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Rediscovery of *Hyles svetlana* Shovkoon, 2010 (Lepidoptera: Sphingidae) from Kyzyl-Kum desert, Uzbekistan

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Abstract. Thirty-six years after the last published record of *Hyles svetlana* in Uzbekistan, we found the species at multiple locations in the Kyzl-Kum desert in 2022. Furthermore, we discovered larvae feeding on *Eremurus anisopterus* pointing to a possible oligophagous nature of *H. svetlana*, as described in early days, when it was still considered a desert population of *H. centralasiae*. We found phenotypes in both larva and imago of *H. svetlana* which appeared to be more similar to *Hyles euphorbiae*, giving rise to more questions regarding the relationships within the genus *Hyles* and the genetic identity of *H. svetlana*.

Keywords. *Hyles, Hyles svetlana*, Sphingid, Central Asia, Uzbekistan, Lepidoptera.

The distribution of *Hyles svetlana* Shovkoon, 2010 is understudied in Uzbekistan, since only a few collection sites have been published. The original description of this taxon was only in 2010 by Shovkoon. The populations were considered *Hyles centralasiae* (Staudinger, 1887) before the observations of significant differences in life-history traits (flight time, food plant and larval development) and phenotypic differences in the larvae compared to *H. centralasiae* were reported (Shovkoon 2010). A phylogenetic analysis of neutral mitochondrial markers confirmed a specimen of the type series and additional individuals from the type location in Kazakhstan (Aqtobe region) as part of the *H. siehei* clade (Hundsdoerfer et al. 2009), which is why the taxon was first described as a subspecies of *H. siehei*. These specimens formed a monophyletic clade only together with other specimens of *H. siehei* and those from the more southerly Plateau Ustyurt (also in Kazakhstan, 43°44'53.2" N, 53°38'13.5" E).

Nevertheless, de Freina & Geck (2014) raised the taxon to full species status. Thus it is currently referred to as *H. svetlana*, despite the lack of monophyletic clade formation based on mitochondrial DNA sequences (Hundsdoerfer et al. 2009). De Freina & Geck (2014) characterised the species as inhabiting semiarid to semihumid steppe and desert areas in a distribution range east of the Caspian Sea. The core area is the Shagyrai Plateau in the Kazakh Aqtobe region, the regions Qyzlorda, Mangistau, the Donyztau Plateau, and the Bolsheye Barsuki Sands, the Ustyurt Plateau in the border region between Southern Kazakhstan, Western Uzbekistan and Northwestern Turkmenistan. Furthermore, the eastern distribution area of *H. svetlana* was extended by R. Yakovlev (2017) to the Mongolian Bajtag-Bogd-Uul mountains (Fig. 1).

The last described finding of *H. svetlana* in Uzbekistan was by Falkovich in 1986 in the Kyzyl-Kum desert, reported as *H. centralasiae*. Before that, it was only found once in Uzbekistan in 1974, likewise in the Kyzyl-Kum desert.

We made two field trips in 2021 and 2022. In 2021 we arrived in the Kyzyl-Kum desert on the 11th of June, where no specimens could be observed. Contrary to the description of flowering time given in the original description of *H. svetlana*, the foodplant *Eremurus inderiensis* (Steven, 1832) was already desiccated when we arrived at sites where it was expected. The precocious development of the foodplant was likely due to the earlier spring leaf emergence (i.e., earlier spring greening) caused by the ongoing Anthropocene climate change (Barichivich et al.

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Table 1. Overview of *Hyles svetlana* specimens found between 1–8 May 2022 in the Kyzyl-Kum desert.

date	place	adult	larva	foodplant
02.05.2022	Kyzylkum desert	–	23	*Eremerus inderensis*
02.05.2022	Kyzylkum desert	–	18	*Eremerus inderensis*
02.05.2022	Kyzylkum desert	1	23	*Eremerus inderensis*
03.05.2022	Shor Kul	5	–	–
08.05.2022	Kyzylkum desert	–	10	*Eremerus inderensis*
08.05.2022	Kyzylkum desert	–	5	*Eremerus anisopterus*
08.05.2022	Kyzylkum desert	–	5	*Eremerus inderensis*
08.05.2022	Kyzylkum desert	–	34	*Eremerus inderensis*
08.05.2022	Kyzylkum desert	–	7	*Eremerus inderensis*
08.05.2022	Kyzylkum desert	–	6	*Eremerus inderensis*
08.05.2022	Kyzylkum desert	–	1	*Eremerus inderensis*

