

## The Behavior of the Bush Dog (*Speothos venaticus* Lund, 1842) in the Field: a Review

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Little is known about the behavior in the field of the bush dog *Speothos venaticus*, a rare South American canid species peculiar by its adaptation to forest living. We here review the available evidence about habits, home range and use, social organization, predatory behavior, and predators of the species, and report the use of different methods for possible location of bush dogs in the field. The difficulty of field research with bush dogs constitutes a challenge that has to be met given the endangered status of the species and its relevance from the view point of comparative studies on canid behavior.

**Index terms:** Bush dog. Behavior in the field. *Speothos venaticus*.

O comportamento do cachorro-vinagre (*Speothos venaticus* Lund, 1842) no campo: uma revisão. Pouco se sabe a respeito do comportamento do cachorro-vinagre, *Speothos venaticus*, uma espécie de cánido sul americano rara, peculiar por sua adaptação à vida em florestas. Passamos aqui em revista o conhecimento existente a respeito dos hábitos, da área de uso, da organização social, do comportamento predatório e dos possíveis predadores da espécie e relatamos vários métodos para a localização dos animais no campo. A dificuldade da pesquisa com cachorros vinagre constitui um desafio que merece ser encarado, dada a condição ameaçada da espécie e sua relevância como objeto de estudo para a compreensão comparativa do comportamento dos cánídeos.

**Descritores:** Cachorro vinagre. Comportamento no campo. *Speothos venaticus*.

The bush dog *Speothos venaticus* is a small canid (4 to 7 kg) which occurs from Panamá to Southern Brazil and Paraguay, extending west to Bolivia, Peru and Ecuador (Cabot, Serrano, Ibañez, & Braza, 1986; Cabrera & Yepes, 1940; Linares, 1967; Yahnke, Fox, & Colman, 1998). While widely distributed in Northern South America (Eisenberg, 1979), its presence has less frequently been reported in Southeastern (São João da Boa Vista and Lorena, State of São Paulo, Carvalho, 1979/1980) and Southern Brazil (Avila-Pires, 1999). There are three recognized subspecies: *S. v. panamensis*, small-sized and light-colored, found in Northwestern South America; *S. v. venaticus*, medium-sized and dark-

colored, found in the Amazon River basin; and *S. v. wingei*, light-colored, similar in size to *S. v. venaticus* and found in Southeastern Brazil (Linares, 1967). The species is extremely rare over most of its distribution area but was reported to be common in some sites of Surinam (Husson, 1978, cited by Strahl, Silva, & Goldstein, 1992). It is considered vulnerable by the IUCN and appears in CITES, Appendix I (Nowak, 1991).

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Little has been published about bush dogs. There are some reports on parasitology (Rausch & Bernstein, 1972; Volcan & Medrano, 1991) and captive reproduction of the species (Collier & Emerson, 1973; Darling & Whitehead, 1991; Jantschke, 1973; Kitchener, 1971) which will not be reviewed here. Behavior of bush dogs have been mostly observed in captivity and there are a few reports of sightings which will be listed and discussed here.

The scarcity of bush dogs, their endangered conservation status, the almost total absence of field studies and the scarcity even of anecdotal observations make any attempt to study the animals in their natural environment quite relevant and promising. We here review the existing literature on the species with an emphasis on natural history and aspects of social organization and we examine the prospects of field study of the species.

## Habits

Among the features which make *Speothos venaticus* peculiar are its forest dwelling and semi-aquatic habits (Langguth, 1975). Bush dogs have inter-digital membranes (Fox, 1975), and the sightings reported by Barnett, Shapley, and Engstrom (2001), Deutsch (1983), Linares (1967), Peres (1991) and one group sighted by Aquino and Puertas (1997) were all in the vicinity of rivers and streams or inside watercourses. A female was sighted swimming across the Negro River with two pups (Coimbra-Filho, 1972); a pair of bush dogs was observed swimming in the Caura River in Venezuela (Strahl et al., 1992). According to Tate (1931) and Strahl et al. (1992), bush dogs are able to pursue and kill pacas in the water. Cabrera and Yepes (1940) were told by Indian hunters that when a bush dog group is hunting a paca, part of the group chases it in the land and part of it waits for it in the water where the animal normally takes refuge from predators.

