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Notes on *Parnassius* LATREILLE, 1804 from Tian-Shan and Alai Part 3: *Parnassius charltonius* GRAY, 1852

(Lepidoptera, Papilionidae)

by

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Summary: A review of all taxa belonging to the *romanovi* subspecies group includes lectotype designations of *Parnassius charltonius romanovi* GRUM-GRSHIMAILO, 1885 and *Parnassius charltonius princeps* HONRATH, 1887 and diagnoses of known taxa with addition of some newly found characters. Three new subspecies are described: *P. charltonius* ***eugenia*** **subspec. nov.** (Peter the Great Range, Muksu R.), *P. charltonius* ***sochivkoi*** **subspec. nov.** (North-East Alai, Ak-Bura R.) and *P. charltonius* ***varvara*** **subspec. nov.** (Tian-Shan, Dzhaman-Too Mts.). The last taxon is the first record of the species from the Tian-Shan mountain system.

Резюме: Обзор таксонов входящих в группу подвидов *romanovi* включает выделение лектотипов *Parnassius charltonius romanovi* GRUM-GRSHIMAILO, 1885 и *Parnassius charltonius princeps* HONRATH, 1887 и диагнозы известных подвидов с использованием некоторых новых признаков. Описано три новых подвида - *P. charltonius* ***eugenia*** **subspec. nov.** (хр. Петра Первого, р. Муксу), *P. charltonius* ***sochivkoi*** **subspec. nov.** (северо-восточный Алай, р. Ак-Бура) и *P. charltonius* ***varvara*** **subspec. nov.** (Тянь-Шань, хр. Джаман-Тоо). Последний таксон – первая находка для вида в горной системе Тянь-Шаня.

Introduction: The efforts to study the distribution and biology of *Parnassius davydovi* CHURKIN, 2006 resulted in the discovery of some unknown populations of *P. charltonius* GRAY, 1852. The species was found for the first time in the Tian-Shan mountain system, far from its previously known area. Another population was discovered by my friend O. PAK in the northern Peter the Great Mts., Tadjikistan, where the butterflies have shown considerable similarity to *P. charltonius aenigma* DUBATOLOV & MILKO, 2003, known from Kashgaria. The additional material collected in East Alai where *P. charltonius* GRAY has also been not known to occur clarified some problems in the comparison between the Alaian and Transalaian populations. Although the article is devoted to the Alaian and Tian-Shanian taxa, some subspecies from Tadjikistan were added to complete the study. Surprisingly, the important distinctions in the wings shape and sexual dimorphism were practically ignored by previous researcher.

The present short review needs to be completed by the knowledge East Pamirian and Afghanian taxa (at least), this being technically impossible now because in lacking sufficient of material.

The genus *Parnassius* is often divided into several genera. In this case, *P. charltonius* GRAY belongs to *Kailasius* MOORE, 1902, but the problems of the generic taxonomy are out of the limits of this paper.

The holotypes of the new subspecies are deposited in the Darwin State Museum (Moscow). The paratypes are preserved in the collections of the author as well as in those of V. PLETNEV (Moscow), B. KHRAMOV (St.-Petersburg), M. DAVYDOV (Moscow), and K. ROSE (Mainz).

Abbreviations: FW - fore wing; HW - hind wing; TL - type locality.

1. **Historical review and lectotype designations**

The type series of *P. charltonius romanovi* GRUM-GRSHIMAILO, 1885 included material from West Transalai (well known Aram-Kungei Valley, Altyn-Dara River) and the neighbouring part of South-West Alai (Dzhirga Pass upper Karamyk village). The taxon was first discovered in the last locality (several specimens were caught), but the main series was collected in Aram-Kungei, this being specially stated by GRUM-GRSHIMAILO (1890: 190) later.

Two years later *P. ch. princeps* HONRATH, 1887 was described, the type series consisting of GRUM's material from Aram-Kungei. The existence of two taxa resulted in some taxonomical problems, especially if somebody restricted the type locality of *P. ch. romanovi* GR.-GR. to the Karamyk area - although GRUM-GRSHIMAILO never did it. These problems were based on some differences between the Alaian and Transalaian butterflies. Nobody has paid attention that recent collectors have butterflies from the northern macroslope of Alai, while GRUM's material originated from the south-western edges of Alai, very close to Aram-Kungei.

GRUM-GRSHIMAILO (1890: 194) personally marked that the butterflies from Aram-Kungei differed from the Karamyk specimens in more developed reddish spots - and that is all. It is easy to check this conclusion by the comparison of the well-known butterflies from Aram-Kungei with the colour plates of the Alaian syntypes published in 1890 (plate II, fig.1 a, b, c); however, even the idea that the material from Transalai has more developed red spots can not be confirmed, maybe only statistically (according to GRUM-GRSHIMAILO, he collected hundreds of individuals in Aram-Kungei). At the same time, the published figures show some strange characters - well developed white pupils in the eyes of the HW (such specimens can be found in Aram-Kungei but only rarely; GRUM-GRSHIMAILO did not mark any differences between his two series concerning the pupils) and even two white pupils in the costal eye of the ♂ - this represents a true and fantastic aberration which has never been recorded after GRUM-GRSHIMAILO. Such a situation does not provide a possibility to use these figures for a serious study - it is clear that the painter selected the most strange and attractive specimens, certainly not so typical.

KREUZBERG (1985a) did not find any syntypes and designated the neotype of *P. charltonius romanovi* GRUM-GRSHIMAILO, 1885 from Alai (Abramov glacier, the neotype is deposited in the collection of the Museum of the Zoological Institute of the Russian Academy of Sciences, St.-Petersburg). Unfortunately, the real valley was not defined, but certainly it was the valley of Kok-Su River, north-west direction from Dchilga (Dzhirga in GRUM's spelling) Pass. The quality of the neotype is bad: the selected ♀ is not fresh, lost some scales/colours - and, that is much more important, has some strange small features which will be discussed below. As far as I know, no other specimen is known from Abramov glacier till now. KREUZBERG did not explain why he selected exactly this specimen - moreover, he made a simple mistake limiting the type series of *P. ch. romanovi* GR.-GR. by GRUM's material from Alai only, although without any proof (KREUZBERG, 1985a: 50). I suppose that no newly collected material from Transalai was available at the time of the preparation of his review (this population was rediscovered only a little later). As a result of the strange neotype designation, the possibility to make any comparison between *P. charltonius* GRAY from North Alai, South Alai and Transalai was eliminated because of the absence of clear type locality and available nominotypical series.

TSHIKOLOVETS (2004) published the photos of the pair collected by GRUM-GRSHIMAILO which he found in SHELJUZHKO's collection. According to ICZN (1999: article 73.2) both butterflies represent the syntypes of *ch. romanovi* GR.-GR. as well as the syntypes of *P. ch. princeps* HONR. as TSHIKOLOVETS (2004 113, Pl. XVIII: 2-4) clearly stated. Therefore, according to the article 75.8 of ICZN, the neotype designated by KREUZBERG becomes not valid from the time when the information about the existing syntypes was published.

To preserve the stability of the zoological nomenclature, and to avoid further confusion over identification, it is important to have the name-bearing type of *P. charltonius romanovi* GRUM-GRSHIMAILO, 1885, fixed by the lectotype designation. The existing syntypes originate from Aram-Kungei and agree with the published distinctions of the taxon. Aram-Kungei represents the most famous place for the subspecies; large series of these butterflies are preserved in many museum and private collections, this being important for further studies.

Here I designate the ♀ of *P. charltonius* GRAY, which is deposited in the collection of the Zoological Museum of Kyiv National Shevchenko University (Ukraine), figured in TSHIKOLOVETS (2004 113, Pl. XVIII: 4) and bears the labels: "Transalai, VII.1884, leg. G. GRUM-GRSHIMAILO, coll. L. SHELJUZHKO" as the lectotype of *Parnassius charltonius romanovi* GRUM-GRSHIMAILO, 1885. The lectotype designation label will be added: "Lectotype, *Parnassius charltonius romanovi* GRUM-GRSHIMAILO, 1885, in ROMANOFF, N.M. Memoires sur les Lepidopteres, St.-Petersbourg 2: 235-236, designated by S. CHURKIN, 2009"

I also designate the same ♀ as the lectotype of *Parnassius charltonius princeps* HONRATH, 1887. The lectotype designation label will be added: "Lectotype, *Parnassius charltonius princeps* HONRATH, 1887, Neue Rhopalocera.VI., Berl. Ent. Z. **31**: 351-352, designated by S. CHURKIN, 2009" According to the lectotype designation, *Parnassius charltonius princeps* HONRATH, 1887 is a synonym of *Parnassius charltonius romanovi* GRUM-GRSHIMAILO, 1885, and no more speculations about the systematic position of *Parnassius charltonius princeps* HONRATH, 1887 **syn. nov.** are possible.

Paralectotype: a ♂ with the same labels and also deposited in the collection of Zoological Museum of Kyiv National Shevchenko University (Ukraine), figured in TSHIKOLOVETS (2004 113, Pl. XVIII: 2).

Another specimen which could be chosen as a paralectotype must be deposited in the British Museum (ACKERY, 1973).

