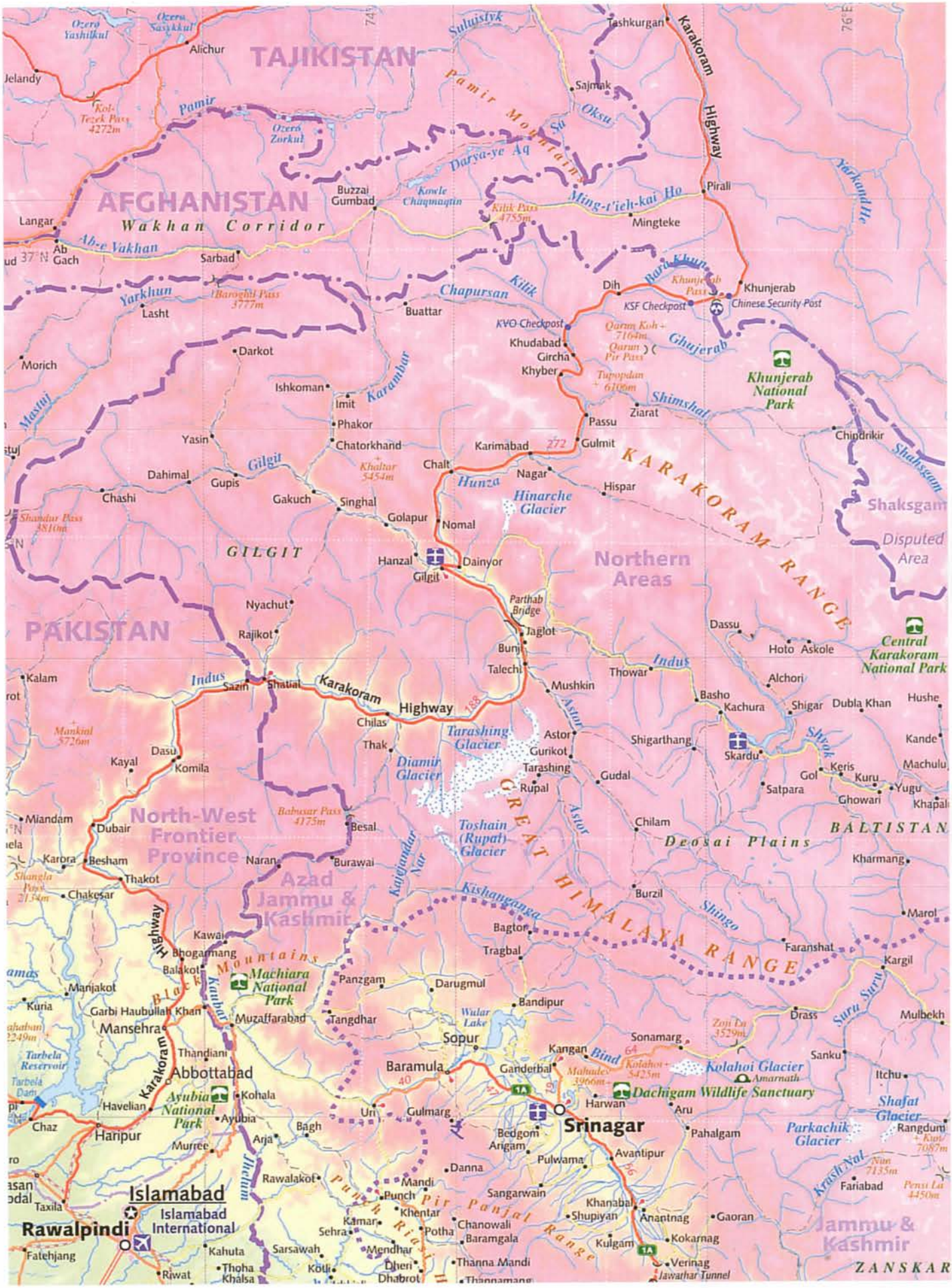
TAJIKISTAN
AFGHANISTAN
Wakhan Corridor
PAKISTAN
GILGIT
Northern Areas
Shaksgam
Disputed Area
BALTISTAN
Azad Jammu & Kashmir
North-West Frontier Province
Jammu & Kashmir
ZANSKAR
Pamir Mountains
Black Mountains
Pir Panjal Range
GREAT HIMALAYA RANGE
KARAKORAM RANGE
Karakoram Highway
Ozero Yashilkul
Ozero Sasykkul
Alichur
Jelandy
Kol-Tezek Pass 4272m
Pamir
Ozero Zorkul
Sulutistyk
Tashkurgan
Sajmak
Oksu
Darya-ye Aq
Ming-t'ieh-kai Ho
Pirali
Yarkand He
Buzzai Gumbad
Kowle Chaqmaqtin
Kilik Pass 4755m
Mingteke
Langar
Ab-e Vakhan
Ab Gach
Sarbad
Yarkhun
Baroghil Pass 3777m
Lasht
Chapursan
Kilik
Buattar
Dih
Bara Khun
Khunjerab Pass
Khunjerab
Chinese Security Post
KSF Checkpost
KVO Checkpost
Qaram Koh 7164m
Qarun Pir Pass
Ghujerab
Khudabad
Gircha
Khyber
Tupopdan 6106m
Khunjerab National Park
Morich
Darkot
Ishkoman
Karambar
Imit
Shimshal
Ziarat
Passu
Mastuj
Phakor
Yasin
Chatorkhand
Karimabad
Gulmit
Chindrikir
Shahsgam
Gilgit
Khaltar 5454m
Chalt
Nagar
Hispar
Dahimal
Gupis
Hunza
Hinarche Glacier
Chashi
Gakuch
Singhal
Shandur Pass 3810m
Golapur
Nomal
Hanzal
Dainyor
Gilgit
Nyachut
Parthab Bridge
Rajikot
Jaglot
Dassu
Hoto
Askole
Central Karakoram National Park
Kalam
Indus
Sazin
Shatial
Karakoram
Highway
Bunji
Talechi
Thowar
Mushkin
Alchori
Basho
Kachura
Shigar
Dubla Khan
Hushe
Chilas
Astor
Mankial 5726m
Thak
Tarashing Glacier
Gurikot
Shigarthang
Skardu
Shyok
Kande
Dasu
Kayal
Komila
Diamir Glacier
Tarashing
Gudal
Keris
Machulu
Gol
Kuru
Yugu
Rupal
Satpara
Ghowari
Khapal
Miandam
Dubair
Babusar Pass 4175m
Besal
Toshain (Rupal) Glacier
Chilam
Deosai Plains
Karora
Besham
Naran
Burawai
Kaghan Nar
Kharmang
Shangla Pass 2134m
Thakot
Chakesar
Kishanganga
Burzil
Shingo
Marol
Kawai
Bagtor
Highway
Bhogarmang
Tragbal
Faranshat
Kargil
Balakot
Machiara National Park
Panzgam
Darugmul
Manjakot
Kaghan
Kuria
Garbi Haubullah Khan
Muzaffarabad
Tangdhar
Bandipur
Drass
Suru
Mulbekh
Mansehra
Wular Lake
Sopur
Sonamarg
Zoji La 3529m
Tarbela Reservoir
Thandiani
Kangan
Bind
Sanku
Tarbela Dam
Abbottabad
Baramula
Ganderbal
Kolahoi 5425m
Kolahoi Glacier
Amarnath
Itchu
Havelian
Ayubia National Park
Kohala
Mahudes 3966m
Dachigam Wildlife Sanctuary
Harwan
Shafat Glacier
Chaz
Ayubia
Uri
Gulmarg
Aru
Srinagar
Haripur
Bagh
Bedgom
Pahalgam
Parkachik Glacier
Rangdum
Murree
Arja
Arigam
Pulwama
Avantipur
Jhelum
Rawalakot
Danna
Nun 7135m
Krish Nal
Fariabad
Pensi La 4450m
Mandi
Islamabad
Taxila
Punch
Sangarwain
Khanabal
Shupiyan
Anantnag
Gaoran
Rawalpindi
Islamabad International
Khentar
Kamar
Chanowali
Sehra
Potha
Baramgala
Kulgam
Kokarnag
Fatehjang
Kahuta
Sarsawah
Mendhar
Thanna Mandi
Verinag
Jawahar Tunnel
Riwat
Thoha Khalsa
Kotli
Dheri
Dhabrot
Thannamang

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BUTTERFLIES OF THE HUNZA REGION, NORTHERN PAKISTAN, AND ADJACENT AFGHANISTAN

DAVID SPENCER SMITH[1], GULAM NASEER[2], ZSOLT BÁLINT[3] AND S. AZHAR HASAN[4]

[1] Dept. of Biological Sciences, Florida International University, Miami, FL 33199, USA, and University Museum of Natural History, Parks Road, Oxford OX1 3PW, UK
[2] Murtaza Abad (Lower), P.O. Aliabad, Dist. Gilgit, Pakistan (Northern Areas)
[3] Hungarian Museum of Natural History, Baross utca 13, H-1088 Budapest, Hungary
[4] Pakistan Museum of Natural History, Garden Avenue, Shakarparian, Islamabad, Pakistan

ABSTRACT.– The virtually unknown butterfly fauna of the western Karakoram, centered on the Hunza Valley, with extremely difficult terrain and with precipitous mountain slopes and many peaks of 20,000ft to 25,000ft and above, was studied from 1994 to 2000. Field work in July and/or August from 1994 to 2000 on butterflies was carried out in 24 localities along the Karakoram Highway (KKH), from Gilgit to the border with China (Khunjerab Pass), plus side valleys, with particular attention paid to high altitude sites over 13,000ft.The interface between Palearctic and Oriental faunistic zones was defined. Khunjerab Pass was worked several times on each visit; other high altitude sites assessed including Mintaka and Kilik passes to China and the Irshad Uwin and Dilsun passes to Wakhan, Afghanistan.Several high altitude species, particularly of the genera *Parnassius, Colias, Karanasa, Melitaea, Sipora* and *Polyommatus*, were not found below 15,000ft. Records from these four passes broke new ground since they lie in territory off-limits for over half a century until 1999. Three visits were made to the Deosai Plateau, Baltistan, 150 miles SSE of Hunza and isolated from it by high mountains and extensive glaciers. A total of 109 butterfly species were recorded from the Hunza complex and Deosai combined; and, of the Deosai fauna of 28 taxa recorded, 9 (32%) diverged from the Hunza fauna. Altitudinal distributions for each species were tabulated. Forty species were recorded from a single foray into Wakhan (NE Afghanistan): 11 (27.5%) of these were never been found in seven years' work in Hunza, underlining the sharpness of the distinction between Karakoram and Pamir faunas across a very short distance. Preliminary lists of angiosperm plants for Khunjerab Pass and the approach to Kilik Pass are presented. Actual and potential habitat degradation by over-grazing at high altitude was assessed, at worst, as severe. All records obtained will serve as reference points for future studies on butterflies of this region of the Karakoram.

KEY WORDS: Afghanistan, Asia, Baltistan, Baluchistan, Bhutan, biogeography, Central Asia, China, Chitral, Diamar, distribution, ecology, Ghizer, Gilgit, Gojal, Hesperiidae, Himalayas, Hindu Kush, India, Karakoram, Kashmir, Kazakhstan, Kirgizstan, Kohistan, Lycaenidae, Nepal, Nymphalidae, Palearctic, Pamirs, Papilionidae, Pieridae, Rhopalocera, Riodinidae, Sikkim, Sinkiang, Skardu, Tajikistan, taxonomy, Tibet, Turkmenistan, Uzbekistan, Wakhan, Waziristan.

The Karakoram range of northern Pakistan, sometimes termed the Western Himalaya, lies at the junction of four other of the highest ranges of Central Asia. To the southeast the Karakoram Mountains are contiguous with the Great Himalaya, and to the northeast extend the Kun Lun Shan defining the northern boundary of the Tibetan plateau. To the southwest lies the Hindu Kush Range, largely in Afghanistan but extending into northwest Pakistan, and to the north the Pamir Range of Tajikistan and Kirgizstan, bordering Sinkiang (Xinjiang), westernmost China, with the Alai Range north of the Pamirs. The Karakoram includes the world's greatest concentration of high peaks: of the several hundred in the range, about 100 exceed 20,000ft (Qamar, 1975), dissecting the region into an extremely complex system of valleys, many with glaciers (see Map 1 and 6).

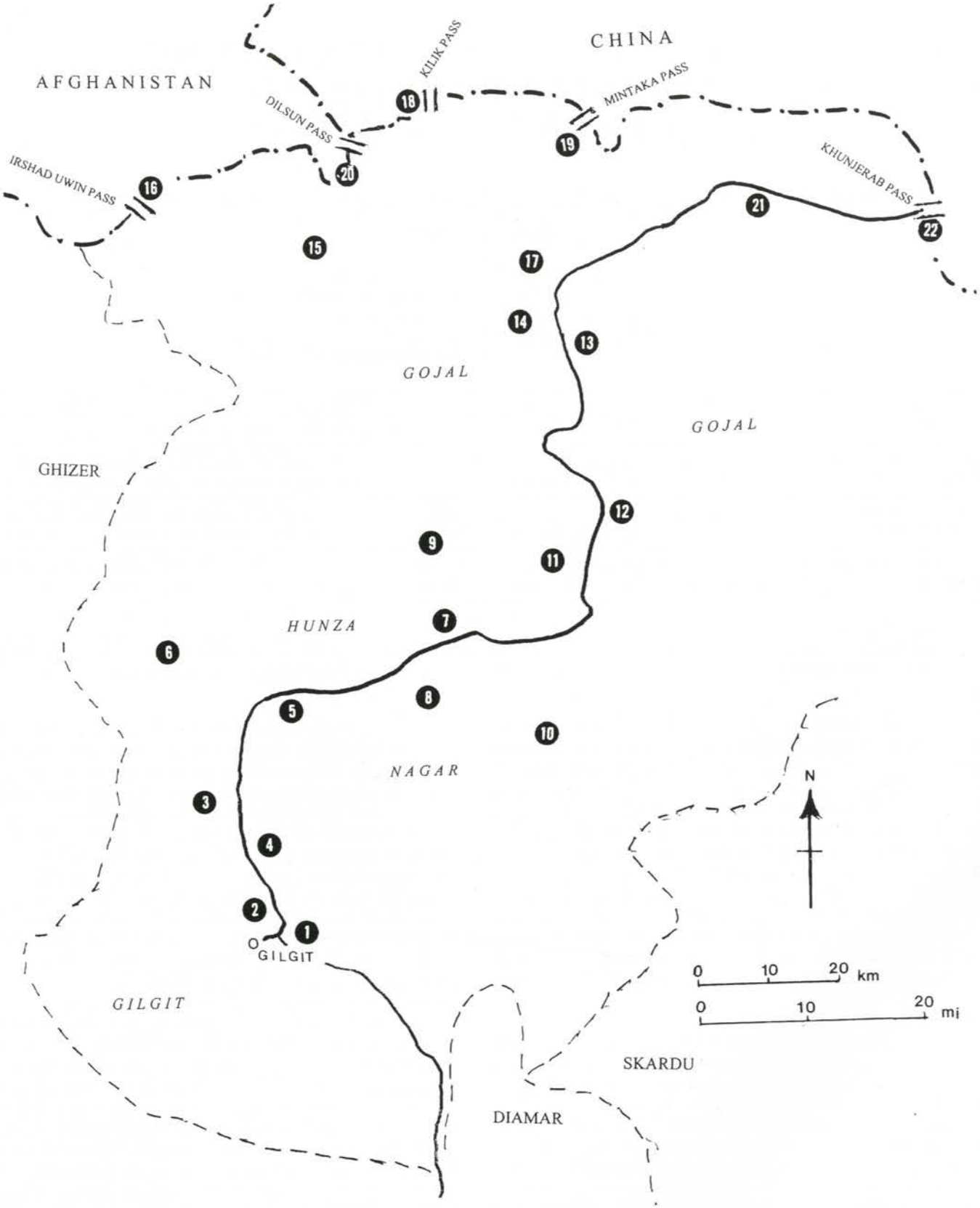
Introduction to Field Studies

The following brief geological account was provided by Dr. Taseer Hussain (Howard University, Washington D.C.) and Mr. Kanwar Sabir Ali Khan (Deputy Director, Geological Survey of Pakistan, Karachi), both of whom accompanied part of the Hunza 2000 expedition. The Karakoram mountains are young and are in the early stages of erosion. As stressed repeatedly in this account, the region is arid, with very little rain/snowfall. The annual precipitation is on average only 100mm (4+ inches) and it is obvious that this low level cannot have formed the immense glaciers of the Karakoram. These were undoubtedly formed during the Quaternary Ice Age (Wadia, 1961).

Map 1. Around Srinigar, Jammu and Kashmir (reproduced with permission from *India & Bangladesh Road Atlas*. ©2001 Lonely Planet Publications).

The geology is characterized by Cretaceous-Tertiary granitic belts, intercalated by metasedimentary rocks and meta-volcanic complexes, the former probably deposited during the early Palaeozoic to Mesozoic era. The recent Pleistocene to Holocene sedimentation consists of streambed deposits, flood plain terraces, gravel fans and fluvio-glacial deposits (Khan *et al.,* 1987). The youngest geological formations are in the south and the oldest in the north, and their contacts are mostly tectonic (Desio and Martina, 1972).

The Karakoram is one of the world's most extensively glaciated areas outside the polar regions. It has seven major glaciers covering an area of 350mi^2; two of the largest are the Hispar and Batura glaciers of the Hunza Valley, each *c.*38 miles in length. Glacio-geomorphological evidence shows that at least three glaciations occurred in the drainage area of the Batura Glacier during the Pleistocene, while since the last glacial epoch of late Pleistocene the amplitude of glacial oscillations has been smaller. This can be seen from the geological evidence that the ancient Batura Glacier of the late Pleistocene was 1.5 times larger than today, with the snow line lower by about 3000ft (Xiansong *et al.,* 1980). Late in the Pleistocene, *c.*25,000 Y.B.P., glacial cover extended almost as far south as present day Islamabad, and since then, the valleys of the Hunza complex have become gradually free of ice, permanently retained only on the high peaks and glaciers. Climatic fluctuations are even traceable during the recent past: about 200 Y.B.P., five canals built by residents of Pasu village, Gojal (see Fig. 6) as far back as 350 Y.B.P. were submerged by lateral moraines of an advancing glacier (Weyning, 1980). Later, the glacier retreated and at present there is no evidence of glacial advance.



Map 2. Sketch-map of the Karakoram Highway from Gilgit to Khunjerab Pass, with the positions of Mintaka, Kilik, Irshad Uwin and Dilsun passes indicated. The area north of Sost, including the tracks to these passes, is shown in more detail in following maps. Numbering of localities worked during this survey given on pages 7-11 corresponds to numerals on the map. NOTE: the entire Hunza region is now included in the Gilgit District, though the traditional areas of Gilgit, Hunza, Nagar and Gojal (Upper Hunza) are still in everyday use. Other Districts bordering Gilgit District are Ghizer to the west, Diamar to the south and Skardu to the southeast.

The gradual opening of the valleys of the Karakoram provided access to butterflies, access which ultimately favored northern forms at higher altitudes, while the present glaciers, together with the very high mountains adjoining them, contribute largely to the isolation which is a major contributor to radiation and genetic divergence in the Karakoram and other extreme mountainous regions of Central Asia.

The entire region of Hunza is now included in the District of Gilgit. Formerly, it formed part of the much larger 'Gilgit Agency' (Map 3, p. 8). The Hunza region is divided into 'traditional' areas, still very much used: 'Gilgit' in the south including the main town, 'Hunza' to the north along the left bank of the Khunjerab River, on the other bank of which is 'Nagar' (Map 4, p. 9). North from Gulmit lies Gojal (Upper Hunza) (Map 5, p. 11). Other districts flanking Gilgit District are Ghizer to the west, Diamar to the south and Skardu (Baltistan) to the southeast (Maps 1-2 and 6, p. 51).

This paper gives an account of collaborative work on the butterflies of one region of the Karakoram, Hunza and some of its neighboring valleys, undertaken by Florida International University and Oxford University, and the Pakistan Museum of Natural History, Islamabad. Field visits took place as follows:

1992 July: Preliminary survey
1994 1 July - 11 July
1995 4 July - 14 July
1996 3 July - 16 July
1997 8 August - 22 August
1998 12 July - 2 August
1999 8 July - 20 July

On 13 July 1996 the track from Skardu to the Deosai Plateau was still blocked by snow and ice. Work was carried out on the plateau on the following dates:

1997 9 August - 11 August
1998 29 July - 31 July
1999 July (Saif Ullah, PMNH)

Following the initial preliminary survey, carried out by David Spencer Smith (DSS) and Sylvia Hyder Smith, each group from 1994 through 1999 comprised DSS, S. Azhar Hasan (PMNH), Fiaz Ahmad (Field Assistant, PMNH), Gulam Mustafa (Driver, PMNH) and Gulam Naseer (GN), the Hunza resident team member. In August-September 2000, a much larger expedition was organized by DSS: the team comprised 5 entomologists (Pakistan), 3 entomologists (UK), 1 botanist (Pakistan), 1 botanist (UK), 1 geologist (Pakistan), 1 geologist (USA). This expedition included work on butterflies, incorporated into this paper, but extended to other insect orders, results of which will be published in appropriate journals.

In addition to annual visits as above, GN made several field expeditions, before or after the group's work. These included:

1997 11-16 June	Muchuwar Valley
1997 16-20 July	Muchuwar Valley
1998 17-19 June	Chaprot (Nagar)
1998 1-6 Sept.	Chumar Bakur (Nagar)
1999 28 June-3 July	Kilik Pass
1999 1-10 Sept.	Mintaka Pass and Kilik Pass
1999 11-22 Sept.	Irshad Uwin Pass
2000 3-13 July	Irshad Uwin Pass
2001 1-30 July	Wakhan Pamir (Afghanistan)
2002 1-30 July	Dilsun Pass; Mintaka Pass
2003 24-31 July	Fakar Peak (Nagar)

GN also made year-round observations in the vicinity of Murtazabad and Aliabad, Hunza.

Historical Introduction

The political divide in the nineteenth century between Czarist Russia and British India, with geographical factors, was the background against which Russia obtained the lion's share of information on the Lepidoptera of the remote regions of Central Asia. It is not easy now to appreciate the depth of ignorance in the West of this vast area, in the 19th century. In an early British map for example (Carey, 1806), the mountains of Central Asia and the Himalaya were shown as running in parallel series, north-to-south — no barrier to invading Czarists! The "Great Game" between Britain and Russia was played out at one level as a gentlemanly exercise where opponents might entertain each other to dinner at camp on the rare occasions they met, as when in 1889 Lt. Francis Younghusband was invited to the camp of the Russian agent Capt. Gromchevsky north of the Hunza region (Hopkirk, 1990). The Russian talked of plans for a massive invasion of British India, and Younghusband may have reciprocated by outlining a winter route for Gromchevsky that almost resulted in the death of his entire group. At another level each country was involved in military operations — for Russia, consolidation of their conquest of the independent townships of Central Asia, and for Britain, attempts to establish an effective Afghan barrier of Afghan territory between the two nations.

This political history played an important part in the documentation of the butterfly fauna of Central Asia. British work on these insects will be considered first, if only to establish the playing field on which the Russians were so clearly the victor. The butterfly fauna of British India was superbly assessed and described by several authors (Marshall, de Nicéville and Evans, 1882-1890; Swinhoe, 1885; Moore and Swinhoe, 1890-1913; Swinhoe, 1893-1895). Early in the 20th century, a valuable account was given by Bingham (1905, 1907) in his contribution to *The Fauna of British India.* But most of the field work backing these accounts was carried out in the southern bulk of the Indian subcontinent; the extreme north was impossible of access or, at best, difficult to reach and then generally when facilitated by a military exercise. For virtually every paper on butterflies of these northern areas, from the nineteenth century, to the author's name is attached his military rank: Capt. R. B. Reed, Capt. A. M. Lang, Major-Gen. H. C. Tytler, Col. W. H. Evans, Lieut-Col. Swinhoe, Maj. G. A. Leslie, Maj. Howland Roberts, and others. For some names, promotions may be traced in the entomological literature. Almost the only civilians involved were the taxonomists back in London who received specimens to publish.

These military collectors were not dilettantes, whiling away empty hours on a quiet front. In general, they were men carrying out often highly dangerous military missions, but with a passion to make the entomological most of their time in this or that remote posting, to which they were unlikely ever to return. The sense of this period is summarized by Swinhoe (1885) who spent 1880-1881 in Quetta (now in Pakistan) and Qandahar (Afghanistan):

> *"I took up a trained native collector with me, who collected every day, and, so long as he lived, my collection increased rapidly; but unfortunately the man was murdered one morning by a* Ghazi *who got into my quarters . . . and my very severe duties as administrative head of the whole of the Commissariat in Southern Afghanistan left me very little time to collect insects".*

Swinhoe's Afghan list, including 43 butterflies and 50 moths were considered to represent *". . . all the Lepidoptera from that country of which we have as yet any knowledge".* There is no other mention of his military work, but the year in question was extremely difficult for the British forces.

An even earlier report derives from collections made by Maj.

Howland Roberts *"about six miles from Candahar"* early in 1880. Collecting involved more than carrying a net: *". . . it is not safe to go even a few yards from quarters without being well armed, and to go any distance at all . . . is very unsafe without an escort"*. He *"made no observations after 2nd July"* but does not mention that Qandahar was soon afterwards under siege for several weeks, relieved when a renegade warlord was finally defeated, on 1 September 1880, ending the Second Afghan War (Smith, 2000). Roberts' collections were published by Butler (1880) and included 23 butterfly species, including descriptions of new *Melitaea, Lampides, Lycaena* and *Chrysophanus.*

There were very few regions of British India that potentially permitted entry into true Central Asia — the very high mountain ranges limiting India to the north. Of these, the most accessible were routes through Ladakh and Baltistan, notably from the hill station of Simla northeast to the border of the Tibetan plateau. These lay to the east of the routes by which the occasional traveller rode from Srinagar, the provincial capital of Kashmir, to the outpost of Gilgit: a very arduous journey of several weeks (open only in summer), which took the traveller across the Deosai Plateau to Skardu. It was these men who named the plateau "Little Tibet" from the physical resemblance, despite the altitude of the Deosai Plain which, at around 14,000ft, is 2000ft lower than much of the vast plateau of Tibet.

An early, and remarkable, list of Lepidoptera collected by Lang in this part of India was published by Moore (1865). The species noted include many from the Oriental zoogeographical zone--including two *Euploea* species, and other danaiines. However, the majority of taxa were Palaearctic, and Lang travelled into the northern highlands to record three parnassiines: *Parnassius jacquemonti, P. hardwickii* and an unidentified species. While most of his cited localities cannot now be identified, all these records were clearly made on one or more routes from Simla, at *c.*8000ft to the Tibetan border at 16,000ft. This account comprised 119 taxa, of which 24 were described as new species; several of these have survived the test of time and (more or less) of taxonomic revision, including some that occur in the fauna of Hunza — *Argynnis jainadeva* (now *Fabriciana adippe jainadeva), Lasiommata menava, Lasiommata (*now *Pseudocharaza) baldiva, Polyommatus (*now *Zizeeria) karsandra, Polyommatus ariana*, and *Chrysophanus (*now *Lycaena) kasyapa.*

Soon after, Moore (1874) published a list of 103 butterfly species collected by Reed in the Valley of Cashmere (Kashmir), in the foothills of the Pir Panjal (to 11,400ft) lying between the plains and the valley, and a low plateau (7000ft) on the Ladakh route. Reed commented on the disappointingly sparse fauna of the valley itself: the now all-too-familiar impoverishment of a heavily cultivated environment.

Another potential route to the highland border of Tibet from British India was through Sikkim. Southern Sikkim, with the town of Darjeeling, was in British India; independent Sikkim to the north lay between Nepal and Bhutan with an inaccessible northern frontier with Tibet. Elwes (1882, 1888) worked in British Sikkim in 1870 and 1886, and also received material collected by others, and notably by Otto Möller who lived in Sikkim for ten years, augmented by employment of "native collectors". Elwes comments that at this time, no European had collected systematically at over 12,000ft in the Eastern Himalaya. His biological philosophy was well ahead of its time:

> *"I am able to give the range and season of most* [species] *with tolerable exactness, which is of far greater importance to Science than the addition of a few bare names to a list that is already so extensive."*

The great difficulty of penetrating into the high regions is shown by his obtaining very few specimens of *Parnassius,* and of only three species: *P. epaphus, P. jacquemontii* and *P. acco.* However, in 1881 Elwes was able to make one foray to the Chumbi Valley on the Tibetan frontier. He comments (Elwes, 1882) on a limitation of material obtained by local people, that most specimens prove to be from low elevation:

> *". . . probably taken on the journey up. This part of the expedition is often made to last as long as possible by these native collectors, who infinitely prefer to spend their advance pay in feasting at villages on their road to hard work in a cold climate . . ."*

De Nicéville (1885) also published an account of the butterflies of Sikkim. He recorded 313 species, twice the list for Calcutta, but all were from relatively low sites, and the fauna of high elevation Sikkim/Tibet remained a tantalizing goal.

A major contribution to knowledge of Kashmir (in the British India context) is the account by Leslie and Evans (1903) of the butterflies of Chitral, in the far northwest. Chitral is *c.*130 miles north of the Khyber Pass, but the British presence in Chitral, reaching a peak in 1895, was concerned not with this entrance to Afghanistan but with efforts to place a preferred candidate (as *Mehtar*) on the throne of Chitral. The historical details are complex and fascinating, but unconnected with Lepidoptera other than accounting for the unusual circumstance that the butterflies of this very remote territory were probably better known, at the end of the nineteenth century, than any other area of the extreme north under British control. The list, published in 1903, was a landmark in two senses: first, the account was prefaced by a synoptic view of the topography of "Chitral" with references to lengths of valleys, and of altitudes, with brief notes on vegetation. Second, in the list of species, precise details are given (a) of flight periods, (b) of frequency and (c) of lowest and highest altitudinal limits; also, (d) the authority is given after each specific name in the text. The authors visited Shandur, and the Baroghil Pass on the Afghan border, at 12,000-13,000ft. *Parnassius jacquemontii* was noted as *"very common from May to September above 10,000 feet",* very small numbers of *Parnassius charltonius* and a few *P. stoliczkanus* (a form of *P. delphius)* above Shandur. The mountain chain of the Hindu Kush is considerably lower than the Karakoram, hence the relative paucity of truly high altitude butterflies in the list. This paper is, for a British publication of the period and geographical region, outstanding.

To a very minor extent, compared with the Russian approach (discussed below), Britain used non-military excursions beyond India to obtain information on Natural History. In association with Forsyth's mission in 1870 to Yarkand, Chinese Turkistan, (Bates, in Henderson and Hume, 1873) the tea planter and trader, Robert Shaw, collected the Central Asian pierid *Mesapia* (now *Baltia) shawii "on the Chang Lang Pass: alt. 18,000 ft".* Soon after, the Indian government arranged a second mission to Chinese Turkistan, then ruled by Yakub Beg, a Khokandi in control of a state which was outside Chinese control between 1865 and 1877, and published an extremely modest account of new species encountered (Moore, 1878): only seven new butterflies were included, one being additional records for *Baltia shawi.* This account did, however, excite the world with descriptions of three new pyralids, four crambids, a tortricid and a tineid. Entomology was evidently not a top priority in this political/economic exercise.

A rare British contribution to Russian Lepidoptera was made by Elwes, who visited the Altai mountains, a range between Siberia and Mongolia, primarily to shoot the wild sheep *Ovis ammon* but also to collect butterflies in search of evidence of a zoogeographical boundary between eastern and western Palaearctic regions. He was assisted by Russian lepidopterists, notably Alphéraky and the President of the Entomological Society of St.Petersburg, Semenoff. His published list (Elwes, 1899) drew together his own records, Russian collections and those of previous Russian authors, resulting in an impressive account of 181 species. His viewpoint was zoogeographical throughout, and he concluded that the bulk of the list had affinities with Europe, Siberia, northern Scandinavia and Amurland, only a small portion having affinities with the Pamir or Central Asia. Thus, of six *Parnassius* species Elwes found, only one, *P. actius,* is shared with Central Asia. This work is somewhat peripheral to the faunas discussed here, but deserves mention for its appreciation of the importance of biogeography — an appreciation shown equally by several Russian lepidopterists, notably André Avinov, as discussed later.

For Britain, an unusual link between political and biological endeavors occurred during the work of the Anglo-Russian Pamir Boundary Commission. In 1895 a joint Anglo-Russian boundary commission agreed on a geographical plan that resulted in the establishing of the 'Wakhan corridor', the very narrow extension of NE Afghanistan reaching the border of Sinkiang (China) and thus separating British India from Czarist Russia. Russia gained much of the Pamir region in return, and the Amir of Kabul received some territorial concessions along the border with India. The British published a report on the natural history records made by the British representatives between 21 June and 12 October, 1895 (Alcock, 1898). The main author of the report, A.W. Alcock (who had the unusual title of 'Surgeon Naturalist to the Commission') noted that the paucity of the zoological and botanical records was due, in part, to "*considerations of decisive political importance* [that] forbade any sort of delay along the road". Nine butterfly species were recorded north of Gilgit, within British Kashmir, and 10 from the 'Great' and 'Little' Pamir, now in Afghanistan/Tajikistan. He notes that he was indebted to De Nicéville for identifying the entire collection and correcting synonymy. Not surprisingly, the species lists included no surprises and certainly no new taxa.

Early in the twentieth century, Capt. F. M. Bailey occupies a unique position in British entomological exploration of Central Asia, and in other respects. In 1911 he followed a lengthy route through western China and SE Tibet, recording 238 butterfly species, also birds and mammals (South, 1913). In 1913, he and one colleague, Capt. Henry Morshead, carried out a much more extensive surveying expedition in south-eastern Tibet. They traversed 1500 miles of very difficult terrain in six months, solved the question of the gorges of the Tsangpo river, and mapped much of the mountainous border between Tibet and Assam (Bailey, 1957). This expedition was conducted without any permission, indeed without the knowledge of the Chinese authorities, at the time once again treating Tibet as a suzerain nation. In addition to this work, Bailey collected two thousand butterflies, of almost two hundred species, published by Evans (1913). In addition, he discovered the celebrated blue poppy, *Mecanopsis betanicifolia baileyi.*

In April 1918, at the time of Germany's WWI Spring offensive, Bailey embarked on a mission from India, via Chinese Turkistan (Kashgar) to Tashkent, capital of Russian Turkistan, in an attempt to contact Russians willing to continue the war against Germany and thus tie up troops who might otherwise be redeployed in the West. Twenty-one months later, he entered Persia. Even without any entomological component, Bailey's story is extraordinary: at one point, in order to obtain travel permits, he enlisted as a counter-espionage agent in the Bolshevik Cheka, searching for "the spy Bailey". He eventually escaped to Persia with quite extensive collections of bird skins, and his account of the episode includes two lists of butterflies (included in an Appendix: Bailey, 1946): first, 39 species collected *"between the Pamirs, Kashgar and the road to Russian Turkestan through the Alai Mountains, May to August 1918",* and a second list of 67 species *"Taken at or around Tashkent, summer 1919".* Almost all his records were from medium to high elevations. In the view of the senior author of this paper, Bailey's determination to document butterfly faunas of remote regions despite other, extremely dangerous activities, is without parallel in entomological history.

Before we turn to Russian work in Central Asia, it will be noted that the Hunza region has not been mentioned in the above account. Through almost all the nineteenth century, the Hunza Valley, ruled by the *Mir,* was impenetrable to foreigners; the British may have ruled India but Hunza was beyond their purview. Francis Younghusband had entered Hunza briefly in 1889, but obtained no assurances about the intentions of the *Mir* vis-à-vis the Russians or Chinese. In December 1891 a force of British, Kashmiri and Gurkha troops defeated Hunza and Nagar tribesmen at the battle of Nilt Fort, with great difficulty; a treaty was signed at Ganesh (Lower Hunza), the *Mir* fled into Sinkiang (China) and thereafter relations between the British and the people of Hunza/ Nagar remained remarkably good, and the perceived threat of Russian infiltration vanished. Only with the opening of the 4-wheel drive "Karakoram Highway" through Hunza to China to civilian use in 1986, via the Khunjerab Pass, was ready access to the region available; before, travel in Hunza was slow, difficult and dangerous. We shall note the first butterfly records from Hunza below; first, a synopsis is given of the very extensive Russian contribution to knowledge of the butterflies of Central Asia, through the nineteenth century.