Captive studies also indicate the semi-aquatic habits of *Speothos venaticus*. Bates (1944) noted that a captive female spent a great deal of time in a water pond where she dived and

swam with ease. Seventy one percent of the bouts of object play of a captive group observed by Macdonald (1996) occurred in the water. At the Emas National Park, a *cerrado* (savanna) area of Central Brazil, however, three of nine sightings occurred at sites relatively near the water (200 meters); the other ones were at distances from 2,600 up to 5,700 meters from the water (Silveira, Jacomo, Rodrigues, & Diniz-Filho, 1998).

*Speothos venaticus* has mainly diurnal habits and thus differs from most small canid species, mainly crepuscular and nocturnal (Macdonald & Geffen, 1993). Most sightings of bush dogs occurred during daylight hours (Dalponte, 1995; Defler, 1986; Deutsch, 1983; Peres, 1991; Silveira et al., 1998; Strahl et al., 1992). Records in captivity conditions reinforce the idea that the animals are more active during the day (Kleiman, 1972).

The diurnal activity of the bush dog may be associated with the forest dwelling and semi-aquatic habits of the species, since thermoregulation is often a factor that forces canids to seek shelters during the day (e.g. *Cerdocyon thous*, see Beisiegel, 1999; Brady, 1979). Langguth (1975) states that the bush dog is the most specialized of a lineage of South American canids adapted for dwelling in forests, with characteristics adapted to this environment, such as short and robust limbs, small and rounded ears and tail, and "a modified pattern of pelage coloration" (p. 203).

*Speothos* lacks the body markings that in other canid species may draw the attention of conspecifics to body areas of great expressive value (Fox, 1970; Kleiman, 1967). In accord with the absence of body markings, their repertoire of visual communication is rigid and stereotyped when compared with other species of social canids (Villa, 2001). A large variety of contact calls, expressing motivational states of the sender, are however available. These calls may represent an adaptation to the demands of communicating in an environment which hinders visual contact at some distance (Brady, 1981; Villa, 2001).

## Behavior of the bush dog in the field

Bush dogs occupy different kinds of dens, mainly those dug by big armadillos (Coimbra-Filho, 1972). Aquino and Puertas (1997) described a tunnel-shaped den made in a fallen tree trunk. The sides of the tunnel had been worn smooth by the passage of animals, revealing a frequent use; dry and fresh feces were found all around the den (Biben, 1982b, however, states that bush dogs do not use feces for scent-marking). Other canids also defecate at the entrances of dens or near rest sites (*Chrysocyon brachyurus*, Dietz, 1984; *Vulpes macrotis*, Egoscue, 1962). There were however no feces near the resting site of bush dogs described by Linares (1967).

### Cooperative hunting and prey species

Unlike other small canid species, *Speothos venaticus* lives in social groups of up to 12 individuals that hunt cooperatively. This is suggested by observations made by Defler (1986), Peres (1991) and Strahl et al. (1992), as well as the information obtained by Peres in interviews with Amazonian people and by Strahl et al. (1992) with Venezuelan Indians. Cooperative behavior allows bush dogs to hunt and prey on animals bigger than themselves. Their main prey are probably the paca (*Agouti paca*) (Cabrera & Yepes, 1940; Deutsch, 1983; Peres, 1991; Strahl et al., 1992; Tate, 1931), the capybara (*Hydrochaeris hydrochaeris*) and the agouti (*Dasyprocta* spp.) (Aquino & Puertas, 1997; Peres, 1991; Silveira et al., 1998; Strahl et al., 1992). According to reports we obtained from people living at the surrounds of Serra das Araras, State of Mato Grosso, bush dogs can also hunt deer (*Mazama* spp.), collared peccaries (*Tayassu tajacu*) and armadillos (Dasypodidae). Bush dog dentition, with a reduced number of molars, indicates that they have a strictly carnivorous diet (Flower, 1880). The bush dogs' feces found in the Peruvian Amazon by Aquino & Puertas (1997) contained hairs of coati (*Nasua nasua*), agouti (*Dasyprocta fuliginosa*), smaller rodents (*Myoprocta pratti* or *Proechimys* sp.) and feathers similar to those of tinamous, terrestrial birds common in that area.

