from red wolves. In ascertaining such characters, 155 adult specimens of the coyote (*Canis latrans texensis*) in the National collections from central and western Texas were carefully studied. The adult status of each was determined by evaluation of tooth wear, suture closure, and development of sagittal crest.

The sample of the red wolf consisted of skulls of 73 adults collected prior to 1930 in Arkansas and Louisiana and identified as *Canis niger gregoryi* by E. A. Goldman. Specimens of red wolf from Alabama and Florida were examined, but were not used because they are from populations far removed geographically from east Texas. The bulk of the material used was from central Arkansas. In Arkansas prior to 1930 coyotes were recorded only from the extreme northern and western parts of the state (Young and Jackson, 1951: 14). Indeed, coyotes only recently have been reported from elsewhere in Arkansas (Paradiso, 1967). Consequently, the possibility of coyotes or coyote-red wolf hybrids being included in the pre-1930 sample was minimal.

The only constant character found to separate skulls of the red wolf and coyote was size. There was no overlap in size in the samples between the smallest male red wolf and the largest male coyote; the same was true for females. Difference in size can be expressed by the three cranial measurements: Greatest length, taken along a straight line from the gnathion (on premaxillae) to the posteriormost tip of sagittal crest; condylobasal length; and zygomatic breadth.

When the post-1960 series of canids from east Texas was compared with

the pre-1930 sample of the red wolf and the sample of the coyote from west Texas, it was found that the post-1960 series from east Texas spanned the size gap between red wolf and coyote, with every intermediate size represented. All of the east Texas material of one sex was combined because no fundamental differences could be observed in series from different collecting stations. Large, small, and intermediate individuals occurred at different places in east Texas.

The variation in size in the three samples studied is shown in Figure 1, based on adult males only. Furthermore, greatest length of skull plotted against number of individuals (Fig. 2) reveals that 27 animals from east Texas are intermediate between the smallest red wolf and largest coyote. The other 63 animals fall off at either extreme. Figures 3 and 4, graphs of condylobasal length and zygomatic breadth, show essentially the same pattern of distribution. The fact that each figure (2 to 4) yields a unimodal instead of a bimodal curve, suggests among other things that two sympatric species have not been combined in the analysis. It appears that in east Texas an interbreeding population of wild canids bridges the size gap between red wolf and coyote. The upper size limit in the sample overlaps the size range of red wolves and the lower size limit overlaps that of coyotes. Many individuals, however, are intermediate between the two.

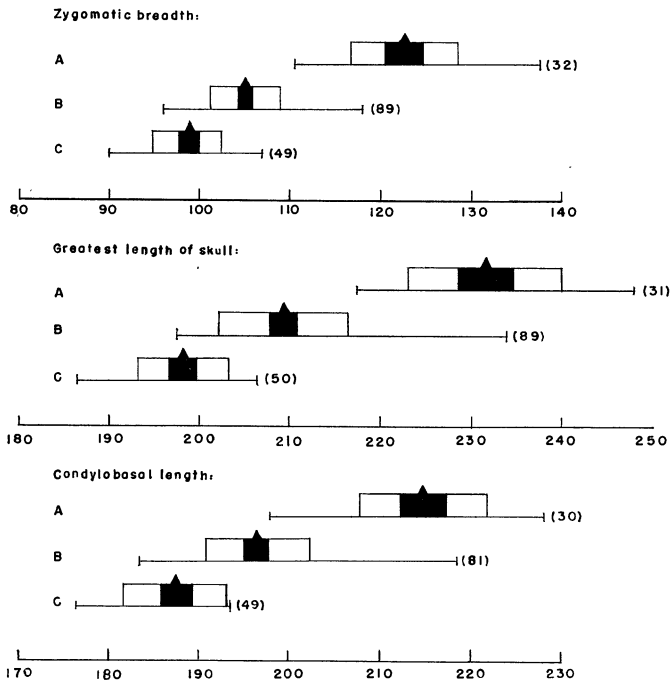


Fig. 1.—Cranial measurements of three populations of adult male canids. (A) Eastern red wolves; (B) east Texas canids; (C) central and west Texas coyotes. Horizontal line is range; black bar plus white bar is one standard deviation on either side of mean; black bar is two standard errors of mean on either side of mean. Mean is at apex of triangle on top of bar. Sample size is indicated to the right of each histogram.

I suspect that the red wolf and coyote occurred, until rather recently, as relatively pure, almost unmixed, primarily allopatric species — the red wolf in the woodlands and coastal prairies of the southeastern United States, and the coyote on the western plains. With the rapid deforestation of the southeastern United States in the present century, interdigitation of the two habitats occurred, permitting a massive confrontation of the two kinds of canids and probably resulted in more extensive interbreeding than formerly occurred. The virtual extirpation by man of the red wolf throughout much of its former range also may have been a factor in accelerating interbreeding. Because of this crossbreeding it could be argued that the red wolf and coyote are only subspecies of a single species. However, I am not at this time advocating such a taxonomic arrangement because I feel that additional studies should be undertaken and completed to prove, if possible, that it is or is not the fact.

