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A revision of *Colias wiskotti* STAUDINGER, 1882, the available names and the type material, with a note on *Colias alpherakii* STAUDINGER, 1882

(Lepidoptera, Pieridae)

Josef GRIESHUBER & Bob WORTHY

Abstract

This paper reports on the taxonomy, types, type localities and distribution of *Colias wiskotti* STAUDINGER, 1882 and the nominotypical subspecies of *Colias alpherakii* STAUDINGER, 1882. Lectotypes are designated for the taxa *C. wiskotti* STAUDINGER, 1882, *C. wiskotti aurantiaca* STAUDINGER, 1892, *C. wiskotti aurea* KOTZSCH, 1936, *C. wiskotti separata* GRUM-GRSHIMAILO, 1888, *C. wiskotti seres* GRUM-GRSHIMAILO, 1890 and *C. alpherakii*. The taxon *C. w. sagina* AUSTAUT, 1891 is synonymised with the nominotypical subspecies; *C. w. aurantiaca* and *C. w. leucotheme* GRUM-GRSHIMAILO, 1890 are considered to be synonymous with *C. w. separata*; and *C. w. tirichmirensis* ROSE, 2001 is considered to be synonymous with *C. w. aurea* (syn. nov.). The taxon *C. hofmannorum* ECKWEILER, 2000 is downgraded to a subspecies of *C. wiskotti* (stat. nov.).

Keywords: Lepidoptera, Pieridae, lectotype, taxonomy, *Colias, alpherakii, aurantiaca, aurea, chrysoptera, draconis, hofmannorum, leucotheme, rueckbeili, sagina, separata, seres, sweadneri, wiskotti*.

Introduction

Colias wiskotti STAUDINGER, 1882 is a rather popular species with collectors of Palaearctic butterflies due to its wide range of colour variations. The males show wide colour variation between subspecies and females vary widely within populations. Despite its popularity, misunderstandings abound, especially in recent literature, because the type material of the whole *C. wiskotti* group has never been properly investigated. The basis of this work is intensive research in various museums in Europe and Russia to identify the type material of all described taxa. The aim of this paper is to provide information about the type specimens in order to clear up misunderstandings about the phenotypes and type localities, and to stabilise the use of the names. All the identified type material has been investigated and an intensive study of the literature dealing with this species was made. Because of the uniformity in the genital morphology between the species of *Colias* the authors did not investigate the genitalia within this single species. This work should be treated as a basis for further studies, e.g. for genetic research (see under *C. w. draconis*) or investigation into the ecology of the species. Based on the zoogeography of the distribution area and the wing morphology the *C. wiskotti* group has been split into four subspecies groups, but this is only provisional. The approximate distribution of each subspecies is given, but not all known collecting sites, as this is not the aim of this taxonomic review. Because there is also some misunderstanding over the nominotypical subspecies of *Colias alpherakii* STAUDINGER, 1882, the type material of which was collected together with that of *C. wiskotti*; and because these species are clearly closely related ecologically, nominotypical *C. alpherakii* is reviewed at the end of this paper.

A) Materials and methods

Key to museum abbreviations

BMNH	British Museum of Natural History, London
MNHU	Museum für Naturkunde der Humboldt-Universität, Berlin
MSNG	Museo Civico di Storia Naturale, Genova
SMFL	Forschungsinstitut und Naturmuseum Senckenberg, Frankfurt a. M.
SMNK	Staatliches Museum für Naturkunde, Karlsruhe
SMTD	Staatliches Museum für Tierkunde, Dresden
ZISP	Zoological Institute of the Russian Academy of Sciences, St. Petersburg
ZMKU	Zoological Museum Schewtschenko-University, Kiev
ZSM	Zoologische Staatssammlung, Munich

Lectotype designations

To preserve the stability of zoological nomenclature, and to avoid further confusion over identification of this highly polymorphic species, the name-bearing types of the taxa *Colias wiskotti* STAUDINGER, 1882, *C. wiskotti aurantiaca* STAUDINGER, 1892, *C. wiskotti aurea* KOTZSCH, 1936, *C. wiskotti separata* GRUM-GRSHIMAILO, 1888 and *C. wiskotti seres* GRUM-GRSHIMAILO, 1890 have been fixed by lectotype designations. The lectotypes and type locality restrictions aid in resolving the status of these taxa. For the same reason a lectotype is designated for the nominal taxon *Colias alpherakii* STAUDINGER, 1882.

The STAUDINGER collection

The STAUDINGER collection is housed in MNHU in STAUDINGER'S original drawers. Recently, the *Colias* in this collection were reorganised by JOSEF GRIESHUBER, and provided with "ex coll. STAUDINGER" labels. In the STAUDINGER collection, normally only the first specimen in a series has a hand-written locality label; all the others have very small round labels made from the same paper as the locality label on the first specimen. KONRAD EBERL (MNHU) has provided appropriate hand-written labels for all specimens without locality labels. As all of STAUDINGER'S *Colias* can now be identified, they have been included in the main collection in the same order as originally used by STAUDINGER. The STAUDINGER butterflies were catalogued by HOLIK in 1947 and 1948 (unpublished manuscript); the catalogue contains mistakes but it gives an excellent overview of the collection. In a few cases the original arrangement of a series was found to have been changed, but using the HOLIK catalogue it has been possible to recreate the original order.

STAUDINGER probably sold some of the type material, but these specimens are impossible to identify as syntypic as they were sold without type labels. The types in MNHU have pink "Origin." labels to signify that they are types. All of these labels are made from the same paper and have the same style; it is unlikely that they were all printed in advance so they were probably added to the specimens after the collection was compiled – this is the reason that no confirmed syntypes can be found in other museums (e.g. BMNH, ZISP, ZMKU, and ZSM). Some of these labels have STAUDINGER'S own handwriting on them, so it is probable that he added them to the specimens himself. Furthermore there are several specimens with such labels in STAUDINGER'S collection which are not part of the syntypic series, e.g., there are a few cases where STAUDINGER described a taxon from only a few damaged specimens, but there are only fresh specimens with "Origin." labels in his collection. Most of STAUDINGER'S new taxa were collected again after their discovery, as it was good business for the collectors and for STAUDINGER himself. Most of these subsequently collected specimens also lack collecting data, so it is impossible to ascertain whether they are part of the type series if they were deposited outside the STAUDINGER collection. For the above mentioned reasons only the specimens in STAUDINGER'S own collection have been included in the type series; in most cases there can be little doubt about their type status, if there is no indication that the specimens are wrongly provided with "Origin." labels they are considered to be syntypic.

The collecting dates of the taxa described by GRUM-GRSHIMAILO

The collecting dates used on the labels of the butterflies collected by GRUM-GRSHIMAILO correspond with the old Russian calendar. The Russians adopted the present-day Gregorian calendar on 31st January 1918; before this they used the Julian calendar. Thus the 31st January became the 14th February, i.e. 13 days were lost. The number of days lost depends on when the calendar was changed in each country, so in the 19th century only 12 days were lost. This means that we must add 13 days to GRUM-GRSHIMAILO's collecting dates to get the correct date in our calendar.

B) Systematic part

Index of names

Colias wiskotti

Colias alpherakii

Abbreviations: ab. = aberration, var. = varietas/variant, ssp. = subspecies, JSS = junior subjective synonym, IS = infrasubspecific and not available, ISS = incorrect subsequent spelling.

1. The Ghissar-Alai group

Notes on the territory

This group contains the taxa *C. w. wiskotti* STAUDINGER, 1882, *C. w. aurantiaca* STAUDINGER, 1892, *C. w. sagina* AUSTAUT, 1891, *C. w. separata* GRUM-GRSHIMAILO, 1888 and *C. w. leucotheme* GRUM-GRSHIMAILO, 1890. This *wiskotti-separata* group is distributed in a system of mountains forming the so-called Ghissar-Alai mountain system. Although the Transalai (Zaalaysky Range) is part of the Pamir mountain system, it is included here because the northern slopes of the Transalai and the Alai belong to the same zoogeographic district. This can be seen in various butterfly taxa, e.g. *C. w. separata*. Note: in some butterfly species it is possible that in the western part of the Transalai, e.g. the Aram-Kungei area, the phenotype could differ from the "Alai phenotype", but this is not the case in *C. wiskotti*. The Peter the Great and Darvazsky Mountains are probably inhabited by *C. w. separata*, but lack of material does not allow a final decision to be made (see under *C. w. separata*).

Because many entomologists have problems identifying the location of the mountain ranges and minor ridges in this region, and because a lot of incorrect and confusing locality data have been published, it is necessary to provide an explanation of the mountain systems as a basis for the taxonomic part of this work. The Ghissar-Alai system comprises 4 main ranges, namely the Alai, Zeravshansky, Turkestansky and Ghissar ranges. This system includes several minor mountains ridges, e.g. the Hazreth-Sultan and Karateghinsky Mountains; whereas the Matcha massif and Fansky Mountains are merely so-called mountain-knots (links between two ranges). These ranges and mountain chains are impossible to separate in a logical way so locality data has often been confused. Furthermore, the current names of these mountain ranges were used in a much wider sense in the past; it is therefore necessary to define these names before type locality restrictions can be accurately made, or before distribution areas can be outlined. Various recent maps (e.g. the topographic ONC G6 map), old maps (e.g. the GRUM-GRSHIMAILO (1890) map) and information from various websites have been used to define the ranges. Any possible geological differences have been excluded from this definition. The ranges are listed from east to west and from north to south.

At the eastern end of the Ghissar-Alai system is the High Alai or Alai, a well-known mountain range between the Ferghana valley to the north, and the Kyzyl-Suu River to the south. The Kyzyl-Suu river valley is also known as the Alai valley. The eastern edge of the Alai is said to be along the Isfayramsay River. The western edge of the Alai is generally considered to be along the Sohk River, which flows through the village of Zardaly (39˚38'N, 70˚56'E) northward to the Uzbek Sohk enclave, although the authors cannot give a reason for the position of this dividing line. In the northern foothills of the Alai there is a minor ridge called Kichik-Alai.

At the intersection of the Alai and the Turkestansky ranges is the Matcha massif, which extends approximately 35 km from east to west. The western end is at the glaciated region of the Zeravshansky glacier (39˚30'00"N, 70˚30'00"E) and Pik Igla (39˚24'00"N, 70˚35'00"E), just to the south of the Tajik enclave of Vorukh. The Shurovski or Tschourovsky glacier is situated in the Matcha massif. The northern slopes of the Matcha massif are split by the Sokh River. As stated above, the part of the Matcha massif which is to the east of the Sokh River is assigned to the Alai, whereas the western part is assigned to the Turkestansky Range. This range runs westward from the Sokh River, approximately 300 km along the northern bank of the Zeravshansky River, ending some 45 km to the east of Samarkand. The Matcha massif is of major zoogeographical interest, because it is an intermediate zone between the Ghissar and Alai zoogeographic districts (sensu TUZOV et al. 1997)). The southern slopes of the Matcha Mts. have in the past been considered to be part of the Karategin Mountains (see below).

At the western end of the Matcha massif, in the Zeravshansky glacier region, is the intersection of the Turkestansky and Zeravshansky ranges. The source of the Zeravshansky River is in this glacier region. The Zeravshansky Range is situated to the south of the Zeravshansky River and from here runs about 350 km to the west, ending just to the south-west of Samarkand. Only the mountain chain that is directly to the south of the Zeravshansky River is considered here to be the Zeravshansky Range, although there are several intersections with the Ghissar Range. There is no reason to separate these ranges zoogeographically, but they are listed separately on various maps as well as on many locality labels. The topographical ONC G6 map provides no justification for such a separation, except that parts of these mountains are drained by the Zeravshansky River system to the north, whilst other parts are drained by various rivers flowing to the south.

The Ghissar Range includes the mountains to the south of the Zeravshansky Range; these ranges are difficult to separate in places. The main part of the Ghissar runs along approximately 39° latitude, but at approximately 68° longitude, it veers south-westward towards the Turkmen border. The eastern extension of the Ghissar Range is in the glacier region of the peaks Samarkand and Dzhavdara, to the north-west of Navabad. The Hazreth Sultan Mountains are part of the Ghissar Range, but they are not shown on recent maps. The main peak of this small mountain range is also called Hazreth Sultan. According to GRUM-GRSHIMAILO`s map (l.c.) the main ridge of the Hazreth Sultan Mountains is approximately between the longitudes 067°30' & 68°15', and at about 39° latitude. The western part runs along the border between Uzbekistan and Tajikistan. In the past the Hazreth Sultan Mountains were used in a wider sense, and included all the mountains from the main ridge of the Ghissar Range to the Zeravshansky River, e.g. HERZ (1900) described the mountains south of Urgut (39°24'N, 67°14'E) as the northern slopes of the Hazreth Sultan Mountains, not Ghissar or Zeravshansky. In reality the northern foothills of the Hazreth Sultan Mountains are an intersection of the Ghissar and Zeravshansky ranges. In the late 19th century, probably only the north-western part of the Hazreth Sultan Mountains was easily accessible for collectors coming from Samarkand.

Directly to the north-west of the Hazreth Sultan Mountains is a high peak called Chimtarga (39°11'56"N, 68°11'36"E), and some other high peaks; these are hemmed in by rivers to the west and east, and the Zeravshansky River in the north. These high mountains and their foothills are called the Fansky or Fan Mountains, a name that has been in wider use during the last few decades. In the past the Fansky Mountains were probably also considered to be part of the Hazreth Sultan Mountains. The Fansky Mountains are an intersection of the Ghissar and Zeravshansky ranges, but they are usually considered to be part of the Ghissar Range.

The Karategin Mountains (Kara-Sagin is a misspelling) could indicate two different regions. The first region is a minor mountain ridge of the Ghissar Range, which is called the Karateghinsky Mountains on recent maps. On GRUM-GRSHIMAILO'S map this small ridge is figured as "Monts Karateghin". The south-western end of these mountains is to the north-east of Dushanbe near Kofarnikhon, and runs north-eastwards from there. The north-eastern end is situated in the glacier region of the Dzhavdara Mountains to the north-west of Navabad. This mountain ridge is part of the Ghissar Range. On the same map, GRUM-GRSHIMAILO figures another much bigger mountainous territory as "KARA TEGIN". These Karategin Mountains include the small Karateghinsky Mountains mentioned above, the southern slopes and foothills of the eastern Zeravshanksy Range, the southern slopes of the Matcha massif, and the extreme south-western slopes of the Alai up to approximately the current border of Kyrgyzstan and Tajikistan. It is quite possible that the mountains to the north of Dushanbe where the Anzob Pass is situated were also considered to be part of the Karategin Mountains. In the past, collectors crossed this pass on their way from Samarkand to Dushanbe, so the area was fairly easily accessible. It is assumed here that old butterfly specimens labelled Karategin, and which are of a phenotype typical of the Ghissar zoogeographical district (sensu TUZOV et al. l.c.), originate from the area of the small Karateghinsky ridge or from the mountains to the north of Dushanbe (Anzob Pass area). If the butterflies are of a typical phenotype for the Alai zoogeographical district (sensu TUZOV et al. l.c.), or if they are intermediate between the Ghissar and Alai phenotypes, they probably originate from the mountains between Navabad and the border with Kyrgyzstan, just to the north of the Shurkhob river.

