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**Syntopic occurrence of *Hemicentetes semispinosus*
and *H. nigriceps* (Lipotyphla : Tenrecidae)
on the Central Highlands of Madagascar**

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Over the course of the past century there have been differing views on the taxonomic status of members of the genus *Hemicentetes* Mivart, 1871. In his monographic work on the Insectivora, Dobson (1882) noted that clear osteological characters exist to separate *H. semispinosus* (G. Cuvier, 1798) and *H. nigriceps* Günther, 1875, and that these two animals should be considered separate species. Genest and Petter (1975) concluded that *nigriceps* represented a geographical form of *semispinosus* and subsequently placed them together under the name *H. semispinosus*. A number of more recent works have followed the suggestion of this latter work and *H. nigriceps* is often considered a synonym or subspecies of *H. semispinosus* (e.g., Hutterer 1993), while other workers have separated them into two different species (e.g., Eisenberg and Gould 1970).

It has been previously noted that « the two species are allopatric and indicate slightly different environmental adaptations. *H. nigriceps* occurs in the vicinity of Manandroy south to Fianarantsoa. It appears to be confined to the central plateau edge. As one descends from the plateau into the true rainforest of the eastern escarpment, one finds *Hemicentetes semispinosus* » (Eisenberg and Gould 1970, p. 79). During a recent field trip to a forest skirting the eastern edge of the Central Highlands (= central plateau) and the eastern escarpment, we found these two forms of *Hemicentetes* living in sympatry.

In January 1999 we conducted an inventory of the small mammals living in a forested zone southeast of Tsinoarivo and approximately 90 km the southeast of Anta-

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nanariva. Little information was previously available on the vertebrate communities occurring in this area of Madagascar (Goodman *et al.*, submitted). The two sites visited were :

– Province d'Antananarivo, 10 km (by air) SE of Tsinjoarivo, Mahatsinjo Forest, Andasivodihazo, 19°40,8'S, 47°46,2'E, 1 550 m. This site is a montane forest block that has been isolated from the nearby large forested area for several decades. The Mahatsinjo Forest habitat was partially degraded by human activities and covered between 220 and 260 ha. A small enclave of agriculturists occupied a valley bottom in an area that had been cleared and converted into rice paddy. This open zone was almost completely surrounded by forest.

– Province d'Antananarivo, 16.2 km (by air) SE of Tsinjoarivo, Ankilahila Forest, along the Andrindrimbolo River, 19°42,4'S, 47°50,1'E, 1 400 m. The forest at this site was formerly part of a much larger area of intact montane habitat, that, at least until recent times, extended from near Tsinjoarivo to the region south of Moramanga. Over the past few years significant portions of this area have been converted into a patchwork of slash-and-burn agriculture plots and regenerating secondary forest surrounded by natural habitat. There are numerous small hamlets scattered around this zone.

The small mammals of these sites were surveyed using to different techniques : pit-fall traps and live animal traps. Details of all trapping techniques are presented in Goodman *et al.* (submitted). People living in forest clearings collected and brought us some small mammals. These animals were all taken in close proximity to our study sites. Captured individuals of *Hemicentetes* were prepared as voucher specimens ; these are deposited at the Field Museum of Natural History, Chicago, and the Département de Biologie Animale, Université d'Antananarivo.

In the forest at the Mahatsinjo site a total of 98 pit-fall nights and 600 trap nights were accrued and a single individual of *H. nigriceps* was captured in a pit-fall device. In the open area next to the forested island where this individual was trapped, we caught by band several individuals of *H. semispinosus* and one of *H. nigriceps*. At the Ankilahila site, during a comparable number of pit-fall and trap nights to that accumulated at Mahatsinjo, two individuals of *H. semispinosus* were trapped in pit-fall devices placed in the forest. Local people from the region also brought us numerous specimens of this taxon from the immediate area of our study site.

Our inventory of the forests to the SE of Tsinjoarivo (Goodman *et al.*, submitted), showed that these sites hold a remarkable diversity of small mammals, including seven rodents (two introduced) and 16 lipotyphlans (one introduced). This geographically limited region has the richest known community of lipotyphlans on the island, and for that matter perhaps in the world. Amongst this remarkable diversity of small mammals is *H. semispinosus* and *H. nigriceps* occurring sympatrically.

To our knowledge, the Mahatsinjo study site is the first known locality where the two species of *Hemicentetes* have been documented in clear sympatry. In this case, *H. nigriceps* was found in forest habitat, in valley bottoms in open agricultural zones, and at the forest edge, while *H. semispinosus* was found in the latter two habitats. All of the sites where these two species were found at the Mahatsinjo site were within 400 m walking distance of one another. These results clearly demonstrate a syntopic occurrence of these two species. We found no evidence of intermediate external morphological or osteological characters in the collected material and there is no evidence of hybridization at this site between these two species. The pelage of adult *H. semispinosus* is characterized by a series of dark yellow to orange longitudinal stripes on the dorsum with well-developed spines. Further, there is a single streak that runs from the base of the nose to the nape. In contrast, the dorsum of adult *H. nigriceps* has distinctly

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less developed dull white to pale yellow spines, which form broad lateral bands and a central stripe. Moreover, the crown and head of this species is black.

The altitudinal zone of overlap between these two species in the Tsinjoarivo area is probably very narrow. In the Ankilahila Forest, which is 150 m lower in altitude and about 8 km from the Mahatsinjo Forest, we only found evidence of *H. semispinosus*. An older man, resident in a forest clearing at Ankilahila for several decades and who brought us several live *H. semispinosus*, was most surprised with this latter animal and insisted that it did not occur at Ankilahila. Our survey of this zone failed to reveal its local presence in this forest.

There are other possible examples of the two species of *Hemicentetes* occurring in sympatry. For example, in the extensive collections amassed by C.I. Forsyth Major between 1894 and 1896 and sent to the British Museum (Natural History) [now The Natural History Museum] there was material from a site called Ampitambe (47°46'S, 20°22'E, Carleton and Schmidt 1990) in the Central Highlands that contain both species of *Hemicentetes*. However, since collectors from a broad geographical area obtained material for Major and he had no means to control exactly where the specimens were taken, it is uncertain that the two species were truly sympatric at Ampitambe. At several sites on the island these two species are known to occur at widely different elevations on the same massif, particularly on mountains that skirt the eastern edge of the Central Highlands and the eastern escarpment. For example, both species of *Hemicentetes* are known in the Andringitra and Ivohibe mountains, but they have never been found in the same elevational zone. In this region, *H. nigriceps* occurs in montane and sclerophyllous forest formations and in the region above forest line (2 000 m) and *H. semispinosus* occurs in lowland forest and clearings near the forest edge (Goodman *et al.*, 1999; Goodman and Rasolonandrasana, submitted; specimens in Muséum National d'Histoire Naturelle, Paris, and The Natural History Museum, London). However, nowhere on these mountains do the two species occur within the same elevational zone.

The sympatric occurrence of these two species of *Hemicentetes* in the Mahatsinjo forest is probably related with the high diversity of habitats available at the site. This is also reflected by the high lipotyphlan specific diversity in general. Presumably the Mahatsinjo forest encompasses the upper elevational limit of *H. semispinosus* and the lower limit for *H. nigriceps*. In contrast, the Ankilahila site appears to be too low in elevation to encompass the range of the latter species. In summary, on the basis of clear morphological characters and syntopic occurrence without evidence of hybridization, we conclude that these two forms are truly separate species.

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