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DESCRIPTION OF A NEW SUBSPECIES OF THE *BOLORIA PALES* ([DENIS ET SCHIFFERMÜLLER], 1775) SENSU WARREN (1944) (LEPIDOPTERA, NYMPHALIDAE) FROM ALTAI

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Boloria pales roddi ssp. n. is described from Central, South-East and South-West Altai (Russia and Kazakhstan). New subspecies is most close to *B. pales banghaasi* Seitz, 1909.

KEYWORDS: Lepidoptera, Nymphalidae, Russia, taxonomy.

О. Э. Костерин. Описание нового подвида *Boloria pales* ([Denis et Schiffermüller], 1775) sensu Warren (1944) (Lepidoptera, Nymphalidae) с Алтая. // Дальневосточный энтомолог. 2000. N 86. С. 1-10.

Из России и Казахстана (Юго-Восточный, Юго-Западный и Центральный Алтай) описан новый подвид *Boloria pales roddi* ssp. n., наиболее близкий к *B. pales banghaasi* Seitz, 1909.

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INTRODUCTION

The genus *Boloria* Moore, 1900, although apparently embracing few species, presents enormous taxonomic problems as being represented by a number of mostly allopatric taxa confined to different mountain systems, which exhibit a

great geographical variation accompanied with a considerable individual variability. In his classical work, Warren (1944) has divided all the diversity of the genus into three species, the main diagnostic features being the ratio of the toothed apical part (head) of the harpe to the total harpe length, being 0.30-0.4 (with the mean 0.33) in *B. graeca* (Staudinger, 1870), 0.33-0.50 (with the mean of 0.40) in *B. pales* ([Denis et Schiffermüller], 1775) s. l., and 0.47-0.63 (with the mean of 0.50) in *B. napaea* (Hoffmannsegg, 1804) s. l. Although this value in different species in some cases may even overlap to a minor extent, this quantitative trait appears to be surprisingly stable and reliable. Other genitalia characters are very similar, except for a decreased aedeagus and disproportionally reduced wings of the phallobase in *B. graeca*. There is some other differences, e. g. ventral curvature of the toothed head of the harpe, which are of little relevance as variable individually. Later *B. napaea* s. l. and *B. pales* s. l. were subdivided into a number of species each (Warren, 1944). As to the group *B. napaea* s. l., at present there are convincing evidences that it embraces at least three good species, while splitting of the *B. pales* s. l. group is more problematic.

In 1986-1987 on the Katunskii Range of the Altai Mts. I have collected a series of the *Boloria* butterflies apparently belonging to the superspecies *B. pales* s. l. which well distinguished from *B. aquilonaris* (Stichel, 1908), the only reported for Altai so far representative of this superspecies (Elwes, 1899; Lukhtanov & Lukhtanov, 1994), as well as from *B. banghaasi* (Seitz, 1909) known from the mountains of Central and East Siberia (Crosson, 1982; Korshunov & Gorbunov, 1995). These butterflies were described in my paper devoted to the butterflies of the Katunskii Range (Kosterin, 1994), but not named, as their taxonomic position remained unclear to me. Later these butterflies were collected in South-East Altai by a number of persons but have not been described yet. In this paper I give description of a new subspecies. The holotype, allotype, and a part of the paratypes are deposited in the Siberian Zoological Museum at Institute of Systematics and Ecology of Animals, Siberian Division of the Russian Academy of Sciences (Novosibirsk), other paratypes are in the personal collections by V. Ivonin and R. Yakovlev.

Since the new subspecies seems to represent a link between North Asiatic and Central Asiatic taxa, I can not help but come back to the Warren's (1944) notion of the limits of the species *B. pales* as embracing a lowland peat-bog inhabiting taxa *B. p. aquilonaris* (Stichel, 1908), *B. p. alethea* (Hemming, 1934) and *B. p. neopales* (Nakahara, 1926), and a great number of local mountain forms spread over Eurasia. Hence I do not accept a species rank for the taxa relevant to considering the taxonomic position of the new taxon, namely, *aquilonaris* (Stichel, 1908), *banghaasi* (Seitz, 1909), *generator* (Staudinger, 1866), and *sipora* (Moore [1875]), which is assumed by various authors. A detailed revision of this group including the discussion of the taxonomic position of the new subspecies will be published elsewhere.

