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A new subspecies of the *Euchloe ausonia* HÜBNER species group from the highlands of the Dzhungarian Alatau (East Kazakhstan)

(Lepidoptera, Pieridae)

by

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Summary: The subspecies *irina* subspec. nov. of the species group *Euchloe ausonia* (HÜBNER, 1804) is described from the Dzhungarian Alatau (East Kazakhstan). It is closely related to the taxa *naina* (KOZHANTSCHIKOV, 1923) and *jakutia* BACK, 1990, differing from them mainly by the roundish major white spots on the underside of the hindwing with the minor spots much reduced. These three Asian subspecies are regarded as belonging to a separate species *Euchloe naina* (KOZHANTSCHIKOV, 1923), stat. nov., stat. rev., which differ from the European *Euchloe simplonia* (BOISDUVAL, 1828) by the ratio of the harpa width to the width of the valva at the narrowest point being greater than 0.5, and also by the degree of wing ground colour in females. The relationship of these and other taxa within the species group *Euchloe ausonia* HB. is discussed.

Резюме: Из Джунгарского Алатау (Восточный Казахстан) описан новый подвид *irina* subspec. nov. из группы *Euchloe ausonia* (HÜBNER), близкий к таксонам *naina* (KOZHANTSCHIKOV, 1923) и *jakutia* BACK, 1990 и отличающийся от них в основном редукции мелких пятнышек. Три упомянутые азиатиские подвида рассматриваются как составляющие отдельный вид *Euchloe naina* (KOZHANTSCHIKOV, 1923), stat. nov., stat. rev., который отличается от европейского *Euchloe simplonia* (BOISDUVAL, 1828) отношением ширины к ширине вальвы в ее самом узком месте, которое у него более 0,5, а также степенью изменчивости основного фона крыльев у самок. Обсуждаются взаимоотношения таксонов в пределах видовой группы *Euchloe ausonia* HBN.

The Dzhungarian Alatau mountain chain is one of the most northerly parts of Tien Shan situated on the frontier of Kazakhstan and the Chinese province Xinjiang (Sintzian). Its butterfly fauna is unique in respect of co-existence in the same biotopes of both typical Tien Shan species and Euro-Siberian species being at their southerly limit. For instance, during our work in the western part of the Dzhungarian Alatau (the Kora river basin, upstream of the city Tekeli, the Taldy-Kurgan province) in June 1993 we observed such Euro-Siberian species as *Lycaena helle* (D. & S.) and *Euphydryas maturna* (L.) and the Siberian species *Tongeia fischeri* (EV.) flying together with the montane Central Asian species *Metaporia leucodice* (EV.) and *Coenonympha sunbecca* ALPH., peculiar Tien Shan species *Cupido buddhista* (ALPH.) and *Euphydryas alexandrina* (STGR.), and the Dzhungarian Alatau endemic *Mellicta alatauica* (STGR.) within the belts of deciduous (birch) and mixed (Shrenk spruce/Siberian fir/common birch) forests. The East-European-Siberian species *Oeneis tarpeja* (PALL.) is accompanied by *C. sunbecca* in the steppe belt. The same picture was seen in highlands as

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well, where within the habitats of *Parnassius tianschanicus* OBTH. and *P. delphius* EV. (the early imagines of the latter just appearing) we found, firstly for Tien Shan mountains, the typical Siberian boreomontane species *Euchloe naina* KOZH., which was formerly known for the Sayans (*E. n. naina* V. KOZHANTSCHIKOV, 1923, **stat. nov.**, **stat. rev.**) and North-East Siberia and the northern Far East (*E. n. jakutia* BACK, 1990, **stat. nov.**, **stat. rev.**) (BELYAEV, 1986; BACK, 1990).
We consider this species as being different from the European species *Euchloe simplonia* (BOISDUVAL, 1828) (= *E. a. marchandae* (GEYER-HÜBNER, 1832)), ranging in the highlands of the Alps, Pyrenees, and Kantabrian mountains. (There were certain nomenclature problems concerning European taxa *ausonia* (HB.), *simplonia* (BSD.), and *crameri* (BSD.), which are considered by us following the recent revision by BACK, 1990). This species differs well from *E. naina* by the size of the harpa on the valva: it is very small, the ratio of its width to the width of the valva at the narrowest point being 0.36–0.44 (VERITY, 1947: T. XI, fig. 12. 1 ♂, France, 05 Ceillac, Vallee du Melezet, 1700–1950 m, 22.VI.1984, NIESZPOREK leg., coll. Zool. Mus. Biol. Ins. Novosibirsk), while in *E. naina* this ratio is always greater than 0.5. The specimens of the latter species from the Dzhungarian Alatau deviate from the hitherto known subspecies and are described here as a new subspecies. The types are preserved in the collection of the Zoological Museum of the Biological Institute of the Siberian Branch of the Russian Academy of Sciences, Novosibirsk.