1.1 *Colias wiskotti wiskotti* STAUDINGER, 1882

"*Colias Wiskotti* Stgr. n. sp." STAUDINGER, 1882: In STAUDINGER & BANG-HAAS, Berliner Entomologische Zeitung **26** (1): 166 – 167, pl. 2., f. 9, 10 (type locality: "Alai Gebirge" and "Hazreth-Sultan Gebirge").

Type material and depository

STAUDINGER (1882) described *C. wiskotti* from an unspecified quantity of male and female specimens (syntypes) collected by HABERHAUER in 1880 in the Alai Mountains and in 1881 in the Hazreth Sultan Mountains. STAUDINGER (l.c.) stated that HABERHAUER collected a slightly damaged male and two white females in the Alai Mountains, but of the 1881 series it is only known that one of the few females is white. STAUDINGER (1882) described the white female form as ab. "*leuca*". TSHIKOLOVETS (2005) figured a syntypic pair from the Alai, and a syntypic male (now the lectotype) from the "Samarkand Alp." (= Hazreth Sultan Mountains).

The type material is deposited in NMHU. It consists of 7 male and 6 female syntypes from the Hazreth Sultan Mountains, and a syntypic pair from the Alai Mountains. One of the two white females from the Alai is missing. One of the female syntypes from the Hazreth Sultan Mountains is a misidentified female of *C. christophi* GRUM-GRSHIMAILO, 1885; this misidentification was reported by STAUDINGER (1892). No types have been found in BMNH. The collections also contain 2 females and 1 male from Samarkand collected by HABERHAUER in 1886; these specimens are probably from the same locality as the type material. Another pair has the label data "*C. wiskotti* var., Samarkand, Ex STAUDINGER". There is no evidence that this pair is from the type series and not a subsequent HABERHAUER series as it has no original STAUDINGER labels, it is therefore excluded from the syntypic series.

Lectotype designation

A lectotype designation is necessary for this taxon as the syntypes are from two different areas which could represent two different subspecies. The specimen selected for the lectotype is the male from the "Samarkand Alp.[es]" which has an original locality label hand-written by STAUDINGER (see above). Because of the year of collecting given on the locality label there can be no doubt that it is syntypic. To preserve nomenclatural stability we have chosen a specimen from the "Samarkand Alp.", because *C. wiskotti* from the Alai is generally assigned to the subspecies *C. w. separata* GRUM-GRSHIMAILO, 1888. The lectotype is a fairly fresh specimen of a brownish-green colour.

The label data are as follows:

– [STAUDINGER's hand on brown paper] Samarkand Alp. H[a]b[er]h[aue]r. [18]81. // [printed pink label] Origin[al]. // [printed label] ex coll. Staudinger [and hand-written] 1/14 // [printed red label] (Samarkand Alpen, Hazreth Sultan Gebirge, 1881, Haberhauer) / Lectotype / *Colias wiskotti* STAUDINGER, 1882 / design. by GRIESHUBER & WORTHY, 2006.

Paralectotypes

Each specimen will be provided with a printed red label similar to the lectotype, but with Paralectotype instead of Lectotype. Each paralectotype has a printed "ex coll. Staudinger" label with a hand-written number from 2-14/14, and a locality label recently hand-written by KONRAD EBERL.

Samarkand series:

All specimens have a small round brown label made from the same paper as the locality label of the lectotype, and a printed pink "Origin." label.

– 6 males; 2 males with an additional hand-written date label "6/7" [06.07.1881] (HABERHAUER's hand?)
– 4 reddish-orange females
– 1 white female with additional labels: [STAUDINGER's hand] Leuca Stgr. // [STAUDINGER's hand] Samarkand Alp. / [18]81 / Haberh.
– 1 female (= *C. christophi* – misidentification): [STAUDINGER's hand] als *Wiskotti* ♀ ♀ ab. von mir beschrieben [described by me as a female aberration of *wiskotti*] // [STAUDINGER's hand] Samarkand Alp. / [18]81 / Haberhauer / [printed label with no hand-written number] ex coll. STAUDINGER.

Alai series:

– 1 male: [STAUDINGER's hand] Alai [18]80 H[a]b[er]h[aue]r. // [printed pink label] Origin. [and STAUDINGER's hand] *Wiskotti* STGR.
– 1 female: [small round brown label made from the same paper as the locality label] // [printed pink label] Origin. [and STAUDINGER's hand] *Wiskotti* STGR.

Type locality

According to STAUDINGER (1882) the type material is from the Hazreth Sultan Mountains and the Alai Mountains. As can be seen on the label of the lectotype, another name for the Hazreth Sultan Mountains is "Samarkand Alpen" or Samarkand Mountains. Typically for HABERHAUER material, there is no exact locality designation. GRUM-GRSHIMAILO (1888) restricted the type locality to the Hazreth Sultan Mountains, this is of no consequence as he did not designate a lectotype, but STAUDINGER (1892) fully accepted this action.

The Alai locality cannot be restricted, but this is unimportant as the type locality is now governed by the lectotype, i.e. Hazreth Sultan Mountains. Where exactly HABERHAUER found the Hazreth Sultan series

is uncertain. The mountains on the southern and south-western side of the main ridge of the Hazreth Sultan Mountains can be dismissed because they are too far away from Samarkand, although the *C. wiskotti* occurs there that is phenotypically identical (e.g. Liagar Mourda Pass, Tash-Kurgan area, and Maidanak). The closest *C. wiskotti* records to Samarkand are from the mountains just to the south-west of the city. During HABERHAUER'S time very few places were easily accessible, so why should a collector search for butterflies in difficult or distant localities if more easily accessible places were unexplored? HERZ (1900) gave some information on the northern slopes of the Hazreth Sultan Mountains. He travelled from Samarkand via Urgut to Farab (39˚14'27''N, 67˚28'12''E), only about 65 km to the south-east of Samarkand. Just before Farab, on the way from the "Kashka-Darja" River up to the village, he found *C. wiskotti* and *C. alpherakii*. The latter species was described by STAUDINGER together with *C. wiskotti*. From Farab he travelled south-eastwards to the village of Roritsch (Rogich) (39˚08'55'N, 67˚44'26''E). Around Roritsch he found *C. wiskotti*, *C. alpherakii* and rarely, *C. christophi*. Slightly further to the east-north-east HERZ found *C. wiskotti* and *C. christophi* which was very common, this was near the village of Bori, in the vicinity of the village of Zimtut (39˚16'N, 68˚02'E). It is presumed that it was in the same easily accessible area that HABERHAUER collected the type series of *C. wiskotti* and *C. alpherakii*, and only one *C. christophi* specimen. As *C. christophi* was a common species near Bori, it is presumed that HABERHAUER didn't reach this village, but returned back to Samarkand along the small river flowing from Roritsch down into the Seravschan River. Although there is no proof, for the reasons stated above the type locality is provisionally restricted to the area between Farab and Roritsch. In other words: Tajikistan, Ghissar Range, Hazreth Sultan Mountains northern slopes, presumably between the surroundings of Farab and Roritsch.

Status and variation
Valid at species rank within the genus *Colias*. The nominotypical subspecies is distinguished by the very wide black borders and the green or brownish-green colour of the males. Most of the females are of a dull orange colour; some of them are light reddish-orange or white. Specimens from the Turkestan Range are on average slightly smaller, and the quantity of dull orange females is higher than in the western Ghissar Range. This is considered to be within the variation of the nominotypical subspecies. The variation in the females in particular can differ from population to population, whereas the males differ very little. The differences between various populations in the Ghissar zoogeographical district (sensu TUZOV et al. 1997) are too insignificant in this highly polymorphic butterfly to allow it to be split into different subspecies. The variation is an ecological adaptation rather than a genetic differentiation.

Distribution
C. w. wiskotti is presumed to be widely distributed in the Ghissar zoogeographical district. It occurs in the Ghissar, Zeravashansky and Turkestansky ranges. The eastern extremities of the Turkestansky Range, i.e. the Matcha massif, appear to be inhabited by *C. w. separata*, although material is very scarce. The huge Zeravshansky glacier region seems to be a natural barrier between the subspecies. The "Karategin" Mountains (sensu GRUM-GRSHIMAILO 1890 – see above) between Navabad and the border with Kyrgystan are perhaps an intermediate zone between the nominotypical subspecies and *C. w. separata* (see under *C. w. aurantiaca*), but the possibility that both taxa are well separated in this area can be not dismissed. There are very few roads in any of the above mentioned mountain ranges, so large parts of this area are unexplored, consequently only a few local populations are known. A list of known *C. wiskotti* localities is given by TSHIKOLOVETS (2000 & 2003). All the evidence confirms that only the nominotypical subspecies inhabits the Ghissar zoogeographical district. Presumptions about a possible intermediate zone with *C. w. separata* can be only highly speculative due to the lack of material. It has to be said that the eastern limit of the Ghissar phenotype and the western limit of the Alai phenotype varies from species to species. The Alai phenotype of *C. wiskotti* occurs in the Matcha massif, but in *C. cocandica* ERSCHOFF, 1874 the Ghissar phenotype is distributed there.

1.2 *sagina* AUSTAUT, 1891

"*Colias Wiskotti* Variété *Sagina* STAUDINGER" AUSTAUT, 1891: Naturaliste **13** (2): 99 (type locality: "les hautes Alpes du Turkestan").

Note: The name was not described by STAUDINGER as AUSTAUT (1891) supposed. STAUDINGER'S "*sagina*" is an unpublished manuscript name used in his sales lists. *C. w sagina* was described as available for the first time by AUSTAUT (l.c.).

Type material and depository
The quantity of syntypes was not given by AUSTAUT (l.c.), but STAUDINGER (1892) mentioned that AUSTAUT described *C. w. sagina* from a single pair that he purchased from STAUDINGER under that name. Recently, the syntypic pair was found in the ROTHSCHILD collection in BMNH. In MNHU there is a topotypical series of 3 males and 8 females collected by MAURER in 1889.

The label data of the syntypes are as follows:

- male: [hand-written label] *Col. Wiskotti* Stgr / Var. *Sagina* Stgr / Stgr. Asie Centrale // [printed label] coll. Austaut // [printed label] Type // [printed red label] Syntype / *Colias wiskotti sagina* AUSTAUT, 1891 / det. by GRIESHUBER & WORTHY, 2006.
- female: [hand-written label] V. *Sagina* ♀ Asie Centrale // [printed label] coll. AUSTAUT // [printed label] Type // [printed red label] Syntype / *Colias wiskotti sagina* AUSTAUT, 1891 / det. by GRIESHUBER & WORTHY, 2006.

Type locality
According to AUSTAUT (l.c.) the type locality is "les hautes Alpes du Turkestan". STAUDINGER (l.c.) stated the type locality to be "Kara-Sagin Mts.", a misspelling of the Karategin Mts. The first male specimen of the topotypical series in Berlin has a label with the locality information "Kara Sagin", which confirms STAUDINGER'S (l.c.) statement. The phenotype (see below) suggests that *C. w. sagina* probably originates from the western part of the so-called Karategin Mountains. The type locality can be given only vaguely as: Tajikistan, Ghissar Range, the Karateghinsky Ridge northeast of Dushanbe or the mountains between this ridge and the mountains north of Dushanbe (Anzob Pass area?).

Status and variation
STAUDINGER (l.c) wrote that AUSTAUT did not know typical *C. wiskotti* and thought that Transalai *C. w. separata* was the typical race; this is why AUSTAUT described *C. w. sagina*. It is also possible that AUSTAUT'S mistake was the result of the poor illustration of STAUDINGER'S *C. w. wiskotti*, which is far too yellow on the plate. To confuse the situation further, STAUDINGER (l.c.) stated that *C. w. sagina* males are nearly identical to nominotypical *C. wiskotti*, but he described the females as nearly identical to *C. w. aurantiaca* STAUDINGER, 1892. On the other hand he stated that *C. w. aurantiaca* females are not very different from *C. w. wiskotti*. For some reason TUZOV et al. (l.c.) accepted *C. w. sagina* as the valid name for *C. wiskotti* from Darvaz, it has to be noted that the authors had not examined the syntypes or STAUDINGER'S topotypes. Furthermore, there is so little material known from Darvaz, that a definitive statement about the status of these *C. wiskotti* can only be highly speculative. TSHIKOLOVETS (2003 & 2005) placed *C. w. sagina* as a synonym of *C. w. separata*. D'ABRERA (1990) placed it as an infrasubspecific form of *C. w. separata*. Under this form he figured a white female from the Transalai collected by GRUM-GRSHIMAILO, which has a misleading "var. *sagina* STGR." label. This female is a syntype of *C. w. chrysoptera* (but see that entry). Misunderstanding of the rules of zoological nomenclature caused VERHULST (2000) to claim that *C. w. sagina* is an infrasubspecific form of *C. w. wiskotti*.

C. wiskotti sagina AUSTAUT, 1891 is considered to be a junior subjective synonym of nominotypical *C. wiskotti* STAUDINGER 1882, in agreement with GRUM-GRSHIMAILO (1907) as the first revising author. The male syntype and the male topotypes in STAUDINGER'S collection are identical to nominotypical *C. wiskotti*, except that they are on average slightly smaller. The female syntype and the female topotypes are also slightly smaller and the ground colour appears to be on average slightly darker, this is due to the fact that the wings have a little more greenish pigment; this also applies to the white females. Specimens similar to *C. w. sagina* are also known from other populations, e.g. from the Kumbel Pass (Turkestansky Range). The differences are insignificant and clearly within the variation of *C. w. wiskotti* (see that entry).

Distribution
See under *C. w. wiskotti.*

1.3 *Colias wiskotti separata* Grum-Grshimailo, 1888

"*Colias Wiskotti* Stgr. var. *separata* m." Grum-Grshimailo, 1888: Horae Societatis Entomologicae Rossicae **22**: 305 (type locality: "Montes Alaienses").

Note: The taxon was figured for the first time by Grum-Grshimailo (1890), together with a more detailed description.

Type material and depository
Grum-Grshimailo (1888) described *C. w. separata* from an unspecified quantity of male and female specimens (syntypes) that he collected in the Alai. Grum-Grshimailo's Transalai specimens have to be excluded (see below). Obviously the type series was very small, because he subsequently stated that this taxon is very rare (Grum-Grshimailo 1890). The male syntype figured by Verity (1911) is preserved in BMNH. No additional syntypes were found in BMNH, ZMKU, ZISP, MNHU or ZSM. All other syntypes are presumed to be lost.

Lectotype designation
Verity (1911 pl. LXXI, fig. 33) figured a syntypic male from "Balekty Sen, Alaï" [sic], captioned "e coll. Gr. Gr." as "type" of *C. w. separata*. This act does not constitute a valid lectotype designation under the provisions of the Code, because Verity recognised two types for each taxon, i.e. a male and a female type (Grieshuber & Worthy in prep.; see also under *C. w. seres*). The male syntype figured by Verity (l.c.) is designated here as the lectotype. It is a fairly fresh yellowish specimen with a slight orange flush on the forewing.

