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Seasonal Reproduction of Vampire Bats and Its Relation to Seasonality of Bovine Rabies

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ABSTRACT: Studies of pregnancy and lactation in vampire bats (*Desmodus rotundus*) in northern Argentina over a 4 yr period showed an inverse relationship between prevalence of pregnancy and lactation, the consequence of birth and onset of lactation, which was correlated with the wet season. The seasonal influx of young susceptibles into the vampire population in the wet season coincided with the well known increase in vampire transmitted rabies in that season.

Key words: Vampire Bats, *Desmodus rotundus*, bovine rabies, seasonal reproduction, seasonality of rabies.

Observations of wildlife rabies in the Americas and Europe have indicated that this disease is seasonal. It has been suggested that the increase in number of cases in a population is due to the introduction of the susceptible young of the year, as in the case of foxes (*Vulpes vulpes*) (Carey et al., 1978; Bogel et al., 1976). In raccoon (*Procyon lotor*) rabies cases seem to increase during the breeding season (McLean, 1975). According to Johnson (1948), there is an increase in bovine rabies during the rainy season, which coincides with the breeding season of vampire bats (*Desmodus rotundus*). An increase in pregnancies and lactating vampire females also has been observed during the rainy season in Costa Rica and Mexico (Turner, 1975; Burns and Flores-Crespo, 1975). Observations indicated that cases of bovine rabies were prevalent during the wet season in Argentina, Paraguay, Venezuela and Trinidad (Quiroga et al., 1931; Kipshagen, 1930; Lord, 1976; Goodwin and Greenhall, 1961). In Venezuela a correlation was noted between bovine rabies and precipitation ($r = 0.83$) which was significant at the 95% level (Lord, 1976).

This study sought to establish whether there were seasonal changes in the prevalence of pregnancy and lactation in vam-

pire bats which breed throughout the year, and whether such changes if observed were possibly related to the well known increase in vampire bat transmitted bovine rabies during the wet season.

Vampire bats were captured with mist nets set at roosting sites and corrals in northern Argentina over a period of 4 yr as part of an investigation of the problem of vampire transmitted bovine rabies. Captured female vampire bats were routinely palpated to determine their reproductive condition. Some were sacrificed for rabies virus and antibody studies (Lord et al., 1975) and were examined internally for reproductive condition. Most were banded and released for home range and movement studies (Lord et al., 1976). A total of 1,929 female vampire bats were palpated for pregnancy; however, only 818 were examined for lactation.

Schmidt (1973) states that during the first 3 mo of age young vampire bats feed entirely on the milk of the mother and are later fed small quantities of blood mouth to mouth. By the age of 5 to 6 mo the young accompany their mothers to the prey, but some may suckle to the age of 9 mo. Schmidt (1974) also shows that the gestation period of vampire bats is about 205 days. The inverse relationship between pregnancy and lactation, the long duration of these events in this species, and the tendency for breeding to occur seasonally (Fig. 1), suggest that the majority of females probably gave birth only once a year. Observations that some females are pregnant and lactate throughout the year may reflect second pregnancies following abortion or late breeding of young females.

The suggestion of a relationship between increased pregnancy and lactation and the wet season (Turner, 1975) prompted an examination of our data in this re-