Euchloe naina ***irina*** subspec. nov.

Male (fig. 1a, b). In holotype the forewing length is 21.5 mm (the wing span 40 mm), in the paratypes it is 20–22 mm (wing span 35–40 mm).
Forewing upperside white; wing base with black suffusion forming a slanting triangle about 1 mm wide in cell and up to 4 mm wide at inner margin. Costal margin up to discoidal vein entirely suffused with black scales, most intense at the discoidal vein, distally to it the suffusion is developed only frontally of vein 11. Discoidal spot bracket-like curved, more rarely almost quadrangular, usually fusing with costal suffusion. Apex shaded proximally to bifurcation of veins 6 and 7+9 and to the distal third of vein 4 along outer margin, end of vein 3 is also shaded. On dark grey apical area there are a large, up to 2 mm in diameter, roundish white costal spot and two spots at outer margin in spaces 5 and 4, respectively; these two spots are either roundish or, more frequently, stretched out and fused with the white spots of fringe. There are three white spots on fringe in spaces 6, 7, and 8, the rest of the fringe is white throughout, with minute black shadings at the vein endings, that at vein 2 being the least expressed, while the end of vein 2 is white.
Hindwing upperside is white with the underside pattern strongly shining through, with diffuse black basal suffusion extending 5–6 mm along space 1c. Margin with dark marks at vein endings starting from vein 2 or, more rarely, from vein 1b. At vein 7 apex, there usually presents a roundish or even quadrate dark spot centered with white.
Forewing underside white, costa frontally to the cell ash-grey with irregular black marks. Discoidal spot oval with a falcate white discoidal vein in the middle. Apical area of bright yellowish-green colour made by mixed green, yellow and black scales, with the same white spots as on upperside, but they are larger, especially those at the costa. Endings of veins 2 and 3 with black marks.

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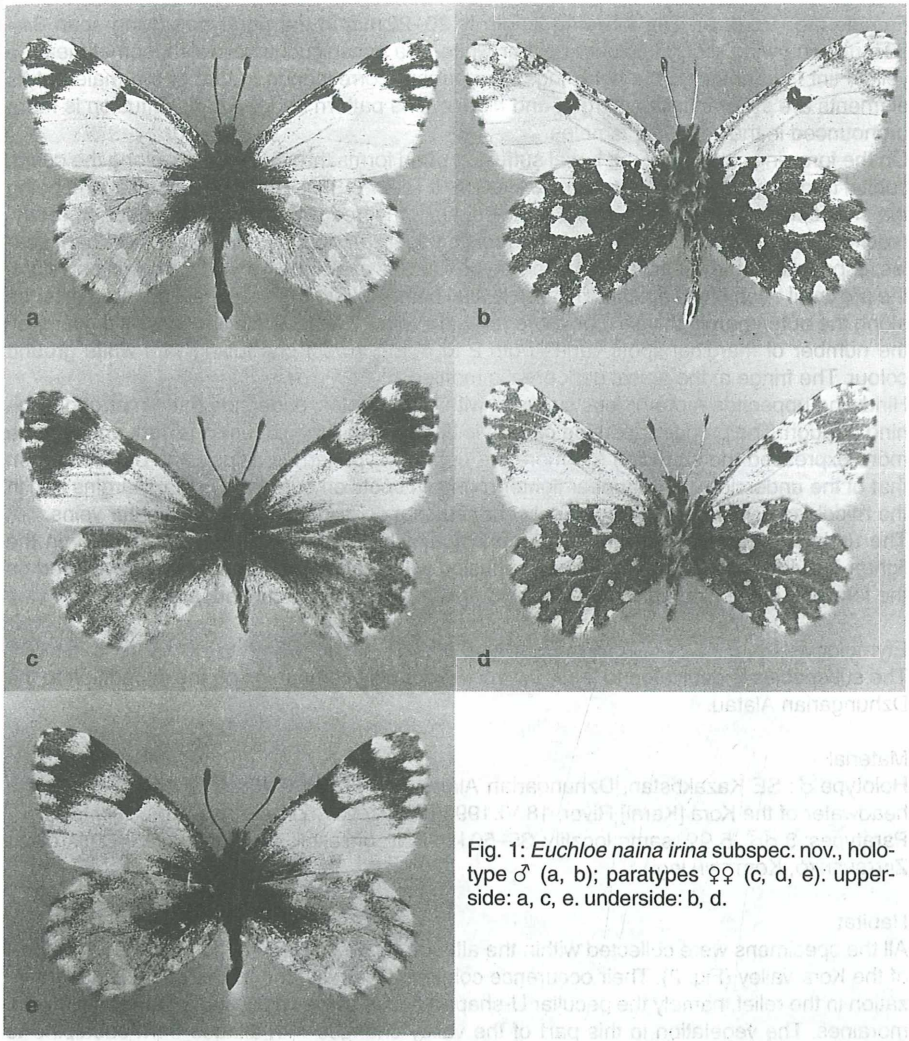

