Dark and pale: taxonomic status of the barbastelle (*Barbastella*: Vespertilionidae, Chiroptera) from Central Asia

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Barbastelles from the Central Asian republics, traditionally included in *Barbastella darjelingensis*, were compared with other *Barbastella* species on the basis of cranial and dental morphometrics, fur coloration and sequences of mtDNA. All these factors indicate that individuals from Central Asia should not be treated as a part of *B. darjelingensis*. They belong to a separate species, closely related to the Egyptian *B. leucomelas*, but morphologically distinct. On the basis of geographical proximity, it seems likely these are representatives of the same taxon as Transcaucasian animals, and therefore the name *B. caspica* Satunin, 1908 appears to be appropriate for this species. Evidence is provided, based on genetic differences, that there may be additional species of *Barbastella* in eastern Asia.

Key words: *Barbastella darjelingensis*, *B. caspica*, Central Asia, taxonomy, nomenclature

INTRODUCTION

The genus *Barbastella*, though very widely distributed from Western Europe and Northern Africa to Japan, Taiwan and Northern Indochina (Fig. 1), until recently was divided into only two species — *Barbastella barbastellus*, European barbastelle, and *B. leucomelas*, Asian barbastelle. This arrangement was supported for decades by many authors (e.g., Tate, 1942; Kuzyakin, 1950; Ellerman and Morrison-Scott, 1951; Corbet, 1978; Yoshiyuki, 1989; Koopman, 1994; Simmons, 2005; Rakhmatulina, 2005), and the number of named forms within the genus was quite limited (Benda and Milikovsky, 2008).

In recent years, molecular approaches in studying bat taxonomy, together with the accumulation of new and better preserved collection material, have resulted in some changes in *Barbastella* taxonomy. A new species, *B. beijingensis*, was described from Central China and currently is considered endemic to Beijing municipality (Zhang et al., 2007). Then, *B. leucomelas* sensu stricto (s. str.) was considered to be a separate species from the Asian forms, restricted to North-east Africa and Jordan (Benda et al., 2008) and the name *B. darjelingensis* was adopted for all other Asian barbastelles.

In this paper, I present results of DNA barcode data and morphological analyses to demonstrate that there are additional unrecognized genetic lineages in *Barbastella*, with the probability that there are several more species than are currently recognized. In particular, I examine the taxonomic position of barbastelles from the former Soviet republics of Central Asia. These bats were once described as a separate taxon under the name ‘*B. bianfordi walteri*’ (Bianchi, 1916). Later this name was treated as a nomen nudum by Ognev (1928) and that point of view was accepted by further authors, who included Central Asian barbastelles within *B. darjelingensis* (or *B. leucomelas* sensu lato), without specifying any geographical races (e.g., Bobrinskiy et al., 1944; Bogdanov, 1953; Strelkov, 1989; Khabilov, 1992; Koopman, 1994; Benda et al., 2011). Recently Benda and Milikovsky (2008) argued that formally the name ‘walteri Bianki, 1917’ (sic!) is not a nomen nudum and could be used for nomenclatural purposes. However, slightly prior to Bianchi’s description, barbastelles from Transcaucasia (Hajigabul district of Azerbaijan) were described as *B. barbastella* (sic!) *caspica* (Satunin, 1908) — a name that has been almost forgotten over the past next century.
relationships with Hindustani *B. darjelingensis* even on a subspecific level. This case has shown that there is likely substantial underestimation of taxonomic diversity even within non-tropical, West Palaearctic bats.

In recent decades, DNA barcoding was proved to be a relatively easy and useful method for revealing and highlighting the taxonomically problematic cases, in particular in bats (Francis *et al*., 2010; Clare *et al*., 2011; Kruskop *et al*., 2012). However, sequences of COI gene on their own, are not sufficient for taxonomic and nomenclature conclusions, and an integrative approach involving morphology, morphometrics and/or other genetic markers is required to obtain reliable results.

It can be supposed that similarly to the related genus *Plecotus*, which possesses high levels of cryptic diversity across its distribution range (Spitzenberger *et al*., 2006), the genus *Barbastella* also has a highly complicated taxonomic structure within its vast trans-Eurasian distribution. In general, results from DNA barcodes clearly indicate that the genus has more than the two or three species currently recognized. At least the position of all available East Asian individuals is highly distant from other currently recognized species, with evidence of at least two genetically distinct forms (Fig. 4). The status of the East Asian lineages is beyond the scope of this particular study and therefore not under discussion here; possible taxonomic position of these forms and their relationships with *B. darjelingensis* and *B. beijingensis* are a subject of an ongoing study (S. V. Kruskop, M. P. Tiunov, and K. Kawai, unpublished data). Although, the very limited material does not allow us to make final conclusions of the phylogeny of the genus, available preliminary data offer the prospect of further integrative taxonomic studies in this group.