The lectotype is represented by a comparatively semi-transparent specimen with the pattern typical for the taxon: marginal blackish suffusion on the HW upperside is reduced; bluish suffusion in 5 submarginal spots on the HW upperside is also less expressed; the eyes on the HW are reddish, large; in addition, a small blackish linear spot is developed between these eyes; two black discal spots on the FW upperside (i.e. , one being situated at the end of the cell and the other situated in the middle of the cell) are large and deeply coloured in contrast to other spots and bands which are only darkened; the ground colour is semitransparent being obviously not so dense as in the ♂ - all these characters agree with the figure of the ♀ syntype from Alai published by the author of the taxon (GRUM-GRSHIMAILO, 1890, plate II, fig.1). Only one small feature disagrees with the mentioned figure: the costal eye on the HW of the lectotype has no white pupil - that is typical for *P. ch. romanovi* GR.-GR.

According to ICZN (1999), article 73.2.3, the type locality of both taxa must be restricted to Aram-Kungei valley (Altyn-Dara R., northern slopes of West Transalai).

The lectotype of *P. charltonius vaporosus* AVINOV, 1913 was designated by KREUZBERG (1985a); the type locality is Viskharvi Pass, Darvaz (Darwas). The lectotype is deposited in the collection of the Museum of the Zoological Institute of the Russian Academy of Sciences, St.-Petersburg. No taxonomic problem is observed concerning this designation; the selected specimen is nearly identical to the figure published in the original description. The full data about the lectotype and 3 known paralectotypes are published by TSHIKOLOVETS (2004: 113).

Four more subspecies were described in recent times - mainly as a result of deep investigations of formerly poorly explored territories and outstanding efforts of L. KAABAK, V. LESIN and A. SOCHIVKO (Moscow).
Two taxa - *P. ch. anjuta* J. J. SHCHETKIN & KAABAK, 1985 and *P. ch. mistericus* KAABAK, SOTSHIVKO & TITOV, 1996, originating from East Pamirs; belong to the *deckerti*-group, thus being out of the limits of the present study.
A very good subspecies was found in Ghissar - *P. ch. ljudmilae* LESIN & KAABAK, 1991. It represents the rarest subspecies known from the territory of the former USSR. The type place is hard to be reached (the authors of the taxon even used helicopter), therefore only two small series were collected after the types. One of these series was caught by the authors of the taxon while the other (6 specimens) was collected in an expedition prepared by the author of the present paper. This taxon was missed by WEISS (1991) and DIETZ (2002).

One of the most attractive subspecies - *P. ch. aenigma* DUBATOLOV & MILKO, 2003 - was discovered at the upperstream of Chinese Kyzyl-Su River, "Kyrgyzian Kashgaria", at the border of Kyrgyzstan and China, where the eastern edges of Alai and Transalai are practically connected (the so-called "Irkeshtam area"). The valley of Chinese Kyzyl-Su is separated from the Alai valley (i.e. the valley of Kyrgyzian Kyzyl-Su) by a watershed of 3600 m. Together with A. ZHDANKO, we collected butterflies here (a new subspecies of *Plebejus rogneda* GRUM-GRSHIMAILO was described from this locality) and visited the place now known as the type locality of *P. ch. aenigma* DUBATOLOV & MILKO. The food plants were observed but not the butterflies - unfortunately, it was an even-numbered year - 2000. The small type series was collected in 2003 by the members of DUBATOLOV's expedition. In 2005 my expedition visited Irkeshtam, and more than 30 specimens were collected.

The author personally collected all the taxa in study in numbers (except *judmilae*). Unfortunately, no series from East Pamirs is available - this is another base to limit the review. In addition, it is necessary to study material from the neighbouring China, Pakistan and Afghanistan - the study of the *romanovi*-complex is not actually complete without the full study of its relations with the neighbours.
Our investigation clearly shows that the previous authors did not pay serious attention to some very important characters, being focused mainly on the size of the spots and bands, and ignored the degree of sexual dimorphism and differences in the development of spots on the upperside and underside. Serious aberrations represent another problem: the authors of different books liked to publish the photos of selected most nice specimens or unusual aberrations - thus misrepresenting the typical colour pattern for the users.
Worth to note, that the photos of the *romanovi*-specimens published by DIETZ (2002) are definitely wrong; the figured specimens belong to *P. ch. vaporosus* AV.
I am not going to publish here new detailed descriptions because it seems senseless to do it once more. Strong aberrations are also ignored because they have no serious taxonomic value.

The systematical part of the present article includes short analyses of the taxa and descriptions of the new taxa, while in "Discussion" all data will be summarized. The newly described taxa clarify some points in the distribution of *P. charltonius* GRAY in the recent times and in the past, and it is possible to prepare the first historical reconstruction for this species.

1. ***Parnassius charltonius romanovi*** GRUM-GRSHIMAILO, 1885

Parnassius Romanovi GRUM-GRSHIMAILO, 1885, Bericht über meine Reise in das Alai-Gebiet. – In: ROMANOFF, N.M. Memories sur les Lepidopteres, **2**: 236-237, 241.

Synonymy: *Parnassius Charltonius* Gray var. n. *Princeps* - HONRATH, 1887 **syn. nov.** Neue Rhopalocera. VI. - Berl. Ent. Z. **31**: 351-352.

The lectotype is designated above.
Type locality: Aram-Kungei, West Transalai.
Material. I have seen hundreds of *P. charltonius* GRAY from Aram-Kungei and collected it two times personally. I have never seen specimens of *P. ch. romanovi* GR.-GR. from other localities except the "neotype" and figures of the Dzhilga specimens published by GRUM-GRSHIMAILO.

Diagnosis: The general shape of the butterfly is rectangular, with straight costal side of the FW. The main ground colour is whitish. In some light conditions the ground colour appears to be with a yellowish tinge but if compared with *P. ch. vaporosus* AV. it is a white subspecies. The ♀♀ have more extended wings.

Male: FW length 36-42 mm (usually 38-40 mm).
The blackish pattern is contrasting (also because of the ground colour), FW discal spots (one is situated at the middle of the cell and the other is situated at the end of the cell) are geometrically rectangular and as a rule larger (wider) than in *P. ch. vaporosus* AV. The marginal semi-transparent blackish band is narrow, the submarginal band is narrow and thinner than the marginal one. The FW postdiscal band is more developed than in *P. ch. vaporosus* AV., their diffuse spots between M3 and CU2 are well visible (but not forming a larger united blackish spot as in the *deckerti*-complex).
The HW eyes are deep-reddish (with very rare pale exceptions), contrasting; the two spots forming the M-eye (i.e., situated between M1-M2 and M2-M3) are often slightly disjoined from their inner sides (in this case the outer sides of the spots are shortly-triangular, but as a rule the whole shape of the eye is oval or very rarely rounded). Sometimes these spots are comparatively small so, that M-eye has an oval shape. The costal eye is triangular with straight inner border. As a rule, the costal eye has no white pupil (exceptions are really rare), while the M-eye bears a small and not contrasting white pupil in the upper spot; very rarely the second white pupil is developed too - but both are never enlarged and contrasting.
The reddish spots in the anal-cubital area are developed as a rule - only rarely they are thin and the reddish colour is faint; even the small reddish spots between M3 and CU1 are often present.
The inner black border of the M-eye is conspicously wider than the external one. The 5 submarginal spots are placed in a reduced non-dense blackish area; this band is often more or less disjoined between the spots and does not reach the M-eye being separated from the reddish spots by the white ground colour. The ground colour also surrounds the external sides of the submarginal spots. Blackish marginal lines between the ends of the veins are developed, but they are not very contrasting and usually not contacting with the spots. The submarginal spots are relatively small with narrowed external parts; their blue suffusion is comparatively reduced, the spots are not so bright and blue-shining.

Female: Statistically larger than the ♂♂, FW length is 38-43 mm (usually 40 mm).

The sexual dimorphism is well developed: the ground colour of the ♀♀ is semi-transparent as a whole, being very different from that of the ♂♂. The pattern is not so contrasting; only the discal spots keep true black colour, other bands being more similar to the semi-transparent marginal bands. However, the dark pattern is generally not reduced, only the M3-Cu2 postdiscal spots are sometimes smaller. At the same time, the FW marginal band is statistically wider than in the ♂♂, as in all other subspecies. I have one ♀ with more dense ground colour, but a simple comparison with the *P. ch. romanovi* Gr.-Gr. ♂♂ (and ♀♀ of *P. ch. aenigma*) shows that the differences between these ♀♀ and ♂♂ are still serious. However, it means that the degree of the sexual dimorphism is not constant - a remarkable fact.
The HW M-eye is larger, often extended but the colour is not so deep as in the ♂♂, being bright orange-red. As a rule, all series of the anal and cubital spots are developed forming a joint band from the anal side of the wing to the M-eye; often this band is enlarged and wide. More rarely the costal and M-eye are joined by the additional linear spot which even bears some reddish scales [such a specimen is figured by Toropov & Zhdanko (2006: 30) together with a ♂ aberration with significantly reduced eyes - both butterflies have some more non-typical characters, and both cases represent the idea to publish the photos of most unusual and attractive individuals].
The dark area around the submarginal spots is considerably reduced as well as the size of these spots and their bluish suffusion. This character must be added to the sexual dimorphism; however, it is not absolutely constant - in very rare cases the development of the submarginal-marginal pattern is nearly the same as in the ♂♂ (unfortunately, such a ♀ is figured as typical in Tuzov et al. (2000: plate 14, fig. 4). The HW marginal lines between the veins are always more or less reduced, shortened, not blackish, but just dark.

