

## Short Communication

### The Sulawesi palm civet: expanded distribution of a little known endemic viverrid

Robert J. Lee, Jonathan Riley, Iwan Hunowu and Edison Maneasa

**Abstract** To date, the Sulawesi palm civet *Macrogalidia musschenbroekii*, a viverrid endemic to the eastern Indonesian island of Sulawesi, was thought to be confined to North and Central Sulawesi. During a 14-month survey throughout south-east Sulawesi, new observations were made of the civet through camera-trapping in south-east Sulawesi forests: at Rawa Aopa National

Park, Tanjung Peropa Wildlife Reserve, and Mangolo Recreation Forest, thereby extending the species' range significantly. This paper describes these sightings, and summarizes information on its status and distribution.

**Keywords** Distribution, Indonesia, *Macrogalidia musschenbroekii*, Sulawesi palm civet, Viverridae.

#### Introduction

The Sulawesi palm civet *Macrogalidia musschenbroekii* (Schlegel, 1877) is one of three civet (Carnivora, Viverridae) species that occur on the eastern Indonesian island of Sulawesi, and is categorized as Vulnerable in the 2002 IUCN Red List (IUCN, 2002) based on criteria A2c; i.e. population reduction (A) of at least 20%, projected within the next 10 years or three generations (2), based on a decline in area of occupancy, extent of occurrence and/or quality of habitat (c). This species is the only endemic civet on Sulawesi, and the largest of the three species on the island. The other two species, the common palm civet *Paradoxurus hermaphroditus* and the Malay civet *Viverra zibellina*, are thought to have been introduced by humans (Weber, 1899; Dammerman, 1939; Groves, 1976).

Records of the Sulawesi palm civet are scant due to the species' solitary nature and nocturnal habits. Although Alfred Russell Wallace made three collection trips to Sulawesi between 1856 and 1859 he never encountered the species (Wallace, 1962). The civet was first mentioned by Schlegel (1877, in Wozencraft, 1993). Although the skeletal remains were found in the Bola Batoe (= batu) and Tjadang caves in South Sulawesi, Hooijer (1950) believed that this species no longer existed

in South Sulawesi. At present 28 specimens are known to exist in museums worldwide, 14 of which were collected by Dutch colonials in the 19th century (Veron, 2001). The most recent records include a sighting at Mount Klabat in North Sulawesi (Anon., 1979, 1980a, 1980b), and at Lore Lindu National Park in Central Sulawesi (Wemmer *et al.* 1983; Wemmer & Watling, 1986).

Based on these few records *M. musschenbroekii* was previously thought to be confined to North and Central Sulawesi (Fig. 1). In this paper we describe the first records of this species in South-east Sulawesi, thereby extending its range significantly, and briefly discuss the ecology and conservation status of the species.