Captive *Speothos* pups are fearful when confronted individually with prey, but attack prey when in company of their parents. During the ingestion of a big prey, the parents position themselves at the extremes of the carcass, thus facilitating the dismembering of it by the pups (Biben, 1982a). These findings suggest that the social behavior of *Speothos* may be specialized for communal hunting. Episodes of communal hunting were observed in captivity (Macdonald, 1996) and in the field (e.g. Cabrera & Yepes, 1940). Although most sightings of bush dogs are sightings of groups of two to seven individuals (Aquino & Puertas, 1997; Barnett et al., 2001; Dalponte, 1995; Defler, 1986; Linares, 1967; Peres, 1991; Strahl et al., 1992) the sightings at Emas National Park were mostly of single individuals suggesting that in open areas bush dogs might rely on small prey and hunt alone (Silveira et al., 1998).

### Social organization

In captivity, parents are clearly dominant over all other members of the group (Macdonald, 1996). The alpha female was, in Macdonald's study, the only one to achieve reproduction; other animals displayed alloparental behaviors such as guarding, carrying and licking the pups. Aquino and Puertas (1997) met four bush dogs in the field in the Peruvian Amazon, two adults, one young and one pup. The adults were exploring an area of approximately 60 meters diameter around a pile of branches. Fifteen minutes after the first contact, a young dog, followed by a pup, emerged from the pile. The authors inferred that the juvenile was guarding the pup while parents foraged in the surrounding area.

In contrast to most canid species, bush dogs do not reproduce seasonally in captivity conditions (Porton, Kleiman, & Rodden, 1987). According to Husson (1978, cited by Nowak, 1991), however, births of litters of 2 or 3 bush dog pups, in Surinam, occur preferentially during the rainy season. Reproductive seasonality is also absent in the crab-eating fox *Cerdocyon thous* kept in captivity (Porton et al., 1987), but was reported in the field with diffe-

rences in birth times according to the site (Brady, 1979; Macdonald & Courtenay, 1996; Montgomery & Lubin, 1978). Absence of reproductive seasonality in *S. venaticus* may thus be an artifact due to features of the captivity context such as the artificial uniformity of temperature and food availability. Other canid species, such as the maned wolf *Chrysocyon brachyurus*, maintain reproductive seasonality in captivity (Porton et al., 1987). The lack of reproductive seasonality in bush dogs may be taken as an indication of the flexibility and context-dependence of their reproductive behavior.

Reproduction in *Speothos venaticus* is influenced by social factors. Females raised by one or both parents, alone or with their sisters, do not cycle, and begin to do so as soon as paired with a male. This suppression of reproduction of the females is typical of monogamous mammals that live in familiar groups in which there are pups of different ages, such as the primates of the genus *Callithrix* and *Leontopithecus* (Abbott & Hearn, 1978; Kleiman, 1979). Suppression of cycling reinforces the idea that bush dogs have a monogamous social organization.

The reports cited above suggest that the basic social unit of *Speothos venaticus* is the extended family. Conflicting interpretations about the social behavior of the species based on captivity studies (Drüwa, 1983; Kleiman, 1972) may be attributed to differences in observation and rearing conditions and to the small numbers of individuals studied.

The bush dogs' social organization and habits can be somewhat different from those of the forest dogs in open habitats as the *cerrado* (Silveira et al., 1998). Foraging conditions (small prey vs. large prey) could make the animals switch to a more solitary way of living and hunting.

## Predators

Very little is known about predation on *Speothos venaticus*. In Peruvian Amazonia, Aquino and Puertas (1997) found the carcass of an adult bush dog surrounded by puma (*Puma concolor*) or jaguar (*Panthera onca*) tracks, suggesting that the dog was killed by one of

these animals. *Speothos* may be hunted for human consumption in some areas of Amazonia where a low disponibility of large mammals forces the population to hunt species not normally eaten (Calouro, 1999).

## Home range size and use

According to Ewer (1973) and to Gittleman and Harvey (1982), size of home range is a function of the animal's body size and also of its diet and group size. Ewer (1973) also pointed out hunting technique as an important factor: a predator that hunts big prey over long chases would probably cover a larger area than animals which hunt by stalking. One would thus expect the big canids that hunt cooperatively to have the largest home ranges of all carnivores. Of the three species of big canids that live in groups and hunt cooperatively, the wolves (*Canis lupus*) and the African wild dog (*Lycaon pictus*) have actually very large home ranges. However, these ranges are limited during the first months of their pups' lives, since at this time adults must remain at a short distance from the dens (Ewer, 1973). Dholes (*Cuon alpinus*) also restrain their hunting area during the first four months of pups' lives (Johnsingh, 1982), though their ranges are not so large as in the case of the first two species. Actually, the restriction of the home range during pup rearing period is one of the few available strategies of animals that use large areas and do not carry their pups during normal movements. Exceptions may however occur. Spotted hyaenas (*Crocutta crocutta*), for instance, remain in the vicinity of their dens, while caring for young pups, when there is plenty of prey, but if migratory species are the only prey available, the hyaena females leave their pups alone, sometime for many days, to hunt (Kruuk, 1972).

