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The taxonomic status of badgers (Mammalia, Mustelidae) from Southwest Asia based on cranial morphometrics, with the redescription of *Meles canescens*

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Abstract

The Eurasian badgers (*Meles* spp.) are widespread in the Palaearctic Region, occurring from the British Islands in the west to the Japanese Islands in the east, including the Scandinavia, Southwest Asia and southern China. The morphometric variation in 30 cranial characters of 692 skulls of *Meles* from across the Palaearctic was here analyzed. This craniometric analysis revealed a significant difference between the European and Asian badger phylogenetic lineages, which can be further split in two pairs of taxa: *meles* – *canescens* and *leucurus* – *anakuma*. Overall, European badger populations are very similar morphologically, particularly with regards to the skull shape, but differ notably from those from Asia Minor, the Middle East and Transcaucasia. Based on the current survey of badger specimens available in main world museums, we have recognized four distinctive, parapatric species: *Meles meles*, found in most of Europe; *Meles leucurus* from continental Asia; *M. anakuma* from Japan; and *M. canescens* from Southwest Asia and the mountains of Middle Asia. These results are in agreement with those based on recent molecular data analyses. The morphological peculiarities and distribution range of *M. canescens* are discussed. The origin and evolution of *Meles* species, which is yet poorly understood, is also briefly discussed.

Key words: skull variation, morphometrics, systematics, cryptic species, *Meles canescens*

Introduction

The Eurasian badgers (*Meles* Brisson) are widely distributed in the Palaearctic Region—from the British Islands and Iberian Peninsula in the west to the Japanese Islands in the east, and from Scandinavia and Western Siberia in the north to Palestine, Iran, and South China in the south (Macdonald 2001; Wozencraft 2005). Throughout the distribution range, the badger displays a significant variation of craniological and external characters (Abramov 2002, 2003; Abramov & Puzachenko 2005, 2006; Abramov *et al.* 2009) and a strong genetic divergence (Marmi *et al.* 2005, 2006; Del Cerro *et al.* 2010; Tashima *et al.* 2011a, b).

Until recently, the genus *Meles* has been considered monotypic (Heptner *et al.* 1967, Corbet 1978; Wozencraft 1993, Nowak 1999). However, recent studies have shown that it includes at least three species: the European badger *Meles meles* (Linnaeus), the Asian badger *Meles leucurus* (Hodgson) and the Japanese badger *Meles anakuma* Temminck (Abramov 2001, 2003; Wozencraft 2005; Abramov & Puzachenko 2005, 2006). The European badger is distributed throughout Europe, from the British Islands eastwards to the west bank of the River Volga. The Asian badger occurs from Eastern Europe (the east bank of Volga River) throughout the Urals, Kazakhstan and Middle Asia, southern Siberia and Mongolia to China and Korea. In the European part of Russia, the distribution border between *M. meles* and *M. leucurus* goes throughout Lower and Middle Volga and Volga—Kama Interfluves (Abramov *et al.* 2003; Abramov & Puzachenko 2006). The Japanese badger occurs in the Japanese Islands (Honshu, Kyushu, and Shikoku).

In recent taxonomical reviews (Abramov & Puzachenko 2006; Abramov *et al.* 2009), the European badger *Meles meles* was divided in 4–5 subspecies: the Scandinavian *M. m. meles* (Linnaeus) (Sweden, Finland, east