In the second half of the nineteenth century, Britain's apprehensions about Czarist Russia's intentions were not based solely on paranoia. In one decade, Russia had incorporated three ancient townships of Central Asia into the Empire, all within present Uzbekistan: the emirate of Bokhara was invaded in 1866 and became a vassal State in 1868; the khanate of Khiva was occupied in 1873 and annexed in 1875, and in that year Khokand was annexed. These military incursions into Central Asia not only added to territories controlled by the Czar but also opened up vast regions to biological, and notably entomological research. The history of Russian investigation of Central Asian Lepidoptera has been excellently reviewed by Tuzov *et al.* (1997) who introduced their historical survey by stating that:

> *"The second half of the XIX century was marked by the outstanding geographical discoveries in Central Asia, opening the doors for Russian researchers to a vast unexplored realm. . . . By the middle of the XIX century, the European part of Russia, including the Crimea, Caucasus and Urals, was a territory of the Empire best studied from an entomological point of view. The . . . Lepidoptera of Siberia and the Far East was known more fragmentarily, while the enormous areas of Central Asia, including the Kopet-Dagh, Tian-Shan, Ghisser-Alai and the Pamirs, still remained a complete terra incognita".*

Even before the Czarist expansion into Central Asia, Pyotr Petrovich Semenov became the first Russian to carry out scientific work at the Ili River (then Russian territory, later returned to Sinkiang), Lake Issyk-Kul and into the Tien Shan Range. Tuzov gives a very sympathetic account of Russia's acquisition of the Central Asian khanates, but notes the establishing of the "Turkestan

Colony" with Tashkent as the capital, in 1867, and notes *". . . by the early 1870's, favourable conditions for research in the Tian Shan had been formed"*. Thereafter, the Russian Entomological Society, Russian Geographical Society and the Academy of Sciences arranged numerous expeditions to Central Asia. In addition, Tuzov mentions that many individual entomologists took advantage of the new access to the region to embark on collecting visits; of these, G. F. Christof, S. N. Alphéraky, G. E. Grum-Grshimailo and others are recorded in specific names of many butterflies of the region. This was a time of almost limitless exploration, with a wealth of taxonomy resulting: the Russian Entomological Society was founded in 1860; Tuzov notes that during the Society's first 50 years, 1300 articles were published, of which 81% concerned insect systematics, with descriptions of over 1200 new species of Lepidoptera.

The Society was supported by many senior state officers; Grand Duke Nicolai M. Romanov was Honorary President and other honorary members included other Dukes, Barons and State Council members. The name foremost in early entomological exploration of Central Asia is that of Aleksei Pavlovich Fedschenko. Between 1868 and 1871 he made a series of expeditions in the lower Syr Darya and Turkestan regions: several localities in the area of Samarkand, Khokand, and the Alai and northern Pamir. Fuller details of these extraordinary field travels are given by Tuzov *et al.* (1997). At this time, N. G. Ershov (Ershoff) worked on much of Fedschenko's material; he had a vast collection, part going to his Imperial Majesty Grand Duke Nicolai, but most acquired by the Imperial Academy of Sciences. He published the first catalog of Russian Lepidoptera (Ershov and Field, 1870).

In 1880, Romanov invited H. F. Christof, an entomologist who worked in the Volga region, Persia, Transcaucasia, Central Asia and the Far East, to collect for him. For reasons not clarified, Tuzov *et al.* note that a substantial part of Christof's collection found its way to the British Museum (Natural History). Romanov's contribution to knowledge of Russian butterflies was outstanding. He published nine superbly illustrated volumes: *Mémoires sur les Lepidoptères*, including accounts of the faunas of Kamchatka, Central Asia, Tibet, Mongolia and Korea (Romanov, 1884-1897). He was critical of Czar Nicolai II for his involvement in the First World War, a view for which he was imprisoned, then released. After the coup of October 1917, he was arrested again and murdered by the Bolsheviks.

A further political benefit to Russian lepidopterists late in the nineteenth century was that the Ili River region, and the main town of Kulja was then Russian territory. Sergei Nicolaevich Alphéraky, a pupil of Staudinger in Dresden, was advised by Col. N. M. Przewalsky (of horse fame) to explore the Kulja region. His timing was opportune: Kulja and the Ili were transferred to China soon after, and remained practically closed to foreigners for a century and still very difficult of access. He was the first European visitor to the eastern Tien Shan, and discovered numerous new butterfly species (details in Tuzov *et al,*. 1997). Alphéraky (1881) published a remarkable account of his 1879 work in and around Kulja: a detailed account of the time of emergence of a wide range of species, with altitudinal limits and distributional data for 112 taxa, several newly described.

The name of G. E. Grum-Grshimailo is attached to many specific and sub-specific names of Central Asian butterflies. He became a friend of Grand Duke Romanov, who encouraged him to visit the Pamir range, at the time almost unexplored. Between 1884 and 1890 Grum-Grshimailo made five expeditions into Central Asia, part of the first two being published in volumes 2 and 3 of Romanov's *Mémoires*. Results of his four Pamir expeditions were included in volume 4 (Grum-Grshimailo, 1890). The many new taxa resulting from these travels were published separately (Grum-Grshimailo, 1888). At that time, the extensive Pamir list of Lepidoptera included 119 endemic species or subspecies, many described by Grum-Grshimailo. In 1889-1890, he made a last expedition to the eastern Tien Shan, and continuing into western China. These collections, of 35,000 insect specimens, were published in a perceptive zoogeographical paper (ref. in Tuzov *et al.* 1997) which included descriptions of 47 new Palaearctic lepidopteran species and subspecies, *"bringing in also material collected by other entomologists in western Siberia, the Altai, Middle Asia, western Tian-Shan, Hindu Kush, the Himalaya, the Pyrenees, Canada, etc."*.

Thirty-six additional taxa were described by Grum-Grshimailo in 1899 and 1902 in a massive zoogeographical and taxonomic work that incorporated the rich collections in the Zoological Museum, St. Petersburg, from Siberia, Mongolia, the Tien-Shan, Szechuan Province (China), the Pamir and Turkmenistan (refs in Tuzov *et al.* 1997). He produced three extensive publications in 1896, 1899 and 1907 on *"Description of travel to western China"* in which he compared the faunas of Siberia, the Altai, the Tien Shan, Manchuria, West and East Tibet and Kansu Province of China, using his own material and collections made by other Russians, stressing possible colonization routes in the post-Pliocene, and the incidence of endemism in the faunas. These works are in Russian and references are given in Tuzov *et al.* 1997).

Andrei Nicolaevich Avinov (Avinoff) spanned both Russia and the West in his entomological career. He also approached butterfly distribution and speciation from a nationalistic as well as a biogeographical standpoint. Quoting from the citation by Tuzov *et al.* (1997) of a 1914 paper by Avinoff:

> *". . . investigations of the heart of Central Asia — Mongolia, western China, Tibet — which, since the second half of the last century, has glorified so many names of Russian explorers and travellers, has been only a logical, inevitable step in the task of a careful study of the flora and fauna of our motherland"*.

Further, that:

> *". . . the leading explorers of Indian Lepidoptera of the time, such as F. Moore and Ch. Swinhoe, paid the main attention to tropical species, and knew very little about Palaearctic forms. Of course. . . there is no distinct border between the faunas, so we are talking about a more or less deep penetration of species which we recognize as Palaearctic into the habitats of tropical ones, and vice versa"*.

The first sentence of this passage is true, but also somewhat unfair: Avinoff and his Russian colleagues of the nineteenth century enjoyed a relatively smooth path into Central Asia and lands beyond, while their British counterparts were restricted, in the main, to observing "tropical species" not through choice but through the physical, political and logistical barriers that impeded their entry into Central Asia from the South. We would counter that despite these barriers, the few Britons who contributed to knowledge of Central Asian butterflies did as much as they could have done, and certainly would not have appreciated Avinoff's rather patronising remark!

Alone among Russian lepidopterists, Avinoff made an extensive visit to British India in 1912. Precisely how this was arranged is not mentioned in his account (Avinoff, 1913), though on the Russian side it was an official expedition of the Biogeographical Commission of the Imperial Institution. Presumably by 1912, the acute suspicion of the Great Game era had lessened. In British territory,

Avinoff omitted Hunza and travelled through Baltistan and Ladakh, then east into the Great Himalaya through Kumaon, Rupal and Sikkim. He returned to Fergana (in present Uzbekistan) *via* Chinese Turkistan. He tabulated not only his own records but also those of all authors who had visited or written extensively on the butterflies of these regions. He recognized and subdivided the Palaearctic zone of British India, and while his analysis is now largely of historical interest, it marks him as a pioneer of the zoogeographical approach that came to underpin work on faunal distribution and evolution.

Avinoff prepared a more accessible paper in English, with an account of his itinerary in Kashmir and Turkistan, and a list of butterflies collected, but as Hampson (1919) notes, the manuscript sent to the Entomological Society of London in 1913 was *". . . lost in the post* [and] *owing to the outbreak of war he has been unable to supply a copy of the missing MSS."* All that remained for Hampson were descriptions of a few moths.

After the Russian revolution in 1917, Avinoff left for the U.S.A., settling in Pittsburgh, becoming Director of the Carnegie Museum of Natural History, where he produced, with a pupil Walter Sweadner, a revision of the important Central Asian satyrid genus *Karanasa* (Avinov and Sweadner, 1951).

The Revolution of October 1917 and the success of the Bolsheviks severely damaged the country in so many ways that lepidopteran taxonomy must be well down the priority list, but it survived. Tuzov *et al.* (1997) note the great contribution made by amateur entomologists in the Soviet Union of the 1920s and 1930s. Tuzov and colleagues note the production, between 1936 and 1960, of six volumes of *"Fauna of the USSR"* which included biogeographical and faunistic surveys of the Soviet Union. A general survey was presented by N.Y. Kuznetsov, who estimated that 75% of the "Macrolepidoptera" were known, but only 25% of the "Microlepidopteran" families. Kuznetsov estimated the butterfly species list for the USSR at over 600: a total coincidentally similar to that of the USA, soon to vie with the Soviet Union in a more ominous parity.

During the 1920s and 1930s travel from the West to the USSR was difficult and biological work virtually impossible. After WWII this situation became generally worse; most importantly few of the wealth of Soviet taxonomic publications emerged to the West, where knowledge of work within Russia and satellite States was minimal. After the demise of the Soviet Union, the picture has changed dramatically: the butterflies of Russia are now documented in the two excellent volumes by Tuzov and his colleagues, so often cited in this paper, while butterflies of the Pamir have received comparably excellent treatment by Tshikolovets (1997). Further superlative accounts by the latter author, on butterflies of Turkmenistan (Tsikolovets, 1998), of Uzbekistan (Tshikolovets, 2000) and Tajikistan (Tshikolovets, 2003) have been published, with accounts of other ex-Soviet territories including Kirgizstan in preparation. The importance of the Uzbekistan work in the present context is that all the emirate/ khanates incorporated into the Czarist Empire in the nineteenth century — Bukhara, Khokand and Khiva — lay within this now independent country.

The purpose of the above lengthy, but still much abbreviated account is to document the great preponderance of Russian work on Lepidoptera in Central Asia in the nineteenth century, with skilled taxonomists working difficult terrain but with an uncomplicated agenda and extensive assistance, compared with the few British entomologists, working equally difficult terrain but generally fighting a war or otherwise occupied in duties that limited entomology to a minor role. During the period when Russia supported many major expeditions to Central Asia and beyond, Britain supported not a single one.

Localities worked from 1994

Before considering early work on butterflies in the Hunza region, it is convenient here to give a brief account of the localities visited during our field visits. The number of times a locality was visited is mentioned for each entry, where appropriate. Localities along the Karakoram Highway (KKH) were visited on each trip, often when both outgoing and returning. The number before each locality is given on the accompanying Map 2 (see p. 2).

Karakoram Highway (KKH) and side-valleys to Sost (10,000ft)

Note (see Map 1): some of the listed localities have been combined in the Distribution Table, in which all sites along the KKH are tabulated under "Hunza" (Gilgit and Kargah sites are combined, likewise Nomal and Naltar, Minapin and Fakar, and Sost and Tharbai/Kalent). Records from Mintaka and Kilik routes are combined. Details of records are given in the Table, and discussed in the taxonomic section: species are mentioned in the list of localities only to provide points of reference for altitude or Palaearctic/Oriental demarcation. In keeping with current British practice and traditional British mountaineering accounts, altitudes are given in feet (readily transposed into meters = feet / 3.3).

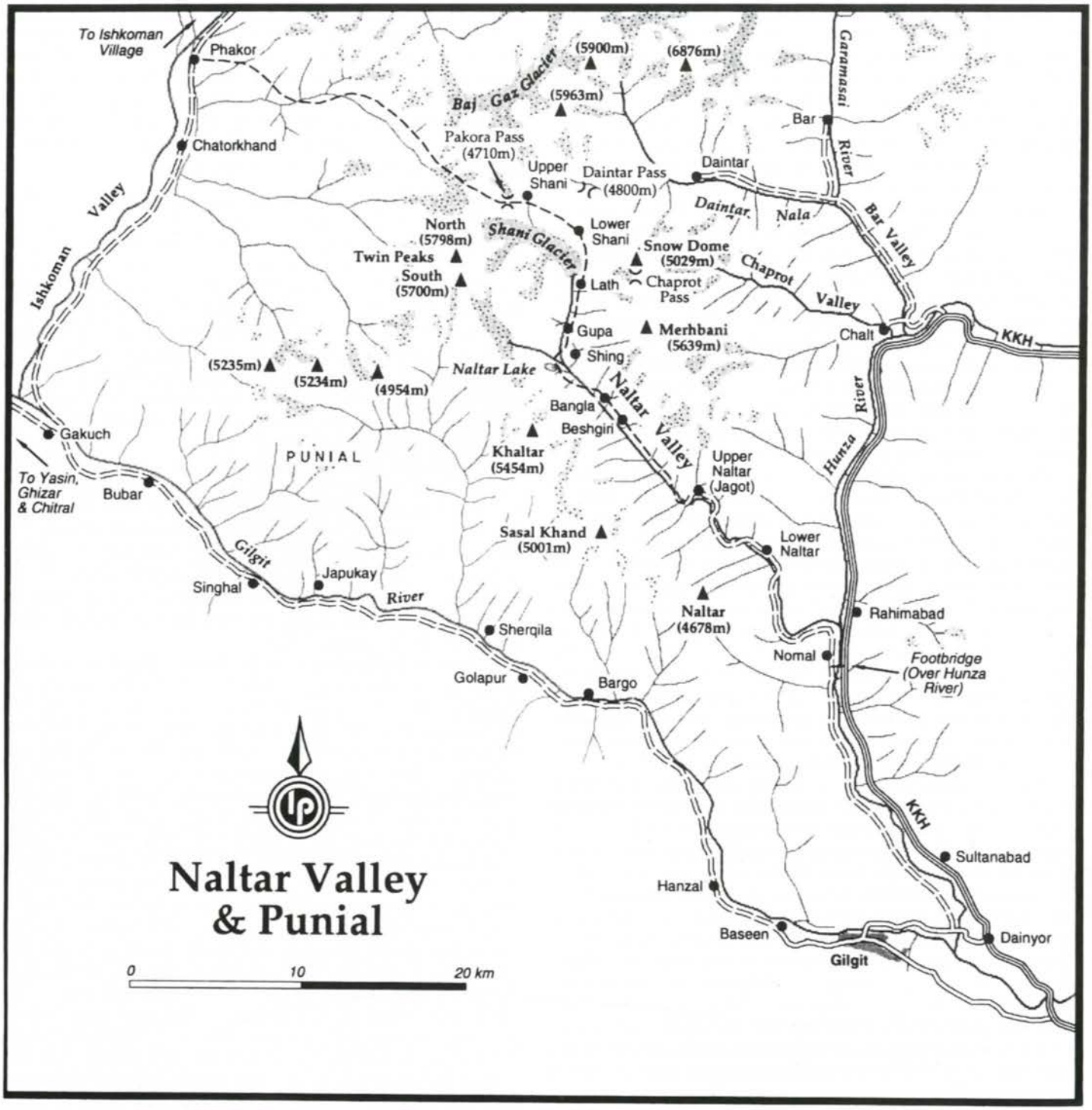
1. Gilgit. This was the administrative center of the former "Gilgit Agency" and remains the center for Hunza and other valleys, including Ishkoman and Yasin to the West. The town lies at 4500-5000ft: the edge of the town is heavily irrigated for field crops, fruit trees and livestock. The town offers few collecting sites, though flowers in hotel gardens and a public park yielded *Danaus chrysippus, Pieris rapae, Pseudozizeeria karsandra, Zizeeria maha* and *Heliophorus sena.* Just outside the town limits to the north, a jeep track leads to the Kargah Valley.

2. Kargah Valley: starting at the altitude of Gilgit and ascending along a narrow ravine (Fig. 9) above a small, fast-flowing stream to 10,000ft, where the ravine opens onto wet cultivated land. The ravine passes through cultivated patches and occasional habitations, but between 7000ft and the flat summit cultivation and irrigation are minimal or absent and the mountainside bears scattered shrubs and occasional coniferous trees. The entire valley below the top, both in and outside areas of cultivation proved very species-rich on each of 3 visits. Another route out of Gilgit to the NNE leads to Nomal.

3. Nomal and Naltar Valley. The village of Nomal is reached after traversing a flat, desert plain. This route lies parallel with and immediately to the west of the main Hunza Valley. The village of Nomal exists through irrigation: fields around the settlement yielded low-altitude pierids, lycaenids and *Papilio machaon.* From Nomal (at 5000ft) a steep jeep track ascends to the start of the Naltar Valley at 7000ft, densely wooded with tall pine trees (Fig. 1). This valley was visited on 4 occasions: in ungrazed areas butterfly diversity was high, but damaging effects of overgrazing became increasingly evident. We estimated that this damage was more extreme in Naltar than in any other region surveyed: following a poor jeep track to Naltar Lakes (10,000ft), we found butterflies virtually absent on the adjacent mountainsides, where flowering plants had been close-cropped by sheep and goat grazing. The higher regions of Naltar were not visited.

The portion of the Khunjerab Highway (KKH) included in our survey extends from Gilgit to Khunjerab Pass; its course is shown in Maps 1 and 2. Several sites along the KKH were worked on each of 7 visits: these are shown on the maps in order of increasing altitude.

4. Joglot: an "oasis" supported entirely by controlled irrigation from local streams, this village provided records of an Oriental *Eurema* and the sole record of the hesperiid *Eogenes alcides.* Just beyond the village is one of the most dangerous land-slide zones, which closed the KKH for several weeks just after we returned in

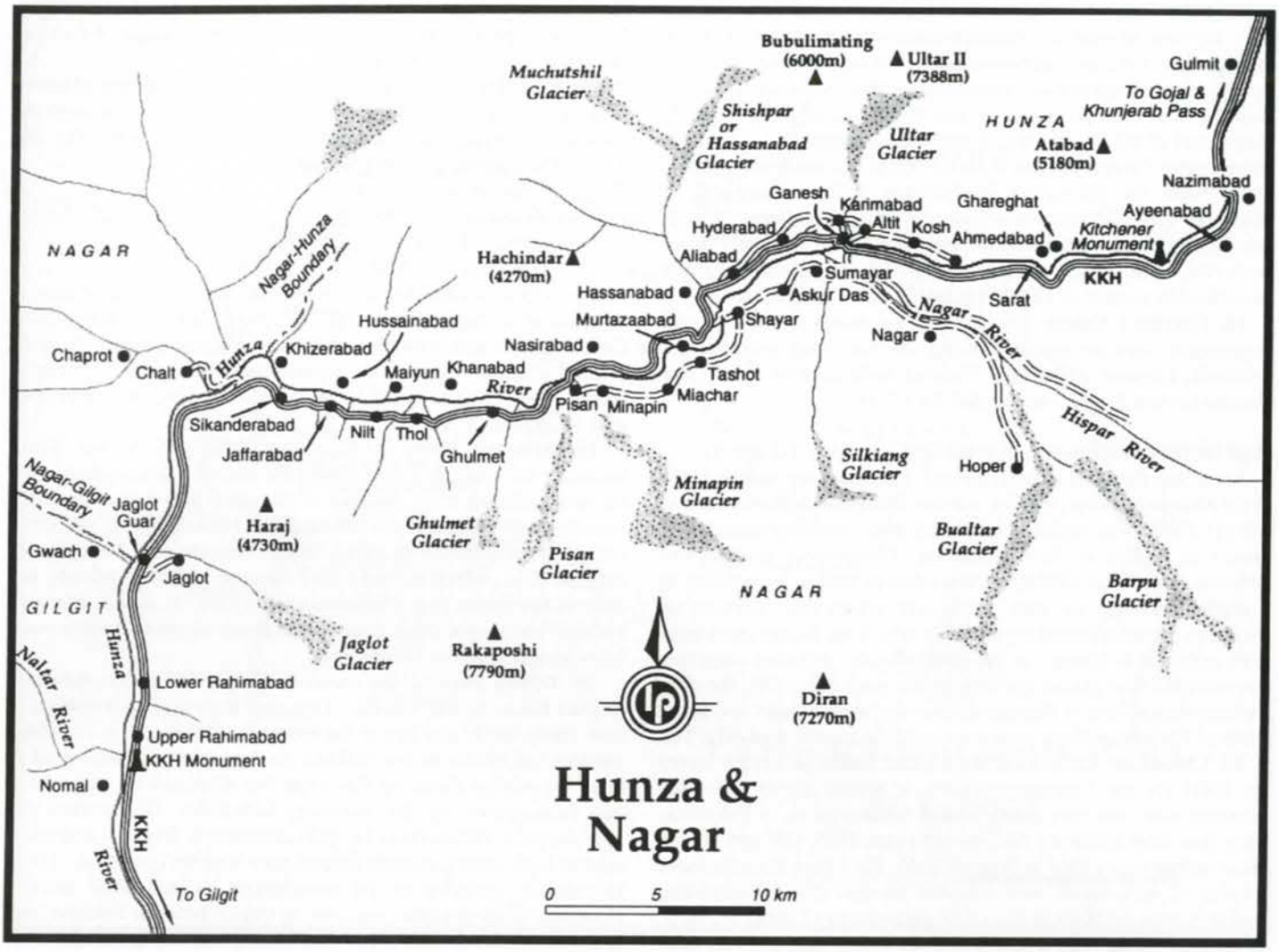


Map. 3. Karakoram Highway: Gilgit, Naltar Valley and Punial sectors (reproduced with permission from *Karakoram Highway*, 3rd edition, ©1998 Lonely Planet Publications).

1998. The region beyond Joglot is extremely arid, in places devoid of vegetation: here, at a site known as Shaitan pari (Devil's Hill) we recorded a shade temperature of 125° F (50°C) where, needless to say, butterflies were absent. A short distance beyond Joglot the KKH leads to Nilt.

5. Nilt: a village that is more important historically than entomologically. It saw the only major battle in Hunza between British and Kashmiri forces and tribesmen of Hunza and Nagar, in 1891, when the British became concerned that the *Mir* (King) of Hunza might negotiate with Czarist Russia and offer a route into India or come to some arrangement with the Chinese administation in Sinkiang. With great difficulty, the British won and the resulting treaty, perhaps surprisingly, initiated an unbroken period of friendship between the people of Hunza and Britain, which was later to have entomological results. At a series of small villages the left-hand side of the KKH (bordering the Khunjerab River, a tributary of the Indus) is cultivated; the hillside on the right side is partly covered in scrub, and proved a good source of low-altitude lycaenids, pierids and satyrids. Beyond Nilt, the KKH continues to site 6.

6. Chaprot: a foot-track leads North from the village of Chaprot,



Map. 4. Karakoram Highway: Hunza and Nagar sectors (reproduced with permission from *Karakoram Highway*, 3rd edition, ©1998 Lonely Planet Publications).

in Gilgit District near the border with Nagar, reached from the KKH. The track leads through cultivated fields onto high, exposed mountainside to 13,000ft. This route was followed only by GN during our work, but his collections were productive and interesting, and are included in the Distribution Table. The KKH continues beyond the turning to Chaprot, gradually ascending to 7500ft through villages, fields, and groves of apricot, almond, apple, cherry, and pear, with occasional white mulberry, reaching site 7.

7. Murtazabad, Aliabad and Karimabad: the main villages of Hunza. This is the most populous region of Hunza (Fig. 2) and the traditional seat of the Mirs of Hunza for a millennium. From here GN has obtained year-round observations of butterflies. From the KKH before Murtazabad leads a foot-track in Nagar to Minapin. Baltit Fort is in Karimabad (formerly Baltit).

8. Minapin and Fakar Peak: in 1995 we followed the track to Minapin (Nagar), a green, well watered and, at higher altitude, relatively lush valley, with scattered stunted juniper (Fig. 3), other conifers and patches of high pasture. This area proved productive for medium altitude lycaenids, pierids, satyrids and nymphalids, together with the lowest record of *Parnassius charltonius* at 10,000ft. Minapin is about 10 miles west of the 24,500ft Fakar Peak (Fig. 4), worked by GN in July 2003 and the two localities are complementary and considered together: records at Minapin reached 10,500ft and at Fakar from 13,000 to 15,000ft. Beyond the start of the route to Minapin a long and hazardous trail from the north side of the KKH led to the Muchuwar Valley.

9. Muchuwar Valley: a very high pasture, used on occasion by local people in the summer. It is extremely difficult of access, involving a traverse of the Muchuwar Glacier: of our party only GN and Fiaz Ahmad worked this region, the former on two occasions. Beyond Aliabad and Ganesh (where the treaty ending the war of 1891 was signed), a jeep track leads from the KKH on the right side of the road through Nagar territory to site 10.

10. Hoper Valley: has a small, seldom visited village, markedly hostile to strangers, at 8000ft. Extensive cultivation of the valley floor (Fig. 5) and limited vegetated mountain slopes above, worked to 10,000ft, yielded the co-highest record of an Oriental butterfly in Hunza — *Papilio polyctor,* at 9000ft, and was the sole locality for *Hyponephele carbonelli* and (Verhulst, 1999) of *H. dysdora.* A very lengthy glacier passes below the village, but did not provide terrain of entomological interest. At higher altitude the KKH leads to Gulmit.

11. Gulmit: the chief village of Gojal (Upper Hunza) at 8000ft is again heavily irrigated an cultivated. In 1994 we walked to 10,000ft above the village, an area that provided the co-highest record of an Oriental species — *Catopsilia pyranthe* — at 9000ft, and the lowest record of *Polyommatus ariana.* The KKH then ascends gradually to Pasu.

12. Pasu: here, at 8500ft, below the foot of the Pasu Glacier (Fig. 10) and beyond a cultivated zone, dry mountain scrub is dominated by *Perovskia abrotanoides,* a labiate plant with pungent flowers that is extremely attractive to the lycaenid *Lyceides samudra*. The extreme aridity of this region, as in many areas of Hunza, and of the importance of irrigation is illustrated in Fig. 6). Fifteen miles (24km) beyond Pasu the KKH reaches Sost.

13. Sost: the last village in Pakistan, before the ascent to Khunjerab Pass and entry into Sinkiang (Xinjiang) China. Sost is heavily irrigated with cultivation extending well above the village. From Sost, a foot-track ascends through Khudabad reaching high mountainside pasture at 13,000ft locally known as Tharbai.

14. Tharbai / Kalent: these very steep mountainside sites are occasionally used for grazing; during our visit, they provided the lycaenids, *Lycaena aditya and Plebejus bellona,* also *Parnassius charltonius* and *P. delphius hunza.*

High localities and passes beyond Sost (see Map 1-2 and 5)

From Sost the KKH ascends through the often very narrow gorge of the Khunjerab River, leading into the Khunjerab National Park at Dih (11,500ft). The region is extremely arid, with vegetation often limited to bushes of *Rosa webbiana, Tamaricaria elegans* and *Ephedra gerardiana.* Collecting was often prompted by sighting of a single butterfly; no sites were very productive. Records of *Lycaeides samudra* ceased immediately after Sost, though specimens were collected at Misgar, at the same altitude. *Albulina chrysopis* was recorded near glacial run-offs by the road. After Dih, the only National Park record of *Parnassius charltonius* was made, and many males of *Plebejus bellona* were seen puddling on wet mud (Fig. 11).

15. Chipursun Valley: 3 miles beyond Sost, a jeep track leaves the KKH for the Chipursun Valley, a region within the 1948 exclusion zone and very rarely visited by foreigners, or Pakistanis other than local residents, for over 50 years. DSS, GN and Darren Mann visited this valley in August 2000; the valley floor includes a series of very small, well irrigated hamlets (Fig.7), ascending gradually from 10,000ft at the valley entrance to 11,000ft at Ziarat, an isolated shrine with a few buildings where Afghans rest after making the descent from the Irshad Uwin Pass. Ziarat is not only a route into Afghanistan, but other passes lead from above Ziarat to the heads of the Ishkoman and Yasin Valleys — paralleling Hunza to the West. No visiting team members made the trek to Irshad Uwin Pass.

16. Irshad Uwin Pass: this pass (Fig. 22), at *c.*16,000ft, leads to Wakhan, Afghanistan. GN recorded butterflies at, and leading up to this pass in July 2000 and July 2001. Of particular note were parnassiines, lycaenids (e.g. *Polyommatus pulchella)* and satyrids. In July 2001 GN followed this route to enter the Wakhan corridor, Afghanistan. Butterfly records made on this expedition are described below (see Afghan records). Just beyond the Chipursun turning, a track from the KKH leads to Misgar.

17. Misgar: this village lies at the end of a 13 mile jeep track branching NW from the KKH a short distance north of Sost. Since 1948 Misgar, and the territory beyond to the West was off-limits to all foreigners, and to Pakistanis other than local residents, as a security zone, bordering China and, further West, Afghanistan. This restriction was lifted in June 1999, and the following month DSS and GN made a brief visit to the village and started to plan a larger expedition for the the year 2000. Misgar lies at 10,000ft, level with Sost; it is small, irrigated and set in very arid terrain (Fig. 8). It was formerly (from 1916) the first (and for many years the only) telegraph station reached by travellers from China and Afghanistan crossing into British India via the Mintaka, Kilik or Afghan passes. It has erroneously, and confusingly, entered the entomological literature as a locality, even a type locality of high altitude butterflies (see "The Misgar Muddle" below). From Misgar, a foot- or yak-track continues to Kilik Pass.

18. Kilik Pass: in August 2000, DSS organized and obtained funding for a large expedition that walked or rode yaks through the uninhabited country from Misgar to Kilik Pass (16,000ft) (Fig. 20-21) via the following locally named sites:

Lup Jangal (11,500ft)
Murkushi (12,000ft) (Fig. 17)
Shirin Maidan (13,000ft) (Fig. 18)
Luto Hari (15,000ft) (Fig. 19)

Butterfly taxa collected on this expedition provided new data on distribution of high altitude species, particularly of parnassiines, *Colias* species and lycaenids. It is probable that all records from Kilik/Mintaka are new: these areas were visited only very rarely before 1948. Prior to our work at Kilik, GN made an exploratory visit to Mintaka Pass.

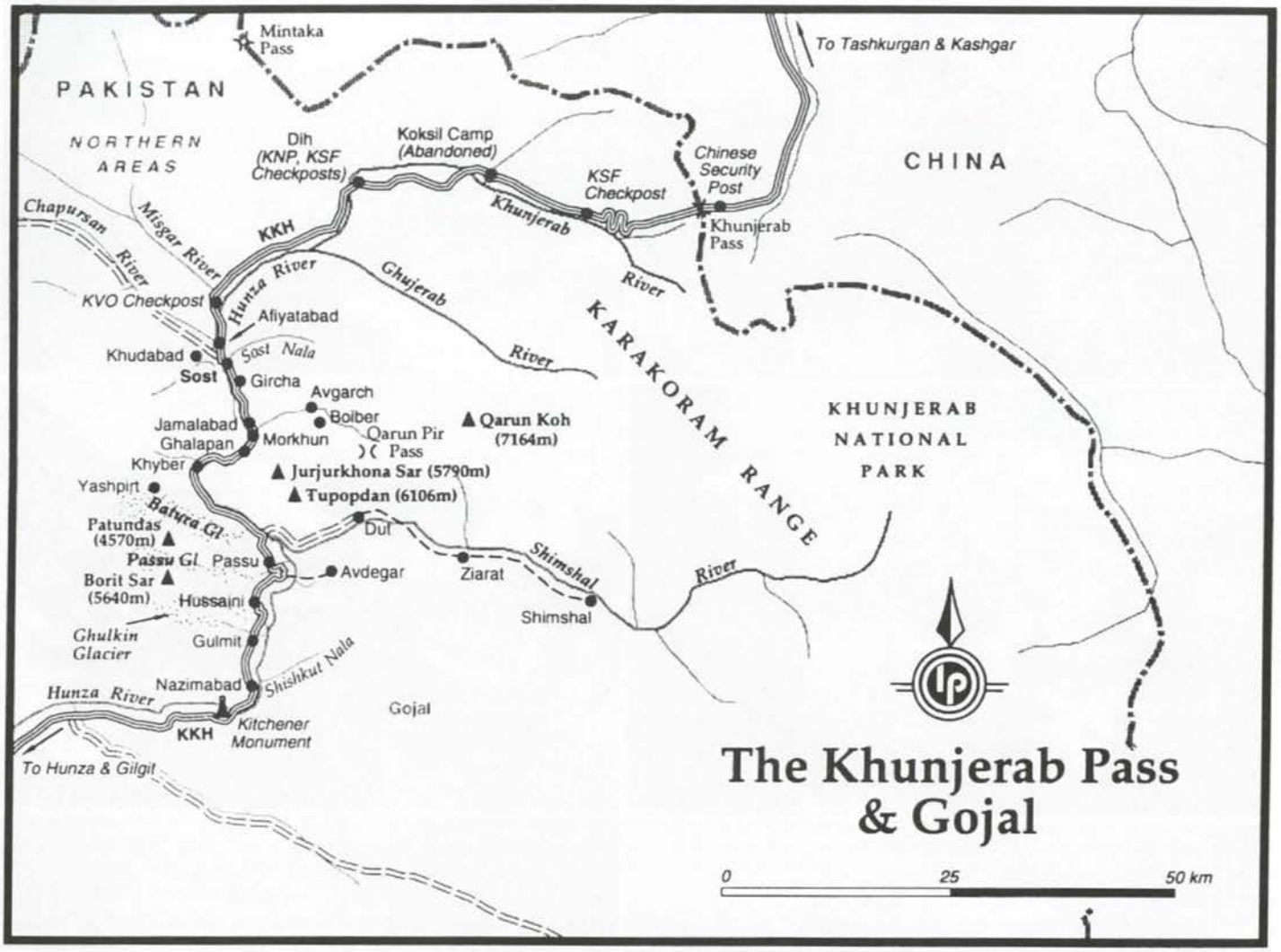
19. Mintaka Pass: in September 1999 GN visited Kilik, assessing the route, and also visited the ancient Mintaka Pass, used for two millennia since the start of the early Silk Route. Butterfly records from Mintaka are tabulated as Mintaka/Kilik. On GN's advice, the expedition of 2000, lacking time to visit both passes, selected Kilik, which proved a very valuable source of records, not only of butterflies (e.g. *Polyommatus erigone, P. hunza, Plebejus bellona)* but also of other insects, and plants. A more easterly track from Misgar leads to Dilsun Pass.

20. Dilsun Pass: at the extreme eastern end of the Pakistan/ Afghan border to the Wakhan. This very high pass (at 19,000ft) is now rarely used, and lies at the extreme eastern end of the Pakistan/Afghan border to the Wakhan. In July 2002 GN attempted to enter the Afghan Pamir by this route, but all passes to Afghanistan had been closed by the Pakistani authorities. GN worked the approaches to Dilsun from 16,200ft downwards (Fig. 23) and made several high altitude records despite poor weather conditions. These records are included in the introduction to individual species. However, some material was lost in transit between Pakistan and England and the species list is thus incomplete, and is omitted from the Distribution Table. To our knowledge, no observations on butterflies have previously been made in the Dilsun area and thus all records are novel for this locality.

Continuing along the KKH past the Misgar turning, the road ascends at first gradually, through an arid and sometimes narrow ravine beside the Khunjerab River, to the entrance to Khunjerab National Park, at Dih (11,500ft). The area around Dih is very arid, and not a productive area for butterfly recording, though it yielded the only record of *Parnassius charltonius* in the Park and a large puddling assembly of male *Plebejus bellona* (Fig. 11). Beyond Dih, the KKH ascends to Barkhun.