***Boloria pales roddi* Kosterin, ssp. n.**

Figs 1-3.

Boloria aquilonaris banghaasi: Tuzov, 1993: 43 (part.).

Boloria pales: Kosterin, 1994: 64.

Boloria aquilonaris: Lukhtanov & Lukhtanov, 1994: 208-209 (part.).

Boloria pales banghaas: Korshunov & Gorbunov, 1995: 110.

Boloria banghaasi: Yakovlev, 1998: 24.

MATERIAL. Holotype - ♂, RUSSIA, «[SE] Altai. Chuiskaya Step', Kosh-Agach, 11.VII 1907 (E.G. Rodd)». Allotype - ♀, «SE Altai, Ukok Plateau, headwaters of the Akkol brook at the Maitobe mountain, 2500 m, 7.VII 1997 (R. Yakovlev)». Paratypes. RUSSIA: «Chuiskaya Step', Kosh-Agach, 8, 11.VII 1907, 2♂ (E. G. Rodd)»; «Chuiskaya Step', the Yustyd River at village Ak-Tal, 14.VII 1959, 1♂ (A. Cherepanov)»; «Altai, Ukok, 22.VI, 7.VII 1995, 2♂ (R. Yakovlev)»; «SE Altai, Plateau Ukok, terrain Mai-Pak, 2200 m, Ak-AJakha River bank, 26.VI-4.VII 1997, 18♂, 4♀ (R. Yakovlev)»; «SE Altai, Plateau Ukok, the Zhumaly River middle reaches, 2200 m, 14.VII 1997, 2♂ (R. Yakovlev)»; «Altai Mts., Kosh-Agach Distr., a damp floodland meadow with *Pentaphylloides fruticosa* on the Dzhazator River left bank in front of the Akbul River mouth, 5 km E of the Zhumaly River mouth, 2000 m, 12.VII 1998, 3♂ (O. Kosterin)»; the same label, 19.VII 1998, 5♂ (O. Kosterin); the same locality, 12.VII 1998, 3♂, 14.VII 1998, 1♂, 20.VII 1998, 2♂, 21.VII 1998, 1♀ (V. Ivonin); the same locality, but «on the Dzhazator River right bank, 11.VII 1998, 1♂, 1♀, 16.VII 1998, 30♂, 1♀ (V. Ivonin)»; «Altai Mts., Kosh-Agach Distr., Yuzhno-Chuiskii Mt. Range S slope, a subalpine meadow with bushes between the Akbul and Chikty Rivulets, 2500 m, 15.VII 1998, 1♂ (O. Kosterin)»; «SE Altai, environs of Dzhazator, Kudatai River mouth, 2000 m, 20-22.VII 1997, 5♂ (R. Yakovlev)»; «Altai, Dzhazator, 15.VII 1994», 1♂, 1♀; «Altai, Belyashi [another name of the village Dzhazator], 5.VII 1995, 1♂ (R. Yakovlev)»; «Altai Mts., Katunskii Range, the Nizhnii Kuragan headwaters, above the lakes, 1800 m, left bank, a damp meadow and dwarf birch thickets within taiga belt, 13.VII 1986, 2♂ (O. Kosterin)». KAZAKHSTAN: «East Kazakhstan Province, Katon-Karagai Distr., Altai Mts., Katunskii Range, valley of the Belaya Berel' River in its headwaters, damp meadow with *Pentaphylloides fruticosa* bushes, 1600 m, 24.VII 1987, 8♂, 2♀ (O. Kosterin)»; «East Kazakhstan Province, Katon-Karagai Distr., Altai Mts., Katunskii Range, bog in the valley of a brook falling into Yazovoe Lake, 1550 m, 27.VII 1987, 1♂, 1♀ (O. Kosterin)»; «Altai, SE bank of Lake Markakol', the Topolevka River mouth, at v. Urunkhaika, 3.VIII 1987. (V. K. Zinchenko)».