A recent paper by Lawrence and Bossert (1967) is pertinent to this and requires comment. On the basis of multiple character analysis and application of a technique of linear discrimination, they find that southeastern red wolves (Louisiana, Alabama, and Florida specimens) resemble more closely gray wolves (*Canis lupus*) than they do coyotes, and they feel that the red wolf should be classified as only subspecifically distinct from the gray wolf. If

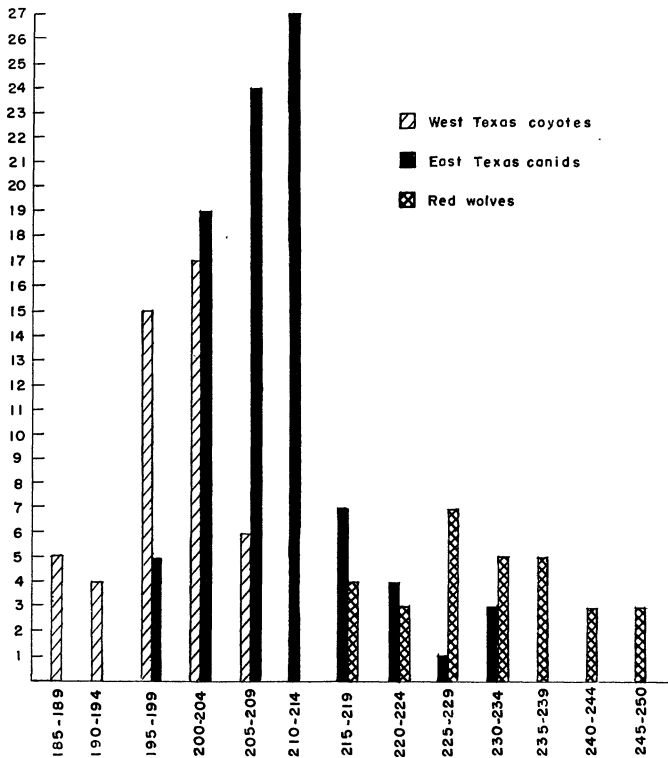


Fig. 2.—Greatest length of skulls of adult males of three canid populations. Size (in mm) plotted against number of individuals.

they are correct, the east Texas canids would appear to be hybrids between two otherwise well-differentiated species. It is conceivable that while coyotes and gray wolves do maintain themselves as distinct species throughout most of their overlapping ranges, genetic factors related to the history of differentiation of the various populations may have produced a lesser degree of reproductive isolation in east Texas. For example, one possibility along this line is that coyotes actually evolved in east Texas from small southeastern gray wolves, adapting to prairie environment to such an extent that they became reproductively isolated from gray wolf populations elsewhere. Another possibility is that the red wolf is the parental stock for both the gray wolf and the coyote. A thorough survey of the paleontological record would be necessary to confirm, if possible, these or other hypotheses.

However, it has not as yet been demonstrated to my satisfaction that the red wolf and gray wolf actually are conspecific. The method used by Lawrence and Bossert relies on one set of relatively small samples (a "biased random selection" of 20 coyotes, 20 gray wolves, and an unspecified number of red wolves) and the information from these samples is analyzed by deriving the discriminant functions and coefficients so as to obtain a basis for classification. In generalizing from statistical analyses of samples, each of the samples must be large enough to be representative of a population of one sex, of one age,

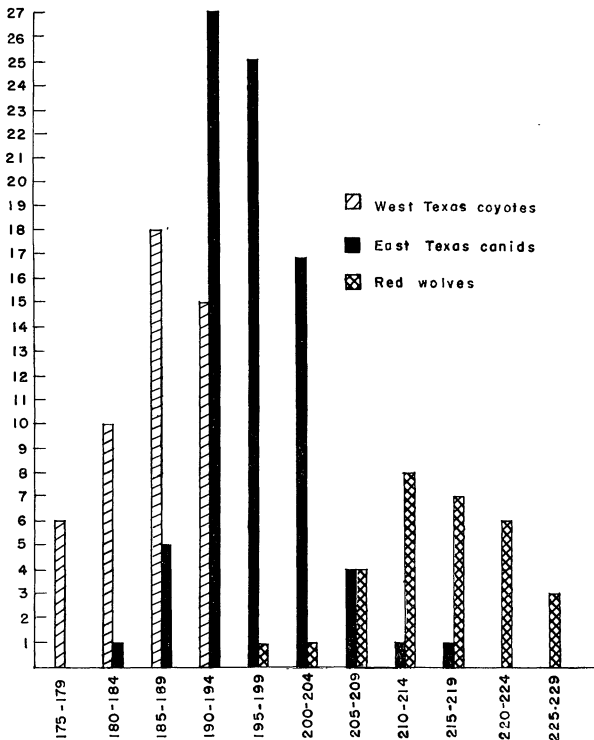


Fig. 3.—Condylbasal length in skulls of adult males of three canid populations. Size (in mm) plotted against number of individuals.