21. Barkhun: this account now returns to the Khunjerab Valley. Barkhun, at 12,500ft, a long-abandoned settlement used by workers constructing the Karakoram Highway, is a thinly vegetated site which provided the first high altitude *Papilo machaon,* and here *Pieris deota* was sympatric with the much scarcer *P. brassicae. Hyponephele brevistigma* was at times common, and the only satyrid in the region. The route also provided the lowest altitide records of *Polyommatus stoliczkana.* Beyond Barkhun the KKH continues to ascend to the Chapchingal Valley.

22. Chapchingal Valley: lying south of the KKH at 13,200ft, the stony valley floor follows a small and dissected river; steep mountainsides abut the valley floor (worked to 15,000ft) and vegetation is limited to isolated plants growing between the stones on the valley floor, and larger patches of low vegetation around a glacier crossing the valley about 3 miles from KKH. Despite the



Map. 5. Karakoram Highway: Khunjerab Pass and Gojal sectors (reproduced with permission from *Karakoram Highway*, 3rd edition, ©1998 Lonely Planet Publications).

very unpromising appearance of this valley (Fig. 13) 13 butterfly species were recorded on 2 visits: these included *Hesperia comma* and *Lycaena phlaeas*, and the more localized *Parnassius delphius hunza*. Visser-Hooft (1926) crossed the 19,000ft pass from Sinkiang, China, (far left, Fig. 13) on the expedition in 1925 that yielded the first published butterfly records from Hunza. It is unlikely that anyone has attempted to cross this pass since that time. Beyond Chapchingal, the KKH enters a series of acute and rapidly ascending bends, from 13,200ft to 14,500ft.

High altitude KKH localities: sporadic collecting yielded larger numbers of *Polyommatus stoliczkana* with *Melitaea fergana* and *Pieris deota*. At 15,000ft, the KKH enters the Khunjerab Plain, which rises gently to *c.*15,500ft at the demarcation of the Pakistan/China border. All work was carried out on the Pakistan side; from the plain arise mountains to north and south: vegetated on the lower slopes, then with a zone lacking obvious vegetation, surmounted by the zone of permanent snow. In July/August, the snow line lay at around 17,000ft. We have worked the Khunjerab Plain several times on each of 7 visits, and in three years higher elevation sites above the plain almost to the snow line were sampled for butterflies. This work has established the ecological separation between the Khunjerab Plateau and higher slopes arising from it, other high passes to the west, and the Deosai Plateau to the SE, notably in distribution of *Parnassius* taxa. As a potentially critically valuable ecological site in northern Pakistan, Khunjerab National Park deserves special mention.

Khunjerab National Park

On April 29 1975 the Khunjerab National Park (KNP) was formally established by the government of Pakistan: 900 mi^2 (2300km^2) of high land without human habitation, at the apex of the Hunza Valley and along the border with Sinkiang (Xinjiang) China. The Park was thought to include populations of the Snow Leopard *(Panthera uncia)*, the Himalayan Brown Bear *(Ursos arctos)*, the Blue Sheep *(Pseudois nayaur)*, possibly the Siberian Ibex *(Capra ibex siberica)* and the Marco Polo Sheep *(Ovis ammon polii)*. The region of the Sino-Pakistan border to the West that included the Mintaka and Kilik passes was omitted from the Park as a closed security zone. The KNP was beset by problems from the outset: in a recent critique of policies relating to the Park, Knudsen (1999) noted that when it was established, the Park excluded villages, but incorporated areas traditionally used for grazing by several Wakhi villages in Upper Hunza.

It is outside the remit of this paper to comment on the political rights and wrongs of this controversy. However, arguments concerning the conservation function of the Park center entirely on mammals: the detailed review by Knudsen (1999) nowhere makes mention of a single invertebrate animal — insect or other. Before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our work started in 1994, the Khunjerab Park lacked *any* invertebrate records. Those responsible for the Park, in our experience, have at times been ignorant of its biological importance and one of the Park Directors we encountered in Gilgit refused to believe that any butterflies would be found on the Khunjerab Plain, showing a lack of comprehension of, or interest in any aspect of the Park that did not offer profit, usually by "sustainable hunting". We have no current information on the administrative status of KNP, but in 1999 and 2000 large numbers of goats and sheep, and smaller numbers of cattle and yak were seen grazing on the plateau.

Apart from grazing and political problems, climatic factors must challenge the ecosystem of Khunjerab Plain and the mountains above. We first visited the plateau on 5 July 1994: much of the plateau was carpeted with plants in full bloom (Fig. 14; and see Botanical Lists). Noon temperature in the sun reached 68°F (20°C) and butterflies were flying in the brisk wind. Despite profuse flowering and favorable weather conditions, the peak of butterfly emergence had not yet occurred — only 7 specieswere recorded on the plateau: *Parnassius epaphus, Colias cocandica, Colias eogene, Pontia callidice, Pieris brassicae, Vanessa cardui* and *Albulina asiatica.* Of these, only *C. cocandica* and *A. asiatica* were common. In that year, at least, peak emergence was not synchronized with peak flowering. Ignorant of the climatic vagaries of the region, and in the total absence of any meteorological data for Khunjerab, we returned the next year on the same date: few plants had commenced flowering, noon temperature was 43°F (6°C), snow was falling and no butterflies were seen. If 1994 conditions are considered "mid-Summer" and in 1995 "late Winter/early Spring", subsequent visits in July 1996 were in "late Winter", in August 1997 "Fall", in July 998 "early Spring", in July 1999 "Spring" and in 2000 "late Summer". It is by no means certain that the Khunjerab Plateau sees the prolific flowering of 1994 every year; we never again encountered these conditions. The highest butterfly diversity on the plateau was recorded in early August 1997, past the time of peak flowering: all the above species were found on or above the plateau, together with *Parnassius actius, P. simo, Karanasa leechi, Boloria sipora, Melitaea didyma* and *Pyrgus alpinus.*

Detailed monitoring of meteorological conditions at Khunjerab (at present non-existant) would provide an invaluable background to work on the phenology of butterflies and other insects, and plants. The "stress ecology" of how insects and plants cope with extreme year-to-year fluctuations could ideally be studied at Khunjerab. At present, we know of no research plans to address this question. We suggest that ecological/meteorological work at Khunjerab (and other, less accessible high-altitude sites on the Sino-Pakistan border) offers unquestionably the most exciting research project on insects that Pakistan has to offer.

Species recorded in the KNP below the plateau are not tabulated separately, but are mentioned further later (see Species Richness of Localities, after the taxonomic listings).

Effects of grazing

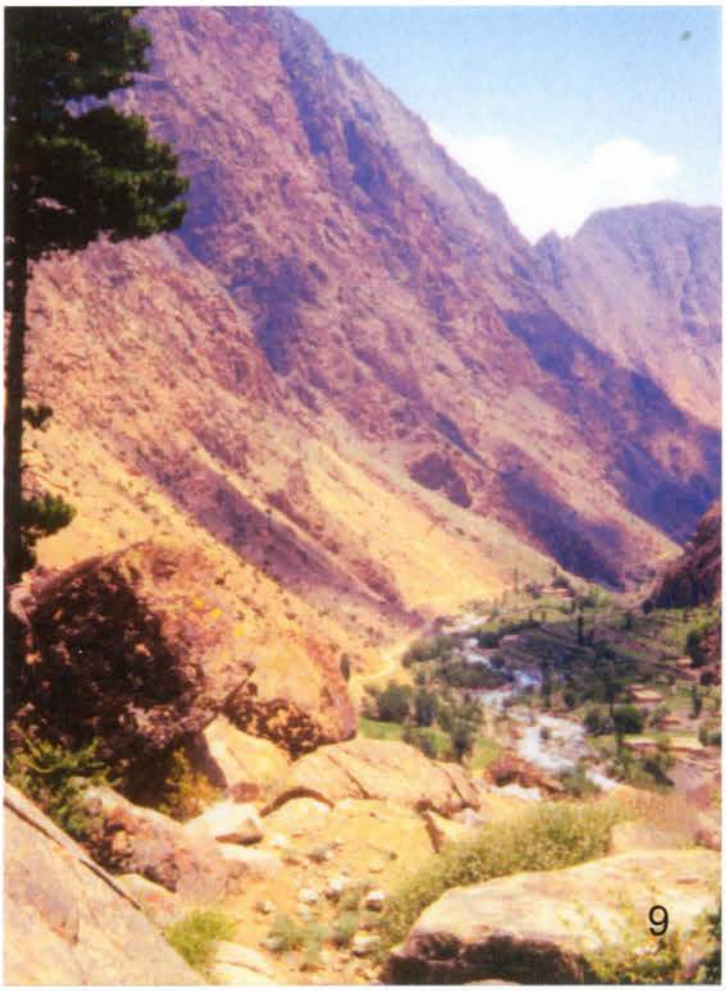
Grazing animals — goats, sheep, cattle, yaks — have been an essential part of the Central Asian scene for centuries, probably millennia. In regions such as Hunza and adjacent valleys, the continued increase in human populations has gone hand-in-hand with increase in numbers of farm animals. This increase, and the general lack of any plan to rotate grazing areas, has emphasized the immediate threat to Pakistan's Northern Areas from uncontrolled grazing. It might reasonably be argued that conservatiuon of butterflies is not a high priority in Pakistan's present political agenda. However, conservation of animals and plants is, in the view of the present authors, an affirmation of high civilization, a status for which Pakistan amply qualifies. Country people must feed their animals: if their traditional grazing lands are taken away (for the valid reason of attempting to preserve indigenous fauna and flora), then the Government is morally obliged to recompense these people, and/or to provide alternative plans for maintaining their farm animals. To do nothing, as seems to be the case at present, will speedily lead to collapse of the flowering plant/insect ecosystem in some delicatedly balanced high altitude localities. If this is allowed to occur, then "Conservation" becomes a hollow issue: if no attempt is made to preserve *all* members of the fauna and flora, then attempts focused on a few mammals and birds becomes a political rather than a biological exercise.

On one occasion in Khunjerab in July 1999, we saw perhaps 1000 goats and sheep led to graze on the plateau. On the approach to the remote Kilik Pass in August 2000 we saw several hundred goats and sheep led from lower elevations in Hunza, through very arid terrain, to graze on the thin vegetation at 15,000ft and above. These were joined by yaks, crossing over from China. In the Naltar Valley in 1995 and 1997, adult butterflies were virtually eliminated by over-grazing; here, and elsewhere, occasional patches of protected land, or perhaps enclosed by a dry-stone wall, or on a mountain slope less accessible to goats and sheep than elsewhere, are sometimes spectacularly species-rich. Without government interest and willingness to act, Pakistan's high altitude insect fauna is critically threatened.

Early butterfly records from Hunza

Despite all the extensive work on Central Asian butterflies, whether from Russia or Britain, the Hunza Valley and its surrounds remained a conspicuous lacuna: until late in the 20th century, no entomologist had worked systematically in Hunza. Other than recently identified records in the Natural History Museum (BMNH) showing that Maj. John Biddulph, the first British Political Agent in Gilgit from 1877 collected a few butterflies (see *Charaza heydenreichi* below), the first butterfly specimens from Hunza were found, unpublished and buried in the same collections, obtained by Maj. R. W. G. Hingston. Hingston was a celebrated naturalist and mountaineer, a member of the 1924 British Everest expedition (Hingston, 1925), on which he collected several new high altitude butterflies.

Plate 1. Fig. 1. Naltar Valley (Site 3) from *c*8000ft.; records from Naltar to 10,000ft include *Metaporia leucodice, Aulocera padma, Aglais caschmirensis, Albulina omphisa* and *Polyommatus ariana.* Fig. 2. Hunza Valley (Site 7) from vicinity of Aliabad, with Hunza River and irrigated areas at *c*7500ft.; Rakaposhi (25,500ft) in background. Fig. 3. High pasture at Minapin (Nagar) (Site 8) with dwarf conifers; lowest locality for *Polyommatus ariana* (9000ft) and *Parnassius charltonius dekerty* (10,000ft). Fig. 4. Fakar Peak (Nagar) (Site 8) at *c*15,000ft.; note low alpine vegetation and patches of snow and ice. Records include *Parnassius epaphus, Charaza heydenreichi, Albulina omphisa* and *Lycaena aditya.* Fig. 5. Hoper Valley (Nagar) (Site 10) looking east from vicinity of Barpu Glacier at *c*8000ft.; Ultar peak (24,400ft) in background. Records included *Papilio polyctor, Pseudocharaza baldiva, Hyponephele carbonelli, Aricia agestis, Aricia eumedon* and *Polyommatus icarus.* Fig. 6. Hillside above Pasu (Gojal or Upper Hunza) (Site 12) at *c*8500ft; note green irrigated fields and adjacent waterless field boundaries. Fig. 7. Chipursun Valley (Site 15), eastern region off KKH. Entire valley to Ziarat (see Map 2; below Irshad Uwin Pass) is arid, with succession of irrigated villages. Fig. 8. Misgar Valley (Site 17) from jeep rack off KKH. Note extreme aridity of terrain; Misgar village lies on right of the ravine in the irrigated green area in the middle distance.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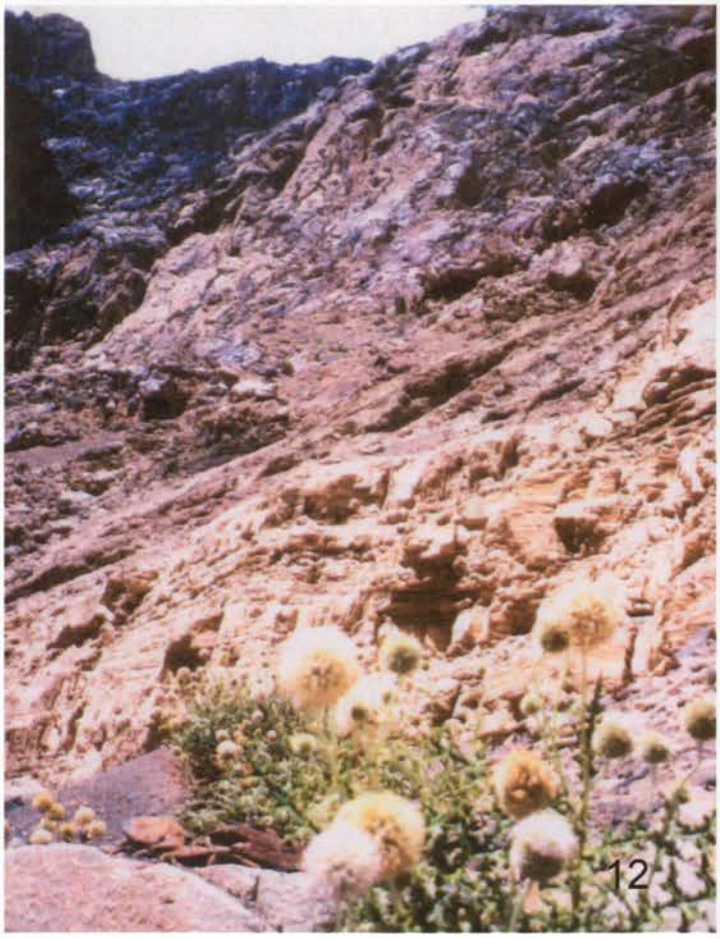
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Plate 3. Fig. 13. Chapchingal Valley entrance (Site 22) at *c*13,200ft., off KKH below Khunjerab Plateau. Records included *Parnassius delphius hunza, Papilio machaon, Melitaea fergana, Plebejus bellona, Polyommatus stoliczkana* and *P. erigone*. Fig. 14. Khunjerab Plateau (Site 22) at *c*15,500ft in July 1995, near peak of flowering season (see Text for records). Fig. 15. Dwarf plant of *Saussurea simpsonianum* growing between stones at *c*16,500ft above Khunjerab Plateau (Site 22), in flight zone of *Parnassius actius catilina* and *P. simo saserensis*. Fig. 16. Glaciated valley above Khunjerab Plateau (Site 22) adjoining Sino-Pakistan border. On lower slopes flanking glacier *Parnassius epaphus, Colias cocandica, C. eogene, Karanasa leechi, Melitaea didyma, Boloria sipora* and *Albulina asiatica* are more common than on the plateau below, but *Parnassius actius* and *P. simo* occur only on the higher slopes above the vegetated zone, near the snow line. Fig. 17. Murkushi (Site 18), a locality *en route* to Kilik, near point of convergence of tracks to Mintaka and Kilik passes (see Map 2). This wet area in very arid territory has probably been used as a camp ground for over two millennia since the time of the old Silk Route. Fig. 18. Shirin Maidan (Site 18), another locality on the Kilik route, at 13,000 ft. where *Colias eogene* and *Lycaena aditya* were frequent.

Plate 2. Fig. 9. Kargah Valley (above Gilgit) (Site 2) at *c*8000ft, locality for *Pseudocharaza droshica, Gonepteryx rhamni, Aricia astorica, Plebejus sarta, Plebejus devanica* and site of puddling assemblies of *Papilio machaon* and *Lampides boeticus*. Fig. 10. Mouth of Pasu Glacier (Gojal) (Site 12) from KKH at 8500ft; *Plebejus samudra* abundant on flowers of *Perovskia* in foreground. Fig. 11. *Salix* stand bordering Khunjerab River at Dih (Site 21), near entrance to National Park; site of puddling assembly of *Plebejus bellona*. Fig. 12. Globe thistle *Echinops cornigerus* along Khunjerab River ravine (Site 21) at *c*11,500ft, at times the sole nectar source for *Hyponephele brevistigma* in this area.


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He lived at intervals from 1914 to 1916 in Hazara, a region crossed by the KKH through Abbotabad, north of Islamabad. Hingston (1920, 1923) published two works on the natural history of this area, on the fringe of the Karakoram foothills, but neither includes any mention of Hunza. However, series in the Museum include two specimens of *Satyrus mniszechii* f. *clarissima* Seitz (= *P. baldiva* Moore, 1865) labelled as collected by Hingston in "Hunza" on 21 and 25 August 1913, at altitudes of 9450 and 7500ft. No doubt other Hingston specimens are present; these records suffice to establish his visit to Hunza before his residence in Hazara.

The first butterflies from this valley destined for publication were received at the British Museum (Natural History) [now the Natural History Museum] in the 1920s. A small collection came in 1926 from Janet Visser-Hooft, a Dutch mountaineer and glaciologist; she and her expedition colleagues traversed the Khunjerab and Chapchigal passes *en route* to the Hunza Valley (Visser-Hooft, 1926). Evans (1927), who described the collection, noted that it comprised 410 specimens, of 27 species. He noted the surprising paucity of species; that *"in parts of Chitral and Central Asia many more species occur at similar elevations"*. His forecasting of "missing" species was perceptive: *Parnassius simo* and *actius* are now known from the region (though *P. acco* has yet to be recorded). He regarded *Pieris deota* as a possible "local race" of *P. brassicae,* while the two are now known to be specifically distinct; Visser-Hooft's collection lacked any *Karanasa,* which Evans reasonably found surprising. Only three lycaenids were found: *Lycaena (=Albulina) metallica,* two populations of *Polyommatus eros* (recte *ariana)* to which Evans assigned subspecific names: *hunza* and *janetae,* and a single specimen of *Lycaena phlaeas.* The only hesperiid included was *Hesperia (=Pyrgus) alpinus*; Evans forecast the presence of *Hesperia sao* and *Pamphila (=Hesperia) comma,* and the latter has now been recorded from Hunza, but not the former. Each of Visser-Hooft's species was found during our survey.

The second group of Hunza butterflies reached London soon after Visser-Hooft's material. Before then, in 1920 Maj.-Gen. H. C. Tytler *"proceeded on a shooting trip to Astor and availed myself of the opportunity to collect what butterflies I could in the short time at my disposal."* The reason for this interest was that although:

> *"The butterflies of the extreme North-West of India are but little known; Chitral has been worked by several collectors fairly thoroughly, and results have been published by Capt. (now Colonel) W. H. Evans, but the adjoining territories of Gilgit, Hunza-Nagar, Astor and Chilas, which are included in the Gilgit agency, and which are a mass of high and inaccessible mountains, have been practically untouched and very little is known of the butterflies that inhabit them".*

Tytler's paper included a few species collected in Astor and Chilas, but in the main relied on specimens sent by the British representative in Hunza:

> *"Through the kindness of Lieut.-Col. D. L. Lorimer, C.I.E., late Political Agent of Gilgit, I have received numerous specimens of butterflies collected by himself and by the local inhabitants in out of the way and inaccessible places of the Gilgit Agency, and but for his kindness and the trouble he has taken on my behalf, the material which has made it possible for me to write much of these notes would never have been obtained".*

David L. R. Lorimer was a very unusual man, and unquestionably the best appointee for the post he held from 1920 to 1924. He was not only the first foreigner to gain sufficient mastery over the isolated language of middle Hunza, Burushaski (Lorimer, 1938), to address an annual assembly in their language during his second year of office, but he and his wife "could have stayed as welcome guests in any house in Hunza" (authority: Haji Shah, Gulam Naseer's father).

According to Tytler (1926) Lorimer sent nine species. One, *Parnassius discobulus baroghila* (now *P. jacquemontii chitralensis* Moore, 1902) was collected by Lorimer at the Baroghil Pass, eastern Chitral, on the border with Wakhan, Afghanistan. *Parnassius simo lorimeri* was collected on the Kine Chish Pass, on the border of Tribal Territory, south-west of Gilgit. The satyrid *Eumenis lehana gilgitica (=Pseudocharaza baldiva* Moore, 1865) was collected by Lorimer at Ghizer, Gilgit. Five other butterflies, *Parnassius discobulus hunzaica (=P. jacquemontii chitralensis), P. delphius chitralica (=P. delphius hunza* Grum-Grshimailo, 1888), *Colias cocandica hinducucica, Karanasa regeli boloricus (=K. bolorica* Grum-Grshimailo, 1888), and *Eumenis lehana clarissima (Pseudocharaza baldiva* Moore, 1865), were noted by Tytler as coming from "Misgar in Hunza". It is seldom that a mis-cited locality deserves a paragraph of its own, but Misgar is the exception.

The Misgar muddle

Several of the specimens sent by Lorimer to Tytler were published as "from Misgar in Hunza". At least two generations of lepidopterists interested in butterflies of Kashmir, later the Northern Areas of Pakistan, must have wondered about this extraordinary locality, Misgar: the senior author of this paper certainly did! A problem was that, after Lorimer's retirement, nobody seems to have continued his occasional butterfly collecting expeditions. Moreover, after 1948 the area west of what became the Karakoram Highway, along the Sino-Pakistan border, including Misgar, the Mintaka and Kilik passes, the Chipursun Valley with the Irshad Uwin Pass to Afghanistan, became off-limits to all foreigners, and to virtually all Pakistanis other than local residents. This restriction ruled out any access to the Mintaka and Kilik passes, ancient routes to and from China used for two millennia. For five years, from 1994 to 1998, we drove past the start of the jeep track to Misgar *en route* to Khunjerab (see Map 5), with regret. In June 1999, the restriction was lifted, and DSS and GN made a brief visit to Misgar (see Map 6, p. 51), but not beyond.

Plate 4. Fig. 19. The highest camp ground on the Kilik route, Luto Hari (Site 18), at *c*15,000ft. The overnight light snow soon melted, and *Parnassius, Colias* and lycaenids were flying by 10:00am. Fig. 20. Valley immediately below Kilik Pass (Site 18). Note grazing yak, having just entered Pakistan from China. Fig. 21. Obelisk marking the boundary between Pakistan and China on the Kilik Pass (Site 18), at *c*16,000ft. Species on the frontier plateau include *Parnassius actius catilina, P. jacquemontii, P. delphius hunza, Colias marcopolo, Polyommatus erigone* and *P. hunza.* Fig. 22. Irshad Uwin Pass (Site 16) at c16,000 ft, from Pakistan to Wakhan, Afghanistan (see Map 2). Species recorded include *Parnassius actius catilina, P. delphius hunza, P. jacquemontii, Colias marcopolo* and *Polyommatus pulchella.* Fig. 23. Below Dilsun Pass (Site 20) between Pakistan and Afghanistan, at *c*15,500ft (see Map 2); see text for records. Fig. 24. Aspect of the northern area of Deosai Plateau, Baltistan above Skardu (see Map 1-2). The plateau lies at *c*13,500-14,000ft, and records were made on the plateau and on mountain slopes above the plateau, to *c*15,000ft. Records from Deosai are compared with records from Hunza in the text. Fig. 25. Qudut Shite (See Map 1-2), a wet valley beyond the Irshad Uwin pass in the Wakhan, Afghanistan. Fig. 26. Bai Qara Plain, Wakhan, Afghanistan (see Map 1-2). Records from Wakhan are compared with records from Hunza in the text (see pp. 48-50).


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The village of Misgar lies at 10,000ft, is heavily cultivated and irrigated (Fig. 8), and is disappointingly lacking entomological interest. Its historical importance lies in its being the first (and for many years the only) telegraph station in Hunza. Travellers entering this region of British India from China or Afghanistan invariably passed through Misgar; mail and telegrams were sent from Misgar before the traveller entered Hunza proper. Evidently the packages sent by Lorimer to Tytler bore some reference to "Misgar". In July 1999 a small room was seen, filled to the ceiling with files and ledgers, and it is very likely that all telegraphic correspondence from the opening of the Misgar office in 1916 is preserved: an historical gold mine that will require an accomplished historian to excavate.

Between the lists of Visser-Hooft and Lorimer, there is little overlap and together they record perhaps 33 butterfly species from Hunza. Unfortunately, few of these records include any useful locality data: even Visser-Hooft's specimens, collected in entirely new and extremely difficult localities, bear imprecise labels. John Clark (Clark, 1956) lived in Hunza in 1950 and sent a small group of butterflies to Carnegie Museum, Pittsburgh. These were mainly collected at Gilgit and in the Hunza Valley from 10,000 to 13,000ft, but few species were represented and these do not add to the earlier species count. Recently, Verhulst (1999) recorded 13 species from the Khunjerab region and eight from Deosai.

Collaborative work between Oxford University Museum of Natural History and Florida International University, and the Pakistan Museum of Natural History

After a preliminary field survey in July 1992, collaborative work was agreed between the Hope Entomological Collections, Oxford University, UK and the Pakistan Museum of Natural History, Islamabad, Pakistan (PMNH). The plan was to investigate the almost unknown butterfly fauna of Hunza, and selected side valleys (a) to fill this lacuna in knowledge of Pakistan's butterflies, and also (b) to determine the altitudinal zonation of species between 5000ft and 17,000ft, (c) to record species occurring within Khunjerab National Park and (d) to compare faunas of valleys adjacent to or parallel with Hunza, in quest of data on evolutionary divergence through isolation. It was agreed that after completion of taxonomic work on material collected, half would remain in the Oxford University Museum of Natural History, and half would be deposited in the Pakistan Museum of Natural History. A preliminary account of the early stages of the survey was published (Smith and Hasan, 1997).

TAXONOMIC LIST

Detailed records of the distribution of the following taxa are given in Table 1 (p. 54).

HESPERIIDAE

Eogenes alcides Herrich-Schäffer, [1852]) (Fig. 33a, b)
[Hesperia] Alcides Herrich-Schäffer, G.A.W., *Syst. Bearb. Schmett. Europas,* 6:38, Tab. Hesp. 7, Abb. 41,42.

Range: Tshikolovets (2000) gives the range of this skipper outside Pakistan as Armenia, Azerbaijan, Turkey, each of the southern ex-Soviet Republics, Afghanistan and western China.
Localities: Joglot (KKH).

For a butterfly with a very wide distributional range, our single record seems very inadequate. We collected a single specimen in July 1994 at the irrigated oasis of Joglot at 6000ft (where *Eurema hecabe* was found — see below) on our first field expedition; it was sought, without success, in this locality, and elsewhere, on each of six subsequent annual visits. It is probable we collected subspecies *chitrala* Evans, 1949; others have been described from the Transcaspian, Baluchistan and Xinjiang (Evans, 1949). Previous records for Pakistan are very sparse.

Eogenes leslei Evans, 1912
Eogenes alcides leslei W.H. Evans, *J. Bombay Nat. Hist. Soc.,* 21:1007.

Range: Chitral, Malakand; Hunza.
Localities: below Minapin.

This species was first found by Leslie in several localities in Chitral from 4000-9000ft; also known from Malakand at low elevation (3000ft). Our record adds the species to the faunal list of the eastern Northern Areas: it was collected on a dry, rocky mountainside at 8000ft on the lower part of the track to Minapin (Nagar). The locality was revisited two years later, but *E. leslei* was seen neither there nor elsewhere.

Erynnis pathan Evans, 1949
Erynnis marloyi Sub-sp. *Pathan* nov. W.H. Evans, *A Catalogue of the Hesperiidae from Europe, Asia and Australia* . Brit. Mus. (Nat. Hist.), p.168.

Range: Pakistan, NW India, Turkmenistan, Afghanistan, Turkmenistan, Uzbekistan, Tajikistan.
Locality: Kargah.

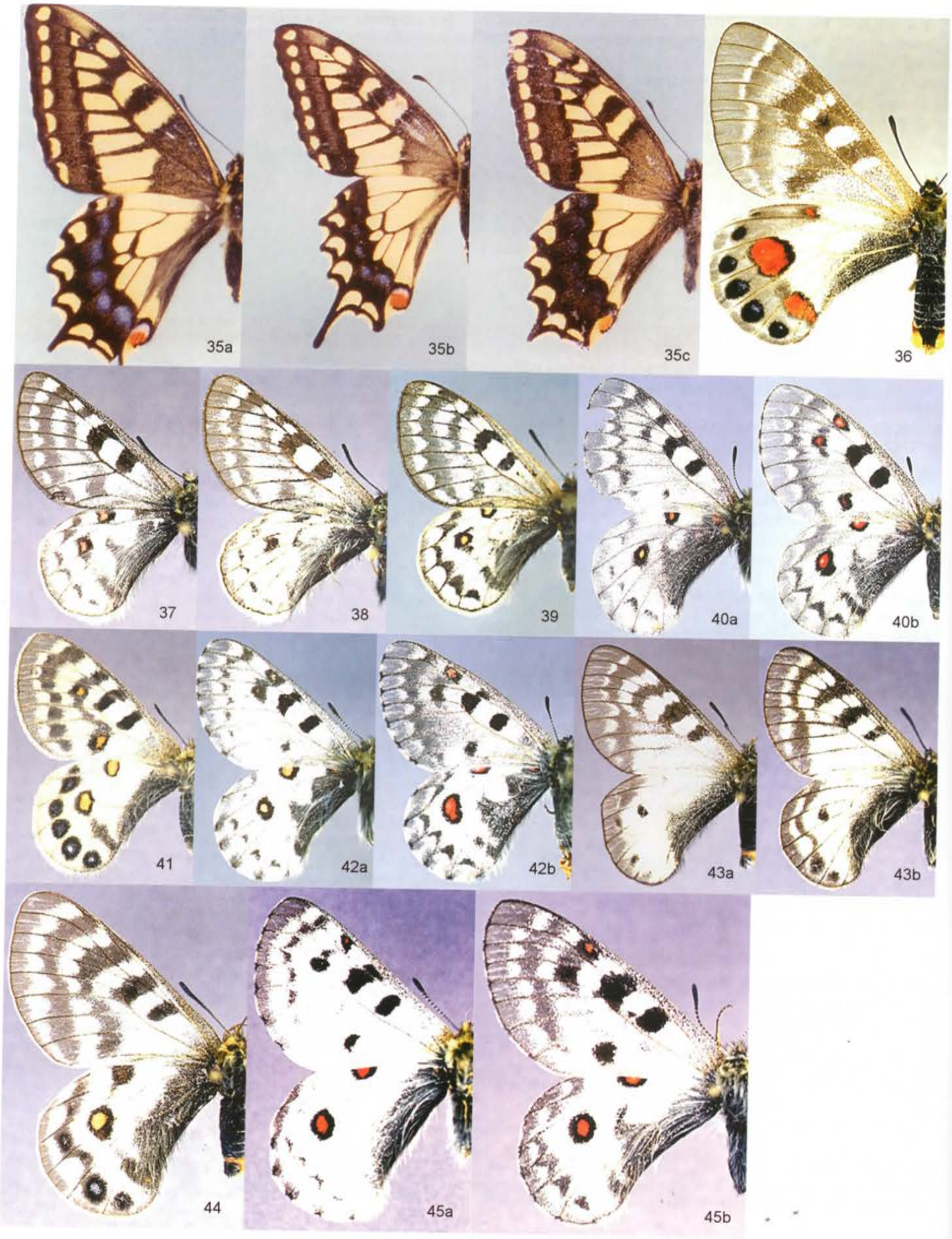
This skipper was noted only once during our survey, a sight record at 9000ft in the Kargah Valley above Gilgit. Roberts (2001) lists it (as *E. marloyi)* as a widespread upland species, from Chitral, Waziristan, Kohistan and Baluchistan.

Pyrgus alpinus (Erschoff, 1874) (Fig. 27a, b)
Syrichthus alveus var. *alpina* Erschoff, N.G., Fedtschenko, A.P. *Journey to Turkestan.* Schmetterlinge, Lepidoptera 11:24. pl. 2, fig.18.

Range: a widely distributed species, known from the Tien Shan, Pamir-Alai, Hindu Kush, the southern Republics east of Turkmenistan, Afghanistan, the Karakoram, northern India and W. China.
Localities: Fakar Peak, Muchuwar, Tharbai, Khunjerab, Mintaka Pass, Kilik Pass, Irshad Uwin Pass.

A true high altitude member of the Hunza fauna, this skipper is known from the Muchuwar Valley (Nagar), the mountainside of Tharbai/Kalent above Sost, each at *c.*13,000ft. At higher altitude, it is common on the Khunjerab Plateau (15,500ft) and on the slopes above the plateau, at times as common as *Albulina asiatica* but is not found on the Karakoram Highway (KKH) leading to the plateau. It is again common on the Mintaka and Kilik passes, and on the Irshad Uwin Pass above the Chipursun Valley, leading to Afghanistan, in each site at *c.*16,000ft. Roberts' (2001) records center on northern Chitral, Yasin, west of Hunza, the Batura Glacier in Hunza and the "mythical" locality of Misgar (see above). The Deosai Plateau is also listed, but there a different species occurs (see next listing). The taxonomy of this and related taxa is complex, and Central Asian populations are poorly evaluated.

Plate 5. Hesperiidae: Fig. 27. a-b) *Pyrgus alpinus*, male. Fig. 28. a-b) *Pyrgus cashmirensis pseudoalpinus*, male. Fig. 29. a-b) *Pyrgus alpinus alichurensis*, male. Fig. 30. a-b) *Hesperia comma comma*, male. Fig. 31. a-b) *Hesperia comma shandura*, male. Fig. 32. a-b) *Hesperia comma mixta*, male. Fig. 33. a-b) *Eogenes alcides*, male. Fig. 34. *Taractrocera danna*, male. Figures about twice life-size.


35a
35b
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Pyrgus cashmirensis Moore, 1874
Pyrgus cashmirensis Moore, F., *Proc. Zool. Soc. Lond.* 1874: 274, pl. 43, fig. 7.

Range: this species occurs in the mountains of Tajikistan, NE Afghanistan, the Karakoram and northern India. According to Tuzov *et al.*, (1997) the nominate race occurs in northern India, and subspecies *pseudoalpinus* in Afghanistan and northern Pakistan.

Pyrgus cashmirensis pseudoalpinus Alberti, 1952 (Fig. 28a, b)
Pyrgus cashmirensis pseudoalpina, Alberti, B., *Z. Lepid.* 2:85.

Range: Hindu Kush, Baltistan, eastern Wakhan (Afghanistan) and SE Tajikistan.
Localities: Deosai Plateau.

This subspecies was described from Gilgit and the Baroghil Pass, but differs from populations (above) from northern Hunza and localities along the western Sino-Pakistan border. We encountered it on the Deosai Plateau, where it was as common as *Agriades jaloka*, at 13,500-14,000ft. It flies only in the sunshine (often of very brief occurrence there), and was not found along the ravine that leads down from the plateau towards Skardu.

Hesperia comma comma (Linnaeus, 1758) (Fig. 30a, b)
P.[apilio] P.[lebejus] Comma Linnaeus, C. *Systema Naturae*, edit. 10, 1:484, no. 162.

Range: an Holarctic species, ranging in the Old World across Europe, North Africa and much of temperate Asia to SW China and Amurland. In the New World, from coast in boreal and subalpine habitats, into Alaska and in Canada to the edge of the tundra; through the Rocky Mountains and much of the Southwest, absent from the Plains States and the Southeast.
Localities: Muchuwar, Chapchingal.

