

REMARKS ON THE BIOLOGY AND ZOOGEOGRAPHY OF
SOLENODON (ATOPOGALE) CUBANUS PETERS, 1861
(MAMMALIA, INSECTIVORA)

by

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SUMMARY

The biology of *Solenodon cubanus* Peters, 1861, is poorly known. Recently, a male and two females were studied in the Havana Zoo and observations on this species were made in the field as well. The animals were docile unless startled or handled roughly. Previously unpublished information on their morphology, salivary toxicity, gland secretion, feeding habits, activity, predators, living quarters, social behavior, etc., is given. The present geographic distribution is centered in dense, humid forests on mountains of the eastern provinces with relict populations in central and western Cuba. The mongoose (*Herpestes*) and feral dog are potential predators that are actually not sympatric with *Solenodon*. Feral cats pose the greatest nonhuman threat to the continued existence of this most interesting mammal endemic to Cuba.

RÉSUMÉ

Les connaissances sur la biologie de *Solenodon cubanus* Peters, 1861, sont imparfaites. Récemment un mâle et deux femelles de cette espèce ont été étudiés dans le Zoo de La Havane et des observations sur *Solenodon cubanus* ont été faites aussi dans la nature. Les animaux se sont montrés dociles, sauf s'ils étaient effrayés ou lors d'un traitement brutal. On présente des informations inédites sur la morphologie, la toxicité salivaire, les sécrétions glandulaires, le comportement lié à la prise de nourriture, l'activité, les prédateurs, les gîtes utilisés, le comportement social, etc. La distribution géographique est centrée sur les forêts denses et humides des montagnes des provinces orientales de Cuba, des populations relictaires subsistant au Cuba central et occidental. La mangouste (*Herpestes*) et les chiens retournés à l'état sauvage sont des prédateurs potentiels qui actuellement ne sont pas sympatriques avec *Solenodon*. Les chats retournés à l'état sauvage représentent le danger le plus grave (menace de la part de l'homme exceptée) pour la survie de ce mammifère fort intéressant et endémique de la faune de Cuba.

INTRODUCTION

The insectivore genus *Solenodon* Brandt, 1833 is considered to be one of the oldest and most basal placental, recent mammals and may be called a "living fossil" indeed. It occurs only in two forms: in Cuba *Solenodon (Atopogale) cubanus* Peters, 1861, and in Hispaniola *Solenodon paradoxus* Brandt, 1833. On the latter some reliable work has been published, but about the former only very little is known. In fact, in the course of this century, the Cuban *Solenodon* was several times thought to be already extinct. However, thanks to strict protection laws in Cuba, the declared endangered species managed to survive and, as will be shown in this paper, even covers a geographically larger area than thought before.

The last and possibly only photographs hitherto published of a living Cuban *Solenodon* showing the entire animal, were taken in 1909 by Dr. E. Lönnberg, Stockholm, and published by Mohr (1938). Later photographs showed either only parts of living specimens or stuffed ones, with the exception of a specimen in crouching position published by Barbour (1944).

Three wild-caught adult Cuban *Solenodons* observed in the Havana Zoological Garden form the basis of part of this report. An adult male caught 26 April 1974 in Duaba Arriba, province Holguín, died 29 March 1975 of digestive problems following an endoparasitic infection. An adult female from La Zoilita,

Sierra del Cristal, Holguín, died 26 months after capture on 1 December 1974. The second female was captured in July 1975 at Mayari Arriba, Holguín, and died of digestive malfunction after 6 years and 11 months. The two first-mentioned individuals are represented in fig. 1.

BIOLOGY

Coloration

Color variation is great among individuals and is age-related (Poey, 1851; Gundlach, 1877; Varona, 1974, 1980). Dark brown or black characterizes the dorsum and sides. The muzzle and shoulders are white to yellow and these colors may extend over the flanks and venter. The usually pale-pink proboscis of the male occasionally intensified (as did the distal tail) when the animal was stimulated by handling, sudden noise, bursts of light, or confrontation with

strange humans or conspecifics. The deep pink faded rapidly after removal of the stimuli.

