RESUME

VOCALIZATION PATTERNS IN WILD RED WOLVES, COYOTES AND HYBRIDS

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To determine the feasibility of using vocalization for field identification, tape recordings of vocal responses of wild coyotes, red wolves and hybrids were obtained in south-central United States. Red wolves and hybrids were recorded only in southeastern Texas and southwestern Louisiana.

Spectral analysis of tape recordings was with a Kay Electric Co. Sonagraph. On the basis of data in hand there was overlap of Hz at beginning, middle and end and in duration of coyote and red wolf howls. Further there was a cline of high to low frequencies and short to long duration converging from Arkansas, Oklahoma and most of Texas toward southeastern Texas and southwestern Louisiana, the present red wolf range. Because three types of animals; red wolves, hybrids and coyotes were present in the red wolf range there was, in fact, a continuum of all vocalization characteristics with coyotes representing one extreme end of the spectrum, red wolves the other extreme and hybrids assorted in between. Nevertheless, on the basis of duration, average Hz, type of beginning, type of ending and general configuration most vocalizations from animals within the red wolf range can be identified using spectral analysis.

These criteria are presently being used to assess and evaluate the local distribution and social interaction of the various kinds of canids in southeastern Texas.

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From

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INTRODUCTION

This study was designed to find out whether vocalization patterns of wild coyotes (*C. latrans*) and wild red wolves (*C. rufus*) were sufficiently species-specific for field identification. Implicit in the study was the development of techniques useful for assessing present red wolf-coyote interrelationships.

Vocal responses from wild canids were evoked by a variety of methods, but mostly by human vocal imitations. Spontaneous sounds were obtained when and where possible. Wild canid vocalizations were recorded in Arkansas - Stone Co., Louisiana -

Calcasieu[1] and Cameron[1] Parishes; Oklahoma - Bryan, Leflore, Marshall and McCurtain Counties; Texas - Archer, Brazoria, Chambers[1], Duval, Fannin, Grayson, Jefferson[1], Lamar, Matagorda, Nacogdoches, Red River, San Patricio, Titus and Webb Counties. The majority of recordings were obtained between Jan 1973 and Sept 1974.

Analysis of tape recordings was with a Kay Electric Co. Sound Analyzer (Sonagraph). Evaluation of resulting sonagrams provided data on (1) pattern or configuration of vocalization, (2) Hz of fundamental frequency at beginning, middle and end of sound and (3) duration of sound.

A baseline for the range of variation of coyote vocalization was established using coyote populations in three South Texas counties (Duval, San Patricio and Webb). These populations were selected because there was no suggestion of hybridization with other canid groups (Paradiso and Nowak, 1971, Spec. Sci. Rep. Wildlife No. 145, Fish and Wildlife Service, Washington).

Determination of the range of variation for red wolf vocalization was considerably more difficult than for coyotes and in all honesty has not yet been firmly established. Russell and Shaw (1971 Proc. 25th Ann. Conf., Southeast Assoc. Game and Fish Comm.) published a sonagram of the first 2.4 seconds of a presumed red wolf howl. The quality of reproduction was too poor to be of much value and their discussion of harmonics, pitch and duration were

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1 Counties included in currently recognized red wolf range and the only areas where presumed red wolves were heard and/or recorded.

difficult to reconcile with my data from the same area. A recording of a captive red wolf, made by Mrs. R. T. Odum of Vinton, La. in Dec 1971 was loaned to me. Considerable harmonic distortion and wind noise was present in her recording, but I was able to produce some sonagrams of the howls of this captive animal ("Lobo"). Recordings were also secured of a red wolf in the Oklahoma City Zoo. Whether these animals were good red wolves is, however, open to interpretation. Pimlott and Joslin (1968, Trans. 33rd N. Amer. Wildlife & Nat. Res. Conf., Wildlife Manage. Inst.) and others reported the howl of a red wolf to be similar to that of the timber wolf (*C. lupus*) and with the help of L. David Mech and Fred Harrington, recordings of wild *lupus* were secured in Superior National Forest. Within the red wolf range, vocalization responses ranged from those very similar to timber wolves and captive red wolves to those clearly from coyotes. Consequently to arrive at any sort of standard for red wolf vocalization, I was forced into the circular reasoning that in the red wolf range those animals vocalizing most like captive red wolves and wild *lupus* and least like coyotes were presumed red wolves.[1]

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1. On 4,5,6 Dec 1974 recordings of the vocalization of 11 known red wolves were obtained in the Point Defiance and Woodland Park Zoos in Tacoma and Seattle, Washington. Preliminary review of these recordings substantiates the discussion on comparison of red wolf and coyote vocalization.