Fig. 1: *Euchloe naina irina* subspec. nov., holotype ♂ (a, b); paratypes ♀♀ (c, d, e): upperside: a, c, e. underside: b, d.

The hindwing underside ground colour is dark yellowish green, formed by mixture of green, yellow and black scales. The veins bear more yellow scales and so are conspicuously lighter than the ground colour. White spots with nacreous bloom, relatively large, contrasted and more or less roundish and smooth in shape; minor white spots are nearly absent or present only in the anal area (Fig. 1b).

Male genitalia similar to those of *E. ausonia, E. n. naina* and *E. n. jakutia* Back; harpa are relatively large, the ratio of the harpa width to the width of the valva at the narrowest point of the latter being 0.51–0.57.

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Female (fig. 1c, d, e). The forewing length is 20–22 mm in the paratypes (wing span 34–30 mm). The wing ground colour is either white or a conspicuous yellowish, sometimes the yellow tint is brighter on the hindwings. The pattern corresponds to that of the male but its elements are substantially enlarged and diffuse. The pattern and the dark suffusion is more pronounced in the yellowish females.
On the forewing upperside, the basal suffusion often forms three projections along the costa, cubital trunk (medial trunc according to HIGGINS & RILEY (1970), and vein 1, the second being the shortest. The area between the widened, as compared with male, rectangular or, rarely, bracked-shaped discoidal spot and the apex is usually more or less suffused with dark scales, especially along vein 4. Only one paratype has this area light but with suffusion on vein 4, the proximal edge of the apical dark area is also being suffused. The apical dark area extends along the outer margin to vein 3 or, more rarely, to vein 2. Costal white spot on it is the largest; the number of marginal spots varies from 2 to 4, the lowest one fusing with white ground colour. The fringe at the apical dark area is mottled.
Hindwing upperside more or less suffused with black scales; underside pattern strongly shining through. The proper upperside pattern is better seen if the suffusion is dark enough, the more expressed the suffusion the more the upperside pattern is diffuse and deviating from that of the underside: there appear lighter roundish spots on outer and costal margins and in the middle of cell and a light irregularily shaped spot on discoidal vein, and lighter veins.
The underside pattern of both wings is principally the same as in males, especially in the lighter individuals. In darker females a suffusion with scattered black scales is developed on the forewing in the hind part of the cell and proximally of the apical dark area.

Etymology
The subspecies is dedicated to IRINA DAVYDOVA, our nice companion on the expedition to the Dzhungarian Alatau.

Material
Holotype ♂: SE Kazakhstan, Dzhungarian Alatau, 40–50 km ENE of the city of Tekeli, the headwater of the Kora [Karai] River, 18.VI.1993 (DUBATOLOV, ZINTSHENKO, KOSTERIN leg.).
Paratypes: 8 ♂♂, 5 ♀♀, same locality, 35–50 km ENE of Tekeli, 17.–20.VI.1993 (DUBATOLOV, ZINTSHENKO, KOSTERIN leg.).