As much an Holarctic butterfly as *Papilio machaon*, *H. comma* is equally a member of a garden or hillside fauna in western Europe as of high altitude rocky mountain slopes. We recorded this skipper in two valleys in the Hunza region: Muchuwar (Nagar), and Chapchingal below the Khunjerab Plateau (Fig. 13), each site at *c.*13,500ft. These records extend the known range of *H. comma*, previously recorded in Pakistan (Roberts, 2001) from Chitral, Yasin and Astor. The infraspecific taxonomy of this species is poorly established: Tshikolovets (2000) cites subspecies *H. comma mixta* Alphéraky, 1881 as *"widely distributed in the mountains of Central Asia"*. But then: *"The differences of nominotypical subspecies from ssp.* mixta *are incidental. A further study based on* [more extensive] *comparative material may show their complete identity."* Numerous other races have been named (Tuzov *et al.* 1997). Here we list only nominate *H. comma* from Hunza; however, specimens from the Deosai Plateau (below) differ consistently from these populations. Throughout its Holarctic range, this is a very variable species; seven subspecies have been been described from North America.

Hesperia comma shandura Evans, 1949 (Fig. 31a, b)
Hesperia comma shandura Evans, W.H., *Cat. Hesp. Eur. Asia, Austr.*, 349-350.

Range: Shandur Pass, Chitral, Gilgit, Astor; Baltistan.
Localities: Deosai Plateau.

This subspecies was described from Chitral and matches specimens of this skipper collected on the Deosai Plateau, where it was uncommon but recorded on each field visit. Differences in wing pattern between this race and *H. c. comma* are seen in Fig. 31a, b and 30a, b .

Taractrocera danna (Moore, 1865) (Fig. 34)
Pamphila danna Moore, F. *Proc. Zool. Soc. Lond.*, 1865:508, Pl. 30, Fig. 8.

Range: Karakoram, S. Tibet, Sikkim, Bhutan.
Localities: Gilgit.

Records of this small skipper from Pakistan are very vague. Evans (1949) notes that it has been collected from Kashmir to Kumaon, and that it may occur in the Murree Hills. A single record from the town of Gilgit, at 5000ft, adds this region of the Northern Areas to its known range.

PAPILIONIDAE

Papilio polyctor Boisduval, 1836
Papilio Polyctor Boisduval, J.B., *Spéc. Gén. Lép.* 1:205.

Range: the nominate subspecies is common in valleys in northern India and Pakistan, generally to *c.*6000ft. Other races have been described across its very wide range in the Oriental region (D'Abrera, 1982).
Localities: Hoper.

Papilio polyctor is a common species in moister, southern stretches of the KKH, becoming rare north of Chilas, where the terrain becomes arid. A single specimen was seen on a grassy mountain slope above Hoper, in Nagar, in July 1995. This record, together with a specimen of the pierid *Catopsilia pyranthe* collected above Gulmit, are the deepest incursions of Oriental species into the Hunza Valley noted during our survey, though in each instance as vagrants from lower altitudes. Both records were made at 9,000ft.

Papilio machaon Linnaeus, 1758
P.[apilio] E.[ques] Machaon Linnaeus, C., *Systema Naturae*, edit. 10, 1:462, No. 27.

Range: It ranges throughout Europe into North Africa, and virtually across the whole of Asia.

This is the only Holarctic Swallowtail. Two subspecies are present in the New World: *aliaska* Scudder from northern Canada and Alaska and *hudsonianus* Clark from the Hudsonian zone of north-eastern Canada.

Papilio machaon ladakensis Moore, 1884 (Fig. 35a, b, c)
Papilio ladakensis, Moore, F. *J. Asiatic Soc. Bengal*, Part II, 53:46.

Range: uncertain: see below.
Localities: from Gilgit to Chapchingal; approach to Mintaka Pass.
Early Hunza record: Evans (1927): as *Papilio machaon*.

Our most southerly record was *c.*125 miles (200km) south of Gilgit near Chilas, in Kohistan, at 2500ft. This swallowtail is widely distributed in Hunza between 4500ft at Gilgit, and 14,500ft above the floor of the Chapchingal Valley (Fig. 13). It was present below the Mintaka Pass in early September 1999, but was not recorded en

Plate 6. Papilionidae: Fig. 35. *Papilio machaon ladakensis*, a) male, b-c female. Fig. 36. *Parnassius charltonius dekerty*, female. Fig. 37. *Parnassius simo saserensis*, female. Fig. 38. *Parnassius simo lorimeri*, male. Fig. 39. *Parnassius simo ganymedes*, female. Fig. 40. *Parnassius jacquemontii*, a) male, b) female. Fig. 41. *Parnassius hardwickii*, female. Fig. 42. *Parnassius epaphus cachemiriensis*, a) male, b) female. Fig. 43. *Parnassius delphius hunza*, a) male, b) female. Fig. 44. *Parnassius delphius workmani*, female. Fig. 45. *Parnassius actius catilina*, a) male, b) female.

route to Kilik Pass in August 2000, in the Chipursun Valley or on the track leading to the Irshad Uwin Pass. It was not recorded from the Deosai Plateau during our visits. It is frequently seen nectaring, but also ranges across arid mountainsides and scree slopes, often flying to higher altitude when disturbed.

The infraspecific taxonomy of this species is by no means clearly established; numerous and often poorly demarcated subspecies have been described across its wide range. Of these, *P. m. ladakensis* Moore, 1884, or *P. m. asiatica* Ménétriés, 1855, most closely match Hunza specimens. We are unable to distinguish between these taxa on wing pattern alone, and have used tail length as a character. Over much of the insect's range, the HW tails are uniformly long, but short-tailed individuals occur in some Central Asian/Himalayan populations. The monograph by Eller (1936) illustrates short-tailed examples, from Pamir, Zanskar and Shipki-la and regarded these as constituting the *ladakensis* group. From specimens collected in the first four years of our survey, it appeared that *machaon* from low altitude were long-tailed, and high altitude specimens short-tailed. However, as additional specimens became available this correlation did not hold; Fig. 35a and 35c illustrate specimens collected at 14,500ft, and Fig. 35b a specimen from 7500ft. Long-tailed examples at high altitude could, of course, be vagrants from lower altitude, providing evidence that there is no isolation between these phenotypes in a geographical or genetic sense. Furthermore, examination of museum series suggests that while tail-length reduction occurs at high altitude in numerous populations, this correlation may never be absolute.

In material in the Natural History Museum (BMNH), tail length is variable in subspecies *P. m. annae (= sikkimensis)* Verity, 1911, from Tibet, Bhutan and Sikkim; similarly, a long series of subspecies *P. m. ladakensis* matches the variation in tail length encountered in Hunza. Subspecies *P. m. everesti* Riley, 1927, from 15,500 to 16,000ft and subspecies *P. m. hieromax* Hemming, 1934 (replacing *montanus* Alpheraky, 1887) from the Tibet-Nepal border are short-tailed, but each is represented by very few specimens in this museum collection. Individuals of another subspecies from Nepal, *P. m. emihippocrates* Verity, 1911 are uniformly long-tailed. Subspecies *P. m. oreinus* Sheljuzhko, 1919 from the Pamir into Afghanistan (Sakai, 1981) and *P. m. centralis* Staudinger, 1886 of Uzbekistan and north-eastern Afghanistan are uniformly long-tailed. Tshikolovets (2000) regards the last two races as synonymous.

In summary, tail length reduction evidently occurs only at high elevation, but detailed statistical analysis of individuals from a wide range of localities is required to determine more precisely the taxonomic significance of this character, which has received little attention in the past.

Parnassius simo Gray, 1852
Parnassius Simo, Gray, G.R., *Cat. Lepid. Ins. Brit. Mus.,* 1:76, pl. 12, figs 3, 4.

Range: this species enjoys a very wide distribution in high regions of Central Asia: the Karakoram, Himalaya, the Hindu Kush of Pakistan and Afghanistan, Tien Shan and Kun Lun ranges, also Tajikistan, Kirghizstan, China, India, Bhutan and Tibet.

Across its entire range, it has diverged into about eighteen named subspecies (Weiss, 1991), of which three have been recorded during our survey.

Parnassius simo saserensis Bang-Haas, 1937 (Fig. 37)
Parnassius simo saserensis Bang-Haas, O., *Int. Ent. Zeit.* 51 (No.32):302.

Range: Weiss (1991) cites this subspecies from the Karakoram to Ladakh.
Localities: Khunjerab.

The wing pattern of this subspecies is shown in Fig. 37. We recorded it only at Khunjerab, where it was never seen on the plateau at 15,500ft, but only considerably higher on the mountain slopes above, to *c.*16,500ft near the snow line, and above the obviously vegetated zone (Fig. 16). It flies on the rocky slopes, often resting with wings pressed tightly against a stone, presumably warmer than the ambient air, and offering minimal resistence to wind. When disturbed it behaves differently depending on the weather conditions: when cloudy, cool and windy the butterfly escapes by crawling down between stones, but in the sun it flies low and rapidly up the mountainside, reaching as high as 17,000ft. At a distance, this region appears devoid of vegetation, but it proves to support very small, stunted plants, notably of *Saussurea simpsonianum (*Fig. 15), *Arenaria polytrichoides* and *Oxytropis microphylla*; the leaf rosette of the first reaches a diameter of 25cm just above the plateau, but near the snow line is reduced to tiny examples only 2-3cm in diameter, rooted beteen rocks. Tshikolovets (1997) notes *P. simo* as a very high altitude species, to *c.*17,000ft and the Khunjerab population accords with this. As with other *Parnassius*, and indeed all butterflies on and above the plateau the flight of *P. simo saserensis* ceases when the sun is obscured (all too frequent at Khunjerab). In the sun, it flies with *Parnassius actius*, which is generally much the faster species on the wing. These two species are rarely sympatric with *P. ethlius,* with a lower center of abundance. The next two subspecies of *P. simo* were found respectively about 50 direct-line miles west of Khunjerab along the Sino-Pakistan border, and about 125 miles to the southeast, above Skardu on the Deosai Plateau of Baltistan.

This race is very similar to, perhaps synonymous with, *P. simo hilariae* Kreuzberg, 1986, described from Tajikistan.

Parnassius simo lorimeri Tytler, 1926 (Fig. 38)
Parnassius simo lorimeri, Tytler, H.C. *J. Bombay Nat. Hist. Soc.,* 31:252, pl. 4, fig. 10.

Range: Chitral and Yasin Valley, east to Mintaka Pass.
Localities: Mintaka Pass, Kilik Pass.

The wing pattern of this subspecies is shown in Fig. 38. The type locality is the Kine-Chish Pass in Yasin, a valley system paralleling Hunza to the west. It has also been recorded from localities in Chitral (Weiss, 1991).

In our survey, it was never found in any localities associated with the main Hunza Valley, and was not recorded at the Kilik Pass in 2000. However, it was present at the beginning of July 1999 at Kilik Pass, and both there and at the Mintaka Pass early in September of the same year. All records were made at or near the summit of each pass, at *c.*16,000ft, maintaining its reputation as a very high altitude butterfly (Weiss, 1991). In each locality it flew with the much scarcer *Parnassius actius,* and at the Kilik Pass with the more common *Parnassius jacquemontii.*

Parnassius simo ganymedes Bryk and Eisner, 1932 (Fig. 39)
Parnassius simo ganymedes F. Bryk and C. Eisner, *Parnassiana* 2:8.

Range: Deosai, Baltistan
Localities: above Deosai Plateau.

The wing pattern of this subspecies is shown in Fig. 39. This race has a restricted range, known only from Baltistan. This third subspecies of *P. simo,* morphologically very distinct from the first two, was collected above the Deosai Plateau of Baltistan, at or over 15,000ft. It was recorded on scree slopes adjoining glaciers above the plain. Again, it is evidently a high altitude insect, not recorded from numerous sites on the plateau at *c.*14,000ft; not sympatric with

the common *Parnassius ethlius,* and possibly not with the Deosai subspecies of *Parnassius delphius* (below).

Parnassius charltonius Gray, 1852
Parnassius charltonius, Gray, E.G., *Cat. Lepid. Ins. Brit. Mus.*, 1:77, pl. 12, fig. 7.

Range: *Parnassius charltonius* has about the same number of named subspecies as *P. simo.*

Weiss (1991) lists the distribution of races within the *charltonius*-Group as including northeastern Afghanistan, Kirghizia, Tajikistan, the Karakoram to northern India, Nepal and Tibet.

Parnassius charltonius dekerty Verity, [1907]) (Fig. 36)
Parnassius charltonius, Gray, form *dekerty,* Verity, R. *Rhopalocera Palaearctica,* [1907] **1**:85, pl. 19, fig. 14; [1911] 1:317.

Range: this race is known from eastern Pamir and Hindu Kush, and the southern region of the Sarykolsky mountain range in Tajikistan (Tshikolovets, 1997).
Localities: Minapin, Muchuwar, Tharbai, Hunza Valley. Early Hunza record: Evans (1927: as *Parnassius charltonius.)*

Of the various morphs, this subspecies matches most closely specimens from Hunza (Fig. 36), where it occurs within a narrow altitudinal zone from 10,000ft to 11,500ft. It was found sparsely above Minapin (Nagar) and at Muchuwar, commonly on high mountainside pasture at Tharbai above Sost, and was recorded once within Khunjerab National Park, at 11,500ft. This butterfly was generally seen flying powerfully, seldom while taking nectar. At Tharbai it flew near a colony of *Parnassius delphius hunza,* but the two were not sympatric.

The BMNH collections include a specimen of *P. charltonius dekerty* from "W. Karakoram, Shimshal, 3500m, Juli 1925". The remote Shimshal Valley is reached on foot by a journey of several days from the Hunza village of Pasu, and lies to the south of the Chapchingal Valley (Fig. 13). No collector's name is attached to the specimen, but the labels indicate a Continental collector. Although Visser-Hooft's material sent to Evans (1927) did not mention *Parnassius charltonius* it is very likely that this specimen was collected by Janet Visser-Hooft, and somehow omitted from the parcel sent to London, or there overlooked. We did not visit Shimshal during our survey.

Parnassius charltonius ella Bryk, 1932
Parnassius charltonius ella F. Bryk, *Parnassiana* 2:49.

Range: Deosai, Baltistan.
Locality: Deosai Plateau.

Verhulst (1999) recorded this race from Deosai. It is quite distinct from *dekerty,* the subspecies occurring in Hunza: in *ella* the red markings near the anal edge of the HW, prominent in *dekerty,* are almost or completely absent. Also, the HW arc between the blue/black submarginal spots and the large red spot is suffused with grey in *dekerty* but forms a whitish band in *ella.*

Parnassius jacquemontii Boisduval, 1836
Parnassius Jacquemontii, Boisduval, J.B., *Spéc. Gén. Lép.*, 1:400.

Range: a species with an extremely wide distribution including the Tien-Shan, Pamir-Alai, Afghanistan, Hindu Kush, the ex-Soviet Southern Republics, Himalaya, Kun-Lun, and Tibet.

Parnassius jacquemontii chitralensis Moore, 1902 (Fig. 40a, b)
Parnassius chitralensis, Moore, F., *Lepidoptera Indica,* 5:107, pl. 406, figs 2, 2a.

Range: beyond Pakistan, this subspecies is known from several regions of the Tajik Pamir, and Uzbekistan,
Localities: Mintaka Pass, Kilik Pass, Irshad-Uwin Pass, below Dilsun Pass. Early Hunza racord: Tytler (1926): (i) as *Parnassius jacquemontii hunzaica* Tytler, 1926; (ii) as *Parnassius discobulus hunzaica* Tytler, 1926.

In Pakistan, this subspecies seems to be very local, in sites of similar altitude. We never encountered it at Khunjerab, but in July 2000 and July 2001 it was the most frequent *Parnassius* at the Irshad Uwin Pass on the border with Wakhan, Afghanistan. and also to 16,000ft below the Dilsun Pass ENE of Irshad Uwin. It was frequent on the Kilik Pass in early July and early September 1999. A male was found in the water of a blue pan-trap at Luto Hari (15,000ft). Roberts (2001) notes it as occurring in the Baroghil Valley, leading to the Afghan border west of Irshad Uwin, and from the Shandur Plateau, Chitral. Numerous other subspecies have been named. Sakai (1981) cited four subspecies from Afghanistan, and Wyatt and Omoto (1966) added a fifth: of these, Tshikolovets regards three as synonyms of *P. j. chitralensis.* Furthermore, two other taxa with Hunza connotations are similarly synonymized by Tshikolovets: *P. discobulus hunzaica* Tytler, 1926 and *P. tianschanica hunzaica* Tytler, 1926.

Parnassius epaphus Oberthür, 1879
Parnassius Epaphus Oberthür, C., *Études d'Ent.*, 4:23.

Range: another species with a wide distribution: Tien-Shan, Kun Lun, China, Nepal, Bhutan, northern India and Tibet, and Pakistan. Apparently its range does not extend northwards into Uzbekistan (Tshikolovets, 2000) or Afghanistan (Wyatt and Omoto, 1965; Sakai, 1981).

Parnassius epaphus cachemiriensis Oberthür, 1891 (Fig. 42a, b)
Parnassius Epaphus var. *Cachemiriensis,* Oberthür, C., Études entomol. 14:14,17,19, Pl.I, figs 6,7.

Range: Pakistan
Localities: Fakar Peak (Nagar), Khunjerab, Deosai Plateau. Early Hunza record: Evans (1927) as *Parnassius epaphus.*

Within Pakistan, this subspecies is widely, though irregularly distributed, and scarce. It is the most common *Parnassius* at Khunjerab, frequent on the plateau at 15,000-15,500ft when nectar sources are plentiful, but always more common on the mountain slopes above the plateau, to at least 16,000ft (Fig. 16). It was uncommon at 15,000ft on Fakar Peak in July 2003. Its flight is slow and fluttering when searching for nectar, but when disturbed, or when caught in a wind gust common on the pass, its movement is very rapid. At the higher elevations at Khunjerab, it is barely sympatric with *Parnassius simo* and *Parnassius actius* and it infrequently ventures above the limit of obvious vegetation. On the Deosai Plateau, *c.*125 miles to the southeast, *P. epaphus* is again the most common member of the genus, at 14,000ft, and Deosai specimens are structurally and morphologically indistinguishable from those from Khunjerab. Any divergence might be sought at the level of molecular genetic analysis, though it should be noted that Nice and Shapiro (1999, 2001) found morphological divergence in the absence of genetic variation in some Rocky Mountain lycaenid populations. Visits to the Irshad Uwin Pass on the border with Wakhan, Afghanistan, in September 1999, July 2000, and July 2001 there and across the border, failed to record *P. epaphus,* when *P. actius, P. delphius hunza* and *P. jacquemontii* were present. *Parnassius epaphus* was recorded neither from Mintaka Pass nor Kilik Pass in July 2000.

Infraspecific taxonomy of this species is less than clear. Moore

(1901-03) described *P. nirius* from Ladakh, and cited the Deosai Plateau as one of its localities. As mentioned above, specimens from this locality are indistinguishable from Khunjerab specimens. However, Bingham (1907) noted: *"I do not think that* nirius *can be separated from* epaphus, *even as a race."* Tshikolovets (1997) regarded specimens from the Hindu Kush and Pamir as *P. e. cachemiriensis* (= *P. e. hinducucicus,* Bang-Haas, 1934) and populations from Khunjerab and Deosai conform precisely to this race.

Parnassius delphius (Eversmann, 1843)
Doritis Delphius, Eversmann, E., *Bull. Soc. Imp. Nat. Mosc,* 16:541, pl. 7, figs 1a, 1b.

Range: Weiss (1992) separates members of the *delphius* Complex from taxa associated with *Parnassius staudingeri* Bang-Haas, 1882 (= *P. delphius staudingeri).* Together, these butterflies have an extremely wide distribution.

Species associated with *P. delphius* have a generally more northern distribution than Weiss' *staudingeri* group: from southern and south-eastern Kazakhstan, Kirghizia, eastern Uzbekistan and north-western Sinkiang (Xinjiang), China. Some members of the second group extend into Tajikistan, Afghanistan and from southern Pamir into Pakistan. We follow the scheme of Tshikolovets (1997) in which all of these taxa are grouped together as races of *delphius.*

Parnassius delphius hunza Grum-Grshimailo, 1888 (Fig. 43a, b)
Parnassius stoliczkanus Feld. var. *Hunza* m. Grum-Grshimailo, G. *Horae Soc. ent. Ross.* 22:303.

Range: known also from the southern Pamir.
Localities: Thakot/Tharbai, Chapchingal, Kilik Pass, Irshad Uwin Pass, below Dilsun Pass. Early Hunza record: as *Parnassius delphius hunza.*

Parnassius delphius or *P. staudingeri* (in the scheme proposed by Weiss (1992)) is a complex assemblage of over twenty taxa, within which Weiss suggests that several true species may be present. Some confusion surrounds the type-locality of *P. delphius hunza.* It was described by Grum-Grshimailo from "Hindukusch orient", but its provenance was discussed more fully in a later paper (Grum-Grshimailo, 1890) when he indicated that the original specimens had been collected at Beik (= Bayik) beyond the 'Kounjout' mountains near pastures supporting the horses of nomadic Kirgiz. The accompanying map suggests that the specimens came from well east of Shimshal (northeast Hunza), in Chinese territory, and the Beik Pass is just east of the border between the Wakhan corridor and China. Tshikolovets (1997) suggested that the type-locality be amended to "Khan de Kounjout (Hunza)" but we feel that this is inappropriate. It is certain that neither Grum-Grshimailo nor any entomologist entered Hunza during the nineteenth century.

However, the name *hunza* has become an excellent descriptor, since during our survey we recorded this butterfly from more localities than any other *Parnassius,* and over a wider altitudinal range. On a pasturing site locally named Tharbai, on steeply sloping grassland above Sost, at 12,000ft, this insect was common at the terminal stony morraine of a small glacier, flying some distance from a colony of *Parnassius charltonius dekerty:* the two were not sympatric. It was the only *Parnassius* recorded, very sparsely, from the Chapchingal Valley at 14,000ft (Fig 13) leading north-east from the KKH below the Khunjerab Plateau. *P. delphius hunza* was found very rarely at Kilik Pass (July and September, 1999) but was unrecorded from the nearby Mintaka Pass. Its center of abundance, during our survey, was the Irshad Uwin Pass, between Pakistan and the Wakhan corridor of north-eastern Afghanistan, where it was very common in July 2000. It was not recorded across the border in Afganistan in July 2001 though it doubtless occurs there. It was again common at 15,000-16,500 ft below the 18,000ft Dilsun Pass in late July, 2002. Below 16,000ft it flew with *P. jacquemontii.* Roberts (2001) adds high elevation sites in northern Chitral, and in the Astor District.

Parnassius delphius workmani Avinoff, 1916.(Fig. 44)
Parnassius delphius workmani Avinoff, A. Trans. Ent. Soc. London, 1915:357, Pl.53, Fig.7.

Range: known from vicinity of Saltoro Glacier, Baltistan; Deosai Plateau.
Localities: Deosai Plateau.

This race of *P. delphius* is significantly different in appearance from that described above. Weiss (1992) regards it as barely meriting separation from subspecies *mamaievi* Bang-Haas, 1915 from Ladakh., but notes that it might be regarded as a good species. It occurred on the Deosai Plain, Baltistan; rarely at the level of the plateau, 14,000ft, and more commonly at 15,000ft on the relatively low mountains rising above the plateau.

Parnassius actius (Eversmann, 1843)
Doritis Actius, Eversmann, E., *Bull. Soc. Imp. Nat. Mosc,* 16:540, pl. 9, figs 2a, 2b.

Range: this species ranges very widely in Central Asia. The regions listed by Tshikolovets (1997) include the Tien Shan, Pamir-Alai, eastern Hindu Kush, Karakoram, Kun Lun, the Southern Republics east of Turkmenistan, Afghanistan, northern India and the Muztagh-Ata massif of Sinkiang (Xinjiang), western China.

Parnassius actius catilina Eisner & Peschke, 1934 (Fig. 45a, b)
Parnassius actius catilina Eisner, C. and Peschke, R., *Parnassiana* 3:41.

Range: this subspecies was described from the "Doubounni-Berge" [Gilgit Agency]. It is the race found in high localities during our survey.
Localities: above Khunjerab Plateau, Mintaka Pass, Kilik Pass, Irshad Uwin Pass, below Dilsun Pass.

At Khunjerab, it was never recorded from the patchily vegetated plateau, but only from mountainsides and scree slopes rising above the plain, at least to 16,500ft (Fig. 16). In this zone, plants are not obvious at a distance, but dwarf specimens of *Saussurea simpsonianum* (Fig. 15), *Arenaria polytrichoides* and *Oxytropis microphylla* subsist between rocks and provide a nectar source for butterflies inhabiting these harsh sites. Here, this species flies with *P. simo saserensis;* both well above the usual flight zone of *P. epaphus.* Its flight is considerably more rapid than that of *P. simo.* It also occurred at both the Mintaka and Kilik passes and, more sparsely, at the Irshad Uwin Pass to Afghanistan. It was recorded rarely below the 19,000ft Dilsun Pass at the extreme eastern limit of Pakistan border with the Wakhan corridor of Afghanistan. Here, at 16,000ft, it flew with the much commoner *P. delphius hunza* and *P. jacquemontii,* all above the upper limit of ground cover.

Parnassius hardwickii Gray, 1831 (Fig. 41)
Parnassius Hardwickii, Gray, E.G., *Zool. Miscell.*:32

Range: Nepal to Sikkim; northern Pakistan.
Localities: Deosai Plateau.

We found this species only on the Deosai Plateau and above, to 15,000ft, and there only rarely. Search for *P. hardwickii* on the high passes around Hunza was unsuccessful. Very surprisingly, Roberts (2001) regarded this species as *". . . the most likely Apollo to be*

encountered. ." as low as 10,000ft in the Murree Hills; also known from Chitral, the Kagan Valley, and Astor (Gilgit). If Roberts' comment is not based on misidentification it is possible that the Deosai records mark the altitudinal limit in Pakistan of a generally low altitude species. If so, it seems remarkable that it does not seem to have become established in any Hunza localities.

PIERIDAE

Catopsilia pyranthe (Linnaeus, 1758)
P.[apilio] D.[anaus] Pyranthe Linnaeus, C., *Systema Naturae*, edit.10:469, No.66.

Range: entire Oriental region including much of Pakistan; absent from Andamans, Nicobars and Sri Lanka.
Localities: Gilgit, Upper Hunza above Gulmit.

Two specimens were recorded above Gulmit, the main Hunza Valley in July 1994. This record, and the sight record of *Papilio polyctor*, both at 9,000ft, mark the highest altitude at which Oriental taxa were found in the Hunza survey. *C. pyranthe* was seen occasionally around Gilgit (5000ft) but was never common.

Euchloe (ausonia) daphalis (Moore, 1865) (Fig. 55a, b)
Anthocaris daphalis Moore, F. *Proc. Zool. Soc. Lond.* 1865:491, pl. 31, fig.14.

Range: western Pamir, northern Afghanistan, northern Pakistan, northern India.
Localities: Nilt, Murtazabad.

In Hunza this species was recorded only twice: a single specimen was collected along the KKH in the Hunza Valley near Nilt, 10 April 1986, at 6000ft, and a second in April 1999 at Murtazabad, middle Hunza. As noted in the original description, this is an early Spring butterfly. This species is very similar to *E. ausonia* Hübner, [1803] and *E. pulverata* Christoph, 1884, and pending further taxonomic work, all may be considered to be constituents of the superspecies *ausonia* (Tuzov *et al.*, 1997).

Metaporia leucodice (Eversmann, 1843) (Fig. 47a, b)
Pontia Leucodice Eversmann, E.A. *Bull. Soc. Imp. Nat. Mosc.* 15:541, pl. 7, figs 2a, b.

Range: Iran, Turkmenistan, Afghanistan, Central Asia to Altai and western China.
Localities: Kargah, Naltar, Chaprot, Minapin, Muchuwar

This species is locally common, but within a precisely defined altitudinal zone of between 6500 and 11,000ft. Not recorded from the main Hunza Valley, it has been found very sparsely in the Kargah Valley above Gilgit, and more commonly in the Naltar Valley, Chaprot/Nagar, Minapin and Muchuwar. In July 1994 all specimens were very fresh, and others collected later in the summer have shown little signs of flight damage. Roberts (2001) lists it as common in the Murree Hills in April and May; also in Chitral and Kaghan, rarely in Lahore and very locally in Baluchistan. Subspecies have been described from the Tien Shan, Alai and western Pamir (Tuzov *et al.* 1997), but populations in Pakistan are of nominate *leucodice*.

Pontia callidice (Hübner, [1800])
Pontia Callidice, Hübner, J., *Samml. europ. Schmett.*, Tab. Pap. 81, Abb. 408, 409, 552.

Range: *Pontia callidice* ranges very widely from the mountains of Europe — Alps and Pyrenees — in the Balkans, the Caucasus, the Urals and high altitude and Arctic regions of Palaearctic Asia (Tshikolovets, 1997). Tuzov *et al.* (2000) note that its range includes tundra and desert, from sea level to 4500m in the Pamir.

Pontia callidice kalora (Moore, 1865)
Pieris kalora, Moore, F. *Proc. Zool. Soc. Lond.*, 1865:489-490, Pl.31, fig.15.

Range: widespread in the southern Pamir, Afghanistan, extreme SW China (Xinjiang) and northern Pakistan.
Localities: Chaprot, Sost, Chapchingal, Khunjerab Plateau. Mintaka Pass, Kilik Pass, Irshad Uwin Pass, Deosai Plateau. Early Hunza record: Evans (1927): as *Pieris callidice kalora* Moore.

In Hunza, as elsewhere in the western Himalaya, this is a relatively high altitude insect. The lowest altitude record is 9000ft at Chaprot, Nagar, above the main Hunza Valley, lower than the 3500m (11,500ft) noted by Tshikolovets (1997). It has been recorded from all high altitude sites: from Sost and the Hunza Valley beyond, from the lower areas of Khunjerab National Park (11,500ft and above), from Chapchingal Valley (13,000ft), Khunjerab Plateau (15,500ft), Mintaka and Kilik passes (15,000-16,000ft), Irshad Uwin Pass (16,000ft), below Dilsun Pass and, to the southeast, the Deosai Plateau in Baltistant (14,000ft). It is never common; adults are especially sparse at the highest altitudes, and its distribution is not immediately dependent on irrigation and human presence. Tuzov *et al.* (2000) suggest that some 'subspecies' described are probably merely varieties, but *P. callidice kalora* Moore, 1865 is generally more lightly marked than European populations of the nominate race, though all show seasonal variation.

Pontia daplidice (Linnaeus, 1758)
P.[apilio] D.[anaus] Daplidice Linnaeus, C., Systema Naturae, edit.10, 1:468, No.62.

Range: this butterfly has a very wide range, including most of Europe (with very occasional records in Britain), North Africa, and much of Palaearctic Asia to Tibet, China and Japan.
Localities: Gilgit, Naltar, Chaprot, Hunza Valley, Deosai Plateau. Early Hunza record: Evans (1927): as *Pieris daplidice moorei.*

This is generally a low altitude species in our area, occurring from around Gilgit (4500ft), in the Naltar Valley and at Chaprot (Nagar); also at irrigated settlements along the KKH, but not recorded within Khunjerab National Park, the southern limit of which lies at *ca.* 11,500ft. However, it has been found on the Deosai Plateau of Baltistan at 14,000ft. It is common where it occurs, and its distribution is largely, but not entirely tied to human presence and irrigation, as for the next species. Roberts records it as very common in Swat, less so in the Murree Hills, and above 5000ft in Baluchistan. A form or subspecies *moorei* Röber, 1906 was described as being very large, with the green underside markings much extended. However, this is a variable species, more heavily marked in spring than summer broods, and this separation is probably unjustified.

This species is associated in a species complex with a parapatric species *Pontia edusa* (Fabricius, 1777), and the two can be reliably identified only by electrophoretic techniques (ref in Tuzov *et al.*, 1977). This is not known to affect any population in our area, and the known range of *P. edusa* is temperate Europe and Siberia.

Pontia chloridice (Hübner, [1808-1813])
Papilio Chloridice Hübner, J., *Samml. europ. Schmett.* pl. Pap. 141: figs 712-715.

Range: an Holarctic species ranging from central and western North America in the New World, and in the Palaearctic from the southern Balkans to southern Central Asia, Mongolia and southern Siberia.

Plate 7. Pieridae: Fig. 46. *Eurema hecabe*, male. Fig. 47. a-b) *Metaporia leucodice*, male. Fig. 48. *Pieris krueperi*, male. Fig. 49. *Pieris deota*, a) male, b) female. Fig. 50. a-h) *Colias cocandica kunjerabi*, a-b, f) female, c-e, g-h) male. Fig. 51.*Colias eogene shandura*, a) male, b-c) female. Fig. 52. *Colias wiskotti*, a) male, b-d) female. Fig. 53. *Colias marcopolo*, a-b) male, c-d) female. Fig. 54. *Baltia shawi*, male. Fig. 55. a-b) *Euchloe (ausonia) daphalis*, male.

Localities: Gilgit, Naltar, Chaprot, Minapin, Muchuwar, Hoper, Hunza Valley, Chipursun Valley. Early Hunza record: Evans (1927): as *Pieris chloridice*.

Despite one of its infraspecific names *(alpina)*, this insect does not occur at the highest altitiudes. It was found on the approaches to the Irshad Uwin pass to Afghanistan, above the Chipursun Valley (Fig. 7) at 12,000ft; otherwise, *P. chloridice* has been recorded from the cluster of medium altitude localities from 7000ft in the Kargah Valley above Gilgit, from Naltar, Chaprot, Muchuwar and Hoper, to 10,000ft. Populations in Pakistan were separated as subspecies *alpina* Verity, 1911 but neither D'Abrera (1990) nor Tuzov *et al.* (1997) recognize this taxon.

Pieris krueperi Staudinger, 1860 (Fig. 48)

Pieris krueperi Staudinger, O., *Wien ent. Monatsschr.* 4(1), 19.

Range: from southern Europe through Transcaucasia to Asia Minor and Central Asia.

Localities: route to Minapin.

In our survey, this was an extremely local species and found on only two occasions, in Nagar on the lower course of the route to Minapin, at 7000ft. The terrain was extremely arid, with few plants.

The hesperiid *Eogenes leslei* was one of the few other butterflies recorded in this region. The center of activity of *P. krueperi* in Hunza, and its breeding ground(s), remain undetected. These specimens probably represent the nominate subspecies rather than the lightly marked *P. kreuperi devta* de Nicéville, 1884, but the species shows great seasonal variation and infraspecific division may be unjustified.

Pieris brassicae (Linnaeus, 1758)
P.[apilio] D.[anaus] Brassicae Linnaeus, C., *Systema Naturae*, edit.10, 1:467, No.458.

Range: distributed across Europe, North Africa, southern Siberia, Central Asia, Mongolia, China and Japan.
Localities: recorded from every locality visited in the Hunza region.

This species, with *Vanessa cardui*, were the only two taxa recorded from every locality in Hunza, and in each side valley visited. *P. brassicae* is most abundant around villages, with irrigated fields, but is also found straying into arid terrain between settlements. It occurs sparsely in upper Hunza above Sost, within Khunjerab National Park, and has been recorded occasionally on the Khunjerab Plateau at 15,500ft. It is sympatric, over a very narrow zone, with the next species. Pending further work, populations in northern Pakistan are assigned to the nominate subspecies: others have been described from Kopet-Dagh and the Tien Shan, and Alai/western Pamir (Tuzov *et al.* 1997).

Pieris deota de Nicéville, 1883 (Fig. 49a, b)
Mancipium deota De Nicéville, C.L.A., *J. Asiatic Soc. Bengal*, Pt. II (1883), 53:82, Pl.IX, fig.10.

Range: Pamir, eastern Hindu Kush, Karakoram, northern Tien Shan, western China (Xinjiang), Tibet.
Localities: Barkhun (Hunza Valley), Misgar, Mintaka Pass, Irshad Uwin Pass. Early Hunza record: Evans (1927).

Evans (1927) suggested that this butterfly, if not sympatric with *Pieris brassicae*, might be considered a subspecies of the latter. However, it is now recognized as a species, and in the main Hunza Valley is narrowly sympatric with *P. brassicae* in the vicinity of Barkhun, between the narrow altitudinal limits of 11,500ft and 13,000ft. The two species were also recorded together at Misgar, at 10,000ft. *P. deota* has not been recorded in the Chapchingal Valley above 13.000ft, or higher on the Khunjerab Plateau, where *P. brassicae* has been noted. Its flight pattern matches that of *P. brassicae* precisely; both may be seen flying across open, arid stony hillsides. Outside, *Pieris deota* was also recorded from the Mintaka Pass (to China) and the Irshad Uwin Pass (to Afghanistan) (Fig. 22) at similar altitudes, to 12,000ft.

