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Rhopalocera and Grypocera of Turkey 14. Taxonomic revision of the *Pyrgus alveus* (Hübner, [1803]) complex from Greece to West China, with description of two new species from southern Turkey (Lepidoptera: Hesperiidae)

W.O. De Prins & D. van der Poorten

Abstract. The individual and geographical variability of *Pyrgus alveus alveus* (Hübner, [1803]) is discussed. The reasons why *Pyrgus jipei* (Alberti, 1967) was for a long time confused with *Pyrgus alveus sifanicus* Grum-Grshimailo, 1891 are given. A lectotype and 3 paralectotypes are designated for *Pyrgus alveus iliensis* (Reverdin, 1912). A lectotype and 5 paralectotypes are designated for *Pyrgus alveus sifanicus*. *Pyrgus alveus sifanicus*, *Pyrgus alveus iliensis*, *Pyrgus iliensis columnus* Kaufmann, 1954 and *Pyrgus alveus confusa* Renner, 1991 are synonymized with *Pyrgus alveus alveus* (Hubner, [1803]). The distribution of *Pyrgus alveus alveus* in Turkey is extended considerably to the southwest. The individual and geographical variability of *Pyrgus jipei* is discussed. The known distribution of this taxon is extended to the west. *Pyrgus centralasiae* Renner, 1991 is synonymized with *Pyrgus jipei*. Two new species are described: *Pyrgus bolkariensis* sp. n. from two peaks in the Bolkar Mts (South Turkey) and *Pyrgus aladaghensis* sp. n. from the Ala Mts (South Turkey). These species are compared with *P. jipei* and *P. warrenensis* (Verity, 1928), with which they have an alpine distribution in common, and with *P. alveus* with which they occur synchronically and sympatrically. The karyotype of the two new species has been defined. The male and female genitalia of all species under consideration are figured and discussed, if they are known.

Samenvatting. Rhopalocera en Grypocera van Turkije 14. Taxonomische revisie van het *Pyrgus alveus* (Hübner, [1803]) complex van Griekenland tot West-China, met beschrijving van twee nieuwe soorten uit Zuid-Turkije (Lepidoptera: Hesperiidae). De individuele en geografische variabiliteit van *Pyrgus alveus alveus* (Hübner, [1803]) wordt besproken. Er wordt verklard waarom *Pyrgus jipei* (Alberti, 1967) lange tijd voor *Pyrgus alveus sifanicus* Grum-Grshimailo, 1891 werd gehouden. Voor *Pyrgus alveus iliensis* (Reverdin, 1912) worden een lectotype en 3 paralectotypen aangeduid. Voor *Pyrgus alveus sifanicus* worden een lectotype en 5 paralectotypen

aangeduid. *Pyrgus alveus sifanicus*, *Pyrgus alveus iliensis*, *Pyrgus iliensis colurnus* Kaufmann, 1954 en *Pyrgus alveus confusa* Renner, 1991 worden gesynonymiseerd met *Pyrgus alveus alveus* (Hübner, [1803]). De tot nu toe bekende verspreiding van *Pyrgus alveus alveus* (Hübner, [1803]) in Turkije wordt geschatst en door nieuw bekend geworden materiaal sterk naar het zuidwesten toe uitgebreid. De individuele en geografische variabiliteit van *P. jupei* wordt besproken. De tot nu toe bekende verspreiding van *Pyrgus jupei* wordt naar het westen uitgebreid. *Pyrgus centralasiae* Renner, 1991 wordt gesynonymiseerd met *Pyrgus jupei*. Er worden twee nieuwe soorten beschreven: *Pyrgus bolkariensis* sp. n. van twee toppen uit het Bolkargebergte (Zuid-Turkije) en *Pyrgus aladaghensis* sp. n. van het Alagebergte. Deze soorten worden vergeleken met *P. jupei* en *P. warrenensis* (Verity, 1928), waarmee ze een alpiene verspreiding gemeen hebben, en met *P. alveus* (Hübner, [1803]), waarmee ze sympatrisch en synchroon voorkomen. Het karyotype van beide nieuwe soorten kan worden vastgesteld. De mannelijke en vrouwelijke genitalia van alle soorten in kwestie worden, wanneer bekend, met elkaar vergeleken.

Résumé. Rhopalocères et Grypocères de la Turquie 14. Révision taxonomique du complexe de *Pyrgus alveus* (Hübner, [1803]) de la Grèce jusqu'en Chine occidentale, avec la description de deux nouvelles espèces de Turquie méridionale (Lepidoptera: Hesperiidae)

La variabilité individuelle et géographique de *Pyrgus alveus alveus* (Hübner, [1803]) est discutée. Il est expliqué pourquoi le taxon *Pyrgus jupei* (Alberti, 1967) a pendant longtemps été confondu avec *Pyrgus alveus sifanicus* (Grum-Grshimailo, 1891). Un lectotype et 3 paralectotypes sont désignés pour le taxon *Pyrgus alveus iliensis* (Reverdin, 1912). Un lectotype et 5 paralectotypes sont désignés pour le taxon *Pyrgus alveus sifanicus*. *Pyrgus alveus sifanicus*, *Pyrgus alveus iliensis*, *Pyrgus iliensis colurnus* Kaufmann, 1954 et *Pyrgus alveus confusa* Renner, 1991 sont placés en synonymie sous *Pyrgus alveus alveus* (Hübner, [1803]). La répartition de *Pyrgus alveus alveus* (Hübner, [1803]) en Turquie telle qu'elle était connue jusqu'à présent est esquissée, et grâce à la découverte de quelques nouvelles localités cette répartition est étendue considérablement vers le sud-ouest. La variabilité individuelle et géographique de *Pyrgus jupei* est discutée. La répartition de *Pyrgus jupei* telle qu'elle était connue jusqu'à présent est étendue vers l'ouest. *Pyrgus centralasiae* Renner, 1991 est placé en synonymie sous *Pyrgus jupei*. Deux nouvelles espèces sont décrites: *Pyrgus bolkariensis* sp. n., provenant de deux localités des monts Bolkar (sud de la Turquie) et *Pyrgus aladaghensis* sp. n. des monts Ala (sud de la Turquie). Le karyotype des deux taxa nouveaux a été établi. Ces espèces sont comparées à *Pyrgus jupei* (Alberti, 1967) et *P. warrenensis* (Verity, 1928), avec lesquelles elles ont une distribution alpine en commun, ainsi qu'à *P. alveus* (Hübner, [1803]), avec laquelle elles voient synchroniquement et sympatiquement. Les genitalia mâle et femelle de toutes les espèces traitées sont comparés, s'ils sont connus.

Резюме. Rhopalocera и Grypocera Турции. 14. Таксономическая ревизия толстоголовок комплекса *Pyrgus alveus* (Hübner, [1803]) – *jupei* (Alberti, 1967) из Греции, Турции и далее на восток до Западного Китая с описанием двух новых видов из Южной Турции (Lepidoptera: Hesperiidae)

Рассматриваются индивидуальная и географическая изменчивость *Pyrgus alveus alveus* (Hübner, [1803]). Выяснены причины, по которым *Pyrgus jupei* (Alberti, 1967) в течение длительного времени смешивался с *Pyrgus alveus sifanicus* (Grum-Grshimailo, 1891). Обозначены лектотип и 5 паралектотипов *Pyrgus alveus sifanicus*, а также лектотип и 3 параплектотипа *Pyrgus alveus iliensis* (Reverdin, 1912). *Pyrgus alveus sifanicus*, *Pyrgus alveus iliensis*, *Pyrgus iliensis colurnus* Kaufmann, 1954 и *Pyrgus alveus confusa* Renner, 1991 сведены в синонимы с *Pyrgus alveus alveus* (Hübner, [1803]). Известное распространение *Pyrgus alveus alveus* в Турции значительно расширено к юго-западу. Рассматриваются индивидуальная и географическая изменчивость *Pyrgus jupei*, известное распространение которого расширено к западу. *Pyrgus centralasiae* Renner, 1991 синонимизирован с *Pyrgus jupei*. Описываются два новых вида: *Pyrgus bolkariensis* sp.n. с двух вершин хр. Болкар (Южн. Турция) и *Pyrgus aladaghensis* sp.n. с хр. Аладаг (Южн. Турция). Эти виды сравниваются с *Pyrgus jupei* и *Pyrgus warrenensis* (Verity, 1928), также

приуроченными к высокогорным биотопам, и с *Pyrgus alveus*, с которым они синхронны и симпатричны. Определены и описаны кариотипы новых видов. Приводятся изображения и описания гениталий самцов и самок всех рассмотренных видов.

Key words: *Pyrgus alveus* - *Pyrgus bokhariensis* sp. n. - *Pyrgus aladaghensis* sp. n. - *Pyrgus alveus iliensis* syn. n. - *Pyrgus iliensis columnus* syn. n. - *Pyrgus alveus confusa* syn. n. - *Pyrgus centralasiae* syn. n. - *Pyrgus jupei* - *Pyrgus alveus sifanicus* syn. n. - taxonomy - distribution - variability - lectotype - paralectotype - karyotype.

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1. Introduction

In [1803] Hübner figured a male upperside and a female upper- and underside of *Papilio alveus* (Plate 92, figs 461-463) (see present fig. 1d), type locality "Deutschland" (Hübner [1806]: 70) (fig. 2). Because the type material is lost¹, Renner (1991) designated a neotype (δ) from "Südwestdeutschland [Baden Württemberg], Münzinger Alb, Umg. Mehrstetten, 750m, 19.8.1978, leg. G. Baisch", coll. ZSSM. We examined this neotype (fig. 1a-c) and concluded that it matches Hübner's figs 461-462 (a male specimen) very well.

The karyotype of *Pyrgus alveus*, n=24, was established from specimens captured in Finland (Federley 1938: 403, 436) and in Croatia, Stenjevec (Lorković 1941: 162). We were able to fix the testes of two specimens (one from the Bolkar Mts and one from the Ala Mts in South Turkey), which were studied by Dr V. Lukhtanov and N. Kandul (St Petersburg). The male from the Bolkar Mts showed n=24, whereas no cells in metaphase could be found in the other male.

At present, there is a lot of taxonomic confusion around the species of the *Pyrgus alveus* (Hübner, [1803]) complex, including *Pyrgus jupei* (Alberti, 1967) from the region of the Caucasus, Transcaucasia and adjacent areas. Apart from *alveus* and *jupei* some other names have been used to denote various taxa from this region or which are related to taxa from this region: *sifanicus* Grum-Grshimailo, 1891, *iliensis* (Reverdin, 1912), *caucasicus* (Picard, 1949), *columnus* Kaufmann, 1954, *confusa* Renner, 1983, *confusa* Renner, 1991 and *centralasiae* Renner, 1991. To point out the correct taxonomic situation and distribution in their book (Hesselbarth, van Oorschot & Wagener 1995, in press), Dr P. S. Wagener and H. van Oorschot asked us to clarify this situation. We examined the collection of the Instituut voor Taxonomische Zoölogie Amsterdam (ITZA), important type-material and other specimens from the Zoologisches Forschungsinstitut und Museum Alexander Koenig, Bonn (ZFMK), the Koninklijk Belgisch Instituut voor Natuurwetenschappen, Brussels (KBIN), the Muséum d'Histoire naturelle de Genève (MHNG), the Nationaal Natuurhistorisch Museum Leiden (RNHL), the Natural History Museum London (BMNH) and the Zoologische Staatssammlungen München (ZSSM). We also used interesting material from several private collections (see acknowledgments) and our own material, kept in the joint collection of J. Dils, W. De Prins, A. Olivier and D. van der Poorten (VLCA). What follows is the result of this study.

¹ The types of the collection Hübner were deposited via V.A. von Mazzola in the Naturhistorisches Museum Wien in 1823. In 1848 at least part of this collection was destroyed by fire. Probably the types of Hübner were lost on this occasion (Horn & Kahle 1935: 119).

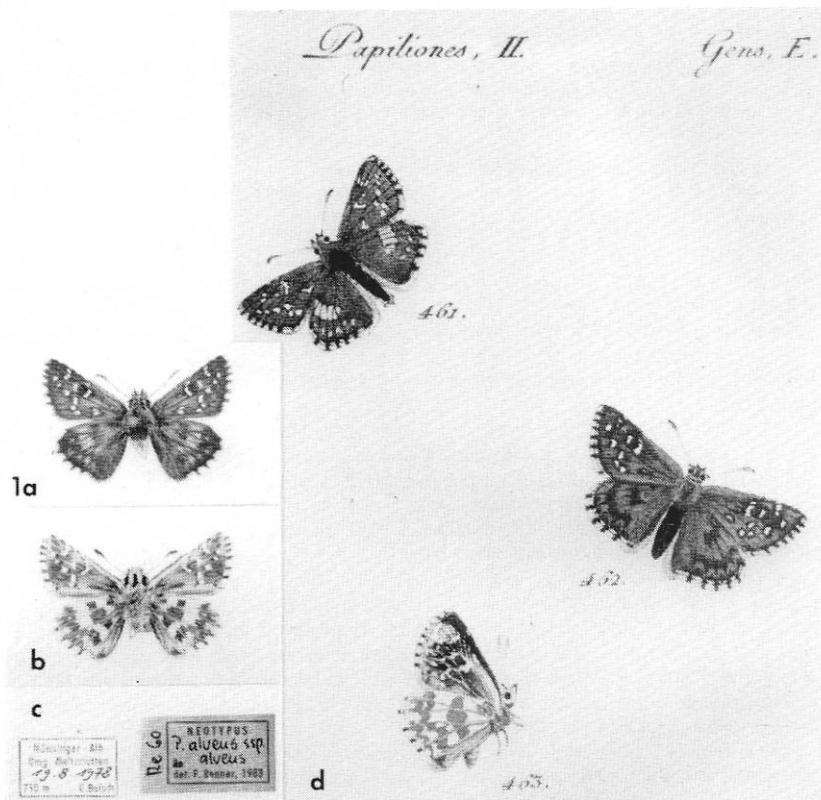


Fig. 1: *Pyrgus alveus alveus* (Hübner, [1803]); a. Neotype ♂ upperside, b. underside, c. labels; d. figs 461-463 on plate 92 in Hübner [1803].

5. Halbwürfiger Falter; *Papilio Alveus*.

Pap. 461. Mas; 462. 463. Fœm.

Die Flügel oben schwärzlichbraun, fleckig schimmrig bestäubt, die Oberen allein halbwürfig gelblichweiß gefleckt, Beiderley aber weißlich, schwärzlich zähnig gefranzt; unten die Oberen schwärzlichgrau, grünlich gemischt, weißlich gewürfelt, die Unteren hell olivengrün, jedoch beträchtlicher fleckig-weißlich bandirt.

Heim. Deutschland.

Fig. 2: Original description of *Papilio alveus* Hübner, [1803]; this text was published in [1806].

2. General remarks on the individual variability of *Pyrgus alveus* from Greece to West China

Pyrgus alveus is a very variable species in the region under consideration: Greece, Turkey, Caucasus, North Iran, Kazakhstan and West China. In particular the groundcolour of the underside hindwing, which is light brown with a yellowish or greenish tinge in some specimens (especially the females), can be greyish or even dark brown in others. The light spots on the underside of the hindwings can be more or less developed. Some specimens have the white borders on the underside of both wings developed in such a way that they recall *Pyrgus carthami* (Hübner, [1813]). The white markings on the upperside of the forewing can be more or less reduced. Sometimes there is a second submedian, white spot at the inner margin of the forewing. On the hindwing the white markings may even be absent (this is often the case in specimens from the Kaçkar Mts, North-East Turkey). These white spots can, on the other hand, be more complete and better developed than in typical *alveus*. This is often the case in specimens from Greece and the Palandöken Mts, North-East Turkey. The white markings are sometimes extremely developed (see next section). Most of the characters used by some authors to divide the species into populations at subspecific level can be found in other populations too, some even in the entire range of the species. However, in the whole area under consideration, there is no indication whatsoever which would suggest that some populations show constant geographically separable characters.

2.1. *Pyrgus alveus iliensis* (Reverdin, 1912)

2.1.1. Historical analysis

Reverdin (1912) described *Hesperia iliensis* from "Turkestan oriental, dans la région de l'Ili" [Kazakhstan]. These populations are characterized by the large white spots on the upperside and by the presence of two white spots at the inner margin of the forewing ("*Iliensis* se distingue d'*alveus* par la grandeur des taches blanches du dessus des ailes et en particulier par la présence près du bord interne des antérieures, à égale distance de la base et du dernier point de la série médiane, de deux traits blancs, parallèles, courts mais larges et très apparents") (Reverdin 1912: 156). We found the latter character also in many characteristic *alveus* in the whole range of the species.

Reverdin (1916: 16, 31) listed *Pyrgus iliensis* as a doubtful species under the "Espèces probablement légitimes". He figured the male genitalia on pl. CCCC fig. 5015.

Without giving his reasons Evans (1949: 194) synonymized *iliensis* with *Pyrgus alveus sifanicus*.

Shepard (1935: 444) listed *iliensis* as a subspecies of *Pyrgus alveus*.

Picard (1949: 57), writing on the variability of *Pyrgus bellieri* (Oberthür, 1910), gave the name *caucasicus* to the populations from the Caucasus and Transcaucasia², which had been referred to as *Pyrgus sifanicus* (Grum-Grshimailo, 1891) by Reverdin (1915). The description of *caucasicus* is rather short, and mentions, apart from the external resemblance to *bellieri*³, the small proportions of the style and antistyle in the male genitalia, which is actually the character state as it is found in *P. jupei*! (see under

² de Jong (1975b) removed the name *caucasicus* from *P. bellieri* (this taxon doesn't occur in the area) and placed it under *P. alveus*.

³ In *P. bellieri* all white markings are better developed than in most *alveus*.

heading Distribution and variability of *P. jupei*).

In 1954 Kaufmann described *Pyrgus iliensis* ssp. *colurnus* from the Southern Alps (see under heading: *Pyrgus "iliensis" colurnus* and *Pyrgus alveus confusa*).

De Jong (1975b) designated a lectotype and a paralectotype of *Pyrgus alveus caucasicus* (Picard, 1949) and placed "the name *Pyrgus alveus caucasicus* as a junior synonym of *Pyrgus alveus alveus*" (l.c.: 3).

Lukhtanov & Lukhtanov (1994: 308, map 396) considered all populations from Central and South Ural Mountains, the West Siberian Plain, Kusnezki-Alatau, Altai, Saur, Tarbagatai and Djungar Alatau Mts to belong to *Pyrgus alveus iliensis*.