The label data are as follows:

– [Grum-Grshimailo's hand] Балакты р. [Balakty-Su / Balakty river] // [Grum-Grshimailo's hand] 26.VI.[18]84 // [Grum-Grshimailo's hand on pink paper] Alai. Balakty-Suu // [printed label] Coll. Gr.-Gr. // [printed label] Elwes Coll. 1902-85 // [printed label] Figuré par R. Verity / Rhopal. Palaearctica / Pl. [LXXI] / fig. [33] // [Hemming's hand] *C. wiskotti* var *separata* Gr-Gr. ♂ [and printed] agrees with figure [and hand-written] 3 a. Pl. IV Rom. Mem. IV [and printed] F.A.H.[emming]. // [small round red bordered printed label] Type [and hand-written] ? / *C. wiskotti separata* Gr Gr. // [printed red label] Lectotype / *Colias wiskotti separata* Grum-Grshimailo, 1888 / design. by Grieshuber & Worthy, 2006 – Coll. BMNH (type collection).

Paralectotypes
No paralectotypes have been found. A specimen ex coll. Felder (in coll. Rothschild in BMNH) labelled "v. *separata* Gr ", "type", and "Taschkent" is excluded from the type series; it does not fit the original description as it is an orangeish form which is rarely found in the Transalai. Although there is evidence that Felder personally received material from Grum-Grshimailo (unpublished letter from Grum-Grshimailo to Felder), there is no evidence that this specimen is a syntype of *C. w. separata*.

Type locality
The type locality "Montes Alaienses" given by Grum-Grshimailo (1888) is rather confusing, because in the same work he also used Alai and Transalai as type localities for various taxa. For this reason it could easily be assumed that "Montes Alaienses" is the generic term for Alai and Transalai, but this is not the case. Grum-Grshimailo (1885) considered the Transalai and the Alai to be separate mountain ranges, and on his Central Asia map from the Pamir monograph (Grum-Grshimailo 1890) the Transalai is not included in the "Monts Alai". Further evidence for this is that in the same paper that he described *C. w. separata* Grum-Grshimailo (1888), he also described the subspecies *C. wiskotti chrysoptera* Grum-Grshimailo, 1888, under which he included the Transalai specimens (see *C. w. chrysoptera*). Subsequently, Grum-Grshimailo (1890) corrected his mistake and placed the Transalai specimens under *C. w. separata*. This can be seen in the statement that most of his *C. w. separata* females he took not in the Alai, but in the Touz-Dari valley below Ters-Agar pass in the Transalai (see also under *C. w. leucotheme*).

For the reasons given above, the Transalai material has to be excluded from the type series, so only the Alai specimens are syntypic. The type locality is now governed by the lectotype, i.e. Balakty-Su. Balakty-Su

fig. 1

fig. 2

fig. 3

fig. 4

fig. 5

fig. 6

fig. 7

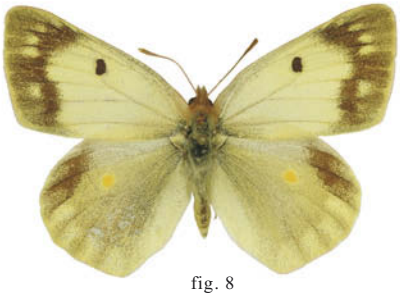

fig. 8

Figs 1-8: 1, ***C. w. wiskotti*** lectotype male (MNHU), **2–3,** ***C. w. wiskotti*** paralectotypes male, female (MNHU), **4–5,** ***C. w. sagina*** syntype male, female (BMNH), **6,** ***C. w. separata*** lectotype male (BMNH), **7,** ***C. w. aurantiaca*** lectotype male (MNHU), **8,** ***C. w. leucotheme*** syntypes female (BMNH).

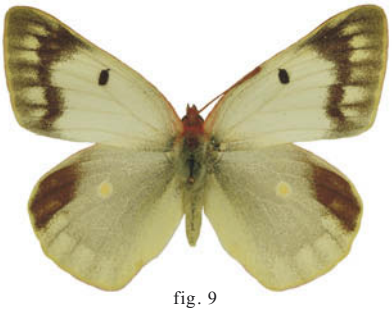

fig. 9

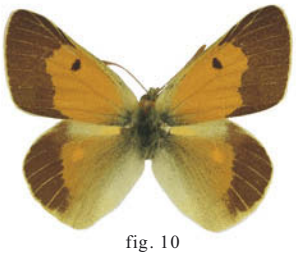

fig. 10

fig. 11

fig. 12

fig. 13

fig. 14

fig. 15

fig. 16

Figs 9-15: 9, *C. w. leucotheme* syntypes female (BMNH), **10, *C. w. chrysoptera*** lectotype (BMNH), **11-12, *C. w. chrysoptera*** paralectotypes female (BMNH), female (ZMKU), **13, *C. w. seres*** lectotype female (BMNH), **14, *C. w. tirichmirensis*** holotype (coll. ROSE), **15, *C. w. tirichmirensis*** paratype (coll. ROSE), **16, C. *w. aurea*** lectotype male (SMTD).

is not figured on any recent map, but GRUM-GRSHIMAILO (1885) gave more information on this locality. He wrote that he followed the Teckelik River and then the Balakty River to the foot of the Dschekaindy Mountain where he collected *C. wiskotti* and other butterflies. Comparing his writings with the map in his Pamir monograph (GRUM-GRSHIMAILO 1890), the Dschekaindy is near the Tengizbay Pass, to the north of Daroot-Korgon. In other words the type locality is: Kyrgyzstan, eastern Alai, near Tengizbay Pass (39˚40'N, 72˚08'E), upper stream of the Balakty River, at the foot of the Dschekaindy.

Status and variation
C. w. separata GRUM-GRSHIMAILO, 1888 is a fairly distinct subspecies of *C. wiskotti* STAUDINGER, 1882, which has narrower borders than the nominotypical subspecies. Instead of green or brownish-green, the ground-colour of the male is greenish-yellow, frequently with an orange flush. Orange males with only very little yellow pigmentation are rarely found. In the Aram Kungei area of the Transalai (see under *C. w. aurantiaca*) nearly all females are white, and only very few are orange or yellow, but orange or yellow females are generally very rare in this subspecies (about 1:10), although there may be some populations where a higher percentage are found. GRUM-GRSHIMAILO (1890) and STAUDINGER (1892) both mentioned the fact that orange females are rare in the Transalai. The latter received only one orange female from the Transalai together with many white specimens. GRUM-GRSHIMAILO (1890, pl. IV) figured an orangeish-yellow female from Transalai; this specimen is a syntype of *C. w. chrysoptera* (see that entry).

VERITY (1909) described the infrasubspecific form "palaenoides" from a yellowish male labelled "Tura" and an orange male from "Samarkand, Ms Ghissar". Both specimens are mislabelled, being typical *C. separata* males; the yellow male belongs to the common form, the orange to the rarer form of that taxon. The name bearing specimens are in ZMKU (TSHIKOLOVETS & KOSTJUK 1994).

Distribution
C. w. separata is distributed in the Alai and the Transalai ranges. Ongoing studies by the authors confirm that Transalai specimens belong to this subspecies, although some *C. w. aurea* specimens from the north-west Pamir are known which resemble the more orange specimens from Aram Kungei. This is contrary to the view taken by TUZOV et al. (l.c.), who stated that the Transalai populations probably represent a distinct subspecies. Various entomologists who regard the Transalai populations as distinct justify this by quoting the ratio of white and orange female forms, but different proportions of female phenotypes in different populations are not unusual in *Colias*, and there is no evidence that orange/yellow females are any more common in the Alai than the Transalai. Normally, a higher quantity of white females is caused by the climate of the biotope, and not by genetic differences. *C. w. separata* is also distributed in the Matcha Massif, which is part of the Turkestansky Range (see above). Parts of the Darvaz and Peter the Great (Peter I) Mountains are possibly populated by this subspecies, but due to the lack of material a definitive statement on its status is not possible. It seems that *C. wiskotti* is very rare and local in these mountains as very few specimens are known. TSHIKOLOVETS (2003) figured a pair of typical *C. w. separata* from "Peter the Great Mts., Tuptshak. It is also possible that specimens occur there that are similar to *C. w. aurea*, or intermediate forms between *C. w. separata* and *C. w. aurea.*

1.4 *leucotheme* GRUM-GRSHIMAILO, 1890

"*Colias Wiskotti* variété *leucotheme*" GRUM-GRSHIMAILO, 1890: In ROMANOFF: Mémoires sur les Lépidoptères **IV**: 350 – 351 (type locality: "Les défilès du Trans-Alaï occidental").

not "*Colias Leucotheme*" GRUM-GRSHIMAILO, 1890, In ROMANOFF: Mém. Lép. **IV**: 304 (nomen nudum).
not "*Col. Wiskotti* v.? *Leucotheme*." GRUM-GRSHIMAILO, 1890, In ROMANOFF: Mém. Lép. **IV**: 288 (nomen nudum).

Type material and depository
C. w. leucotheme was described from two female syntypes collected by GRUM-GRSHIMAILO in 1884 and 1886; one female is greyish-white, the other is a pale yellow similar to "*C. Palaeno* var. *Lapponica*" (GRUM-GRSHIMAILO 1890). GRUM-GRSHIMAILO (l.c, p. 288, footnote 151) wrote that he took 4 females of *C. w. leucotheme*, a "form" which was "so far problematic" for him. This is probably a lapsus, because he described the taxon from two females only. Investigations in BMNH and ZISP show that GRUM-GRSHIMAILO indeed collected more white females in the West Transalai (Aram Kungei and Kara-Su), but these are slightly different from his *C. w. leucotheme*. The authors identified the two females by comparing them with the

original description; both are in BMNH. Note: The syntypes of *C. w. leucotheme* were probably included in the syntypic series of *C. w. chrysoptera* (see that entry).

The label data of the syntypes are as follows:

- female: [GRUM-GRSHIMAILO'S hand] Kapa-Cy [Kara-Su], 19/VII [18]84 // [GRUM-GRSHIMAILO'S hand on pink paper] Kara-Su, Zaalai // [printed label] Elwes Coll. 1902-85 [and hand-written] ex GrGr coll. // [printed label] Determined from description F.A.H.[emming] [and HEMMING'S hand] 16.I.09, *C. wiskotti leucotheme* GrGr ♀ // [printed label] Figuré par R. Verity RHOPHAL. PALAEARCTICA Pl. [LXXI] fig. [35] // [printed rounded label with red border] Co-type // [printed red label] Syntype / *Colias* wisko*tti leucotheme* GRUM-GRSHIMAILO, 1890 / det. by GRIESHUBER & WORTHY, 2006. – coll. BMNH (type collection)
- female: Greyish-white female: [GRUM-GRSHIMAILO'S hand] Арамъ-Кунгей [Aram-Kungei] 12 VII.[18]86 // [GRUM-GRSHIMAILO'S hand] Aram Kung. Transalai // [printed label] Coll. Gr.-Gr. // [printed label] Elwes Coll. 1902-85 // [hand-written label] d. f. 2. *Leucotheme* G.-G. // [printed rounded label with red border] Type [and hand-written] *C. wiskotti leucotheme* Gr Gr // [printed red label] Syntype / *Colias wiskotti leucotheme* GRUM-GRSHIMAILO, 1890 / det. by GRIESHUBER & WORTHY, 2006. – coll. BMNH (main collection).

Type locality
GRUM-GRSHIMAILO (l.c.) gave the type locality as "Les défilès du Trans-Alaï occidental", i.e. the gorges of the western Transalai. GRUM-GRSHIMAILO (l.c.) stated that the collecting places of both specimens are to the north of the Ters-Agar Pass at a locality that he called Touz-Dari valley. The Ters-Agar is the pass (rather a plateau) between the Aram-Kungei valley and Altyn Mazar Pass, and the Touz-Dari valley is somewhere in the upper part of the Aram Kungei valley. According to the label data, one syntypic female is from Aram Kungei, and the other is from Kara Su (a spring), collected in the year 1884 on the way to the Altyn Dara, between the source of the Kara-Su and the headwaters of the Aram Kungei River. The Kara-Su collecting locality is very close to the headwaters of the Aram (Kungei) river, perhaps slightly to the north of it. However, both localities should be part of the same local population.

The type locality can be given as follows:

- Tajikistan, Transalai northern slopes, 20 km S Daroot-Korgon, Altyn Dara River valley, upper part of the Aram Kungei River valley (right tributary of the Altyn Dara River) near the Kara Suu source, probably not far away from the co-ordinates 39°25'N 72°18'E.

This locality is actually rather high for C. wiskotti; it is quite common lower down the valley at about 3,000 m but the type locality is at about 3,500 m. At this altitude only occasional specimens are found, which appear to be strays from the main colonies lower down (R. WORTHY pers. obs.).

Status and variation
The name is available and applicable to the Transalai populations. However, *C. w. leucotheme* GRUM-GRSHIMAILO, 1890 is within the variation of *C. w. separata* GRUM-GRSHIMAILO, 1888 and is therefore a junior subjective synonym of that taxon (see that entry). Note: It appears that GRUM-GRSHIMAILO (l.c.) was uncertain as to what status should be given to the taxon. Having first listed it as a subspecies of *C. wiskotti* (l.c., p. 288) then as a species of *Colias* (l.c., p. 304), in the description (l.c., p. 350-351) he said it is a "variety of *Wiskotti*, but which, in future may be recognised as a species very similar to *Wiskotti*" and "it's also not unlikely that these are only varieties of the ♀ of *Separata*".

TSHIKOLOVETS (2003 & 2005) placed *C. w. leucotheme* as a junior synonym of *C. w. separata*. TUZOV et al. (l.c.) considered it to be synonymous with *C. w. separata* from Alai, but then stated that the Transalai populations probably represent a distinct subspecies! VERHULST (2000-2001) misinterpreted the status and assigned the name to the white female form of *C. w. separata*, hence as infrasubspecific and unavailable.

Distribution
See under *C. w. separata.*

fig. 17

fig. 18

fig. 19

fig. 20

fig. 21

fig. 22

Figs 17-22: 17–18, *C. w. aurea* paralectotypes male (MNHU), female (ZSM), **19-20, *C. w. hofmannorum*** paratypes male (coll. ROSE), female (coll. ROSE)**, 21, *C. w. sweadneri*:** Afghanistan, Hazaradjat, Koh-i-Baba, Pandjao vic., 2,500m – male (coll. GRIESHUBER)**, 22, *C. w. sweadneri*** paratype male (BMNH).

fig. 23

fig. 24

fig. 25

fig. 26

Figs 23-26: 23, *C. w. draconis* lectotype male (BMNH), **24, *C. w. draconis*** paralectotype female (BMNH), **25, *C. w. rueckbeili*** syntype male (MNHU), **26, *C. alpherakii*** lectotype male (MNHU).

1.5 *aurantiaca* STAUDINGER, 1892

"*Colias Wiskotti* STGR. var.[ietas] (ab.[erration]) *Aurantiaca* STGR." STAUDINGER, 1892: Deutsche Entomologische Zeitschrift Iris **4**: 230-232 (type locality: "aus dem Transalai- und Kara Sagin-Gebirge").