Comparison of Red Wolf and Coyote Vocalization

On the basis of available data the evoked vocal repertoire of coyotes and red wolves included about the same type sounds with the exception of two coyote sounds I have named the laugh and the gargle. The infrequent occurrence, however, of these two sounds in evoked coyote responses reduced their usefulness as a distinguishing characteristic.

Evaluation of the sonagrams of chorus responses of all canid groups from the south central U. S. showed an almost complete continuum from the very chopped-up response of coyotes to the very smooth and harmonious response of presumed red wolves. The choppiness and irregularity of coyote responses was due to the short duration of long sounds, the sharp rise and fall in pitch of the long sounds and the presence of many short sounds (yelps and hackles). In red wolves, the smoothness was the result of much longer duration of long sounds and the near-absence of yelps and hackles (at least in adults).

The most common vocalization of both red wolves and coyotes was a sound designated the flat howl. It was easily identified and was the most useful single sound type by which to distinguish the two forms. Paul Joslin (in an undated report to the IUCN on the status of the red wolf) said, "The only reasonably reliable way to differentiate red wolves from coyotes in the field was on the basis of voice characteristics. The coyote has a peculiarly sharp rise in pitch to its call which the wolf call lacks. Moreover, its call is much higher in pitch generally and each call is usually of much shorter duration".

Data presented in Table 1, however, show there was no sharp statistical distinction in frequencies (pitch) and duration of known coyote howls (San Patricio, Webb and Duval Counties) from the howls of all animals in the red wolf range. The data in Table 1 for the East Bay Bayou and Yellow Tank animals describe the variation and pitch of red wolf flat howls. Fig. 1 shows a treatment of the highest fundamental frequencies in graphic form. In this case a non-overlap of 2 standard errors of the mean indicates a significant difference at the .05 percent level. On this basis only the San Patricio, Webb, and Duval County samples differed significantly from all other samples. Similar treatment of beginning and ending frequencies showed similar results. Thus there was a wide overlap of lower Hz of coyote howls with upper Hz of presumed red wolf Hz. These data do support Joslin's statement, but they also show that in the south central U. S. in 1973 and 1974, a simple evaluation and comparison of fundamental Hz and duration was inadequate to distinguish all animals as either coyote or red wolf, simply because one does not know where to draw the dividing line.

Fig. 2 shows another approach to the problem. Here, beginning, middle (highest) and ending frequencies for flat howls were plotted against duration for selected canid groups. This sort of display shows that, on the average, the flat howls of coyotes have a distinctive configuration differing markedly from most animals in the red wolf range. Again, Fig. 2 shows, to a degree, the differences to which Joslin referred.

The data presented in Table 1 and Figs. 1 and 2 show rather clearly there were no absolute quantitative differences separating all coyote howls from all presumed red wolf howls. These data do show, however, that fundamental frequencies, duration and configuration are important in distinguishing the vocalizations of coyotes and red wolves. If the sum of the beginning, highest and ending frequencies of the flat howl was divided by the duration of the howl an index number was produced. Using this technique a lumping of all coyote flat howls produced an index above 600. When the same technique was applied to individual coyote flat howls from South Texas, 96 percent of the flat howls had an index number above 600. Within the red wolf range the flat howls from presumed red wolves had an index below 400. The howls of certain animals regarded as questionable or of hybrid nature produced index numbers between 400 and 600. The danger of this sort of approach is that the responding animal was seldom seen and in the red wolf range where three general types of animals occur, there was no way to be certain what the animals looked like.

An additional and very helpful diagnostic clue to the identity of the vocalizing animal was the manner in which the flat howl began. In coyotes the highest fundamental frequency of the howl was usually achieved within .2 sec from beginning and nearly always prior to the midpoint. Presumed red wolf howls did not achieve peak frequency until at least .6 second after beginning and often not until after the midpoint of the howl had passed. I think Joslin was referring to this in his comment on the "peculiarly sharp rise in pitch of coyotes." Further, the last .2-.4 sec of a coyote flat howl was generally of the same amplitude as preceeding sound and in the last .1-.2 sec there was usually a sharp drop in pitch. In red wolves the howl (as in lupus) ordinarily loses amplitude gradually in the last portion of the howl and while the pitch may drop, it was a gradual drop rather than a sharp drop.