Adaptations

The flexible snout continually moves during foraging or when other animals are present. Along with considerable movement of the long vibrissae, these motions apparently compensate for the presumed poor eyesight in this microphthalmic species. Proboscis involvement with echolocation as suggested by Eisenberg & Gould (1966) for *S. paradoxus* could, however, not be confirmed. Whatever the visual restrictions of the Cuban species, they do not prevent response to bright light.

Though the elongated snout places the buccal opening considerably behind the nostrils, the mouth is not restricted. Indeed, when irritated, a *Solenodon* retracts its lips, curls its snout dorsally, and with bared teeth, presents a gape similar to that of marsupials (see fig. 3). During



Fig. 1. On the left a female, on the right a male of *Solenodon cubanus*. Note the long hair on the heads and the tiny eyes.

frequent drinking, the proboscis is held parallel above the surface of the liquid, which is lapped dog-fashion.

The muscular tail is strong but flexible and is used, along with the hind legs, to form a tripod on which the animal sits to free the hands for manipulation of objects. Allen's (1910) comments notwithstanding, the tail is mobile and can be brought forward alongside the body or used in supporting the body during climbing, for which the long claws are adapted.

Salivary toxicity

It is asserted that the second lower incisors of *S. paradoxus* are ducted to maxillary glands whose

secretions kill injected mice (Rabb, 1959), but bites to humans elicit no ill effects (Mohr, 1937; Poduschka, 1975). Three reports of *S. cubanus* conflict, however. A farmer's dog from the province Guantánamo died with unhealed wounds after being bitten by a *Solenodon*. Gundlach (1877) reported that a man suffered a swollen arm after a *S. cubanus* bite and that he himself experienced inflammation of a wound from the lower (but not upper) incisors of this species.

A bite to my hand (between thumb and forefinger) by the male in this study also preceded adverse reactions, even though medical attention was promptly provided. Body temperature elevated for a week to 38.5-40°C; inflammation



Fig. 2. Female *Solenodon cubanus*, captured in 1981 in the Sierra del Cristal, Holguín, and released again at the same site.

spread from the forearm proximally; painful thorax and head were accompanied by hypalbuminuria (36%) and increased alpha (13.4%) and gamma (27.5%) globulin titers. Hematological analysis was negative, but microbiological examination of the blood revealed *Clostridium* (see Anonymus, 1975).

S. cubanus, like *S. paradoxus* (see Poduschka, 1975), bites rapidly and repeatedly, inflicting considerable subcutaneous damage which is slow to heal.

Social behavior and reproduction

When captured, the male described here was with a female and two young which were discarded after being killed by a dog. Both females were also accompanied when caught; the first by a male (killed by a dog) and the second by two juveniles and five others, all of which fortunately escaped. A male taken in 1912 near Moa was with four other *Solenodons* hiding in a cave "like crabs" (Bofill, 1948). *S. cubanus* thus seems sociable and the young may remain with the parents for a protracted time. Obviously, in the *Solenodontidae* there is but one baby (Mohr, 1936; Ottenwalder, 1979). No twin births are known. The report on even three babies (Verrill, 1907) is dubious.

Feeding

As noted by Poey (1851), *S. cubanus* (the "Almiquí") consumes large quantities of insects but also takes caterpillars, land crabs, frogs, toads, lizards, snakes, and bird eggs. Chopped meat and other food is eaten by captive animals, but may cause diarrhea. Tubers are refused. Meat hidden under 7.5 cm of earth was detected, uncovered, and eaten.

The male studied here sniffed any food offered, while undulating his trunk. Large items were held down with the foreclaws while dismembered and eaten. Favorite foods were *Anolis*, *Columba* eggs, *Hyla*, roaches (*Periplaneta*), and land crabs, which were eaten noisily. An *Anolis* was even taken from the observer's hand by lifting the body on the hind legs and the tail as on a tripod.

Activity pattern

S. cubanus is essentially nocturnal, sleeping curled on his side with nose tucked into his abdomen, often with forearms over the head. From dusk to dawn, however, the Almiquí incessantly searches for any available prey. When threatened or frightened, he rapidly seeks the security of a hide-out.