Note: The figures of a ♂ and a ♀ of *P. charltonius* Gray from Dzhilga ("Dzhirga") Pass show all main characters of *P. ch. romanovi* Gr.-Gr. including whitish colour, only the white pupils are more developed but it was not confirmed by the Grum's explanations. It is easy to suppose that the painter used the most attractive specimens (as I marked above, the other painted specimen represents a strong aberration with a double costal eye where each part of it includes a developed pupil!) – however, it is logical to suppose that the population from South-West Alai contains more individuals with developed pupils because of some genetic exchange with the populations from North Alai and even West Pamirs in the past (see "Discussion"). Kreuzberg's "neotype" also represents a very strange form with all characters of *P. ch. romanovi* Gr.-Gr., but the discal spots on the FW are joined by a thin black line developed at the lower border of the cell. This character is not known among Alaian or Transalaian populations but is typical for *P. ch.* ***varvara*** **subspec. nov.** from Tian-Shan. Of course, rare specimens with such genetic combination appear in each population of *P. charltonius* Gray; this only confirms the subspecies status of the populations in study - but once more marks that this "neotype" could hardly be used for taxonomic purposes. As a summary, the 3 known specimens from SW Alai include 2 abnormal forms; this looks strange and supports a hypothesis that the South Alaian macropopulation is a heterogeneous result of numerous contacts between several different subspecies - ICZN does not recommend to describe taxa based on such populations. Only fresh new material can clarify this question.

Distribution: This should include the western edges of South Alai and Transalai. Unfortunately, there is no material from the main part of the Alai valley (neither from the Alai range nor from Transalai) between Aram-Kungei and the watershed with Chinese Kyzyl-Su.

Biology: Flies in even years in contrast to all other known populations (but see remarks to the *P. ch.* ***sochivkoi* subspec. nov.**). The difference in the density of the population in odd and even years is very high, this fact being confirmed by many collectors. My personal data agree with this: if in 1991 ten collectors saw the total of 3 specimens, in 1992 and 1994 five collectors caught more than 100 specimens.

2. ***Parnassius charltonius vaporosus*** AVINOV, 1913

P.[arnassius] charltonius subsp. *vaporosus* nov. AVINOV, 1913, Quelques formes nouvelles du genre *Parnassius* LATR. - Horae Soc. Ent. Ross. **40**: 15, Tab.II, fig. 4.

The lectotype was designated by KREUZBERG (1985a, see above). The lectotype and 3 paralectotypes are deposited in St.-Petersburg.
Type locality: Viskharvi Pass, Darvaz Mts.
Material. Hundreds of specimens from Vanch Mts. (collected in different valleys of the range), series from Dzhilandy and Sangou-Dara. Unfortunately, I have no series from Ishkashim for the study. I personally collected many specimens in 1991, 1992 and 1993. I have never seen other material from Darvaz except the types of the taxon.

Diagnosis presented in the original description is nearly perfect. The general shape of the prepared butterfly is rectangular, i.e. the wings are extended. FW with straight costal margin (which is only slightly convex near the apex) and forceful angled apex (as in all other taxa except Tianshanian subspecies).
Worth to note that the ground colour of *P. ch. romanovi* GR.-GR. is outstanding compared with *P. ch. vaporosus* AV. (or *ljudmilae,* or *sochivkoi).* Everybody who collected series of these butterflies in nature know that *P. ch. vaporosus* AV. looks dirty and yellowish while *P. ch. romanovi* GR.-GR. is large, "aristocratic" and whitish. This can be also easily seen while comparing a series of non-prepared material: the non-prepared butterflies demonstrate the same features. Pinned specimens need good light and attention to see the differences.

Male: Smaller than *P. ch. romanovi* GR.-GR. - FW length is 35-40 mm (usually 35-37).
The ground colour is definitely yellowish, so that the black pattern is not so contrasting. In addition, this pattern is reduced: the discal spots are reduced, being thinner and sometimes even not fully touching the borders of the cell (especially the spot situated in the middle of the cell). The diffuse spots in the middle of the postdiscal band are reduced, often nearly absent or visible as a slight dark suffusion.
The HW costal eye is triangular, the white pupil is usually absent, but not always.
The M-eye is smaller than in *P. ch. romanovi* GR.-GR., more or less rounded and without clear disjoinment from the inner side; the internal blackish border is thicker than the external. The colour of the eyes is not deep and bright becoming pale with an orange hue. The anal and cubital spots are more developed than in *P. ch. romanovi* GR.-GR. - even the spot between the M-eye and the cubital spot (M3-Cu1) sometimes includes an orange-reddish mark. The blush suffusion in the submarginal spots is also more expressed, the spots are statistically larger and totally placed in the much more extended blackish area (these characters being similar to those of the deckerti-group). This blackish area often touches the anal/cubital spots and only the M-eye is separated by a thin line of the ground colour. The whitish ground colour is also distinct just near the external sides of the bluish spots. The marginal linear blackish spots are larger and darker than in *P. ch. romanovi* GR.-GR.

Female: FW length 35-43 mm, usually 39-40 mm.
The sexual dimorphism is the same as in *P. ch. romanovi* Gr.-Gr., i.e. the ground colour is semi-transparent, so that the butterfly is not contrasting as a whole. However, if the *P. ch. romanovi* Gr.-Gr. ♀♀ have clearly reduced HW submarginal spots and reduced blackish area around these spots (compared with the *P. ch. romanovi* Gr.-Gr. ♂♂), in *P. ch. vaporosus* Av. the situation is opposite: the ♀♀ have more developed blackish area and at least not reduced bluish suffusion compared with the ♂♂. In addition, the *P. ch. vaporosus* Av. ♀♀ are not so yellowish as the ♂♂ (because the ground colour scaling is not so dense - thus, the hue is not so distinct); the FW marginal band is wider. The anal and cubital spots are well developed, also forming a more or less united band - this character is the same as in *P. ch. romanovi* Gr.-Gr., only the size of the spots/eyes is smaller.

Note: The nominotypical butterflies from Viskharvi seem to be identical to the Vanch-population; no significant differences were observed. The type specimens were definitely collected from the southern slopes of Viskharvi Pass; there were no isolating barriers between this macroslope and the Vanch valley.
The populations from Dzhilandy and Southern-West Pamir have more reduced blackish pattern, but I do not suppose that it is correlated with other more taxonomically weighted characters. However, the status of these populations need clarification with more material than I have studied - also because several more taxa were described from the neighbouring parts of Afghanistan.

Distribution The distribution area extends from the southern and eastern slopes of the Darvaz range through the whole West Pamirs to Ishkashim and the adjacent territory of the Afghan Badakhshan, from where two synonymic taxa were described (nevertheless, the taxonomic status of the southern populations needs further study, see above).

Biology. Flies in uneven years, but the differences in the density of the populations are not so great as in the case with *P. ch. romanovi* Gr.-Gr. I have numerous data from two different valleys situated in Vanch Mts. In one case the local *P. charltonius* Gray is a relatively rare butterfly, and the density in uneven years in only 3 times more than in even years. In another valley, which I found personally in 1991, *P. charltonius* Gray is very common and the difference in the number of specimens is 5-7 times. In both cases, it is very possible to collect some specimens in "bad" even-years.

3. ***Parnassius charltonius ljudmilae*** Lesin & Kaabak, 1991
A new subspecies of *Parnassius charltonius* Gray (Lepidoptera, Papilionidae) from Hissaric mountain range. - Bull. Soc. Nat. Moscow **96** (1): 74-77, fig. 1-2.

Type locality: Tadjikistan, Ghissar Mts., upper stream of Diakhan-Darja River.
Type series includes the holotype and 25 paratypes collected in 1985 and 1989 years. The holotype is deposited in the collection of the Zoological Museum of Moscow State University.
Material. As noted above, this is the rarest butterfly in the collections. I saw and studied only several specimens collected also at Diakhan-Darja River basin (Angisht Pass) - plus some types and all published photos. Fortunately, this is very a distinctive subspecies, and the original description is detailed. In addition, the results of the study of 30 known specimens (including the whole type series) were additionally summarized by Kaabak & Lesin (1994).
Diagnosis: The wing shape and sexual dimorphism are practically the same as in *P. ch. vaporosus* Av. and *P. ch. romanovi* Gr.-Gr. The main and characteristic feature of this subspecies (in additi-

on to the characters commonly used) - a slight grey-bluish-greenish suffusion of the wings.

Male: FW length is 39-43 mm, according to the description. However, my butterflies are not so large and have the same size as *P. ch. romanovi* Gr.-Gr. or slightly smaller. I do not agree that this subspecies is the largest - most probably, we have different style of measuring the wings.

The ground colour is yellowish with a grey suffusion; the grey scales are not dense but forming a strange habitus of the butterfly in nature, with even slight dirty-dark greenish or bluish shades. The widened marginal semitransparent band is marked in the description - but I can not confirm this opinion. The submarginal band is slightly wider than in *P. ch. romanovi* Gr.-Gr. and *P. ch. vaporosus* Av. The costal part of the postdical band (i.e. the first 3 spots which are joined together in all known subspecies) is narrowed, thinner than the corresponding part of the submarginal band. Although this character is not totally constant, it is in contrast to the features of all other related taxa; the exceptions are very rare.
The FW discal spots are enlarged (widened), even statistically larger than in *P. ch. romanovi* Gr.-Gr. and in contrast to the characters of *P. ch. vaporosus* Av.
The HW costal eye is triangular, dark with thick blackish borders. Very important to note that the specimens which were selected in Tuzov et al. (2000: plate 14, fig. 7) have this eyes even slightly rounded (however, the straight inner side is more or less distinct) - a very rare form. The M-eye is small, reduced in size and narrowed, oval, bordered with a thick blackish line from both sides - this character has practically never been found in other taxa studied, except very rare cases, but represents a sign of Afghanian taxa - like *P. ch. voigti* Bang-Haas, 1927. Some taxa distributed in Pakistan also show this character.
Both parts of this eye have white pupils inside, often even enlarged, with unclear borders. The red colour of the eyes is darkened, deep but not shining and bright. The submarginal/marginal pattern is similar to that of *P. ch. romanovi* Gr.-Gr., but the bluish suffusion is more developed; the external side of the spots is often not so narrowed. The anal/cubital spots are small, reduced and have no reddish pupils inside (or have only a few scales), the spot M3-Cu1 is fully reduced or represented by a small dark mark.