The amount of barking in a vocal response was probably, in part, a reflection of the distance of the animals from the point of evocation; the closer the animals the more barking. The bark of a red wolf, however, has a different quality than the bark of a coyote. (This may simply be an indication of size of the animal.) Both barks were explosive sounds but sonagrams of coyote barks nearly always showed one or more clear harmonics, and sonagrams of presumed wolf barks showed no clear harmonics. Phonetically, these were distinguished as the yap bark of a coyote and the cough or thump bark of a red wolf.

In summary, this study revealed there were, on the average, distinguishable differences in the vocalization of coyotes and red wolves, but these differences were more qualitative than quantitative. Diagnosis depended largely on a subjective judgement based on type of vocalization, dominant frequency, duration and vocalization configuration. Identification of animals within the red wolf range was fairly clear for coyotes and red wolves which represented opposite extremes of a spectrum of variation. The presence of hybrid type animals with intermediate vocalizations greatly complicated the identification and those animals vocalizing in an intermediate manner cannot positively be identified as to species.

This study is continuing under a contract effective 1 Nov 1974, with the Regional Office, U. S. Fish and Wildlife Service, Albuquerque, New Mexico, using my evaluation of recordings made by U. S. Fish and Wildlife Service personnel. The objective of this ongoing research is to use the techniques developed with support from National Geographic Society and World Wildlife Fund to help identify, evaluate and assess the distribution and social relationships of the kinds of canids now present in the red wolf range.

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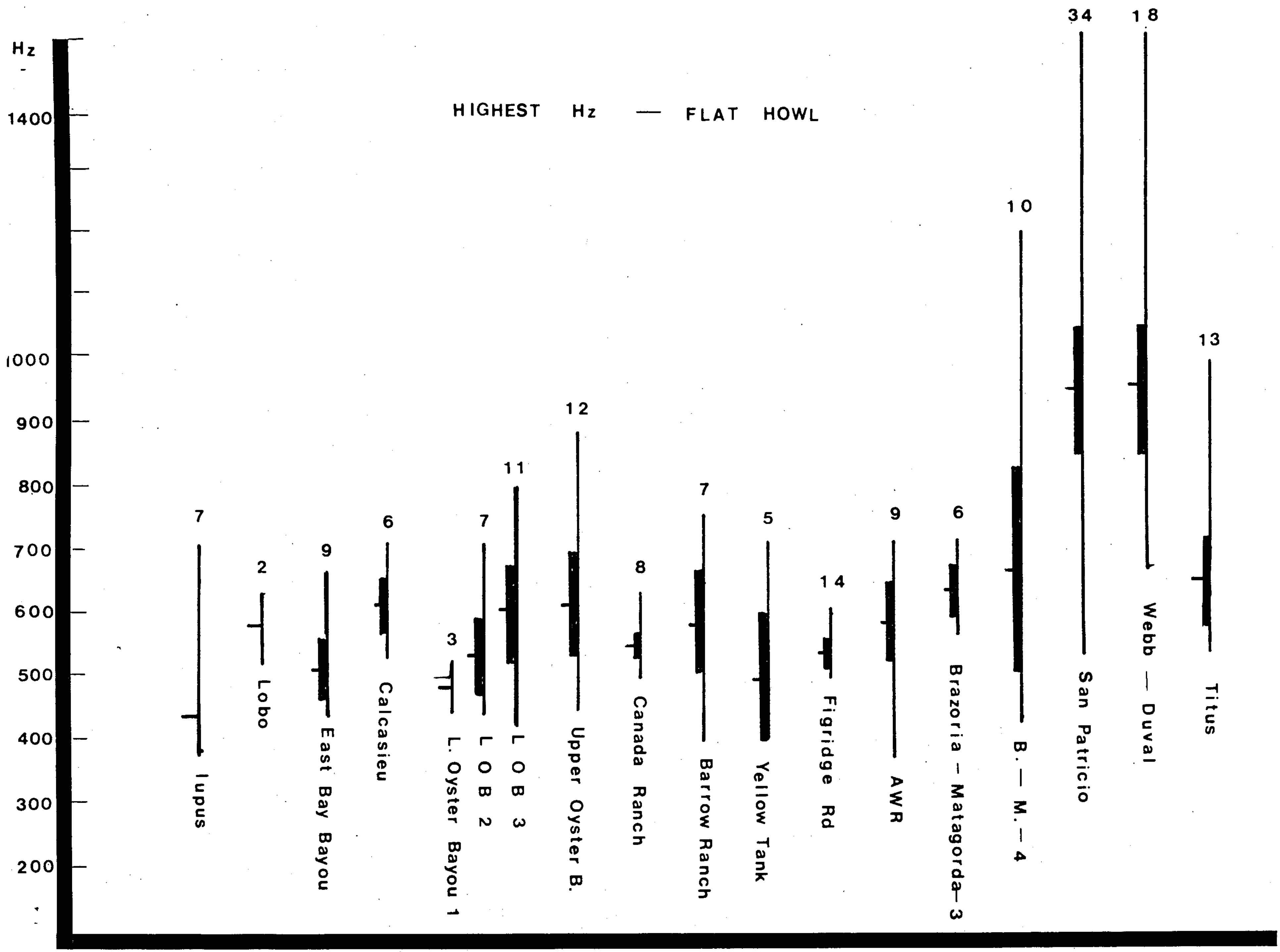
Table 1. Variation in fundamental frequencies of flat howls of selected canid groups. The mean, standard error of mean and extremes are shown for beginning, middle (highest) and ending frequencies. The same data are given for duration. [1]Baseline reference for coyotes; [2]presumed hybrid population; [3]typical East Texas canids; [4]packs within currently recognized red wolf range. The Yellow Tank and East Bay Bayou packs are probably the best examples of red wolves.