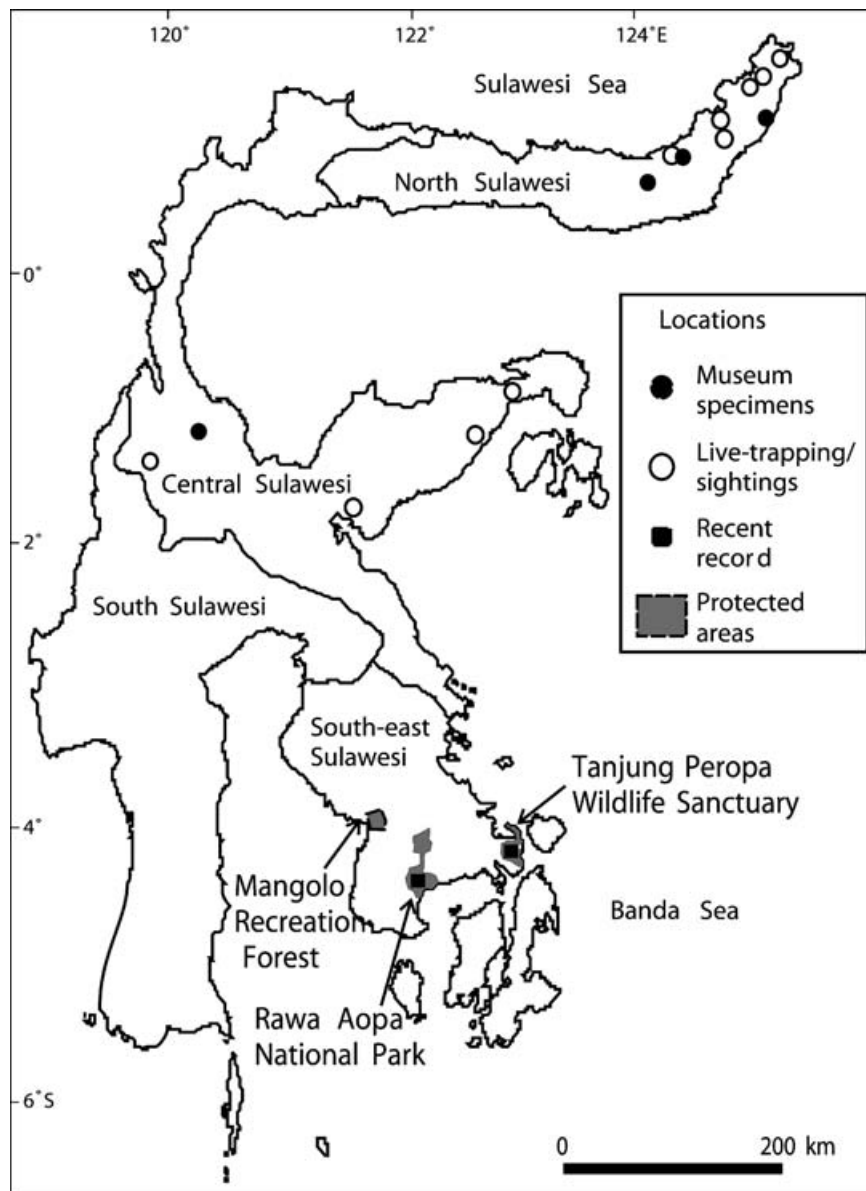
Sulawesi is the largest island in the biogeographic subregion of Wallacea, and is characterized by high levels of species endemism. Of the 127 mammal species, 79 (62%) are endemic; endemism rises to 98% if non-volant mammals are excluded (FAO, 1982; Whitten *et al.*, 1987). The natural history of South-east Sulawesi is the least studied of the island's four peninsulas. Preliminary studies indicate that the peninsula contains an array of ecosystems that have high levels of endemism (FAO, 1982; Wardill *et al.*, 1999). The peninsula is characterized by mountains and highland forests in the north, and has the largest swamp area and most extensive mangrove system in Sulawesi.

The information presented here was gathered as part of an island-wide biodiversity survey carried out over a 14-month period beginning in March 2000. Of the five forests that we surveyed in South-east Sulawesi (Fig. 1) we recorded the Sulawesi palm civet in three forests: Rawa Aopa National Park, Tanjung Peropa Wildlife Reserve, and Mangolo Recreation Forest. Two observations were made in May during the rainy season, and the sighting at Peropa was made in the dry season.

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Received 26 November 2001. Revision requested 10 May 2002.  
Accepted 8 October 2002.



**Fig. 1** Previous locality records throughout Sulawesi and new sightings of Sulawesi palm civet *Macrogalidia musschenbroekii* in South-east Sulawesi.

The records were all made using camera-traps (CamTrakker), six of which were placed 1–1.5 m above the ground, one per km, all set in the same direction away from transect lines. Total camera-trap effort was 9,653 h. We also carried out transect censuses during which we searched for signs of animals between 05.30 and 10.00, for a total survey effort of 483.8 km. No civet tracks or scat were detected during these surveys. The three civets photographed, one in each of the three areas, were adults, judged on the basis of body size relative to surrounding vegetation (Plate 1). The individual in Rawa Aopa was a male and that in

Mangolo a female, judged by the presence or absence of testis. The sex of the individual in Tanjung Peropa was unclear.