from one geographic area; and the populations should be comparable in these several aspects. Lawrence and Bossert have given no evidence that their samples were adequate in these respects. In addition, in problems involving the classification of animals into one of several categories, especially when dealing with animals as variable as canids are known to be, it may be necessary to analyze a number of sets of samples from the populations in order to insure stability of results and to arrive at firm generalizations.

Therefore, the conspecificity of the gray wolf and red wolf has not to my mind been sufficiently demonstrated. Indeed, I have found that the red wolf and the gray wolf differ in a number of trenchant characters. Some of these are:

*Gray wolf*: bulging frontal region; short broad rostrum; widely flaring zygomata; absence generally of protocone on upper PM 4; lack of deep molar sculpturing; short, heavy canines.

*Red wolf*: flat frontal region; long slender rostrum; relatively narrow breadth across zygomata; protocone generally present on upper PM 4; molar teeth deeply sculptured; long, slender canines.

In all of these cranial details the red wolf resembles the coyote.

Pending further studies, Goldman's concept of the speciation of North American canids (Young and Goldman, 1944), in which three species (gray wolf, coyote, and red wolf) are recognized, remains acceptable. The east Texas canids discussed herein may tentatively be regarded, in Goldman's taxonomic framework, as an interbreeding population of red wolf and coyote. He

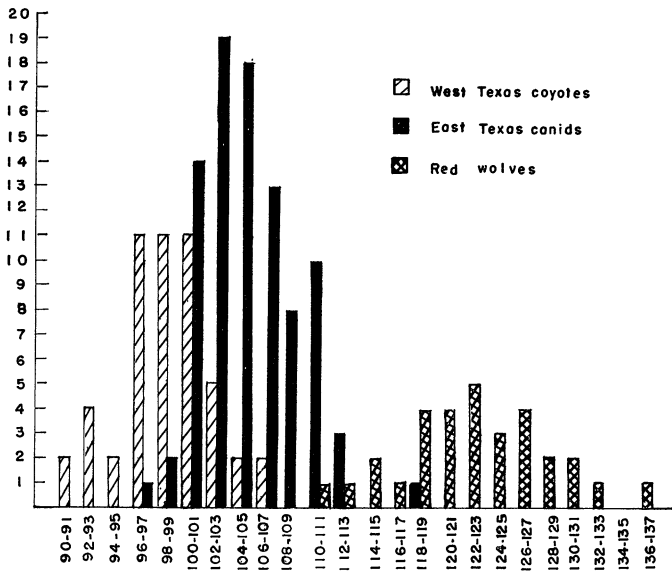


Fig. 4.—Zygomatic breadth in skulls of adult males of three canid populations. Size (in mm) plotted against number of individuals.

recognized the close relationship of these two forms, and noted that some specimens from Texas were intermediate between them. He regarded such intermediates as hybrids between two species rather than as intergrades between two subspecies (*op. cit.*, p. 488). The recently collected Texas material suggests that hybridization has increased greatly since Goldman's material was collected. Although this makes the classification of these canids more complicated and involved than it did when he surveyed them, I think it is premature to alter his taxonomic arrangement.

A nomenclatural change, however, is necessary with regard to the red wolf. As pointed out by Nowak (1967:60, 62), the name *Canis niger*, used since 1942 (Harper, 1942:339) for the red wolf, dates from Bartram's "Travels. . ." 1791. The International Commission on Zoological Nomenclature, on 29 January 1957, in Opinion 447, placed this book on its official list of invalid works, and the name *C. niger* is not available on the specific or subspecific level for the red wolf. The next oldest name for the red wolf is *Canis rufus* Audubon and Bachman 1851. No type locality or type specimen was designated, but Goldman (1937) restricted the type locality to 15 miles west of Austin, Texas. Goldman stated that specimens from Llano and Burnet in adjoining counties to the northwest were typical. He designated no neotype, but the name *rufus* as he used it refers to the larger canids in this area, which are like red wolves in character, rather than coyotes or obvious coyote-red wolf hybrids. The name *Canis rufus*, therefore, applies to the red wolf and is the specific name that I would use at present for the species throughout its range from Florida to Texas.

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