2.1.2. Discussion

We examined four male syntypes of *Pyrgus iliensis* (from a total series of 6♂ and 1♀ in coll. MHNG). We designate a male lectotype from these specimens of which the labels read: "Asia centr. Turkestan Ili-Gebiet Coll. Wagner / type / [a photograph of fig. 7 on plate 16 in Reverdin 1912] / Lectotype *Hesperia iliensis* Reverdin, 1912, des. De Prins & van der Poorten, 1995" (fig. 3). We furthermore designate the three other syntypes which we examined as paralectotypes. Their labels read:

"Asia centr. Turkestan Ili-Gebiet Coll. Wagner / typus / 1314 / *Hesp. iliensis* an species? Reverdin / Coll. J.L. Reverdin / Paralectotype *Hesperia iliensis* Reverdin, 1912, des. De Prins & van der Poorten, 1995" (fig. 4-5).

"Asia centr. Turkestan Ili-Gebiet Coll. Wagner / 1321 / Paralectotype *Hesperia iliensis* Reverdin, 1912, des. De Prins & van der Poorten, 1995" (fig. 6).

"Asia centr. Turkestan Ili-Gebiet Coll. Wagner / 1324 / Paralectotype *Hesperia iliensis* Reverdin, 1912, des. De Prins & van der Poorten, 1995".

One male labeled "Caucasus, Ararat [Ağrı Dag]⁴ 12.VII [no year]" in coll. Reverdin (determined by Reverdin as "*Pyrgus sifanicus*") corresponds in every respect with the description and the lecto- and paralectotype material mentioned above (fig. 13).

The lectotype of *Pyrgus alveus caucasicus* (from Adschara [Adzhar], Transcaucasia) shows in every respect the *iliensis* characters as described by Reverdin although the male genitalia are characteristic *alveus* (de Jong 1975b). The paralectotype (from Kuban, North-West Caucasus) has these *iliensis* characters less well developed and can be considered as intermediate between *alveus* and *iliensis*. Because de Jong synonymised *Pyrgus alveus caucasicus* with *Pyrgus alveus alveus* and because of the very strong resemblance between the lectotype of *caucasicus* and the type-material of *iliensis*, de Jong indirectly indicated the similarity of these two taxa and hence with *alveus*. Lukhtanov & Lukhtanov (1994: 418, plate 50, fig. 18) figured a specimen from West Caucasus, Oschten [?], 2000 m, which is intermediate between *alveus* and *iliensis*, but which does not agree with the type material from Reverdin.

De Jong (1972) examined *iliensis* specimens from Kansk (West Siberia) and Boro Choro ([Borohoro Shan, West China]), which resemble very much those from the type-locality. He furthermore examined specimens from Albakan (north of Altai) and from the Altai Mts, which have smaller spots. However, they have the white spots better developed than in European specimens of *Pyrgus alveus* (cf. de Jong 1972: 92).

⁴ All geographical names have been checked with "The Times Atlas" (Bartholomew 1987) and when different from the spelling in the original publication, their spelling is added between brackets.

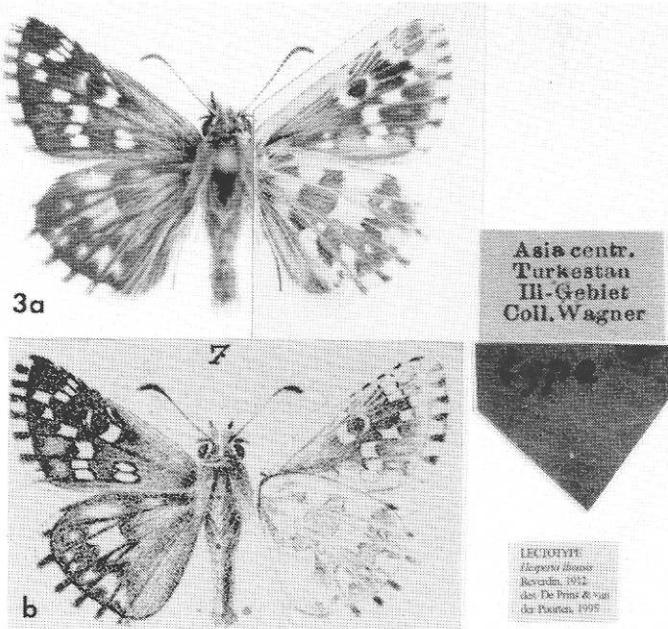


Fig. 3: *Pyrgus iliensis* (Reverdin, 1912). Lectotype ♂, Asia centr., Turkestan, Ili-Gebiet, Coll. Wagner, coll. MHNG; a. upper- and underside of the specimen; b. photograph of fig. 7 on plate 16 in Reverdin 1912 (the same specimen) which is also a label under the specimen.

We studied 3♂ from the Altai Mts, vic. Barnaul (coll. Häuser) (Plate 1, figs 16-17), which have the characters described for *iliensis* very well developed. However, from the same region (Altai Mts: Kurai range (Plate 1, fig. 24) and Tschegan Uzun [?], coll. Baumann (Plate 1, figs 19-20)) we saw characteristic *alveus* and specimens with intermediate characters. From Central Russia (vic. Voronezh [Voronezh]⁵, coll. Baumann (Plate 1, figs 22-23)) we saw 1♂ and 1♀ with intermediate characters.

Renner (1991) showed four specimens as "*Pyrgus alveus iliensis*", the one from Ağrı Mountain (Turkish Armenia) (Pl. 7, fig. 29) has the same characters as the ones mentioned in the original description and as repeated by de Jong (1972). The three other specimens of "*Pyrgus alveus iliensis*" from Armenia, Mongolia and the Altai (pl. 7, figs 28, 30, 31) do not show these clear-cut markings but have intermediate characters between *iliensis* and characteristic *alveus*. This clearly shows the variability of the character. It is not possible to draw a sharp line between the distribution ranges of *alveus* and *iliensis* and intermediate forms occur as far east as Mongolia.

Alberti (1967, Pl. 3) figured four specimens from North-West Caucasus, Teberda, fig. 1a, a male which is characteristic *alveus*, fig. 1c, a female with slightly broader

⁵ This locality fills up the gap in the distribution of *P. alveus* as given by de Jong (1972: 91, and map 16): "The distribution in Russia north of the Caucasus is entirely unknown".

white termen on the underside (see under *sifanicus*) and figs 1d and 1f, two which show the *iliensis* characters well developed. Thus both phenotypes occur in one locality.

On Ilgar Mountain, Turkey, prov. Ardahan, 18 km South of Posof, we caught three males between 1-8 August 1993 with the same characters as described for *iliensis* (Plate 1: figs 10-12). One specimen shows the characters even more pronounced than the most extreme specimens of the type-series of *iliensis*. According to Kaufmann (1954a: 27), who reports an experiment carried out by Meyer, the pupae of *P. alveus* are sensitive to low temperatures, producing adults with much reduced white spots. Undoubtedly, this will be true in most cases, but it must be noticed that there are interesting exceptions, as shown by our observations of extremely well developed *iliensis* phenotypes on Ilgar Mountain. This locality is known to be very cold and humid. Here, it rains nearly every day in summertime and the place is covered with snow from October to May, as we were told by local people.

The specimen from Tunceli province (Plate 1, fig. 13), mentioned under the heading "distribution" below, is very close to the *iliensis* phenotype, except for the groundcolour which is slightly more yellow, as are the specimens from the province of Niğde (Bolkar (Plate 1, figs 14, 18) and Ala Mts(Plate 5, figs 24, 32)). The two males from the province of Hakkari (Plate 1, fig. 15) (see under "distribution") show the *iliensis* characters very well pronounced.

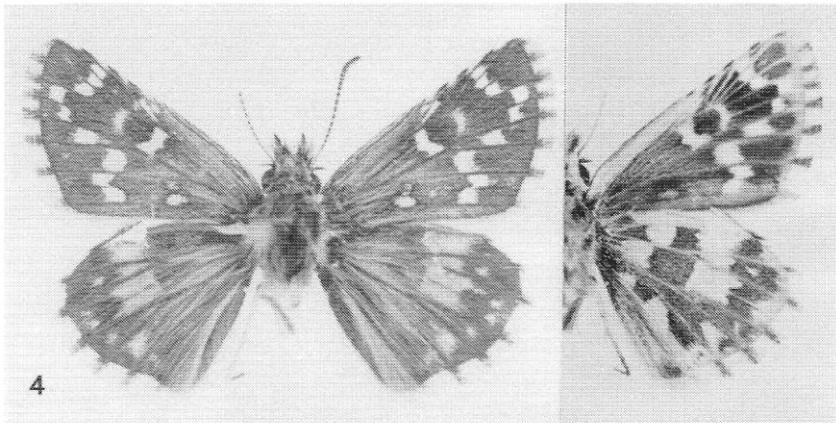
In different localities in Turkey (prov. Erzurum: Palandöken Mts (Plate 1, fig. 9), Pass 22 km North of Ovacık, Kireçli Pass, Tortum; prov. Bayburt: Kop Mountain; Kars: Sarıkamış; Ardahan: Çamlıçatak) we collected specimens which are intermediate between the *iliensis* form as described by Reverdin and characteristic *alveus*. In the province of Artvin (Kaçkar Mts) (Plate 1, fig. 7) we found, among an extensive series of characteristic *alveus*, some intermediate forms.

It is very remarkable that in a series of 67 specimens of *P. alveus* from Greece (colls VLCA and Coutsis), 8 clearly show the characters of the *iliensis* phenotype: Pelopónissos, Ahaía, Ór. Aroánia (3♂), Tzoumérka (1♂), Fokida, Ór. Gióna (1♂) (Plate 1, fig. 6), Evritanía, Kaliakoúda (2♂) (Plate 1, fig. 5) and Dráma, Ór. Falakró⁶ (1♂). This last one was caught together with very characteristic *alveus* and with specimens showing intermediate characters (Plate 1, figs 1-4). Such specimens can be found in all Greek *alveus* populations.

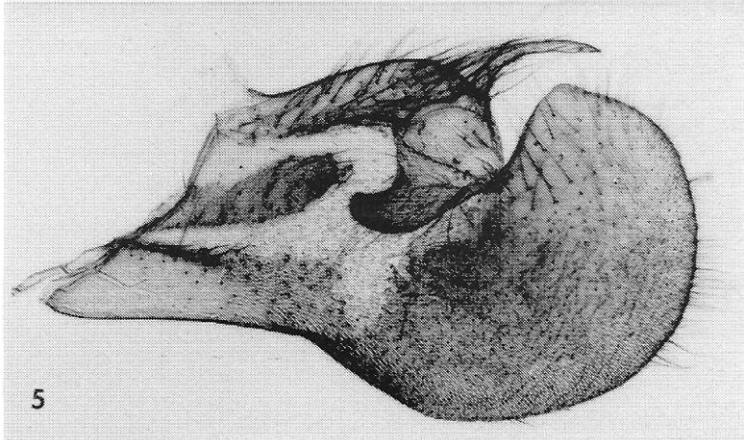
Olivier (1989: 63, figs 1 and 2) figured a male specimen of *Pyrgus alveus* from "Óros Helmós [Óros Aroánia]⁷, Pelopónissos, Greece, 1850 m, 17.VII.1985", which shows very well all characters of *iliensis*. This author mentions that "similar phenotypes are occasionally met with in other areas [in Greece] and there is no reason to suppose that this marked expression of the spotting is due to anything else than to ecophenotypic variation." (l.c.: 63). Gallo (1989) figured a male specimen captured near Kalávrita, 1800 m, Óros Aroánia, Pelopónissos, Greece, 23.VII.1979. This specimen shows the characters to a lesser extent than the *alveus* figured by Olivier and is clearly intermediate between *iliensis* and characteristic *alveus*.

⁶ J.G. Coutsis (i.l.) mentioned also Vathirema (Rhodópi) as a locality for *alveus*, this represents the most northeastern record for the species in Greece.

⁷ It is interesting to note that on the Pelopónissos, *P. alveus* is only mentioned from Óros Aroánia (Achaia) and that this population represents the most southern locality known for the species in the Balkan Peninsula.



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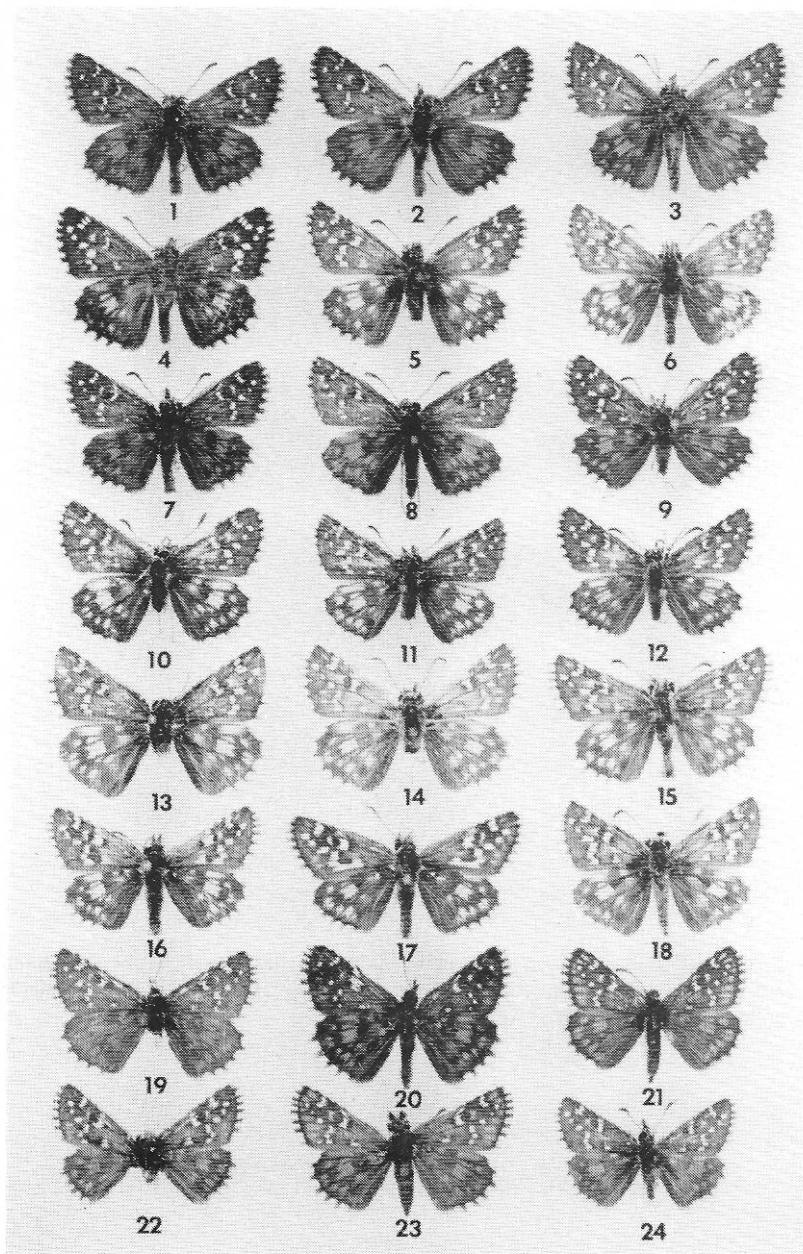


5

Fig. 4-5: *Pyrgus iliensis* (Reverdin, 1912), Paralectotype ♂; 4. Upper- and underside, Central Asia, Turkestan, Ili region, coll. Wagner, MHNG; 5. right valva of the specimen in fig. 4, prep. Reverdin 1314.

Among all the examined specimens, including the type-material, we found no features at all in the male (see figs 5-6) and female genitalia that fall outside the normal range of variation of *P. alveus*.

Plate 1



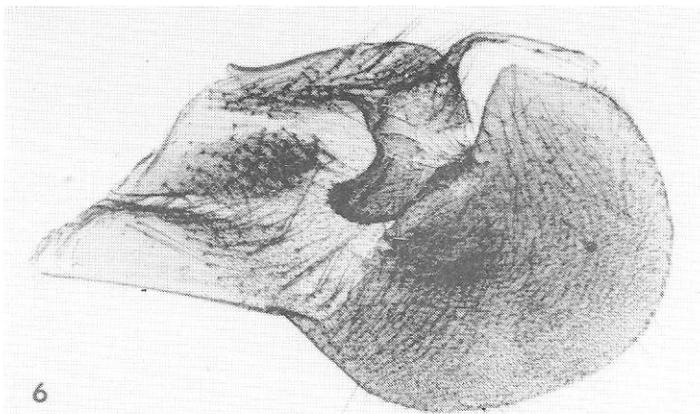
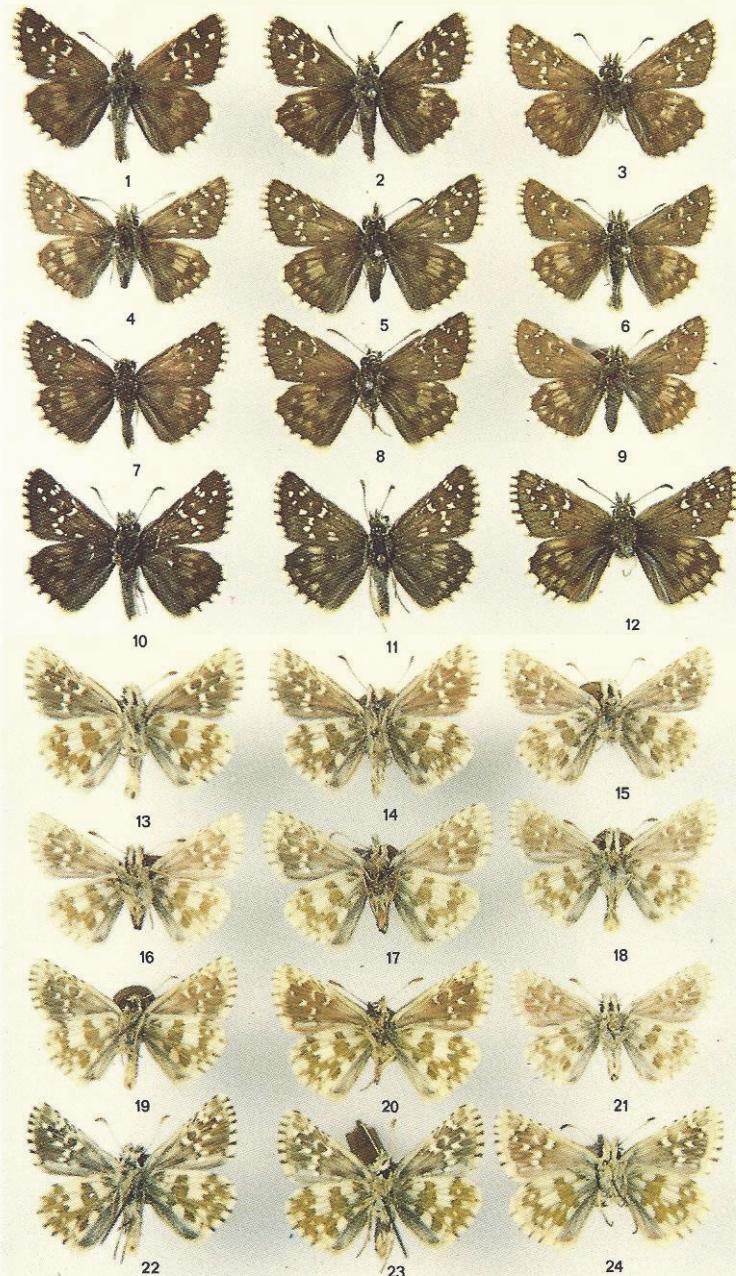


Fig. 6. *Pyrgus iliensis* (Reverdin, 1912), right valva of paralectotype, Asia centr., Turkestan, Ili-Gebiet, Coll. Wagner, MNHG, prep. Reverdin 1321 (this valva has already figured by Kaufmann 1954, pl. II, fig. 7).