DESCRIPTION. MALE. Fore wing length 16-19.5 mm (18 mm in the holotype), wing expanse 30-36.5 mm (35 mm in the holotype). The smallest males are mentioned from the Nizhnii Kuragan headwaters (fore wing length 16 mm) and Belaya Berel' headwaters (16-17.5 mm). Wing upperside brick-red to ochre-fulvous

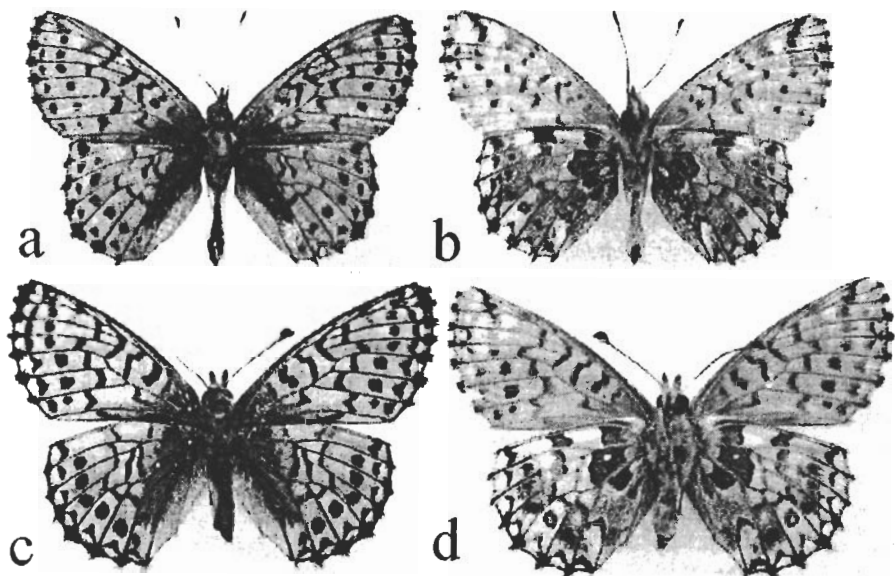


Fig. 1. *Boloria pales roddi* ssp. n.: a, b) holotype; c, d) allotype.

(in old specimens) with characteristic pattern for the *B. pales* s.l. In general appearance the butterfly looks very mottled, mostly since of a black elements pattern are of rather equal in sizes and are not arranged into even bands [although far from being so separated as in *B. pales caucasica* (Lederer, 1852)], and due to a conspicuously chequered fringe, fulvous-whitish with black spots. The black pattern is variable but in general is sufficiently less pronounced than in the *banghaasi* (Seitz, 1909) and *aquilonaris* (Stichel, 1908) and not so reduced as in *generator* (Staudinger, 1866). The specimens from the Belaya Berel' have the finest black pattern - the specimens from the Ukok - the heaviest ones; nevertheless in both places variation is substantial. All black elements are rather evenly expressed, no cases of disproportional enlargement and fusing of the black spots in the wing basal area are observed in the type series. The dark basal suffusion is rather weakly expressed: on the fore wing it does not reach the first black spot in the cell while on the hind wing it occupies no more than 1/3 of the cell area and extends to the median line in space A_2-A_3 . The median black elements vary from narrow lines and chevrons to bars only twice as narrow as long. In about a half of the examined males the element in space Cu_1-Cu_2 , which is shifted to the cell in relation to its counterparts in the adjacent spaces, is wide enough to contact either of these counterparts at veins Cu_1 or Cu_2 (Fig. 2, b, d, f-j) while in the other half of specimens it is narrow to be fully separated from them (Fig. 2, a, c, e, k). A degree of curvature of the median elements also varies, from almost straight to curved (convex to the wing base). In general, very few specimen have a contiguous dentate median line. The black median spot in space Cu_1-Cu_2 in 20% of cases contacts the

