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Comments On Red Wolf Taxonomy

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Introduction

Dowling et al. (1992) point out that results presented by Wayne and Jenks (1991) added to the controversy concerning the specific and conservation status of the red wolf (*Canis rufus*). Their assessment was correct as the results were used to challenge the integrity of the red wolf recovery program (Gittleman & Pimm 1991), and as rationale by the American Sheep Industry to petition the Secretary of Interior to remove the red wolf from the List of Endangered and Threatened Wildlife. The U.S. Fish and Wildlife Service determined that the petition did not present substantial information to warrant delisting (Henry 1992).

The debate over the origin of the red wolf is not new but rather has been brewing since the animal was classified as nearly extinct about 30 years ago (McCarley 1962). Some authorities consider the red wolf a full species, while others think it is a subspecies of the gray wolf (*Canis lupus*) or a hybrid resulting from interbreedings of gray wolves and coyotes (*Canis latrans*).

Dowling et al. (1992) point out potential problems with the interpretations presented by Wayne and Jenks (1991) and emphasize that no single data set should receive priority consideration when addressing taxonomic issues. We agree with Dowling et al. (1992) and below present data on red wolf behavior, ecology, and morphology that we feel should be considered when debating the origin of the species.

Behavioral, Ecological, and Morphological Studies

During the 1970s, four studies documented behavioral and ecological differences between red wolves and coyotes (Riley & McBride 1972; Carley 1975; Shaw 1975; McCarley 1977). All these researchers concluded that *C. rufus* was a valid taxon.

In 1986 the Red Wolf Recovery Program initiated a reintroduction project in the Alligator River National Wildlife Refuge in northeastern North Carolina (Phillips & Parker 1988; Phillips 1990; Parker & Phillips 1991). From September 1987 through August 1992, 42 captive-born wolves were released in the refuge and a minimum of 23 wolves were born in the wild. Intensive telemetric monitoring (over 7000 relocations) of these animals led to additional insight into red wolf behavior and ecology.

Reintroduced and wild-born red wolves were very social and most belonged to packs (i.e. extended families) that occupied territories. It was not unusual for yearling and 2-year-old wolves to associate with their parents, assist with pup-rearing, and restrict movements to natal home ranges. Red wolves were relatively intolerant to strange conspecifics, and intraspecific aggression led to the death of 7 wolves. A similar social structure was observed for red wolves in Texas and Louisiana (Riley & McBride 1972). Thus, in terms of sociality red wolves are similar to gray wolves (*Canis lupus*) (Mech 1970:38–146). In contrast, coyotes (*Canis latrans*) are often more asocial: animals belong to breeding pairs or small family groups, home ranges of groups often evince considerable overlap, pups often disperse before their

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second summer, and intraspecific aggression is not thought to be an important source of mortality (Gier 1975; Andrews & Boggess 1978; Danner & Smith 1980; Althoff & Gipson 1981; Bekoff & Wells 1982; Roy & Dorrance 1985; Windberg et al. 1985; Harrison 1986: 1–55; Gese et al. 1989; Person & Hirth 1991).

The ecological role of the red wolf is largely defined by its food habits. Analysis of 2000 scats indicated that white-tailed deer (*Odocoileus virginianus*) and raccoons (*Procyon lotor*) were the primary year-round food items for wolves in the refuge. Although some of the deer probably were eaten as carrion, we documented wolf predation of apparently healthy adult deer. Most raccoons probably were taken as live prey. Gray wolves also rely heavily on ungulates and sometimes make extensive use of medium-sized mammals (Mech 1970:168–192; Peterson 1977:49–66). In contrast, deer and raccoons are of tertiary or lesser importance to coyotes in southern States, use of deer tends to be seasonal (greatest during the fawning period and hunting season), and adult deer are usually eaten as carrion (Korschgen 1957; Fooks 1961; Wilson 1967; Gipson 1974; Meinzer et al. 1975; Michaelson & Goertz 1977; Smith & Kennedy 1983; Wooding et al. 1984; Lee 1986; Leopold & Krausman 1986; Blanton & Hill 1989; Windberg & Mitchell 1991).

Fourteen individuals comprised the founding stock for the red wolf captive breeding program. Every animal generated from the founding stock has conformed to the morphological standards for the species (Paradiso & Nowak 1972; Carley 1975). The red wolf is intermediate to the coyote and gray wolf in most physical characteristics (Bekoff 1977; Mech 1974; Paradiso & Nowak 1972). The disproportionately long legs and large ears of the red wolf are the two most obvious external features separating the species from both the coyote and gray wolf. Experienced observers usually can distinguish adults of the three species on the basis of these external features (Riley & McBride 1972). In addition to unique external features, the morphology of the red wolf brain and skull differ from other canids (McCarley 1962; Paradiso 1968; Atkins & Dillon 1971; Paradiso & Nowak 1971, 1973; Gipson et al. 1974; Freeman 1976; Elder & Hayden 1977; Atkins 1978; Nowak 1979)

Conclusions

In terms of behavior, ecology, and morphology red wolves have never exhibited the variability one would expect if the species originated from interbreedings of gray wolves and coyotes. Indeed, Wayne and Jenks (1991) noted that hybridization between coyotes and gray wolves in the northern United States and Canada does not produce red wolves. Data concerning red wolf form and function support that contention that red

wolves possess wolf-derived nuclear DNA that produces a wolf-like rather than a hybrid-like organism. Thus, it seems that *Canis rufus* is a valid taxon or, at the very least, a subspecies of *Canis lupus*.

We realize that the taxonomic identity of the red wolf cannot be unequivocally defined from available data. Accordingly, the Red Wolf Recovery Program has sponsored an analysis of the species' nuclear DNA and further investigations of wolf and coyote skull morphology.

Because young *Canis* show distinct and significant differences in behavioral ontogeny (Bekoff & Jamieson 1975; Bekoff 1978), the Recovery Program is also interested in sponsoring a study to analyze the development of agonistic and play behavior in red wolves. Linear discriminant function analysis would permit direct comparison to other studies of canid behavioral development and skull morphology. Bekoff (1978) and Bekoff et al. (1975) demonstrated the utility of using behavioral phenotypes to assess taxonomic relationships.

Additionally, the Recovery Program is considering sponsoring captive hybridization studies involving coyotes, red wolves, and gray wolves as this line of investigation has not been adequately addressed (Kolenosky 1971; Schmitz & Kolenosky 1985).

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