Legend of plate 1: Variability of *Pyrgus alveus alveus* (Hübner, [1803]), from dark characteristic *alveus* to the well marked *iliensis* phenotype:

1. Greece, Drama, Partheno Dasos, 1300 m, 11.VII.1993, leg. J. Dils, coll. VLCA.
2. Greece, Drama, Ör. Falakró, 2000 m, 4.VII.1984, leg. D. van der Poorten, coll. VLCA.
3. Greece, Drama, Ör. Falakró, 1000 m, 18.VIII.1983, leg. J. Dils, coll. VLCA.
4. Greece, Drama, Ör. Falakró, 550 m, 9.VIII.1983, leg. J. Dils, coll. VLCA.
5. Greece, Evritania, Kaliakouda, 1950 m, 9.VIII.1986, leg. J. Dils, coll. VLCA.
6. Greece, Fokida, Ör. Giona, 1800 m, 7.VIII.1986, leg. J. Dils, coll. VLCA.
7. Turkey, Artvin, Kaçkar Mts, 34 km SW Sangol, 2200-2600 m, 6.VIII.1993, st. 1964, leg. D. van der Poorten, A. Riemis, W. De Prins, coll. VLCA.
8. as in fig. 7.
9. Turkey, Erzurum, Palandöken Mts, 5 km South of Erzurum, 2200-2500 m, 20.VII.1991, st. 1730, leg. D. van der Poorten, W. De Prins, coll. VLCA.
10. Turkey, Ardahan, İlgarağı Pass, 18 km South of Posof, 2500 m, 1.VIII.1993, st. 1948, leg. D. van der Poorten, W. De Prins, coll. VLCA.
11. Turkey, Ardahan, İlgarağı Pass, 18 km South of Posof, 2500 m, 8.VIII.1993, st. 1967, leg. D. van der Poorten, W. De Prins, coll. VLCA.
12. as in fig. 10.
13. Turkey, Tunceli, 5-30 km West of Tunceli, Road Tunceli-Ovacık, 1100 m, 11-12.VII.1987, st. 1399, leg. H. & Th. van Oorschot, W. De Prins & F. Coenen, coll. VLCA.
14. Turkey, Niğde, Bolkar Mts, North-side, South-West of Maden, 2600-2800 m, 24.VII.1994, st. 1996, leg. H. van Oorschot, H. van den Brink, D. van der Poorten & W. De Prins, coll. VLCA.
15. Turkey, Hakkari, Cilo Mts, Sümbül East-side, 1900-2100 m, 26.VII.1982, coll. Nr. 136, leg. E. Görögner, coll. C. Häuser.
16. Russia, Altai region, vic. Barnaul, coll. H. Baumann.
17. Russia, Altai region, vic. Barnaul, 17.VII.1974, leg. Kopylov, coll. H. Baumann.
18. as in fig. 14.
19. Russia, Altai region, Kurai Steppe, 1600 m, 10.VII.1965, coll. H. Baumann.
20. Russia, Central Asia, Altai region, vic. Origudis, 13.VII.1965, coll. H. Baumann.
21. Kazakhstan, vic. Kamenogorsk, 28.VI.1959, leg. B. Izenbek, coll. H. Baumann.
22. Russia, vic. Voronezh, Petsharonska valley, 8.VIII.1977, coll. H. Baumann.
23. as in fig. 22.
24. Russia, Altai region, Kurai Steppe, 17.VII.1965, leg. B. Izenbek, coll. H. Baumann.

Plate 2



2.1.3. Conclusion

As it nowhere seems possible to indicate geographically isolated populations of the *iliensis* phenotype, since both *iliensis* and *alveus* forms occur syntopic and synchronous in many places, and because there exist many intermediate forms between the two, thus demonstrating the extensive variability within *alveus*, in which *iliensis* merely represents a well-marked phenotype occurring from the Balkans to the Altai and the Ili region, we place the name *Pyrgus alveus iliensis* (Reverdin, 1912) as a junior synonym of *Pyrgus alveus alveus* (Hübner, [1803]).

2.2. *Pyrgus iliensis columnus* Kaufmann, 1954 and *Pyrgus alveus confusa* Renner, 1991

2.2.1. Historical analysis and discussion

Because in 1954 Kaufmann described *columnus* from specimens caught in Tessin [Switzerland], Formighé 860 m as a subspecies of *Pyrgus iliensis*, we prefer to include this taxon in the present study. According to him this "subspecies" occurs in "Insubria, Vallese, alpi Retiche, Piemonte, Alto Adige, Lombardia" (Kaufmann 1954: 273). Warren (1957: 374) wrote that "the *alveus* and *columnus* types" of genitalia "occur together throughout the central Alps, though in differing proportions, and the transition from one to the other is imperceptible. Even in those southern regions where *columnus* predominates, the extremely developed *alveus* type also occurs." De Jong (1972: 90) acknowledged this and found both types of genitalia in specimens from "S. Bavaria, C Italy and the Balkans in varying proportions. Thus, it is even impossible to define *columnus* geographically."

In 1983 Renner introduced the name *Pyrgus alveus confusa* into the entomological literature, however without giving any formal description and hence Ebert & Rennwald (1991: 487) considered the name invalid under Article 13(a)(i) of the ICBN.

In 1991 Renner described *Pyrgus alveus confusa* for the second time (Type-locality: Kaiserstuhl, South-West Germany [Baden-Württemberg]). Again, Renner gave no formal description of *confusa*, the distinctive characters are only retrievable from table 42 (p. 79).

Legend of Plate 2: *Pyrgus alveus alveus* (Hübner, [1803])

1. ♂, West China, Kuku-Nor [Qinghai Hu], ex coll. Tancré, coll. ZSSM.
2. ♂, West China, Kuku-Nor [Qinghai Hu], coll. ZSSM.
3. ♂, West China, Kuku-Nor [Qinghai Hu], coll. ZSSM.
4. ♂, *Pyrgus alveus* var. *sifanicus* Grum-Grshimailo, 1891, Paralectotype, West China, Kuku-Nor [Qinghai Hu], ex coll. Grum-Grshimailo, ex Elwes coll. 1902-85, coll. BMNH.
5. ♂, *Pyrgus alveus* var. *sifanicus* Grum-Grshimailo, 1891, Paralectotype, West China, Amdo, ex coll. Grum-Grshimailo, ex Elwes coll. 1902-85, in coll. BMNH.
6. ♂, *Pyrgus alveus* var. *sifanicus* Grum-Grshimailo, 1891, Paralectotype, South of Kuku-Nor [Qinghai Hu], 26.VII.[18]90, ex coll. Grum-Grshimailo; ex Elwes coll. 1902-85, in coll. BMNH.
7. ♂, West China, Kuku-Nor [Qinghai Hu], ex Leech coll. 1901-173, in coll. BMNH.
8. ♂, West China, Kuku-Nor [Qinghai Hu], ex Rothschild coll. B.M. 1939-1, in coll. BMNH.
9. ♀, *Pyrgus alveus* var. *sifanicus* Grum-Grshimailo, 1891, Paralectotype, South of Kuku-Nor [Qinghai Hu], 26.VII.[18]90, ex coll. Grum-Grshimailo, ex Elwes coll. 1902-85, in coll. BMNH.
10. ♂, Caucasus, Dzhermagat valley, 27.VII.1971, leg. B. Alberti, coll. RNHL.
11. ♂, as in fig. 10.
12. ♀, Caucasus, ex coll. O. Leonhard, ex coll. C. Eisner, in coll. RNHL.
- figs 13-24: undersides of specimens in figs 1-12.

The only statement about the external morphology of *confusa* is given as: variable, very close to *alveus* ("variabel, sehr ähnlich ssp. *alveus*"). In the same table, the supposed differences in the male genitalia between *alveus* and *confusa* are very subtle and very variable ("äußerst variabel").

In his list of paratypes of *confusa* Renner included 3♂ from "Tessin, Valle Capriasca, Formighé, 860m, 22.5.1957", 5♂ from the same locality but 3.8.1950 and 9♂ from the same locality but 13.9.1947 (all leg. Dr Kaufmann). Renner (1991: 77) wrote about these animals: "1954 beschrieb Kaufmann "*alveus*"-Tiere aus dem Tessin, Formighé, 850m, als *P. iliensis columnus*. Diese Beschreibung ist nie anerkannt worden. Aus zoogeographischen Überlegungen ist es unsinnig, der asiatischen Form *iliensis*, deren taxonomischer Rang ungeklärt ist, die ssp. *columnus* zuzuordnen." On plate 6 (fig. 23) Renner gave a photograph of one of the *Pyrgus alveus confusa* paratypes which belongs to the type-series from which Kaufmann described *Pyrgus iliensis columnus*. The origin of the neotype of *P. alveus alveus* (Hübner, [1803]) is "Südwestdeutschland" [Baden-Württemberg]. Renner's holotype of *confusa* was caught in South-West Germany (Baden-Württemberg). It seems highly unlikely that there would exist two subspecies so close to one another (about 100 km) apparently without any existing barrier, in a species that ranges from North-West Africa to the Amur region.

In his list of examined specimens of *confusa*, Renner mentioned four specimens from the Caucasus⁸ (not included in the type-series), without further details. On pl. 26, fig. 184 and 185 he figured the male genitalia of two specimens caught at Teberda, Dzhemagattal [?] (North-West Caucasus) (genitalia slides Re 514 and Re 785). However, on pl. 7 fig. 32, he figured the butterfly of which the genitalia are shown in fig. 184 (Re 514), but this time he refers to it as *Pyrgus alveus alveus*.

The Caucasus material we examined contained four male *alveus* from Teberda, Dzhemagattal, leg. Alberti (RNHL) (Plate 2, fig. 10-11, 22-23) and one male from the same locality (coll. Coutsis) (fig. 7, right valva). After comparison with all other *alveus* specimens we used for this study, and with the figures of two male genitalia and of the adult (from Teberda) in Alberti (1967: Pl. 3, figs 1a, 1c, 1d, 1f), and with the figures in Renner (vide supra) of original Teberda material, we can only conclude that both the external characters and the genitalia structures are indistinguishable from *P. alveus alveus* (figs 7-9).

2.2.2. Conclusion

Because there are no clear-cut differences between *confusa* and *alveus* and as there are no populations of *confusa* that can geographically be isolated from *alveus* we place the name *Pyrgus alveus confusa* Renner, 1991 as a junior synonym of *Pyrgus alveus alveus* (Hübner, [1803]). For the same reasons, we place the name *Pyrgus iliensis columnus* Kaufmann, 1954 as a junior synonym of *Pyrgus alveus alveus* (Hübner, [1803]).

⁸ For this reason we also include this taxon in our present study.

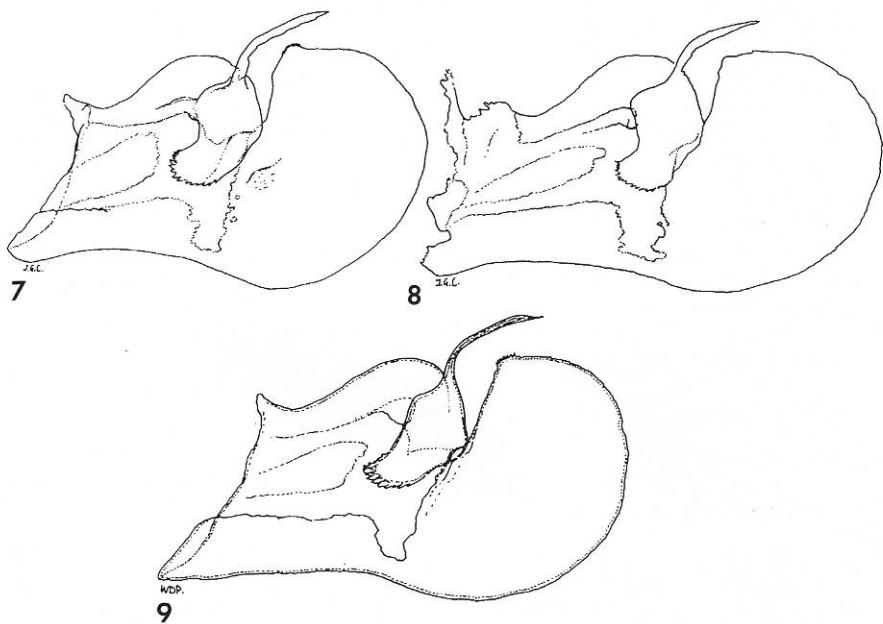


Fig. 7-9: *Pyrgus alveus alveus* (Hübner, [1803]): 7. right valva, Caucasus, Teberda, Dzhermagat valley, 1600 m, 1-3.VII.1985, coll. J. Coutsis; 8. right valva, Greece, Pindus, Aspropotamos, 1100 m, 25.VII.1970, leg. et coll. J. Coutsis; 9. right valva, Neotype of *Pyrgus alveus alveus* (Hübner, [1803]), Germany, Baden-Württemberg, Umg. Mehrstetten, 750 m, leg. Baisch, coll. ZSSM.

2.3. *Pyrgus alveus sifanicus* Grum-Grshimailo, 1891

2.3.1. Historical analysis and discussion

In 1891 Grum-Grshimailo described *sifanicus* as a form of *Pyrgus alveus* from Tibet (actual West China): "Wings upper- and underside clear, with small spots. Found in mountains of Dshachar [Dzagar] and at lake Kuku-Nor [Qinghai Hu]" (Grum-Grshimailo 1891: 459) (fig. 10).

42. *Pyrgus Alveus* var. *Sifanicus*.

Alis supra et subtus dilutioribus, maculis minoribus.
In montibus Dshachar et ad lacum Kuku-Noor repertus.

Fig. 10. Original description of *Pyrgus alveus sifanicus* (Grum-Grshimailo, 1891).

Leech (1893: 579) received one of the specimens of Grum-Grshimailo from Kuku-Nor and wrote that "individuals in my European series of *H. alveus* (...) agree with them."

Mabille (1909) mentioned *sifanicus* as a form of *P. alveus*.

Reverdin (1915: 112) supposed that *sifanicus* might be a separate species ("Hesperia *sifanicus* Gr.Gr., bona species (?)") and mentioned *sifanicus* from the Caucasus. He figured the male genitalia on Pl. 6, fig. 6, which in fact belong to *Pyrgus jupei* (Alberti, 1967) (see below).

Reverdin (1916: 12, 31) listed *Hesperia sifanicus* as a doubtful species under the "Espèces probablement légitimes". He figured the male genitalia on pl. CCCC, fig. 5007, but again they belong to *P. jupei* (see below).

B.C.S. Warren (1926: 116) considered *sifanicus* as a subspecies of *alveus*, as did Evans (1949: 194). Warren (1926, Pl. 9, fig. 6) gave a photograph of the slide used by Reverdin for the figures in his 1915 and 1916 papers.

Shepard (1935: 444) listed *sifanicus* as a subspecies of *alveus* occurring in the Caucasus, Persia and Tibet.

B.C.S. Warren (1953: 91) raised *sifanicus* to specific rank, but Alberti (1967: 466) found no reason to recognize both taxa as different species.

Kaufmann (1954b: 261-262) mentioned *sifanicus* as a separate species but he had doubts about its specific status.

De Jong (1972: 92-93) considered *sifanicus* as a subspecies of *alveus*, restricted to the Kuku Nor region (China).

The confusion started with Reverdin (1915). This author received two specimens from Bang-Haas, labelled "Achalzig [Akhaltsikhe], *alveus* var." and a series from Korb caught in Transcaucasia. He stated that the groundcolour of the hindwing underside in all these specimens was very different from *alveus*, and resembled rather *serratulae* ("cette coloration rappelle plutôt *serratulae*") (Reverdin 1915: 113). The male genitalia are very close to *alveus*, but the style is shorter than in *alveus* ("Le style de la valve est plus court que chez *alveus* et n'est pas coudé comme chez lui.") (Reverdin 1915: 116). These two characters (groundcolour underside hindwing and short style) are characteristic for *P. jupei*. The pale termen on underside of both wings in some specimens of *P. jupei* resembles some *sifanicus* very much. This character probably caused some misidentifications by earlier authors (see also Devyatkin 1994: 9). In fact, Reverdin (1915, Pl. 6, fig. 6; 1916, Pl. CCCC, fig. 5007) figured the male genitalia of *Pyrgus jupei*, called *Hesperia sifanicus*. This was already noticed by de Jong (1972: 18). The material from the collection of Reverdin which we examined (1♂, Adschara, 1910, leg. Korb) (fig. 11); 2♀, Caucasus [recte Transcaucasia], Borshom [Borzhomi], 1910, leg. Korb), and determined by Reverdin as *sifanicus*, turned out to be *P. jupei* (figs 11-12); one male "Kaukasus, Ararat, 3.VII" is *P. alveus* (see under *iliensis*) (fig. 13), and one female "Kaukas." is *P. alveus* (fig. 14). After very careful examination this turned out to be the specimen which served as model for the excellent colour figure by J. Culot in Reverdin (1915, Pl. 5, fig. 7), named *Hesperia sifanicus* in the legend. Three male genitalia (slides 2253, Adschara, leg. Korb; 2329, Ararat, leg. Korb, and 3319, Caucasus, Kuban, leg. Bartel) are *P. alveus*. Figures 5 (♀) and 6 (♂) on Plate 5 in Reverdin (1915) are *P. alveus*, the latter tending towards an intermediate form between characteristic *alveus* and f. *iliensis*. Reverdin (1915: 116) mentions *sifanicus* from: "Koukou Nor (...) Achalzig [Akhaltsikhe], Adshara (Caucase), Borshom (Caucase), Ararat (Caucase), Kuban (Caucase) et Urmia (Perse)." In fact, Reverdin gave

here the almost complete distribution, known at present, of *Pyrgus jupei* (see under "distribution of *P. jupei*") except for Ararat (*alveus*) and Kuku Nor (*sifanicus*).

