

Gene introgression between *Gazella subgutturosa* and *G. marica*: limitations of maternal inheritance analysis for species identification with conservation purposes

Marine Murtskhvaladze · Zurab Gurjelidze ·
Natia Kopaliani · David Tarkhnishvili

Received: 18 January 2012 / Accepted: 29 March 2012
© Mammal Research Institute, Polish Academy of Sciences, Białowieża, Poland 2012

Abstract It has recently been suggested that goitered gazelles (*Gazella subgutturosa* and *Gazella marica*) have paraphyletic maternal origin, and that the mitochondrial cytochrome b gene fragment can be used for species identification prior to reintroduction of the gazelles. Although there is a large geographic area where the gazelles have intermediate morphology, previous researchers have not inferred any signs of mitochondrial haplotype introgression, and it is thought that the introgression, if it exists, is male-biased. We studied mitochondrial haplotypes of morphologically typical *G. subgutturosa* from two geographic locations. Goitered gazelles from eastern Turkey, morphologically identical to *G. subgutturosa*, had haplotypes identical to *G. marica*. This finding confirms ongoing maternal gene introgression from *G. marica* to *G. subgutturosa*. Our suggestion is that there is a natural gene flow between these two nominal species, and morphological characters together with recombinant genetic markers rather than mitochondrial DNA should be used to differentiate among individuals from areas close to the contact zone.

Keywords *Gazella subgutturosa* · *Gazella marica* · Hybridization · Species identification · Reintroduction · Mitochondrial DNA

Introduction

Wacher et al. (2011) showed that two "traditional" subspecies of goitered gazelle, *Gazella subgutturosa subgutturosa* and *Gazella subgutturosa marica*, are paraphyletic through the maternal lineage. The authors suggest treating these forms as full species and recommend the species identification procedure, based on the analysis of the mitochondrial cytochrome b gene, prior to the species reintroduction. Other authors (Groves and Harrison 1967; Groves 1997; Malkon and Kingswood 2001; Durmuş 2010) indicate that a broad geographic area, including Syria, northern Iraq, and western Iran, has morphologically intermediate individuals, probably natural hybrids between the two nominal forms. Females of "typical" *G. subgutturosa* have no horns, whereas females of *G. marica* have prominent horns, and females from intermediate populations usually have poorly developed horns (Groves and Harrison 1967; Wacher et al. 2011). Wacher et al. (2011), based on five individuals of *G. subgutturosa* haplotype from northern Iraq, concluded that either the overlap is little or hybridization is male-biased, although they acknowledged that the sample from the anticipated hybrid zone was small. We analyzed mitochondrial haplotypes of 16 gazelles from two populations, previously described as typical *G. subgutturosa*: one from the eastern Caucasus and the other one from southeastern Turkey, in order to validate whether mitochondrial haplotypes and morphology show consistent pattern in the studied gazelles.

Material and methods

We analyzed tissue samples of 12 goitered gazelles from Azerbaijan (Shirvan National Park), and those of four individuals from the Ceylanpinar breeding farm in eastern

Communicated by: Magdalena Niedziałkowska

M. Murtskhvaladze · Z. Gurjelidze · N. Kopaliani ·
D. Tarkhnishvili (✉)
Institute of Ecology, Iliu State University,
3/5 Cholokashvili Ave.,
Tbilisi 0162, Georgia
e-mail: david_tarkhnishvili@iisuni.edu.ge