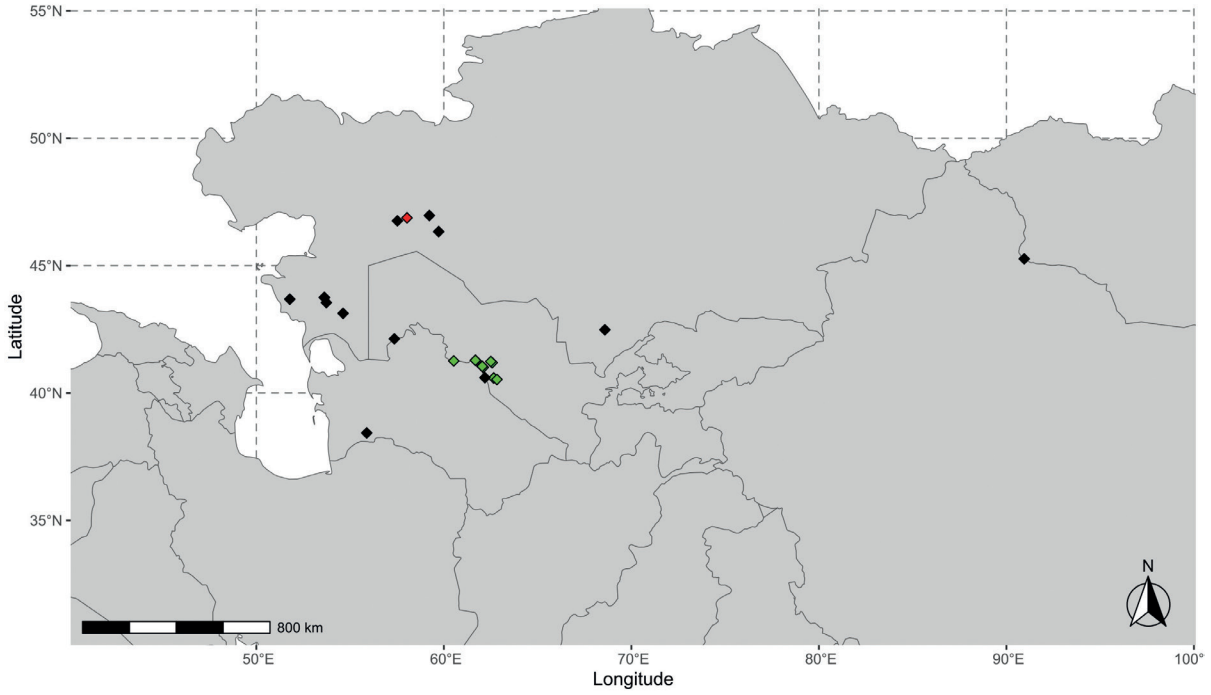

Fig. 1. Map of the localities in Central Asia where *Hyyles svetlana* was observed. The dots in green are the locations where we found *H. svetlana*. Black are localities which other authors described (Yakovlev et al. 2017, de Freina & Geck 2014). The locality in red is the type locality in western Kazakhstan (Shagyray Plateau, Aktobe region).

2013; Piao et al. 2015; Liu et al. 2016). However, we found typical larval excretions and feeding marks on the plants, so we came back earlier the subsequent year.

In 2022, we found 138 specimens of *H. svetlana* over eight days (1–8 May 2022), of which 132 individuals were larvae, and six individuals were imagos (Table 1).

They were either collected with the flower spike of the foodplant to enable further larval development or preserved in ethanol for further research. The imagos were collected using a mercury-vapour lamp and white linen placed beneath the light. Although extensive search in the Karakalpakistan region was done, we found *H. svetlana* only at the sites marked in Fig. 1. The material collected is deposited in the Senckenberg Natural History Collections in Dresden, Germany, and the Zoological Institute, Academy of Science Uzbekistan in Tashkent, Uzbekistan.