## An attempt to locate bush dogs at Parque Estadual Carlos Botelho

We were informed of about ten sightings of bush dogs made in May 1995 at the Parque Estadual Carlos Botelho (PECB), state of São Paulo, in an area of Atlantic rain forest. Two animals were repeatedly seen in a short strip of

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road of roughly 100 meters, always around dawn or dusk (Maurício Talebi Gomes, personal communication, 1996). One sighting was made in 1993 (P. P. Soares, personal communication, 1996): a single animal was seen near a stream, at approximately 1.5 km from the site where the 1995 sightings were made.

This relatively high frequency of sightings for bush dogs (in Emas National Park, bush dogs were seen only nine times from 1966 to 1995, according to Silveira et al., 1998) motivated us to perform a field study at the PECB. Research was conducted from February 1997 to August 1999, totalling 6000 hours of field work. In a previously trailed area of approximately 5000 ha we walked systematically through 3000 ha searching for signals and dens of *Speothos venaticus*. Tracks of *Speothos venaticus* were identified by comparison with those published by Becker and Dalponte (1991). When a track was found, it was drawn and photographed, and we started to search the region where it was found more frequently. In some of these sites we put baits and, in some of them, camera traps during a period lasting from one week to two months. We searched for dens with the characteristics described for dens of other canid species (presence of tunnels and multiple entrances) and recorded those displaying at least one entrance large enough to allow the passage of a bush dog. In order to identify the animals that used the dens, we placed at the entrance (1) layers of sand in which tracks could be detected, and (2) camera traps. Attempting to attract bush dogs, several types of baits were placed near the tracks and in sites where they had been sighted. We also stayed in ambush near the sites where bush dogs had been observed, at the times of day when the sightings happened.

In spite of such efforts, it was not possible to fulfill our ambition of locating bush dogs and observing their behavior. 36 tracks of bush dogs were found along streams, in twenty-four different sites, but no photographic record of the animals were obtained. In 207 of the almost seven hundred dens located which might be canid dens, the sand layer method indicated that they were used by animals (in 108 cases, the actual user could be identified to a certain extent). Camera traps allowed us to identify the

users of some 30 dens, but none was a bush dog. Baits were not consumed and proved to be unpractical. A single bush dog was sighted by a research assistant, in March 1997, two meters from a stream, in the morning. Two animals were afterwards spotted on August 7, 2002, 10:00 am, also near a small stream (P. Izar, personal communication, August 7, 2002).

In our study, many paca tracks were found in all types of environments in the PECB. There is still need for a more rigorous assessment of the biomass of this and other possible prey of bush dogs in the PECB around the year. As pacas do not constitute a migratory species, bush dogs preying on pacas could remain committed to the same hunting locality until the supply of pacas and other middle-sized animals is eventually exhausted, when bush dogs have to move to other parts of their range.

We believe that the relatively high amount of sightings of bush dogs reported in the PECB, in a short period of time, can be attributed to the vicinity of a den with pups. When pups reach maturity, bush dogs probably revert to an extensive foraging pattern, all over their range. The difficulty of locating and studying the bush dogs in the field can be attributed to this pattern of extensive movement in a very large home range area, and to the secretive habits of the dogs.

### Perspectives

Studies of the distribution and abundance of bush dogs are considered a priority by Ginsberg and Macdonald (1990). We suggest that such studies be long-term searches, extending for many years. The publicizing of signs and features of bush dogs among field workers could increase the very low rate of sightings and help to select areas for research. Studies could be conducted along with other field studies so that longer periods be spanned.

We believe that the difficulty to find bush dogs could be overcome by an appropriate knowledge of the use of a given area by the animals over time. Our own study could have

succeeded, given a more extensive period of study and the know-how we now have about the strategies of tracking the animals.

The knowledge of the behavior of *Speothos venaticus* in the field remains very limited. Difficulties should not discourage researchers but constitute a challenge for the discovery of the ecology and behavior of a very interesting species.

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