Pieris rapae (Linnaeus, 1758)
P.[apilio] D.[anaus] Rapae Linnaeus, C., *Systema Naturae*, edit.10, 1:468, No.59.

Range: distributed across the entire Palaearctic other than the extreme north and south, and introduced into North America.
Localities: all sites in the Hunza region to 11,000ft. Early Hunza record: Evans (1927).

This pest species is abundant in the Hunza Valley system to *ca.* 10,000ft. It is very much a butterfly of cultivated and irrigated land, recorded from all localities from Gilgit (5000ft) along the Hunza Valley to Sost (10,000ft). It has not been found above Sost, or in Khunjerab National Park. Its presence in the Chipursun Valley below Irshad Uwin Pass at 11,000ft marks the highest record for *P. rapae:* this was around a small settlement at Ziarat and no butterflies were recorded from the surrounding extremely arid terrain. Several subspecies of uncertain validity have been proposed (Tuzov *et al.*, 1997) and we regard Hunza specimens as nominate *P. rapae*.

Pieris canidia Sparrman, 1768
Papilio Canidia Sparrman, A., *Amoen. Akad.* 7:504.

Range: this Palaearctic species occurs in Afghanistan, and from Pakistan to Sikkim, and in Bhutan, from 2000 to 11,000ft, in the hills of southern India, in Assam, Upper Burma, the Shan States into western China (Bingham, 1907), and Japan. Its range also includes the mountains of Central Asia, including Afghanistan and Tibet.
Localities: Naltar; Deosai Plateau.

Surprisingly, we found *P. canidia* only twice: one specimen was recorded above Gilgit in the lower Naltar Valley at 6000ft, and another on the Deosai Plateau at 13,500ft. It is generally common in Pakistan; Roberts (2000) notes it from Chitral, Swat, the Murree Hills, northern Baluchistan, and occasionally as far south as Lahore.

Colias fieldii Ménétriés, 1855
Colias Fieldii, Ménétriés, E., *Enumeratio corporum animalium musei imperialis Academiae Scientarum Petropolitanae*, 1:79, pl.1, fig.5.

Range: widely distributed in Nepal, Bhutan, Afghanistan, the SW Pamir (Tajikistan), southern Uzbekistan and Pakistan and northern India to Assam, and northern Burma.
Localities: most sites in the Hunza region to 11,000ft; Deosai Plateau. Early Hunza record: Evans (1927): as *Colias croceus* Fourer.

This species, and the next, are widespread in Hunza and side valleys, at low to moderate elevation, never flying with the high altitude species *C. cocandica, C. eogene* and *C. marcopolo. Colias fieldii* is most abundant in irrigated areas near settlements, especially in fields with legumes, but also extends sparsely along roadsides and in arid hill slopes. It occurs in the heavily cultivated areas of the Chipursun Valley (Fig. 7), but was not recorded along the uninhabited route to Kilik and Mintaka passes. It occurs sparsely on the Deosai Plateau at 13,500-14,000ft, an elevation far greater than in any Hunza localities, although Verhulst (2000) found it at 4900m (16,100 ft) in Nepal. Elsewhere in Pakistan it occurs in the Murree Hills, Swat, Hazara and Chitral, in northern Baluchistan and at times as far south as Lahore (Roberts, 2001). Roberts suggests that this species is "less adapted to dry areas than *Colias erate,*" but both are equally frequent in arid sites in Hunza.

Colias erate (Esper, 1805)
Papilio Erate Esper, E.J.C. *Ausländische Schmetterlinge Suppl.* 1(13), Pl.119, fig.3.

Range: this species is widely distributed from Eastern Europe to southern Siberia, the Pamir and Altai, Afghanistan, western China, Mongolia and Japan. According to Roberts (2000), its distribution in Pakistan is similar to that of *C. fieldii*, but it occurs throughout Baluchistan, and was collected by Swinhoe (1887) at Karachi.
Localities: most Hunza localities to 11,500ft; Deosai Plateau. Early Hunza record: Evans (1927): as *Colias hyale* Linnaeus.

It flies with the last species in Hunza and associated side valleys, and is perhaps more common than *C. fieldii* in the lower localities. At 11,500ft, it has been recorded within the limits of Khunjerab National Park. Both are common in irrigated areas, nectaring on cultivated plants but also extend onto dry mountain slopes. With the last species, *C. erate* occurred around settlements along the Chipursun Valley; it was common at Misgar, but was not found beyond this village on the arid, unpopulated route to Mintaka and

Kilik passes. It joins *C. fieldii* as occasional on the Deosai Plateau, to 14,000ft, much higher than in Hunza localities. The white/cream female form *pallida* is as common as the typical form in all populations. According to Roberts (2001) its distribution in Pakistan is similar to that of *C. fieldii* but it occurs throughout Baluchistan and was collected by Swinhoe (1887) at Karachi. Verhulst (2000) lists the nominate race and no fewer than nine generally unimpressive subspecies, differing one from another primarily in size and the degree of spotting (if any) in the black borders on the male upperside. *Colias erate lativitta* was described by Moore (1882) from Nepal, also occuring in Ladakh and Kashmir, and is the race from the Hunza area. However, it differs little from nominate *erate;* moreover, the FW border in the male is unspotted though Verhulst confusingly illustrates specimens with conspicuous spotting (Plate 5). Neither Tshikolovets (1997) nor Tuzov *et al.* (1997) recognize any subspecies, and this may be the most prudent course.

Colias cocandica Erschoff, 1874
Colias Nastes var. *cocandica* Erschoff, N.G In: Fedtschenko, A.P., Journey to Turkestan, 2:6, pl. 1, fig. 3.

Range: *Colias cocandica* has a very wide range, including each of the ex-Soviet southern republics east of Turkmenistan, Afghanistan, western China, northern Pakistan and northern India.

Colias cocandica kunjerabi Verhulst, 1999 (Fig. 50a-h)
Colias cocandica kunjerabi, Verhulst, J.T. *Lambillionea*, 2:267.

Range: Khunjerab region.
Localities: Khunjerab, Kilik Pass, Irshad Uwin Pass. Early Hunza record: Tytler (1926): as *Colias cocandica hinducucica* Verity.

This race was recently described from the population at Khunjerab. In a very detailed monograph of the genus, Verhulst (2000) notes that *"great confusion has always governed the exact status of the described subspecies of* C. cocandica." He recognized 5 subspecies in addition to the nominate race. Moreover, a group of populations formerly regarded as part of the *cocandica* complex were separated as distinct species: *C. tamerlana, C. tibetana, C. grumi* and *C. thrasibulus,* all except *tibetana* possessing one or more subspecies. In the past, specimens from northern Pakistan have generally been assigned to subspecies *hinducucica* (see Tshikolovets, 1997), but we will follow Verhulst in attaching the new name *kunjerabi* to populations from the Khunjerab Plateau, Kilik and the Irshad Uwin passes. This race was separated primarily through its heavy black scaling on the upper surface, particularly in males. Illustrations in Plates 44 & 45 in Verhulst support this distinction to a degree, but some overlap with *cocandica* is obvious, and individuals from the type locality of subspecies *kunjerabi* certainly accord with Verhulst's summary that these *Colias* form an extremely variable complex: the range of phenotypic variation is suggested in Fig. 50a-g.

Tshikolovets (2000) notes that populations of the nominate race from Central Turkestan Mountains of Uzbekistan are unusually dark in color, a feature ". . . often observed in this part of Pamir-Alai for numerous butterfly species, i.e. *Pseudocharaza turkestana, Hyponephele laeta, H. hilaris, H. tristis, Melitaea sultanensis, Hyrcanana sartha".* Each of the individuals used by Tshikolovets to illustrate *C. cocandica cocandica* in Uzbekistan could readily be matched by a specimen from Khunjerab. It is possible that further information on the infraspecific divisions of *C. cocandica* might stem from molecular genetic techniques, though the findings of Nice and Shapiro (1999, 2001) that phenotypic and structural divergence may occur before genetic divergence provide a caveat.

Colias cocandica well exemplifies the confusion over the collection site of early specimens sent to the British Museum (Natural History). Roberts (2001) proposes that *". . . Within Pakistan territory it has only definitely been collected from Misgar in northern Hunza".* He cites Tytler's (1926) account of butterflies collected by Janet Visser-Hooft for this record but, as shown above, the village with postal and telegraph facilities became transmuted into a "collecting locality" for several species. It is certain that *Colias cocandica* never occurred anywhere near Misgar, in the 1920s or now. Its distribution at high altitude along the Sino-Pakistan border is very patchy. It is much more common than *C. eogene* at 15,500ft on the Khunjerab Plateau at times when nectar is plentiful, and abundant on mountain slopes above the plateau, to over 16,000ft, considerably higher than Verhulst's records. It was rarely seen at the Kilik and the Irshad Uwin passes at *ca.* 16,000ft; in these localities it flew with the much commoner *C. eogene.* Its flight is low and erratic, but often blown by the high winds that are frequent on these exposed passes.

Colias eogene C & R Felder, 1865
Colias eogene, in: *Reise der Österreich. Fregatte Novara um die Erde in den Jahren 1857, 1858, 1859.* 2:196, pl. 27, fig.7.

Range: the nominate subspecies is widely distributed from the Hindu Kush, Tien Shan and Himalaya.

Colias eogene shandura Evans, 1926 (Fig. 51a-c)
Colias eogene shandura Evans, W.H., *J. Bombay Nat.Hist. Soc.,* 31:713.

Range: northern Pakistan.
Localities: Fakar Peak (Nagar), Khunjerab, Mintaka Pass, Kilik Pass, Irshad Uwin Pass, below Dilsun Pass; Deosai Plateau. Early Hunza record: Evans (1927): as *Colias eogene.*

On the Khunjerab Plateau, *C. eogene* is much scarcer than *C. cocandica*, but was the most frequent *Colias* at *c.*16,000ft on the Kilik and Mintaka passes in July/August, and on the Irshad Uwin Pass, on the border with Wakhan, Afghanistan, in July. The lowest elevation at which we found this species was 13,000ft at Shirin Maidan, on the Kilik route (Fig. 18). It was frequent at 13,500-14,000ft on the Deosai Plateau (Baltistan). It was less common than *C. marcopolo* at 15,000-16,000ft below the Dilsun Pass in late July, 2002. Elsewhere in Pakistan (Roberts, 2001), it occurs at high elevation in Chitral. Subspecies *shandura* was described from specimens collected in Chitral Province; Verhulst (2000) lists four other named races, but differences between them are less than dramatic (Verhulst, Pl.58, 59).

Colias marcopolo Grum-Grshimailo, 1888 ((Fig. 53a-d)
Colias Marco-Polo Grum-Grshimailo, G., *Horae Soc. Ent. Ross.* 22:304.

Range: Pamir, Hindu Kush, Afghanistan, Badakshan, Tajikistan, northern Pakistan.
Localities: Kilik Pass, Irshad Uwin Pass, below Dilsun Pass.

This species was recorded in present Pakistan by Evans (1926), from the border between Yasin and Chitral, west of Hunza, as late as September. During seven annual visits to Khunjerab, it was never recorded. Its center of distribution is evidently the Pamir, the Afghan Hindu Kush and Tajikistan (Tshikolovets, 2000). In August 2000 it was frequent on the summit of Kilik Pass (16,000ft) but was not found on the Mintaka Pass to the east. It also occurred on the Irshad Uwin Pass on the border between Pakistan and Wakhan, Afghanistan, where it was less frequent than *C. eogene.* Below Dilsun Pass, at 15,000-16,000ft, it was more common than *C. eogene* in late July, 2002. Across the border, in Wakhan, it was found in July 2001. Populations elsewhere in Afghanistan represent

a distinct race *kushana* Wyatt & Omoto 1966.

At the Dilsun locality, as elsewhere, males were dimorphic. Most were typical (Fig. 53a): yellow upperside without cell spot, and a yellow-orange morph (Fig. 53b) with a conspicuous cell-end spot as in the female.

Gonepteryx rhamni (Linnaeus, 1758)
P.[apilio] D.[anaus] Rhamni, Linnaeus, C., *Systema Naturae,* edit.10, 1:470, No.73.

Range: with a very extensive Palaearctic distribution, this species ranges from Europe, North Africa, Asia Minor, the Caucasus, Siberia and Central Asia.
Localities: Kargah, Minapin.

In our survey *G. rhamni* was found in only two localities: commonly at 7500-9000ft in the lower Kargah Valley, and sparsely at Minapin (Nagar) at 10,000ft. In both localities it flew in thinly wooded open terrain; only the former was irrigated. Elsewhere in Pakistan it reportedly occurs (Roberts, 2001) in the Murree Hills, Hazara, Swat, Chitral, and in the juniper forests of Ziarat, Baluchistan. It is also known from Astor, and from Chilas, south of Gilgit, but we did not see it there. The related *Gonepteryx farinosa* Zeller, 1847, widely distributed from the Balkans, Bulgaria, Greece, Turkey, the Lavant, Iran, Iraq, much of ex-Soviet Central Asia, eastern Afghanistan and northern India. For Pakistan it is recorded by Roberts as rare, from Mastuj, Chitral Province; we never encountered this species in Hunza or adjacent valleys.

Eurema hecabe (Linnaeus, 1758) (Fig. 46)
P.[apilio] D.[anaus] Hecabe, Linnaeus, C., *Mus. Lud. Ulric.,* 249.

Range: occurs widely throughout the Ethiopian and Oriental regions.
Locality: Joglot, Gilgit District.

Roberts (2000) reports its distribution in Pakistan as extensive in Punjab and Sind provinces, cultivated areas of North West Frontier Province, and in a locality in Baluchistan. He records its spread into foothill valleys with rice cultivation, and its preference for damp, grassy sites.

We recorded this Oriental species at only one site: along the KKH beyond Gilgit at the village of Joglot, at 6000ft, at the edge of irrigation channels where it was locally common in July 1994. It was not seen in subsequent years in this locality. This wet oasis is set in extremely arid surrounding terrain. Across its wide range, this species varies seasonally, with intergrading between populations. However, this has not discouraged the describing of almost 40 "subspecies"!

SATYRIDAE

Lasiommata menava Moore, 1865 (Fig. 56)
Lasiommata menava Moore, F. *Proc. Zool. Soc. Lond.,* 1865:499, pl. 30, fig.3.

Range: a species with an extensive distribution (Tshikolovets, 2000) from Azerbaijan, Iran, Turkmenistan and the other southern republics, Afghanistan, the Karakoram and northern India.
Localities: Kargah, Naltar, Chaprot, Muchuwar, Hunza Valley.

It was locally common in several Hunza localities: in the Kargah and Naltar valleys, at Chaprot, in the Muchuwar Valley, and occasionally along the main KKH in the Hunza Valley south of Sost. Records were for July and August, at an altitude of from 7000ft to 10,000ft. Elsewhere in Pakistan Roberts (2001) records this butterfly as uncommon, from the juniper forests of central Baluchistan, and around Drosh, Chitral, between 6000ft and 9000ft.

Lasiommata schakra (Kollar, 1844)
Satyrus schrakra Kollar, In: Hügel, F.C., *Kaschmir und das Himaleyagebirge* 4:446, pl. 15, figs 3, 4.

Range: from the Karakoram this species extends eastwards into the Great Himalaya.
Localities: Kargah, Chaprot.

In our survey, *L. schakra* was encountered in only two localities: in the Kargah Valley above Gilgit at 7500ft, and at similarly low elevation on the track to Chaprot (Nagar).
Elsewhere in Pakistan Roberts (2000) records it from northern Baluchistan and Chitral, from 6000ft to 9000ft.

Pseudocharaza baldiva (Moore, 1865)
Lasiommata baldiva, Moore, F., *Proc. Zool. Soc. Lond.* 1865:499-500.

Range: apart from Pakistan, this satyrid ranges from the Pamir, eastern Hindu Kush, Afghanistan, Tajikistan, Ladakh and northern India (Tshikolovets, 1997), also in Tibet.
Localities: Minapin, Muchuwar, Hoper, Tharbai, the main Hunza Valley, approaches to Kilik and Irshad Uwin passes. Early Hunza records: Tytler (1926): as *Eumenis lehana clarissima* Seitz; and Evans (1927): as *Eumenis mniszechii lehana* Moore.

We recorded *P. baldiva* from several side valleys in the Hunza region, from the approach to Kilik Pass, and most commonly on the approach to the Irshad Uwin Pass up to 12,000ft. Roberts (2000) lists both this species and *P. lehana* Moore, 1879; D'Abrera (1992) illustrates both but notes that *lehana* may be synonymous with *baldiva,* and Tshikolovets (1997) follows this course. Roberts notes *P. baldiva* also from central Baluchistan, and Baltistan from 4000ft to the Shandur Plateau (Chitral) at 13,000ft. Populations in northern Pakistan have been separated as subspecies *gilgitica* Tytler, 1926, probably unnecessarily.

Pseudocharaza droshica (Tytler, 1926) (Fig. 57)
Eumenis lehana droshica Tytler, H.C., *J. Bombay Nat. Hist. Soc.,* 31:256.

Range: outside Pakistan, this satyrid ranges from Turkmenistan, Iran, Uzbekistan, Tajikistan, Kirgizstan, Afghanistan, and the Pamir and Hindu Kush.
Locality: Kargah.

We found *P. droshica* quite commonly, but in only one locality: the top of the Kargah Valley above Gilgit, just below the point where the narrow defile opens into a wet plain at 10,000ft. This represents the nominate race; subspecies *badacshana* Wyatt & Omoto, 1966, occurs in Badakshan Province, Afghanistan, and in Uzbekistan, and additional subspecies have been described from other regions of Afghanistan, and from the Tajik Pamir (Tshikolovets, 1997).

Charaza heydenreichi (Lederer, 1853)
[Satyrus] *Heydenreichi* Lederer, J., *Verh. zool.-bot. Ver. Wien,* 3:359, pl. 1, fig. 2.

Range: distributed through the Central Asian southern Republics east of Turkmenistan, Afghanistan, the Karakoram, N.W. India and western China. Roberts (2000) cites it as a high altitude butterfly of "extreme northern areas" including the Baroghil Pass to Afghanistan, and Shandur.

The most interesting record of this satyrid is a specimen labelled *"Gilgit* [without locality] *by Biddulph"* in the BMNH. This name refers to Maj. John Biddulph, who held the post of Political Agent when this office was first opened in 1877, in the then extremely re-remote town of Gilgit. He was the first European to enter the Hunza Valley. Biddulph (1881) published an account of the birds of Gilgit,

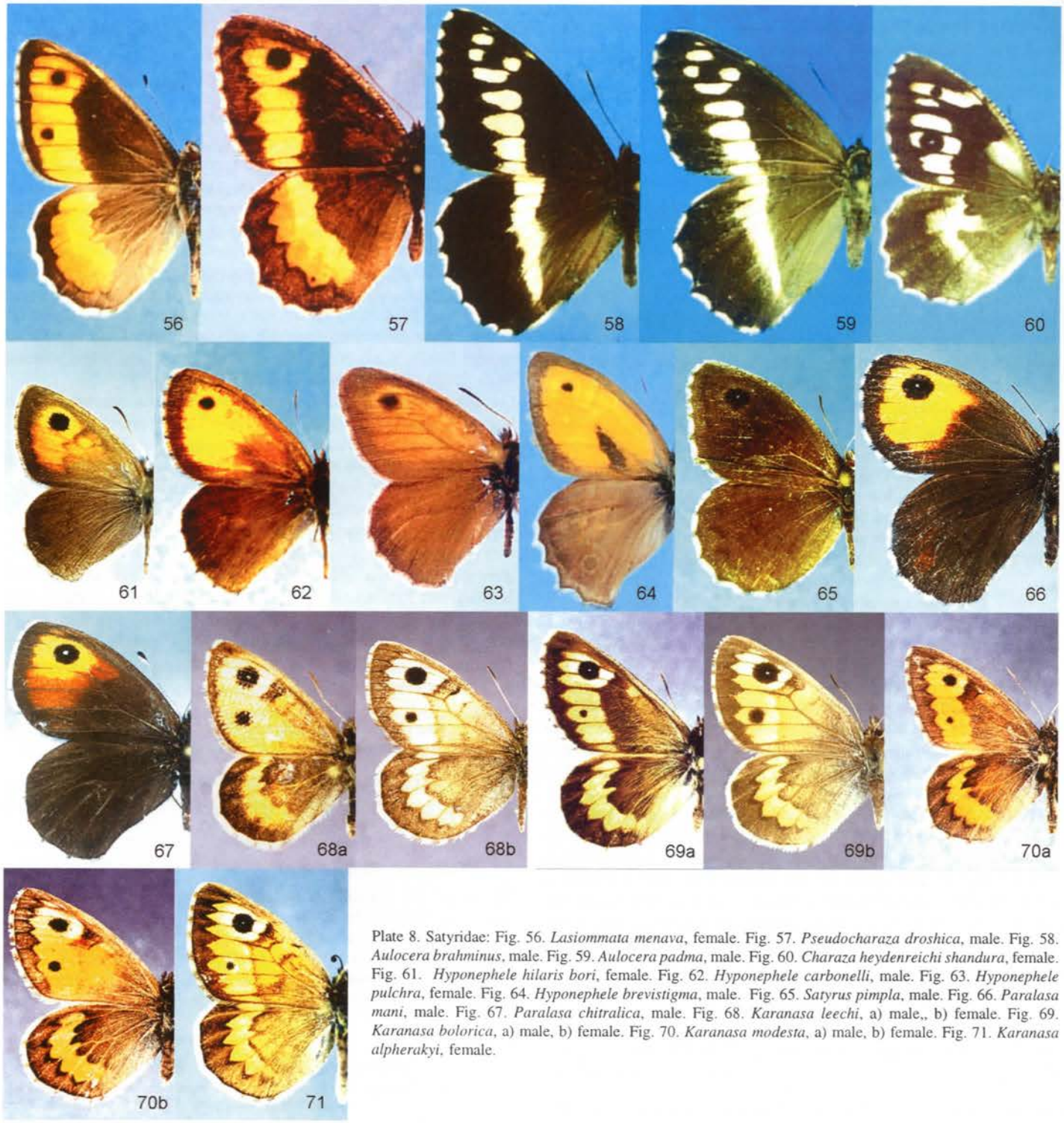


Plate 8. Satyridae: Fig. 56. *Lasiommata menava*, female. Fig. 57. *Pseudocharaza droshica*, male. Fig. 58. *Aulocera brahminus*, male. Fig. 59. *Aulocera padma*, male. Fig. 60. *Charaza heydenreichi shandura*, female. Fig. 61. *Hyponephele hilaris bori*, female. Fig. 62. *Hyponephele carbonelli*, male. Fig. 63. *Hyponephele pulchra*, female. Fig. 64. *Hyponephele brevistigma*, male. Fig. 65. *Satyrus pimpla*, male. Fig. 66. *Paralasa mani*, male. Fig. 67. *Paralasa chitralica*, male. Fig. 68. *Karanasa leechi*, a) male,, b) female. Fig. 69. *Karanasa bolorica*, a) male, b) female. Fig. 70. *Karanasa modesta*, a) male, b) female. Fig. 71. *Karanasa alpherakyi*, female.

and Col. John Scully, who took over Biddulph's post when the latter was on furlough published an independent ornithological paper (Scully, 1881). Both accounts were very extensive, but until now it has not been known that Biddulph collected a single butterfly. Perhaps "Scully butterfly specimens" lurk in the Natural History Museum collections, in London.

Charaza heydenreichi shandura (Marshall, 1882) (Fig. 60)
Hipparchia shandura Marshall, G.F.L. *J. Asiatic Soc. Bengal* Pt.II, 51:38, Pl.4, fig.3., 1895

Range: northern Pakistan, Tajikistan north of Wakhan.

Localities: Minapin and Fakar Peak (Nagar), Hassanabad Nallah (nr Murtazabad).

During much of our survey we obtained only two specimens of *C. heydenreichi*, one at 10,000ft, in July 1999 at Minapin, and the second collected by GN at Hassanabad Nallah, at 8500ft in September 2002. However, it was common on Fakar Peak in July 2003, at the much higher altitude of 13,000ft, when most specimens were fresh. Subspecies *shandura* differs little from nominate *heydenreichi* but is very distinct from the Afghan subspecies *kullmanni* Wyatt and Omoto, 1966, in which the pale markings are much extended — a taxon that Tuzov *et al.* synomize with subspecies *nana* Rühl from the western Pamir and Alai.

Hyponephele hilaris (Staudinger, 1886)
Epin.[ephele] Hilaris Staudinger, O., *Stettin. Ent. Zeit.*, 47:249-250.

Range: this species occurs in the Tien Shan, Pamir-Alai, the Hindu Kush, through the Southern Republics east of Turkmenistan, in Afghanistan and in western China. The nominate subspecies, *H. hilaris hilaris,* is widely distributed in the Pamir and eastern Hindu Kush, and into northern Pakistan.
Localities: Kargah, Naltar, Hunza Valley, Minapin, Muchuwar, Hoper, Deosai Plateau. Early Hunza records: Evans (1927): as *Maniola pulchella* Felder.

We recorded *H. hilaris hilaris* (sometimes cited as *Hyponephele pulchella* C. Felder, 1857) outside the Hunza region at least as far south as Kohistan. It occurred in numerous sites along the main Hunza Valley and in several side valleys, but not beyond Sost. Its highest elevation recorded during our survey was at 14,000ft on the Deosai Plateau. Roberts notes that Evans found it the commonest butterfly around Shandur Lake, and mentions another specimen evidently collected by the First British Political Agent in Gilgit: *"coll. J. Biddulph Astor, Gilgit, 7700ft in September."*

Hyponephele hilaris bori (Herz, 1900) (Fig. 61)
Epinephele hilaris var. *bori* Herz, O., *Ann. Mus. Acad. Sci. Zool. St. Pétersbourg,* 5:446.

Range: eastern Tajikistan; extreme northern Pakistan.
Localities: Mintaka, Kilik and Irshad Uwin passes.

We did not record this race from the Khunjerab region, but it was present below the summit of the Mintaka, Kilik and Irshad Uwin passes, at *c.*14,000ft, and across the border in Wakhan, Afghanistan.

Hyponephele carbonelli (Lukhtanov, 1995) (Fig. 62)
Hyponephele carbonelli Lukhtanov, V.A., *Atalanta* (Wurzburg) 26:197-200, Fig. 6a.

Range: Tarishing, Baltistan; Hoper, Hunza.
Localities: Hoper.

During our survey, this distinctive species was found only on steep slopes above the village of Hoper, in Nagar, Hunza. The placing of dark androconial scales at the base of the male FW (Fig. 62) is unique among members of the genus (Lukhtanov, 1995). The locality of *H. carbonelli* was generally impoverished; it is isolated by heavy agriculture in the Hoper Valley (Fig. 5), by arid terrain to the west (along the track to the KKH) and is immediately flanked by an extensive glacier to the east.

The altitude where *H. carbonelli* was found, *c.*10,500ft, is midway between the reported limits of the type material from Baltistan.

Hyponephele pulchra (C. & R. Felder, [1867])
Epinephele Pulchra Felder, C. and Felder, R., *Reise Novara Lep.*, 491.

Range: a widely distributed species. Outside the Karakoram, it is known from the Pamir, Tajikistan, Hindu Kush, Afghanistan, Kashmir and northern India.

Hyponephele pulchra baroghila (Tytler, 1926) (Fig. 63)
Maniola pulchra baroghila, Tytler, H.C., *J. Bombay Nat. Hist. Soc.*, 31:257.

Range: this subspecies was described from the ". . . north-east corner of Chitral and the watershed between Chitral and Wakhan, Afghanistan and the adjoining country of the extreme northwest of Yasin in Gilgit at elevations over 9000'." The type locality of *baroghila* is close to Hunza; Yasin is the next-but-one valley to the West and the Baroghil Pass to Afghanistan lies about 25 direct-line miles west of the Irshad Uwin Pass and 65 miles from Kilik.
Localities: Naltar, Chaprot, Muchuwar, KKH south of Sost, below Mintaka and Kilik passes.

In our survey, we found *H. pulchra baroghila* in the Naltar Valley above Gilgit, on mountain slopes at Chaprot (Nagar), in the Muchuwar Valley, occasionally near the KKH approaching Sost, and below the Mintaka and Kilik passes, but not below the Irshad Uwin Pass. Elevations ranged from 9000ft in Naltar to 14,000ft below the passes on the Sino-Pakistan border. It was common in July 2001 at *c.*14,000ft in the Wakhan Pamir, Afghanistan. Subspecies *sylvia* Hemming, 1933 was described from the Pamir.

Hyponephele brevistigma (Moore, 1893) (Fig. 64)
Maniola brevistigma Moore, F., *Lepidoptera Indica,* 2:47, pl. 103, figs 3, 3a.

Range: outside Pakistan, this species is known from Afghanistan, southern slopes of the Alai range, the western Pamir and northern India (Tshikolovets, 1997).
Localities: Fakar Peak (Nagar), Naltar, Hoper, KKH north of Sost, below Mintaka, Irshad Uwin and Dilsun passes.

Roberts mentions only *H. tenuistigma* and *H. latistigma* from Pakistan. We found neither species during our survey, but undoubted *H. brevistigma* was a frequent medium-altitude butterfly in the Naltar (Gilgit) and Hoper (Nagar) valleys at 9000ft, and it was at times the commonest butterfly along the Khunjerab River ravine beyond Sost, nectaring on the Globe-thistle *Echinops cornigerus* (Fig. 12), where it reached an altitude of 11,500ft, just inside the National Park. It was found on the approaches to Mintaka, Irshad Uwin and Dilsun passes, at *c*12,000ft. This species is very similar to *H. chitralica* Evans, 19923: the two are most readily separated by the shape of the post-discal FW black spots (circular in *H. chitralica* and slightly ovoid in *H. brevistigma*).

Hyponephele dysdora (Lederer, [1869])
Epinephele Dysdora Lederer, J. *Horae Soc. Ent. Ross.* 6:85-86, Pl.5, figs 1-2.

Range: ranging widely from Iran, each of the former Soviet southern republics, and western China.
Locality: Hoper.

Verhulst (1999) recorded this satyrid from Hoper. We did not encounter it.

Paralasa mani (de Nicéville, 1880) (Fig. 66)
Erebia mani de Nicéville, L., *J. Asiat. Soc. Bengal,* 1880:247.

Range: this species is distributed from Asia Minor to Siberia, in Afghanistan, uncertainly in the Pamir (Tshikolovets, 1997). The nominate race occurs in Pakistan; several subspecies have been described, including *roxane* Grum-Grshimailo from the Trans-Alai and *summa,* Avinoff from Uzbekistan.
Localities: Kargah, Chaprot, Fakar Peak, Muchuwar, Thakot/Tharbai, below Irshad Uwin Pass. Early Hunza records: Evans (1927): as *Erebia mani.*

We found *P. mani* in several localities: the Kargah Valley, mountainside pasture at Chaprot (Nagar), the Muchuwar Valley, mountainside pasture at Thakot/Tharbai above Sost, and on the approach to the Irshad Uwin Pass. The last locality marked the highest elevation (13,500ft) of our records, while the lowest was 8500ft at Kargah. For Pakistan, Roberts (2001) cited it as rare, at Shandur and in the extreme northwest of the country, localities distant from Hunza.

Paralasa chitralica (Evans, 1923) (Fig. 67)
[Erebia] kalinda chitralica Evans, W.H., *J. Bombay Nat. Hist. Soc.*, 29:783, pl. 13, fig. D13.2.

Range: Pamir, Alai, Hindu Kush, Karakoram, Afghanistan, Tajikistan, possibly northern India.
Localities: Mintaka, Kilik, Irshad Uwin and Dilsun passes.

Described from Chitral, this species occupies a higher altitudinal zone in the Hunza region than the closely related *Paralasa mani.* It was recorded from each of the high passes in the survey; the highest altitude was 16,500ft at below the Dilsun Pass, and the lowest records were made at *c.*14,000ft. It was thus never sympatric with *P. mani.*

Satyrus pimpla C. Felder, [1867] (Fig. 65)
Satyrus Pimpla Felder C., *Reise der Österreich. Fregatta Novara um die Erde in den Jahren 1857, 1858, 1859.* 2:494, pl. 69, figs 10, 11.

Range: a locally distributed species, other than in Pakistan known from Badakshan, the western Pamir, Hindu Kush, Afghanistan, Tajikistan and northern India.
Localities: Fakar Peak (Nagar), Muchuwar.

We found *S. pimpla,* in small numbers, in the mountain pasture of the Muchuwar Valley, where the altitude of *c.*13,000ft was slightly higher than for the Tajik race, and considerably higher than previous records from Pakistan. It was much more common on Fakar peak at the same altitude, in July 2003. Roberts (2001) records it from Baluchistan, at 7000ft, in Chitral from Drosh northwards, and in Astor. The nominate subspecies occurs in Pakistan and throughout most of the species' range. *S. pimpla shachdara* Yu. Yu. Shchetkin, 1986, was recently described, and represents the species in Badakshan and Tajikistan.

Aulocera padma (Kollar, 1844) (Fig. 59)
Satyrus Padma Kollar, V. in: Hügel, F.C., *Kaschmir und das Himaleyagebirge* 4:445, pl. 15, figs 1, 2.

Range: this species ranges from the Karakoram, the Great Himalaya to northern Burma, and in western China (D'Abrera, 1992).
Localities: Kargah, Naltar, Chaprot, Nilt, Fakar and Minapin, Muchuwar.

We found this butterfly to be more widespread than Roberts suggested for other regions of Pakistan. He cites it as very rare in Baluchistan but common in the Murree Hills and lower Kaghan Valley, in Astor and rarely in Yasin, the second valley paralleling Hunza to the west. Our locality records include the Kargah and Naltar valleys, Chaprot, Minapin and the high pasture at Muchuwar, and at Nilt and other sites along the KKH, between 7000ft and 10,000ft. It was found at 13,000ft on Fakar Peak. It was generally common in each locality, though very difficult to collect when in swift flight over steep, rocky hillsides. It was seen (GN) in large numbers at Murtazabad and Aliabad, feeding from drying apricots and mulberries, in late September and October.

Aulocera brahminus (Blanchard, 1853) (Fig. 58)
Satyrus Brahminus Blanchard, C.E., in: Jacquemont, V., *Voyage dans l'Inde,* 4:22, pl. 2, fig. 4,

Range: from the Karakoram to Kashmir.
Localities: Chaprot, Minapin, Muchuwar.

This species is not mentioned by Roberts (2001). We encountered it rarely during our survey, and in only three localities: a mountainside at Chaprot (Nagar), Minapin, a locality in Nagar *en route* to the Diran Base Camp, and in the remote Muchuwar Valley. All records lay within the narrow altitudinal range of 9000ft to 10,000ft. As the last species, this is a powerfully flying butterfly.

Aulocera swaha (Kollar, 1844)
Satyrus swaha Kollar, V. in: Hügel, F.C., *Kaschmir und das Himaleyagebirge* 4:444, pl. 14, figs 1, 2.

Range: Karakoram and Himalaya; Afghanistan; western China.
Localities: Kargah, Hoper. Early Hunza record: Evans (1927).

We found this satyrid in only two localities: in the Kargah Valley above Gilgit, at 8500ft, and on an exposed mountainside above the village at Hoper (Nagar), at 10,000ft. Roberts (2001) records it from southern Gilgit on slopes at the foot of Nanga Parbat, in Chitral, and commonly in Hazara and the Murree Hills. He suggests that this species flies at slightly lower altitudes than *A. padma,* but we found it too infrequently to comment on this.

Eumenis parisatis (Kollar, 1849)
Satyrus parisatis Kollar, V., *Denkschr. Akad. Wiss. Wien,* 1:52.

Range: distributed from Iran to Kashmir, this species barely enters Central Asia. It is widely distributed from Baluchistan through the Northern Areas of Pakistan to Baltistan.
Localities: Naltar, Chaprot, Nilt, KKH.

We found *E. parisatis* more commonly than *Aulocera padma,* but occurring in fewer localities. It was particularly frequent along the jeep track leading from Nomal to Naltar, at Nilt (Gilgit) along the KKH, and outside Hunza at low altitude (5000ft) on the road to Skardu soon after it leaves the Karakoram Highway, 16 miles south of Gilgit. The highest altitude noted was 10,000ft at Chaprot and Muchuwar. The flight of this species is as swift and powerful as that of *A. padma,* behavior seldom encountered in Palaearctic satyrids.

Karanasa leechi (Grum-Grshimailo, 1890) (Fig. 68a, b)
Satyrus Leechi Grum-Grshimailo,G. 1890. In: Romanov, N.M. *Mémoires sur les Lépidoptères,* 4:473-5, pl. 25, figs 3a,b.

