

## On the status and position of Tian-Shanian populations of *Paralasa* cf. *kusnezovi* (Avinoff, 1910) (Lepidoptera: Satyridae)

### О статусе и положении тянь-шанских популяций *Paralasa* cf. *kusnezovi* (Avinoff, 1910) (Lepidoptera: Satyridae)

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КЛЮЧЕВЫЕ СЛОВА: *Paralasa kusnezovi*, Тянь-Шань, подвиды, таксономия.

ABSTRACT. Using COI sequence, it is shown, that *Paralasa kusnezovi bektur* Korb, 2013 is a junior synonym of *P. kusnezovi kusnezovi* (Avinoff, 1910) **syn.n.**, and that *P. kusnezovi kolesnichenkoi* Churkin et Zhdanko, 2001 has full-species rank: *P. kolesnichenkoi* Churkin et Zhdanko, 2001, **stat.n.**

РЕЗЮМЕ. С использованием последовательности гена COI показано, что *Paralasa kusnezovi bektur* Korb, 2013 является синонимом *P. kusnezovi kusnezovi* (Avinoff, 1910) **syn.n.**, *P. kusnezovi kolesnichenkoi* Churkin et Zhdanko, 2001 рассматривается в качестве самостоятельного вида *P. kolesnichenkoi* Churkin et Zhdanko, 2001, **stat.n.**

#### Introduction

In 2012 the species complex of *Paralasa jordana* (Staudinger, 1882) was revised by S.V. Churkin, V.A. Pletnev [2012]. The main result of this paper was in merging of almost all Tian-Shanian representatives of this genus (including *P. helios* (O.Bang-Haas, 1927) and *P. bogutena* Lukhtanov et Lukhtanov, 1994) into one species with the oldest available name *P. kusnezovi* (Avinoff, 1910). This revision was criticised by the first author [Korb, 2013] in that point that the taxon *P. bogutena* is a separate species. The other unclear taxon in this group is *P. kusnezovi kolesnichenkoi* Churkin et Zhdanko, 2001, a very distinctive butterfly with intermediate characters between *P. bogutena* and *P. kusnezovi*.

*P. bogutena* without doubts occurs in eastern part of North Tian-Shan: mountain ridges Transilian Alatau, Terskey Ala-Too and Kungey Ala-Too. The spe-

cies is also present in Boguty and Syugaty Mts. Its border from *P. kusnezovi* is in Boom valley between Kungey Ala-Too and Kirghizsky Mts. We sampled and sequenced one specimen from Kirghizsky Mts. to confirm this opinion. Also we sampled one specimen from Inner Tian-Shan, where the taxon *kolesnichenkoi* is present, to clarify its status and position.

#### Materials and methods

DNA was extracted using the Geneaid Genomic DNA Mini Kit, Tissue. 5P fragment of the Cytochrome C oxidase subunit I (“barcode region”) was amplified using primers HybLCO and HybHCO according to protocols by Wahlberg and Wheat [2008]. PCR products were sequenced by Macrogen (Seoul, Korea) on an ABI capillary sequencer. The sequences were aligned in BioEdit ver. 7.0.9.0. For the calculations of tree, we used Maximum Likelihood with transition and transversion substitutions included, and with Gamma distributed heterogeneous rates in MEGA 6.

Two specimens were sequenced:

1 ♂ *P. kusnezovi bektur* Korb, 2013: 30.07.2014, Kirghizia, Kirghizsky Mts., Ala-Archa Nature Reserve, 2400 m, leg. S.K. Korb (Figs 1–2).

1 ♂ *P. kusnezovi kolesnichenkoi* Churkin et Zhdanko, 2001: 9.07.2014, Kirghizia, Suusamyrtoo Mts., Kekemer river valley 30 km S of settlement Kozhomkul, 1800 m, leg. S.K. Korb (Figs 3–4).

Both sequenced specimens will be transferred to the collection of Zoological Institute of the Russian Academy of Sciences (St.-Petersburg, Russia).

Comparative material was used from GenBank (see Fig. 1 for Accession Numbers) and was published by Lukhtanov et al. [2009].

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Fig. 11. Part of the ML-tree of the genus *Paralasa*, *P. kusnezovi*-related taxa (Kimura-2 parameter model, 10000 bootstrap-replications).

Рис. 11. Фрагмент ML-дерева рода *Paralasa*, таксоны, родственные *P. kusnezovi* (Kimura-2 parameter model, 10000 bootstrap-replications).

