New subspecies of *Colias tyche* (Boeber, 1812) (Lepidoptera, Papilionoidea: Pieridae) from Taimyr Peninsula (Northern Siberia)

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Abstract
The article describes a new subspecies, *Colias tyche antonkozlovi* Yakovlev ssp. n. (Lepidoptera, Papilionoidea: Pieridae) from Taimyr Peninsula. We provide a detailed illustrated description and distinctive features of the new subspecies from other Palaearctic subspecies of *C. tyche*.

Key words: *Colias*, Pieridae, taxonomy, fauna, Arctic zone, Putorana plateau.

Introduction

*Colias tyche* (Boeber, 1812) (Lepidoptera, Papilionoidea: Pieridae) (Figs 1–24) is a boreo-mountainous species widely spread in the Palaearctic and North America. Currently, there are several Palaearctic subspecies of *C. tyche* (Grieshuber & Lamas 2007; Grieshuber et al. 2012; Grieshuber 2014): *Colias t. tyche* (Boeber, 1812) (type locality “…en Sibérie” [SW or W of Lake Baikal, or somewhere along the Lena River from its source to its mouth] (Grieshuber et al. 2012), *C. t. werdandi* Zetterstedt, [1839] (type locality: Lapponica septentrionalis … in alpium jugo latere Norvegico [Altevatn Lake area, SE Bardu District, N. Norway]), *C. t. kolosovae* Churkin, Grieshuber, Bogdanov & Zamolodchikov, 2001 (type locality: Gilmimlviem, 20 km south-east Ioni Lake, E. Chukotka, NE Russia), *C. t. zemblica* Verhulst, 1999 (type locality: Nouvelle Zemble [Schubert Bay, east coast of southern Novaya Zemlya, Russia]). The most polymorphic is the nominative subspecies, widely spread in the mountains of south-western Siberia, in all eastern Siberia to East up to Amur region, in Mongolia, northern China (Altai, Hebei, Inner Mongolia, Heilongjiang); *C. t. werdandi* was reported for Norway, Sweden, Finland, Kola Peninsula; *C. t. kolosovae* was given for Chukotka, Kamchatka and Taimyr; *C. t. zemblica* – for Novaya Zemlya. However, examining the specimens from Taimyr (Putorana Plateau), we have revealed significant differences of this population from *C. t. kolosovae* of Chukotka.
Material and methods

The specimens (11 males, 4 females) were collected on Putorana Plateau in July 2010. The holotype was given to the collection of ZISP, two paratypes are deposited in the collection of the author, the other paratypes are in the collection of Anton Kozlov (Moscow).

The images were taken with camera iPhone 7 and processed in Corel Draw.

Description of new taxa

_Colias tyche antonkozlovi_ Yakovlev, _ssp. n._

**Material.** Holotype, male, Russia, [Krasnoyarsk Reg., Taimyr Dolgano-Nenets Distr.], Putorana Plateau, Kharaulakh Ridge, Talnakh [~69°29′11″ N / 88°23′49″ E] env., July 2010 (ZISP). Paratypes, 10 males, 4 females, same locality (AKPC & RYB).

Description. Male. Length of fore wing 20–24 mm (holotype – 22 mm). Antenna pink, apically yellow. Wings pale green from above, fringe pink. Slight sputtering of grey scales on costal edge of fore wing, poorly developed marginal grey band with pale green strokes along veins, submarginal series of pale green round spots, discal poorly developed grey band, slight sputtering of grey scales in discal and wing root area, well expressed grey discal spot. Hind wing with series of boundary grey triangle spots at veins (in some specimens, the spots developed only at veins Sc+R₁, Rs and M₁−₃), slight sputtering of black scales at wing root. Fore wing pale green from below, apically with slight ochre sputtering, slight grey scales sputtering throughout wing, discal spot small, silver-white, framed in thin grey rim. Hind wing olive-green from below, with light submarginal band, discal spot silver-white, framed in thin pink rim.

Female. Length of fore wing 24–25 mm. Antenna pink, apically yellow. Fringe on wings pink. Fore wing light-yellow from above, wide grey submarginal band with light-yellow wide spots along veins, grey sputtering on costal edge, discal spot black, sputtering of grey scales in root area. Hind wing grey, wide light-green submarginal band, series of boundary grey triangle spots at veins Sc+R₁, Rs and M₁−₃, discal spot yellow. Fore wing light-green from below, with slight sputtering of light-grey scales throughout wing, apically poorly expressed ochre sputtering, discal spot small, silver-white, framed in thin grey rim. Hind wing olive-green from below, with a lighter submarginal zone and dense sputtering of grey scales throughout wing, discal spot silver-white, framed in thin pink rim.