Type material and depository
STAUDINGER (1892) described *C. wiskotti aurantiaca* from an unspecified quantity of male and female specimens (syntypes), collected by MAURER in 1886 in the Transalai and in 1889 in the Kara Sagin Mountains. The type material is deposited in NMHU. It consists of 3 male syntypes from the Transalai, and 3 male and 6 female syntypes from the "Kara Sagin" Mountains. No syntypes have been found in other museums. Syntypes sold by STAUDINGER are now impossible to identify (see above).

Lectotype designation
A lectotype designation is necessary for this taxon as the syntypes are from two different areas which could potentially represent two different subspecies. To avoid confusion the specimen selected for the lectotype here is a male from the Transalai, which has an original locality label hand-written by STAUDINGER (see above). It is a fairly fresh specimen with a little damage on the left forewing and hindwing. The forewings have an orange flush.

The label data are as follows:

– [STAUDINGER's hand on brown paper] Transalai [18]86 Maurer // [printed pink label] Origin[al]. // [printed label] ex coll. Staudinger [and hand-written] 1/12 // [printed red label] (Transalai, 1886, Maurer) / Lectotype / *Colias wiskotti aurantiaca* STAUDINGER, 1892 / design. by GRIESHUBER & WORTHY, 2006.

Paralectotypes
Each specimen will be provided with a printed red label similar to the lectotype, but with "Paralectotype" instead of "Lectotype". All paralectotypes have a printed "ex coll. Staudinger" label with a hand-written number from 2-12/14, and a locality label hand-written by Konrad EBERL.

Transalai series:
- 2 males: [small round brown label, made from the same paper as the locality label of the lectotype] / [printed pink label] Origin.[al].

Kara Sagin series:
- 1 male: [STAUDINGER's hand on brown paper] Kara Sagin [18]89 Maur.[er] // [printed pink label] Origin.[al]
- 2 males, 6 females: [small round brown label, made from the same paper as the locality label on one of the male specimens] // [printed pink label] Origin.[al].

Type locality
The collecting locality of the "Kara Sagin" (= Karategin) series is rather dubious, because the males are of a typical *C. w. separata* phenotype, but the female is of the Ghissar phenotype. It appears that the males and females were collected in different areas. It is quite possible that MAURER collected the females together with the *C. w. sagina* specimens in 1889, because the coloration is nearly identical to the *C. w. sagina* females in the STAUDINGER collection. The males were presumably collected further east in the Alai or Transalai. It is unlikely, but if the males and females were indeed collected together, the collecting locality should be in the eastern part of the Karategin Mountains, somewhere in a possible intermediate zone between *C. w. wiskotti* and *C. w. separata*. It should be investigated whether such females and males are found together in these mountains.

However, the collecting locality of the Karategin series is of no consequence, because the type locality is now governed by the lectotype, which is from the Transalai. Orange-flushed yellow specimens like the lectotype are well-known from the Aram-Kungei valley in the western Transalai. The Aram Kungei area was well explored by GRUM-GRSHIMAILO in 1884 and 1886 (GRUM-GRSHIMAILO 1885 & 1890). In the past nearly all *C. w. separata* from the Transalai were collected in the Aram Kungei area, because it was probably the easiest place in the Transalai to reach during that time. It is presumed that MAURER was also in the Aram Kungei area following the route described by GRUM-GRSHIMAILO (1885), although the authors have no evidence for this theory.

The type locality is provisionally fixed as follows:
- Tajikistan, Transalai northern slopes, 20 km S Daroot-Korgon, Altyn Dara River valley, Aram Kungei River valley (right tributary of the Altyn Dara River) at around 3,000 m, close to 39˚25'N, 72˚18'E [see note under *C. w. separata*].

Status and variation
Colias wiskotti aurantiaca STAUDINGER, 1892 is a junior subjective synonym of *C. w. separata* GRUM-GRSHIMAILO, 1888 and of *C. w. leucotheme* GRUM-GRSHIMAILO, 1890 (see that entry). STAUDINGER's (1892) notes on *C. w. sagina* and *C. w. aurantiaca* are rather complicated and confusing, and only investigation of the type material made it possible to resolve these taxa. He wrote that *C. w. aurantiaca* males differ from the rather similar, but predominantly sulphurous yellow *C. w. separata* in their completely yellowish-orange colour. The lectotype and the two paralectotypes are indeed a bit more orange; one male is completely orange on the forewing upperside. The coloration slightly resembles the orange colour of *C. w. aurea* from the Vanchsky Mountains, but as stated above such males can also be found in the Aram Kungei valley. STAUDINGER (l.c.) obviously doubted whether he should describe *C. w. aurantiaca* as new, because he stated that he did not know whether the *C. w. aurantiaca* specimens were collected together with typical *C. w. separata* or in another locality. STAUDINGER's doubts are also reflected by his use of the words "var.[ietas or] (ab.[erration]) *Aurantiaca* STGR."

This taxon has been treated in various ways in the past, this was as a result of STAUDINGER's (l.c.) complicated and confusing description, and failure to investigate the type material. GRUM-GRSHIMAILO (1907) placed it as a junior synonym of *C. w. seres*, and TSHIKOLOVETS (2003 & 2005) as a junior synonym of *C. w. separata*. TUZOV et al. (l.c.) considered it synonymous to Alaian *C. w. separata*, but then he stated that the Transalai populations probably represent a distinct subspecies! VERHULST (2000) gave a rather peculiar version by placing the available taxon as an unavailable infrasubspecific form of *C. w. separata.*

Distribution
See under *C. w. separata*.

2. The Pamir – Hindukush group

Notes on the territory
The Pamir-Hindukush group contains the taxa *C. w. chrysoptera* GRUM-GRSHIMAILO, 1888, *C. w. seres* GRUM-GRSHIMAILO, 1890, *C. w. aurea* KOTZSCH, 1936, *C. w. tirichmirensis* ROSE, 2001 and *C. w. sweadneri* CLENCH & SHOUMATOFF, 1956. This group is distributed in the east and west Pamir, the Hindukush Range and the Koh-i-Baba Mountains (Kuh-i-Baba). The Koh-i-Baba Mountains to the west of Kabul are populated by some endemic butterfly species, but some typical Hindukush species also occur there. It is separated from the Hindukush Range by deep, wide river valleys, but the authors are unsure whether or not it belongs geologically to the Hindukush system. Because of the similarity of *C. w. sweadneri* and *C. w. aurea* both are provisionally included in the same group. The taxon *C. w. hofmannorum* ECKWEILER, 2000 shows some similarities to this group, but because it is geographically well-separated from *C. w. sweadneri* it is provisionally placed in its own group. It has to be noted that the large mountainous region to the west of the Koh-i-Baba Mountains is largely unexplored. It is highly probable that *C. wiskotti* has a much wider distribution in this area than is known, and the missing link between *C. w. sweadneri* and *C. w. hofmannorum* could well be found there. Only two specimens are known from north-western Afghanistan, which were determined by CLENCH & SHOUMATOFF (1956) as *C. w. sweadneri*, but see that entry.

2.1 *Colias wiskotti chrysoptera* GRUM-GRSHIMAILO, 1888

"*Colias Wiskotti* STGR. var. *Chrysoptera*" GRUM-GRSHIMAILO, 1888: Horae Societatis Entomologicae Rossicae **22**: 305 (type locality: "Roschan (Afghanistan), Transalai (var. ??), Sarykol").

Type material and depository
GRUM-GRSHIMAILO (1888) described *C. w. chrysoptera* from an unspecified (small) quantity of male and female specimens (syntypes), that he collected in 1884 and 1886 in the Transalai, and in 1887 in the Pamir and the Sarykol [sic] - NE Hindukush. The syntypic series comprises specimens from three different populations which are currently assigned to different subspecies: *C. w. chrysoptera*, *C. w. separata* (Transalai), and *C. w. seres* (NE Hindukush). He described *C. w. chrysoptera* as a small variety, which is perfectly correct for the east and central Pamir specimens, but not for the much larger Transalai specimens. The original statement of the type locality – "Transalai (var. ??)" – indicates that he was uncertain about the status of the Transalai specimens; the question marks can be interpreted to mean that he only provisionally included them in the type series. The reason that GRUM-GRSHIMAILO included the Transalai *C. wiskotti* under *C. w. chrysoptera* was because he took a single orange male in 1884 in the Aram Kungei valley (GRUM-GRSHIMAILO 1890). The consequence of his inclusion of the Transalai specimens is that the two white females later described as *C. w. leucotheme* are syntypes of *C. w. chrysoptera*. Subsequently, as the first revising author, GRUM-GRSHIMAILO (l.c.) corrected the mistake; he restricted the taxon *C. w. chrysoptera* to the specimens from Roschan and determined the Transalai specimens as *C. w. separata*, except for the two females described as *C. w. leucotheme*. Without a lectotype designation for *C. w. chrysoptera* this act has no effect.

The lectotype, 4 male and 7 female paralectotypes are in BMNH, there is 1 female in ZMKU and 1 female in ZISP. No type material has been found in the STAUDINGER collection in NMHU.

Lectotype
HAUGUM (2001) designated a lectotype for the nominal taxon *C. w. chrysoptera* from Kudara. For this he used the smallest specimen of the series, figured by VERITY (1911). The label data were incompletely given by HAUGUM (l.c.).

They are as follows:

– [GRUM-GRSHIMAILO'S hand] Кудара [Kudara], 17.VI.[18]87 // [GRUM-GRSHIMAILO'S hand] Kudara // [hand-written label] 24. // [hand-written label] var. *Chrysoptera* Gr Gr // [printed label] Elwes Coll. 1902-85 // [printed label] Coll. Gr.-Gr. // [printed label] Determined from description F.A.H.[emming], [and hand-written] 16.I.09 / *Colias wiskotti* var *chrysoptera* Gr Gr ♂ // [printed label] Figuré par R. Verity, RHOPAL. PALAEARCTICA Pl. [LXXI] fig.[36] // [red-bordered, round printed label] Type [and hand-written] *C. wiskotti chrysoptera* Gr Gr, ♂ // [printed red label] Lectotype / *chrysoptera* GRUM-GRSHIMAILO, 1888 / HAUGUM design. 2001. – Coll. BMNH (type collection).

Paralectotypes

Most of the paralectotypes were unknown to HAUGUM, and he did not provide labels for those specimens of which he was aware. This will be done by the authors with a label reading: Paralectotype / *Colias wiskotti chrysoptera* GRUM-GRSHIMAILO, 1888 / det. by GRIESHUBER & WORTHY, 2006. The paralectotypes referable to *C. w. separata* and *C. w. seres* will also be provided with appropriate labels. To avoid further confusion a full list of the specimens found, with their label data, is given below for the first time.

Kudara (Roschan) syntypes referable to *C. w. chrysoptera*:

- 1 male: [GRUM-GRSHIMAILO's hand] Кудара [Kudara], 17.VI.[18]87 // [GRUM-GRSHIMAILO's hand] Kudara // [printed label] Elwes Coll. 1902-85 // [printed label] Coll. Gr.-Gr. // [printed label] Figuré par R. Verity, RHOPAL. PALAEARCTICA Pl. [LXXI] fig.[38]. - Coll. BMNH (main collection).
- 2 males: [GRUM-GRSHIMAILO's hand] Кудара [Kudara], 17.VI.[18]87 // [GRUM-GRSHIMAILO's hand] Kudara // [printed label] Elwes Coll. 1902-85 // [printed label] Coll. Gr.-Gr. - Coll. BMNH (main collection). –1 male: [GRUM-GRSHIMAILO's hand] Кудара [Kudara], 17.VI.[18]87 // [GRUM-GRSHIMAILO's hand] Kudara. – Coll. BMNH (main collection).
- 1 female (orange): [red-bordered, round printed label] Type [and hand-written] *C. wiskotti chrysoptera* Gr Gr, ♀ // [GRUM-GRSHIMAILO's hand] Кудара [Kudara], 17.VI.[18]87 // [GRUM-GRSHIMAILO's hand] Kudara // [hand-written label] 25 // [printed label] Determined from description F.A.H.[emming], [and hand-written] 16.I.09, *Colias wiskotti* var. *chrysoptera* Gr Gr ♀ // [printed label] Elwes Coll. 1902-85 // [printed label] Coll. Gr.-Gr. // [printed label] Figuré par R. Verity, RHOPAL. PALAEARCTICA Pl. [LXXI] fig.[37]. - Coll. BMNH (type collection).
- 1 female (white): [GRUM-GRSHIMAILO's hand] Кудара [Kudara], 17.VI.[18]87 // [GRUM-GRSHIMAILO's hand] Kudara // [printed label] Determined from description F.A.H.[emming], [and hand-written] 16.I.09, *Colias wiskotti* var *chrysoptera* ab ♀ leuca Gr-Gr. // [printed label] Elwes Coll. 1902-85 // [printed label] Coll. Gr.-Gr. Coll. BMNH (main collection).
- 1 female (white): [SHELJUZHKO's hand] *chrysoptera* Gr. ♀ *alba* Verity., Kudara, Roshan, Gr.Gr., 17.VI.[18]87, [and printed] e coll. Deckert, coll. L. Sheljuzhko. - Coll. ZMKU; figured by TSHIKOLOVETS (2001, pl. XXVII, fig. 1).

Sarykol syntypes referable to *C. w. seres*

1 female (orange): = lectotype of *C. w. seres* – see that entry.

Transalai syntypes referable to *C. w. separata*

- 2 females (white): = syntypes of *C. w. leucotheme* – see that entry
- 1 female (white): [GRUM-GRSHIMAILO's hand] Арамъ Кунгей [Aram Kungei] / 6.VII.[18]86 // [GRUM-GRSHIMAILO's hand] Aram Kung[ei] Transalai // [hand-written black bordered label] var. *Sagina*. STGR. // [printed label] Elwes Coll. 1902-85 // [printed label] Coll. Gr.-Gr. - Coll. BMNH (main collection).
- 1 female (yellowish-orange) [GRUM-GRSHIMAILO's hand] Zaalai / Kisil-Kungei-ssu // [hand-written black bordered label] var. *separata* GrGr // [printed label] Elwes Coll. 1902-85 // [printed label] coll. Gr.-Gr. // [HEMMING's hand] *Colias wiskotti* var *separata* Gr Gr [and printed] agrees with figure [and hand-written] 3 b Pl IV Rom. Mem IV [and printed] F.A.H.[emming] // [printed label] Figuré par R. Verity, RHOPAL. PALAEARCTICA Pl. [LXXI] fig.[33] // [red-bordered round printed label] Type [and hand-written] *C. wiskotti separata* Gr Gr, ♀ // - Coll. BMNH (type collection). Note: This is clearly the specimen used for the figure of the *C. w. separata* female in GRUM-GRSHIMAILO's (1890) Pamir book.
- 1 female (white): [GRUM-GRSHIMAILO's hand] Кара-Су [Kara-Su] // [printed label with crown] Колл.[екция] Вел.[икого] Князя Николая Михайловича [Coll. Grand Duke Nikolas Mikhailovich]. – Coll. ZISP.

