



Conference Abstract

# Ground beetles (Coleoptera, Carabidae) of Kunashir Island's fumarole fields, Kuril Archipelago

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## Abstract

Fumarole fields on the Kunashir Island are confined to the main mountain ranges formed by the Ruruy, Mendeleev and Golovnin volcanoes. Due to residual volcanism, their soil, water and air are enriched with sulfur compounds, the vegetation is strongly depressed and degraded, while the temperature of soil and subsoil air is markedly increased (Zharkov 2014). Only a few publications are specifically devoted to the fauna of fumarolic sites (Konakov 1956).

Based on repeated collections in 2008 to 2018, a complex of ground beetles living in these particular conditions was revealed and studied.

Among the approximately 170 species of ground beetles recorded from the Kunashir Island (Sundukov and Makarov 2016), only five appear to be permanent inhabitants of fumarole fields: *Cicindela* (*Cicindela*) *sachalinensis sachalinensis* A. Mor., 1862, *Cylindera* (*Eugrapha*) *elisae* (Motsch., 1859), *Bembidion* (*Ocydromus*) *dolorosum* (Motsch., 1850), *Bembidion* (*Peryphanes*) cf. *sanatum* Bates, 1883 and *Poecilus* (*Poecilus*) *samurai* (Lutsh., 1916). Two species (*C. sachalinensis* and *B. dolorosum*) are found on all volcanoes studied, while the other species are narrowly localized. For example, *C. elisae* occurs on the Mendeleev and Ruruy volcanoes alone, *B. cf. sanatum* inhabits only the Mendeleev

volcano, whereas the widespread *P. samurai* lives solely on the fumaroles of the Ruruy volcano.

The species that populate both fumarole fields and other habitats react differently to particular conditions. In *C. sachalinensis* and *P. samurai*, the proportions of melanistic specimens at the fumaroles are increased, in the latter species the body size being significantly increased as well. The most interesting is the variability of *B. dolorosum*. With an increase in temperature and acidity of the habitat, this species becomes increasingly small, elongated, flattened and partially unpigmented. Such individuals are phenotypically indistinguishable from *Bembidion (Ocydromus) negrei* Habu, 1958 (= *B. kuznetsovi* Lafer, 2002), with transitions from the typical *B. dolorosum* to a form imitating *B. negrei* which can be observed even in tens of meters apart.

Thus, only a few species have been capable of getting adapted to fumarolic field environments, but even they change significantly under the influence of extreme factors. At the same time, we believe that thermal (including fumarole) fields could have ensured the survival of a number of species under the conditions of temperature pessima during the Pleistocene and Holocene. Such a scenario was considered by us earlier for *Bembidion* (? *Nipponobembidion*) *ruruy* Makarov et Sundukov, 2014 (Makarov and Sundukov 2014) and some other beetles (Shavrin and Makarov 2019). The features of morphology and distribution of *B. cf. sanatum* also seem to favour this hypothesis. Interestingly, *C. elisae* is represented on the Kunashir Island both by the relict *C. elisae kunashirensis* (Putz et Wiesner, 1994) that inhabits only the Mendeleev volcano (Fig. 1) and by a form that populates only the Ruruy volcano, the latter form being morphologically more similar to the nominative subspecies than to *C. elisae novitia* (Bates, 1883) from northern Hokkaido.



Figure 1. [doi](#)

The upstream of Kislaya River on the fumarole field of the Mendeleev volcano (photo by Andrey Matalin) and living here the Kunashirian endemic *Cylindera (Eugrapha) elisae kunashirensis* (Putz et Wiesner, 1994) (photo by Artem Zajtsev).

## Keywords

fumarole fields, volcanoes, Kunashir Island, Kuril Archipelago, Carabidae

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