B.C.S. Warren (1926: 116) merely repeated the locality list of *sifanicus* given by Reverdin (1915). On pl. 9, fig. 6 he showed the male genitalia of "*sifanicus*" (without mentioning a locality) which in fact belong to *jupei* (see also p. 15). On pl. 39 he figured "*Hesperia alveus* ssp. *sifanicus*" (figs 1-12). However, all specimens, except figs 4 and 10 (a male from Ararat) and figs 5 and 11 (a female from Transcaucasia), are *jupei* (all from Adshara). The ones on figs 4, 5, 10 and 11 are *alveus*.

Although de Jong (1972: 92) mentioned some specimens from the Caucasus and a single specimen from North Iran (Hyrkania) with *sifanicus* characters, he clearly states that *sifanicus* does not occur in the Caucasus and Transcaucasus region.

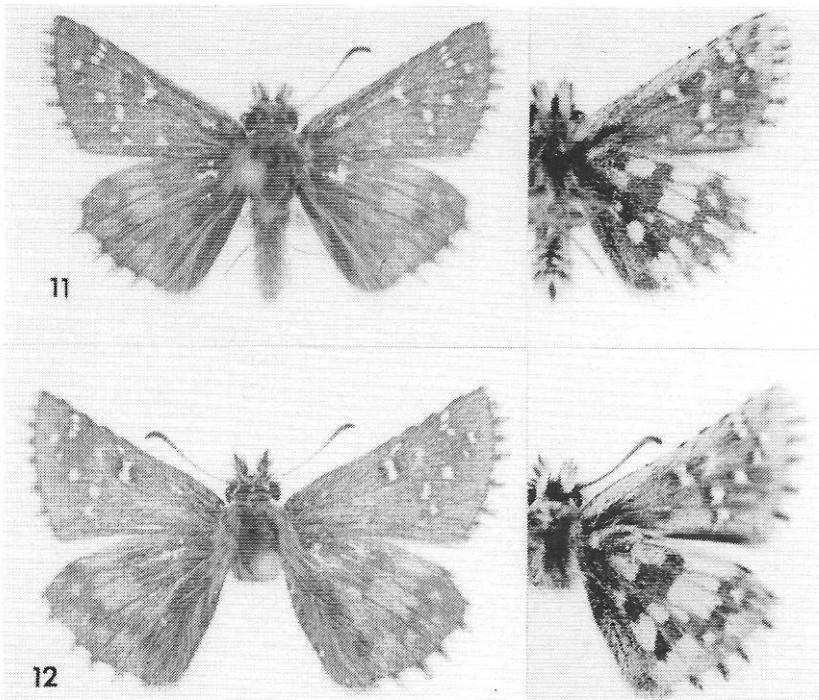
2.3.2. Discussion on taxonomy

Alberti (1967: 462) gave a detailed description and a list of specimens (5♂ and 2♀) of nominotypic *sifanicus*. Two males from Kuku Nor "tendieren zur normalen *alveus* Zeichnung". Therefore, Alberti found no convincing arguments to separate *sifanicus* from *alveus* at species level, but noticed that the external characters of the specimens from West China and Caucasus fall into the variability of *alveus* material from South Germany.

Due to an obvious translation mistake E.J.M. Warren (1983: 63) wrote that "in 1967 Dr. B. Alberti discovered that not one but three species of the *alveus* group occurred in the Caucasus: 1) *P. sifanicus* like that from North Tibet, 2) *P. alveus* the same as the central European *alveus*, and 3) *P. jupei* a new high altitude species named by Alberti". B. Alberti himself corrected this statement one year later, repeating his text from 1967 stating that there are no convincing arguments to separate *alveus* and *sifanicus* at species level (Alberti 1984: 3).

Reverdin (1915: 114) and Alberti (1967: 462) already mentioned the white spots on the underside of *sifanicus*, but de Jong (1972: 19) mentioned "the white border of the underside of the wings" as "the only real difference" between *sifanicus* and *alveus*. De Jong (l.c.) examined nine males and one female of nominotypic *sifanicus* and found only five males and the female showing obvious white borders, while "the other males more closely resembled C European *alveus*". We found this character present, though rarely, in several specimens from C Europe, Greece and Turkey (Bolkar Mts, Palandöken Mts). Alberti (1967: Pl. 3, fig. 1c) gave a photograph of a female from Teberda showing this character. We traced only one ♀, labelled "Caucasus" coll. D. Leonhard (RNHL ex coll. C. Eisner) (Pl. 2, fig. 12, 24) showing the same character. All other Caucasian material we examined is characteristic for *P. alveus alveus*.

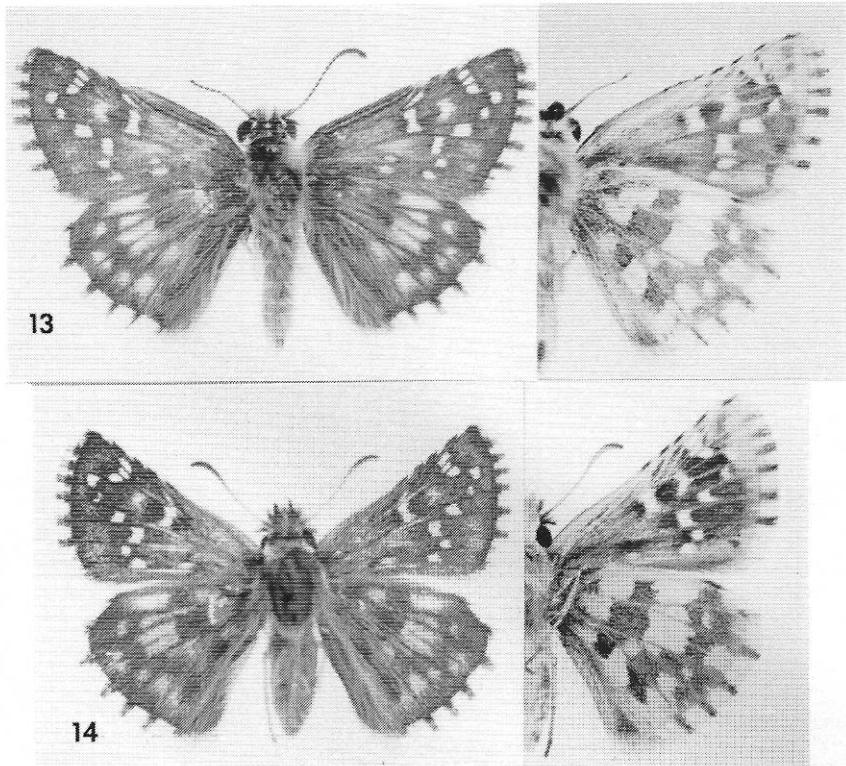
The photographs of adult *sifanicus* in Alberti (1967, Pl. 3, figs 3a, c, d, f) and in de Jong (1972, Pl. 6, figs 97, 106) from original Kuku Nor material (Sining [Xining]) clearly show specimens with strongly developed white spots on the upperside of both wings, almost like in the *iliensis* phenotype. This is in strong contrast with the original description of Grum-Grshimailo: "maculis minoribus" (spots small). Only the Kuku Nor specimen figured in Reverdin (1915, Pl. 5, fig. 4) and the one in Renner (1991, Pl. 7, fig. 33) show this character. These figures show us in all objectivity that something as



Figs 11-12: *Pyrgus jupei* (Alberti, 1967): 11. ♂, Adschara, 1910, leg. Korb; 12. ♀, Transcaucasia, Borshom [Borzhomi], 1910, leg. Korb (Both det. Reverdin as *Pyrgus alveus sifanicus* Grum-Grshimailo).

a constant, clearly definable *sifanicus* character does not exist. We furthermore examined 15♂ and 1♀ of nominotypic *sifanicus*. 5♂ (ZSSM), including the specimen figured by Renner (1991, Pl. 7, fig. 33) have small white spots on the upperside, thus contrasting with the figures given in Alberti and de Jong (vide supra). Only one specimen shows the characters ("the white borders unf and unh and the large spots unh") given by de Jong (1972: 92), one specimen is somewhat intermediate in this character and the other three are indistinguishable from characteristic *alveus* (Plate 2, figs 1-3, 13-15).

Three *sifanicus* males of the Rothschild collection (BMNH) (Plate 2, fig. 8, 20) from Kuku Nor have the wing upperside as in characteristic *alveus*. One of these males has a somewhat broader white termen on the underside, whereas the two others are not more than intermediate. One male from the Leech collection (BMNH) (Pl. 2, fig. 7, 19), Kuku Nor, has characteristic *alveus* markings both on upper- and underside. We examined 5♂ and 1♀ syntypes of *P. alveus* var. *sifanicus* (in coll. BMNH).



Figs 13-14: *Pyrgus alveus alveus* (Hübner, [1803]): 13. ♂ (specimen of well developed *iliensis* phenotype), Caucasus, Ararat, 3.VII., det. Reverdin as *Pyrgus alveus sifanicus* Grum-Grshimailo, 1891; 14. ♀, Caucasus, det. Reverdin as *Pyrgus alveus sifanicus* Grum-Grshimailo, 1891, figured by Culot in Reverdin 1915, pl. 5, fig. 7.

Because Grum-Grshimailo did not designate a holotype, we designate 1♂, forewing length 15 mm, as the lectotype of *Pyrgus alveus* var. *sifanicus* Grum-Grshimailo, 1891. The labels under this specimen read: "Amdo⁹ / Муджик г. [Mudzik g.]¹⁰ / 106 / *alveus* v. *sifanicus* Gr Gr / ist eine Serratulae var.? (ab.?) von Gr.Gr. gar nicht mal falsch "maculis minoribus" diagnostiziert. / Coll. Gr.-Gr. / Elwes Coll. 1902-85 / ORIG. /

⁹ At the end of the 19th Century, Amdo was a province in East Tibet (Barbier 1849). Nowadays, it is a small town about 290 km North of Lhasa.

¹⁰ In Vivien de Saint-Martin & Schrader (1923), the name of this river is spelled as Moudjik. The river is situated at about 60 km South-East of the Kuku Nor Lake.



Fig. 15-16: Lectotype ♂ of *Pyrgus alveus* var. *sifanicus* Grum-Grshimailo, 1891; 15. Upper- and underside of the specimen; 16. The labels under the specimen.

Type / Lectotype *Pyrgus alveus* var. *sifanicus* Grum-Grshimailo, 1891, des. De Prins & van der Poorten, 1995". The upperside of this lectotype is characteristic for *alveus*, the white termen on the underside is slightly broader than in typical *alveus* (fig. 15-16).

We designate the 4 other males and the female from the syntype series in the BMNH as paralectotypes of *Pyrgus alveus* var. *sifanicus* Grum-Grshimailo, 1891. Their labels read as follows:

♂: "Apa r [xxx]¹¹ [Ara-g[xxx]] / Coll. Gr.-Gr. / KukuNor / Elwes Coll. 1902-85 / ORIG. / Paralectotype *Pyrgus alveus* var. *sifanicus* Grum-Grshimailo, 1891, des. De Prins & van der Poorten, 1995". The upperside of this specimen is intermediate between characteristic *alveus* and the *iliensis* phenotype. The underside has a well developed white termen (Plate 2, fig. 4, 16).

♂: "IO Kuk.H. Xp. [Ju. Kuk. N. Khr.] / 24.VI.90 / Coll. Gr.-Gr. / Elwes Coll. 1902-85 / ORIG. / Paralectotype *Pyrgus alveus* var. *sifanicus* Grum-Grshimailo, 1891, des. De Prins & van der Poorten, 1995". Upperside and underside as in characteristic *alveus* (Plate 2, fig. 6, 18).

♂: "Ambo / *alveus* v. *sifanicus* Gr Gr / Coll. Gr.-Gr. / Elwes Coll. 1902-85 / ORIG. / Paralectotype *Pyrgus alveus* var. *sifanicus* Grum-Grshimailo, 1891, des. De Prins & van der Poorten, 1995". Upperside as in characteristic *alveus*, underside with slightly better developed white termen (Plate 2, fig. 5, 17 and fig. 18, right valva).

♂: "*Alveus*. var *sifanicus* Koukou noor Reçu de Groum-Grshimailo en Janvier 1894 / R. Oberthur Coll. Brit.Mus. 1931-136 / Paralectotype *Pyrgus alveus* var. *sifanicus* Grum-

¹¹ The sign "x" means an illegible character on the label. A slash means a new label.

Grshimailo, 1891, des. De Prins & van der Poorten, 1995". Underside with better developed white termen. C. Häuser (i.l.) suggested that this specimen is presumably the original which was illustrated by Culot in Reverdin (1915, Pl. 5 fig. 4). After careful comparison we can confirm this assumption (fig. 17).

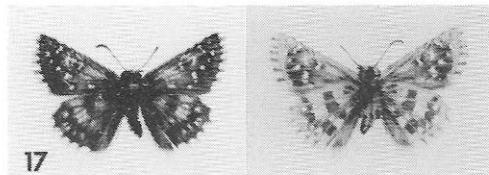


Fig. 17: Paralectotype ♂ of *Pyrgus alveus* var. *sifanicus* Grum-Grshimailo, 1891.

♀: " IO Куккы. Hopar[X] Xp. [Ju. Kukku Norag[x] Khr.] / 26.VII 90 / Coll. Gr.-Gr. / KuKuNor / Elwes Coll. 1902-85 / ORIG. / Paralectotype *Pyrgus alveus* var. *sifanicus* Grum-Grshimailo, 1891, des. De Prins & van der Poorten, 1995". Upperside characteristic *alveus*, underside groundcolour paler than usual (Plate 2, fig. 9, 21).

The genitalia of nominotypical *sifanicus* (described and figured in Alberti 1967, Pl. 1, fig. 2d, described by de Jong 1972: 93, and figured in Renner 1991, Pl. 25, figs 173, 174) and the material we examined are characteristic for *P. alveus alveus* and show no characters that fall outside the normal range of variation of the species (fig. 18).

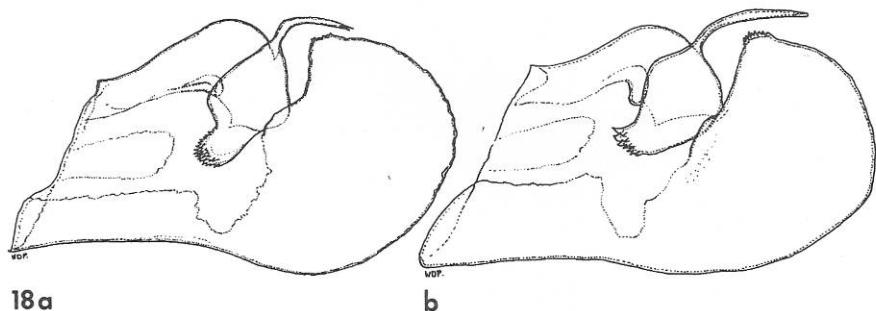


Fig. 18: a. Paralectotype ♂ of *Pyrgus alveus* var. *sifanicus* Grum-Grshimailo, 1891, right valva, West China, Amdo; b. right valva, West China, Qing Hai, Kuku Nor.

2.3.3. Conclusion

As "a subspecies is an aggregate of local populations of a species, inhabiting a geographic subdivision of the range of the species, and differing taxonomically from other populations of the species" (Mayr 1979: 348), we can only conclude that in the province of Qing Hai populations of *P. alveus* exist which are very variable, showing characters which can be found from Germany through Greece, Turkey, the Caucasus, Kazakhstan and North Iran till West China. Because of all the previous arguments discussed above we place the name *Pyrgus alveus sifanicus* Grum-Grshimailo, 1891 as a junior synonym of *Pyrgus alveus alveus* (Hübner, [1803]).