Female: The FW length published was 41-45 mm (too much according to my measures, 40-42 mm). The ground colour is also semi-transparent, being only more dirty/greyish than in *P. ch. romanovi* Gr.-Gr. and *P. ch. vaporosus* Av., this masking the distinction. The marginal band is slightly wider, the postdiscal band (especially the median spots) are slightly reduced compared to *P. ch. romanovi* Gr.-Gr., the HW submarginal blackish area is slightly smaller than in the ♂♂. At the same time, the submarginal bluish spots are more developed than in the males and even enlarged, with dense and bright blush scales - looking very different from *P. ch. romanovi* Gr.-Gr. and even more expressed than in *P. ch. vaporosus* Av. All eyes with white pupils inside, often the upper white pupils in the M-spot is enlarged and covering most part of the M1-M2 spot. The M-eye as a whole seems to be not reduced (not considerably smaller than in the related taxa) and, moreover, the external blackish border around the eye is distinctly thinner than the inner border (i.e., according to this feature the *ljudmilae* ♀♀ has no significant differences from *romanovi/vaporosus* in contrast to the male characters). The anal and cubital spots are developed and are clearly reddish, but the spot M3-Cu1 is absent or very small, even if it has some reddish scales - this distinction is clearly opposite to those of the neighbouring taxa (except *aenigma*!).

Distribution. Known only from the upper stream of Diakhan darja River, southern slopes of Ghissar Range.

Biology: Flies in uneven-years. The dynamics of the population is very slow - so, that in even years the butterflies are practically absent, as it is known from the collectors who visited the type locality in a "wrong" year. It seems that the period of flight is variable and seriously depends on the weather: two experienced collectors, including B. KHRAMOV, did not see even a single specimen in 2005 being in the true place at the end of July (this was a cold and rainy year). In general, the butterfly flies much later, mainly in August as it is known only for the East Pamirian subspecies (I do not discuss the taxa distributed further in Pakistan or India).

4. ***Parnassius charltonius aenigma*** DUBATOLOV & MILKO, 2003

Parnassius (*Kailasius*) *charltonius aenigma* DUBATOLOV & MILKO, 2003, A new subspecies of *Parnassius* (*Kailasius*) *charltonius* GRAY, 1852 from Kyrzhyz Kashgaria (Lepidoptera, Papilionidae). - Atalanta **34** (3/4): 435 – 437, colour pl. XXIVa, fig. 1-4.

Type locality: Kyrgyzstan, Chinese Kyzyl-Su R. valley at the confluence with Kok-Su R.
Material. The type series includes 2 ♂♂ and 5 ♀♀ of different quality. In 2005, we collected (together with V. PLETNEV and S. SALUK) more than 30 topotypes. I also studied the specimens (2 ♂♂, 10 ♀♀) which were caught by a local collector in 2007.

Diagnosis. The original description is very detailed - but, however, it is not so clear because of the small type series and ignoring of some important characters.

As it is stated in the original description, the taxon has large size and extended wings with prominent apex. It looks really larger than the related subspecies, but measuring does not confirm it - especially for the ♀♀. For example, some ♀♀ from Tian-Shan have obviously larger wing expanse and look smaller at the same time! The explanation of this clarifies one of the most important character of *P. ch. aenigma* DUBATOLOV & MILKO: the wing shape is not the same as in all other taxa studied, the specimens being comparatively square-shaped with LESS extended wings which look wider (in contrast to the rectangular shape in other taxa). At the same time, the costal side of the wing is nearly straight and the apex is angled (as in other taxa). I suppose that the authors had no serious material of other taxa for the comparison, using mainly the photos of the specimens. Another base of the discussed observation is even more important: *P. ch. aenigma* DUBATOLOV & MILKO has much less sexual dimorphism than *P. ch. romanovi* GR.-GR., *P. ch. vaporosus* AV., and *P. ch. ljudmilae* LESIN & KAABAK. The ♀♀ of *P. ch. aenigma* DUBATOLOV & MILKO have no significant differences from the ♂♂ in the ground colour, they are not semi-transparent but contrasting and colourful being similar to the ♂♂ or only very slightly paler. Such bright and excellent colouration makes these butterflies more distinct and large at the sight. Such experienced scientists as DUBATOLOV & MILKO should have found this if they had a possibility to compare their taxon with the real individuals of other subspecies of *P. charltonius* GRAY.
As a summary, *P. ch. aenigma* DUBATOLOV & MILKO has two very significant distinctions from other taxa - a different shape of the wing and the absence of the sexual dimorphism. Only these two features would be enough to make a subspecies status but the distinctions of the colour pattern are also outstanding for the group.

Male: The FW length is 40-43 mm. The ground colour is whitish, the blackish pattern is contrasting, the colour of the eyes is deep-bright reddish with rare exceptions - all characters as in *P. ch. romanovi* Gr.-Gr. The marginal semitransparent band is much wider than in other taxa of the *romanovi*-group; the submarginal band is thin, contrasting, the postdiscal band is complete, the diffuse spots M3-Cu1-Cu2 are well developed, but not united in a single blackish area as in *deckerti* Verity, 1879. These spots form the same wavy pattern as in romanovi, being only larger and dense. The two discal spots are large, even slightly larger than in *P. ch. romanovi* Gr.-Gr. Dubatolov & Milko marked as important feature that the distance between these spots is shorter than their width. I suppose that this distinction is not so serious being more or less variable in different taxa - but correlated with the shortening of some elements of the wing pattern because of the different wing shape.
The costal eye on the HW is large and colourful (quite opposite to the main subspecies of the deckerti-group), with a white pupil. Sometimes only traces of the pupil are visible; individuals without the pupil represent an exception. The M-eye is also enlarged and colourful, with white pupils, as a rule. Important to note that the degree of the development of the pupils is nearly the same as in *P. ch. romanovi* Gr.-Gr. - if we compare the size of the eye and the size of the pupil; the pupils as a rule are not very enlarged, never covering the main part of the eye. Only the frequency of the specimens with distinct pupils is 2-3 times higher in *P. ch. aenigma* Dubatolov & Milko than in *P. ch. romanovi* Gr.-Gr. Sometimes - not often but not so rare - the individuals have an additional dark spot (even with few reddish scales) between the two eyes (f. *conjuncta*) - this form is registered also for *P. ch. romanovi* Gr.-Gr. and even for *P. ch. vaporosus* Av.; it is unknown or very rare among other taxa studied.
The shape of the M-eye is very important: "large proximal lengthwise extension towards the wing base of the red postdiscal spot on the hindwing underside which produces an acute-angled corner with black v-shaped border" (Dubatolov & Milko, 2003: 435). The two spots forming the M-eye on the upperside are often extended towards the wing base (sometimes slightly disjoined, sometimes fully joined) - so, that the eye has triangular shape (about 50% of the individuals). Moreover, if the general shape of the eye is more or less rounded, the black triangular spot is more or less visible through the wing surface from the underside as an unclear "bird's beak"- spot. The differences between the shape of the eye on the upperside and underside are known for other subspecies as rare aberrations; so distinctive and strongly expressed cases are nearly absent.
The submarginal bluish spots are enlarged, with bright bluish shining; they are situated in a well developed blackish area which is larger than in *P. ch. romanovi* Gr.-Gr., but white ground colour separate this area from the reddish spots (thus, the pattern is different from *P. ch. anjuta* Stshetkin, Kaabak & Stshetkina, 1987/*mistericus* Kaabak, Sotshivko & Titov, 1996 or *P. ch. vaporosus* Av.). The ground colour is also clear at the external side of the spots, near the margins.
The HW blackish marginal linear spots between the veins are dense and well developed.
The HW cubital and anal reddish spots are developed and even enlarged, but the spot between M3 and Cu2 is considerably reduced, represented by a small linear dark spot without reddish scales.
Only very rare specimens have not so bright colour of the eyes, being paler in general as a whole; the shape of the M-eyes in this case is also normal and the size of the eyes is smaller - such specimens look as "hybrids" between *P. ch. romanovi* Gr.-Gr and *P. ch.* ***varvara*** **subspec. nov.**
Genitalia - see the discussion.

Female: The FW length is the same as in the ♂♂. The sexual dimorphism is almost not expressed, the butterflies are very similar to the ♂♂ but the eyes are slightly larger and the black pattern is slightly reduced; the M3-Cu2 spots are smaller and (that is interesting) forming not such a wavy line, because

the spots are slightly removed from the cell towards the wing margin. The submarginal HW pattern is nearly the same as in the ♂♂; the marginal band is slightly wider as in all other taxa. Worth to note that the HW M3-Cu2 spot is also reduced (only very rarely it includes a small reddish area) in contrast to the enlarged anal and cubital spots. It forms a pattern similar to that in *P. ch. ljudmilae* LESIN & KAABAK and distinctively opposite to *P. ch. romanovi* GR.-GR. and *P. ch. vaporosus* AV.

