Ecological survey of two Calomyscidae species; Goodwin's brush-tailed mouse and Hotson's brush-tailed mouse (Rodentia) in the eastern parts of Iran

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1. Introduction

Brush-tailed mice are a family of small rodents found in rocky outcrops and semimountainous areas in desert regions of Iran, Turkmenistan, Afghanistan, Pakistan, Azerbaijan, and Syria. Although they were traditionally known as “mouse-like hamsters”, they are not true hamsters [1]. They represent an early divergence from the rest of the mouse-like rodents (such as mice and rats), thus brush-tailed mice have been placed in a separate family, Calomyscidae Vorontsov and Potapova, 1979 [2–5].

Calomyscidae consists of eight known species which all belong to a single genus, Calomyscus Thomas, 1905 [2]. Despite several studies on morphological [2,6–13], biological [14], molecular [1,15–21] and karyologic [22–28] traits of this genus, relatively little is known about habitat and ecology of any species of Calomyscus [29–39]. The favorite habitat of Calomyscus species is considered as well-drained rocky slopes in arid steppes, semi-deserts and desert regions [30,34]. There is a record of this rodent nesting in a narrow horizontal crevice in rock strata in Iran with storing fine grasses and sheep wools [29]. In few literatures there are descriptive notes on vegetation covers in the habitats of most of the species.
Calomyscus species which consist of scant vegetation of grass clumps, nettle weed, legumes, thistle, and wild rose bushes [29,33,37]. They feed mainly on seeds, leaves, buds and flowers of wild plants and are used to storing their food for consuming in cold months [31]. They also willingly eat animal matter [36] and are cannibalistic in captivity [35].

Three species of the genus Calomyscus are distributed in the eastern parts of Iran including Afghan mouse-like hamster (C. mystax Kashkarov, 1925), Goodwin's brush-tailed mouse (C. elburzensis Goodwin, 1938) and Hotson's brush-tailed mouse (C. hotsoni Thomas, 1920). However, the distribution ranges of these species are not completely known [2]. C. elburzensis has been reported from mountains of north and northeast of Iran [10], eastern parts of Yazd province (Iran) [28], southwest and south of Turkmenistan and also northwest of Afghanistan [2]. This species is found in barren, dry and rocky mountain sides with little vegetation. It nests in concealed rock crevices, and feeds on brome grasses (Poaceae; Bromus Scop.) [40]. C. hotsoni has been recorded from southeastern parts of Iran and southwestern regions of Pakistan [1,2]. Recently we reported this species from South Khorasan province, in the northeast of Iran (e.g. [21]). This species is found in arid rocky habitats in association with dwarf mazari palm (Arecaceae; Nannorrhops ritchieana (Griff.) Aitch.) and dry rocky mountain tops with sparse shrubby vegetation [1].

In our recent molecular study (analysis of Cytb and COI gene sequences) [19], one major clade for C. elburzensis in the northeast of Iran was considered to consist of four subclades as follows: 1) a subclade which includes samples from the middle of the Kopet-Dag Mountains in Razavi Khorasan province (Tandure, Chenaran), 2) a subclade which contains those samples captured from the type locality (Kurkhud; North Khorasan province) and the central Kopet-Dag (Saluk and Dasht; North Khorasan province, and a single individual from Chenaran; Razavi Khorasan province) or nearby (Sabzevar), 3) a subclade which includes samples from Khaje-Morad, Binalud Mountains (Neyshabur), eastern Kopet-Dag (Sarakhs), southern parts of Razavi Khorasan province (Bajestan, Torbat) and northeast of South Khorasan province (Ghaen, Darmian), and finally 4) a subclade consisting of one individual from Gazik (South Khorasan province) and samples from central Iran (Taft, Fakhrabad; Yazd province). Moreover, in this study the mean genetic distances within samples of C. elburzensis from Iran were recorded as 1.9% for Cytb and 1.2% for COI. Comparative genetic distances (for both Cytb and COI genes) between different sets of subclades in C. elburzensis populations showed that genetic differences increased linearly with geographic distances [19]. Furthermore, based on our phylogenetic trees obtained from Cytb and COI data set [21], only two subclades of C. hotsoni were identified in Iran: 1) a subclade including samples from Saravan (the southernmost known locality for C. hotsoni in Iran), and 2) a subclade containing samples from Birjand, Zahedan, and Khash (in Iran) and also samples of a site near the type locality (in Pakistan). These two molecular subclades along with a subclade containing samples from the vicinity of the type locality and also its western parts in southern Pakistan, exhibited low mean genetic divergence (1.8% for Cytb) [21].

Herein, we aimed to study the climatological, geological and ecological characteristics of C. elburzensis and C. hotsoni in details. We hypothesize that differences observed in the habitat and ecological characteristics within the distribution range of these two species are in accordance with divergence at intraspecies level and the topology of molecular trees. In other words, we assume that species which are distributed in areas with different climates and vegetation might show greater intraspecific differentiation than species which inhabit areas with more similar climates and vegetation. Thus, integration of ecological surveys with molecular studies may bring about novel findings.
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