Plate 3

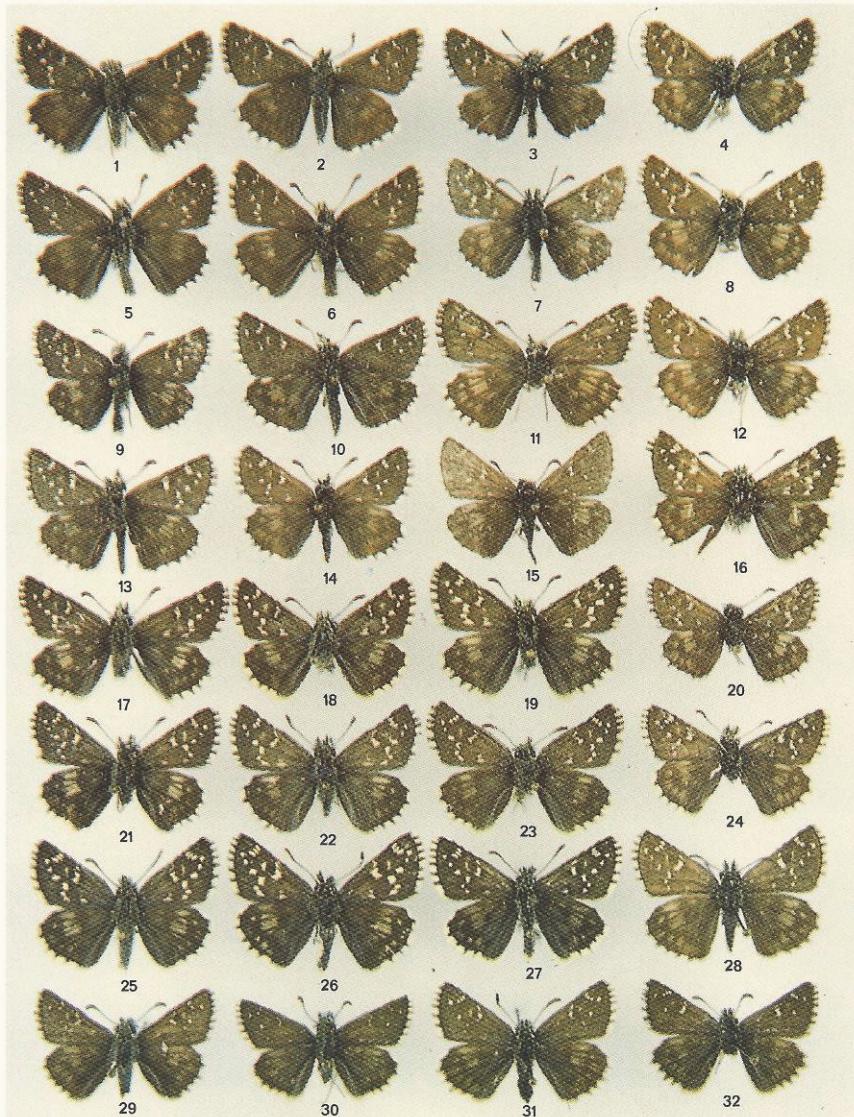


Plate 4



Legend of plate 3 and 4:

1-24: *Pyrgus jipei* (Alberti, 1967)

1. Holotype ♂, Central Caucasus, Kasbegi, vic. Gergeti glacier, 2600 m, 12.VII.1966, leg. B. Alberti, coll. ZSSM.
2. Paratype ♀, data as in fig. 1.
3. ♂, Turkey, Ardahan, Ilgadagi Pass, 18 km South of Posof, 2500 m, 1.VIII. 1993, st. 1948, leg. D. van der Poorten & W. De Prins.
4. ♂, N Iran, Mazandaran, Elburs Mts, Sardab valley, Alam-Kuh, 80 km NNW Tehran, Hecarcal, 3500-3800 m, 27.VII.1980, leg. et coll. C. Häuser.
5. Paratype ♂, North-West Caucasus, Dombai, Tshutshur, 2300 m, 19.VII.1965, leg. B. Alberti, coll. ZSSM.
6. ♂, Gruziya, Pasanauri, 1-12.VII.1970, leg. B. Alberti, coll. ZSSM.
7. ♂, data as in fig. 3.
8. ♂, North Iran, Elburs Mts, Takht-i-Suleiman, Hecarcal valley, 2800-3200 m, 3-7.VII.1936, coll. E. Pfeiffer in ZSSM; Holotype of *Pyrgus centralasiae* Renner, 1991.
9. ♂, data as in fig. 3.
10. ♀, data as in fig. 3.
11. ♀, Turkey, Erzurum, Ispir, Çapans, 2200-2500 m, 13-15.VIII.1982, leg. E. Görgner, coll. Nr. 156, coll. C. Häuser.
12. ♂, data as in fig. 8; Paratype of *Pyrgus centralasiae* Renner, 1991, coll. ZSSM.
13. ♀, data as in fig. 3.
14. ♀, data as in fig. 3.
15. ♀, data as in fig. 3.
16. ♂, data as in fig. 8; Paratype of *Pyrgus centralasiae* Renner, 1991, coll. ZSSM.
17. ♂, Turkey, Erzurum, Ispir, 1900-2600 m, 9.VIII.1989, leg. et coll. B. Mollet.
18. ♂, Turkey, Gümüşhane, Kostandağı Pass, 2010 m, 9.VIII.1988, leg. et coll. B. Mollet.
19. ♂, Turkey, Rize, Ovit Pass East side, 2300 m, 12.VII.1991, st. 1719, leg. W. De Prins, D. van der Poorten & A. Riemis, coll. VLCA.
20. ♂, North Iran, Tehran, Elburs Mts, vic. Dizin near Gajereh, 3200-3500 m, 7.VIII.1979, leg. et coll. C. Häuser.
21. ♂, Turkey, Artvin, Kaçkar Mts, South of Yaylalar, 2500-2800 m, 11.VIII.1993, leg. D. van der Poorten & W. De Prins, coll. VLCA.
22. ♂, data as in fig. 21.
23. ♂, data as in fig. 19.
24. ♀, North Iran, Mazandaran, Alam-Koh region, Takht-i-Suleiman, Hecarcal valley, 3500-4000 m, 26-28.VII.1980, coll. nr. 1967, leg. Edelmann & C. Naumann, coll. C. Häuser.

25-28: *Pyrgus serratulae* (Rambur, [1839])

25. ♂, Turkey, Erzurum, Ovit Pass, 10-15 km North-West of Ispir, 1500-1800 m, 2-12.VII.1991, st. 1706, leg. W. De Prins, D. van der Poorten & A. Riemis, coll. VLCA.
26. ♂, data as in fig. 25.
27. ♂, data as in fig. 25.
28. ♀, Turkey, Erzincan, Puskedağı Pass, 2000 m, 21.VII.1987, st. 1411, leg. H. & Th. van Oorschot, W. De Prins & F. Coenen, coll. RNHL.

29-32: *Pyrgus warrenensis* (Verity, 1928)

29. ♂, Austria, Carinthia, Goldeck, 1800 m, 16.VII.1973, leg. G. De Prins, coll. VLCA.
30. ♂, Austria, East Tyrol, Virgen, 20.VII.1977, leg. B. Maes, coll. VLCA.
31. ♀, Austria, Tyrol, Lech valley, Steeg-Kaisers, 1500 m, 22.VII.1981, leg. G. De Prins, coll. VLCA.
32. ♀, data as in fig. 30.

3. On the distribution of *Pyrgus alveus* (Hübner, [1803]) in Turkey

According to the map given in de Jong (1972: 114) *P. alveus* occurs only in the northeastern part of Turkey. We caught or examined specimens from the provinces Ağrı, Ardahan, Artvin, Bayburt, Erzincan, Erzurum, Gümüşhane, İğdir, Kars, Rize, Trabzon and Tunceli. The most southwestern locality we could trace is Tunceli: 5-30 km west of Tunceli, road Tunceli-Ovacık, 1100 m, 11-12.VII.1987, st. 399, leg. H. & Th. van Oorschot, W. De Prins & F. Coenen, in coll. ITZA. Two males from prov. Hakkari, Cilo Mts, Sümtil East side, 1900-2100 m, 26.VII.1982, leg. E. Görgner, in coll. C. Häuser, represent the most southeastern population of *P. alveus* in Turkey.

During the 36th expedition (1994) we, together with H. van Oorschot, H. van den Brink and K. Larsen, discovered also *P. alveus* in the Taurus range, Ala and Bolkar Mts (prov. Niğde). As far as we are aware, this is now the most southwestern population of *P. alveus* known in Turkey. A more detailed distribution can be seen in Hesselbarth, van Oorschot & Wagener (1995, in press).

4. The variability and distribution of *Pyrgus jupei* (Alberti, 1967)

4.1. Discussion

Alberti (1967) described *Pyrgus jupei* from the Central Caucasus: Kazbek. It can be distinguished from *alveus* by its smaller size (forewing length 13-14 mm), and by the greenish groundcolour on the underside of the hindwing, which, together with the white markings (especially a basal oval white dot in cell 7), resemble much *Pyrgus serratulae* ([Rambur, 1839]). The pale termen on the underside of both wings is more complete and better developed than in most *alveus* (figs 11-12 *jupei*, Plates 3-4, figs 1-24 *jupei*, figs 25-28 *serratulae*). The karyotype remains unknown.

In the male genitalia of *jupei* the valvae are somewhat shorter and more compact ("gedrungener") (Alberti 1967) than in *alveus* (fig. 19a-c, 25). Both stylifer and antistyle are smaller than in *alveus*. Their junction is strongly concave basally (Alberti 1967: 464). The style is shorter than in *alveus* (Alberti 1969: 140). It must be noticed, however, that there is a considerable variation in the structure of the style, stylifer and antistyle. Either the style or the antistyle or both can be better developed than in the average condition. We found such genitalia in specimens from Turkey, Ovit Pass, Ispir (fig. 23) and from the Caucasus, Kazbek (fig. 24). See also Devyatkin (1994: 6, fig. 3).

Already Reverdin (1915, Pl. 6, fig. 6; 1916, Pl. CCCC, fig. 5007) described and figured the genitalia of *P. jupei* (but he used the name *sifaricus*). Also Picard (1949: 57), in his description of *Hesperia bellieri caucasicus*, mentioned the specific characters of the male genitalia of *jupei*. However, de Jong (1975b: 3) could not find "the small stylifer/antistyle that, according to Picard, is characteristic for *caucasicus*". De Jong's figure of the male genitalia of the *Pyrgus alveus caucasicus* lectotype clearly shows it to be characteristic for *alveus*. We therefore presume that the syntype-series of *caucasicus*, of which Picard did not give the exact number ("divers exemplaires") (nor did he designate a holotype), consisted of a mixed series of both *jupei* and *alveus*. Figures of the male genitalia of *jupei* can also be seen in B.C.S. Warren (1926, Pl. 9, fig. 6), where it is called *sifaricus* (no locality) (see de Jong 1972: 18), in Alberti (1967, Pl. 1, fig. 1a, b and Pl. 2, fig. 1d), in de Jong (1972: 20; 1975b: 2) and in Renner (1991, Pl. 28, figs 195-196 [photographs of *jupei* genitalia from the type-locality] and figs 197-201 [photographs of the genitalia of *Pyrgus centralasiae* Renner, 1991, see below]) and Devyatkin (1994: 6-8).

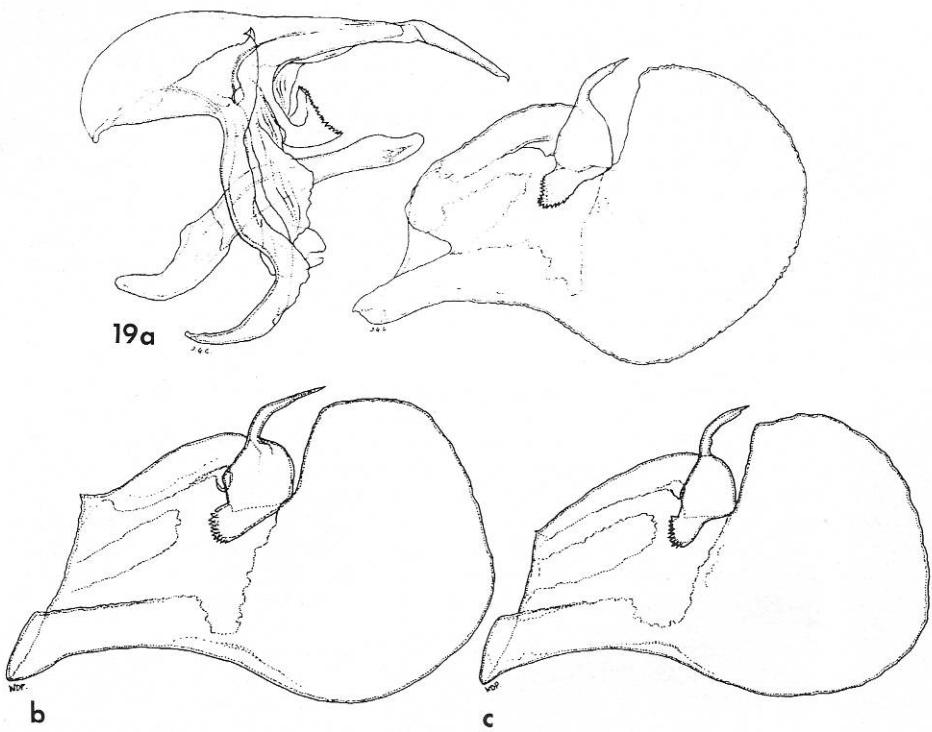


Fig. 19: *Pyrgus jipei* (Alberti, 1967), male genitalia: a. Turkey, Ardahan, Ilgarağı Pass, 2500 m, 18 km South of Posof, 1.VIII.1993 (JGC 2194); b. Turkey, Artvin, Kaçkar Mts, Yaylalar, 2500-2800 m, 11.VIII.1993 (WDP 3315); c. Turkey, Ardahan, Ilgarağı Pass, 2500 m, 1.VIII.1993 (WDP 3198).

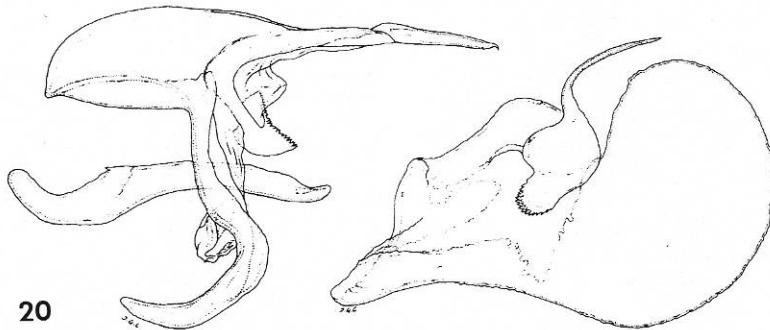


Fig. 20: *Pyrgus alveus* (Hübner, [1803]), Turkey, Artvin, Kaçkar Mts, 30 km South-West of Sangöl, Yaylalar, 2000 m, 15-18.VII.1991, St. 1727 (JGC 2199).

As far as we could find the first *jupei* specimen caught in Turkey is a ♀ leg. et coll. S. Wagener, det. B. Alberti as *Pyrgus jupei*, caught on the "Pass zwischen Damal und Posof" [Ilgardagi Pass, prov. Ardahan], 2450 m, 28.VII.1975. A second ♀ from this same locality was taken on 19.VII.1989 (ITZA). Other Turkish specimens include a ♂ from prov. Rize, Verschambek Massiv [Verçenik], 2900-3100 m, 10-11.VIII.1983, leg. J.J. de Freina (coll. Baumann), and a ♀ from prov. Erzurum, İspir, Çapans [Çayrözü], 2200-2500 m, 13-15.VIII.1987, leg. E. Görgner (coll. Häuser) (Pl. 3-4, fig. 11). B. Mollet caught 2♂ in prov. Gümüşhane, Kostandağı Pass, 2010 m, 5 and 9.VIII.1988 (Plates 3-4, fig. 18), and 1♂, prov. Erzurum, İspir [Ovit Pass, East-side], 1900-2600 m, 9.VIII.1989. We collected 2♂ specimens of *P. jupei* in Turkey, province of Rize, Ovit Pass, East-side, 2300 m, 12.VII.1991 (Plates 3-4, fig. 19). On 1-8 August 1993 we found a series of 26♂ and 9♀ in the province of Ardahan, Ilgardagi Pass, 18 km South of Posof, 2500 m (Plates 3-4, figs 3, 7, 9-10, 13-15), and on 11 August 1993 we caught 2♂ in the province of Artvin, Kaçkar Mts, South of Yaylalar, 2500-2800 m (Plates 3-4, figs 29-32). On Ilgardagi Pass, Ovit Pass and in the Kaçkar Mts we captured *jupei* sympatrically with *alveus*.

We compared this Turkish material with the holotype, 1♂ (Plates 3-4, fig. 1) and 1♀ (Plates 3-4, fig. 2) paratype and 5♂ (Plates 3-4, figs 5-6) and 1♀ from the series of Alberti (ZSSM), 1♂ leg. Alberti in coll. S. Wagener, and 1♂ and 1♀ leg. Alberti in coll. RNHL, all original Caucasus material. The specimens from Verschambek, Kaçkar Mts, Kostandağı Pass and Ovit Pass (Erzurum side) have the same size as the specimens from Alberti. The specimens from the Ilgardagi Pass (Plates 3-4, figs 3, 7, 9, 10, 13-15) are clearly smaller (forewing length 12.5 - 13.0 mm) than the size given by Alberti, but they are indistinguishable from average *jupei* in wing pattern and male genitalia. The 2 specimens from Kaçkar Mts (Plates 3-4, figs 21-22), those from Kostandağı Pass (Plates 3-4, fig. 18) and the one from Ovit Pass (Erzurum) have their markings better developed. Especially the upperside hindwing shows an unsharp but well-developed pale median band. The specimens from Ovit Pass (Rize) (Plates 3-4, figs 19, 23) are remarkably larger (forewing length 14.7 mm). It is the largest Turkish specimen of *jupei* we examined and the white markings on the upper- and underside of both wings are very well developed, thus contrasting markedly with the groundcolour. Especially the pale termen on the underside of both wings is well developed, thus reminding one of some specimens of *P. alveus* with the same character from the Caucasus (Plate 2, figs 12, 24) and from West China (Plate 2, figs 1-9, 13-21) (see under *sifanicus*).

4.2. *Pyrgus centralasiae* Renner, 1991

4.2.1. History and discussion

Renner (1991) described *Pyrgus centralasiae* after 5 male specimens caught in "Persien, sept. Elburs, Tacht i Suleiman [Takht-i-Suleiman], Hecarcal-Tal, 2800-3200m, 3.-7.7.1936, leg. Pfeiffer" (ZSSM) (Plates 3-4, fig. 8). He mentions the similarity of *centralasiae* with *jupei*: "Die Art ist in die nächste Verwandtschaft von *P. jupei* einzugliedern" (Renner 1991: 91). The external morphological characters given to distinguish *centralasiae* from *jupei* (better developed white markings) are exactly the same as those we found in some Turkish *jupei* (Kaçkar Mts, Kostandağı Pass and Ovit Pass). The differences in the male genitalia between *jupei* and *centralasiae* given by Renner are very minute and fall within the individual variability of *jupei*. Also Devyatkin (1994: 6), after study of *jupei* material from the Caucasus and *centralasiae* from Elburs and Shahrud [Emamrud] (North Iran), noticed that "both taxa are very

similar in general appearance and pattern of male genitalia", and on p. 9: "it seems reasonable to me to regard *P. jupei* and *P. centralasiae* as subspecies of a single Caucasian-Hyrcanian high altitude species *P. jupei*."

We examined the entire type series of *centralasiae* (ZSSM) (Plates 3-4, figs 8, 12, 16) and compared it with the other material mentioned above, with the figures in Devyatkin (1994, fig. 4a-m), and with 3♂ and 1♀ from North Iran (coll. Häuser). 1♂ and 1♀ (Plates 3-4, fig. 24), prov. of Mazandaran, Alam-Koh region (Takht-i-Suleiman), Hazarçal Valley, 3500-4000m, 26-28.VII.1980, leg. Edelmann & Naumann, have the white markings slightly better developed than in characteristic *jupei*. 1♂ from prov. of "Mazandaran, Elburs Gebirge, Sardab Tal, Alam-Kuh, 80 km NNW Tehran, Hazarçal-Hochtal, 3500-3800 m, 37.VII.1980", leg. Häuser (Plates 3-4, fig. 4), has the white markings somewhat better developed. 1♂, prov. of Tehran, Elburs Mts, [Alborz], vic. Dizin near Gajereh, 3200-3500 m, 7.VIII.1979 (Plates 3-4, fig. 20) is indistinguishable from average *jupei*.

According to Renner (1991) the size of the cuiller in *centralasiae* is wider and its apex is sharply pointed. Both characters are not constant as shown by some specimens in the type series (figs 21-22). Many Turkish *jupei* specimens show exactly the same structures (see also Devyatkin 1994: 6, fig. 3). Also the style, stylifer and antistyle would be better developed in *P. centralasiae*, but their structure falls within the range of individual variability of *P. jupei* (see p. 26 and figs 21-25).