Note: The wide marginal FW band makes *P. ch. aenigma* DUBATOLOV & MILKO related to *P. ch. anjuta* STSHETKIN, KAABAK & STSHETKINA, *mistericus* KAABAK et al. and the *deckerti* group as a whole. However, the band seems to be wider even than in *deckerti* VTY. or *P. ch. anjuta* STSHETKIN, KAABAK & STSHETKINA. A comparison with a good series of the *deckerti*-taxa is needed which I am unable to do.

Distribution: Known only from the type locality. I suppose that this butterfly populates also some other river valleys situated close to Kyzyl-Su in China.

Biology: Flies in uneven years. Then it seems that the density of the population in even years is very small, in contrast to *P. ch. romanovi* GR.-GR.
The altitude is relatively low (2850-2950 m), but the surrounding mountains are very high and covered by large glaciers. However, the Kyzyl-Su River valley is even hot in the short local summer - only several kilometers lower the type locality of *Plebejus rogneda grumi* ZHDANKO & CHURKIN, 2001 is situated (the representatives of this complex usually fly only in hot valleys, other taxa are not known at the altitudes above 2000 m). The main flight period is July but not August.
The *Corydalis* was identificated as a local race of *transalaica* by M. MIKHALOVA (pers. communication) but she marks that this needs serious further confirmation.

5. ***Parnassius charltonius s o c h i v k o i*** **subspec.nov.** (col. pl. 4: 1a, 1b)
Holotype ♂: North-East Alai, Ak-Bura River, 2600-2700 m, 25.VI.-2.VII.2009, S. CHURKIN leg.
Paratypes: 29 ♂♂, 12 ♀♀, same data as holotype ♂, S. CHURKIN, V. PLETNEV & B. KHRAMOV leg.; 3 ♂♂, 2 ♀♀, same loc., 2700–2800 m, 28.-29.VI.2008, S. CHURKIN, V. PLETNEV & S. SALUK leg.; 2 ♂♂, 2 ♀♀, North-East Alai, Ak-Bura River, 2500 m, 28.VII.2009, A. SOCHIVKO leg.

Description and diagnosis: The butterflies have extended wings and expressed sexual dimorphism. The ground colour is whitish with greyish tinge; not fresh butterflies show also yellowish shades. Flying specimens look greyish, not whitish (opposite to *P. ch. romanovi* GR.-GR.), but not greenish-bluish.

Male: The FW length is 40 mm in the holotype, 36-41 mm in the paratypes.
The FW blackish pattern is similar to *P. ch. romanovi* GR.-GR.; however, the semitransparent marginal band is statistically slightly wider, the M3-Cu2 postdiscal suffused spots are sometimes slightly reduced. The discal spots are rectangular and wide, more similar to those of *P. ch. ljudmilae* LESIN & KAABAK (being even wider than in *P. ch. romanovi* GR.-GR. - but also only statistically).
The HW presents the main distinctions: the bluish spots are obviously more developed than in *P. ch. romanovi* GR.-GR., larger and covered with dense and bright bluish scales; the costal eye always with a developed white pupil (this character is not developed only in the case of serious reduction of the eye's size), the M-eye with two white pupils (the same as in *P. ch. ljudmilae* LESIN & KAABAK and also with very rare exceptions), the upper pupil is often enlarged. The blackish area around the submarginal spots is widely separated from the anal/cubital spots and the M-eye as it is in *P. ch. romanovi* GR.-GR. but is more extended and deep; the marginal linear spots are more expressed (it means that these characters are more similar to . *P. ch. ljudmilae* LESIN & KAABAK

than to *P. ch. romanovi* GR.-GR.!). The anal and cubital spots are comparatively developed but the M3-Cu1 spot is absent or considerably reduced.

Female: The FW length is 38-42 mm. The ground colour is semitransparent with more distinct yellowish shades. The FW with the same pattern as in the males but the M3-Cu1 suffused postdiscal spots are more reduced, similar to those in *P. ch. vaporosus* AV. or *P. ch. ljudmilae* LESIN & KAABAK. The HW with normally (or even more) developed bluish submarginal spots and the blackish area in contrast to the *P. ch. romanovi* GR.-GR. ♀. The anal and cubital reddish spots are developed while the M3-Cu2 spot is reduced and has no any reddish scales (maximum, a very small pale reddish mark not connected with the larger neighbouring spots), as it is in *P. ch. ljudmilae* LESIN & KAABAKOT *P. ch. aenigma* DUBATOLOV & MILKO and quite opposite to *P. ch. romanovi* GR.-GR. or *P. ch. vaporosus* AV.

Distribution covers the northern macroslopes of Alai. I studied two series from Isfaramsai R. (near Ljangar v.) which are nearly identical but I prefer to limit the type locality to avoid any possible misidentifications as it was with this group of taxa in the past. The butterflies from Dugoba R. must be included into this subspecies; however, here the characters of *P. ch. romanovi* GR.-GR. are statistically more conspicuous - thus, this population has (or had in the past) some genetic exchange with *P. ch. romanovi* GR.-GR. which inhabits the south-west slopes of Alai. Worth to note that the genetic exchange must be more intensive with the populations which must inhabit Kuruk-Sai Range, further to the west from Dugoba: it is possible that this range is populated by whitish butterflies too. The northern Alai consists of 3 different small districts: western (Kuruk-Sai is the center of it), central (Collectorsky Range and the neighbouring slopes) and eastern (from Kichik-Alai to Alaiku-River near Fergansky Mts.); the fauna of all districts includes some endemics - mostly, at the subspecies level, see the first part of the present paper. Thus, the western *P. charltonius* GRAY populations are of a great interest to taxonomists.

Biology: Flies not very high - the main altitude is 2800-3200 m in Dugoba or in Isfaramsai. The population from the type locality inhabits lower rocks - this is the lowest known population in the territory studied. Flies mainly in uneven years - one more and a very serious difference with *P. ch. romanovi* GR.-GR. The differences of the density between even and uneven years are not so dramatic compared to *P. ch. romanovi* GR.-GR. but absolutely clear (3 times); i.e. the density is always low. Important to note the situation in Dugoba: the same collector found here 15 specimens in 1991, then 12 in 1992, 18 in 1993 and so on. If this data are confirmed, this population is more or less numerous in even years too; this can be a result of mixing with *P. ch. romanovi* GR.-GR.-populations (and a base for hybridization).
The food plant of the Ak-Bura population must be *Corydalis heterophylla* MIKHAILOVA (1982). The examples were collected and we hope that the true identification will be published later by M. MIKHAILOVA.

Note: The new subspecies combines the characters of 3 taxa - *P. ch. romanovi* GR.-GR., *P. ch. vaporosus* AV. and *P. ch. ljudmilae* LESIN & KAABAK. The most serious Russian collectors know that the Alaian butterflies are different from Transalaian ones, but their opinion has never been published - unfortunately, KREUZBERG's review did not contain any subspecific distinctions or geographical variability.
The butterflies from Dugoba are not rare in West European collections too, but I always saw them mixed with more numerous *P. ch. romanovi* GR.-GR. from Aram-Kungei - so that it was not easy

to observe the differences in the chaos. The Isfaramsai population (central part of Alai) was found only 10 years ago, while *P. charltonius* GRAY in the eastern Alai has not been known at all.

Etymology: The subspecies is named after ANDREY SOCHIVKO (Moscow), one of the best explorers of the *charltonius*-complex; his advices were very important for the author.

6. ***Parnassius charltonius v a r v a r a*** **subspec. nov.** (col. pl. 4: 2a, 2b)

Holotype ♂: Kyrgyzstan, Dzhaman-Too Mts., Karasu R., 24.VII.2008, 2900 m., S. CHURKIN leg.
Paratypes: 17 ♂♂, 9 ♀♀, same data, S. CHURKIN, V. PLETNEV & S. SALUK leg.

Description and diagnosis: The general wing shape as in *P. ch. romanovi* GR.-GR. and related taxa, i.e. the wings are extended in contrast to the compact *P. ch. aenigma* DUBATOLOV & MILKO. However, the costal side of the FW is not straight but convex, so that the apex looks not so angled. As a result, the individuals look abnormally or not well prepared. This distinction is very valuable because it is absolutely unknown for other subspecies.

Male: The FW length is 38 mm in the holotype, 37-41 mm in the paratypes. The ground colour is yellowish, similar to that of *P. ch. vaporosus* AV. and *P. ch.* ***sochivkoi*** **subspec. nov.** The FW blackish pattern is like in *P. ch. vaporosus* AV., with the reduction of the M3-Cu1 postdiscal suffused spots. The FW discal spots partly lost their regular geometrical shape and represent another very important distinction: these spots are joined by a thick blackish linear spot situated along the inner border of the cell (the exceptions are practically absent) - that is important taxonomically because the main blackish pattern is slightly but distinctly reduced. The typical *deckerti* VTY. specimens have dense and wide united median (postdiscal) spot which is separated from the cell by a thin whitish line of the ground colour. The black linear spot which connects the discal spots in *P. ch.* ***varvara*** **subspec. nov.** exactly replaces this marked whitish line. At the same time, such form is rarely known for *deckerti* VTY. but represent a result of further development of the black pattern. According to the published photo, this character is frequent in some Afghanian and Pakistanian populations [like *robertjan* EISNER, 1959 or *ducalis* BOULLET & LE CERF, 1912 sensu DIETZ (2002) - I have no material to confirm it]. Rarely traces of *P. ch.* ***varvara*** **subspec. nov.** can be found in *P. ch. anjuta* STSHETKIN, KAABAK & STSHETKINA and *mistericus* KAABAK et al.; the "neotype" of *P. ch. romanovi* GR.-GR. has this feature too as I mentioned above. A reduced variant of this character is obvious from the photo of the paratype of *P. ch. aenigma* DUBATOLOV & MILKO (DUBATOLOV & MILKO, 2003: col. pl. 24, fig. 3, ♀) - but I have not seen more such specimens of this subspecies. There are no individuals with this distinction among hundreds of specimens examined during this work.