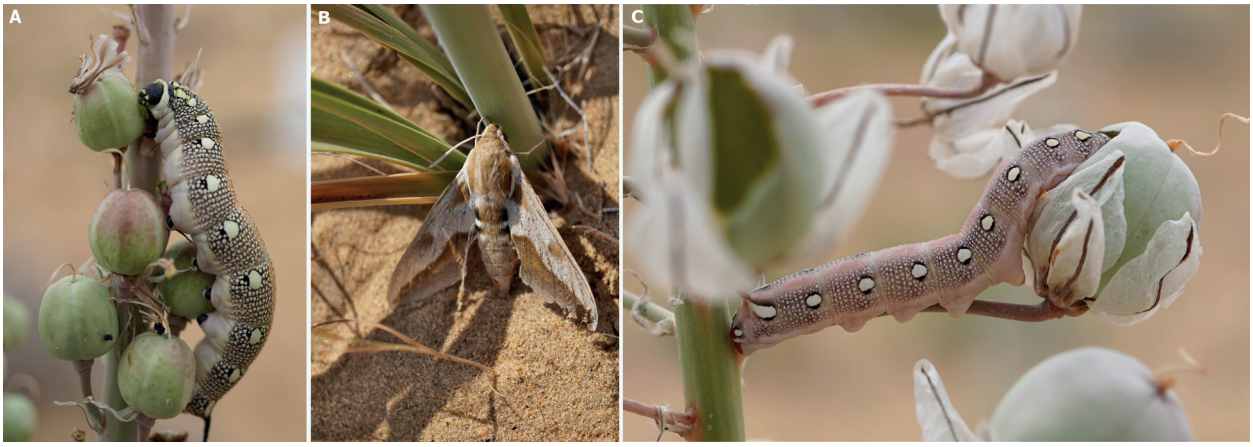

Fig. 2. Common phenotype of *Hyles svetlana.* **A**. Larva. **B**. Imago. **C**. Larva feeding on *Eremurus anisopterus*.

Fig. 3. Rare phenotypes of *Hyles svetlana*. **A**. Larva. **B**. Imago resembling *H. euphorbiae*. **C**. Plant of the genus *Euphorbia* found close to caterpillar localities in the Kyzyl-Kum desert.

When we arrived, the food plant already showed completely developed seed capsules, contrary to the expected flower spikes, indicating an earlier flowering period in 2022. We found all developmental stages of *H. svetlana,* from eggs laid directly on the fruit capsules, over different larval stages to imagos, coming to light during the night (except for pupae, Fig. 2 A–B). All specimens were collected from or close to *Eremurus inderiensis* and *Eremurus anisopterus* (Karelin & Kirilov, 1842). We observed *H. svetlana* larvae feeding on *Eremurus anisopterus* (Fig. 2C). Until now, *H. svetlana* was described as monophagous for *E. inderiensis* by the original subspecies description. In contrast, our observation points to a possible oligophagous nature of *H. svetlana* on different species of *Eremurus*, as described in Shchetkin (1952, 1975) when *H. svetlana* was still considered a desert population of *H. centralasiae*. Additionally, the *H. svetlana* larvae were indifferent to food sources (fruit capsules compared to flowers), while those of *H. centralasiae* were reluctant to feed on fruit capsules in 2021 (pers. obs.).

At the collection sites, we found all developmental stages of larvae, of which some differed from the phenotype described by Shovkoon (2010) and Shchetkin (1952, 1960, 1975). Besides the light-rosé coloured phenotype (Fig. 2A), we found a variation that appeared to be a mixture of the typical light-rosé coloured phenotype of *H. svetlana* and the green-coloured *Hyles euphorbiae* (Linnaeus, 1758) (Fig. 3A). The finding of this phenotype gives room for speculations about possible hybridisation events and their regularity. Even more so, as we found plants of the genus *Euphorbia* (Fig. 3C) and uncommonly marked imagos (possibly either *H. svetlana* or *H. euphorbiae*) close to the collection sites (Fig. 3B). This unexpected finding opens more questions regarding the genus *Hyles*. Further research on the genetic identity of *H. svetlana* is needed.

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