Range: this species occurs in the Pamir, Eastern Hindu Kush, Tajikistan, Kirgizstan and western China, in addition to Pakistan.
Localities: Chapchingal, Khunjerab Plateau.

This butterfly was not recorded for Pakistan by Roberts (2001) but is an established member of the high altitude Hunza fauna. It was rarely recorded in the Chapchingal Valley below the Khunjerab Plateau, at 13,500ft, but on the plain above, from 15,500ft to higher mountain slopes at 16,000ft, it is the only satyrid, and at times not uncommon. It was not found on the Deosai Plateau, or at higher elevation on the mountains arising from the plateau, to 15,000ft, which yielded *Parnassius simo accona* and *Parnassius delphius jacobsoni.* It was also collected, at 15,000ft, on the Afghan side of the Irshad Uwin Pass in July 2001 (see Afghan Records below). Surprisingly, it was not cited from Afghanistan by Sakai (1981). It is replaced on the high passes to the west of Khunjerab — Mintaka, Kilik, Irshad Uwin and Dilsun, by *Karanasa bolorica* Grum-Grshimailo, 1888.

The type locality is "méridionales des monts Kounjout" (Beik), as for *Polyommatus hunza,* a locality in extreme western China adjacent to the short Sino-Afghan border of the Wakhan corridor. The nominate race occupies the widest range, including the Hunza localities. The type locality of a second subspecies *K. leechi mihmana* Avinoff & Sweadner, 1951 is the Mihman Pass, west of Beik (or Bayik), at 18,000ft. The same authors also described *K. leechi hunza* from a single "Misgah Hunza" specimen; this was presumably collected in the Khnjerab region and was presumably typical *K. leechi.*

Karanasa bolorica (Grum-Grshimailo, 1888) (Fig. 69a, b)
Satyrus Boloricus Grum-Grshimailo, G., *Horae Soc. Ent. Ross.*, 22:307.

Range: a widely distributed species, from the Pamir, Hindu Kush, Afghanistan, Tajikistan, the Karakoram, western China and possibly northern India.
Localities: Mintaka Pass, Kilik Pass, Irshad Uwin Pass, below Dilsun Pass. Early Hunza record: Tytler (1926): as *Karanasa regeli boloricus* Grum-Grshimailo.

The nominate subspecies occurs along the high passes between Pakistan and China west of Khunjerab, and on the Irshad Uwin and Dilsun passes to the Wakhan Pamir (Afghanistan), into Tajikistan and extreme western China (Xinjiang). A second subspecies, *K. bolorica chitralica* Tytler, 1926, occurs in the high country above Chitral, across the Wakhan and into Tajikistan, west of the range of *K. bolorica bolorica.* Within Pakistan, this *Karanasa* does not seem to be sympatric with the related *K. leechi* though both occupy the same high altitudinal zone. The ranges of *K. leechi* and *K. bolorica* overlap extensively across the Wakhan corridor into Tajikistan, but only the latter was recorded from the region of extreme eastern Afghanistan across the Irshad Uwin Pass in July 2001. The only other *Karanasa* recorded in the Wakhan at that time was *K. alpherakyi* Avinoff, 1910, a species that we never encountered in Pakistan (see Afghan Records below).

Karanasa moorei Evans, 1912
Karanasa moorei (as *K. leechi)* Evans, W.H., *J. Bombay Nat. Hist. Soc.*, 21:563.

Range: other than in Pakistan, this satyrid is known from Badakshan, the Pamir and Hindu Kush, Tajikistan, Afghanistan and northern India.
Localities: Muchuwar.

We have added Hunza to its known distribution in Pakistan, but only from the high pasture on slopes of the Muchuwar Valley, at 13.000ft, in July. Tshikolovets (1997) records it from the Pamir on steppe vegetation at elevations of over 14,000ft. A second subspecies *K. moorei dubia* Avinoff & Sweadner, 1951, was found only at the type locality of the Baroghil Pass, between present Pakistan and Afghanistan. Listed by Roberts (2001) as known in Pakistan only from Chitral, and the Yasin and Ghizer valleys of Gilgit, west of Hunza, from 9000ft to 14,000ft.

Avinoff and Sweadner (1951) note that *Karanasa moorei* "was first described from specimens mistakenly identified as *leechi* Moore by Evans . . ."

Karanasa modesta Moore, 1892 (Fig. 70a, b)
Karanasa modesta Moore, F., 1893-1896, *Lepidoptera Indica* 2:41,

Range: Deosai, Lahul, Bara Lacha Pass.
Localities: Deosai Plateau.

We did not record this species from any Hunza localities, but it was quite common on the type locality of the Deosai Plateau of Baltistan, at 13,500-14,000ft. It contributes to the *c.*31% disparity between the faunas of Deosai and Hunza (see below). Avinoff and Sweadner (1951) discuss the taxonomy of Deosai *Karanasa,* which evidently include two distinct morphs, but our specimens all match their figures of *modesta.*

NYMPHALIDAE

Melitaea didyma [Esper, [1779])
Pap.[ilio] Didyma Esper, E., *Die Europaischen Schmett.*, 1: pl. 41, fig. 3.

Range: very widely distributed, through most of Europe, North Africa and across temperate Asia.

Melitaea didyma nadezhdae Sheljuzhko 1912 (Fig. 72)
Melitea didyma O. nadezdae, Sheljuzhko, L. 1912. *Deut. Ent. Zeit. Iris* 26:137.

Range: widely distributed in Tajikistan and the Hindu Kush, also in the Pamir outlier of Muztagh Ata in Sinkiang (Xinjiang), western China.
Localities: Khunjerab, Kilik Pass, Irshad Uwin Pass.

Newly recorded from Pakistan, this insect was found in small numbers on the Khunjerab Plateau at 15,500ft, and more frequently on vegetated mountain slopes above the plain to 16,000ft, flying with the much commoner *Boloria sipora.* It also occurred sparsely on the high passes to China and Afghanistan, and was recorded in July 2001 in the Wakhan Pamir, at *c.*14,000ft.

Melitaea fergana Staudinger, 1882 (Fig. 73a, b, c)
Melitaea Fergana Staudinger, O., *Berl. Ent. Zeit.*, 26:168.

Range: this very widely distributed species, within a group of seven closely related species (D'Abrera, 1992), is known from the Tien Shan, Pamir, Badakshan, Afghan Hindu Kush, Kazakhstan, Kirgizstan, Tajikistan, China and India, in addition to localities in Pakistan (Tuzov, 1997).
Localities: Hunza Valley, Chapchingal, approach to Mintaka, Kilik and Irshad Uwin passes. Early Hunza record: Evans (1927): as *Melitea saxatilis fergana.*

It is the nominate race that occurs in and near Hunza. It was found on the approaches to the Mintaka and Kilik passes, also to the Irshad Uwin Pass, never above 15,000ft. Other Pakistan localities noted by Roberts (2001) are the Kaghan Valley and Astor, south of Hunza, and Roberts erroneously gives Misgar as a collection site. It has not been found on the Khunjerab Plateau, but occurs along the KKH just below, and in the Chapchingal Valley, sites at from 13,000ft to 15,000ft. Another subspecies, *M. fergana maracandica* Staudinger, 1882 (Fig. 74a-c), was recorded from Wakhan, Afghanistan, just across the border at the Irshad Uwin Pass (see below under Afghan Records). Another race, *M. fergana jacobsoni* Higgins, 1941 is known from mountain ranges in Tajikistan (Tshikolovets, 1997) and Afghanistan (Sakai, 1981).

Clossiana jerdoni Lang, 1868 (Fig. 78)
Argynnis Jerdoni Lang. A., *Ent. Mon. Mag.*, 5:34.

Range: a species with a restricted distribution: the Karakoram, northern India and Afghanistan. Subspecies *chitralensis* Moore, 1900 was described from Chitral District, near the Baroghil Pass on the Afghan border. The type locality of the nominate race is 'Goolmurg" (Gulmarg) in Baltistan, west of Srinagar; this race occurs in the Hunza region.
Localities: Chaprot, Muchuwar.

During our survey *C. jerdoni* was found in small numbers in two localities: a vegetated but uncultivated mountainside at Chaprot, Nagar, and in the high pasture of the remote Muchuwar Valley, both sites at *c.*13,000ft.

Clossiana franciscana Verhulst, 1999
Clossiana franciscana Verhulst, J. *Lambillionea* 99:213-216, figs 1-2.

Range: Kirghizstan, northern Pakistan.
Locality: Khunjerab Plateau.

This recently described species, closely related to *C. hegemone,* was recorded by Verhulst (1999) in the Khunjerab region, apparently on the plateau.

Plate 9. Nymphalidae: Fig 72. *Melitaea didyma nadezhdae*, female. Fig. 73. *Melitaea fergana fergana*, a) male, b-c) female. Fig. 74. *Melitaea fergana maracandica*, a) male, b-c) female. Fig, 75. *Melitaea chitralensis shugnana*, a-b) female. Fig. 76. *Melitaea shandura*, a-b) female. Fig. 77. *Melitaea minerva*, a-b) female. Fig. 78. *Clossiana jerdoni*, female. Fig. 79. *Boloria sipora hunzaica*, a-b) male, c-f) female. Fig. 80. *Boloria sipora nitida*, a-b) male. Fig. 81. *Argynnis aglaja vitatha*, a-b) female. Fig. 82. *Argynnis adippe jainadeva*, a-b) female. Fig. 83. *Aglais caschmirensis*, female. Fig. 84. *Nymphalis xanthomelas*, a-b) female. Fig. 85. *Limenitis lepechini*, a-b) male. Fig. 86. *Polygonia interposita*, a-b) female.

Boloria sipora (Moore, [1875])
Argynnis sipora Moore, F., *Proc. Zool. Soc. Lond.* 1874:569-9, pl. 66, fig. 11.

Range: *Boloria sipora* was described from Kashmir and ranges from the Pamir-Alai to the Tien Shan, Hindu Kush, Kun Lun, Himalaya, and the four southern ex-Soviet Republics.

Tshikolovets (1997) regards *B. sipora* as constituting a species group associated with several very closely related taxa. Subspecies *baralacha* Moore, 1882 is synonymous with subspecies *hunzaica* Tytler, 1940, the race occurring in our area.

Boloria sipora hunzaica (Tytler, 1940) (Fig. 79a-f)
Argynnis pales hunzaica, Tytler, H.C., *J. Bombay Nat. Hist. Soc.* 42:120.

Range: outside Pakistan, this butterfly is known from several Pamir ranges, primarily in eastern Tajikistan.

Localities): Fakar Peak (Nagar), Khunjerab, Mintaka Pass, Kilik Pass, Irshad Uwin Pass. Early Hunza record: Evans (1927): as *Argynnis pales sipora.*

This is yet another instance of the mythical type-locality of "Mizghah, Hunza". The specimens sent to London from the Post and Telegraph Office at Misgar could have been collected at Khunjerab or one of the passes to China or Afghanistan — Mintaka,

Kilik or Irshad Uwin but this important information never reached the Natural History Museum. It was common at 15,000ft on Fakar Peak, and was by far the most common 'Fritillary' on and above the Khunjerab Plateau (Fig. 79a, b), flying with the much scarcer *Melitaea didyma*. It was also recorded, always in small numbers, from the other high passes visited. Several specimens of an aberration (Fig. 79c-f) were obtained on three annual visits to the plateau.

Boloria sipora nitida Warren, 1944 (Fig. 80)
Boloria palres nitida Warren, B.C.S., *Trans. Roy. Ent. Soc. London*, 94:1-101, Pl.22. fig.101 and Pl.38, figs 230-233.

Range: Baltistan: Deosai.
Localities: Deosai Plateau.

Closely related to *B. sipora hunzaica*, this race differs consistently from that occurring at Khunjerab and elsewhere in the Hunza area. Typical specimens of the two are shown in Fig. 79-80. This subspecies was described from Deosai, and separated from typical *sipora* on color detail of the underside HW. We did not find this character compelling, but two characters clearly separate *sipora hunzaica* from *sipora nitida:* (i) the upperside black markings in both sexes (particularly in males) are heavier in *s. hunzaica* and (ii) the underside HW submarginal row of dark spots conspicuous in *s. hunzaica* are very reduced or absent in *s. nitida*. It is a common butterfly in Deosai, from 13,500 to 14,000ft, and does not extend even a short distance below the plateau.

Clossiana hegemone (Staudinger, 1881).
Argynnis hegemone Staudinger, O., *Stett. ent. Zeit.* 42:292.

Range: this species has a very wide range, including the Tien Shan, Pamir-Alai, Hindu Kush, Karakoram, Ladakh, the former southern Soviet Republics east of Turkmenistan, Afghanistan, northern India and western China.
Localities: Khunjerab, Irshad Uwin Pass. Early Hunza record: Evans (1927): as *Argynnis hegemone*.

This fritillary has rarely been recorded from Pakistan. We encountered it only twice in our survey: one specimen on the Khunjerab Plateau and another at the Irshad Uwin Pass, both records at just over 15,000ft. Another singleton was collected at a similar altitude in Wakhan, Afghanistan, in July 2001. Tshikolovets (1997) mentions another race, *chotana* Bang Haas 1915, from the Kun Lun and E. Pamir: however, Tuzov *et al.* (2000) question the attribution of this taxon to *hegemone*.

Argynnis aglaja (Linnaeus, 1758).
P.[apilio] N.[ymphales] aglaja Linnaeus, C., *Systema Naturae*, edit. 10, 1:481, No.140.

Range: this fritillary ranges through Europe (including Britain), to North Africa and Palaearctic Asia excluding tundra and desert areas, and many races have been named across this wide range (Tuzov *et al.* 2000).

Argynnis aglaja vitatha Moore, [1875] (Fig. 81a, b)
Argynnis vitatha Moore, F., *Proc. Zool. Soc. Lond.*, 1874:568.

Range: southern Pamir, Afghanistan, Karakoram.
Localities; Kargah, Muchuwar, Upper Hunza (KKH), Mintaka Pass, Kilik Pass. Early Hunza record: Evans (1927): as *Argynnis aglaia vithata* [sic].

The small subspecies *A. a. vitatha* (probably synonymous with *cannelata* Peschke, 1934), occurs in the Hunza area. The upperside black markings, in both sexes, are much smaller than in the nominate race of Europe. During our survey, *A. aglaja* was far less common than the next species, and the two were sympatric only in the Muchuwar Valley. Otherwise, *A. aglaja* was found in very occasionally in the Kargah Valley above Gilgit, along the KKH in Upper Hunza (Gojal) near Gulmit and on the approaches to the Mintaka and Kilik passes. The elevation of these sites ranged from 9000ft to 13,000ft. In the Wakhan corridor, Afghanistan, this species was common in July 2001, but the next was not recorded there.

Argynnis adippe ([Denis and Schiffermüller], 1775) (Fig. 82a, b)
P.[apilio] Adippe L. [Denis, J.N.C.M. and Schiffermüller, I.], *Ankünd. eines system. Werkes Schmetterl. Wienergegend.* 177, pl. 24, figs 14-18, pl. 25, figs 1-6, pl. 26, figs 1-6.

Range: a very widely distributed butterfly across the entire Palaearctic except the extreme north, and the southern deserts.
Localities: Naltar, Hoper, Muchuwar, Deosai Plateau.

We found this species quite commonly in several localities: the Naltar Valley above Gilgit, and in the Muchuwar and Hoper valleys. We did not encounter it in the very arid environs of Skardu, but it was common on the Deosai Plateau above the town. Its altitudinal limits were marginally greater than for the last species: 10,000ft to 14,000ft. Many subspecies have been named across the very wide range; Tuzov *et al.* (2000) list twelve, excluding races from China and Japan. They note the great variability of *A. adippe*, and suggest that geographical variation is generally clinal. The race in the Hunza region is perhaps best attached to the race *jainadeva* Moore, 1865. Roberts recorded the species from northern Chitral and from the foot of Nanga Parbat.

Polygonia interposita (Staudinger, 1881) (Fig. 86a, b)
Vanessa (Grapta) *c-album* var. *Interposita* Staudinger, O. *Stett. Ent.Zeit.*, 42:286.

Range: distributed widely in the Pamir, Alai, Altai, Tien-Shan, Karakoram and Himalaya.
Localities: Chaprot, Fakar and Minapin, Mintaka Pass approach, Deosai approach. Early Hunza record: Evans (1927): as *Vanessa egea undina* Grum-Grshimailo.

We found this species, always in small numbers, in three Hunza localities: at Chaprot (Nagar), Minapin (Nagar), and on the lower approaches to Mintaka Pass, in each instance at c.10,000-11,000ft. It was most frequent on the open hillside/thin woodland of Minapin, *en route* to the base camp of Diran. It was also recorded, rarely, on the jeep track to Deosai, above Skardu at about the same elevation. Roberts (2001) cites localities for this species (as *Polygonia egea* Cramer, 1775) as juniper forests of Baluchistan, from drier regions of Chitral and rarely in the Murree Hills; localities ranging downwards to 8000ft. The nominate race occurs in Pakistan; subspecies *undina* Grum Grshimailo, 1890 occurs in the Pamir-Alai and much of the Tien Shan. All populations of *P. interposita* show seasonal variation, the later brood being much paler than the first.

Aglais urticae (Linnaeus, 1758)
P.[apilio] N.[ymphales] Urticae Linnaeus, C., *Systema Naturae*, edit. 10, 1:477, No.114.

Range: throughout Europe and much of temperate Asia to the Pacific Ocean. Is rare in Pakistan (Roberts, 2000); known from northern Chitral, Gilgit and Baltistan.
Localities: Gilgit.

We found this very widespread species once only, at 5000ft in the town of Gilgit, while Roberts (2001) recorded it also from Chitral and Baltistan, above 8000ft. In our survey, it was thus never sympatric with its two relatives listed below. The nominate

subspecies occurs in Pakistan; other taxa have been described for populations in the far North, the Caucasus, the Baikal region and western China (Tuzov *et al.* 2000). It is likely that some Pakistan records of this species are misidentifications of the very similar *A. rizana* Moore, 1872.

Aglais caschmirensis (Kollar, 1849) (Fig. 83)
Vanessa caschmirensis Kollar, V. In: Hügel, C.F. *Kaschmir und das Himaleyagebirge* 4:442, pl. 11, figs 3, 4.

Range: widely distributed in Central Asia, including Uzbekistan, Tajikistan, Afghanistan, the Himalaya and western China.
Localities: Kargah, Naltar, Chaprot, Minapin, Muchuwar, KKH, below Mintaka and Kilik passes; Deosai Plateau.

During our visits, this species was most abundant in the Naltar Valley, north of Gilgit in July and August. We never found *A. caschmirensis* below 8000ft; it occurred in the side valleys of Kargah, Naltar, Minapin, Muchuwar and on mountain slopes at Chaprot (Nagar) at 8000-11,000ft. It was recorded along the KKH within Khunjerab National Park just beyond the entrance at Dih, at 11,500ft, also on the lower approaches to the Mintaka and Kilik passes at a similar altitude. It was uncommon on the Deosai Plateau. Roberts (2001) notes it as absent from Baluchistan, but common from Chitral eastwards. We agree with his estimate that this is the most common nymphalid in the Northern Areas.

Aglais ladakensis (Moore, 1878)
Vanessa ladakensis Moore, F., *Ann. Mag. Nat. Hist.*, 5:227-8.

Range: a close relative of the last, with as wide a distribution that includes the Kun Lun, Kirgizstan, Nepal, Tibet and Xinjiang (western China). Tsikolovets (1997) questioned its occurrence in Pakistan, and Roberts (2000) does not mention it.
Localities: Muchuwar.

We recorded this species from a few specimens collected in the remote Muchuwar Valley, where it was sympatric with *A. caschmirensis*, at 11,000ft. D'Abrera (1992) illustrates a BMNH specimen from "Karakoram" at 18,000ft.

Vanessa cardui (Linnaeus, 1758)
P.[apilio] N.[ymphales] Cardui Linnaeus, C., *Systema Naturae*, edit. 10, 1:475-6, No.107.

Range: virtually cosmopolitan, though rare in South America and present only in isolated high inter-Andean valleys, and in Venezuela (Smith *et al.*, 1994).
Localities: every locality in the Hunza region from Gilgit to Khunjerab. Early Hunza record: Evans (1927).

This is one of the earliest Hunza butterflies to be seen and one of the last on the wing: GN has observed it in February and in November. We recorded it, often commonly, at all sites visited along the Hunza Valley from Gilgit, at 5000ft, to above the Khunjerab Plateau at 16,000ft, and in each side valley. However, it was not found at the Mintaka and Kilik passes, or on the Irshad Uwin Pass, all at an altitude similar to Khunjerab, although we attribute this absence to chance rather than to an ecological restriction. Tshikolovets (1997) notes that it *"Flies across glaciers and snowland over the whole Pamir territory"*, and the same is undoubtedly true in other regions of Europe and Central Asia. Roberts (2001) suggests that it may migrate to the North in Spring; occurring in the plains during Winter, and from April to November in the Northern Areas.

Nymphalis xanthomelas ([Esper, [1781]} (Fig. 84a, b)
P.[apilio] Nymph.[alis] Xanthomelas Esper, E., *Die Schmetterlinge in Abbildungen nach det Natur mit Beschreibungen*, 1:77-81, pl. 63, fig. 4.

Range: distributed from Central and Eastern Europe through Central Asia to China and Japan.
Localities: Minapin, Muchuwar.

We found this butterfly only in the Minapin Valley (Nagar), and in the high pasture of Muchuwar. Records were made in July, at 11,000ft to 13,000ft. Roberts (2001) noted records in Pakistan from Chitral, eastwards to Murree Hills (Cumming, 1916), but between 2000ft and 9000ft and thus considerably lower than in Hunza.

Limenitis lepechini Erschoff, 1874 (Fig. 85a, b)
Limenitis Lepechini Erschoff, N., In: Fedtschenko, *Journey in Turkestan*, 2:14, pl. 1, fig. 10.

Range: Tshikolovets (2000) lists this species from Kirgizstan, Uzbekistan, Tajikistan and Afghanistan; Pakistan is also mentioned but Roberts (2000) omits it.
Localities: Kargah.

We recorded *L. lepechini* only once, at 8000ft in scrub and thin woodland in the Kargah Valley, above Gilgit, in August. This specimen is probably referable to subspecies *L. lepechini gilgitica* Tytler, 1926, described from Simla but also noted by Tytler from Chitral, Gilgit, Kaghan, Hazara and other localities in the old province of Kashmir. This race is very different from *lepechini lepechini* illustrated by Tuzov *et al.*, in which all light markings on both surfaces are greatly expanded.

DANAIDAE

Danaus chrysippus (Linnaeus 1758)
P.[apilio] D.[anaus] Chrysippus Linnaeus, C., *Systema Naturae*, edit. 10, 1:471, No. 81.

Range: this very wide-ranging species occurs in the Canary Islands, extreme southern Europe, the Middle East, and throughout the Oriental, Afrotropical and Australian regions.
Localities: Gilgit.

On the route north from Islamabad *D. chrysippus* was seen regularly, seldom in large numbers, and it became rare (as did all butterflies) in the extremely arid terrain beyond Chilas and Nanga Parbat. It was not recorded from any Hunza localities, and its presence on this list rests on a few specimens seen nectaring in a hotel garden in Gilgit, at 5000ft. Although this may seem an extreme northern record for Pakistan, *D. chrysippus* penetrates much further north elsewhere in Central Asia: Tshikolovets (2000) cites several records from Uzbekistan, all recent, and mentions that these are distributed generally except in high mountains. However, Tshikolovets (1997) does not include it in the body of the work for Pamir, citing only a mention in Tuzov *et al.* (1993) as a vagrant in Central Asia. Roberts (2001) regards it as *"Without doubt the most widespread and commonest butterfly in Pakistan, found throughout the plains and lower foothill areas, being much better adapted to dry areas than any of the other Danainae. . ."* Records from lower Swat and Chitral are regarded as stragglers.

LYCAENIDAE

Lampides boeticus (Linnaeus, 1767)
P.[apilio] P.[lebejus] Boeticus Linnaeus, C. *Systema Naturae*, edit.12, 789, No. 126.

Range: almost cosmopolitan, absent only from the Americas; very

widely distributed from southern Europe and an occasional vagrant as far north as Britain; the Atlantic Islands and Africa, the Middle East, the Indian Subcontinent and elsewhere in southern Asia, and a large area of Australia. A recent record from Martinique (Vincens, 2001) is the first for the New World. It occurs in Afghanistan (Sakai, 1891); it is not listed for the Pamir (Tshikolovets, 1997) but for Ukbekistan, Tshikolovets (2000) records it as *"everywhere except high mountains and sandy deserts."*
Localities: Kargah; Murtazabad, Aliabad.

While this is by no means a high altitude butterfly in Hunza, it was not found below 6000ft, and extended to 8000ft. In July 1998 many males were seen in exclusive puddling assemblies with males of *Papilio machaon* along the lower Kargah Valley track above Gilgit, the day after an unseasonably heavy rain. This was the only instance of extensive butterfly puddling behavior observed during our visits to Hunza. Elsewhere in Hunza, *L. boeticus* was recorded occasionally at Murtazabad and Aliabad, middle Hunza. Roberts (2001) records it only from low altitude localities: southern Sind, Baluchistan, Punjab and the Murree Hills.

Zizeeria karsandra (Moore, 1865) (Fig. 116)
Polyommatus karsandra Moore, F., *Proc. Zool. Soc. Lond.*, 1865:505, pl. 31, fig. 7.

Range: widely ranging, from the Near East across the Oriental region to the Philippines. This species and the next contribute to the limited Oriental component of the Hunza butterfly fauna.
Localities: Gilgit, Kargah, Nomal, Joglot, lower Hunza Valley.

Omitted by Roberts (2001) from the Pakistan list, this butterfly was very common on cultivated lawns in Gilgit, at the foot of the Kargah Valley near the spectacular cliff-side Buddha where it flew with the next species, in the lower approches to the Naltar Valley, and in heavily irrigated settlements along the KKH, notably at Joglot (Gilgit). In these localities, its altitudinal limit was about 6000ft. It flies very weakly, and is especially common early in the morning and before sundown, not flying in the heat of the day.

Pseudozizeeria maha (Kollar, [1844]) (Fig. 117a, b)
Lycaena Maha Kollar, V., In: Hügel, F.C., *Kaschmir und das Himalayagebirge*, 422.

Range: an Oriental species, ranging to southern India and China.
Localities: Gilgit, Kargah, Nomal, Joglot, lower Hunza Valley.

This "grass blue" flew with *Zizeeria karsandra* on cultivated grasses in Gilgit, at the foot of the Kargah Valley, but extended further along the main Hunza Valley to an altitude of 8000ft, near Gulmit in Gojal (Upper Hunza). It was generally less abundant than *Z. karsandra*, but flight behavior and habitat preference of the two were identical. Roberts (2001) regarded it as a butterfly of the foothills: outside Hunza, Pakstan localities include Hazara, Rawalpindi, Peshawar and the Khyber Pass, and the Murree Hills. It is apparently more common in lower Chitral, to 9000ft, but in Baluchistan reportedly only as a straggler.

Celastrina kollari (Westwood, 1852)
Lycaena kollari In: Doubleday, E. and Westwood, J.O., *The Genera of diurnal Lepidoptera*, 3:491.

Range: northeast Afghanistan, from Chitral eastwards to Kumaon.
Localities: Kargah.

This lycaenid and the next are regarded by Eliot and Kawazoé (1983) as subspecies of *Celastrina argiolus*. *C. kollari* was collected on several occasions in the Kargah Valley above Gilgit, beside water channels from the valley entrance (5000ft) to the central region at about 7000ft, in July and August. It was always scarce, recorded from single specimens.

Celastrina huegelii (Moore, 1882)
Cyaniris huegelii Moore, F., *Proc. Zool. Soc. Lond.*, 1882:244.

Range: Eliot and Kawazoé (1983) list the nominate subspecies as extending from the Karakoram and the Himalaya to Naini Tal, and *C. huegelii oreoides* Evans, 1925 in the eastern Himalaya and Nepal.
Localities: Naltar, Murtazabad, Sost.

This species was recorded from the Naltar Valley, in very wet pasture at 7500ft. It was found occasionally in Murtazabad (Middle Hunza) at the same altitude, and on grassy open land at Sost, the last village in Hunza, at 10,000ft.

Pseudophilotes vicrama cashmirensis (Moore, 1874) (Fig. 91a,b)
Scolitanides cashmirensis Moore, F., *Proc. Zool. Soc. Lond.*, 1874:272.

Range: this species ranges from southern Central and Eastern Europe to temperate and subtropical areas of Eastern and Central Asia.
Localities: Kargah, Naltar, Chaprot, Gulmit-Nagar, Hoper.

The nominate subspecies is present through the western part of the range. The eastern subspecies, *P. vicrama cashmirensis* Moore, 1874 was described from "N.E. Cashmere"; it is very local in the Tajik Pamir (Tshikolovets, 1997) and is the race present in Pakistan. In our experience, this distinctive lycaenid was scarce to occasionally common in several Hunza localities, but only between 7000ft and 9000ft, considerably lower than Roberts' data and the Pamir altitudinal range of 11,500-12,500ft. It occurred sparingly in the Kargah Valley above Gilgit, in the Naltar Valley, on the mountainside at Chaprot, and more commonly near Gulmit-Nagar in lower Hunza and on mountain slopes above Hoper. Most localities were vegetated; the Gulmit-Nagar site was an arid slope with little vegetation other than occasional plants of *Perovskia abrotanoides*. A third subspecies, *P. vicrama astabene* Hemming, 1932 is described as "ubiquitous, except in high mountains and sandy deserta" in Uzbekistan (Tshikolovets, 2000). Roberts (2001) regarded it as a ". . . very high elevation species, and very widespread in the dryer northern Himalayan regions" at 6000ft to 14,000ft, from Chitral, Punial (Gilgit Agency), rarely in the juniper forests ar Ziarat (Baluchistan) and in Baltistan.

Everes indica Evans, 1932 (Fig. 118)
Everes indica Evans, W.H., *Identification of Indian Butterflies*, edit. 2, 219.

Range: other than in Pakistan, the northern range of this Oriental species extends to the northwest Himalaya and Afghanistan.
Localities: Gilgit, Kargah, lower Hunza Valley.

In the Hunza area, it is common in and around Gilgit, as at the foot of the Kargah Valley at 5000ft, in grassy, flowery and well irrigated sites. There, it flies with *Zizeeria karsandra* and *Pseudozizeeria maha*. Along the KKH it occurs sporadically to about 7500ft near Aliabad, only in similarly wet localities, flying weakly, above vegetation, resting and nectaring often.

Cupido buddhista (Alphéraky, 1881)
[Lycaena] Buddhista Alphéraky, S.N., *Horae Soc. Ent. Ross.*, 16:393, pl. 14, figs 9, 10.

Range: Tshikolovets (2000) lists the nominate race, described from the district of Kulja (then Russian territory, now in Xinjiang Province, China), as distributed through each of the Southern Republics; in Uzbekistan widespread in mountain meadows of the Alai Mountains, the Uzbek Turkistan, and the Tien Shan.

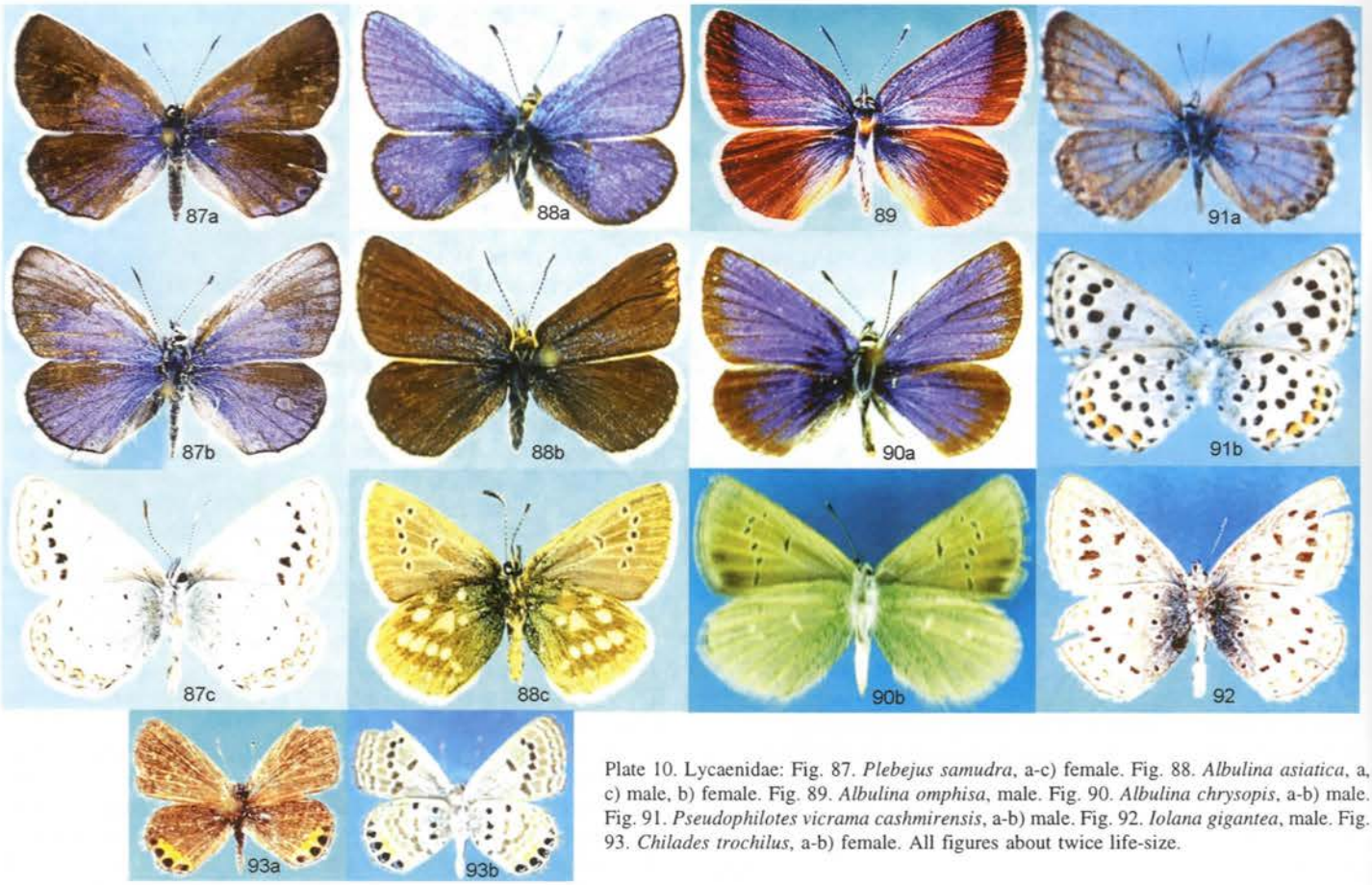


Plate 10. Lycaenidae: Fig. 87. *Plebejus samudra*, a-c) female. Fig. 88. *Albulina asiatica*, a, c) male, b) female. Fig. 89. *Albulina omphisa*, male. Fig. 90. *Albulina chrysopis*, a-b) male. Fig. 91. *Pseudophilotes vicrama cashmirensis*, a-b) male. Fig. 92. *Iolana gigantea*, male. Fig. 93. *Chilades trochilus*, a-b) female. All figures about twice life-size.

Localities: Minapin, Muchuwar.

Roberts (2001) reported it as rare in Pakistan, known only from the Shandur region of Chitral. *Cupido buddhista* was indeed rarely encountered during our survey: at Minapin and in the Muchuwar Valley, from 8000ft to 12,000ft; in both localities found nectaring in grassy mountain slopes.

Iolana gigantea (Grum-Grshimailo, 1885) (Fig. 92)
Lycaena Gigantea Grum-Grshimailo, G., In: Romanov, *Mémoires sur les Lépidoptères*, 2:215.

Range: Tshikolovets (2000) gives the distribution of the nominate race as Kirgizstan, Tajikistan, Afghanistan and Pakistan.
Localities: approach to Minapin.

We recorded it only twice, in July 1995 and 1998, in arid terrain at 8000ft on the track to Minapin, on the Nagar side of the Hunza Valley. Roberts (2001) reports this species for Pakistan only from extreme northern Chitral and Gilgit District, but without locality data, and Tshikolovets (2000) provides numerous records for Uzbekistan, from dry rocky slopes and scree, at the relatively low altitude of 3300ft to 6600ft. Subspecies *I. gigantea gilgitica* Tytler, 1926 was described from the Yasin Valley, to the west of Hunza. This taxon differs little from nominate *I. gigantea*, and is of doubtful value.