Agonistic behavior

If unable to passively defend by retreating to shelter, *S. cubanus* rears upon its hind legs and tail. It then strikes out with the sharp foreclaws and bites to either side. Afterwards, it bristles, the long dorsal hairs erecting to uncover the nearly hairless lower back. The same behavioral complex is revealed when fighting conspecifics. Confronted with dogs or cats, however, the *Solenodon* flees, unable to successfully repel these introduced adversaries. Nevertheless, when cornered, he snaps at his predators.



Fig. 3. Male *Solenodon cubanus* in state of defense. Note the curved proboscis and the raised vibrissae.

Skin glands

A popular common name for *S. cubanus* is "Berrenchin", and indeed, their odor resembles weakly that of male goats. This odor is presumably associated with the secretions from a ventral gland field described for both sexes of *S. paradoxus* (see Starck & Poduschka, 1982) and whose secretions have impressed observers from

Poey (1851) to the present (Regalado, pers. comm.).

The axillae of all three animals observed were coated with a sticky, mildly acrid liquid. This liquid, and its odor, were easily transferred to my hands and presumably originated in the ventral gland field.

Shelter

S. cubanus prefers to den in hollow logs or underground between tree roots. In mountainous areas, it hides in crevices between large rocks. Tunnel openings 10-12 cm in diameter lead into complex burrow systems dug parallel with the surface of the ground, usually under tree roots. Single or interconnected (up to three) circular nests lined with coarse leaves are presumably constructed by one or more females during the breeding season.

Predators

The chief potential enemy of *S. cubanus* is the feral cat (*Felis catus*) which can enter the Solenodon's tunnels and dens. Farmers and mountaineers report that the typical Solenodon habitat is unsuitable for feral dogs (*Canis familiaris*) and that they are in any event too large to enter Solenodon shelters. Introduced mongooses (*Herpestes auropunctatus*; "huron") are diurnal and do not occur in the humid, dense forests favored by Solenodons. Though widespread over Cuba and a potential threat, *Herpestes* is not known to have killed *Solenodon*.

ZOOGEOGRAPHY

S. cubanus has been widely distributed in Cuba during the Pleistocene and precolumbian Holocene, as is shown by fossil remains of recent specimens and of undescribed members of the genus. Until the second half of the last century, *S. cubanus* was known from the entire mountain range (Sierra del Escambray), where it was called "tacuache". Recently it was thought to be confined to the eastern provinces of Holguín, Guantánamo, and Granma (Provincia de Oriente until 1975), where it is known as "tejon".

A survey of these provinces was conducted during the late 1970's with the view of establishing forest fauna refuges. This revealed the presence of *S. cubanus* in humid upland primary forest areas (fig. 4): Baracoa, Guantánamo (1); Sierra del Cristal, Holguín (2); near Bayamo, Granma (the locality of the first specimens described by Poey) (3); as well as in the Sierra Maestra, Santiago de Cuba (4). In 1975, relatively fresh osteological material of *S. cubanus* was obtained from the Sierra del Escambray, province Sancti Spiritus (5). Finally, there are even indications of its occurrence in the Sierra de los Organos, Pinar del Río (6), reported in 1975-76.

Though apparently rare, *S. cubanus* is thus more widely distributed than previously thought. Three animals have recently (1976, 1981, 1982) been captured and released in ac-



Fig. 4. Map of Cuba with the new (since 1975) province boundaries. Numbers refer to the recent areas of occurrence: (1) Baracoa, Prov. Guantánamo; (2) Sierra del Cristal, Prov. Holguín; (3) Bayamo, Prov. Granma; (4) Sierra Maestra, Prov. Santiago de Cuba; (5) Sierra del Escambray, Prov. Sancti Spiritus; (6) Sierra de los Organos, Prov. Pinar del Río.

cordance with protective law at the site of capture. In each instance, the captured Solenodons were members of small groups of animals. Skeletal remains, scats, and reports of sightings by reliable observers all point to the above-mentioned range extensions in the remaining primary habitat of south-central and western Cuba (fig. 4).

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