Habitat
All the specimens were collected within the altitude range of 2100–3100 m in the upper part of the Kora valley (Fig. 2). Their occurence coincided well with the traces of ancient glacierization in the relief, namely the peculiar U-shaped profile of the valley and a number of stadial moraines. The vegetation in this part of the valley changes with altitude from subalpine to alpine type. The subalpine spruce (*Picea schrenkiana*) parkland with peculiar saucer-like bushes of the junipers (*Juniperus pseudisabina* and *J. sibirica*) covers the surface of magnificent lower moraines, displaying an explicit case of the so-called knob-and-kettle topography. At greater altitudes the spruce disappears and junipers become more dense growing on the valley bottom, bordered by magnificent screes. In the vicinity of the snout of the Bessonov glacier the junipers in turn nearly disappear manifesting entering the alpine zone. In the period of our work the meadow areas all over these parts of the valley were covered by a carpet of luxuriant flowers, among which *Iris bloudowii*, *Fritillaria pallidiflora*, *Eritrichium*

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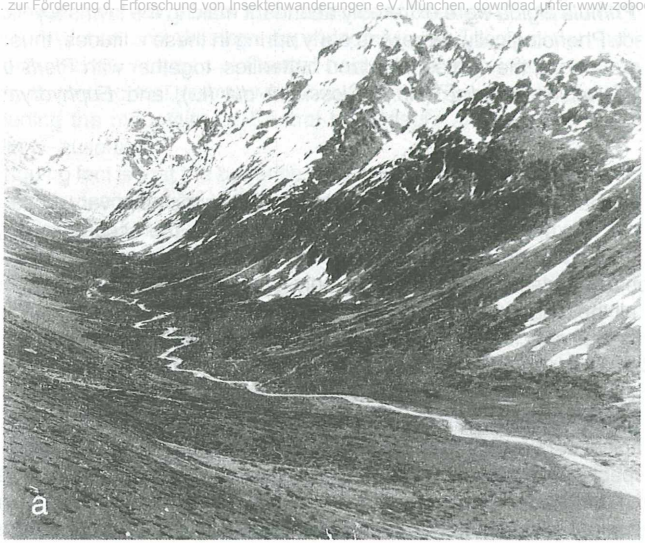

Fig. 2: Type locality of *Euchloe naina irina* subspec. nov.: the headwater of the Kora [Karai] River, Dzhungarian Alatau, East Kazakhstan. a) upper part with juniper thickets, subalpine and alpine meadows; b) lower part with open spruce woodland at the tree line, juniper thickets and subalpine meadows.

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villosum, and *Primula algida* were extremely abundant making the lawns a yellow, blue, rose, or mixed aspect. Phenologically, there was early spring in these altitudes, thus the butterflies considered were among the earliest highland butterflies, together with *Pieris bryoniae bryonides* SHELJ., *Synchloe callidice* (HB.), *Clossiana dia* (L.), and *Euphydryas alexandrina* (STGR.).

Remarks

According to the pattern of wing upperside, the new subspecies is very close to *E. n. naina* and *E. n. jakutia*. It exhibits the dimorphism of females, i. e. the occurence of yellowish and heavily dark suffused forms, as in both mentioned Siberian subspecies (while females of the related European species *E. simplonia* may only have a partial yellowish tint on hindwings). The males of all these taxa have a substantial costal suffusion.

The males of other species of the *E. ausonia* (HB.) group, namely, *E. ausonia* (HB.) and *E. crameri* (BSD.), lack such an even costal suffusion, their costa is light and may have only irregular black dots and streaks. The females of these taxa, as compared to *E. naina* and *E. simplonia*, are never yellowish, they are white and have no suffusion between the discoidal spot and the apical dark area.