Excluded specimens:

- 1 female ex coll. GRUM-GRSHIMAILO from "Tura?" deposited in BMNH is excluded from the type series, although it fits *C. w. chrysoptera* the locality is not mentioned in the original description.
- 1 male ex coll. FELDER (in BMNH, coll. ROTHSCHILD) labelled "var. *chrysoptera*" (orange *C. w. separata* specimen) is also excluded. Although there is evidence that FELDER received material from GRUM-GRSHIMAILO (unpublished letter from GRUM-GRSHIMAILO to FELDER), there is no evidence that it is a syntype of *C. w. chrysoptera*.

Type locality

The type locality is governed by the locality data of the lectotype, i.e. Kudara. Being unaware of GRUM-GRSHIMAILO's (1890) map, HAUGUM (2001) gave the type locality incorrectly. In the original description GRUM-GRSHIMAILO (1888) considered the Kudara area to be part of the Roschan, but later he (GRUM-GRSHIMAILO 1890) corrected it to the "extreme north-west of the central Pamir, on both sides of the Koudara Mountains". Comparing GRUM-GRSHIMAILO's map (l.c.) with the "ONC G 6" map, the type locality can be

restricted to a mountain massif of the Kudara Mountains; GRUM-GRSHIMAILO seems to be the only person to have used this name for the mountains that he explored extensively. Here he found *C. wiskotti* on both sides of this mountain massif. Note: there is a village named Kudara (Gudara/Popiz) at 38˚34'06''N, 72˚40'46''E, and there is a mountain called Kudara at 38˚36'N, 72˚47'E; however, according to his map GRUM-GRSHIMAILO did not collect insects at these localities. Mount Kudara is to the north of the Kokuybel River but GRUM-GRSHIMAILO'S Kudara Mountains are to the south of the river. In a modern transcript the type locality is: Tajikistan, east Pamir, the "Kudara Mountains" some 35 – 50 km south of Karakul Lake, approximately between the co-ordinates 38˚25'-38˚35'N and 73˚07'-73˚20'E.

For the collecting localities of the paralectotypes from the Transalai see under *C. w. separata* and *C. w. leucotheme*; the collecting locality of the Sarykol specimen is given under *C. w. seres*.

Status and variation

C. w. chrysoptera is a well-defined small subspecies, of an orange-ochre, sometimes greenish colour. The type series in London is indeed a good match for the small *C. wiskotti* specimens which fly in the East Pamir. The lectotype and the paralectotype female figured by VERITY (1911) are the smallest specimens in the type series. GRUM-GRSHIMAILO (1890) gave the wingspan of Kudara specimens as 50 mm, and the smallest specimen is just 38 mm. HAUGUM (l.c., & pers. comm.) determined the lectotype and three paralectotypes from photographs only, so he did not appreciate the very small size of this taxon. He also misinterpreted the type locality and phenotype of *C. w. seres*, which he incorrectly considered to be the smallest *C. wiskotti* (see under *C. w. seres*). ROSE (2001) & HAUGUM (l.c.) incorrectly believed that *C. w. chrysoptera* is a large subspecies distributed in the Central Pamir, but in reality it is the small subspecies from the East Pamir. The pair from the Sarykol Range, Toktamysh, figured by ROSE (l.c.) under the name *C. w. seres*, is a perfect match for *C. w. chrysoptera*. TSHIKOLOVETS (1997) also misinterpreted these taxa; on the distribution map he figured the collecting localities of *C. w. chrysoptera* under the name of *C. w. seres*, but he correctly placed the type locality of *C. w. seres*. The specimen from "Bodom" figured by VERHULST (2001) under *C. w. chrysoptera* belongs to the *C. w. aurea* population group. In recent literature only TUZOV et al. (l.c.) correctly applied the name *C. w. chrysoptera* to the East Pamir populations, but they did not mention the taxon *C. w. seres*.

Distribution

The taxon is distributed in the East and Central Pamir and the Sarykol Range. Note: the taxon *C. w. seres* is not from the Sarykol Mountains, but see that entry. GRUM-GRSHIMAILO (l.c.) correctly assumed that the small *C. w. chrysoptera* also flies to the south of the Kudara Mountains. As well as the Kudara region, it is well known from the vicinity of Tokhtamysh in the SE Pamir. Typical small *C. w. chrysoptera* are also known from the Severo-Alichurskiy Mountains (Yashikul Lake), which seems to be rather a westerly locality for the taxon. Specimens from Rushanskiy and Shugnanskiy are different from the small East Pamir phenotype (*C. w. chrysoptera*); they are very closely related to and probably identical to the subspecies *C. w. aurea*, which is distributed in the Hindukush and the West Pamir. As can be seen in various other butterfly species, the Rushanskiy and Shugnanskiy region, and other parts of the West Pamir, belong to the same zoogeographical district as the Hindukush Mountains. On the other hand, the East Pamir is a well-expressed, distinct zoogeographical district which is inhabited by endemic flora and fauna (CHURKIN pers. comm.). The intermediate zone between the Hindukush phenotype from the West Pamir (*C. w. aurea*), and the small East Pamir phenotype seems to be very narrow, but further investigation is necessary to establish the exact distribution.

2.2 *Colias wiskotti seres* GRUM-GRSHIMAILO, 1890

"*Colias Wiskotti* var. *Seres*" GRUM-GRSHIMAILO, 1890: In ROMANOFF: Mémoires sur les Lépidoptères **IV**: 352-353 (type locality: "les alentours de Goudjabai, sur les pentes N. E. des monts Kounjout", "riv.[ière] Mazar dans le Sarikol", and "Sarikol").

Type material and depository

GRUM-GRSHIMAILO (1890) stated that he collected a single well-preserved female and 2 or 3 very badly damaged males at the beginning of July [1887] (syntypes). This statement leads us to believe that the whole series was not available to him when he described the taxon, as he could not remember the total number of males. As he described the taxon only 3 years after discovering it, it is presumed that he remembered precisely the phenotype of the sold or exchanged specimen(s). It is assumed that he studied all 3 specimens, so they are all syntypes. Note: GRUM-GRSHIMAILO (1888) studied the *C. w. seres* syntypes for the description

of *C. w. chrysoptera* under which he had previously included it, so they are also paralectotypes of *C. w. chrysoptera* (HAUGUM l.c. – see under *C. w. chrysoptera*).

None of the males have been found in BMNH, ZISP, ZMKU or MNHU; they are presumed to be lost or impossible to identify. It is possible that GRUM-GRSHIMAILO could have discarded the poor quality specimens, as hardly any worn GRUM-GRSHIMAILO material is known. The female is in BMNH in the type collection.

Lectotype designation

The female syntype was figured by VERITY (1911, pl. LXXI, f. 34) as "type" of *C. w. seres*. HAUGUM (l.c.) misinterpreted Art. 74 of the Zoological Code (ICZN 1999) and regarded VERITY'S use of the term "type" as a valid lectotype designation. In his Rhopalocera Palaearctica VERITY (1905-1911) never expressly stated that any selected specimen was the only type, but Art. 74.5 clearly demands that the term lectotype, or an exact translation or equivalent expression (e.g. "the type"), should be used. VERITY'S concept of types was confused; he recognized two types for each taxon: a male type and a female type, and when they were available to him he figured them both. He did not recognize just a single name-bearing type – equivalent to a holotype or lectotype. When VERITY (l.c.) used the term "le type" it means only that he had no specimen of the opposite sex available, such an act cannot therefore be regarded as an inadvertent but valid lectotype designation. In taxa that he did not describe (e.g. *C. w. seres*) he only quoted the label data; this cannot be a valid lectotype designation. VERITY'S intention was clearly to have both a male and a female type, if the intentions of the author are ignored in such cases, a huge amount of inadvertent and questionable lectotype designations would be created; this cannot be in the interest of stability as the Zoological Code demands (GRIESHUBER & WORTHY in prep.). HAUGUM'S (l.c.) action cannot be regarded as an "inadvertent lectotype designation" because he clearly and erroneously ascribed the designation to VERITY (Art. 74.4, 74.7).

To preserve stability and to avoid any further confusion in the phenotype and the type locality, the female is herein designated as the lectotype. The male syntypes of this taxon are not available, but it is possible that they are not from the same locality as the female because GRUM-GRSHIMAILO collected everywhere along his travel route. The information on the locality labels of GRUM-GRSHIMAILO'S butterflies is frequently much more accurate than in his descriptions. The southern end of the distribution of the small subspecies *C. w. chrysoptera* is obviously very close to the distribution of a much bigger *C. wiskotti* phenotype. It is possible that the males are of an intermediate character if they were collected a few km further north than the female. The label data of the lectotype are: [GRUM-GRSHIMAILO'S hand] Мазар-Дарья [Mazar-Darya (Mazar Darya River)], 9.VII.[18]87 // [GRUM-GRSHIMAILO'S hand] Sarykol // [hand-written label] var. *Seres*. Gr Gr. // [printed label] Elwes Coll. 1902-85 // [printed label] Determined from description F.A.H.[emming], [and HEMMING'S hand] 16.I.09, *C. wiskotti* var *seres*. Gr. Gr. ♀ Type // [printed label] Figuré par R. Verity, RHOPAL. PALAEARCTICA Pl. [LXXI] fig.[34] // [red-bordered, round printed label] Type [and hand-written] *C. wiskotti seres* Gr Gr, ♀ // [printed red label] Lectotype / *Colias wiskotti seres* GRUM-GRSHIMAILO, 1890 / design. by GRIESHUBER & WORTHY, 2006.

Type locality

According to GRUM-GRSHIMAILO (1890) the type locality is around Goudjabai, on the north-east slopes of the Kounjout Mountains, in the same work he rendered it more precisely as the "Mazar River in Sarikol [Sarykol]". The arrangement of the mountain ranges in the region of the type locality is very confusing because the main ranges of the Pamir, Karakorum and Hindukush all meet in this region; in the zone where they meet it is impossible to separate the ranges purely by using maps. The Kounjout Mountains where the type locality is situated, and the Kandoor Mountains, are minor ridges at the western end of the Karakorum Range. The southern end of the Sarykol Range is to the north of Kurgan-Goudjabai in the area of the Beik pass; therefore the stated locality of Sarykol, and the Sarykol label are lapses by GRUM-GRSHIMAILO. Surprisingly, (GRUM-GRSHIMAILO l.c.) did not figure the Sarykol Range on his map, so it is possible that his Sarykol is not a mountain range, but a loose area designation for the territory around the intersection of the above-mentioned mountain ranges.

The female lectotype has one extra label which was unknown to HAUGUM (l.c.). GRUM-GRSHIMAILO wrote Mazar-Darya on this label in Russian, in other words the Mazar Darya River. This was the first label that he wrote; he later added the lilac label with the name Sarykol. It has been confirmed that the lilac and green labels were later additions to many other butterflies collected by GRUM-GRSHIMAILO. The first and most important label is a tiny yellowed label with very small hand-writing; these labels are very difficult to see because GRUM-GRSHIMAILO "pressed" them on the pin directly onto the underside of the thorax of the specimens. These small hand-written Russian language labels are the most important labels for correct identification of type localities.

The Mazar-Darya River (Mazar River) is shown on GRUM-GRSHIMAILO'S (l.c.) map, it is the river which flows from the Kunjerab Pass towards "Kourgan-Goudjabai" (A-chich-k'o-ap-i/Aijiekebayi, 37˚12'N,

75˚22'E). Kurgan-Goudjabai is at the confluence of the Mazar River and the Myn-teke River (Ming-t'ieh-kai). According to his map, the part of the river where GRUM-GRSHIMAILO collected the lectotype female is half-way between the "Monts Kounjout" and "Monts Kandoor". The type locality is between Kurgan-Goudjabai and the place where he stopped and turned back from his long Pamir trip (some 30 – 35 km SSE of Kurgan-Goudjabai). In other words the type locality is: China, Xinjiang, eastern slopes of the NW Karakorum Range, on the slopes to the west (Kounjout Mountains) or east (Kandoor Mountains) of the Mazar-Darya River, SSE of Kurgan Goudjabai/A-chich-k'o-ap-I, approximately between the coordinates 37˚12'N, 75˚22'E and 36˚57'N, 75˚33'E.

Status and variation
C. w. seres is considered to be an available subspecies of *C. wiskotti*, but it has to be noted that due to the lack of material, its relationship with the subsequently described *C. w. aurea* cannot be confirmed. Topotypical material of this taxon has never again been collected. The subspecies *C. w. seres* is much bigger than *C. w. chrysoptera*, being of the same size as subspecies *C. w. separata* and *C. w. aurea*; also the specimens are more orange, as confirmed by the lectotypic female. GRUM-GRSHIMAILO'S (l.c.) description and the preserved female are a good match for *C .w. aurea* from the West Pamir and the Hindukush Range. Females of the colour of this lectotype can be found in every *C. w. aurea* population, and also occasionally in *C. w. separata*. The distribution ranges of. *C. w. seres* and *C. w. aurea* are close to each other as both fly in the same zoogeographical district. Further investigation is necessary to prove whether *C. w. seres* is indeed genetically separated from *C. w. aurea*. However, if *C. w. aurea* proves to be identical to *C. w. seres* the latter name takes priority by 46 years.

ROSE (l.c.) & HAUGUM (l.c.) misinterpreted the phenotype of *C. w. seres*; they regarded the small *C. wiskotti* from the Sarykol Range to be *C .w. seres*, but these are clearly *C. w. chrysoptera* (see that entry). This misinterpretation was due to the fact that: the authors knew the syntypes only from photographs, and GRUM-GRSHIMAILO (l.c.) erroneously gave the locality information "Sarykol" (see above). VERHULST (2000) inexplicably listed *C. w. seres* as a junior synonym of *C. w. separata* (from Alai), but provided no argument for that disposition. Under *C .w. chrysoptera* he stated that he saw "On the slopes, N-E of Mt. Kounjount, in Goudjabai vic.[inity]" *C. wiskotti* which were close to the Transalaian specimens; what VERHULST didn't realise is that he actually saw genuine *C . w. seres* in the region of the type locality, although he did cite the type locality.

Distribution
C. w. seres is only known from the type locality, this is probably at the eastern end of the distribution of the large "*aurea*" phenotype (see under *C. w. aurea*).

2.3 *Colias wiskotti aurea* KOTZSCH, 1936

"*Colias wiskotti aurea* subsp. n." KOTZSCH, 1936: Entomologische Rundschau **54** (5): 45 (type locality: "Ost-Hindukusch, Nordseite, Alpenwiesenzone, 3500 bis 3800 m").