**Diagnosis.** The new subspecies has the following characters distinctive from the other known Palaearctic subspecies:
- the nominative subspecies is bigger (the fore wing length of males is 24–27 mm, of females – 25–29 mm); in both sexes the dark submarginal bands are much more expressed; the hind wing of males is more green and unicolorous from below; the discal spot on the bottom surface of the hind wing in most specimens is not framed with a pink rim;
- _C. t. kolosovae_ is smaller (the fore wing length of males is 18–22 mm, of females 22.5–24 mm) [Churkin et al., 2001]; the fore wing of males has an expressed grey sputtering;
- in _C. t. werlandii_, males and females are lighter coloured;
- _C. t. zemblica_ is smaller (the fore wing length of males – 18 mm); the male is lighter coloured, with a contrast black pattern from above.

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Figures 1–13. Colias tyche, adult specimens, upperside: 1. C. t. tyche, male, Irkut (ZISP); 2. C. t. tyche, female, [Russia, Amur reg.], Amur Ufer (ZISP); 3. C. t. tyche, male, [Russia, Transbaicalia Reg.], Nerchinsk, [Karym Distr.], Darasun [51°38′59″N / 113°58′07″E], vi.1911, coll. Fabri (ZISP); 4. C. t. tyche, female, [Russia], Transbaicalia [Reg.], Nerchinsk, [Karym Distr.], Darasun [51°38′59″N / 113°58′07″E], 2.vii.1913, coll. Fabri (ZISP); 5. C. t. tyche, male, [Russia, Buryatia Republic, Oka Distr.], Nukhu-Daban [pass, 51°47′30″N / 100°40′47″E], 9.vi.1915, S. Rodionoff (ZISP); 6. C. t. antonkozlovi, male, holotype (ZISP); 7. C. t. antonkozlovi, male, paratype (RYB); 8. C. t. antonkozlovi, female, paratype (RYB); 9. C. t. werdandi, holotype (NRS; from Grieshuber, Worthi & Lamas, 2012); 10. C. t. werdandi, female, Sweden, Norsbootten Län (MNKB; from Grieshuber, Worthi & Lamas, 2012); 11. C. t. zemblica, male, holotype (NHMUK; from Grieshuber, Worthi & Lamas, 2012); 12. C. t. kolosovae, male, paratype (DMM, http://www.darwinmuseum.ru/); 13. C. t. kolosovae, female, paratype (DMM, http://www.darwinmuseum.ru/).
Figures 14–23. *Colias tyche*, adult specimens, underside: 14. *C. t. tyche*, male, Irkut (ZISP); 15. *C. t. tyche*, female, [Russia, Amur reg.], Amur Ufer (ZISP); 16. *C. t. tyche*, male, [Russia, Transbaicalia Reg.], Nerchinsk, [Karym Distr.], Darasun [51°38′59″N / 113°58′07″E], vi.1911, coll. Fabri (ZISP); 17. *C. t. tyche*, female, [Russia, Transbaicalia [Reg.], Nerchinsk, [Karym Distr.], Darasun [51°38′59″N / 113°58′07″E], 2.vii.1913, coll. Fabri (ZISP); 18. *C. t. tyche*, male, [Russia, Buryatia Republic, Oka Distr.], Nukhu-Daban [pass, 51°47′30″N / 100°40′47″E], 9.vi.1915, S. Rodionoff (ZISP); 19. *C. t. antonkozlovi*, male, holotype (ZISP); 20. *C. t. antonkozlovi*, male, paratype (RYB); 21. *C. t. antonkozlovi*, female, paratype (RYB); 22. *C. t. kolosovae*, male, paratype (DMM, http://www.darwinmuseum.ru/); 23. *C. t. kolosovae*, female, paratype (DMM, http://www.darwinmuseum.ru/).
**Etymology.** The new subspecies is named after Anton O. Kozlov (Moscow), who provided the specimens for examination.

**Discussion.** Numerous Papilionoidea of Putorana Plateau due to their isolation from the nearest populations are well differentiated subspecies described in the recent years (Korshunov 1982; Churkin & Grieshuber 2001; Korshunov & Nikolaev 2002; Churkin 2005; Lastukhin 2008): *Parnassius phoebus zamolodtschikovi* Belik, 2006 (Papilionidae), *Colias hyperborea paradoxa* Churkin & Grieshuber, 2001, *Agriades glandon saluki* Churkin, 2005, *Polyommatus eros taimyrensis* Korshunov, 1982 (Lycaenidae), *Euphydryas iduna putorana* Lastukhin, 2008, *Oeneis nanna taimyrcha* Lukhtanov & Eitschberger, 2001, *O. ammon putorana* Korshunov & Nikolaev, 2002 (Nymphalidae), thus, the discovery of a new subspecies in the Putorana mountains was highly anticipated.

![Figure 24. Type localities of Asian subspecies of Colias tyche.](image)

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