## Results

The differences in COI sequences between nominotypical population of *P. kusnezovi* from West Tian-Shan (Karabura river valley, samples FJ663883, FJ663884) and the population described from Kirghizsky Mts. under the name *P. kusnezovi bektur* Korb, 2013, are less than 0.1% (Fig. 11). It means that both populations belong to the same subspecies, and thus *P. kusnezovi kusnezovi* (Avinoff, 1910) = *P. kusnezovi bektur* Korb, 2013, **syn.n.**

The differences in COI sequences between nominotypical population of *P. kusnezovi* from West Tian-Shan (Karabura river valley, samples FJ663883, FJ663884), population of *P. bogutena* from Almaty vicinities (samples FJ663877, FJ663879) and population of *P. kusnezovi kolesnichenkoi* from Suusamyrtoo Mts. are similarly high and clearly show that in fact we have three different species (Fig. 11). Thus the new status should be implemented: *Paralasa kolesnichenkoi* Churkin et Zhdanko, 2011, **stat.n.**

## Discussion

The genus *Paralasa* has a wide Central Asiatic distribution. However, the distribution in Tian-Shanian territory is very local and sporadic. It is also very important to note that all the taxa inhabiting Tian-Shanian mountains are similar to *P. kusnezovi*. The taxonomic situation within this genus cannot be in many cases resolved by only traditional morphologic methods. The wing pattern in this group is very conservative and mostly cannot be used for species separation. The genitalia morphology has never been studied in its variability, so far it was studied only on few samples

without any statistical analysis. Only then it can be used as a tool for species differentiation. We did it for very limited amount of taxa [Korb, 2013] but a lot of work is still incomplete.

Most likely all these taxa we treat now as the separate species (*P. kusnezovi*, *P. bogutena*, *P. kolesnichenkoi*) are young species which differ mainly in DNA (we checked the COI sequence) and biotope preferences (see below). The last differentiation should be described in details as in our opinion it is very important and can be presented as a good example of the cluster biodiversity of the multidimensional strategy [Korb et al., 2016].

Low-mountainous xerophylic habitat (600–1200 m) (Figs 5–6): *P. bogutena*. Butterflies inhabit xerophylic locations within low-mountainous biotopes (mostly deeply dissected valleys with red clay on its bottom: semi-deserts and deserts). These are very hot places, the peak day temperature can be easily 40–45°C in shadow.

Middle-mountainous xerophylic habitat (1600–2400 m) (Figs 7–8): *P. kolesnichenkoi*. Butterflies inhabit xerophylic locations within middle-mountainous biotopes (mostly red rocks in the steppe vertical zone). There are quite hot places, the peak day temperature can reach 30–35°C in shadow.

Middle- or high-mountainous mesophylic habitat (over 2000 m) (Figs 9–10): *P. kusnezovi*. Butterflies inhabit mesophilous locations within middle-mountainous and high-mountainous biotopes (mostly screes in the forest and meadow vertical zone). There are not hot places. The peak day temperature can reach 25–30°C in shadow.

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Figs 1–10. *Paralasa*, males and biotopes: 1–2 — *P. kusnezovi bektur*; 3–4 — *P. kusnezovi kolesnichenkoi*; 5–6 — *P. bogutena* biotope, Kazakhstan, Boguty Mts., Chingilsu valley, N43° 34.825' E78° 39.847', 800–1200 m; 7–8 — *P. kolesnichenkoi* biotope, Kirghizia, Suusamyrtoo Mts., Kekemerren river valley 30 km S of settlement Kozhomkul, N41°55', E74°10', 1800–2300 m; 9–10 — *P. kusnezovi bektur* biotope, Kirghizia, Kirghiz Mts., Ala-Archa Nature Reserve, N42°31', E74°29', 2400–3000 m.

Рис. 1–10. *Paralasa*, самцы и биотопы: 1–2 — *P. kusnezovi bektur*; 3–4 — *P. kusnezovi kolesnichenkoi*; 5–6 — биотоп *P. bogutena*: Казахстан, хр. Богуты, долина Чингилсу, N43° 34.825' E78° 39.847', 800–1200 м; 7–8 — биотоп *P. kolesnichenkoi*: Киргизия, хр. Сусамыр Тоо., долина р. Кекемерен 30 км Ю от пос. Кожомкул, N41°55', E74°10', 1800–2300 м; 9–10 — биотоп *P. kusnezovi bektur*, Киргизия, хр. Киргиз, заповедник Ала-Арча, N42°31', E74°29', 2400–3000 м.

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