cubital vein of the cell (Fig. 2 a). however, this is rather a reflection of the degree of the spot displacement towards the cell rather than of a median line heaviness shows a great variation also. The second black element in the cell in about 50% of cases is represented by two separate dots (Fig. 2, a, d, h, j, k), in 30% by a fractured bar composed of two spots (Fig. 2, b, c, g), in 20% by a conspicuous curved spot exceeding in size other black elements within the cell (Fig. 2, c, f). The postmedian round spots are moderately developed, their area does not exceed the other black elements, so they are not conspicuous. Only in one male these spots are noticeably large on the hind wings (Fig. 2, k). In the hind wing, the first three postmedian spots (between veins R_s and M_3) are equal in size in about 3/5 of cases, the second being slightly larger in about 1/5 of cases, in 1/5 of cases the first being noticeably smaller than two others.

Wing underside in general characterized by clear and bright colours and elaborated ornament. Dark elements on the fore wing upperside, corresponding to those of the upperside, are of the same size in general, but reddish, in majority of the specimens they contain black scales as well to form narrower black spots or lines inside. On the hind wing underside the discal band continues from the fore to anal margin, has rather an even outline, parallel to the outer margin, and an even colouration of clear light-, ochre-, or fulvous yellow; its lower part is not or very little suffused with darker scales, the veins are only slightly darker and are not contrasted. The spot at the cell apex within the band is silvery, silvery glitter as a rule (but not in all specimens) is present just at proximal margins of the band spots within spaces $Sc+R_1-R_s$ and Cu_2-A_2 . The band is outlined with interrupted black lines from inside almost throughout its length and from outside above vein M_1 . The basal light spots are well seen, of the same colour as the band, in space Cu_2-A_2 usually silvery. The ground colour between these spots and the band is rather dark, cinnamon-red, with a very small white dot inside the cell. The postdiscal area has the same ground colour but with a complicated ornament consisting of: a) white bracket-shaped spots with diffuse outer margins at the fore margin and in anal angle, the latter usually with a silvery glitter, the fore margin with or without such glitter; b) well-expressed vedge-shaped lightening between veins M_3 and Cu_1 of the same colour as the median band, almost reaches this band, being separated from it by a thin streak of the ground colour only; in some males, however, it reaches the ocellus only; c) the same colour lightening just along the row of submarginal lunules; d) a row of reddish-brown postdiscal ocelli with traces of light rims, which are mostly blind, but in space M_3-Cu_1 has a scarcely seen silvery light pupil (almost absent in the holotype).

There is a row of small light spots along the margin, below vein M_1 they are silvery while above this vein usually yellow, without a silvery bloom. These spots are accompanied with the reddish-brown lunules from inside and with spots of the same colour at vein tips. The intensity and development of red and brownish colour vary substantially. In some cases these colours are so shrieked that in the postdiscal area the white spots and yellow lightening expand substantially, almost