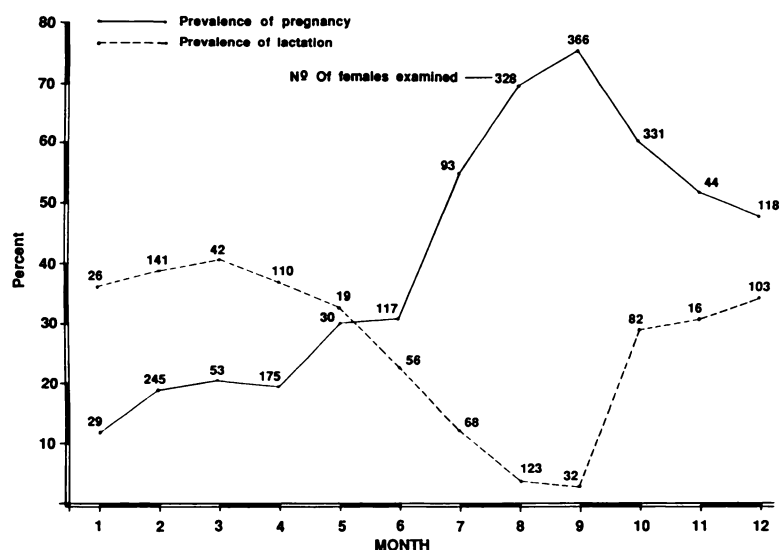


FIGURE 1. The prevalence of pregnancy and lactation in vampire bats in northern Argentina.

spect. Rainfall data for northern Argentina (Fig. 2) are an average of those reported for the Provinces of Misiones, Corrientes, and Santiago del Estero (De Aparicio, 1958). It is evident that there was a nearly inverse relationship between the prevalence of pregnancy and the rainfall pattern in Argentina (Fig. 2).

Turner (1975) suggested there was an increase in births in Central America during the wet season. In Argentina, this was reflected through fewer pregnancies and more lactating females, both of which agree with increased births during the wet season as suggested by Turner (1975).

A cause and effect between rainfall and vampire bat reproduction is not suggested. Instead, other aspects of vampire ecology observed in relation to season may have their effect. Vampire bat colonies in the dryer parts of northern Argentina roost in water wells. When wells go dry, vampire bats concentrate in wells still containing water. Conversely, when dry wells are recharged during the wet season, they disperse again. A similar situation was observed in a cave in northern Brazil which was occupied by a colony of vampire bats during the wet season when water flowed through the cave, but during the dry season the flow ceased and vampire bats were absent. Possibly the annual change in population density synchronizes breeding, which because of a 205 day gestation, occurs in the dry season when colonies are concentrated.

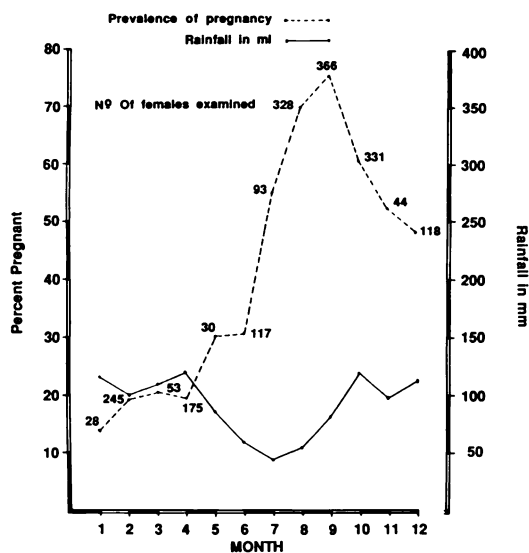


FIGURE 2. Prevalence of pregnancy in vampire bats and rainfall in northern Argentina.

Soon after the wet season begins and vampire bats are giving birth in increasing

numbers, as reflected by increased lactation, young vampire bats from the previous season are left increasingly on their own. The situation is similar to gray (*Urocyon cinereoargenteus*) and red foxes following weaning, when during fall dispersal an influx of young susceptibles into the population occurs, likewise in vampire bats, during the wet season there is also an increase of susceptibles into the population which can result in increased rabies transmission.

The social organization of vampire bats into principal colonies containing most of the females, and peripheral colonies with most of the males (Lord et al., 1981) may also play a role in the seasonal influx of young vampires into the mobile population. When no longer dependent on the female, young males are no longer accepted within the principal colonies, being repelled by the dominant male (Lord et al., 1981). Thus, they are forced to join the satellite colonies of bachelor males. In these all male colonies, fighting occurs with bites, as evidenced by scars seen on examination.

In conclusion, the seasonal breeding of vampire bats results in an influx of young susceptibles into the vampire bat population which coincides with the well known increase in vampire transmitted bovine rabies during the wet season.

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