The HW with the general pattern similar to that of *P. ch.* ***sochivkoi*** **subspec. nov.** (blackish area, colour of the eyes, etc.) with some important differences. The costal eye is small and fully rounded, as a rule, and has no white pupil (or with only traces of it - in contrast to *P. ch. sochivkoi* **subspec.nov.**). I know one such specimen of *P. ch. romanovi* GR.-GR. (in the collection of V. NEFOROSNYI, Bishkek, who has collected a lot of them during many years and selected it as strange aberration). *Parnassius ch.* ***sochivkoi*** **subspec. nov.** shows slight tendency in the changing of the shape of the costal eye - and this feature is slightly expressed in the "neotype" of *P. ch. romanovi* GR.-GR. Important that the shape of the eye on the underside is more or less triangular, but the black borders are thick and unclear.
The M-eye is rounded and not large, smaller than in *P. ch.* ***sochivkoi*** **subspec. nov.**, but on the under-

side the inner sides of both spots (which compose the eye) are extended towards the corner forming a blackish "bird's beak", which is visible from the upperside - the same feature as in *P. ch. aenigma* DUBATOLOV & MILKO, only not so strongly developed. The bluish submarginal spots are slightly less developed compared to *P. ch.* ***sochivkoi*** **subspec. nov.** (i.e. more similar to those of *P. ch. vaporosus* AV.). The anal/cubital spots are developed but the M3-Cu1 spot is absent or small and dark.

Female: The FW length is 40-44 mm.
The wings are extended (in contrast to *P. ch. aenigma* DUBATOLOV & MILKO but similar to other subspecies), the unusual shape of the FW is not so expressed as in the ♂♂ but quite conspicuous. The ground colour is semitransparent, yellowish shades are not so clear. Other pattern as in the ♂♂, with some reducing of the blackish elements, except slightly the widened marginal band. The spot between M3 and Cu1 is also reduced (only rarely it has few reddish scales) in contrast to *P. ch. romanovi* GR.-GR. and *P. ch. vaporosus* AV. but similarly to *P. ch. aenigma* DUBATOLOV & MILKO and *P. ch.* ***sochivkoi*** **subspec. nov.**

Distribution: Known only from the type locality. *P. charltonius* GRAY was not recorded from Tian-Shan in the past. The new subspecies combines the characters of all known subspecies, especially the neighbouring *P. ch.* ***sochivkoi*** **subspec. nov.** and *P. ch. aenigma* DUBATOLOV & MILKO; in addition, 3 characters are unusual for the complex or even species as a confirmation that it has been isolated for a long time.

Biology: The altitude corresponds to that known for the main Alaian populations. Some biological data seem to be unusual and I hope to publish an additional paper about it. The food plant is *Corydalis*, similar to *C. stricta* STEPH. which however has never been recorder from this area of Tian-Shan (MIKHAILOVA, 1981). The examples of the plant are under study.
Possibly it flies in even years, but we were not able to confirm or disprove this hypothesis due to extremely unfavorable weather conditions.

Etymology: *Parnassius ch.* ***varvara*** **subspec.nov.** is the name of the beloved daughter of my friend MIKHAIL DAVYDOV; she shares her father's interest to butterflies. Such a name is given also to continue the tradition (LJUDMILA, ANJUTA - common Russian feminine names).

7. ***Parnassius charltonius e u g e n i a*** **subspec. nov.** (col. pl. 4: 3a-3c)
Holotype ♀: Tadjikistan, Muksu R., 15.VIII.2007, O. PAK leg.
Paratypes: 22 ♂♂, 8 ♀♀, same loc, 1.-20.VII.2009, S. SALUK leg.

Description and diagnosis: The first record of this butterfly was published by TSHIKOLOVETS (2004: 115): "KREUZBERG pers. comm..: Peter the Great Mts., Depshar" As far as I know, the butterfly was not collected but only observed.
The new subspecies is similar to *P. ch. romanovi* GR.-GR. at the first glance being whitish with deep colour of the reddish eyes. However, more important characters demonstrate the relations with *P. ch. aenigma* DUBATOLOV & MILKO: the sexual dimorphism is not much expressed, the HW M3-Cu1 spot is reduced, the general shape is comparatively square.

Female: The FW length is 40.5 mm in the holotype, 38-41 mm in the paratypes.
The ground colour is clearly whitish (as in the males) - more than in *P. ch. romanovi* GR.-GR. because it is dense, not semitransparent - the same as in *P. ch. aenigma* DUBATOLOV & MILKO. Someti-

mes the density of the ground colour is lower, i.e. this character is variable, as it is known for *P. ch. aenigma* DUBATOLOV & MILKO and *P. ch. romanovi* GR.-GR. (see above about the rare form of *P. ch. romanovi* GR.-GR.). Very fresh virgin ♀♀ sometimes are slightly yellowish (because the veins were full of lympha). The general shape is square, the FW is wider than in *P. ch. romanovi* GR.-GR. but this feature is more variable and not so expressed as in *P. ch. aenigma* DUBATOLOV & MILKO.
FW: The discal spots are wider than in all other related taxa (even wider than in the *P. ch. aenigma* DUBATOLOV & MILKO ♀♀), having the same size as in the ♂♂ of *P. ch. ljudmilae* LESIN & KAABAK or *P. ch.* ***sochivkoi*** **subspec. nov.** The spot situated inside the cell has normal rectangular geometrical shape, while the spot situated at the end of the cell is not regular, with uneven margins. The black pattern is contrasting (but often more or less reduced) as it is in the *P. ch. romanovi* GR.-GR. ♂♂ and in opposite the ♀♀ of all other taxa except aenigma. The marginal semitransparent band is only statistically slightly wider than in *P. ch. romanovi* GR.-GR. and narrower than in *P. ch. aenigma* DUBATOLOV & MILKO. The submarginal band is narrow, very wavy. The postdiscal bands are typical, the postdiscal suffused M3-Cu2 spots are distinct but reduced (sometimes fully disappeared).
The HW eyes are similar to those of *P. ch. aenigma* DUBATOLOV & MILKO (deep reddish - as in the *P. ch. romanovi* GR.-GR. ♂♂, but very different from the paler and orange eyes of the *P. ch. romanovi* GR.-GR. ♀♀) but considerably reduced in size; the costal eye is triangular, the M-eye is oval, with more developed blackish border from the external side; sometimes a distinct small "bird's beak" visible on the upperside. The white pupils are faintly expressed and more or less developed only in the M-eye (one pupil, as a rule). The bluish submarginal spots are well expressed (in contrast to *P. ch. romanovi* GR.-GR.) and are placed in a contrasting blackish area which is separated from all reddish spots by a contrasting and thick strip of the white ground colour (opposite to *P. ch. vaporosus* AV.). The anal/cubital reddish spots are well developed, but the spot between M3 and Cu1 is considerably reduced or totally absent. The HW marginal linear spots between the veins are also blackish and contrasting, ending the pattern oppositely to the nearest *P. ch. romanovi* GR.-GR. and *P. ch. vaporosus* AV. but similarly to the "reduced" version of *ch. aenigma* DUBATOLOV & MILKO, in addition to the main distinctions (wings shape and dense ground colour).

Male: FW length 35-39 mm. Similar to the ♀ because the sexual dimorphism is not expressed - so, more or less similar to *P. ch. romanovi* GR.-GR. ♂♂ because the general pattern is mainly the same. Ground colour is clearly white, the FW discal spots are widened (as in *P. ch. ljudmilae* LESIN & KAABAK). The black pattern is usually reduced, submarginal band is thin and small (marginal band is always normally developed). The FW postdiscal M3-Cu2 spots are often not so dense and more or less reduced (closer to *P. ch. vaporosus* AV.). The HW eyes are deeply reddish, costal eye is usually reduced to small dark spot or even small dot (only 20% of the ♂♂ have this eye reddish); however, this costal eye is normally developed at the underside of the HW. The M-eye is narrow and oval. The M3-Cu1 spot is totally reduced, while *P. ch. romanovi* GR.-GR. ♂♂ have small dark spot between these veins. The blackish area around the normally developed bluish spots as in *P. ch. aenigma* DUBATOLOV & MILKO or *P. ch. romanovi* GR.-GR. - in contrast to *P. ch. vaporosus* AV. The HW blackish marginal linear spots between the veins are contrasting. As a whole, the specimen figured in fig.3c presents more a common form (and not present the aberration), other ♂♂ often look even more unusual. Rarely the black pattern is strongly reduced; one piece have this pattern enlarged (discal spots are enlarged and widely joined, blackish area of the HW are very large and deep).

Distribution: Known only from the type locality but the distribution area may cover other river

valleys in the Surhob basin.

Biology needs to be clarified. *Corydalis transalaica* was described exactly from Muksu R. and is known only by the two typical examples. Some other populations which are sometimes recorded as *C. transalaica* - from the Chinese Kyzyl-Su, for example - are not identical to the types (M. MIKHAILOVA, pers. comm.). The altitude is not high, the density of the known population is very small. The Flight period is August.

Etymology: EUGENIA is the name of my beloved daughter. She helped me seriously with the map work while preparing and planning the expedition.