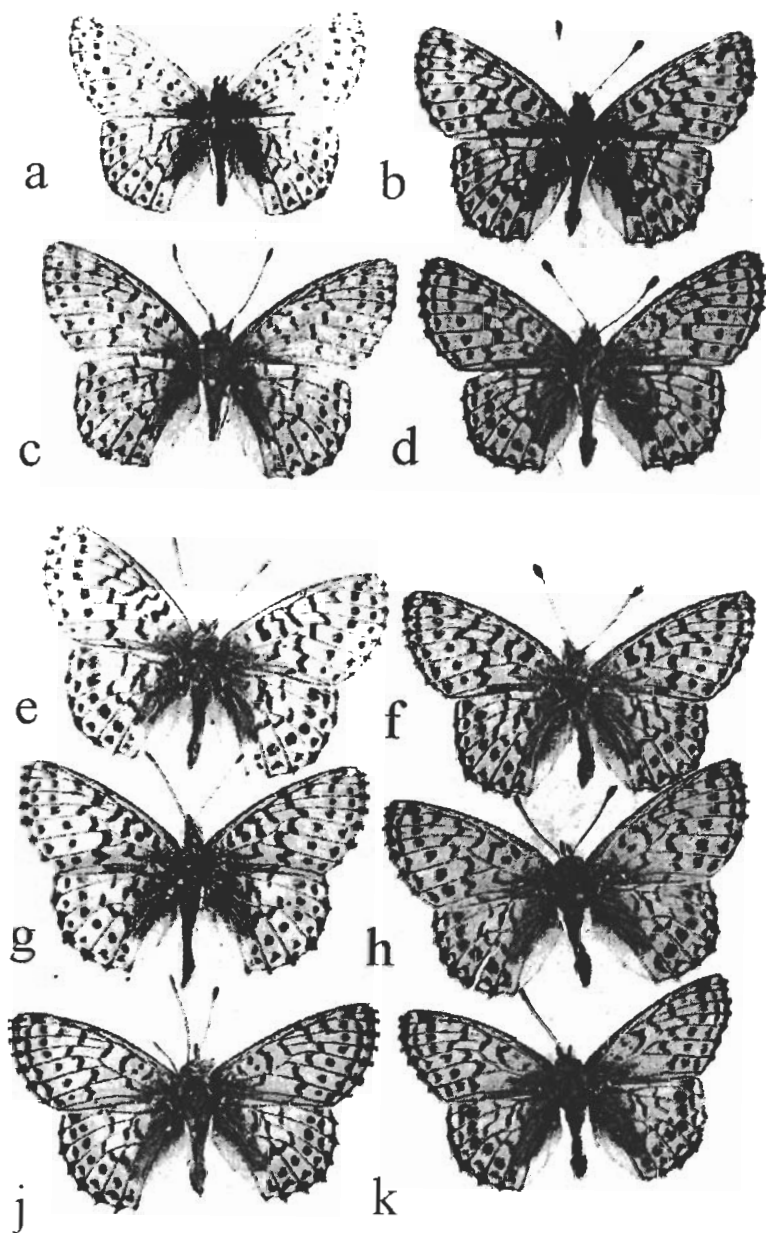


Fig. 2. *Boloria pales roddi*, ssp. n., variation of the wing upperside among male paratypes: a) Belaya Berel' River; b) Ukok; d) Yustyd River; e) Mai-Pak; f) Dzhazator; g) Kudatai River; h) Dzhazator River; j) Mai-Pak; k) Dzhazator River.

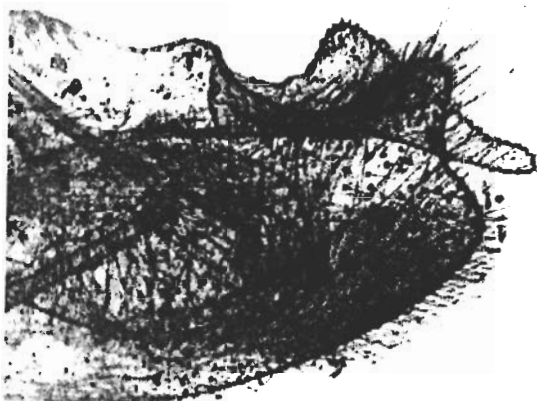


Fig. 3. *Boloria pales roddi*, ssp. n., male genitalia of the paratype from the Yustyd River at village Ak-Tal.

to contact to the band. However, in many cases the brownish-red brown colour retains its intensity at the basal area and at the ends of the postdiscal area so that the hind wing underside colouration remains contrasted.

Male genitalia: typical for *B. pales* s.l. In specimens studied the dentate head of the harpe comprises about 0.42 of the total harpe length, the ventral curvature is not expressed (Fig. 3).