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**LITERATURE CITED**


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TAXONOMIC STATUS OF THE CENTRAL ASIAN BARBASTELLE

APPENDIX

List of specimens used in morphometric studies

Barbastella darjelingensis: India, Darjeeling: MNH54.9.1.13, sex unknown (type of Synotus darjelingensis Hodgson); MNH14.4.23.7, δ; MNH17.4.23.8, δ; MNH14.4.23.9, δ; MNH17.4.23.10, ♂; MNH17.4.23.11, ♂; MNH17.4.23.12, ♂; India: ZMB4372, ♂; ZMB4862, δ; Nepal: ZMMU S-164496, δ; Bhutan: MNH16.7.29.8, ♂. B. leucomelas: Jordan: NMP PB4148, ♂; NMP PB4704, ♂; NMP PB4716, δ; Sinai: NMP PB2883, δ; NMP PB2884, δ. B. barbastellus: Czech Republic: ZMMU S-74660, sex unknown; Slovakia: NMP 17461, ♂; Ukraine: ZMMU S-49160, ♂; ZMMU S-49161, δ; ZMMU S-49162, δ; ZMMU S-84118, ♂; ZMMU S-151944, δ; Moldova: ZMMU S-91357, ♂; ZISP 55684, δ; France: MNHN1895-44, sex unknown; MNHN1932-4169, ♂; MNHN1932-4171, ♂; MNHN1932-4172, ♂; MNHN1932-4173, ♂; MNHN1932-4174, ♂; MNHN1932-4176, ♂; MNHN1950-416, δ; MNHN1963-873, δ; MNHN1963-878, δ; MNHN1983-728, sex unknown; MNHN1981-1003, ♂; MNHN2003-224, ♂; MNHN2003-225, ♂; MNHN2004-1453, δ; Russia, Krasnodar territory: ZMMU S-171543, sex unknown; ZMMU S-168252, ♂; ZISP 61672, ♂; ZISP 85774, ♂; ZISP 85775, ♂; ZISP 85776, ♂; ZISP 85778, δ; ZISP 85779, δ; ZISP 85780, δ; Iran: NMP PB3243, ♂; NMP PB3244, ♂; NMP PB3245, ♂. B. caspica (=walteri): S. Turkmenistan: ZMMU S-186685, δ; B. caspica (walteri): S. Turkmenistan: ZMMU S-90966, δ; ZMMU S-90967, δ; ZMMU S-90968, δ; ZMMU S-90969, δ; ZMMU S-90970, δ; ZMMU S-90971, δ; ZMMU S-94696, δ; ZMMU S-105053, δ; ZISP 53997, sex unknown; ZISP 56633, δ; ZISP 56634, δ; ZISP 56635, δ; ZISP 57945, δ. B. walteri: China, Szechwan: MNHN11.2.1.5, δ; China, Yunnan: MNHN23.3.7.1, δ; N. Vietnam: ZMMU S-186685, δ. Barbastella: India: ZMB4372, ♂; ZMB4862, δ; Nepal: ZMMU S-164496, δ; Bhutan: MNH16.7.39.8, ♂. B. leucomelas: Jordan: NMP PB4148, ♂; NMP PB4704, ♂; NMP PB4716, δ; Sinai: NMP PB2883, δ; NMP PB2884, δ. B. barbastellus: Czech Republic: ZMMU S-74660, sex unknown; Slovakia: NMP 17461, ♂; Ukraine: ZMMU S-49160, ♂; ZMMU S-49161, δ; ZMMU S-49162, δ; ZMMU S-84118, ♂; ZMMU S-151944, δ; Moldova: ZMMU S-91357, ♂; ZISP 55684, δ; France: MNHN1895-44, sex unknown; MNHN1932-4169, ♂; MNHN1932-4171, ♂; MNHN1932-4172, ♂; MNHN1932-4173, ♂; MNHN1932-4174, ♂; MNHN1932-4176, ♂; MNHN1950-416, δ; MNHN1963-873, δ; MNHN1963-878, δ; MNHN1983-728, sex unknown; MNHN1981-1003, ♂; MNHN2003-224, ♂; MNHN2003-225, ♂; MNHN2004-1453, δ; Russia, Krasnodar territory: ZMMU S-171543, sex unknown; ZMMU S-168252, ♂; ZISP 61672, ♂; ZISP 85774, ♂; ZISP 85775, ♂; ZISP 85776, ♂; ZISP 85778, δ; ZISP 85779, δ; ZISP 85780, δ; Iran: NMP PB3243, ♂; NMP PB3244, ♂; NMP PB3245, ♂. B. caspica (=walteri): S. Turkmenistan: ZMMU S-90966, δ; ZMMU S-90967, δ; ZMMU S-90968, δ; ZMMU S-90969, δ; ZMMU S-90970, δ; ZMMU S-90971, δ; ZMMU S-94696, δ; ZMMU S-105053, δ; ZISP 53997, sex unknown; ZISP 56633, δ; ZISP 56634, δ; ZISP 56635, δ; ZISP 57945, δ; Krygyzstan: ZISP 64609, δ; ZISP 64610, sex unknown; ZISP 65452, δ; ZISP 79612, δ; ZMMU S-69214, δ; NMP CT84/125; Uzbekistan: ZISP 57307, δ; ZISP 57308, ♂; ZMMU S-74868, ♂; ZMMU S-94786, ♂; ZMMU S-135846; Tajikistan: ZMMU S-190370, δ; ZMMU S-190371, δ; ZISP 32255, sex unknown; ZISP 32256, sex unknown; ZISP 32257, sex unknown; ZISP 32258, sex unknown; ZISP 32260, sex unknown; ZISP 69063, δ; ZISP 69064, ♂. B. caspica: Armenia: ZMMU S-108969, ♂; ZMMU S-173352, δ; Dagestan: ZMMU S-28503, sex unknown; ZMMU S-28504, sex unknown.

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