4.2.2. Conclusion

As we found characteristic *jupei* and specimens fitting the subtle differences in external characters and male genitalia indicated by Renner for *centralasiae* to be syntopic and synchronous in some places in North-East Turkey and North Iran, the latter can be no more than a better marked individual form of *jupei*. Also the female genitalia of specimens from the type-locality of *centralasiae* and from North-East Turkey showed no differences at all (see chapter 6 and figs 38-43). We therefore place the name *Pyrgus centralasiae* Renner, 1991 as a junior synonym of *Pyrgus jupei* (Alberti, 1967).

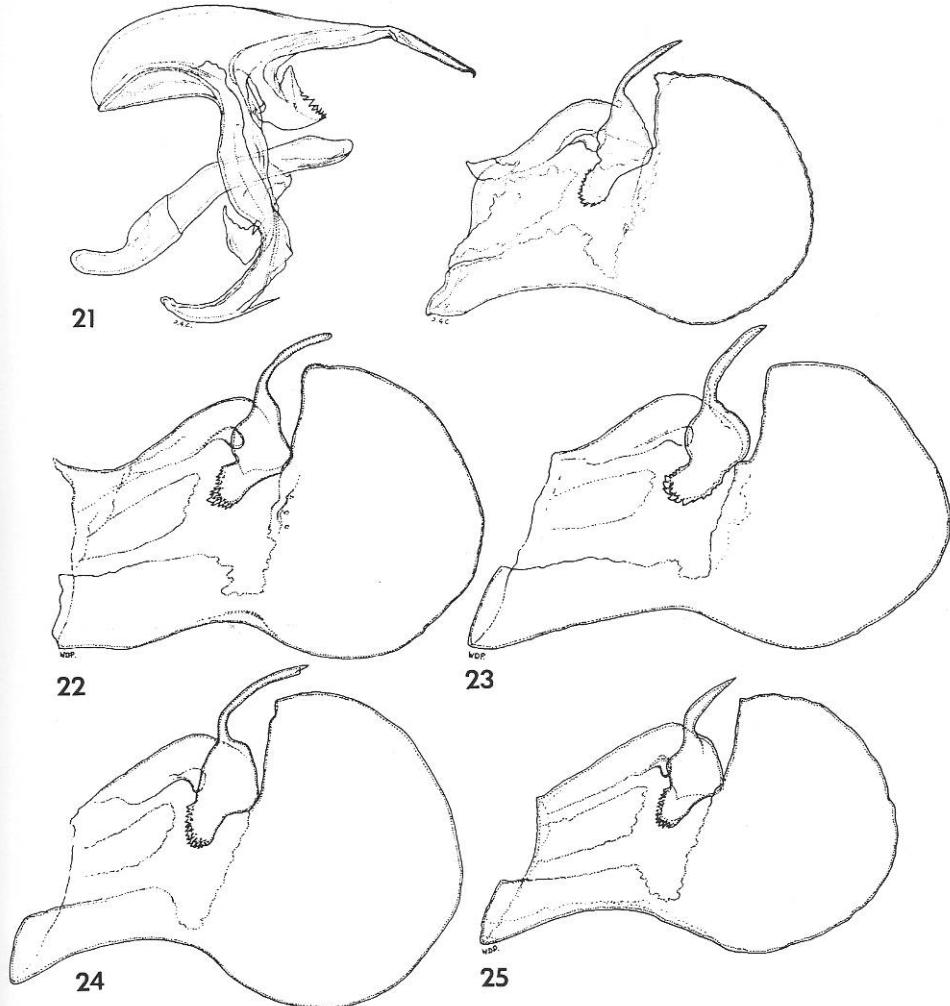


Fig. 21-25: *Pyrgus jupei* (Alberti, 1967), variability of the male genitalia:
 21. North Iran, Māzandarān, Mt. Alam-Koh, Takht-i-Suleiman, Hazarçal Valley, 3500-4000 m, 26-28.VII.1980 (JGC 2264).
 22. Paratype of *Pyrgus centralasiae* Renner, 1991; North Iran, Elburz Mts, 2800-3200 m, 3-7.VII.1936 (Re 695).
 23. Gruziya, Central Caucasus, Kazbek, 1-12.VII.1940 (Re 659).
 24. Turkey, Erzurum, Ispir, 1900-2600 m, 9.VIII.1989 (WDP 3314).
 25. Turkey, Ardahan, Ilgardoğlu Pass, 2500 m, 1.VIII.1993 (WDP 3309).

4.3. Distribution of *Pyrgus jupei* (Alberti, 1967)

The hitherto known distribution of *jupei* is as follows: Caucasus Major (areas of Elbrus and Kazbek), Transcaucasia: Gruziya (Pasanauri), Caucasus Minor (vicinities of Achalziche [Akhalsikhe] and Borzhomi), Zangezur range in Nakhitchevan, North Iran (North-West Elburs: Takht-i-Suleiman; East Elburs: Shahrud [Emamrud] (Devyatkin 1994: 5).

From the preceding notes, it is obvious that the known distribution of *P. jupei* extends much further than was hitherto assumed. It is now known from several provinces in Turkey (Artahan, Artvin, Erzurum, Gümüşhane and Rize) and from West Iran: Urmia [Orumiyeh])¹².

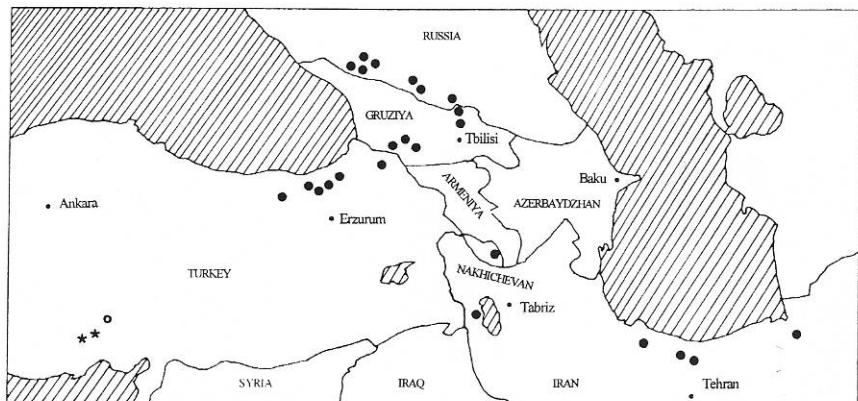


Fig. 26: Distribution map of *Pyrgus jupei* (Alberti, 1967) (●), *Pyrgus bolkariensis* sp. n. (*) and *Pyrgus aladaghensis* sp. n. (○) (see below).

4.4. Habitat and behaviour of *Pyrgus jupei*

The habitat of *P. jupei* consists of alpine flowery slopes. In all localities where we observed the species, the habitat was very humid. The butterflies fly close to the ground and are very inconspicuous amongst the other flying insects, whereas *P. alveus* is easier to see. On Ilgardoğlu Pass *jupei* was attracted to small orange Asteraceae on which they often settled. Here we found *jupei* sympatric with a.o. *Pyrgus alveus*, *Parnassius nordmanni* ([Ménétriés, 1850]), *Colias thisoa* Ménétriés, 1832, *Lycaena candens* (Herrich-Schäffer, [1844]), *Erebia graucasica* Jachontov, 1909 and *Boloria caucasica* (Lederer, 1852).

¹² We include this record with reservation as we have not seen the specimen nor the figure (Reverdin 1915: 116). The record needs confirmation.

5. Two new species of the genus *Pyrgus* Hübner, [1819] from S Turkey

5.1. The populations in the Bolkar Mountains

5.1.1. Introduction

On 25 July 1985, during the 20th expedition of the Working Group Greek-Turkish butterflies, the first author, together with B. van Oorschot, caught 5 specimens of a small *Pyrgus* species on the southwestern slopes of Mount Aydos, Bolkar Mts (prov. of Konya, Turkey), at an altitude of 3150 m. These specimens were until now thought to belong to the *Pyrgus alveus* complex, or even merely to be a high altitude form of this species, comparable to the smaller and darker, high altitude form *alpicola* (Rebel, 1909) in the Alps.

Recently, we received 3 specimens (1♂ and 2♀) of the same taxon captured 8 August 1993 by B. Mollet in the Bolkar Mts (prov. of Niğde, Turkey). A preliminary study of this material revealed that the specimens were most probably not conspecific with *Pyrgus alveus*, but that before definitive conclusions could be drawn, more specimens were needed for comparative study. One of the aims of the 36th expedition (1994) of the aforementioned Working Group therefore was to collect and observe more material of this taxon.

Both authors, together with H. van Oorschot, H. van den Brink and K. Larsen succeeded in collecting a small series of the small *Pyrgus* species in the Bolkar Mts on 20, 21 and 28 July 1994, together with real *Pyrgus alveus* (Plate 5, figs 23, 31) and *Pyrgus armoricanus* (Oberthür, 1910) (Plate 5, figs 21-22, 29-30). This synchronic and syntopic occurrence led to the conclusion that the small *Pyrgus* species, although possibly belonging to the *Pyrgus alveus* complex, must be specifically distinct from *P. alveus*. Comparative morphological study of the external characters, the genitalia, and the karyotype confirmed this latter opinion, supported by the observations on its behaviour. These small specimens are described hereafter as a distinct species.

5.1.2. *Pyrgus bolkariensis* sp. n.

Type-material:

Holotype: ♂, Turkey, Taurus Mts, Bolkar dağları, Sivri tepe, 3100 m, 28.VII.1994, leg. W. De Prins.

Paratypes: 22♂, 11♀, same date and locality as holotype; 1♂, 2♀, Taurus Mts, Bolkar dağları, 2900 m, 24.VII.1994; 1♂, 1♀, same locality as holotype, 4.VIII.1994, all leg. H. van Oorschot, H. van den Brink, D. van der Poorten, W. De Prins & K. Larsen. 3♂, 3♀, Taurus Mts, Aydos dağı, 3150 m, 25.VII.1985, leg. B. van Oorschot & W. De Prins. 1♂, 2♀, Bolkar Mts, 8.VII.1993, leg. B. Mollet (Plate 5, figs 1, 16). All type-material is deposited in the collection of the VLCA, except for 1♂ and 2♀ from Bolkar Mts, 1♂ and 1♀ from Aydos dağı deposited in coll. ITZA, 2♂, 1♀ from Aydos dağı in coll. RNHL, 1♂ from Bolkar Mts in coll. J.-P. Borie, 1♂ from Bolkar Mts in coll. K. Larsen, 1♂ and 2♀ from Bolkar Mts in coll. B. Mollet, 1♂ from Bolkar Mts in BMNH, 1♂ from Bolkar Mts in ZSSM, and 1♂ from Bolkar Mts in coll. S. Wagener.

Description:

Male: Holotype (Plate 5, figs 20, 28) forewing length 11.0 mm (10.2 - 12.0 mm, n=28), on average somewhat smaller than *P. jupei* (with average forewing length 12.1 mm, n=25). Upperside: groundcolour darker than in *jupei*; all white markings on fore- and hindwing better developed than in most *jupei*; between white discal spot and the

row of three white subapical spots always a white spot at the end of the cell. In *jupei* and *alveus* this spot is absent or only faintly indicated, however, the more the *iliensis* phenotype in the latter is pronounced, the more this spot is developed. Subapical spots strongly developed. Fringes clearly chequered. Hindwing: white markings unsharp but much better developed than in most *jupei* and *alveus*, except in specimens of the *iliensis* phenotype (Plate 5, figs 1-4).

Underside: pattern more contrasted than in *jupei*; all white markings larger than in *jupei*; in fresh specimens the white spots have a somewhat glossy aspect (as far as we know this is a unique feature in *Pyrgus*), in *jupei* they are dull, resembling the white spots in *P. serratulae*. Forewing darker grey-brown than in *jupei*; hindwing as in *jupei* but all white markings more pure glossy white and sharply delineated, giving the whole pattern a seemingly more "rounded" appearance (Plate 5, figs 5-8).

Female: forewing length 12.5 mm (11.9 - 13.0 mm, n=16), on the average somewhat larger than the male; pattern as in male, white markings upperside forewing more pure white than in male, where the white markings have a slightly yellowish tinge (Plate 5, figs 9-16).

Legend of plate 5:

Figs 1-16, 20, 28: *Pyrgus bolkariensis* sp. n.

1. Paratype ♂, Turkey, Niğde, Bolkar Mts North-side, South-West of Maden, 2600-2800 m, 24.VII.1994, st. 1996, leg. H. van Oorschot, H. van den Brink, D. van der Poorten, W. De Prins & K. Larsen, coll. VLCA.
2. Paratype ♂, Turkey, Niğde, Bolkar Mts North-side, South-West of Maden, 3100 m, 28.VII.1994, st. 2006, leg. H. van Oorschot, H. van den Brink, D. van der Poorten, W. De Prins & K. Larsen, coll. VLCA.
- 3-8. as in fig. 2 (karyotype of specimen in fig. 5 n=30).
- 9-10, 12-15. Paratype ♀, data as in fig. 2.
11. Paratype ♀, data as in fig. 1.
16. Paratype ♀, Turkey, Konya, Bolkar Mts, Aydos Dağ, 2500-3150 m, 25-26.VII.1985, st. 1273, leg. B. van Oorschot & W. De Prins, coll. RNHL.
- 20, 28. Holotype ♂, data as in fig. 2.

Figs 17-19 (upperside), 25-27 (underside): *Pyrgus aladaghensis* sp. n.

- 17, 25. Holotype ♂, Turkey, Nigde, Ala Mts, 18 km South-East of Çamardı, Avci Veli, 2500-2800 m, 31.VII.1994, st. 2010, leg. D. van der Poorten, coll. VLCA (karyotype n=18-19).
- 18, 26. Paratype ♂, Turkey, Nigde, Ala Mts, 18 km South-East of Çamardı, Esnevıt, 2200-2600 m, 9.VIII.1983, st. 1139, leg. H. van Oorschot, H. van den Brink & H. Wiering, coll. RNHL.
- 19, 27. Paratype ♂, Turkey, Nigde, Ala Mts, 18 km South-East of Çamardı, 2500-2800 m, 4-8.VIII.1982, st. 1070, leg. B. van Oorschot, coll. ITZA.

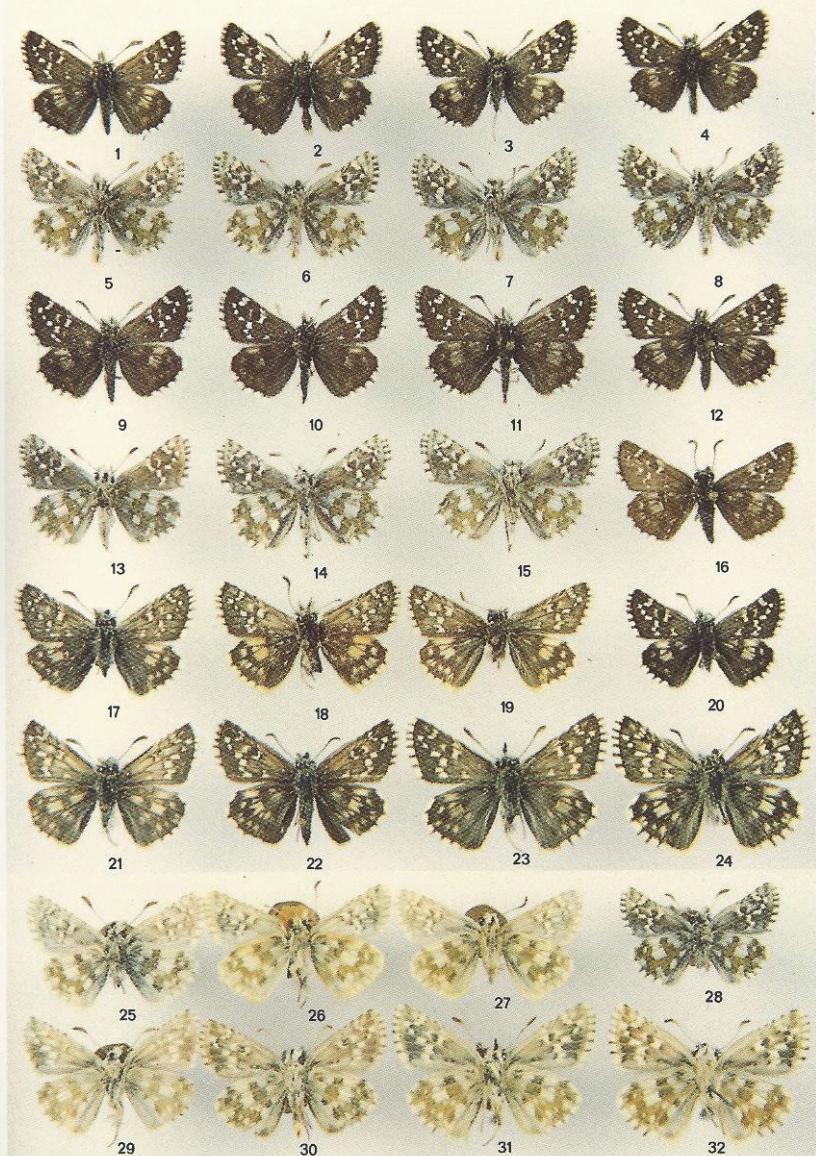
Figs 21-22 (upperside), 29-30 (underside): *Pyrgus armoricanus* (Oberthür, 1910)

- 21, 29. ♂, data as in fig. 1.
- 22, 30. ♂, Turkey, İçel, 7 km North-West of Çamlıayla (southern slopes of Bolkar Mts), 1800 m, 7.VIII.1994, st. 2016, leg. D. van der Poorten, coll. VLCA.

Figs 23-24 (upperside), 31-32 (underside): *Pyrgus alveus* (Hübner, [1803])

- 23, 31. ♂, data as in fig. 1 (karyotype n=24).
- 24, 32. ♂, Turkey, Niğde, Ala Mts, Demirkazık, 2300-2600 m, 24.VII.1994, st. 1999, leg. H. van Oorschot, coll. ITZA (well marked *iliensis* phenotype).