LOCALITY	N	BEGINNING Hz	MIDDLE Hz	ENDING Hz	DURATION
San Patricio Co.[1]	34	680±25(475-1260)	946±53(528-1500)	688±26(366-1126)	2.0±.12(1.0-3.8)
Webb-Duval Cos.[1]	18	639±19(495- 792)	943±54(660-1500)	697±23(563- 880)	2.4±.18(1.4-4.2)
Brazoria-Matagorda[2]	23	682±28(594- 935)	736±43(420-1188)	667±42(396-1126)	2.4±.20(1.2-4.4)
Titus Co.[3]	13	605±33(440- 880)	638±37(528- 990)	592±40(420- 935)	3.0±.18(1.6-3.9)
AWR[4]	9	511±60(375- 630)	579±32(375- 704)	566±44(475 -660)	2.1±.78(1.0-3.2)
Upper Oyster Bayou[4]	12	429±13(375- 528)	501±19(440- 660)	435±19(375- 594)	3.5±.42(1.0-5.3)
Lower Oyster Bayou[4]	11	555±15(420- 594)	603±43(420- 792)	412±26(295- 563)	3.0±.24(1.9-3.9)
Barrow Ranch[4]	7	482±56(375- 660)	581±42(396- 750)	482±33(396- 563)	4.2±.34(2.6-4.8)
Calcasieu Parish[4]	6	573±44(475- 660)	608±23(528- 704)	562±54(440- 704)	5.5±.41(3.8-5.8)
Canada Ranch[4]	8	545±35(495- 594)	545±13(495- 630)	486±34(475- 563)	4.9±.03(4.8-4.9)
Yellow Tank[4]	5	467±41(375- 630)	491±50(396- 704)	502±49(396- 704)	3.8±.71(1.2-5.7)
East Bay Bayou[4]	9	438±13(396- 528)	507±24(440- 660)	420±16(375- 495)	3.6±.57(1.0-5.3)