The new subspecies differs substantially from *E. simplonia* and other subspecies of *E. naina* by the hindwing underside with large and even roundish nacreous-white spots and without or almost without minor white spots. As different from it, *E. n. jakutia* has numerous minor spots and large spots irregular in shape (the same combination of characters is exhibited by *E. ausonia*), while in *E. n. naina* all the white marking is reduced and diffuse, minor spots are absent, but large spots are not roundish but irregular in shape. Another peculiarity of the new subspecies consists in the roundish marginal spots on the hindwing underside, resembling those of *E. ausonia* (HB.) and *E. pulverata* (CHR.) and differing from the oblong ones in *E. simplonia* and other subspecies of *E. naina*. The common feature of *E. simplonia, E. n. naina*, and *E. n. irina* subspec. nov., and also *E. ausonia* and *E. crameri* is the lighter yellowish veins on the hindwing underside, as different from *E. n. jakutia*. Besides, the forewing apex underside in *E. n. irina* is of a bright yellowish-green colour a bit paler than that of hindwing underside, while in *E. n. naina* and *E. n. jakutia*, especially in the latter, the apices are much more grey, and in *E. simplonia* they are whitish.

The taxon *pulverata* (CHR.), which inhabits the deserts at the foot of the Dzhungaran Alatau and has certain superficial similarities with *E. n. irina* consisting of very roundish large spots of the hindwing underside (although accompanied with numerous minor spots), should be considered as a separate species. Its harpa is very narrow, the mentioned ratio being always less than 0.5, as different from *E. ausonia* (HB.), *E. crameri* (BSD.), and *E. n. jakutia* BACK, where this ratio is larger than 0.5 (we were not able to examine the genitalia of *E. n. naina*).

Discussion

The new subspecies is an extreme southern variant of the boreomontane species *Euchloe naina* KOZH., represented by *E. n. jakutia* on a vast territory of NE Asia, and by *E. n. naina* in the Sayans and North Mongolia (BELYAEV, 1986). *E. simplonia*, the European alpine counterpart of *E. naina*, has acquired the differences of a specific rank. The fauna of the *E. ausonia* species group of the Central Asian mountains is still poorly known and demands a thorough study, but from the first glance the specimens originating from moderate altitudes of the Zailiiskii Alatau (North Tien Shan) and the Gissaro-Alai mountains belong to *E. ausonia* s.str.

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which were thought to inhabit semiarid landscapes of Southern Europe and Western Asia to Southern Ural, NW Iran and Western Kopetdagh Mts. in Turkmenistan (while *E. pulverata* inhabits deserts and dry steppes of Central Asia, North Afghanistan and, possibly, Iran. In Turkmenistan, according to DUBATOLOV's observations, *E. pulverata* occurs throughout the republic, including the mountains of Central Kopetdagh, and only in West Kopetdagh it is sympatric with *E. ausonia*).

The most intriguing fact is that the butterflies much resemble *E. ausonia* s.str. (not *E. naina*!), which will be soon described by YU. P. KORSHUNOV as a separate subspecies, flying in the alpine zone of Central Altai (the Katunskii mountain range). The only character approaching *E. naina* is the projections of the dark suffusion of the apical area of the forewing upperside in the direction to the discoidal spot, noticable in some females. A question arises: how can the range of *E. naina* extend the NE Tien Shan leaving Altai beside? An acceptable explanation may be as follows. During the Pleistocene cooling all the high mountains underwent glaciation but to different extent, depending on the height, latitude and on the precipitation amount. The greater this amount the greater was the depression of the snow-line (IVANOVSKII, 1960). The Russian and Kazakhstan parts of the Altai have a relatively wet climate, therefore, their natural conditions in Pleistocene were most different from the recent. The fate of the alpine insect species during the ice-age is difficult to reconstruct, but it is reasonable to suppose that *E. naina* failed to persist in Russian Altai by moving to lower altitudes, where the conditions could differ from the ones of recent alpine valleys. After the climate had become warm, *E. ausonia*, the similar species of moderate altitudes, could occupy the vacating niche of *E. naina*. NE Tien Shan is situated in a more arid zone, so, inspite of bearing numerous glaciers even nowadays, its Pleistocene climate was less different from the recent one than that of the Altai. Besides, the penetration of the Siberian *E. naina* during one of the Pleistocene stadials into the Dzhungarian Alatau from the Sayans can be imagined to happen through the Mongolian Altai and the East Tien Shan rather than through the Russian Altai and Tarbagatai, taking into account that the Mongolian Altai, having dry and continental climate, retained the conditions close to the recent ones (IVANOVSKII, 1960).

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