All sightings were in lowland rainforest, with the forest edge close by at Tanjung Peropa (0.3 km), and farthest at Rawa Aopa (6.3 km); the nearest human settlements were 4–10.5 km from the camera trap sites. There were no discernable similarities in tree density, composition or size, or proximity to water, for the three sites in which the species was photographed. Tree species whose fruits were reportedly fed on by *M. muschenbroekei* (Wemmer & Watling, 1986) were rare



**Plate 1** This camera trap photograph taken at Mangolo Recreation Forest shows the typical characteristics of the Sulawesi palm civet, including grayish cheeks and face, dark brown upper parts, fulvous underparts, and dark and pale brown ringed-tail. (Photo © Wildlife Conservation Society).

in all three reserves. Palms, a supposed preferred food item, constituted <1% of the trees identified in the three forests. Other food species such as *Cananga odorata*, *Pandanus* sp., *Dracontomelon dao* and *D. mangiferum*, were not recorded at Mangolo and only *C. odorata* at Peropa was slightly common, representing 1.2% of trees measured.

Although there is now some information on which to build a basic understanding of the Sulawesi palm civet's distribution and ecology, it is still one of the least known carnivores. Historically in Sulawesi most biological surveys have focused in the North and Central provinces. By surveying a relatively unexplored area of Sulawesi and by using camera-traps, which greatly increased the detectability of civets, we were able to show that the species is more widely distributed than previously thought.

The ecology of the species is still obscured by limited behavioural observations. Using three individuals in a semi-captive setting Wemmer & Watling (1986) showed that they eat small mammals and fruit. Analysis of faecal samples showed them to commonly eat small mammals and fruit, and occasionally to take birds and farm animals as well as grass as an intestinal scourer. They also suggested that individuals range over large areas, taking 5–10 days to complete a circuit of a home range of c. 150 ha.

This civet is not a specialist, neither restricted by elevation nor disturbance regime. They have been found in lowland rainforest (Wemmer & Watling, 1986; Whitten *et al.*, 1987; WCS, 2001), lower and upper montane forest (Wemmer & Watling, 1986; Musser, 1987), grassland

(Wemmer & Watling, 1986) and beside farms (Wemmer & Watling, 1986; Y. Maneros, pers. com.). However, the species appears to be more common in forests than in agricultural areas. It is probable that the civets raid farms and gardens when small mammals and fruit are scarce in the forest.

Our three camera-trap records are not adequate for determining the conservation status of *M. musschenbroekii* or for preparing a conservation plan. However, our surveys suggest that overall numbers are probably very low. Our surveys in North Sulawesi (5,187 camera trap hours and 683 km of transect surveys) and Central Sulawesi (8,645 camera trap hours and 302 km of transect surveys), areas in which the species was previously recorded, yielded no evidence of their presence. These results, along with the low encounter rates of the Sulawesi civet in South-east Sulawesi, and current trends in habitat loss and fragmentation, warrant concern. Sulawesi has one of the highest rates of forest loss in the world (Myers, 1992). Between 1985 and 1997 the three peninsulas from which the Sulawesi palm civet is known, North, Central and South-east, have experienced forest losses of 58.5% (253,600 ha), 72.3% (959,100 ha) and 67.3% (447,500 ha), respectively (World Bank, 2001). Although the Sulawesi palm civet can probably tolerate disturbed habitat, forest loss on Sulawesi is creating an agro-forest mosaic that probably limits movement. All sites where Sulawesi palm civets have been found are currently surrounded by savannah, grassland or agricultural areas.

## Acknowledgements

We wish to thank the Balai of Rawa Aopa National Park, M. Hariyanto, G. Sinaga, head of conservation, Forestry Department of South-east Sulawesi, and Zainal, head of Natural Resources Protection in South-east Sulawesi for granting permission to work in the field. L. Isa, L. Sifu, Saudale, A. Hayat, Tamsar and P. Sutarya assisted with fieldwork and Wildlife Conservation Society staff F. Talangamin, J. Mole, S. Siwu, M. Nuslawo, Y. Hunowu and M. Taifiq provided invaluable assistance in data collection and entry, and Y. Hadiprakarsa produced the map. This work was supported by the St. Louis Zoo, Disney Conservation Fund, AZA Conservation Endowment Fund and the Wildlife Conservation Society.

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### Biographical sketches

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