Type material and depository
KOTZSCH (1936) described *C. w. aurea* from an unspecified but obviously large number of males and females that he and his wife collected in 1936. He named the white female form ab. "*blanda*". Most of the known type material is from the Nuksan Pass, he collected some specimens in Sebak a month earlier, and one specimen is known from the Chodja-Mahomed Mountains (HAUGUM in litt.). In KOTZSCH'S mind all of these localities are in the "Ost-Hindukusch". KOTZSCH (l.c.) quoted none of these collecting localities in the description, but he gave the altitude as being between 3,500 – 3,800. The altitude on the locality label of most of the Nuksan specimens is given as 3,500 – 4,000 m; in only a few of the syntypes is the altitude identical to the original description. Except for the different altitude information all of the other information on the Nuksan labels is identical, this is considered to be a lapse by KOTZSCH when he prepared the labels. Another lapse is that in the original description he gave the locality as "Ost-Hindukusch", but "Nord-Ost-Hindukusch" is written on all the labels. There is no doubt that he included all the specimens he collected in the type series, because they were all provided with "Co-Type" labels prepared by KOTZSCH himself. Note: whether the Sebak and Chodja-Mahomed specimens are indeed syntypic is of no consequence, because the lectotype has been selected from the Nuksan specimens.

There are 26 male and 6 female syntypes in SMTD (NEKRUTENKO 2003), 2 males and 1 female in MNHU, 1 male and 1 female in ZMKU, 4 males and 4 females in ZSM, and 1 male and 1 female in coll. WITT (Munich); 15 specimens are in SMFL (NÄSSIG pers. comm.; probably 7 males and 8 females), 2 specimens ex coll. BARI in Museo Civico di Storia Naturale in Genova (RAINERI & CARNEVALE 1998), and

one pair in coll. GRIESHUBER (Bad Griesbach). According to HAUGUM (pers. comm.) there is also a pair in coll. SJÖBERG, 2 pairs in coll. LAY, 2 males and one female in coll. KITSCH, 4 males in coll. HOFMANN, and a male ex. coll. Groenendael in Institut voor Systematiek en Populatiebiologi in Amsterdam

Lectotype designation
In her catalogue of the type material deposited in SMFL, FRANZ (1955) noted and figured a male of *C. w. aurea* as "Typus". Furthermore she counted 11 "Paratypoide" (paratypes) and 3 "Cotypen" of the infrasubspecific form "blanda", which are also part of the *C. w. aurea* type series. FRANZ'S concept of types did not meet the standards of the Code of Zoological Nomenclature: e.g. she designated lectotypes for various unavailable taxa, and for taxa that she believed were described from single specimens. In the tradition of BANG-HAAS and VERITY she accepted both a syntypic male and female specimen as types if the taxon was described from both sexes. All other syntypic specimens from a type series she called co-types or paratypes. The Zoological Code (ICZN 1999) clearly demands that "in a lectotype designation made before 2000, either the term "lectotype", or an exact translation or equivalent expression (e.g. "**the type**"), must have been used or the author must have unambiguously selected a particular syntype to act as the unique name-bearing type of the taxon". There is no explicit indication that she was selecting that particular specimen from the type series to serve as the name-bearing type. FRANZ'S figured "Typus" has a hand-written label with the number 2123, but NÄSSIG (pers. comm.) could not identify that specimen in SMFL.

The Nuksan Pass (Hindukush) syntypic series (from where most of the syntypes originate) also contains greenish specimens similar to *C. w. tirichmirensis*, but they are not so frequent (see under *C. w. tirichmirensis*). Green pigmented specimens are also known from the West Pamir, but none of these are as dark as some of the Tirich Mir (Hindukush) specimens. The Chodja-Mahomed syntypes should be identical to the West Pamir specimens. The authors consider this colour variation to be an ecological variation, but they have no proof of this. To preserve stability a male specimen from the Nuksan Pass is herein designated as the lectotype. In agreement with recommendation 74 D of the Code (ICZN 1999), a specimen from KOTZSCH'S own collection has been used. KOTZSCH was a well-known dealer who bought the insect trading company STAUDINGER & BANG-HAAS. All of KOTZSCH'S unsold material was later purchased by SMTD. A fresh male specimen with a typical co-type label prepared by KOTZSCH himself has been selected for the lectotype. The few specimens in SMTD that were available to the authors and that are labelled 3,500 – 3,800 m are in worse condition. Because there is no doubt about its syntypic status (see above), priority was given to a fresh specimen from 3,500 – 4,000 m which perfectly fits the original description.

The label data of the lectotype are: [printed label on white paper] Nord-Ost-Hindukusch / Nuksan-Pass-Nordseite / Alpenwiesenzone / 3500-4000 m / Mitte Juli / leg. H. & E. Kotzsch // [printed label on red paper] Co-Type / e Collection Kotzsch // [printed label] 351. // [printed label on white paper] Coll. Staudinger & Bang-Haas, Dresden, Ankauf 1961 // [printed label] Staatl. Museum für Tierkunde Dresden // [printed label on yellow paper] aurea Kotzsch, 1936 / SYNTYPUS / Y. Nekrutenko det. 14.08.2002 // [printed label on red paper] Lectotype / *Colias wiskotti aurea* KOTZSCH, 1936 / design. by GRIESHUBER & WORTHY, 2006.

Paralectotypes
Due to the quantity of paralectotypic specimens, and because they can all be easily identified, only 4 different kinds of label will be quoted here. The label data of the SMTD specimens were cited by NEKRUTENKO (2003) and those from Kiev by TSHIKOLOVETS & KOSTJUK (1994). Most of the specimens have a printed red or pink label reading "Co-Type" e Collection Kotzsch". Each specimen will be provided with a printed red label similar to the lectotype, but with Paralectotype instead of Lectotype.

- [printed label] Nord-Ost-Hindukusch / Nuksan-Pass-Nordseite / Alpenwiesenzone / 3500-3800 m / Mitte Juli / leg. H. & E. Kotzsch
- [printed label] Nord-Ost-Hindukusch / Nuksan-Pass-Nordseite / Alpenwiesenzone / 3500-4000 m / Mitte Juli / leg. H. & E. Kotzsch
- [printed label] Badachschan / Sebak-Tal / Alpenwiesenzone / 2800-3000 m / Mitte Juni / leg. H. & E. Kotzsch
- Chodja-Mahomed / Geröllzone / 3800-4000m; exact data unknown to the authors – mentioned in a manuscript by JAN HAUGUM

Type locality
According to the label data the type series was collected in at least 3 different localities. KOTZSCH collected very few specimens in the Chodja Mahomed Mountains (Khvajeh-Mohammad / Khodja Mahomet / Khwaja-Mohammed) between 3,800 and 4,000 m. It is presumed that he travelled from Zebak towards Feyzabad or from Feyzabad towards Zebak, where he crossed the northern end of the Khodja Mahomet mts. The collecting locality should be some 15 – 20 km SE of Feyzabad around 37˚03'N, 70˚45'E. The second

collecting locality is in the Sebak Valley; this is somewhere in the vicinity of Zebak/Zibak (36˚30'N, 71˚19'E), it is probably the valley from Zebak heading towards the Nuksan Pass.

However, the type locality is now governed by the lectotype, which is from the northern side of the Nuksan Pass. The Nuksan Pass is not shown on any available recent map; only SAKAI (1981) shows the approximate location of this pass on a small map that he drew. Once again a little known locality can be found on GRUM-GRSHIMAILO'S (1890) excellent map. Comparing his map with the ONC G6 map the pass can be more or less exactly located. The Nuksan Pass is on the border between Afghanistan and Pakistan at approximately 36˚20'N, 71˚35'E at an altitude between 4,300 and 4,600 m. The type locality can be given as follows: Afghanistan, Badachshan, Hindukush Range, just below the northern side of the Nuksan Pass, 3,500 – 4,000m, near 36˚20'N, 71˚35'E.

Status and variation
The taxon is provisionally accepted as a subspecies of *C. wiskotti*. Indications are that *C. w. aurea* could be a junior synonym of *C. w. seres*, but a definitive decision on this is not possible due to the lack of material from the area of the type locality of *C. w. seres* (see that entry). It has to be noted that this taxon varies from population to population; this is probably caused by different ecological conditions (see *C. w. tirichmirensis*). Nearly all *C. w. aurea* populations show some differences, but in this highly polymorphic species such differences are a long way from constituting any subspecific delimitation. Whether there is a tension zone where *C. w. aurea* and *C. w. chrysoptera* mix in the central parts of the Pamir, or one between *C. w. aurea* and *C. w. separata* towards the Transalai still needs to be investigated.

Distribution
The *C. w. aurea* phenotype is well-known from the West Pamir in Tajikistan. No material is known from the Afghan part of the West Pamir, but the taxon should also be found in this region. The northernmost known localities are in the Vanchsky Mountains, but it is quite possible that the taxon flies even further to the north. The southern limits of the distribution are the southern slopes of the main Hindukush chain. The *C. w. aurea* phenotype may be found in the Hindukush Range eastwards until it reaches the type locality of *C. w. seres* (see above). The western limit in the Hindukush Range is somewhere in the mountains north of Kabul (Salang Pass), but large parts of the western Hindukush are still unexplored. VERHULST (2000) placed the Salang Pass specimens under *C. w. sweadneri*, but investigation of such material clearly shows that these are typical *C. w. aurea*. Not very far to the south-west of the Salang Pass the taxon *C. w. sweadneri* is found; this is obviously very closely related to *C. w. aurea* (see *C. w. sweadneri*). A small distribution map of the Afghan distribution was given by SAKAI (l.c.).

2.4 *tirichmirensis* ROSE, 2001

"*Colias wiskotti tirichmirensis* subsp. n." ROSE, 2001: Nachrichten des entomologischen Vereins Apollo, N.F. **22** (1): 5 – 9, pl. 1, f. 1 – 6 (type locality: " Nordpakistan, NW Chitral, Hindukusch range, Tirich Mir, Atak, 3200 – 3500 m").

Type material and depository
The taxon was described from a male Holotype, 59 male and 32 female paratypes, collected in early July 1996 by WEISS, HANUS, and SALK. The holotype, 9 male and 10 female paratypes are in coll. ROSE. The other paratypes are preserved as follows; 19 males and 5 females in coll. HANUS, 6 males and 4 females in coll. WEISS, 2 males and 2 females in coll. HOFMANN, 2 males in coll. WORTHY, and 4 males and 3 females in coll. GRIESHUBER; the remainder should be in coll. SALK.

Type locality
The type locality is in the vicinity of the small village of Atrak, not Atak, some 25 km NE of Mt. Tirich Mir, situated near the confluence of the Atrak Gol [river] and the Tirich Gol. In other words: Pakistan, North-West Frontier Province, Hindukush Range, 25 km NW Mt. Tirich Mir, Atrak, at approximately 36˚20'N, 72˚05'N.

Status and variation
C. w. tirichmirensis is provisionally considered to be an ecological form and therefore a junior subjective synonym of *C. w. aurea* (**syn. nov.**), it may also be a synonym of *C .w. seres* (see that entry). The type locality of *C .w. tirichmirensis* is only about 45 km to the north-east of the Nuksan Pass – the type locality of *C. w. aurea*. Between these places there are two mountains of more than 7,000 m; the Tirich Mir and the Nowshak, with its huge glaciers. It would be impossible for *C. wiskotti* to cross these glaciers, but it could easily disperse a distance of some 70 km around them, especially if there are no natural barriers. The

ecological conditions in such high, glaciated areas vary widely, due, among other things, to the different degree of solar radiation between the southern and northern sides, or the fact that weather conditions, including the amount of rain, can be quite different on each side of such high mountains. The type material studied of *C. w. aurea* shows that there are fewer greenish pigmented males than in *C. w. tirichmirensis*, but the type series of *C. w. aurea* contains more greenish, and darker males than in west Pamir populations. Pale greenish-yellow females are known from the *C. w. tirichmirensis* population, but KOTZSCH found none of these at the Nuksan Pass.

Comparing all the known populations of the *aurea-seres* group it seems that in warmer regions the colour is more orange, whereas in colder habitats the specimens are more greenish. This could explain why *C. w. seres* is orange - the region of the type locality is probably influenced by the hot, dry climate of the Taklamakan desert. Another example is *C. w. sweadneri* which is quite a dark orange; it flies in the warm and dry Koh-i-Baba Mountains. The same effect can be seen in the West Pamir which has a warmer climate than the East Pamir. In the colder East Pamir the greenish pigmentation is much stronger than in the west. Even in the West Pamir (e.g. Vanchsky, and Rushansky Mts.) minor differences can be found between the known populations. The same ecological effect probably causes the higher quantity of greenish pigmented specimens in the Tirich Mir populations.

These assumptions create a tricky situation that could end up with the synonymisation of all subspecies, this would clearly not be correct. As stated above, the colder climate of the East Pamir causes a more greenish and darker phenotype known as *C. w. chrysoptera*, but the authors accept this subspecies. The reasons for accepting this subspecies are the smaller size and the different colouration, as well as the fact that the East Pamir forms a well-defined zoogeographical district; also the connecting zone of *C .w. chrysoptera* and *C. w. aurea* seems to be very narrow. The *C. w. tirichmirensis* locality is part of the southern end of the distribution of *C. wiskotti*. The Tirich Mir region is considered to be part of the Hindukush zoogeographical district, the distribution area of the *C. w. aurea* population group. The facts can be only summarised here, the decision to synonymise *C. w. tirichmirensis* with *C. w. aurea* is subjective, and no absolute evidence can be given. Unfortunately, far too little is known about the distribution and dispersal of the butterflies in the Pleistocene and Holocene eras, but this would be the key for such studies. It has to be noted that genetic studies show very little difference in the DNA of some easily distinguishable *C. wiskotti* subspecies (LAIHO, pers. comm.).

Distribution
As well as the Tirich Mir specimens, ROSE (2001) also included Shandur Pass specimens under *C. w. tirichmirensis*. Note: there is very little material known from other localities in Pakistan apart from Tirich Mir; for this reason it is not possible to give the exact distribution in north-western Pakistan, which is the south-eastern limit of the distribution of *C. wiskotti*.

2.5 *Colias wiskotti sweadneri* CLENCH & SHOUMATOFF, 1956

"*Colias wiskotti sweadneri*, subsp. n." CLENCH & SHOUMATOFF, 1956: Videnskabelige Meddelelser fra Dansk naturhistorisk Forening I Kjobenhave **118**: 175 – 177 (type locality: "…between Surtu and top of Mt. Shah Fuladi, ca. 5000 m").

Type material and depository
CLENCH & SHOUMATOFF (1956) described *C. w. sweadneri* from a male holotype, a female allotype, and 3 paratypic pairs collected by HAARLØV during the 3rd Danish Expedition to Central Asia. They also assigned the two *C. wiskotti* from Firus Kuhi Mts. (W. Afghanistan) ex coll. AVINOFF to this subspecies, but they were not included in the type series. The holotype, allotype, one male and three female paratypes should be in the Carnegie Museum of Natural History in Pittsburgh (Pennsylvania, USA). A male paratype from Marak numbered "no. 287" is in the Zoological Museum, University of Copenhagen. Another male paratype is in BMNH. It is labelled as follows: [printed label] 3rd. Danish Exp. Centr. Asia '48 N. Haarlov (sic) [and handwritten] / 117 // [printed label] Mt. Shah Fuladi, Surtu- Aug. 10, Afghanistan // [printed label] Avinoff Coll. CN Acc. 14608 // [printed label] Brit. Mus. 197[and handwritten]4-415 // [hand-written label with red line left and right] Paratype ♂ *Colias wiskotti sweadneri* [and printed] Clench & Shoumatoff // [printed red label with hand-written number] Paratype No. 288 Carn. Mus. Ent. // [round yellow bordered label] Paratype.