Discussion

1. The comparison of all studied taxa confirms their status - each taxon has a unique combination of characters. The populations of each subspecies may include some (very rare) individuals with features unusual for the taxon - which can be at the same time typical for another taxon. It confirms the close relations between the studied subspecies which belong to one complex of one species.
The subspecific characters do not represent ecological forms only, as it is sometimes stated (TSHIKOLOVETS). For example, *P. ch. vaporosus* AV. has expressed and enlarged blackish area around the HW submarginal spots in contrast to *P. ch. romanovi* GR.-GR., but the FW blackish pattern in *P. ch. vaporosus* AV. is reduced. Such a combination clearly shows genetic differences - in the case of an ecological form the blackish pattern must be reduced or developed as a whole.

The general shape of the wings and the absence of obvious sexual dimorphism separate *P. ch. aenigma* DUBATOLOV & MILKO and *ch.* ***eugenia*** **subspec. nov.**, the latter representing a small copy of *P. ch. aenigma* DUBATOLOV & MILKO with reduced eyes and FW postdiscal band (with some features of the neighbouring taxa, of course). *Parnassius ch. aenigma* DUBATOLOV & MILKO, in addition, has one more outstanding character: a wide marginal semitransparent band. All other taxa belonging to the group have extended wings and rectangular general shape, the sexual dimorphism is expressed - the ♀♀ are not so densely scaled being semitransparent and not contrasting. In general, *P. ch. romanovi* GR.-GR. is an opposite version to *P. ch. aenigma* DUBATOLOV & MILKO/*P. ch.* ***eugenia*** **subspec. nov.**, with maximally expressed sexual dimorphism: the ♀♀ are not only semitransparent but have a definitely different degree of the development of the submarginal pattern on the HW. However, worth to note that some other important characters show similarity to *P. ch. aenigma* DUBATOLOV & MILKO/*P. ch.* ***eugenia*** **subspec. nov.** The areal of *P. ch. romanovi* GR.-GR. divides the areals of the last two taxa, and such a disposition, in view of the morphological characters, seems very curious and remarkable, in worth of further discussion.

The Tian-Shanian *P. ch.* ***varvara*** **subspec.nov.** is isolated in another mountain system and bears several unique characters: the convex costal side of the FW, the discal spots connected by a thick blackish line, the costal eye is rounded. At the same time it combines some characters of the North Alaian *P. ch.* ***sochivkoi*** **subspec. nov.** and the Kashgarian *P. ch. aenigma* DUBATOLOV & MILKO. *Parnassius ch. vaporosus* AV. distributed in West Pamirs and neighbouring parts of Darvaz has an extended black HW area (in contrast to all other taxa of the group but similar to *P. ch. anjuta* STSHETKIN, KAABAK & STSHETKINAfrom East Pamirs), reduced FW pattern but is related to *P. ch. romanovi* GR.-GR. in the developed and enlarged submarginal reddish spot between M3 and Cu1 (i.e. reddish spots form a continuous band - an outstanding feature of *P. ch. romanovi* GR.-GR. and *P. ch. vaporosus* AV. ♀♀).

Parnassius ch. ljudmilae LESIN & KAABAK flies in Ghissar and has greyish (greenish-bluish) shades in colouration, slight but constant differences in the width of the submarginal and postdical bands. Some other characters of *P. ch. ljudmilae* LESIN & KAABAK are common with the North Alaian *P. ch.* ***sochivkoi*** **subspec. nov.**, for example, white pupils are always developed and enlarged. Two other smaller features unite these two taxa with *P. ch. vaporosus* AV.: the submarginal bluish spots are expressed - more than in *P. ch. romanovi* GR.-GR. (especially important for the ♀♀), while the FW black pattern is slightly but conspicuously reduced. The developed black ring around the M-eye on the HW clearly makes *P. ch. ljudmilae* LESIN & KAABAK related to *P. ch. voigti* B.-H.
It seems that only *P. ch.* ***sochivkoi*** **subspec. nov.** has no significant unique characters - or, more important to note, it is characterized by the absence of unique distinctions of other taxa. Thus, the North Alaian population can not be included into other subspecies. It can be easily distinguished from *P. ch. romanovi* GR.-GR. by the developed and enlarged white pupils, enlarged bluish spots and greyish hue of the wings; the ♀♀ of these two taxa are absolutely different because of the unusual dimorphism of *P. ch. romanovi* GR.-GR. From *P. ch. ljudmilae* LESIN & KAABAK it differs in the absence of the greenish-bluish shades, larger size of the eyes (in the ♂♂), different width of the blackish borders of the M-eye, and some other smaller but significant characters. At the first glance, *P. ch.* ***sochivkoi*** **subspec. nov.** is similar to *P. ch.* ***varvara*** **subspec.nov.** but has normal shape of the FW, normal shape of the costal eye, the junction of the discal spots is not expressed. In addition, *P. ch.* ***varvara*** **subspec.nov.** does not have enlarged white pupils.

2: The examination of the ♂ genitalia and sphragis of the ♀ confirms close relations between the taxa. The detailed structure and characters of the genitalia of the *romanovi*-complex were published before (CHURKIN, 2006a). *Parnassius ch. vaporosus* AV. has some small and (as I suppose) not important differences. The *P. ch.* ***varvara*** **subspec.nov.** has comparatively reduced teeth (spines) on the uncus - this character seems to be constant (and is registered also for one individual of *P. ch. aenigma* DUBATOLOV & MILKO). The ♂ genitalia of *P. ch. aenigma* DUBATOLOV & MILKO seems to be the smallest - and the sphragis is also distinctly smaller than in other taxa.
I also dissected *deckerti* VTY.-specimens which I have at my disposal (from Lamayuru, *P. ch. kataerutae* BRYK, 1927). Surprisingly, their genitalia are different in size from those of the *romanovi*-group - they are 1.5 times larger, while the size of the butterflies is equal to *P. ch. aenigma* DUBATOLOV & MILKO. Moreover, the uncus is even more enlarged and looks two times longer compared to the uncus of *P. ch. aenigma* DUBATOLOV & MILKO/*P. ch.* ***varvara*** **subspec.nov.**/*P. ch. romanovi* GR.-GR. - the difference in size is more than between the valvae. The uncus has the most important role in the first phase of the copulation - and in the taxonomic system of *Parnassius* (exactly the distinctions of uncus are usually specific, including all studied *Kailasius*). I can not explain this fact; it needs confirmation and clarification.

3: I suppose that the ancestor of the group was distributed in this area in the period between the time when the main relief was formed in general and time of the first glaciation. It is logical to suppose that *P. charltonius* GRAY changed its life circle before spreading its distribution area, because all populations studied, fly synchronously in uneven years, while in even years only the "reserved" small number of the butterflies appears. Only *P. ch. romanovi* GR.-GR. breaks this system (and, probably, some other related populations from Alai), and this needs especial explanation. A two-year cycle provides more possibility for surviving and distribution in cold mountains. The older group of *Kailasius* (*davydovi-loxias-autocrator*) has kept - and is keeping till now – a one-

year cycle as the main variant - and, as a result, their areals are very small and the possibility for distribution is weak (KREUZBERG, 1985b; KREUZBERG, 1987).
No worth to note that WEISS (1991) published the idea that lower populations of *P. charltonius* GRAY have a one-year cycle while higher populations are two-yeared. However, it is wrong for the *romanovi*-group: all studied populations have 2-year life cycle independent of the altitude - even the lowest found population from Ak-Bura, living not so far from the hot Fergana Valley.
The yearly synchronization of the flight period of many different populations, which have lived in different mountain ranges for a very long time, during abrupt and serious climate changes, is not possible without a genetic support (especially because we have the example of *P. ch. romanovi* GR.-GR.). Another way of explanation is simple: the whole territory under study was populated by *P. charltonius* GRAY recently, after the last glacial period, and still keeps the characters of the ancestral population. However, this strongly contradicts with all data known for the group studied. Thus, only one logical version is possible: the life cycle changed before spreading of the species - and the wide distribution was the result of the changes (most probably, the structure of the ♂ genitalia and ♀ sphragis also changed significantly at the same time). Some rare individuals may realise 1 or even 3 year-life cycle - possibly, to provide a genetic exchange between the odd- and even-year parts of the population. However, there is no doubt that the 2-year cycle is the base, and, moreover, it is not a result of unfavorable climatic conditions (as it is known for some *Erebia* or *P. eversmanni* MÉNÉTRIÈS, 1849) but is determined genetically. Rare populations with similar numbers of individuals in odd and even years represent not the dominating one-year life cycle but a more numerous population reserve flying in a "wrong" year. For instance, *P. ch. mistericus* KAABAK et al. occurs every year in East Pamirs at the altitude of more than 4,000 m where the climatic conditions far do not allow to speak about the domination of the one-year cycle.
WEISS's hypothesis was proposed to explain the strange differences between the periods of flight in different known subspecies - some of them fly in August, very late, while the others fly in July, more than one month earlier. However, in the case of *P. ch. romanovi* GR.-GR. this mostly depends on the altitude, in my opinion: *P. ch. anjuta* J. J. SHCHETKIN & KAABAK and *P. ch. ljudmilae* LESIN & KAABAK fly in August and very high while *P. ch.* ***sochivkoi*** **subspec. nov.** flies even at the end of June much lower than 3000 m. WEISS was fully right paying attention to the flight period, and this question needs further clarification: the different time of the flight period is a one more important isolation factor. *Parnassius charltonius* GRAY is a very local butterfly, so, if two even close populations fly in different years or even at different time, the possibility of the genetic exchange becomes much less.
In any case, the 2-year cycle for all subspecies of the *romanovi*-group is confirmed now by the observations in nature and breeding - and, in my opinion, this question is much more serious than it was supposed by previous authors, not depending on the point of views on the reasons of this phenomenon.