Plate 5



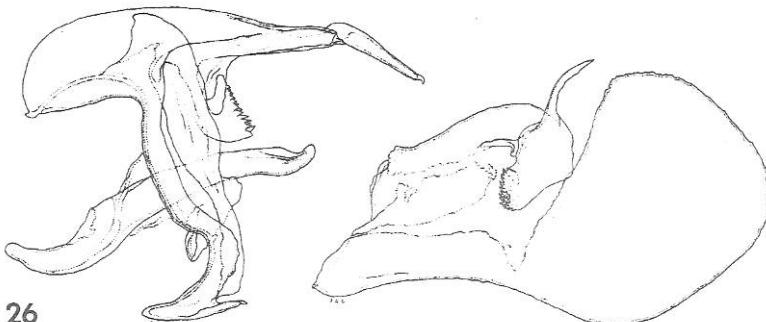


Fig. 26: *Pyrgus bolkariensis* sp. n., Paratype, male genitalia, Turkey, Niğde, Bolkar Mts, Sivri Tepe, 3100 m, 28.VII.1994 (JGC 2196).

Genitalia: Male. Tegumen, uncus and lateral apophyses as in *alveus* (see description of *alveus* male genitalia in de Jong 1972: 16 and figs 33-34, 39 in present study). Styliifer and antistyle as in *jupei*, the junction also concave basally, but the style shorter. Cucullus not evenly rounded outwardly, but with an angle in the middle (figs 26, 29-32).

Female. An apparent ventral plate, connected to the first of a series of chitinous ridges, which are also present in *jupei* but absent both in *warrenensis* and *alveus* (figs 38-43). In some specimens the ventral plate is not so strongly chitinized in the middle as shown in fig. 43 but resembles somewhat the condition in figs 41-42 of *jupei*, though the ventral plates are always larger in *bolkariensis* sp. n. Bursa without any distinct markings (fig. 27).

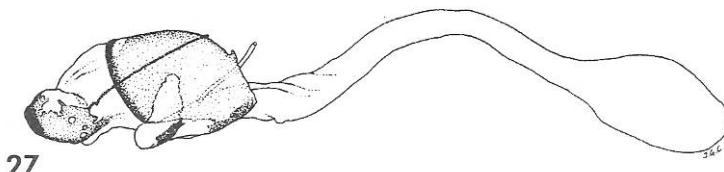


Fig. 27: *Pyrgus bolkariensis* sp. n., Paratype, female genitalia, lateral view, Turkey, Niğde, Bolkar Mts, Sivri Tepe, 3100 m, 28.VII.1994 (JGC 2197).

Diagnostic characters: *P. bolkariensis* sp. n. is the smallest species in the *P. alveus*-complex. It can be very easily recognized in fresh condition among all other species in this complex and from all *Pyrgus* species indeed by the glossy white aspect of the white markings on the underside. Further details see under next species.

Karyotype: we fixed the testes of 3 specimens, including the holotype. Dr. V. Lukhtanov and N. Kandul (St.-Petersburg) found $n=30$ in one specimen. In the 2 other specimens no cells in metaphase could be detected. *P. alveus* from the same locality (Plate 5, figs 23, 31) showed $n=24$ (Lukhtanov, pers. comm.).

5.1.3. Habitat

The main habitat at the type-locality of *Pyrgus bolkariensis* sp. n. is an arid, rocky slope with very low inclination (about 10%) towards the east. The area measures about 100 m x 200 m and is covered with small pieces of limestone and sandstone between which very few low plants grow. Most of the time a strong wind blows over this biotope. Because of the altitude this wind can be severely cold, even at noon by a cloudless sky, as we experienced during a second visit on 4 August 1994. Hardly any insect is on the wing under such weather conditions and those that eventually can withstand the barren circumstances often rest in depressions which were formed by the melting snow.

Very few other butterfly species were observed in this habitat: some *Pontia callidice* (Hübner, [1800]), *Chazara persephone* (Hübner, [1805]), *Vanessa cardui* (Linnaeus, 1758), a single specimen of *Pieris brassicae* (Linnaeus, 1758) and of *Melitaea didyma* (Esper, [1788]).

The locality on Aydos Mountain occupies a much smaller area of about 10 x 50 m on a rocky slope with strong inclination (about 45%) to the southwest.

5.1.4. Behaviour

The butterflies fly swiftly very low above the ground, generally at less than 5 cm. They often settle on flowers (e.g. *Dianthus* sp.), sometimes on stones. Their flight distance is normally very short, just a meter or so, before they settle on another flower. Due to their small size they remind very much of the numerous honey bees visiting the same flowers. When a cloud throws some shadow over parts of the locality, the animals sitting on flowers remain quiet, those on the wing immediately settle on the ground, ready to crawl between the stones in case a cold shower should come down. Similar behaviour pattern was observed by both authors and A. Riemis during the 35th expedition, for *Pyrgus jupei* on Ilgar Mountain (Artvin, Turkey), 1 August 1993, and by both authors for *P. warrenensis* (Verity, 1928) in the Lech Valley (Austria, Tyrol), Goldeck and Grossglockner (Austria, Carynthia); Lago Giovaretti (Italy, Alto Adige); also Karwendel Mts (Austria, Tyrol) (A. Olivier, pers. comm.).

When a male meets a female, they fly around each other in a swirling flight over a distance of several meters, always very low above the ground. We never observed a copulation nor the oviposition.

When disturbed, the butterflies always show a tendency to escape from below and never fly up as most of the other butterfly species do.

The few specimens caught at lower altitudes than the main locality may have reached these biotopes (2900 m) by active flight or they may have been dragged there by the strong winds that often blow in the mountains. Here (2900 m), *Pyrgus bolkariensis* sp. n. flies together with *Pyrgus alveus* and *Pyrgus armoricanus* (Oberthür, 1910) (of which we caught 1♂) on more flowery slopes. It was always possible to distinguish *alveus* from *bolkariensis* sp.n. during flight, the former being much paler and larger. *P. alveus* flies higher above the vegetation, longer distances at one time, whereas *bolkariensis* sp.n. always sticks close to the ground and lands more often. Other butterfly species occurring in this habitat are a.o. *Lycaena virgaureae* (Linnaeus, 1758), *Polyommatus molleti* Carbonell, 1993, *P. actis* (Herrich-Schäffer, [1851]), *P. iphigenia* (Herrich-Schäffer, [1851]), *P. dorylas* ([Denis & Schiffermüller], 1775) and *Pseudochazara mamurra* (Herrich-Schäffer, [1846]). It is interesting to note that the specimen of *P. armoricanus* has remarkably large spots and the ground colour is much paler than characteristic *armoricanus*. The specimen was first confused with a

smaller, light coloured *alveus*, but the genitalia examination proved its true identity (figs 21, 29). Specimens captured in other localities in the Bolkar Mts showed the characteristic *armoricanus* pattern (figs 22, 30).

The whole situation with *alveus* and *bolkariensis* sp.n. seems quite similar to that described for *Pyrgus warrenensis* and *Pyrgus alveus* in the Alps. De Jong (1975a: 55) wrote that he found *warrenensis* to be locally common at higher altitudes, whereas *alveus* was seen in more localities but most of the time in small numbers. In some localities both species occur, though hybrid specimens were never found.

5.1.5. Etymology

Both localities of this new species, Sivri tepe and Aydos dağ, are two of the highest summits in the Bolkar Mts (respectively about 3500 and 3480 m high), one of the main mountains in the Taurus range. The name refers to these mountains.

5.2. The populations in the Ala Mountains

5.2.1. Introduction

During the 12th expedition (1982) of the Working Group, B. van Oorschot caught one male in the Ala Mts (Niğde, Turkey) of a small *alveus*-like specimen of which the genitalia diverge from the average *alveus* type. At that time the only logical solution was to accept the specimen as an aberrant *alveus*. During the next expedition in 1983 however, H. van Oorschot collected a second male in the same region showing the same characters. A third male turned up in coll. C. Häuser.

One of the aims of the 36th expedition was to find more material of this enigmatic taxon. Due to bad weather conditions during our visit of the higher regions of the Ala Mts on 30 and 31 July and 1 August 1994, we could only collect one further male specimen of this small skipper. However, H. van Oorschot caught two real *alveus* as well (Plate 5, figs 24, 32).

Although we have only four specimens at our disposal, the sympatric occurrence in the Ala Mts with *alveus*, the external morphological characters, a different chromosome number, and differences in the structure of the male genitalia are sufficient to consider them as a separate, hitherto undescribed, species.

5.2.2. *Pyrgus aladaghensis* sp. n.

Type-material:

Holotype: ♂, Turkey, Taurus Mts, prov. of Niğde, Ala Mts, 18 km South-East of Camardi, Eznevít valley, 2800 m, 31.VII.1994, leg. D. van der Poorten, coll. VLCA (Plate 5, figs 17, 25).

Paratypes: 1♂, Turkey, prov. of Niğde, Ala Mts, 18 km South-East of Camardi, 2500-2900 m, 4-8.VIII.1982, leg. B. van Oorschot, coll. ITZA (Plate 5, figs 19, 27); 1♂, Turkey, prov. of Niğde, Ala Mts, 18 km South-East of Camardi, Eznevít valley, 2200-2600 m, 9.VIII.1983, leg. H. van Oorschot, coll. RNHL (Plate 5, figs 18, 26); 1♂, Turkey, prov. of Niğde, Ala Mts, vic. Çukurbağ (prope Çamardi, 1600 m, 26.VII.1981, leg. C. Naumann, coll. C. Häuser.

Description:

Male: forewing length 13.0 mm (holotype) and 13.2-13.3 mm (paratypes).

Upperside groundcolour paler grey than in *bolkariensis*, due to scattered white scales which cover the whole surface. Upperside forewing bears the same pattern as in *bolkariensis* and *alveus*. Upperside hindwing median white spot more strongly developed and more sharply edged than in *bolkariensis* and *alveus*. The paratype of 1983 shows this character very strongly developed. 5 or 6 marginal white spots, sharply edged, well developed. These spots are sometimes present in *alveus* (f. *iliensis*) (Plate 5, figs 23-24, 31-32) and most often absent or, when present, very reduced in *bolkariensis*.

Fringes faintly chequered on the upperside, but clearly white on the underside. In *jupei* and *bolkariensis* clearly chequered on both sides. In *alveus* more often chequered but this character is not constant.

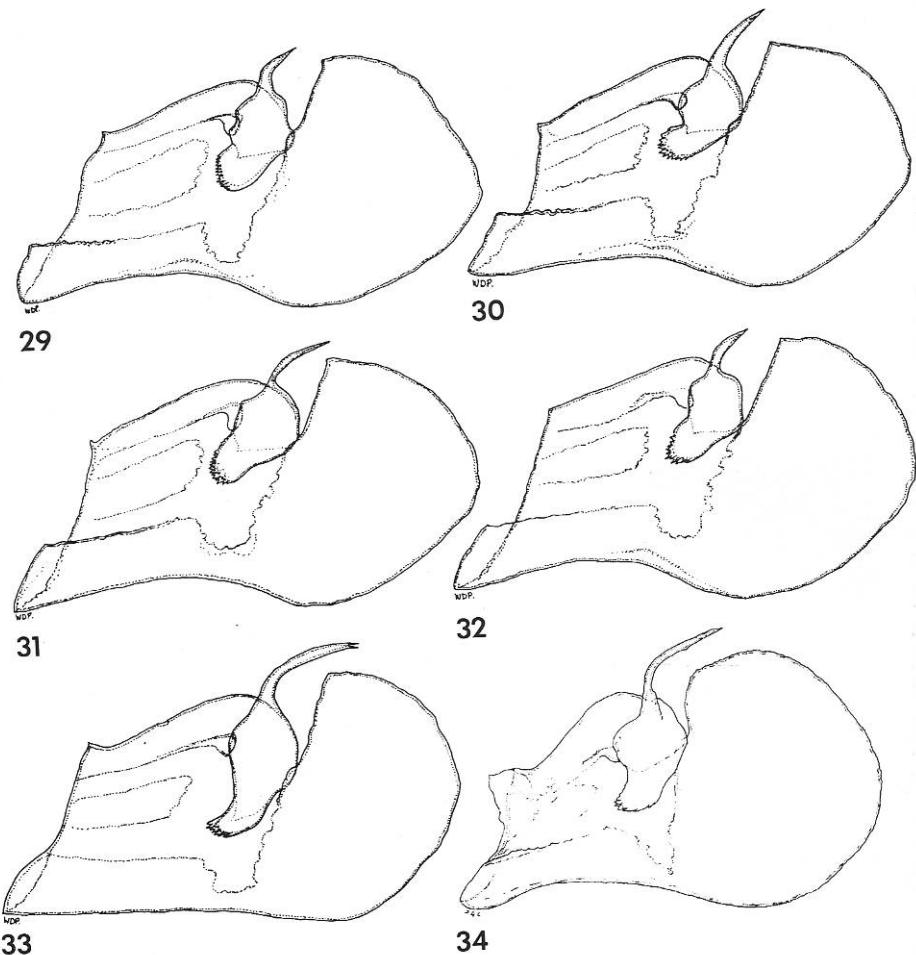
Underside forewing very pale grey, white pattern not contrasting very well, dull (not glossy as in *bolkariensis*). Underside hindwing groundcolour greenish as in *jupei* (the greenish in *bolkariensis* has a brownish tinge). Median row of white spots larger than in *jupei*, forming an almost complete, massive band. The paratype of 1982 has all white markings somewhat better developed than the holotype.

Female: unknown.

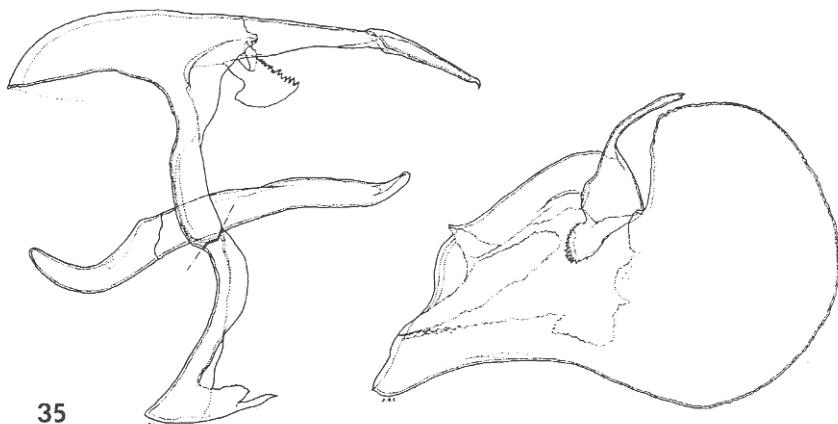
Genitalia (figs 28, 35-37): Tegumen, uncus and lateral apophyses as in *alveus* (fig. 20). Cucullus as in *bolkariensis* sp. n. but without the angle, wider than in characteristic *alveus*, more than a semicircle, resembling *Pyrgus alveus accretus* (Verity, 1925). Ventral margin of valva more concave than in most *alveus* and *armoricanus*. Style, antistyle and stylifer resembling the condition in *jupei*. This structure is not evenly rounded as in *alveus* but has more abrupt edges. The male genitalia of *aladaghensis* sp. n. can easily be confused with average *alveus alveus*. However, *alveus* specimens from Niğde and Tunceli have a narrower cucullus than in average *alveus* (fig. 33) and also the style and antistyle are slenderer. Their shape reminds of the North African *Pyrgus alveus numidus* (Oberthür, 1910) (see de Jong 1972: 20, fig. 42).



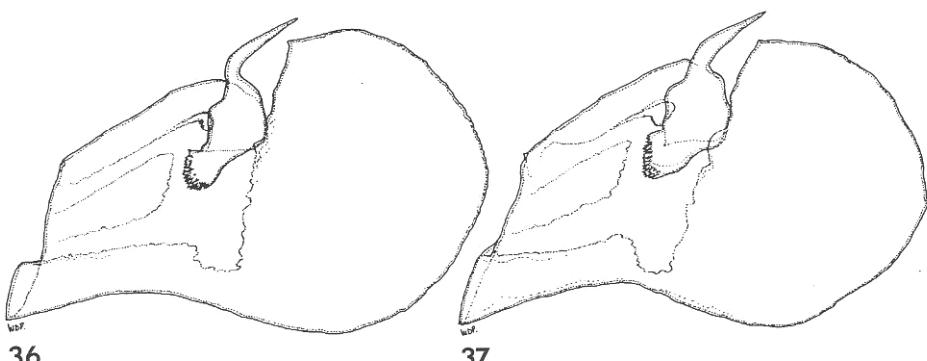
Fig. 28: *Pyrgus aladaghensis* sp. n., male genitalia, Paratype, Turkey, Ala Mts, Eznevít, 18 km South-East of Çamardı, 2200-2600 m, st. 1139, 9.VIII.1983 (JGC 2198).



Figs 29-32: *Pyrgus bolkariensis* sp. n., right valva
 29. Paratype, Turkey, Niğde, Bolkar Mts, South-West of Maden, 3100 m, 28.VII.1994 (WDP 3313).
 30. Paratype, date as in fig. 29 (WDP 3310).
 31. Paratype, date as in fig. 30 (WDP 3305).
 32. Paratype, Turkey, Niğde, Bolkar Mts, 8.VIII.1993, leg. B. Mollet (F. Carbonell 93/93).
 Fig. 33: *Pyrgus alveus alveus* (Hübner, [1803]), right valva, Turkey, Niğde, Bolkar Mts, South-West of Maden, 2600-2800 m, 24.VII.1994 (WDP 3313).
 Fig. 34: *Pyrgus warrenensis* (Verity, 1928), right valva, Austria, East Tyrol, Virgen valley, 15.VII.1977 (JGC 2201).



35



36

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Figs 35-37: *Pyrgus aladaghensis* sp. n., male genitalia

35. Paratype, Turkey, Niğde, Ala Mts, Çukurbağ, 1600 m, 26.VII.1981 (JGC 2258).

36. Holotype, Turkey, Niğde, Ala Mts, 18 km South-East of Çamardı, Avcı Veli, 2500-2800 m, 31.VII.1994 (WDP 3312).

37. Paratype, Turkey, Niğde, Ala Mts, 18 km South-East of Çamardı, 2500-2900 m, 4-8.VIII.1982 (WDP 3212).

Karyotype: we fixed the testes of the holotype. After examination by Dr V. Lukhtanov & N. Kandul (St.-Petersburg) it showed a variable number of $n=18-19$ (Lukhtanov, pers. comm.).

Diagnostic characters: In the *Pyrgus alveus* complex, four smaller species with alpine distribution can be recognized. Apart from *P. aladaghensis* sp. n. and *P. bolkariensis* sp. n., also *P. jupei* and *P. warrenensis* (type-locality: Lenzerheide,

Graubünden, Switzerland; only known from the French Alps, Switzerland, Tyrol and Carynthia) (Plates 3-4, figs 29, 32) belong to this group. *P. bokariensis* sp. n. can be distinguished from the other three species by the main character given in the description above (glossy white markings on the underside), from *P. warrenensis* by the more complete white upperside pattern on both wings, from *P. aladaghensis* sp. n. by the chequered fringes and the darker ground colour on the underside.