Type locality
The type locality is governed by the Holotype, collected "between Surtu and top of Mt. Shah Fuladi, ca. 5000 m". In other words: Afghanistan,: Koh-i-Baba Mountains, about 130 km West of Kabul, about 25 km SE Bamian, southern slopes of Mt. Shah Fuladi, between the village Surtu and the peak (34˚37.00'N, 67˚57.50'E) at ca. 5,000 m.

The paratypes were collected at Surtu (4,600), Marak (4,500 m), the Kotal Pass (3,800 m) and Panjao (2,500 m). All of these localities are in the Koh-i-Baba Mountains. Panjao is to the south-west at approximately 34˚23'N, 27˚02'E, the locality Surtu is on the southern slope of Mt. Shah-Fuladi, and the Kotal Pass is at the eastern end of the Koh-i-Baba Mountains. The locality Marak could not be located.

Status and variation
The subspecies *C. w. sweadneri* is considered to be a distinct subspecies which probably originates from a different historical refuge from *C. w. aurea*. It is on average a darker orange colour with a narrower marginal border than *C. w. aurea*, and it is on average considerably smaller than the latter. There is great variation in size in the Koh-i-Baba Mountains; specimens are known with a forewing length of only 20 mm (e.g. from Joshanak Valley), while some others are large like *C. w. aurea* (e.g. from Panjao). Note: specimens are known which are intermediate between *C. w. sweadneri* and *C. w. aurea*.

Distribution
C. w. sweadneri is well-known from various localities in the Koh-i-Baba Mountains, but it is highly probable that it is much more widely distributed in the little explored mountainous regions to the west, north-west and south-west of the Koh-i-Baba Mountains. CLENCH & SHOUMATOFF (l.c.) mention two specimens from the Firus Kuhi Mountains that "agree closely" with *C. w. sweadneri*. The Firus Kuhi Mountains are in north-western Afghanistan, approximately 200 km to the north-west of Herat. The potential western limit of the distribution is in the mountains close to Heart; to the west of this is a low depression. To the east the Koh-i-Baba Mountains are separated from the *C. w. aurea* localities in the main Hindukush Range by deep, wide river valleys.

3. The Iran population

Notes on the territory
At present there is only one known population of *C. wiskotti* in Iran, this was described as *C. hofmannorum* ECKWEILER, 2000, thus as a species. The suggested western limit of the distribution of *C. w. sweadneri* (see that entry) is only about 300 – 350 km to the west of the type locality of *C. w. hofmannorum*, but these regions are well-separated by a low depression that runs north-south. For this reason, this population is provisionally placed in a separate group, although it shows some close affinity to *C. w. sweadneri* from Afghanistan. There is possibly an argument for placing *C. w. sweadneri* and the Iranian population together in a separate group, but this needs to be studied further. It is quite possible that *C. w. hofmannorum* has a wider distribution in the mountain ridge that runs north-south along the eastern border of Iran.

3.1 *Colias wiskotti hofmannorum* ECKWEILER, 2000, stat. nov.

"*Colias hofmannorum* sp.[ecies] nov.[um]." ECKWEILER, 2000: Nachrichten des entomologischen Vereins Apollo, N. F. **21** (1): 45 – 48, pl. 1 (type locality: "Iran, Khorasan, Birjand, 20 km N Sar Bisheh, 2200 – 2500 m").

Type material and depository
The taxon was described from a male holotype, 49 male and 34 female paratypes. According to the original description there were 25 male and 19 female paratypes in coll. ECKWEILER (Frankfurt). Some of this material has subsequently been transferred to other collections. The holotype and a paratypic pair are deposited in SMNK, a paratypic pair is in SMFL, 3 male and 1 female paratypes are in ZSM, 3 male and 4 females paratypes in coll. ROSE (Mainz), a paratypic pair is coll. WORTHY (Caterham), 2 male paratypes are in coll. GRIESHUBER (Bad Griesbach), 22 male and 13 female paratypes are in coll. HOFMANN (Limeshain).

Type locality
The type locality was given inaccurately as "Iran, Khorasan, Birjand, 20 km N Sar Bisheh, 2200 – 2500 m", this is in E Iran, not very far from the Afghan border. DIETZ (2002) described the type locality very precisely as follows: "This biotop is located 55 km from Birjand (Highway Birjand – Sar Bisheh). Between a salt lake and a salt factory on the right, there is a side road at the left with direction to the mountains (in the distance you can see the white cupola of an observatory). Following 17.5 km you will arrive at a small valley on the right side of the street. At the end of this valley (approx. 1.5 km footway) you will find the biotope discovered by Axel HOFMANN, Breisach-Hochstetten".

Status and variation
The taxon was described as a distinct species intermediate between *C. wiskotti* and *C. aurorina*. However, the morphological and biological data leave little doubt that it is a subspecies of *C. wiskotti*, and it is now generally accepted as such by collectors. Furthermore, genetic investigation into the COI gene (a 640 bp fragment) of the taxa *C. w. separata, C. w. draconis*, and *hofmannorum* reveals little variation, suggesting that the taxon *hofmannorum* is a subspecies of *Colias wiskotti* rather than a distinct species (JUHA LAIHO, pers. comm.; see under *C. w. draconis*). The biotope figured by DIETZ (l.c.) is not untypical for *C. wiskotti*. *C. w. hofmannorum* is an isolated outlying population of *C. wiskotti*, but the imaginal characters show a very close affinity to *C. w. sweadneri* from Afghanistan. The differences in the submarginal border between *C. w. sweadneri* and *C. w. hofmannorum* are not as well-expressed as described by ECKWEILER (2000), only a few of the *C. w. sweadneri* males have a wider black border than *C. w. hofmannorum* males; the submarginal border of the female does not differ. Some females of *C. w. hofmannorum* could be easily determined as *C. w. sweadneri*. The main difference in *C. w. hofmannorum* is a paler orange ground colour, and a greenish-yellow colour on the base of the forewing and parts of the hindwing. The taxa must definitely have been separated since the global warming at the end of the last glacial period.

Distribution
Only known from the type locality.

4. The West Tian-Shan group

Notes on the territory
The West Tian-Shan zoogeographical district was well described by TUZOV et al. (1997). The taxa *C. w. draconis* GRUM-GRSHIMAILO, 1891, and the rather enigmatic *C. w. rueckbeili* LUKHTANOV, 1994 are included in the west Tian-Shan group.

4.1 *Colias wiskotti draconis* GRUM-GRSHIMAILO, 1891

Colias Wiskotti var.[ietas] *Draconis*" GRUM-GRSHIMAILO, 1891: Horae Societatis Entomologicae Rossicae **25**(4): 465 (type locality: "… in regione Pamir dicta, in montibus ad 'Lacum Draconis' (Kara-Kul, Kirghisorum)").

Type material and depository
The type material was examined by GRIESHUBER & WORTHY (2004). The label data of all syntypes was given by the authors. They found 7 male and 5 female syntypes in BMNH, and 4 male and 3 female syntypes in ZMKU. The authors designated a lectotype from a male syntype deposited in BMNH because the type series contains specimens that resemble the *C. wiskotti rueckbeili* LUKHTANOV, 1994 phenotype (see that entry).

The label data of the lectotype are as follows:

– [GRUM-GRSHIMAILO's hand] Kisyl-Art // [GRUM-GRSHIMAILO's hand] Mt. Alexandr. // [printed label] Coll. Gr.-Gr. // [printed BMNH acquisition label] Elwes Coll. 1902-85 // [printed red label] Lectotype, *Colias wiskotti draconis* GRUM-GRSHIMAILO, 1891, Horae Soc. ent. ross. **25**(4): 465, design. J. GRIESHUBER & R. WORTHY, 2004.

Type locality
The type locality "Lacum Draconis" is an erroneous original statement of type locality (GRIESHUBER & WORTHY l.c.). GRUM-GRSHIMAILO (1907) subsequently corrected this and made a very clear statement: "erroneously stated by me [in 1891] to occur in Pamir, [but] in fact it was found in a mountainous region westwards of Issyk-Kul lake". GRIESHUBER & WORTHY (l.c.) stated that it is impossible to pinpoint the type locality of *C. w. draconis* due to the fact that the material was collected by the RÜCKBEILS. The RÜCKBEILS had an unfortunate habit of collecting specimens from far and wide, then returning to their base camp and labelling every specimen as if it had been caught at their camp. They were also commercial collectors and there have been suggestions that they may have deliberately falsified data to protect their collecting localities. Therefore any quotation of type localities of these or any other taxa collected by the RÜCKBEILS is provisional and cannot be guaranteed to be correct. However, GRIESHUBER & WORTHY (l.c.) gave the following possible type localities: between the Suusamyr-Too and the western part of the Terskey Ala-Too, or the western part of the Kyrgyz Ala-Too, a region that is not well explored.

Status and variation
The taxon was originally described as a subspecies. TUZOV (1993) was one of the first authors to give specific status to the taxon, followed by TUZOV et al. (1997) and TSHIKOLOVETS (2000 & 2005), but none of those authors gave any reason or evidence for this speculative act. The males and females are of a deep red colour; most of the females have no submarginal spots in the black border, but some females do show faint submarginal spots. As long as there is no definitive evidence for specific status, the taxon is considered to be a subspecies of *C. wiskotti*, but with a longer period of isolation than other *C. wiskotti* subspecies. *C. wiskotti* is a highly polymorphic *Colias* species, e.g. the male of the nominotypical subspecies is greenish whilst *C. w. sweadneri* males are dark orange. Small differences in the COI gene (a 640 bp fragment) made by JUHA LAIHO (pers. comm.; also see his website: http://kotisivu.dnainternet.net/laihoju/cow/) in *C. w. separata* and *C. w. draconis* indicate that these taxa belong to one and the same species. In contrast there are very clear differences between several Central Asian *Colias* species, e.g. between *C. wiskotti* and *C. alpherakii*. Even between the different subspecies of *C. cocandica*, there is more variation in the COI gene, although *C. cocandica* is a species which is far less polymorphic than *C. wiskotti*. Although investigation of a few specimens is not conclusive, they provide an argument for the subspecific status of *C. w. draconis*, especially if morphological and/or biological data support the DNA results.

Distribution
C. w. draconis is distributed in the mountains in NE Uzbekistan, and NW Kyrgyzstan. It is known from the Talassky, Chataklsky, Chandalashsky, Ugamsky, Pskemsky and Kuraminsky Mountains. Further information about the various localities was given by TSHIKOLOVETS (2000 & 2005).

4.2 *Colias wiskotti rueckbeili* LUKHTANOV, 1994

"*Colias wiskotti rueckbeili*" LUKHTANOV, 1994: *In* LUKHTANOV & LUKHTANOV 1994: Die Tagfalter Nordwestasiens. *Herbipoliana* **3**: 74 (type locality: "Alexander Gebirge").

History
The history of this taxon is rather peculiar. In 1889 and 1890 the RÜCKBEILS collected a large series of red and reddish-orange *C. wiskotti* in the mountains to the south-west of Lake Issy-Kul ("Alexander Gebirge"); these were collected for the insect trader TANCRÉ who sold some of them to STAUDINGER. GRUM-GRSHIMAILO procured a few of these, either directly from TANCRÉ or via STAUDINGER, and described the new taxon in 1891 as *C. w. draconis*; however, the type series also contains specimens of the *C. w. rueckbeili* phenotype (see under *C. w. draconis*). Being unaware of the description of *C. w. draconis*, STAUDINGER (1892) misidentified his own series as *C. w. chrysoptera*. Probably shortly after this publication, STAUDINGER realised that part of his series differed from the recently described *C. w. draconis*, and started to sell this "new form" under the name "*alexandra*". Some years later, RÖBER (1907) made the name available as *Colias wiskotti alexandra* [Stgr. i.l.] RÖBER, 1907. The letters "Stgr. i.l." could refer to an unpublished manuscript name used by STAUDINGER in his sales-lists, but it probably refers to the label data of a specimen from the STAUDINGER collection (see below), as RÖBER regularly used specimens from STAUDINGER'S collection for his descriptions (pers. invest.). VERITY (1909, p. 263) also introduced the name, but it was unavailable as he used it in the fourth position: *Colias wiskotti separata* [race] *alexandra* [Stdgr., in litt.], VERITY, 1909. Whether VERITY'S "*alexandra*" was a reflection of RÖBER'S publication of the name, or whether he used material from another source, is not known.

The name *Colias wiskotti alexandra* RÖBER, 1907 is a junior primary homonym of *Colias alexandra* EDWARDS, 1863. BANG-HAAS (1927) realised this, but unfortunately downgraded the name *C. w. alexandra* to infrasubspecific status and renamed it "*rueckbeili*". Because he explicitly proposed it for an aberration – "*Colias wiskotti draconis* ab. *rückbeili* O.B.-HAAS, nom. nov." – he did not make the name available (LAMAS pers. comm.). LUKHTANOV (1994) published the name in the combination "*Colias wiskotti rueckbeili* O. BANG-HAAS, 1927" and also referred to it as "*C. wiskotti* v.[ar.] *rueckbeili* O. BANG-HAAS, 1927 (sic) … nom. nov. pro *alexandra* RÖBER, 1907" in his text. As LUKHTANOV (l.c.) gave a short description and differential diagnosis for the taxon using a syntypic specimen, he made the name available under his authorship. He subsequently stated that *C. w. rueckbeili* differs considerably from other *C. w. wiskotti* subspecies, he also stated that new material is necessary to judge whether it is indeed a subspecies or only an aberration.

Type material and depository
LUKHTANOV (l.c.) mentioned only one male specimen deposited in the STAUDINGER collection in MNHU, but the original syntypic series was evidently larger. HOLIK (unpublished catalogue) stated that there are 2 males and a female of "var. *rückbeili* O.BH. (*alexandra* Stgr. i.l.) … l.[eg.] Rückbeil)" in the STAUDINGER collection. Before the STAUDINGER *Colias* were reorganised (see above) it was clear from the gaps in the drawer that there are two *C. w. rueckbeili* specimens missing, as well as one male of *C. w. draconis*. LUKHTANOV (l.c.) found only a male syntype, which means that the material went missing (possibly stolen?) between 1948 and 1994 (before LUKHTANOV'S visit). By inference the syntypic series consists of the specimens used by RÖBER and BANG-HAAS for the description of *C. w. alexandra* and *C. w. draconis* [ab.] *rueckbeili*, as well as the specimen investigated by LUKHTANOV. RÖBER and BANG-HAAS both used the STAUDINGER collection for their works; therefore STAUDINGER'S original series of two males and one female must be part of the type series. It is unknown whether RÖBER & BANG-HAAS also had any of their own specimens available. Note: The STAUDINGER and main collections of MNHU were obviously one of the main sources of material for RÖBER and BOLLOW for their works published in SEITZ'S well-known book series "*Die Groß-Schmetterlinge der Erde*", because a good number of syntypes of taxa that they described can be found in these collections. TANCRÉ'S collection is deposited in ZSM (Munich), this is probably how some of the topotypical *C. w. rueckbeili* specimens found their way to ZSM.