Chilades trochilus (Freyer, [1845]) (Fig. 93a, b)
Lycaena Pap. Trochilus, Freyer, C.F., *Neuere Beitr. Schmett.*, 5(74):98, pl. 440, fig. 1.

Range: this lycaenid is distributed from Greece, Turkey, North Africa, through subtropical and tropical Asia. It is not mentioned from the Pamir (Tshikolovets, 1997) but is widely distributed in Uzbekistan *"except in high mountains and sandy deserts"* (Tshikolovets, 2000).
Localities: Naltar.

Chilades trochilus is surely in the running to qualify as the World's smallest butterfly. We found it once in Kohistan, at 2500ft, along the KKH en route for Gilgit, flying feebly around ferns in the spray of a roadside glacial run-off. We did not record it from Hunza, but a single specimen was collected in Naltar Valley, at 9000ft. Roberts (2001) cited it as widespread in Pakistan; in Sind, mainly near the coast and always in grassland, occasionally seen in North West Frontier Province including the Khyber Pass; in Baluchistan, a few localities in Punjab and one in Chitral.

Plebejus samudra (Moore, 1874) (Fig. 87a, b, c)
Polyommatus samudra Moore, F., *Proc. Zool. Soc. Lond.*, 1874:574, pl. 67, fig. 2.

Range: Pamir, Karakoram, northern India, Xinjiang (western China).
Localities: many sites from above Gilgit to Sost, Misgar, Chipursun.

In the Hunza area, the distribution of this butterfy parallels precisely that of the labiate plant *Perovskia abrotanoides*. We found neither below Gilgit at 5000ft, then as the KKH ascends, the plant becomes more common, as does the lycaenid. This butterfly was the most consistently present in localities along the KKH from just beyond Gilgit (6000ft) to Sost (10,000ft): it occurred in the Kargah and Naltar valleys, Chaprot (Nagar), Minapin, Muchuwar Valley, Hoper, and at many sites along the KKH. On the dry hillsides from Gulmit to the area below the terminal moraine of the Pasu glacier in Gojal (Upper Hunza), *Perovskia* is the dominant plant, and *P. samudra* abounds, nectaring on the flowers. Oviposition was not

seen, but it seems very certain that this plant is here used as larval host, although *Hippophae* is used by populations in Tajikistan (Tuzov *et al.*, 2000). It occured at Sost (10,000ft), but no specimens of *Perovskia* were noted more than a mile further along the KKH, and this limit marked the limit of occurrence of *P. samudra*. It was common at Misgar (July, 1999) but this village is at the same altitude as Sost. The highest altitude we recorded was 10,500ft, at Ziarat in Chipursun Valley, west of Sost: an extremely arid terrain but with occasional plants of *Perovskia*. In our experience, this precision in ecological integration between a butterfly and a plant is very unusual for this region.

Plebejus samudra affords a further aspect of interest: males are similar across the range, with unmarked blue UPS, but the female UPS is dark brown/black with a variable blue flush. The amount of blue varies clinally along the Hunza Valley: in specimens from lower altitude localities, this is limited to the FW/HW wing bases (Fig. 87a) while at higher altitude, blue scaling extends over much of the FW and HW (Fig. 87b).

Agriades jaloka (Moore, 1875) (Fig. 94a-f)
Polyommatus jaloka Moore, F., *Proc. Zool. Soc. Lond.*, 1874:573-4, pl. 66, fig. 3.

Range: from Baltistan to eastern Kashmir.
Localities: Deosai Plateau.

We did not find this small lycaenid in the Hunza area; within Pakistan, its center of abundance is the Deosai Plateau, at 13,500ft to 14,000ft, where on each of our visits it was the most common butterfly. It was totally and strikingly limited to the plateau and not seen even a short distance along the downward track, though other plateau species including *Lycaena kasyapa* and *Lycaena aditya* extended some distance further down. Roberts (2001) regarded it as a high altitude species, from 12,000ft to nearly 17,000ft on Chogo Lungma, in the Rupal Valley, Astor, and rarely in Chitral.

Agriades pheretiades (Eversmann, 1843)
Lycaena pheretiades Eversmann, E., *Bull. Soc. Imp. Nat. Moscou*, 16:536, pl. 7, figs 3a, 3b.

Range: Tien-Shan, Pamir, Hindu-Kush, Himalaya.
Localities: [Upper Hunza Valley].

This species is widely distributed at high altitude regions of Central Asian mountains, including scattered colonies that have been described as geographical races, some regarded as semispecies of the *pheretiades* superspecies concept (cf. Tshikolovets, 1997). Bálint and Johnson placed this species in the *pyrenaicus*-group of *Agriades*. The group requires a taxonomic revision.

We did not find this species during our survey, but in July/August 1999 we were shown specimens collected illegally in Khunjerab National Park by two French nationals. We were not told the collecting locality, but this was probably below the level of the Chapchingal Valley, at 13,200ft. We have no information on the disposition of these specimens. It was also recorded by Verhulst (1999), but again no precise locality data were given other than "Khunjerab Pass". Another butterfly recorded with the same qualification is the riodinid *Polycaena tamerlana* (see below). Roberts (2001) lists *P. pheretiades* as rare in Chitral but more common in Swat and Kohistan, also in Chilas and Astor.

Albulina asiatica (Elwes, 1882) (Fig. 88a-c)
Lycaena pheretes var. *asiatica* Elwes, H.J., *Proc. Zool. Soc. Lond.*, 1882: 404.

Range: Karakoram, Himalaya and other high mountains of Central Asia.
Localities: Khunjerab, Mintaka Pass, Lup Jangal and Kilik Pass, Irshad Uwin Pass, below Dilsun Pass.

This species was described as a local variation of the transpalaearctic oreo-tundral *Papilio pheretes* Hoffmansegg, 1804: a junior subjective synonym of *Papilio orbitulus* de Prunner, 1785 (TL: Piedmont, North Italy). A similar phenotype occurs at high latitudes in Europe (Lapland) and is probably a sibling species of *orbitulus*. The geographical form *asiatica* was described from Chumbi, upper Sikkim, and differs from *A. orbitulus* in many respects, and the two are clearly not conspecific (Huang, 2001). It has been regarded as a subspecies of *Polyommatus lehanus* Moore, 1878 TL: Leh, Ladakh, by Bridges 1994); both nominal taxa fall within the difficult and nomenclaturally elusive *orbitulus* group of *Albulina* (cf. Bálint and Johnson, 1997; Huang, 2001). Knowing the types of both *asiatica* and *lehanus*, we have applied the Elwesian name since our material matches *asiatica*. However, taxonomic revision is necessary to define all available names and to restrict their application.

In the past, this butterfly has been scarcely known from Pakistan, Roberts citing it only from northern Chitral at over 12,000ft. Rather, it is an important member of the exclusively high altitude assemblage of species along the borders between Pakistan, China and Afghanistan. On the Khunjerab Plateau (15,500ft), it is at times the most abundant butterfly during the brief period when nectar sources are plentiful. Then, it is even more abundant further up the mountain slopes rising from the plateau (Fig. 16), at least to 16,000ft, but absent from the zone above obvious vegetation (see *Parnassius actius* and *P. simo*). In windy conditions, all too common on the plateau, only males are seen on the wing; when disturbed, females crawl down into the ground cover or between stones. In calm conditions, both sexes are equally active. The lowest altitude at which it was found at Khunjerab was 15,000ft, on the edge of the plateau: it was never seen even on vegetated patches in the Chapchingal Valley at 13,500ft.

It was found, but in far smaller numbers, on the Mintaka and Kilik passes to China, and on the Pakistan-Afghan border at Irshad Uwin Pass and, rarely, below Dilsun Pass — all at *c.*16,000ft. Surprisingly, it was found commonly at the small grassy enclave of *"Lup Jangal"*, perhaps 50 acres in extent, on the track beyond Misgar before the routes to the Mintaka and Kilik passes diverge at Murkushi. This natural oasis lies in almost vegetation-free desert terrain, and has probably been used for two millennia as a camping ground for travellers and caravans, from the time of early Silk Route. At Lup Jangal, *Albulina asiaticus* flew with *Plebejus sarta* and *Argynnis aglaja*. The site is at 11,500ft altitude; the species was not recorded at subsequent oases *en route* to the top of Kilik Pass.

Albulina galathea (Blanchard, 1844)
Lycaena galathea Blanchard, C.E., In: Jacquemont, *Voy. Ind.* 4(Zool):21, pl. 1, figs 5, 6.

Range: apparently restricted to the Karakoram and northern India.
Localities: above Minapin.

This species was described from Kashmir, and is a member of a group of polyommatine lycaenids endemic to the Himalaya and other high mountains of Central Asia. This group has been distinguished as the genus *Pamiria* (Zhdanko, 1995) or the *galathea*-group of *Albulina* (Bálint and Johnson, 1997) characterized by a metallic green HW underside with restricted markings. *A. galathea* is quite widespread in the western Himalaya/Karakoram. Populations in Chitral were named *chitralica* by Evans (1925), but the type material does not differ from topotypical *galathea* and we consider *chitralica* as a synonym.

We encountered this lycaenid only once, on an exposed mountainside between Minapin and below the Diran base camp, at

Plate 11. Lycaenidae: Fig. 94. *Agriades jaloka*, a-c) male, d-f), female. Fig. 95. *Aricia astorica*, male. Fig. 96. *Polyommatus icarus*, male. Fig. 97. *Polyommatus icadius*, male. Fig. 98. *Polyommatus ariana*, a-g) male, h) female (a, Hoper; b, Deosai; c, Ladak 12,000ft (BMNH coll.); d, Ladakh 7500ft (BMNH coll.); e-f, Goorais Valley (BMNH coll.); g-h Hunza Valley. Fig. 99. *Polyommatus stoliczkana*, a-b) female. Fig. 100. *Polyommatus erigone*, male. Fig. 101. *Plebejus bellona*, a-b) male. Fig. 102. *Polyommatus hunza*, a-b) female. Fig. 103. *Polyommatus pulchella*, a-b) male. Fig. 104. *Aricia agestis*, female. Fig. 105. *Aricia eumedon*, a-b) male. All figures about twice life-size.

12,000ft, in August 1997. These insects were very worn.

Albulina chrysopis (Grum-Grshimailo, 1888) (Fig. 90a, b)
Lycaena chrysopis Grum-Grshimailo, G., *Horae Soc. Ent. Ross.* 25:306.

Range: this species is widely distributed from the Karakoram, the Hindu Kush, Tajik Pamir, the Kun Lun, Ladakh, northern India and western China.
Localities: Naltar, Fakar Peak, above Sost, approach to Irshad Uwin Pass, Deosai Plateau. Early Hunza record: Evans (1927): as *Lycaena metallica* Hübner.

This species was described from 'Beik' in extreme western Sinkiang (Xinjiang), near the boundary between Wakhan (Afghanistan) and China. A population from Gilgit was named *gilgitica* by Tytler (1926) and Afghan specimens were misidentified as *"Albulina metallica chitralensis* Tytler" by Sakai (1981). The type material of Tytler's *gilgitica* was examined and the taxon was synonymized with *chrysopis* (Bálint, 1999; Tshikolovets, 1997). The taxon *chitralensis* Tytler, 1926 represents a distinct species (Bálint, in preparation).

Albulina chrysopis is newly recorded from the Hunza region, where it is a distinctly high altitude butterfly. Our lowest altitude records were from upper Naltar, near Naltar Lakes, at 10,000ft. Beyond Sost it occurred near glacial water run-offs with ferns and flowering vegetation at 11,000ft, and it was recorded from the approach to Ishad Uwin Pass on the Wakhan (Afghanistan) border at 15,000ft. It occurred commonly at the same altitude below Dilsun Pass at the eastern limit of the Wakhan (Afghanistan)-Pakistan border. It was also found on the Deosai Plateau, Baltistan, at 13,500-14,000ft. Roberts (2001) mentions previous records from upper Chitral: Baroghil Pass and Shandur. Most populations, including those in Pakistan, represent the nominate race; subspecies *artenita* Fruhstorfer, 1916, was described from Pamir.

Albulina omphisa (Moore, 1874) (Fig. 89)
Polyommatus omphisa Moore, F., *Proc. Zool. Soc. Lond.*, 1874[1875]:573, pl. 66, fig. 5.

Range: the distribution of this species centers on the southern Hindu Kush and the Karakoram.
Localities: Naltar, Chaprot, Minapin, Hoper.

This species was described from Ladakh. The male represents an unusual upperside phenotype with a very wide black border and basal purple-blue suffusion; in *A. chrysopis* the male upperside is uniformly duller blue. In both species the female is generally brown above. A sibling species has very recently been discovered in Afghanistan (Bálint, in preparation).

In Hunza, this species occupies a much lower altitudinal niche than *A. chrysopis*. We recorded it in the Naltar Valley, in the mountainside pasture of Chaprot, in the Minapin and Hoper valleys; a range of between 6000ft and 10,000ft. It was not recorded from the Deosai Plain, Baltistan, or from the track leading from Skardu to this plateau. It is not mentioned by Roberts (2000).

Aricia agestis ([Denis & Schiffermüller], 1775) (Fig. 104)
P.[apilio] Agestis Denis, M. & Schiffermüller, I., *Syst. Werke Schmett. Wienergegend:* 184.

Range: widely distributed in the western Palaearctic.
Localities: Kargah, Naltar, Hoper.

This insect, with its semispecies sister taxa *A. cramera* Escholtz, 1821, and *A. calida* Bellier, 1862, is restricted to the western Palaearctic region, achieving two or three generations in steppe-like or Mediterranean scrub habitats with a hot, dry summer climate and relatively low rainfall. In addition, it readily colonizes degraded ubiquitous habitats created by human activity, including suburban and agricultural areas. Its sister taxon, the *artaxerxes* superspecies, represents a different ecotype, with a single generation per annum and occurring in isolated populations throughout the Old World from Atlantic to Pacific, generally distinguished as geographical subspecies or semispecies. In Europe, *A. artaxerxes* is a good indicator of undisturbed habitat.

A. agestis varies clinally, individuals from lower latitudes tending to have more vivid submarginal orange markings, and some lepidopterists fail to distinguish taxonomically the southern taxa of the *agestis* group. In the last century, many geographical subspecies of *agestis* were described, but these are scarcely recognizable due to the breakdown of isolation between Continental populations and the very wide ecological tolerance of this species.

The small lycaenid *Polyommatus nazira* Moore, 1865, described from Kunawur was considered to be a junior synonym of *agestis* (Bridges, 1994), and indeed its lectotype is indistinguishable from Central European populations of *agestis* (Bálint, 1999). This insect was found in a few Hunza localities, always sparsely. It occurred in the Kargah and Naltar valleys in flowery pasture to 9000ft, and on a grass-covered mountainside above Hoper (Nagar) at a similar elevation. The distinct Pamirian *P. (artaxerxes) transalaica* Obratsov, 1935, a member of the *artaxerxes* complex, was found in the Wakhan (Afghanistan) in July 2001 (see Afghan Records below).

Aricia eumedon (Esper, [1780]) (Fig. 105a-e, 106))
P. Pl. Urb. Eumedon. Esper, E., *Schmett. Abb. Nat.*, 1:16, pl. 52, figs 2, 3.

Range: across much of Europe and temperate Asia, from Atlantic to Pacific.

Aricia eumedon sarykola (Sheljuzko, 1914) (Fig. 105a, b; 106)
Lycaena eumedon sarykola Sheljuzhko, L., *Deutsche Ent. Zeit. Iris*, 28:21.

Range: Pamir; eastern Hindu Kush; Afghanistan; northern Pakistan; western China.
Localities: [Wakhan], Kargah, Minapin, Hoper.

Aricia eumedon occurs throughout much of the Old World and at lower altitudes in Europe forms two distinct ecotypes: a widely distributed hygrophilous form inhabiting biotopes with high vegetation along watercourses and a xeromontane form inhabiting low steppe biotopes. An example of the latter is the poorly known and endangered subspecies *A. e. mayencis* Eitschberger & Setiniger, 1975. The hygrophilous ecotype is known from Siberia, Mongolia and Korea, and most probably some high altitude Asian populations belong to the second group (cf. *mylitta* Hemming, 1930) though this is still an open question.

Tshikolovets (1997) distinguishes *A. eumedon sarykola* and *A. eumedon* spp. indicating an easterly distribution for the former, and a westerly distribution of the latter in Pamir. He also figured these taxa, which basically represent the same *eumedon* phenotypes. However, in addition to *A. e. sarykola* which we recorded only in Wakhan, Afghanistan, we obtained a series of about 10 specimens from Hunza (Fig. 105b-e). In most of these, post-discal spots are extremely reduced or absent, while the white medial streak is prominent against the dark grey underside ground coloration. This phenotype possesses characters used to signify individual forms of *A. eumedon*, such as *privata* Staudinger, *speyeri* Husz and *vittata* Oberthür. More material and associated field study is needed to clarify the true taxonomic status of this curious phenotype.

The "Hunza phenotype" was recorded from the faunistically rich Kargah Valley, at Minapin and was the second *Aricia* from the generally depauperate butterfly fauna of Hoper. Most records span

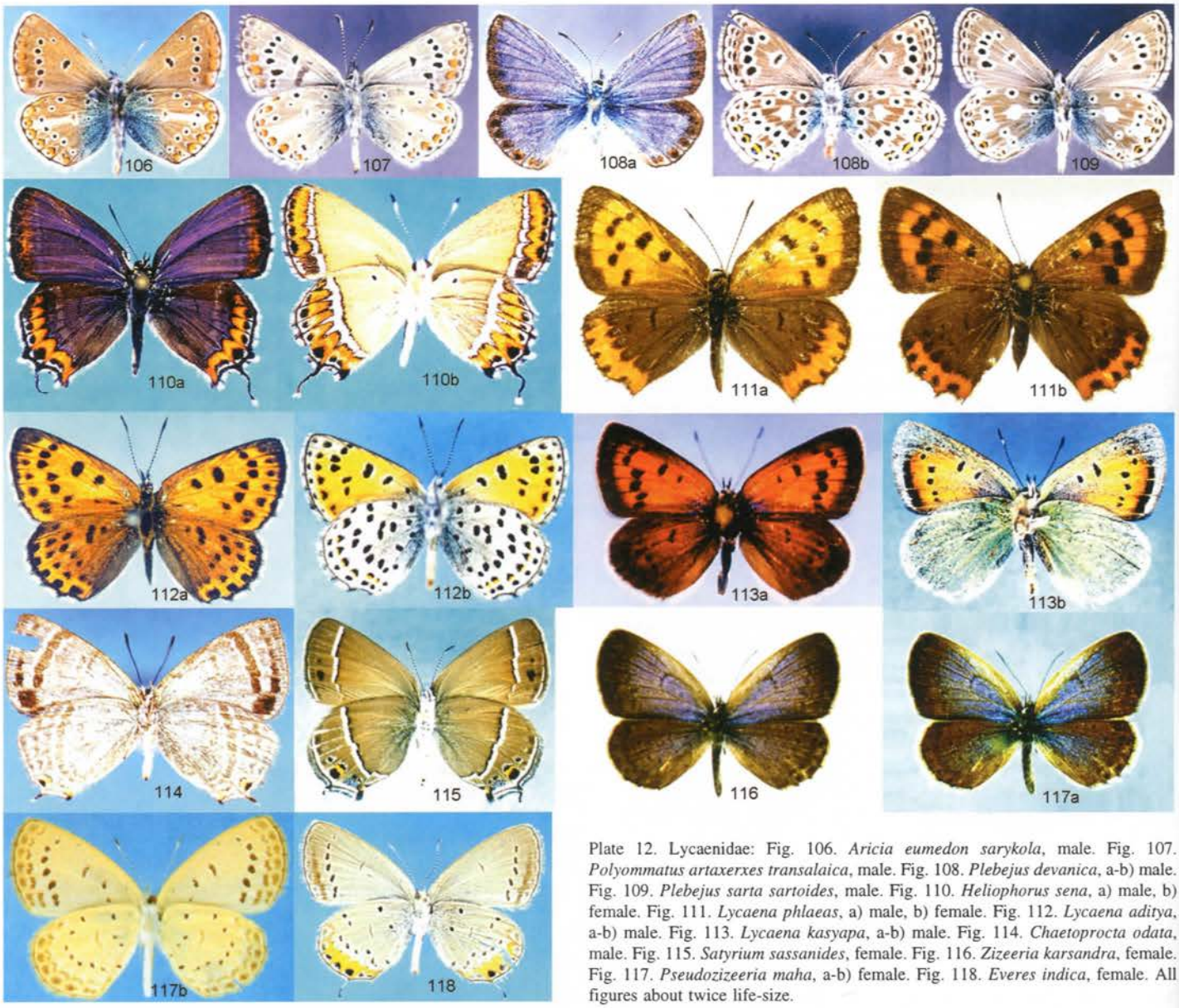


Plate 12. Lycaenidae: Fig. 106. *Aricia eumedon sarykola*, male. Fig. 107. *Polyommatus artaxerxes transalaica*, male. Fig. 108. *Plebejus devanica*, a-b) male. Fig. 109. *Plebejus sarta sartoides*, male. Fig. 110. *Heliophorus sena*, a) male, b) female. Fig. 111. *Lycaena phlaeas*, a) male, b) female. Fig. 112. *Lycaena aditya*, a-b) male. Fig. 113. *Lycaena kasyapa*, a-b) male. Fig. 114. *Chaetoprocta odata*, male. Fig. 115. *Satyrium sassanides*, female. Fig. 116. *Zizeeria karsandra*, female. Fig. 117. *Pseudozizeeria maha*, a-b) female. Fig. 118. *Everes indica*, female. All figures about twice life-size.

an altitudinal range of 7000ft to 10,000ft and it was most common at 13,000ft on Fakar Peak (Fig. 4).. Recorded by Roberts (2001) from the dry valleys of Chitral through Yasin, a valley paralling Hunza to the West, and at Babusar Pass, Chilas (also see Afghan Records below).

Aricia astorica (Evans, 1925) (Fig. 95)
Lycaena astorica Evans, W.H., *J. Bombay Nat. Hist. Soc.*, 30:346.

Range: apparently restricted to Pakistan.
Localities: Kargah, Muchuwar.

This species was described from specimens from Astor, a valley south of Hunza, and has been placed either in the genus *Polyommatus* (Bridges, 1994) or *Aricia* (Bálint and Johnson, 1997). In fact, both placements are erroneous (Bálint, in preparation), but since systematic investigations are beyond the scope of the present paper, we follow the current placement of this taxon.

This strikingly marked lycaenid was most regularly recorded at Kargah, above Gilgit, on each of four visits to the valley. *A. astorica* was never common, generally flying swiftly around low bushes, and found only from 8000ft to the top of the narrow valley where the terrain opens onto a flat, wet plain at 10,000ft. The only other locality for this species during our field work was the steep mountainside of the Muchuwar Valley at 13,000ft, although Verhulst (1999) found it in the Hoper Valley. Though we did not record it from the Deosai Plateau, Roberts (2001) cites it without locality information from the vast area of "Baltistan", also from mainly southern localities in Gilgit Agency: Nanga Parbat, Astor and Rupal, but not known from Chitral. He gives an altitude range of 8000ft to 10,000ft, but sites in Baltistan may well match or exceed the elevation of the Muchuwar records.

Plebejus devanica Moore, [1875] (Fig. 108a, b)
Polyommatus devanica Moore, F., *Proc. Zool. Soc. Lond.*, 1874:573, pl. 66, fig. 4.

Range: Karakoram to Ladakh.
Localities: Kargah, Naltar.

This species was described from Ladakh, and was found at low altitude in Hunza, in two valleys near Gilgit between 8000ft and

10,000ft, in open scrub/thin woodland. We are of the opinion that *P. devanica* is closer to *P. bellona* than to *Plebejus sarta,* Alphéraky, 1887. Our specimens are identical to the lectotype (BMNH 264584). The taxon *Polyommatus sarta rupala* was described from "Rupal, Astor" by Tytler (1926). The lectotype of *rupala* (BMNH 264591) cannot be distinguished from *P. devanica* and thus we consider *devanica* and *rupala* as synonyms. Accordingly, the original combination of *rupala* was incorrect because *P. sarta* is not conspecific with *P. devanica.*

P. devanica was placed either in *Polyommatus* (Tshikolovets, 1997) or *Alpherakya* (Zhdanko, 1994) (and see Tuzov *et al.,* 2000). We consider *P. devanica* and its close relatives, the *devanica*-species group (*sensu* Bálint and Johnson, 1997) as a species group of *Plebejus* from genitalic and wing pattern characters. The *devanica* species group is equivalent to the genus *Alpherakya.*

The taxon *Lycaena devanica gracilis* Evans, 1912 turned out to be a secondary homonym of *Lycaena gracilis* Miskin, 1890 and therefore Tshikolovets (1997) renamed the taxon as *Polyommatus devanica evansii.* However, this new name was in turn also a secondary homonym of *Polyommatus (Agrodiaetus) evansi* Forster, 1956, and the taxon was renamed *Plebejus devanica tshikolovetsi* by Bálint and Johnson (1997). However, all these nomenclatural machinations were unnecessary since, in our view, *Lycaena bellona* takes priority as the types of *gracilis* and *bellona* are indistinguishable. This conclusion is also supported by long series from Pakistan and Afghanistan at our disposal.

Plebejus bellona (Grum-Grshimailo, 1888) (Fig. 101a, b)
Lycaena bellona Grum-Grshimailo, G., *Horae Soc. Ent.,* 22:306.

Range: Pamir, Hindu Kush, Karakoram; Deosai Plateau.
Localities: Hoper, Tharbai/Kalent, Khunjerab National Park, Chapchingal, Mintaka, Kilik and Irshad Uwin passes.

This species was described from two male specimens from the Pamir localities of "Roschan" and "Koudara" and the lectotype was subsequently designated (Bálint, 1999:19). We regard *bellona* as a taxon distinct from *P. devanica* wich was considered to be conspecific with it as listed in the combination *Polyommatus devanica bellona* by Tshikolovets (1997). *P. bellona* was recorded from Afghanistan as *Polyommatus devanica kohibabaensis* by Sakai (1987) but comparison of type material leads us to synonymize the two taxa. *Plebejus devanica,* described from Ladakh, is in the male dorsally dark ink-blue in color with a very wide marginal border, and with quantitatively distinct genitalia.

This butterfly was generally rare, though found in numerous localities. It was found at 11,000ft above the generally impoverished Hoper Valley (Nagar) flying with *P. icarus*, on the steeply sloping mountainside pasture at Tharbai/Kalent above Sost (12,000ft) and near the KKH within the Park, again at 12,000ft. At this last site in July 1998, large numbers of males were found puddling on mud flats (Fig. 11) bordering the Khunjerab river, in *Salix* stands. No other species was present. *P. bellona* was sympatric with *P. erigone* on rock and scree slopes above the floor of the Chapchingal Valley (Fig. 13). It occurred near the highest regions of the Kilik and Mintaka passes and was sympatric with *P. pulchella* near the summit of the Irshad Uwin Pass, and was found across the border there in July 2001 (see Afghan Records below). Roberts (2001) notes what is probably this butterfly as rare and local in the far north of Chitral, from Yasin, a valley west of Hunza.

We have material from the Kargah Valley above Gilgit (Fig. 9) which seems to be identical with specimens obtained in 1994 during a Hungarian Museum of Natural History visit to Deosai. These are larger and darker than *P. bellona* elsewhere, and may well prove to be subspecifically distinct.

Plebejus sarta (Alphéraky, 1881)
Polyommatus sarta Alphéraky, S.N., *Horae Soc. Ent. Ross.,* 16:387, pl. 16, fig. 8.

Range: a very widely ranging species from the Tien Shan, Altai. Pamir-Alai, Hindu Kush, the southern Republics, Afghanistan and northern Pakistan

Plebejus sarta sartoides (Swinhoe, 1910) (Fig. 109)
Polyommatus sartoides Swinhoe, C., In: Moore, F. and Swinhoe, C., *Lepidoptera Indica,* 8:21, pl. 654, fig. 1.

Range: Pamir, Karakoram, Afghanistan.
Localities: Kargah, approach to Kilik Pass, Deosai Plateau.

This distinctively marked subspecies was described from Chitral and was also recorded from the Pamir as *Polyommatus sarta sartoides* by Tshikolovets, 1997). However, Tuzov *et al.* (2000) considered *sartoides* as a separate species. Our specimens are identical with those illustrated from the Pamir. In the Hunza region we found this insect only in the Kargah Valley above Gilgit, at 10,000ft, flying with *Aricia astorica,* and at the isolated oasis of Lup Jangal (Map 3) just before the trails to Mintaka and Kilik passes diverge near Murkushi. It was also recorded in July 2001 across the Irshad Uwin Pass in the Wakhan Pamir (see Afghan Records). Roberts (2001) lists an unidentified race of *P. sarta* as widespread at high elevation in Chitral, including the Baroghil Pass and Shandur Plateau, from Yasin, west of Hunza and from Astor.

The specimens from Kargah seem to be identical to those obtained in 1994 during a Hungarian Museum of Natural History visit to Deosai. These are larger and darker than *P. sarta* elsewhere and may well prove to be subspecifically distinct.

Polyommatus icarus (Rottemburg, 1775) (Fig. 96)
Papilio icarus Rottemburg, S.A., *Anmerk. Hufnagelischen Tab. Schmett. I. Abt. Tagevögel. Naturforscher* (Halle), 6:21.

Range: across the Palaearctic region.
Localities: Naltar, Hoper.

That this is one of the most widespread polyommatines in the western Palaearctic region at present is a reflection of its wide ecological tolerance. It has penetrated a great variety of habitats in Europe, but in natural or less disturbed ecosystems this species is not common, or even absent.

Several subspecies have been described, centering on certain geographical regions. One of the most striking is *P. i. turanica* Heyne, 1895 with a tendency toward tannish color and an almost patternless white underside. The exposure of many regions to two millennia of human influence has often broken down former isolating mechanisms, permitting gene flow. As a result, even amongst populations with *turanica* features, individuals have recently been found that are identical with individuals from other parts of the range of the species. However, we have retained the subspecific name *P. i. chitralensis* Swinhoe, 1910 described from Drosh, a locality in the foothills southwest of Hunza, although amongst the luxuriously patterned Hunza specimens are individuals identical with darker European ones. We consider *P. icarus* to be an extremely polymorphic species and one of the most successful survivors of the present biodiversity crisis.

This species was recorded from only two relatively low elevation localities, suggesting human influence. In the Naltar Valley it was locally frequent in July 1995 and August 1997, in areas that had escaped goat and sheep overgrazing. It was then sympatric with the more common *P. ariana* but was not found on subsequent visits to this valley, when grazing had severely reduced adult lycaenid numbers. It was also recorded, sparsely, at 11,000ft on hillsides

above the Hoper Valley in Nagar again flying with *P. ariana,* and with *Plebehus bellona.* Roberts (2001) lists what is presumably this subspecies as widespread in Chitral, common in cultivated areas of the Quetta Valley (Baluchistan) and in the Murree Hills.

Polyommatus icadius (Grum-Grshimailo, 1890) (Fig. 97)
[*Lycaena Icarus* Rott.] var. *Icadius* Grum-Grshimailo, G. In: Romanoff, N.M., *Mémoires sur les Lépidoptères,* 4:402-3.

Range: Tien-Shan, Alai, Pamir, Karakoram, Hindu Kush.
Localities: Kargah, KKH (Nilt), Minapin, Muchuwar.

This species was described from a series of males and females from the Fergana region and the Pamir, and seems to be widely distributed in Central Asia. It is difficult to separate specimens from the congeneric *P. icarus* occurring syntopically, as in the past no diagnostic character was known. However, the two taxa may reliably be separated in large samples, as *P. icadius* males possesses a slightly lighter dorsal structural blue color, and a white of greyish-white underside ground color with extensive blue basal suffusion. Females are difficult to separate: in *P. icadius* the wing shape is generally rounder, and the submarginal orange lunules less developed. According to Russian workers the species is oligophagous on the leguminous genus *Cicer* (Zhdanko, 1993; Ivonin & Kosterin, 1995). We have no data on larval hostplant of sympatric *P. icarus* populations. There are some available names introduced as subspecies or geographic forms of *P. icarus* from this general region and some should probably refer to *P. icadius.* As for the latter, we consider *P. icadius* as a widely distributed, polytypic Central Asian species, and we do not apply any subspecific name.

P. icadius is a butterfly of low altitude in Hunza localities. It was found in lower stretches of the Kargah Ravine above Gilgit, at 6000ft, and commonly at a similar altitude on the sparsely vegetated slopes bordering the KKH opposite the Khunjerab River near Nilt. It was also found, in smaller numbers, in the pastures of Minapin and Muchuwar, at *c.*10,000ft.

Polyommatus ariana Moore, 1865 (Fig. 98a-h)
Polyommatus ariana Moore, F., *Proc. Zool. Soc. Lond.*, 1865:504, pl. 31, fig. 2.

Range: Hindu Kush, Karakoram, Himalaya.
Localities: Naltar, Minapin, Muchuwar, above Gulmit; Deosai Plateau. Early Hunza records: Evans (1927): (i) as *Polyommatus eros hunza* Grum-Grshimailo, 1890, and (ii) *Polyommatus eros janetae* Evans, 1927.

This species was described from an unstated number of male and female specimens from Kunawur (Himachal Pradesh). Moore mentioned it as abundant from 8000ft to 10,000ft. The male was described as *Upperside brilliant blue; anterior margin of hind wing black, inner margin whitish* with no mention of a marginal black border on fore- and hind-wing. The accompanying figure shows a very narrow black edging. The BMNH lectotype designated by Bálint (1999) possesses these traits.

In each of the Hunza localities listed above, the males bear a narrow, black fore- and hind-wing border (Fig. 98a) from 0.1 - 0.3mm in width (measured on the FW at the distal end of vein M_3. The female is dark brown above (Fig. 98h) sometimes with basal blue flush, generally lacking in Deosai populations (Fig. 98h). At 13,500ft to 14,000ft on the Deosai Plateau of Baltistan, *c.*125 miles south-east of central Hunza, flies a polyommatine identical with Hunza *P. ariana* on the underside (Fig. 98g) but in which males have very conspicuous broad black fore- and hind-wing marginal bands (Fig. 98b): as measured above the average FW band width is 2.0mm.

Were only these populations to be considered, the Deosai morph would be sufficiently distinct for taxonomic separation, at least at the subspecific level. The picture, however, changes when a fuller geographical range of the butterfly is examined — here, the collections in the BMNH, London. Males similar to Deosai specimens are present from other localities in Baltistan including Dras and Karghil, the latter on the Deosai Plateau near the present Line of Control between Pakistan and India. Most specimens from Ladakh have moderately wide borders (Fig. 98c) but in others (Fig. 98d) this is very narrow. Again, about half of the long series of *P. ariana* from Goorais (Kashmir) have moderately wide borders (1.2-1.6mm) while in the remainder the border is even narrower than in Hunza specimens (Fig. 98e, f). This pattern is repeated in series from Sind ("Scind Valley") southwest of Hunza and well south of the Hindu Kush/Karakoram. The few specimens labelled "Chitral" and "Gilgit" have narrow borders.

This variation rules out the Deosai population as a strictly taxonomically definable entity. The sympatric presence of both wide- and narrow bordered specimens (Sind, Goorais) negates the possibility of subspecific status for wide-bordered morphs from Deosai. We are left with the option that Deosai specimens represent a sample of an extremely polymorphic species. The question of why this morph predominates at high altitude, in Deosai and elsewhere in Baltistan and in Ladakh can perhaps best be approached via molecular genetic analysis; similarly the occurrence of a wide range of band widths in some populations (Sind, Goorais) and more consistent band widths in others (Deosai). It is, of course, possible, even likely, that *"Polyommatus ariana"* is not a single very variable species but a group of closely related species.

Polyommatus ariana was recorded from several side valleys of Hunza, though not along the main valley: Naltar, Minapin (Nagar), Muchuwar and above Gulmit (Hunza), all close to an altitude of 10,000ft. At higher elevations in the Hunza region, *P. ariana* is replaced by *Polyommatus erigone* and *Polyommatus stoliczkana* between 13,000ft and 14,000ft.

Polyommatus stoliczkana (Felder & Felder, 1865) (Fig. 99a, b)
Lycaena Stoliczkana C. & R. Felder, *Reise Novara:* 283, pl. 35, fig. 10-11.

Range: Hindu Kush and Karakoram, to Ladakh.
Localities: Muchuwar, Chapchingal, KKH below Khunjerab.