FEMALE. Fore wing length 18-19.5 mm (18.5 mm in the allotype), wing expanse 33-36 mm (35 mm in the allotype). The wing upperside ground colour is somewhat duller than in males, fulvous-ochre. The black pattern is virtually the same. The black median element in space Cu_1-Cu_2 is contacted to the cell in about 1/4 of cases and in about 1/4 of cases it does not contacted to its counterparts in the adjacent cells. The first three postmedial spots on the hind wing are equal in size. The wing underside in general as in males, but a bit more contrasted, the yellow discal band and lightnings never have a fulvous tint, silver glittering on the proper light spots is better expressed. In one female from the Belaya Berel' River the brownish-red colours are extremely reduced so that most of the postdiscal area is of the same ochre-yellow colour as the discal bands.

DIAGNOSIS. New subspecies is most close to *B. p. banghaasi* from the mountains of the southern Central and East Siberia and of the northern Mongolia. I study numerous specimens from various localities of Central and East Siberia preserved in Siberian Zoological Museum including those from the southern part of Chitinskaya oblast' (the Bukukun River valley, northern Khentei Mts., the type locality *B. p. banghaasi*). The specimens of *B. p. banghaasi* is very variable (see also Crosson, 1982), but in general the wing underside is much less contrasted than in *B. p. roddi* ssp. n.; the males discal band is ochre or ochre-fulvous, as in some paratypes of the new subspecies, but not yellow, as in other paratypes, while the basal and postdiscal areas are dull brick-red to ochre fulvous, much less contrasted to the discal band than in *B. p. roddi* ssp. n.; white spots, ochre lightning and dark ocelli in the postdiscal area of *B. p. banghaasi* are much less contrasted. The wing upperside black pattern in *B. p. banghaasi* is wider, the black bar in space Cu_1-Cu_2 on the fore wing usually contacting the cell; the round black spots of the postmedial row are as a rule relatively larger so that the row is conspicuous. The studied specimens of *B. p. banghaasi* are on average larger than *B. p. roddi* (fore wing length being 18-20 mm in males) but this difference is hardly significant.

Both *B. p. aquilonaris* (Stichel, 1908) and *B. p. aethea* (Hemming, 1934) distinguished from *B. p. roddi* ssp. n. by the wing much more heavy upperside black pattern, especially in the basal area, by the hind wing underside much darker and less contrasted, so that the discal band is substantially suffused with red and dark scales, while the lightening patterns on the postdiscal area are much weaker or absent.

B. p. roddi ssp. n. is similar to three subspecies from Tibet and adjacent mountain regions: *B. p. baralacha* (Moore, 1882) from Ladakh, *B. p. palinoides* Reuss, 1925 from Sichuan, and *B. p. sifainca* (Groum-Grshimailo, 1891) from Aindo (see Warren, 1944) by clear and contrasted colours of the hind wing underside, by clear yellow unsuffused discal band, and by relatively small size. *B. p. baralacha* and *B. p. palinoides* have quite a heavy upperside black pattern. *B. p. sifainca* has the dullest, least contrasted coloration of the hind wing underside; upperside black pattern finer and better corresponds than in *B. p. roddi* ssp. n. The main features distinguishing a new subspecies from all of them are the same as for *B. p. banghaasi*: a fine marking of the fore wing underside and an evenly rounded and wide discal band. More precisely, in Central Asian butterflies the inner margin of the band plate in space $Sc+R_1-Rs$ coincides with that in the cell at the upper cell-bordering vein, on the other hand, the inner margin of plate in space Cu_2-A_2 is much shifted proximally so that it does not coincide with that in the cell at the lower cell-bordering vein. In *B. p. roddi* ssp. n. and *B. p. banghaasi* the band plate in space $Sc+R_1-Rs$ is shifted to the base while that in Cu_2-A_2 is not so much shifted. Noteworthy these are the characters proposed for distinguishing *B. napaea* (Hoffmannsegg, 1804) and *B. alaskensis* (Holland, 1900) by Crosson (1977).