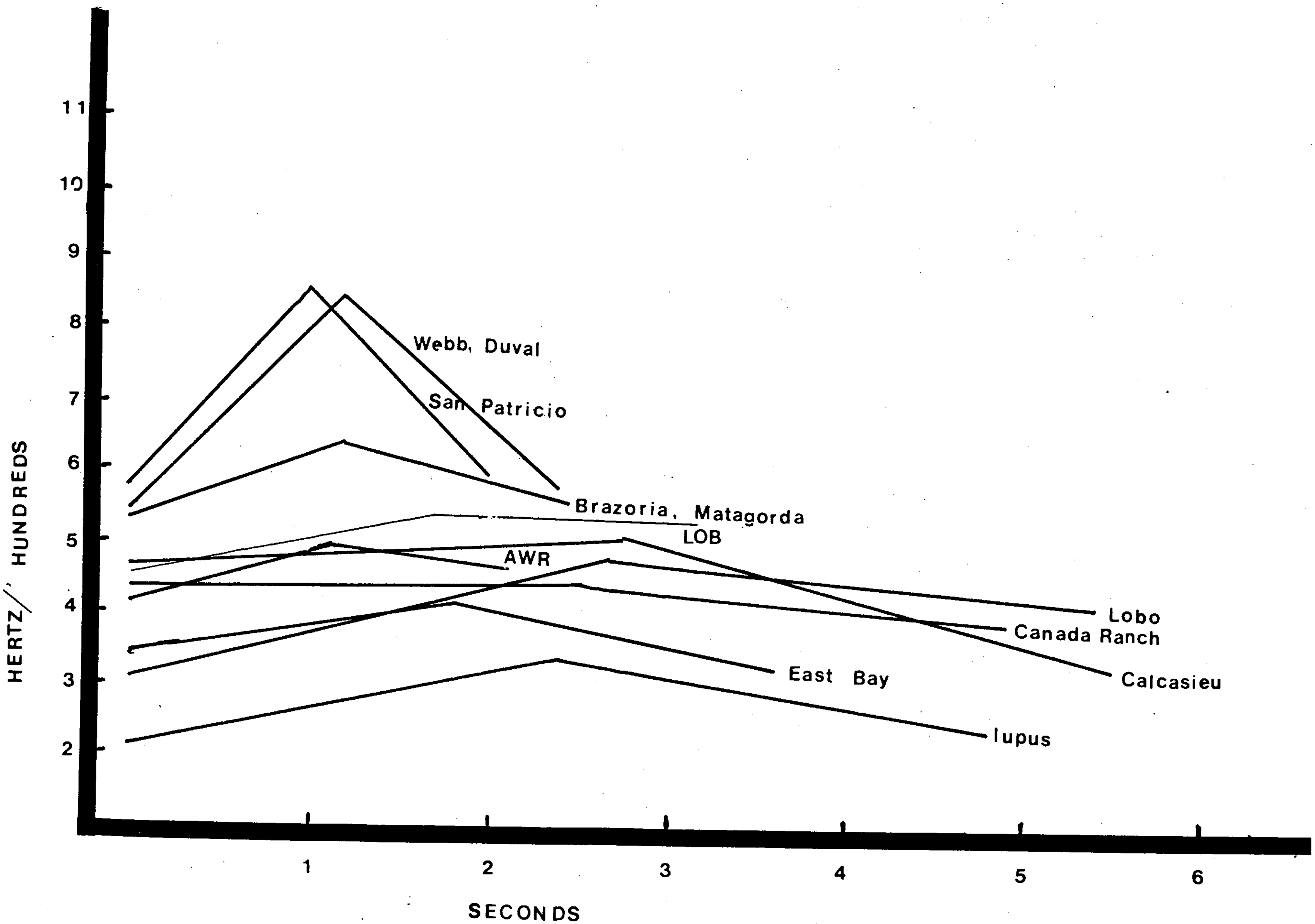
Fig. 1 The mean, extremes, and 2X the SE of the mean on each side of the mean for the highest fundamental Hz of flat howls of 16 canid groups from Texas and Louisiana, one captive red wolf (Lobo), and one *C. lupus* group from Minnesota. Sample size is shown at top of each plotting.



HIGHEST Hz — FLAT HOWL
Hz
1400
1000
900
800
700
600
500
400
300
200
7
2
9
6
3
7
11
12
8
7
5
14
9
6
10
34
18
13
lupus
Lobo
East Bay Bayou
Calcasieu
L. Oyster Bayou 1
L O B 2
L O B 3
Upper Oyster B.
Canada Ranch
Barrow Ranch
Yellow Tank
Figridge Rd
AWR
Brazoria – Matagorda–3
B. — M. – 4
San Patricio
Webb — Duval
Titus

Fig. 1.

Fig. 2. The configuration of flat howls of selected canid groups from south-central United States based on beginning, middle (highest), ending fundamental Hz and duration. The Webb, Duval and San Patricio groups represent typical coyote flat howls. The *lupus* configuration is based on 7 flat howls from Minnesota grey wolves. The East Bay, Calcasieu, Canada Ranch and Lobo groups represent presumed red wolves. AWR (Anahuac Wildlife Refuge), LOB (Lower Oyster Bayou) and Brazoria, Matagorda groups represent packs of probable hybrid origin.



HERTZ/ HUNDREDS
11
10
9
8
7
6
5
4
3
2
Webb, Duval
San Patricio
Brazoria, Matagorda
LOB
AWR
Lobo
Canada Ranch
East Bay
Calcasieu
lupus
1
2
3
4
5
6
SECONDS

Fig. 2.