4: Some hypothesis is possible to suggest about the origination of the taxa studied, and about the observed unusual elements of the subspecific structure. Unfortunately, it can not be completed and verified by the study of other subspecies groups - no publications with a serious analysis of the flight periods or sexual dimorphism of the southern *P. charltonius* GRAY subspecies are known to me. So, this is only the first step in the study of the natural history of the species.
I believe that the ancestral race firstly penetrated the territory of Ghissar and Alai using the valleys of the Amu-Darja River basin, i.e. came from the former southern Pamirs, Hindukush and

Karakorum - I base my opinion on the existence of *P. inopinatus* KOTZSCH, 1940 the distribution of which outlines the most old territory inhabited by the ancestor.
The southern-western populations of *P. charltonius* GRAY (inhabiting a part of Afghanistan) have been fully isolated as a result of the main relief changes which later led to the origination of *P. inopinatus* KOTZSCH. I did not find any confirmed information about the life cycle of this species; it would be not a surprise if *P. inopinatus* KOTZSCH keeps a one-year circle, the old version. In this case it definitely originated at the time of the origination of *P. charltonius* GRAY. One sister species may keep old adaptations while another has changed its characters (including the genitalia) and now populates a giant territory.

Note: I made a serious mistake placing *P. inopinatus* KOTZSCH together with *P. imperator* OBERTHÜR, 1883 (CHURKIN, 2006a) on the base of the structure of sphragis. It was not so important for that study and I had only one ♀ of this rare species, with an unusually developed and broken sphragis. At present I have examined several ♀♀ of both known subspecies and agree that *P. inopinatus* KOTZSCH is the closest relative of *P. charltonius* GRAY; this was confirmed by many scientists and DNA-studies (OMOTO et al., 2009).

The areal of the old race populating the territory in study was definitely larger than the recent distribution of the *romanovi*-group and included the main part of Ghissar: the distinctions of *P. ch. ljudmilae* LESIN & KAABAK do not support the hypothesis that this population was settled only recently. It represents a relic population, the rest of the race the former area of which was shrunken. In addition, the *Corydalis* spp. belonging to the section Strictae, the foodplants of *P. charltonius* GRAY, are distributed in different parts of Ghissar but at the lowest altitudes (MIKHAILOVA, 1982). I suppose that some more populations will be found in future in Ghissarian zoogeographical district.

The most important (for the *romanovi*-group) natural events took place in the Alai Valley, the glacial history of which was displayed in the previous parts of the present paper.
The first glacial period had a cover character, and it was very dangerous for so heat-loving species as *Kailasius* because the number of niches and different types of the relief were obviously less than they became later, when the deglaciation played a serious role in the forming of the recent slopes and valleys. As I noted, the Alai Valley is so deep and large because it was seriously transformed and deepened by the glacier.

After the first ice age, during the hot interglacial time, the southern *P. ch. aenigma* DUBATOLOV & MILKO-like population with some plesiomorphic characters reached Kyrgyzian Kyzyl-Su - Surkhob - Vakhsh valleys (if any *P. charltonius* GRAY populations had inhabited the Alai Valley before, they became totally extinct during the first cover glaciation). Whitish populations without sexual dimorphism penetrated the territory of yellowish/greyish butterflies with expressed differences between the ♂♂ and the ♀♀.

During later glacial periods the bottom of the Alai Valley was covered by a massive glacier, while other glaciers lay at high and medium altitudes of the neighbouring mountain chains - Alai and Transalai. A large parts of the slopes was simply lifeless because of very cold conditions.
In the glacial times the *P. charltonius* GRAY populations lived much lower than now (700-1000 m approximately) - but they survived because it was possible to find available niches and foodplants

on long slopes and large mountain territories. The northern macroslopes of Transalai and the southern macroslopes of Alai are steep and short - in contrast to the northern Alai consisting of long and developed river valleys and several rows of ranges.
It is easy to understand that exactly the population which appeared in the Alai Valley between the upper and lower glaciers got into the worst conditions during the next glacial period. The ecological niches of *Parnassius staudingeri* A. BANG-HAAS, 1882 or *Parnassius simonius* STAUDINGER, 1889 are much higher. These species do not need special vertical surfaces because they do not keep the old version of flight-gliding. Moreover, gliding needs flows of warm air.
It is logical to suppose that such an exceptional position of the mentioned population must be associated with another exception known for *P. ch. romanovi* GR.-GR. now: the opposite year of flight. I suppose that exactly during the second or third glaciation the main part of the population inhabiting the Altyn-Dara river basin (where Aram-Kungei is situated) was extinct, as a result of a natural catastrophe. The population as a whole survived, but the year of flight changed - and this broke the whole system of the relations. Firstly, during the glaciation, the kashgarian race was divided between the 3 chains (the Chinese part, the Alai Valley in Kyrgyzstan and the Tadjikian part) - and secondly, when the warm period came, the contacts were not fully restored because the median population had changed the year. As a result, *P. ch.* ***eugenia*** **subspec.nov.** appeared inside the areal of the "normal" taxa. while the characters of *P. ch. romanovi* GR.-GR. were quickly and significantly transformed. The genetic divergence of this race ancestral to *P. ch. romanovi* GR.-GR. should be also quick and serious, because the population was too small. Some genetic exchange with the butterflies from Alai/Pamirs resulted in the expressed sexual dimorphism (as it is an apomorphic character).

The position of the populations from SW Alai are of great interest in this case. "The Karamyk" chain is a bridge between all western subspecies of the group. In my opinion, this population must be included into *P. ch. romanovi* GR.-GR., but the variability will be much higher. I can not exclude the opposite version - which it is closer to the North Alaian macropopulation (it means that GRUM-GRSHIMAILO collected the representatives of two taxa) - in this case *P. ch. romanovi* GR.-GR. represents exactly the butterfly which has survived in the Alai Valley and still lives here, while SW Alai is inhabited by heterogeneous populations, as a result of the distribution and mixing of different taxa in recent times. I do not support this version, but only real material can confirm or not confirm the hypothesis. The lectotype designation cancelled only the possible "juridical" problems with applying the name of "*romanovi*", while the actual study of elusive Karamyk populations is wanting.

The presented hypothesis logically explains practically all significant differtences in the subspecific structure of the *romanovi*-group. This hypothesis may include some mistakes, but the accordance between the systematic data and the most important events of the natural history is impressive.
It would be important to compare the available data of the interglacial periods - with the results of the DNA-studies of the *romanovi*-taxa and more serious information from glaciologists - the three variants of the dating of the natural events. Such a comparison can help to check different hypotheses about the "DNA-clocks"; the verified DNA data are very important for the systematics, as well.

Some recent authors declare a tendency to unite the subspecies and even species taxa (for example, TSHIKOLOVETS) or a tendency to "break up" the taxa (for example, S. KORB).
From the professional point of view, the natural science excludes the "tendencies". A tendency can only follow the recent human practice. In the taxonomy, the number of taxa must be the same as in

nature, doesn't matter is it good for the amateur collectors or not. While working with the natural populations, we step by step make the system closer to that existing in nature. True systems can help seriously in the understanding of the history of nature as a whole and provides important data for the studies in evolution, glaciology, and molecular biology. The systems of taxa, according to TSHIKOLOVETS, has no sense because of ignoring serious data accumulated during more than one hundred years of study (see CHURKIN, 2006b: 115). Such a system is not possible to be used for the purposes of other biological sciences - thus, it makes no more sense than the system of stamps valuable to make the butterflies matching their position in a collection box. This is a pity compared to the bank of the photographs and bibliography published by the same author.

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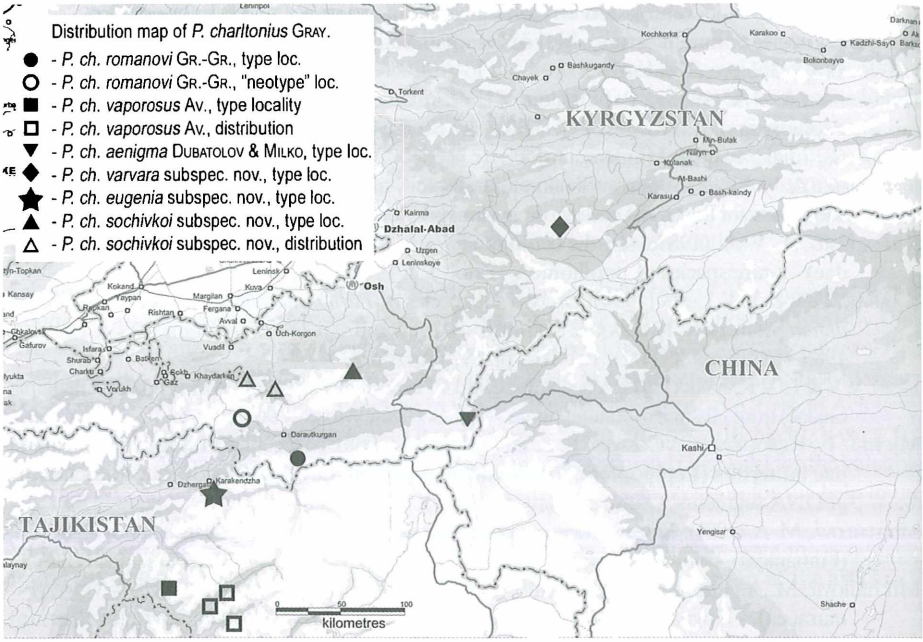

Distribution map of the *Parnassius charltonius* GRAY, 1852 subspecies.