B. pales generator s. l. (Staudinger, 1866) from Tian Shan and Alai-Pamir is very variable, so the differences of a new subspecies from it are explicit: in *B. p. generator* the male upperside black pattern almost disappears from the basal wing halves; the hind wing underside is as well contrasted and have the same coloration as in *B. p. roddi* ssp. n., but the pattern is very different: the discal band with a very jagged margins, its plates in spaces $Sc+R_1-Rs$, M_2-M_3 , and Cu_2-A_2 much longer, the latter suffused with dark scales and sometimes merge to the basal spot; veins within the bands are contrasted as accompanied with fulvous scales; the lightening spots in space M_3-Cu_2 large, clear (sometimes specimens from Tian Shan without ocellus); other ocelli with yellow rims.

New subspecies differs from the Alpine *B. pales pales* (Denis et Schiffermüller, 1775) by more rounded and wide wings and by the hind wing underside coloration and the shape of the discal band. In *B. p. pales* the discal band is not so even, almost straight from the fore margin to the cell where it is sharply bent to the anal margin (as the band inner margins coincidence in space $Sc+R_1-Rs$ and in the cell and far from coincidence in the cell and space Cu_2-A_2); besides, it has a more jagged outer margin. Lower part the band usually suffused with dark scales and disappears below vein A_2 . The hind wing underside ground colour of the same tones as in new subspecies, but much duller, the postdiscal area is uncontrasted, the ocelli and marginal spots are lighter.

B. p. caucasica (Lederer, 1852) differs from *B. p. roddi* ssp. n. by peculiar wing upperside black pattern with large but more or less rounded spots, well separated from each other to leave a very mottled appearance, by the fore wing underside with the same black spots as the upperside while the hind wing underside resembles that in *B. p. pales* but more contrasted.

DISTRIBUTION. Russia (Altai), Kazakhstan (Altai). The available specimens of the new subspecies originate from Central (the Katunskii Mountain Range), South-Eastern (the intermontane hollow called Chuiskaya Step', the Yuzhno-Chuiskii Mt. Range, the Ukok Plateau) and South-Western (Lake Markakol') Altai. A point on the map for *B. aquilonaris* in a Lukhtanov & Lukhtanov (1994) plotted on the Katunskii Range obviously corresponds to *B. p. roddi* ssp. n.

HABITAT. I observed *B. p. roddi* in the Katun', Belaya Berel', and Dzhazator River valleys. New subspecies was strictly confined to a very peculiar habitat: wide and flat river valleys, at 1.550-1.700 m above sea level in the Katun' and Belaya Berel' and 2000 m in Dzhazator, covered with damp or even murshy meadows, with tussocks and more or less sparse bushes of *Pentaphylloides fruticosa*. In the Dzhazator River valley the butterflies penetrated for several hundred metres to the neighboring damp thickets of *Betula rotundifolia* on a northern slope of the valley, with sparse *Larix sibirica* stands. Remarkably, the same habitat was observed for *B. p. banghaasi* in East Siberia (personal communications by V. V. Dubatolov and V. I. Ivonin). According the labels of R. Yakovlev for the Ukok Plateau the butterflies was found even about 2200-2500 m. During month-long observations in 1998 in the Dzhazator River valley, I recorded only one male in another habitat: a southern slope 500 m above the valley bottom and separated from it with a larch forest, in a transition between the subalpine larch parkland and a dwarf birch tundra belts, on a short-grass flowery meadow with bushes of *Betula rotundifolia* and sparse larch trees. This male was collected among numerous *B. napaea altaica* Gr.-Gr. which prefers such habitats. Females less frequently than males. The imagines were observed to feed on the flowers of *Pentaphylloides fruticosa*, *Tripleurospermum ambiguum*, *Bistorta vivipara*, and at neighboring rocky slopes on *Thymus serpyllum*.

ETYMOLOGY. The name is devoted to the memory of Evgenii Georgievich Rodd (1871-1933), a forester, a head of the Altai Laboratory of Plant Defense, and an eager naturalist, who firstly collected this butterfly.

ACKNOWLEDGEMENTS

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