P. aladaghensis sp. n. can be separated from *P. bokariensis* sp. n. by the well-developed white marginal spots on hindwing upperside, the paler underside ground colour and the almost complete median band on hindwing underside. From *P. warrenensis* it can be distinguished by the much stronger white pattern on the upperside, from *P. jupei* by the more complete white pattern, especially on hindwing upperside.

All four species and *P. alveus* can be identified by characters in the male genitalia (figs 29-37) and three in the female genitalia (figs 38-48) (the female of *P. aladaghensis* remains unknown so far).

It is noteworthy that these four species show a similar behaviour, adapted to the alpine climate and biotope, whereas *P. alveus* lives in a more subalpine habitat.

5.2.3. Habitat and behaviour

The holotype was found on an east-facing, rocky slope (ca. 45% inclination), with very little and low vegetation. The butterfly flew very low above the stony ground, no other butterfly species were on the wing at that moment except for a few *Chazara persephone* (Hübner, [1805]). The paratypes from 1982 and 1983 were captured in the same habitat (B. van Oorschot and H. van Oorschot, pers. comm.), the one from 1981 was captured at a much lower altitude. More exploration is necessary to point out the distribution and habitat requirements of this species.

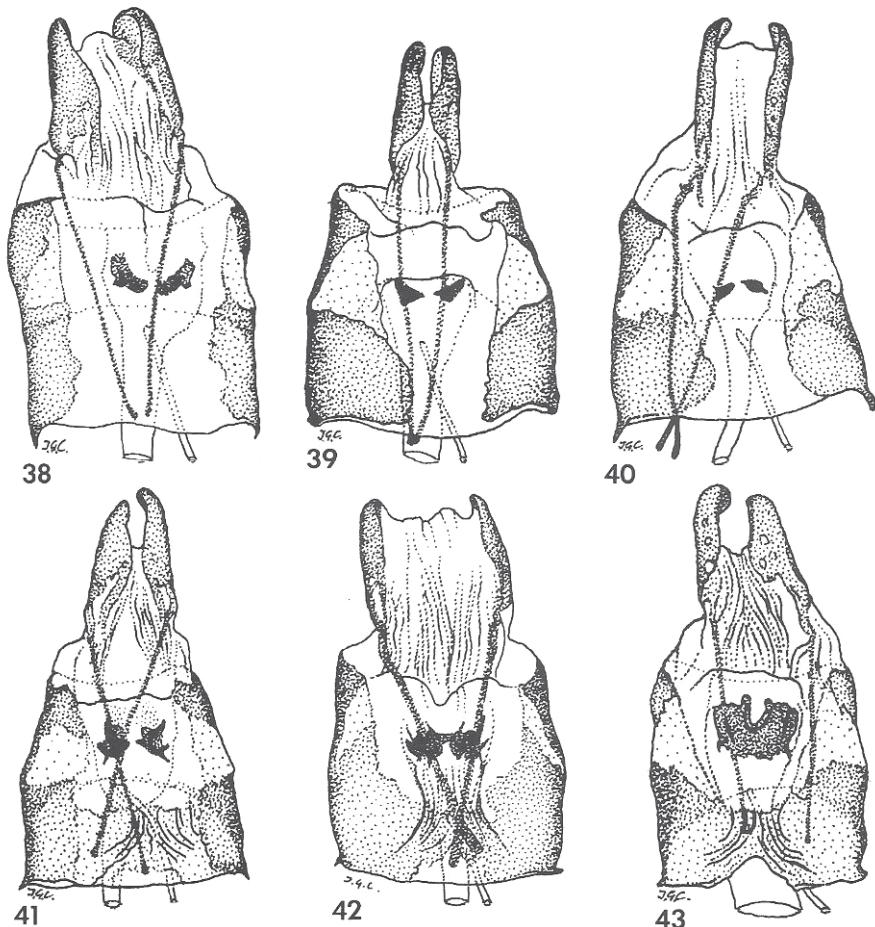
5.2.4. Etymology

The name *aladaghensis* refers to the Aladağları [Ala Mts] (3756 m high), which is an impressive rocky and isolated massive in the Taurus range.

6. The female genitalia of the taxa under study

We found but very few references to the female genitalia of the genus *Pyrgus*. Guillaumin (1966: 298) gave a figure of the female genitalia of *Pyrgus alveus* and de Jong (1972: 16) stated for the *alveus* complex: "Without a distinct genital plate, at most two sclerotized postvaginal spots." These postvaginal plates, situated at the ostium bursae, can be very weakly to rather strongly sclerotized. Most of the times they have a triangular shape (figs 38-39). Also *P. warrenensis* possesses two such small postvaginal plates (fig. 40), which can be sometimes very weakly sclerotized. In *P. jupei* the two sclerotized postvaginal plates are larger than in *P. alveus* and *P. warrenensis*, multiangled and rather intricate in shape (figs 41-42). In *P. bokariensis* sp. n., however, the ostium bursae bears a single large sclerotized plate with a cleft distally (fig. 43). In some specimens this plate is not so strongly sclerotized in the middle.

In the female genitalia of *P. alveus* and *P. warrenensis* the sides of the 8th tergite are separated ventrally by transparent, membranous tissue (figs 38-40), whereas in *P. jupei* and *P. bokariensis* sp. n. they are connected by sclerotized tissue (figs 41-43). This area has several chitinous ridges of which two are connected with the postvaginal plates. In lateral view there are some small differences in the shape of the 8th tergite, but no distinct features could be detected in the bursa copulatrix (figs 44-48).



Figs 38-43: Female genitalia in ventral view (without bursa copulatrix)

38. *Pyrgus alveus alveus* (Hübner, [1803]), Turkey, Gümüşhane, 21 km North-East of Erzincan, 2200-2300 m, 26-28.VII.1989 (JGC 2200).

39. *Pyrgus alveus alveus* (Hübner, [1803]), Greece, Pindos, Katara Pass, 1420 m, 5.VII.1971 (JGC 2000).

40. *Pyrgus warrenensis* (Verity, 1928), Austria, East Tyrol, Virgen valley, 15.VII.1977 (JGC 2002).

41. *Pyrgus jupei* (Alberti, 1967), Turkey, Ardahan, Ilgardoğlu Pass, 18 km South of Posof, 2500 m, 1.VIII.1993 (JGC 2195).

42. *Pyrgus jupei* (Alberti, 1967), North Iran, Mazandaran, Takht-i-Suleiman, 3500-4000 m, 26-27.VII.1980 (JGC 2261).

43. *Pyrgus bolkariensis* sp. n., Paratype, Turkey, Niğde, Bolkar Mts, South-West of Maden, 3100 m, 28.VII.1994 (JGC 2197).

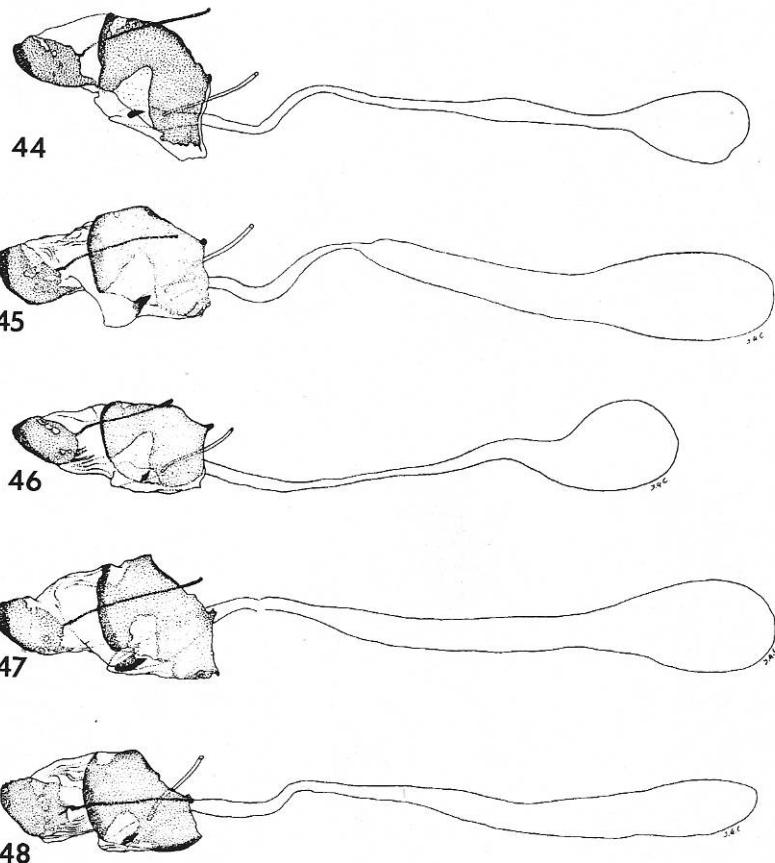


Fig. 44: Female genitalia in lateral view

- 44. *Pyrgus alveus alveus* (Hübner, [1803]), same data as in fig. 39.
- 45. *Pyrgus alveus alveus* (Hübner, [1803]), same data as in fig. 38.
- 46. *Pyrgus warrenensis* (Verity, 1928), same data as in fig. 40.
- 47. *Pyrgus jupei* (Alberti, 1967), same data as in fig. 41.
- 48. *Pyrgus jupei* (Alberti, 1967), same data as in fig. 42.

7. Taxonomic synopsis of the *Pyrgus alveus* (Hübner, [1803]) complex in the area under consideration

Pyrgus alveus alveus (Hübner, [1803])

=*Pyrgus alveus* var. *sifanicus* Grum-Grshimailo, 1891, **syn.nov.**

=*Hesperia iliensis* Reverdin, 1912, **syn.nov.**

=*Hesperia bellieri caucasicus* Picard, 1949 (synonymized by de Jong 1975b)

=*Pyrgus iliensis columnus* Kaufmann, 1954, **syn.nov.**

=*Pyrgus alveus confusa* Renner, 1983, invalid (Ebert & Rennwald 1991)

- =*Pyrgus alveus confusa* Renner, 1991, syn.nov.
Pyrgus juprei (Alberti, 1967)
 =*Pyrgus centralasiae* Renner, 1991, syn.nov.
Pyrgus aladaghensis sp. nov.
Pyrgus bolkariensis sp. nov.

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We intend to continue this study with other taxa described in the *Pyrgus alveus* group: *reverdini* Oberthür, 1912 and *speyeri* Staudinger, 1887, both from China, *numidus* Oberthür, 1910 from North Africa, and *insigniamiscens* Verity, 1929, *accretus* Verity, 1920, *centralispaniae* Verity, 1925, *jurassicus* Warren, 1926, *centralitaliae* Verity, 1920, *scandinavicus* Strand, 1903, *trebevicensis* Warren, 1926 and *germanica* Renner, 1991 from Europe. To solve some of the taxonomic problems more material is needed. Therefore, we use this opportunity to make a request to any interested reader to co-operate by putting at our disposal any material of forementioned taxa.

9. References

- Alberti, B., 1967. Über die *Hesperiya alveus* Hbn.-Gruppe im Kaukasus-Raum nebst Beschreibung einer neuen Art (Lep. Hesperiidae). - *Deutsche entomologische Zeitschrift*, N.F. **14**: 461-472.
- Alberti, B., 1969. Zur Kenntnis der Hesperiiden-Fauna des Kaukasus-Raumes und Armeniens (Lepidoptera, Hesperiidae). - *Faunistische Abhandlungen Staatliches Museum für Tierkunde in Dresden* **2**: 129-147.
- Alberti, B., 1984. Zur Taxonomie der *Pyrgus alveus* Hb. - Gruppe (Lep. Hesperiidae). - *Nota lepidopterologica* **7**: 2-6.
- Barbier, J.-V., 1894. *Lexique Géographique du Monde entier*. Tome premier. Berger-Levrault et cie, Paris-Nancy.
- Bartholomew, J.C. et al., 1987. *The Times Atlas of the World*. - Times Books Ltd, London.
- Devyatkin, A.L., 1994. Distribution and variation of *Pyrgus juprei* (Alberti, 1967) (Lepidoptera, Hesperiidae), with discussion of the taxonomic status of *Pyrgus centralasiae* Renner, 1991. - *Actias* **1**: 5-9.
- Ebert, G. & Rennwald, R. (Eds), 1991. *Die Schmetterlinge Baden-Württembergs Band 2: Tagfalter II*. - Verlag Eugen Ulmer, Stuttgart.
- Evans, W.H., 1949. *A catalogue of the Hesperiidae from Europe, Asia and Australia in the British Museum (Natural History)*. - The Trustees of the British Museum, London, 502 p., 53 pls.
- Federley, H., 1938. Chromosomenzahlen finnlandscher Lepidopteren I. Rhopalocera. - *Hereditas* **24**: 397-464.
- Gallo, E., 1989. On the presence of *Pyrgus alveus* (Huebner, 1803) in the Peloponnesus (Lepidoptera,

- Hesperiidae) - *Nota lepidopterologica* **12**: 164-165.
- Grum-Grshimailo, G., 1891. Lepidoptera nova in Asia centrali novissime lecta et descripta. - *Horae Societatis entomologicae Rossicae* **25**: 445-465.
- Guillaumin,M., 1966. Détermination des femelles du genre *Pyrgus* (espèces françaises) d'après les caractéristiques de leurs génitalia. - *Alexanor* **4**: 293-302.
- Hesselbarth, G., van Oorschot, H. & Wagener, S., (1995 in print). *Die Tagfalter der Türkei unter Berücksichtigung der angrenzenden Länder*.
- Horn, W. & Kahle, I., 1935-1937. Über entomologische Sammlungen, Entomologen und Entomo-Museologie. - *Entomologische Beiheften* **2**: 1-160; **3**: 161-296; **4**: 297-536; T. I-XXXVIII.
- Hübner, J., 1796-[1838]. *Sammlung europäischer Schmetterlinge*. Augsburg.
- Jong, R. de, 1972. Systematics and geographic history of the genus *Pyrgus* in the Palaearctic region (Lepidoptera, Hesperiidae). - *Tijdschr.Ent.* **115**: 1-121, pl. 1-6.
- Jong, R. de, 1975a. *Pyrgus warrenensis* Verity en *alveus* Hübner in de Hohe Tauern (Lepidoptera, Hesperiidae). - *Ent.Ber. Amst.* **35**: 52-58.
- Jong, R. de, 1975b. Notes on the genus *Pyrgus* (Lepidoptera, Hesperiidae). - *Zoologische Mededelingen, Leiden* **49**: 1-11.
- Kaufmann, G., 1954a. Beobachtungen über die ersten Stände einiger alpiner Pyrginae. - *Zeitschrift der Wiener entomologischen Gesellschaft* **39**: 23-28.
- Kaufmann, G., 1954b. *Pyrgus (A.) ilensis* Rev. ssp. *columbus* nov. in tema di ricerche genitoanatomiche sul gruppo *alveus* nell'Insubria. - *Redia* **39**: 261-274, pl. 2.
- Leech, J.H., 1893-1894. *Butterflies from China, Japan and Corea, Part II: Lycaenidae, Papilionidae and Hesperiidae*. London, Prov. Publ.
- Lorković, Z., 1941. Die Chromosomenzahlen in der Spermatogenese der Tagfalter. - *Chromosoma* **2**: 155-191.
- Lukhtanov, V. & Lukhtanov,A., 1994. Die Tagfalter Nordwestasiens (Lepidoptera: Diurna). - *Herbipliana* **3**, Marktleuthen, 440 p.
- Mayr, E., 1979. *Animal species and evolution*. The Belknap Press of Harvard University Press, Cambridge, 797 p.
- Olivier, A., 1989. *Pyrgus alveus alveus* (Hübner, [1803]) in Greece (Lepidoptera: Hesperiidae). - *Phegea* **17**: 61-66.
- Mabille, P., 1909. In Seitz, A. *Grossschmetterlinge der Erde I. Die Palaearktischen Tagfalter*. - A. Kernen Verlag, Stuttgart.
- Picard, J., 1949. Petite étude sur *Pyrgus bellieri* Obth. - *Revue française de Lépidoptérologie* **12**: 49-58.
- Renner, F., 1983. Neues aus der *Pyrgus alveus*-Gruppe für den mitteleuropäischen Raum (Lepidoptera, Hesperiidae) [sic!]. - *Carolinae* **41**: 133-134.
- Renner, F., 1991. Neue Untersuchungsergebnisse aus der *Pyrgus alveus* Hübner Gruppe in der Palaearktis unter besonderer Berücksichtigung von Süddeutschland (Lepidoptera: Hesperiidae [sic!]). - *Neue ent.Nachr.* **28**: 1-157.
- Reverdin, J.L., 1912. Notes sur le genre *Hesperia*. - *Bull.Soc.Lép.Genève* **2**: 141-172, pl. 16-19.
- Reverdin, J.L., 1915. Espèces paléarctiques nouvelles des Genres "Carcharodus" et "Hesperia". - *Bull.Soc.Lép.Genève* **3**: 103-116, pl. 5-6.
- Reverdin, J.L., 1916. Révision du Genre *Hesperia* (Espèces paléarctiques). - *Etudes de Lépidoptérologie comparée* **12**: 7-34, pl. CCCC-CCCCVII.
- Shepard, H.H., 1935. Pars 69 Hesperiidae [sic]. Subfamilia Pyrginae III. in: Strand, E.: *Lepidopterorum Catalogus*, W. Junk, 's-Gravenhage.
- Stieler, 1931. *Stieler's Grand Atlas de Géographie moderne*. Dixième édition, Tome I Europe et Asie. Justus Perthes, Gotha.
- Vivien de Saint-Martin & Schrader, 1923. *Atlas universel de géographie*. Nouvelle édition conforme aux traités de Paix et conventions de 1912-1922. Librairie Hachette.
- Warren, B.C.S., 1926. Monograph of the tribe Hesperiidi (European species) with revised classification of the subfamily Hesperiinae (Palaearctic species) based on the genital armature of the males. - *Transactions of the Entomological Society of London* **74**: 1-170, pl. 1-60.
- Warren, B.C.S., 1953. Three unrecognized species of the genus *Pyrgus*. - *The Entomologist* **86**: 90-103.
- Warren, B.C.S., 1957. Hitherto overlooked anatomical data concerning the genital structures in the Rhopalocera. - *Transactions of the Royal Entomological Society of London* **109**: 361-377, pl. I-III.
- Warren, E.J.M., 1983. A note on *Pyrgus warrenensis* Verity its history and distribution (Hesperiidae). - *Nota lepidopterologica* **6**: 61-64.