The remaining syntype deposited in MNHU is labelled as follows:

– [STAUDINGER'S hand on brown paper] Alex.[ander] Geb.[irge] / [18]99. R[ü]ckb[ei]l. // [STAUDINGER'S hand in black] v. *Chrysoptera* Gr.Gr. / wohl [probably] v. *Draconis* Gr.Gr. [and by another hand in red] falsch [false] // [STAUDINGER'S hand in black] var. *Alexandra* Stgr. in l. // [printed label] ex coll. STAUDINGER [and GRIESHUBER'S hand] 1/1 // [printed red label] Syntype / *Colias wiskotti rueckbeili* LUKHTANOV, 1994 / nec. *C. w. alexandra* RÖBER, 1907 / nec. "*rückbeili*" BANG-HAAS, 1927 (unavail.) / GRIESHUBER det. XII.2004.

Type locality
RÖBER (l.c.) and BANG-HAAS (l.c.) gave the Alexander Mountains as the type locality; this corresponds with the label data of the syntype. GRUM-GRSHIMAILO'S (1907) locality definition "in a mountainous region westwards of Issyk-Kul lake" and STAUDINGER'S (l.c.) "south-west of the Issyk-Kul lake" refer to the Alexander Mountains, now known as the Kyrgyzsky Range. As stated under *C. w. draconis* (see above), which is from the same region, any quotation of type localities of these or any other taxa collected by the RÜCKBEILS is provisional and cannot be guaranteed to be correct, therefore it is impossible to pinpoint a type locality. If the label data and STAUDINGER'S locality definition is correct, the type locality should be between the Suusamyr-Too and the western part of the Terskey Ala-Too. In 2001, a Russian expedition searched unsuccessfully for *C. wiskotti* in this region (CHURKIN, pers. comm.). Another possible type locality is the western part of the Kyrgyz Ala-Too, this area is not well explored so it may be possible that the *C. w. draconis* as well as the *C. w. rueckbeili* phenotypes could be found there in the future.

A small detail in the description of *C. w. draconis* and in the label data of the *C. w. rueckbeili* syntype is of some interest. GRUM-GRSHIMAILO stated that the *C. w. draconis* specimens were collected in 1890, but the year 1889 is given on the label of the *C. w. rueckbeili* specimen. There is a possibility that the RÜCKBEILS collected *C. w. rueckbeili* in 1889 and *C. w. draconis* in 1890 in different localities, and later the material could have been mixed up by the RÜCKBEILS or TANCRÉ before it was sold?

Status and variation
The taxon is provisionally accepted a subspecies of *C. wiskotti.* The phenotype of the missing syntypes is not known, but the only remaining type specimen could be also an aberrant *C. w. draconis* specimen. Such specimens are occasionally found in *C. w. draconis* populations. The remaining syntype does not fit perfectly with what RÖBER (l.c.) and BANG-HAAS (l.c.) described, but there is no evidence that it was not part of the original type series.

However, the good number of known (topotypical?) specimens of *C. w. rueckbeili* indicate that we are dealing with a very stable phenotype. The female looks like a pale orange *C. w. draconis*; this is a regular form in known *C. w. draconis* populations. But the male appears to have a yellow ground colour overlaid with red scales rather than the solid red or orange of *C. w. draconis*, this appears to be unique in the genus. Such specimens have never been rediscovered either within or outside the known *C. w. draconis* populations; this could be an indication of a very local and hard-to-find population. Furthermore the RÜCKBEILS collected a series of it. All of this makes it unlikely that it is a form or aberration of *C. w. draconis*. If both phenotypes were indeed collected in one and the same locality, the *C. w. rueckbeili* phenotype would appear to be a recurrent form in that population. As the phenotype is known from none of the currently known populations, it is probable that the *C. w. rueckbeili* specimens were collected in the area of mountain ranges mentioned

above, and the *C. w. draconis* specimens originate from another locality, probably from the region of the known distribution.

There are so many unanswered questions on this taxon, that definitive statements cannot be made. Furthermore, the authors have no evidence that the only remaining syntype is indeed that for which the name *alexandra* / rueckbeili was originally proposed. The notes above are only a summary of the known facts; a proper revision of this taxon can be only made if such specimens are rediscovered.

Distribution
Unknown – see above

5. Note on *Colias alpherakii* STAUDINGER, 1882

"*Colias Alpherakii* Stgr." STAUDINGER, 1882: *In* STAUDINGER & BANG-HAAS, *Berliner Entomologische Zeitung* **26**(1): 164 – 166 (type locality: "Alai Gebirge (Fergana Turkestan)" and "Hazret Sultan Alpen (Prov. Samarkand)").

General information
C. alpherakii is clearly very closely related to *C. wiskotti*; although it looks very different and is far less polymorphic than *C. wiskotti*, its ecological requirements are very similar. Except for the West Tian-Shan (*C. w. draconis*) and east Iran (*C. w. hofmannorum*), which are the two most distinct subspecies of *C. wiskotti*, *C. alpherakii* has a nearly identical distribution to *C. wiskotti*. Both species frequently fly together, and the larvae use the same foodplant. KESKÜLA (1997) stated that *Astragalus aegacantha* is the probable foodplant. Because of its close relationship to *C. wiskotti* and because the type material was collected together with the syntypes of *C. wiskotti*, it seems appropriate to include this taxon in the present study as a basis for further study of the species. Furthermore, nominotypical *C. alpherakii* has exactly the same problems with the type locality as *C. wiskotti*, this has resulted in the description of two unnecessary subspecies.

Type material and depository
STAUDINGER (1882) described *C. alpherakii* from a small number ("in kleiner Anzahl") of specimens from Alai, including a gynandromorph, collected by HABERHAUER in late June 1880; and a similar small number ("gleichfalls in kleiner Zahl") from the Hazreth Sultan Mts. collected by HABERHAUER in early July 1881. In the STAUDINGER collection in MNHU there are 2 male and 3 female syntypes from the Samarkand Alpes (Hazreth Sultan Mountains), and 3 male and 4 female syntypes from Alai. The gynandromorph has not been found, neither did HOLIK (unpublished catalogue) mention it in his catalogue. ELWES (1884) stated that he received three specimens from STAUDINGER, one from Hazreth Sultan and two from Alai. The ELWES collection is in BMNH; the authors searched three times for these possible syntypic specimens, but they were unable to find them. Only 2 males and 3 females from "Sarafshan" collected by HABERHAUER and ex coll. ELWES were found. All of these specimens have an additional label reading "Tura"; they were probably collected later and in another locality, because the coloration differs slightly from the type series in Berlin. One additional ex coll. ELWES female from Hazreth Sultan Mts., Farab, is also not syntypic, because it was collected by GRUM-GRSHIMAILO. Although STAUDINGER named the species after his friend ALPHÉRAKY, he obviously didn't send specimens to him, because no syntypes can be found in ZISP where the ALPHÉRAKY collection is housed.

VERHULST (1995) figured a male holotype and a female allotype of *C. alpherakii* [sic.]. The specimens were erroneously provided with such type labels by some misguided past curator. The pair figured by VERHULST (l.c.) were found by the authors in BMNH, these specimens are not syntypes of *C. alpherakii*, but they are syntypes of *C. alpherakii roschana* GRUM-GRSHIMAILO, 1893

Lectotype designation
The specimen selected for the lectotype is the male from the "Samarkand Alp.[es]" which has an original locality label hand-written by STAUDINGER (see above). Because of the stated year of collecting on the locality label there is no doubt that it is syntypic. To avoid nomenclatural instability it is necessary to fix the type locality; this cannot be done with the Alai syntypes, because it is not known where HABERHAUER collected these types. The phenotype in the Ghissar zoogeographical district is rather uniform, whereas the status of the Alai populations is unclear (see below). As stated above, the western part of the Alai (e.g. Matcha massif) is an intermediate zone between the Ghissar and Alai zoogeographical district. If further studies show that the Alai populations are indeed different from the Ghissar populations, it could cause nomenclatural instability if the collecting locality of an Alai lectotype is unknown. As can be seen in *C.*

christophi GRUM-GRSHIMAILO, 1885 two distinct subspecies can occur very close to each other in the western part of the Alai (GRIESHUBER & WORTHY 2005).

The label data of the lectotype are as follows:

– [STAUDINGER'S hand on brown paper] Samarkand Alp H[a]b[er]h[aue]r. [18]81. // [probably HABERHAUER'S hand on white paper] 9/7 [09.07.1881] [printed pink label] Origin[al]. // [printed label] ex coll. Staudinger [and hand-written] 8/12 // [printed red label] (Samarkand Alpen, Hazreth Sultan Gebirge, 06.-09.07.1881, Haberhauer) / Lectotype / *Colias wiskotti* STAUDINGER, 1882 / design. by GRIESHUBER & WORTHY, 2006.

Paralectotypes
Each specimen will be provided with a printed red label similar to the lectotype, but with Paralectotype instead of Lectotype. All paralectotypes have a printed "ex coll. Staudinger" label with a hand-written number from 1-12/12 (except 8/12), and a locality label hand-written recently by KONRAD EBERL.

Samarkand series:
All specimens have a small round brown label, made from the same paper as the locality label of the lectotype, and a printed pink "Origin." label.
– 2 females
– 1 male with an additional hand-written date label "6/7 [06.07.1881]" (probably HABERHAUER'S hand)
– female with an additional hand-written date label "7/7 [07.07.1881]" (probably HABERHAUER'S hand)

Alai series:
– 1 male: [STAUDINGER'S hand] Alai [18]80 H[a]b[er]h[aue]r. // [probably HABERHAUER'S hand on blue paper] 30/6[18]86 // [printed pink label] Origin.
– 1 female: [probably HABERHAUER'S hand on blue paper] 30/6[18]80 // [printed pink label] Origin.
– 2 male, 3 females

Type locality
The type locality was given incorrectly by VERHULST (1995 & 2000-2001) and TUZOV et al. (l.c.), because they considered only Alai to be the type locality. *C. alpherakii* was collected together with the type material of *C. wiskotti* (see that entry). As in nominotypical *C. wiskotti* the type locality is provisionally restricted as follows: Tajikistan, Ghissar Range, Hazreth Sultan Mountains northern slopes, presumably between the surroundings of Farab and Roritsch.

Status and variation
Valid at species rank within the genus *Colias*. As stated above, the phenotype in the Ghissar zoogeographical district (sensu TUZOV et al. l.c.) is rather uniform. Obviously overlooking the fact that part of the type series is from the Ghissar Range, KESKÜLA (1997) described the subspecies *C .a. tashkurgonica* KESKÜLA, 1997 from the Tashkurgon Pass; this is also situated in the Hazreth Sultan Mountains. The distance between the type localities of the taxa is less than 80 km. *C. a. tashkurgonica* is slightly more greenish-grey, but this is clearly within the variation of the nominotypical subspecies. The impression of a more greenish-grey colour is caused by a reduction in the quantity of yellow scales. The amount of yellow scaling varies from locality to locality; this is caused by different microclimates in the biotopes. The difference in the amount of yellow pigmentation cannot on its own justify separation into different subspecies. For this reason the subspecies *C. a. tashkurgonica* is considered to be a junior subjective synonym of *C. alpherakii*. We have an identical case in *C. a. usmatica* STSHETKIN, 1990, which was described from the western end of the Turkestansky Range (environs of Usmat (39˚44'19"N, 67˚38'36"E)). STSHETKIN (1990) distinguished *C. a. usmatica* from the taxa *C. a. roschana* GRUM-GRSHIMAILO, 1893, *C. a. kohibaba* WYATT & OMOTO, 1966, and *C. a. alpherakii*, but he gave no information on the origin of his "nominotypical" *C. alpherakii*. It is quite possible that he had only Alai specimen in his hands, and not material from the Ghissar Range. Material from the western Turkestansky Range in the collections of the authors clearly shows that *C. a. usmatica* is within the variation of *C. a. alpherakii* from the Ghissar Range, therefore *C. a. usmatica* is considered to be a junior subjective synonym of *C. alpherakii*. Note, TSHIKOLOVETS (2000) considered the taxa *tashkurgonica* and *usmatica* to be synonyms of the nominotypical subspecies, due to "a wide individual variability in size and wing colouration".

STAUDINGER (l.c.) stated that his specimens from Alai are more greenish-yellow on the underside. In some of the Alai specimens the yellow pigmentation is indeed more distinct than in any populations from the Ghissar zoogeographical district. The authors provisionally consider the Alai (and Transalai) specimens to be within the variation of the nominotypical subspecies, because a slight difference in the yellow pigmentation in specimens of a local population does not justify a different subspecies being described for

C. alpherakii. According to TUZOV et al. (l.c.) the Alai and Transalai form a different zoogeographical district, but this does not automatically mean that a different subspecies should occur there. However, to finalise the status of populations from this zoogeographical district, much more material from different localities is needed; in particular, material from the suspected intermediate zone between the two zoogeographical districts (see above). Without further investigation, e.g. into the DNA and biology, there can be no justification for separating the Alai and Transalai populations from the nominotypical subspecies; it should not be separated from the nominotypical subspecies merely due to a slight difference in the wing coloration. Two other subspecies are also of questionable status: *C. a. roschana* and *C. a. pakistana* KOÇAK, 1990. The differences between these taxa and the nominotypical subspecies are weakly defined; further investigation is necessary to confirm their status.

Zusammenfassung

In dieser Arbeit wird zur Taxonomie von *Colias wiskotti* STAUDINGER, 1882, und der nominotypischen Unterart von *Colias alpherakii* STAUDINGER, 1882, Stellung genommen. Das Typenmaterial aller angesprochenen Taxa wird aufgelistet und die Typenfundorte so exakt wie möglich festgelegt. Ergänzend werden Angaben zur Verbreitung der einzelnen Unterarten gemacht. Für die Taxa *C. wiskotti* STAUDINGER, 1882, *C. wiskotti aurantiaca* STAUDINGER, 1892, *C. wiskotti aurea* KOTZSCH, 1936, *C. wiskotti separata* GRUM-GRSHIMAILO, 1888, *C. wiskotti seres* GRUM-GRSHIMAILO, 1890, und *C. alpherakii* werden Lectotypen designiert. Das Taxon *C. w. sagina* AUSTAUT, 1891, wird als jüngeres subjektives Synonym von *C. wiskotti* betrachtet. Die Taxa *C. w. aurantiaca* und *C. w. leucotheme* GRUM-GRSHIMAILO, 1890, werden als jüngere subjektive Synonyme zu *C. w. separata* gestellt. Das Taxon *C. w. tirichmirensis* ROSE, 2001, wird als jüngeres subjektives Synonym zu *C. w. aurea* gezogen (syn. nov.). *Colias hofmannorum* ECKWEILER, 2000, ist keine eigene Spezies sondern eine Subspezies von *C. wiskotti* (stat. nov.).

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