The phenotype represented by the lectotype of *P. stoliczkana* from Ladakh (BMNH(E) 264744, see Bálint, 1999) has a distinctive underside in which submedian intercellular spots are lacking or extremely reduced. Cell CuA1 is entirely white in the hind-wing median and submedian area. The characters contrast with the closely related taxa *P. ariana, P. erigone* and *P. hunza* which have more "normal" polyommatine markings. The phenomenon of reduction in ventral markings is probably correlated with a harsh, arid climate, as is known for the *P. icarus* complex, where certain *icarus*-like populations have been segregated as either species or subspecies on the basis of this trait: for example *P. kashgharensis* Moore, 1878, *P. szabokyi* Bálint, 1990 or *P. turanicus* Heyne, 1895.

This is a medium-to-high altitude species in Hunza, and it was recorded in the high pasture of Muchuwar at 13,000ft, higher than either *Polyommatus ariana* or *Plebejus sarta.* It occurred more commonly in the arid Chapchingal Valley (Fig. 13) above 13,000ft on occasional vegetated patches, but at a lower altitude than the much rarer *P. erigone,* and along the edge of the KKH beyond, to 14,500ft — just below the Khunjerab Plain. It was not recorded on the sparse vegetation below the Irshad Uwin Pass, but was found in the Wakhan Pamir in July 2001 (see Afghan Records below). Roberts (2001) cites it (in error, as a subspecies of *Polyommatus eros)* from two Upper Hunza localities, Shimshal and Batura glacier,

but without collection data. Two subspecies of *P. stoliczkana* have been described from Afghanistan (Sakai, 1981).

Polyommatus erigone (Grum-Grshimailo, 1890) (Fig. 100)
[*Lycaena Eros* O.] var *Erigone* Grum-Grshimailo, G., In: Romanoff, N.M., *Mémoires sur les Lépidoptères,* 4:396-397.

Range: Tajikistan, Afghanistan, extreme northern Pakistan.
Localities: Chapchingal, Mintaka Pass, Kilik Pass.

A high altitude species; newly recorded for Pakistan, it was found rarely on mountain slopes bordering the Chapchingal Valley, higher than records of *P. stoliczkana,* and near the top of Kilik Pass, each site at 15,000ft and more commonly to 16,000ft at the Mintaka Pass in August 2002. It was not recorded at the same altitude or above on the Khunjerab Plateau, or across the border in the Wakhan Pamir.

Polyommatus hunza (Grum-Grshimailo, 1890) (Fig. 102a, b)
Lycaena Hunza Grum-Grshimailo, G., In: Romanoff, N.M., *Mémoires sur les Lépidoptères,* 4:397-9, pl. 15, fig. 2.

Range: Afghanistan, Tajikistan, Pakistan.
Localities: Mintaka Pass, Kilik Pass.

Another polyommatine newly recorded from Pakistan despite its name: the species was described from a mountain range in western China. The specimens of the original series were taken along the river Mazar. The type locality of the species was designated as "Beik" via the lectotype designation of Bálint (1999). Actually, the species name given by Grum-Grshimailo is misleading; no entomologist had entered Hunza in 1890, and the type locality is not situated there: Beik (or Bayik) lies in Sinkiang (China) a short distance from the Sino-Afghan border at the end of the Wakhan corridor. The species belongs to a complex of small blue polyommatine lycaenids with poorly understood taxonomy. Tshikolovets (1997) records the species from the ex-Soviet part of the Pamir mountains and suggested that *P. hunza* is probably a subspecies of *P. stoliczkana.* However, the lectotype of *P. hunza* (BMNH(E) 264677 (see Bálint, 1999) accords with the original figure given by Grum-Grshimailo and represents a phenotype distinct from *P. stoliczkana* (see entry for the latter species, above). *P. hunza* is probably phenotypically closer to the complex of the taxa *annamaria-ariana-erigone.*

In the Hunza region, we recorded this species only from the summit areas of the Mintaka and Kilik passes at c.16,000ft. Its flight is brisk, and it was seen only occasionally. Across the Irshad Uwin border in Wakhan, Afghanistan, it was more frequent in July 2001, and sympatric with *P. stoliczkana.*

Polyommatus pulchella (Bernardi, 1951) (Fig. 103a, b)
Lysandra pulchella Bernardi, G., *Bull. Soc. Ent. Fr.,* 56:30.

Range: Pamir; Hindu-Kush; Karakoram of extreme northern Pakistan.
Localities: Irshad Uwin Pass.

This species belongs to the subgenus *Agrodiaetus* Hübner, 1822. It is the sole representative of the clade recorded from our area, although more species have been found in adjacent regions: *P. florenciae* Tytler, 1926; *P. iphigenides* Staudinger, 1886 and *P. poseidonides* Staudinger, 1886.

This striking little species is newly recorded barely within Pakistan territory, just below and at the summit of the Irshad Uwin Pass, between 15,000ft and 16,000ft. on the Afghan border above the Chipursun Valley. It was not found, in July 2001, across the border in the Afghan Pamir, but it must occur there.

Heliophorus sena (Kollar, 1844) (Fig. 110a, b)
Polyommatus Sena Kollar, V., In: Hügel, F.C., *Kaschmir und das Himaleyagebirge,* 4:415, pl. 5, figs 3, 4.

Range: this species seems to be restricted to the the southern Hindu Kush, Karakoram and Kashmir, recorded neither from the Pamir nor Uzbekistan (Tshikolovets, 1997; 2000).
Localities: Gilgit, Kargah, Nomal, Aliabad.

We found *H. sena* occasionally on the route towards Gilgit, in Kohistan and northwards, always near water and never leaving shrub vegetation. It occurred at Gilgit and in the Kargah Valley above, on the track from Nomal leading to the Naltar Valley, and around Aliabad, middle Hunza. In all these localities it was common, settling often on leaves and nectaring on a variety of plants. It was particularly abundant at the oasis of Joglot on the KKH north of Gilgit, a heavily irrigated site in extremely arid terrain, that also afforded records of *Eurema hecabe* and *Eogenes alcides.* The precision of the altitudinal cut-off point of this species was remarkable: above 7500ft it was not recorded in any locality, whereas it was common slightly lower. Roberts notes it as extremely common in Chitral and Swat, from March to October, and from 4000ft to 7000ft, also in the Murree Hills in late summer.

Lycaena phlaeas (Linnaeus, 1761) (Fig. 111a, b, c)
Papilio Phleas Linnaeus, C., *Fauna Sueciae.,* ed. 2, 285.

Range: this butterffly has a generous Holarctic distribution, across Europe and North Africa, and temperate and subtropical Asia and Japan, to North America.
Localities: Gilgit, Kargah, Hunza Valley, Chapchingal, approach to Mintaka, Kilik and Dilsun passes; Deosai Plateau.

Tshikolovets (2000) accepts the morph of this very variable butterfly that is ubiquitous in Uzbekistan, except in sandy deserts, as the nominate subspecies. In his work on the Pamir (Tshikolovets, 1997), he lists two subspecies: *L. phlaeas comedarum* Grum-Grshmailo, 1890, a pale morph in both sexes, as representing the insect in the Pamir, including Muztagh-Ata, the massive Pamir outlyer in western Sinkiang (China). The second subspecies, *L. phlaeas stygianus* Butler, 1880 is probably the race best fitting specimens from northern Pakistan. The type-locality of this subspecies is "Candahar", Afghanistan. However, the distribution map in Tshikolovets (1997) is confusing: it appears to show ssp. *comedarum* as extending across the eastern end of the Wakhan and including the extreme northern terrain of Pakistan, with Khunjerab and the westerly passes of Mintaka and Kilik. *L. phlaeas comedarum,* if it has any taxonomic merit, does not impinge on Pakistan. Our records are unambiguous and both sexes are deeply colored, often with upperside melanic suffusion as in *L. p. stygianus.*

We recorded this "copper" more widely than any other lycaenid: from Gilgit and Kargah at 5000ft, all valleys visited except depauperate and heavily cultivated Hoper, within the National Park at 11,500ft, in the arid and sparsely vegetated Chapchingal Valley at 13,500ft, on the approaches to Mintaka, Kilik and Dilsun passes to 14,500ft, and on the Deosai Plateau at almost the same elevation. This is not the "Hill Station" species suggested by Roberts, but a very versatile lycaenid capable of reaching a level close to the highest altitude of Himalayan butterflies.

Lycaena aditya (Moore, [1875]) (Fig. 112)
Chrysophanus aditya Moore, F., *Proc. Zool. Soc. Lond.,* 1874:571-572, pl. 66, fig. 1.

Range: Badakshan, Pamir, northern Pakistan, India, Kashmir, Afghanistan, Tajikistan

Localities: Minapin, Muchuwar, Tharbai, approach to Mintaka and Kilik passes, above Chipursun Valley.

The taxonomy of this and related lycaenids is less than clear: Tshikolovets (1997) synonymized *L. solskyi* Erschoff, 1874 with *L. aditya*, but in the lengthy series in the Natural History Museum, London, the two are separated as species, *solskyi* having a much brighter hindwing ground color in the female. This color is even brighter in *L. solskyi fulminans* Grum-Grshimailo, 1888 from the Alai and Transalai regions. Tuzov *et al.* (2000) also regard *aditya* and *solskyi* as distinct species. Our material is uniform, with the female upperside hindwing much duller than the forewing and we regard these specimens as *L. aditya aditya*.

We found this species in several localities, each close to an altitude of 12,500ft: above Minapin (Nagar), the Muchuwar Valley, the steep mountainside pasture at Tharbai/Kalent above Sost, on the approach to both the Mintaka and Kilik passes, and above Chipursun Valley near the start of the trail leading to the Irshad Uwin Pass. The Natural History Museum (BMNH) has specimens from Shandur and other sites in Chitral, and from Yasin, the valley next-but-one to Hunza to the west. It is thus a widely distributed butterfly in the high border regions of Pakistan adjoining China and Afghanistan.

It may be noted that the black upperside markings in our female specimens, and most of those in the BMNH are much heavier than the females of *aditya* and the very closely related *L. alpherakii* Grum-Grshimailo, 1888 illustrated in Tshikolovets (1997: Fig. 26, 28).

Lycaena kasyapa (Moore, 1865) (Fig. 113a, b)
Chrysophanus kasyapa Moore, F., *Proc. Zool. Soc. Lond.* 1865:506, pl. 31, fig. 10.

Range: occurs in Chitral, Kashmir, Baltistan to Ladakh. Over part of its range, it appears to be sympatric with the closely related *L. zariaspa* Moore, 1874, the distribution of which centers on the Chitral region to extreme western Gilgit Province. The two are clearly closely related, and we regard all our specimens as *L. kasyapa*.
Localities: Muchuwar, Tharbai (Sost); below Deosai Plateau.

We recorded this species in only two localities in Hunza: mountain slopes of the rich and barely accessible Muchuwar Valley at 11,500ft, and in the high pasture on steep slopes at Tharbai/Kalent, above Sost, at 13,500ft. It was not found on the Deosai Plateau, but occurred along the steep side of a ravine just below the plateau rim, above Skardu, Baltistan. The weather of Deosai is unpredictable, and poor more often than not: in a window of sunlight on 30 July 1998 this butterfly was common. This was the only occasion we recorded it, stressing the importance of serendipity in brief periods of field work. Conversely, another lycaenid, *Lycaeides jaloka*, very common on the plateau, did not descend beyond the plateau edge.

Chaetoprocta odata (Hewitson, 1865) (Fig. 114)
Dipsas Odata Hewitson, W.C., *Illustr. Diurnal Lep. Lycaenidae*, 66, pl. 30, figs 13, 14.

Range: Karakoram; Afghanistan.
Localities: Murtazabad.

Leslie and Evans (1903) provided a vivid description of this species: "At Khilas 9,000 feet in the Shishi nallah in July, this butterfly fairly carpeted the grass under the walnut trees." Walnut trees, its larval hostplant, are distributed throughout Lower and Middle Hunza, but we found *C. odata* only once, at Murtazabad, near Aliabad, at 7500ft, in July 1996. This is a new record for the eastern Northern Areas, where it is evidently very uncommon. Roberts (2001) notes it as a lower Himalayan valley species wherever walnut trees grow: in Kaghan, the Murree Hills and lower Chitral valleys, from 4000ft to 9000ft.

Satyrium sassanides (Kollar, [1849]) (Fig. 115)
Thecla Sassanides Kollar, V. *Denkschr. Kais. Akad. Wiss. Wien*, 1:51.

Range: a very widely distributed hairstreak, occurring in Iran, each of the southern republics east of Turkmenistan, Afghanistan, China and northern India (Tshikolovets, 2000), in addition to records for Pakistan.
Localities: Kargah, Naltar.

We found it in only two localities: in the upper Kargah Valley above Gilgit, from 8000ft to the valley apex at 10,000ft, where it flew swiftly before nectaring on flowering shrubs, and less commonly in the Naltar Valley, in the same altitudinal range but in open, flowery patches of meadow that had escaped grazing. Marshall and de Nicéville (1890) reported *S. sassanides* from Baltistan, but we did not find it in our very limited foray into this vast area. Tshikolovets (1997) cites only a late nineteenth century record for the Pamir, but the nominate race is common in shrub zone of dry foothills of Uzbekistan, with dog-rose and wild almond, to an upper limit of 10,000ft (Tshikolovets, 2000). Roberts (2001) lists it from Chitral, Swat, Kohistan and Hazara, also central Baluchistan in the juniper zone, to 10,000ft.

RIODINIDAE

Polycaena tamerlana Staudinger, 1886
Polycaena Tamerlana Staudinger, O., *Stettin. ent. Ztg.*, 47:227.

Range: this species is distributed in the Tien Shan, Pamir, the southern Republics east of Turkmenistan, Afghanistan and western China (Tshikolovets, 1997).
Localities: [Chapchingal]

We did not see this butterfly in life during our survey, but were shown specimens collected illegally in Khunjerab National Park by two French nationals. The collection site was probably the mud-flats bordering the river flowing along the Chapchingal Valley (Fig. 13), at *c.*13,000ft, south of the KKH just before it ascends onto the Khunjerab Plateau. We have no information on the disposition of these specimens. Verhulst (1999) again recorded it, without precise locality data, but his altitude range for "Khunjerab Pass" included the level of Chapchingal.

ECOLOGICAL NOTES

Deosai

The Deosai Plateau is situated in the Province of Baltistan, about 125 miles SSE of Khunjerab. Two major mountain ranges, the Hispar and Haramosh reaching 25,000ft, together with the Hispar and Chogo Lungma glaciers lie between the two. The Deosai Plateau was termed "Little Tibet" by 19th century travellers from its superficial appearance (Fig. 24), but it lies at only 13,500-14,000ft, 2000ft short of the Tibetan plateau to the south-east. Small mountains and glaciers rise from the plateau, some with permanent snow at 17,000ft. In the nineteenth century the Deosai Plateau was on the route from Srinagar, chief town of British Kashmir, to Gilgit, a journey only possible for a short time in the Summer and taking several weeks. Most of the Deosai Plateau is Pakistani territory; the "Line of Control" between this and Indian-occupied Kashmir crosses the plateau to the south. We worked on the plateau on two occasions; additional records were obtained by Saif Ulla (PMNH).

Butterfly taxa recorded from Deosai

In the following list, taxa not found in the Hunza region are indicated (**). These have been considered along with taxa from Hunza in the above taxonomic listing. All Deosai specimens were collected within 10 miles of the edge of the plateau above Skardu, at from 13,500ft to 14,000ft, except for *Parnassius simo ganymedes* and *Parnassius delphius workmani,* recorded from sites up to 15,000ft.

** *Pyrgus cashmirensis*
** *Hesperia comma shandura*

***Parnassius delphius workmani*
***Parnassius hardwickii*
Parnassius epaphus cachemiriensis
***Parnassius simo ganymedes*
***Parnassius charltonius ella*

Hyponephele pulchra
Hyponephele hilaris
***Karanasa modesta*

***Boloria sipora nitida*
Fabriciana adippe
Polygonia interposita
Aglais caschmirensis
Vanessa cardui

Pontiia callidice
Pontia daplidice
Pieris brassicae
Pieris canidia
Colias erate
Colias fieldii
Colias eogene

***Agriades jaloka*
Albulina chrysopis
Polyommatus ariana
Plebejus sarta [Hungarian Nat. Hist. Mus.]
Lycaena phlaeas
Lycaena kasyapa

Divergence between the faunas of Deosai and Hunza, from our data, is as follows:

Four species recorded from Deosai (not from Hunza): *Pyrgus cashmirensis, Parnassius hardwickii, Karanasa modesta, Agriades jaloka.*

Five species occur on the Deosai Plateau differing infraspecifically from Hunza populations:

Parnassius delphius
Parnassius simo
Parnassius charltonius (Verhulst, 1999)
Boloria sipora
Hesperia comma

In addition, Deosai *Polyommatus ariana* are very distinct from those occurring in Hunza localities as described above, but have not yet been formally separated.

The incidence of incongruity between Deosai and Hunza faunas in our sample is thus 9 taxa in 28 or 32%. This is a quite dramatic divergence between localities only 125 direct-line miles apart. While this is only one instance, it serves to illustrate the role of isolation, and presumably of physical barriers, in evolutionary divergence at the infraspecific and specific level.

Interface between Oriental and Palaearctic

Throughout Central Asia and beyond, the Palaearctic butterfly fauna to the north interfaces with the Oriental zoogeographical zone to the south. This is a very imprecise boundary, varying from one locality to the next, reflecting the ecological and climatic conditions of each region. Furthermore, the divide between Palaearctic and Oriental is not symmetrical: in the Hunza region, the northerly limit of Oriental species can be determined with some precision, but southerly incursion of Palaearctic species has yet to be assessed. In Hunza and other areas in Central Asia, altitude is the chief parameter limiting the northerly movement of Oriental taxa. During our survey, two species, *Papilio polyctor* and *Catopsilia pyranthe* were recorded from 9000ft, the highest altitude of any Oriental representative. These records are certainly of vagrants from lower breeding areas, probably at 5000ft or below.

About 26 species were recorded no higher than this altitude during our survey. Of these, seven species (27%) have Oriental zoogeographical affinities: *Papilio polyctor, Catopsilia pyranthe, Eurema hecabe, Danaus chrysippus, Zizeeria karsandra, Pseudozizeeria maha* and *Everes indica. Vanessa cardui* and *Lampides boeticus* are virtually cosmopolitan and cannot be assigned to either zoogeographical zone. All species limited to sites above 9000ft, or extending from below 9000ft to sites at higher altitude, are exclusively Palearctic. Thus for Hunza, the northern limit of vagrant Oriental butterflies is the altitude level of 9000ft and the upper limit of breeding populations probably several thousand feet lower. Our survey of Deosai involved only the plateau and low mountain slopes above it, and the ravine just below; at the altitude of 13,000ft and above the fauna is, as expected, entirely Palearctic.

Species richness of localities

Of the localities worked during the seven years of our survey, the Gilgit area with the adjacent Kargah Valley proved one of the most diverse, with 36 species recorded. It is a well irrigated region; the altitude is low and the valley is well vegetated. Its relative diversity is not surprising and should be compared with localities at much greater altitude and often set in very arid terrain. The main Hunza Valley (along the KKH) yielded records of a similar number of species; this list is grouped together for convenience and covers numerous revisited sites from just beyond Gilgit (5500ft) to the edge of the Khunjerab Plateau at 15,000ft. Of this total, 33 were recorded to and including Sost (10,000ft) and four species, *Polyommatus stoliczkana, Agriades pheretiades, Plebejus bellona*, and *Polycaena tamerlana* are part of the high altitude fauna.

Localities below the high passes with the lowest species count were Hoper (25), a heavily cultivated valley with limited access to mountain slopes and Tharbai (17), a very steep mountainside overlooking Sost, briefly visited only once.

From Khunjerab National Park (KNP) 30 species have been recorded from many visits over seven years. Of these, eleven (*Pyrgus alpinus, Parnassius epaphus, P. actius, P. simo, Colias cocandica, C. eogene, Karanasa leechi, Melitaea didyma; Boloria sipora, Clossiana hegemone,* and *Albulina asiatica)* were never found below 15,000ft on the Khunjerab Plateau. Sixteen are known from KNP but found only below the plateau: *Hesperia comma, Papilio machaon, Parnassius charltonius, P. delphius hunza, Pieris deota, Colias fieldi, Hyponephele pulchra, H. brevistigma, Melitaea fergana, Agriades pheretiades, Albulina chrysopis, Polyommatus stoliczkana, P. erigone, Plebejus bellona, Lycaena phlaeas*, and *Polycaena tamerlana.* The list is completed by three species, *Pieris brassicae, Pontia callidice* and *Vanessa cardui,* recorded from the

Khunjerab Plateau down to the lowest Hunza altitudes.

Counts for Kilik/Mintaka and Irshad Uwin passes are, respectively, 32 and 34 species. Kilik was worked during the 2000 expedition; Mintaka and Irshad Uwin have been extensively worked only by GN. Differences between these sites, each richer than Khunjerab, are discussed below.

It should be stressed that none of these species lists has any numerical/statistical significance. The time spent at each locality was not standardised, weather conditions were certainly not uniform and records for many localities were compiled over several years. Nevertheless, it is suggested that these lists provide a first approximation of butterfly diversity at the present time and, given the ongoing level of habitat degradation in some areas, a base-line against which results of future field studies may be assessed.

Variation between localities.

While several of the species totals do not vary greatly from one locality to the next, this does not mean that the range of species is uniform. Quite the contrary: during our survey only two species, *Pieris brassicae* and *Vanessa cardui*, were recorded from every locality worked. Moreover, 27 taxa were recorded from one locality only. Valleys in the Hunza complex, at the same altitude, from our limited geographical sample generally have numerous species in common, but overall each valley or high pass has a different species spectrum. This is well illustrated by the scatter of records in parts of the Distribution Table (see pp. 54-56).

Local faunal variation is perhaps most strikingly seen in the high passes: Khunjerab, Kilik/Mintaka and Irshad Uwin, particularly in the genera *Parnassius* and *Colias*. *Parnassius epaphus* is at times common on and above the Khunjerab Plateau, but very rare or absent on the passes to the west, but again common, at lower altitude, on the Deosai Plain. *Parnassius jacquemontii* is unknown from Khunjerab, but is often common on the Kilik, Mintaka and Irshad Uwin passes. *Parnassius delphius hunza* is present at Tharbai, above Sost, rare in the Chapchingal Valley below the Khunjerab but unrecorded on the plateau, present on the Kilik and Mintaka passes and at times common on the Irshad Uwin Pass. *Colias marcopolo* has never been recorded from Khunjerab, but is known from each of the passes to the west. *Karanasa leechi* is the only satyrid known from Khunjerab Plateau, but is replaced by *Karanasa bolorica* on passes to the west and into the Afghan Wakhan. *Polyommatus hunza,* despite its name, is unknown from the Hunza Valley and in Pakistan was recorded only from the Kilik and Mintaka areas. *Polyommatus pulchella* was recorded in Pakistan only from the Irshad Uwin Pass. The satyrid *Hyponephele carbonelli.* recently described from a distant locality in Baltistan, was found only in the generally depauperate and isolated Hoper Valley, as was the related *H. dysdora.*

We regard our lists as "raw data" for future field studies that add the important parameters of larval and adult plant-associations, and of phenological response to presently undocumented but obviously extreme year-to-year climatic fluctuations in the high Karakoram localities.

The dissection of the Karakoram zone into a complex system of valleys separated by high mountain ranges has undoubtedly accelerated evolutionary divergence between butterfly populations. Some examples of divergence, as for populations of *Polyommatus ariana* in Hunza and Deosai, are obvious to the eye. Other possible instances of divergence, in the absence of morphological differentiation, as for populations of *Parnassius epaphus* on the Khunjerab and Deosai plains, may be shown later by molecular genetic analysis at the DNA level. "Subspecific" differences occur between Khunjerab and Deosai populations of *Hesperia comma, Parnassius charltonius, Boloria sipora* and others, but these are merely instances where genetic divergence chances to have an obvious effect on wing pattern. Other isolating genetic mechanisms may not have such fortuitous morphological markers.

Records from Wakhan, Afghanistan

As mentioned above, the first records of butterflies of Afghanistan were made by British soldiers in the nineteenth century. For much of the twentieth century knowledge of this fauna remained poorly known, but the work of Sakai (1981) was pivotal in revealing much of the Afghan butterfly fauna. Previously, Wyatt (1961), Wyatt and Omoto (1966a,b), and Ebert (1967) refined some aspects of taxonomy and added numerous new taxa. Howarth and Povolný (1973, 1976) gave a full account of material from five years of Czech expeditions to Afghanistan. From the time of the Soviet invasion, and thereafter during the even more damaging periods of civil war and the Taliban regime, no field work could be carried out. Even in the unlikely event of a stable government being achieved in Afghanistan in the near future, field work in much of the country will remain hazardous for many years, by virtue of several million, primarily Soviet landmines laid indiscrimately prior to 1992 across the terrain, with no thought of their long-term dangers (since 1992, the local Taliban have laid more landmines). The more recent paper by Balletto and Kudrna (1989) was based on material collected twenty years before, and was expanded into a useful checklist.

For residents of Hunza, travel across the border with Wakhan, Afghanistan, has not been difficult. Many families have members on both sides of the border, and they share a common bond in the Ismaili Muslim faith. In July 2001, Gulam Naseer entered Afghanistan *via* the Irshad Uwin Pass and worked on butterflies for most of that month. This was made difficult not only by poor weather, but also by extreme scarcity of food. Despite these setbacks, 40 species were collected. This preliminary faunal list is given below; taxa recorded from the Hunza region have been discussed previously and are merely named, while taxa not recorded during our work in Hunza are discussed briefly. In July 2002, GN intended again to visit the Wakhan Pamir *via* the very high Dilsun Pass; heavy snow delayed the journey, and GN found the border closed by the government of Pakistan. Instead, the Pakistan approach to Dilsun Pass and then the Mintaka Pass region were worked extensively.

Hesperia comma mixta (Alphéraky, 1881) (Fig. 32a, b)
H.[esperia] Comma L. var. *Mixta* Alphéraky, S., *Horae Soc. ent. Ross.*, 16:432.

Tshikolovets (1997) cites this subspecies as widespread and common in several mountain ranges in SE Tajikistan, and in the Hindu Kush. Sakai (1981) records nominate *H. comma* and subspecies *shandura* for Afghanistan, the latter also occurring on the Deosai Plateau.

Pyrgus alpinus alichurensis De Jong, 1975 (Fig. 29a, b)
Pyrgus alpinus alichurensis De Jong, R., *Zoöl. Meded. Leiden*, 49:6.

Listed by Tshikolovets (1997) as common across much of the Tajik Pamir, and in the eastern Hindu Kush, flying from, "mountain semideserts to meadows at 3600-4500m."

Parnassius jacquemontii
Parnassius actius
Pieris rapae
Pieris brassicae
Pieris deota

Colias wiskotti Staudinger, 1882 (Fig. 52a-d)
Colias Wiskotti Staudinger, O., *Berlin. ent. Zeit.*, 26:166, pl. 2, figs 9, 10.

This *Colias* is widely distributed through the southern ex-Soviet Republics, Afghanistan, the Hindu Kush, Tien Shan, Pamiro-Alai and western China. It was never recorded during seven visits to upper Hunza/Khunjerab, nor was it found at the Mintaka, Kilik or Irshad Uwin passes.

The Natural History Museum (BMNH) collections include specimens from Chitral district, and Leslie and Evans (1903) recorded it from the Shandur Pass. Evidently, this species follows the Hindu Kush barely into Pakistan, but is absent from the Karakoram to the east. It was found at several sites in the Wakhan Pamir, at *c.*14,000ft. Both the yellow form of the female and the white form *alba* Verity were noted (Fig. 52d). Subspecies *chrysoptera* Grum-Grshimailo, 1888 is known from Afghanistan, Tajikistan and the Trans-Alai; the race occurring in northern Pakistan and Wakhan is *C. wiskotti seres* Grum-Grshimailo, 1890, also found in parts of Tajikistan (Tshikolovets, 1997). The type locality of *seres*, "N.E. des monts Kounjout" is similar to that cited for *Polyommatus hunza*, and has here been located just inside China adjacent to the eastern limit of the Wakhan corridor.

Colias marcopolo
Colias erate
Colias cocandica
Colias eogene
Pontia callidice

Baltia shawi (Bates, 1873) (Fig. 54)
Mesapia shawi Bates, H. (in Henderson, G. & Hume, A.O.) *Lahore to Yarkand, incidents of the route...* 305-307.

A species with a very wide range, including Kirgizstan and Tajikistan (but apparently not Uzbekistan), Afghanistan, the Pamiro-Alai, western Kun Lun, Karakoram, NW Himalaya, Ladakh, western Tibet, western China and northern India.

This is evidently a Hindu Kush/Pamir species. We never encountered it from Hunza, nor from any of the high passes to the west. A single specimen was obtained in July 2001 at *c.*15,000ft in the Wakhan Pamir of Afghanistan. The species was discovered by the tea-trader-cum-emissary Robert Shaw in 1870 *en route* to Chinese Turkistan, at 18,000ft on the Chang Lang Pass in the Kun Lun. Much of the range including northern Pakistan and the Wakhan Pamir is occupied by the nominate race; subspecies *B. shawi baitalensis* Moore and *B. s. karakuli* Bang-Haas were described from extreme NE Tajikistan. Roberts notes it for Pakistan in Chitral district above 13,000ft.

Karanasa alpherakyi (Avinov, 1910) (Fig. 71)
Satyrus alpherakyi Avinov, A.N., *Horae Soc. ent. Ross.* 39:240-2, pl. 14, figs 13-15.

This species is known from the Pamir-Alai, Badakshan, the Hindu Kush, Tajikistan and Afghanistan. The nominate race occurs in several mountain ranges of the Tajik Pamir (Tshikolovets, 1997).

We never encountered this species in the Hunza region; indeed it has scarcely been recorded from Pakistan. The type locality of subspecies *K. alpherakyi kafir* Avinoff & Sweadner, 1951 was the Nuksan Pass, in the northeastern Hindu Kush on the border with Afghanistan NNW of Chitral. In July 2001 *K. alpherakyi alpherakyi* was recorded from several sites in the Wakhan corridor of Afghanistan, to 16,000ft. The type locality, Pamirsky Post (= Murgab) lies *c.*60 miles (100km) north of Wakhan in extreme eastern Tajikistan.

Paralasa chitralica
Hyponephele hilaris bori

Hyponephele pamira Lukhtanov, 1990
Hyponephele pamira Lukhtanov, V.A., *Vest. Zool* 1990(6):16-17, fig. 3.1-4, 4.1.

This species is known from the Pamir of Tajikistan, and now from the eastern Wakhan (Afghanistan). It was recorded from an area locally known as Gozan, Wakhan, NE of the Irshad Uwin Pass, in July 2001. There it flew with the much commoner *Hyponephele pulchra baroghila*, and with *Parnassius jacquemontii*, *Argynnis aglaja* and *Albulina chrysopis*. This population is of nominate *pamira;* subspecies *jacobsoni* Lukhtanov. 1990 was described from Pamirsky Post (Murgab) in SE Tajikistan and from several neighboring mountain ranges.

Hyponephele pulchra baroghila
Karanasa bolorica
Argynnis aglaja vitatha
Clossiana hegemone
Melitaea didyma nadezhdae

Melitaea chitralensis shugnana Sheljuzhko, 1929 (Fig. 75a, b)
Melitaea didyma shugnana Sheljuzhko, L. *Mitt. Münch. Ent. Ges.* 19:355-7, pl. 27, figs 7-10.

This species, described by Moore, 1901, ranges through the southern Republics east of Turkmenistan, in Afghanistan and northern India. Tshikolovets (1997) mentions Pakistan in its range; it is presumably recorded from Chitral district but Roberts (2000) omits it, and we did not encounter it in the Hunza region. Subspecies *shugnana* is known (Tshikolovets, 1997) from the Vakhansky and Yuzhno-Alitshursky ranges of Tajikistan, lying parallel with and immediately to the north of the Wakhan corridor. Another subspecies, *enarea* Fruhstorfer, 1916, is centered on localities in Uzbekistan (Tshikolovets, 2000). This species was not recorded for Afghanistan by Sakai (1981) but several specimens of *M. chitralensis shugnana* were obtained in eastern Wakhan in July 2001, from localities at *c.*14,000ft, extending its known range to the south.

Melitaea fergana maracandica (Staudinger, 1882) (Fig. 74a-c)
Melitaea Fergana var *Maracandica* Staudinger, O. 1882. *Berlin. Ent. Zeit.* 26:168-170.

This species is widely ranging, but the subspecies recorded in the eastern Wakhan Pamir in July 2001 is known only (Tshikolovets, 1997) from several mountain ranges in the central and southern areas of eastern Tajikistan. Tshikolovets notes that another subspecies, *M. fergana jacobsoni* Higgins, 1941, is present in southwestern areas of Tajikistan, and Sakai (1981) recorded this race from the Issyk Valley, in western Wakhan.

Melitaea shandura (Evans, 1924) (Fig. 76a, b)
[Melitaea] shandura Evans, W.H. 1924. *J. Bombay Nat. Hist. Soc.* 30:90

This species has a relatively restricted range in Central Asia: the Pamir-Alai, Badakshan, Hindu Kush, Tajikistan and Afghanistan. Roberts (2000) records it from Museum specimens as occurring from Afghan Badakshan to the Shandur Plateau of northern Chitral. It was not recorded during our seven-year survey of the Hunza region, but was included in the collection from Wakhan Pamir, July 2001. Evidently, this is a Hindu Kush/Pamir butterfly that barely impinges on the Pakistan region.

Melitaea minerva Staudinger, 1881 (Fig. 77a, b)
Melitaea minerva Staudinger, O., *Stettin. Ent. Ztg.* 42:289-291.

This is a widely distributed Central Asian species, ranging from the Tien Shan, the Pamir-Alai, the Hindu Kush into extreme northern Pakistan, Afghanistan, the former Soviet southern Republics east of Turkmenistan to extreme western China.

This *Melitaea* was never found during our survey, though it is known from Chitral and the Shandur Plain. In July 2001, it was present on the Afghan side of the Irshad Uwin Pass at Bai Qara. It flew there at *c*15,000ft, considerably higher than Chitrali records. This joins *Colias wiskotti* as another instance of a butterfly entering extreme north-western Pakistan *via* the Hindu Kush, but further east apparently not crossing the Pamir-Karakoram divide. Tshikolovets (1997) notes that the taxonomy of Pamir populations is unclear. Subspecies *palamedes* Grum-Grshimailo, 1881, was described from Kirgizstan and Tytler (1926) described pale specimens from Shandur as *M. minerva balbina.* Our material from the Wakhan precisely matches Tshikolovets' figures of the nominate race.

Boloria sipora hunzaica
Aglais ladakensis

Lycaena phlaeas
Lycaena aditya
Albulina chrysopis
Plebejus bellona
Aricia eumedon sarykola (see text for taxonomic status of Hunza specimens)

Polyommatus artaxerxes transalaica (Obratsov, 1935) (Fig. 107)
Lycaena allous transalaica Obratsov, N.S., *Folia zool hydrobiol.*, 8:147.

Known from the eastern part of the Yuzhno-Alitshursky range of SE Tajikistan, just north of the Wakhan corridor, from Murgab (Pamirsky Post), the Oksu (Aqsu) and Gunt river regions further north in the Tajik Pamir (Tshikolovets, 1997). It is listed as "rare in steppe slopes at 3500-4200m." It was found quite commonly in the Wakhan Pamir in July 2001, at intermediate altitudes of 13,000ft to 14,000ft.

Polyommatus stoliczkana
Polyommatus hunza
Polyommatus icarus
Polyommatus ariana
Plebejus sarta sartoides

From the Irshad Uwin Pass (Fig. 22), the border between Afghanistan and Tajikistan lies only *c.* 25 miles (40km) due north. Within Wakhan, GN followed a north-easterly trail, but precise details cannot be presented in the absence of topographical maps or GPS records. Two topographical views in the Wakhan which served as collecting areas in July 2001 are shown in Fig. 25 and 26. Only occasional isolated dwellings are present in this area. From the Irshad Uwin Pass, at *c.*16,000ft, the trail initially descends, but towards the Tajik border higher plateau terrain intervenes, again to 15,000-16,000ft, and all field work was carried out at 13,000ft or above. It is remarkable that only a relatively short distance beyond the limit of Pakistan, 11 taxa had not been recorded during seven periods of work in the Hunza area. But in Central Asia, with extremely complex mountain ranges and potentially isolated valleys, evolutionary divergence is as prolific as in an island archipelago, where populations are separated by water barriers (e.g. Smith *et al.*, 1994).

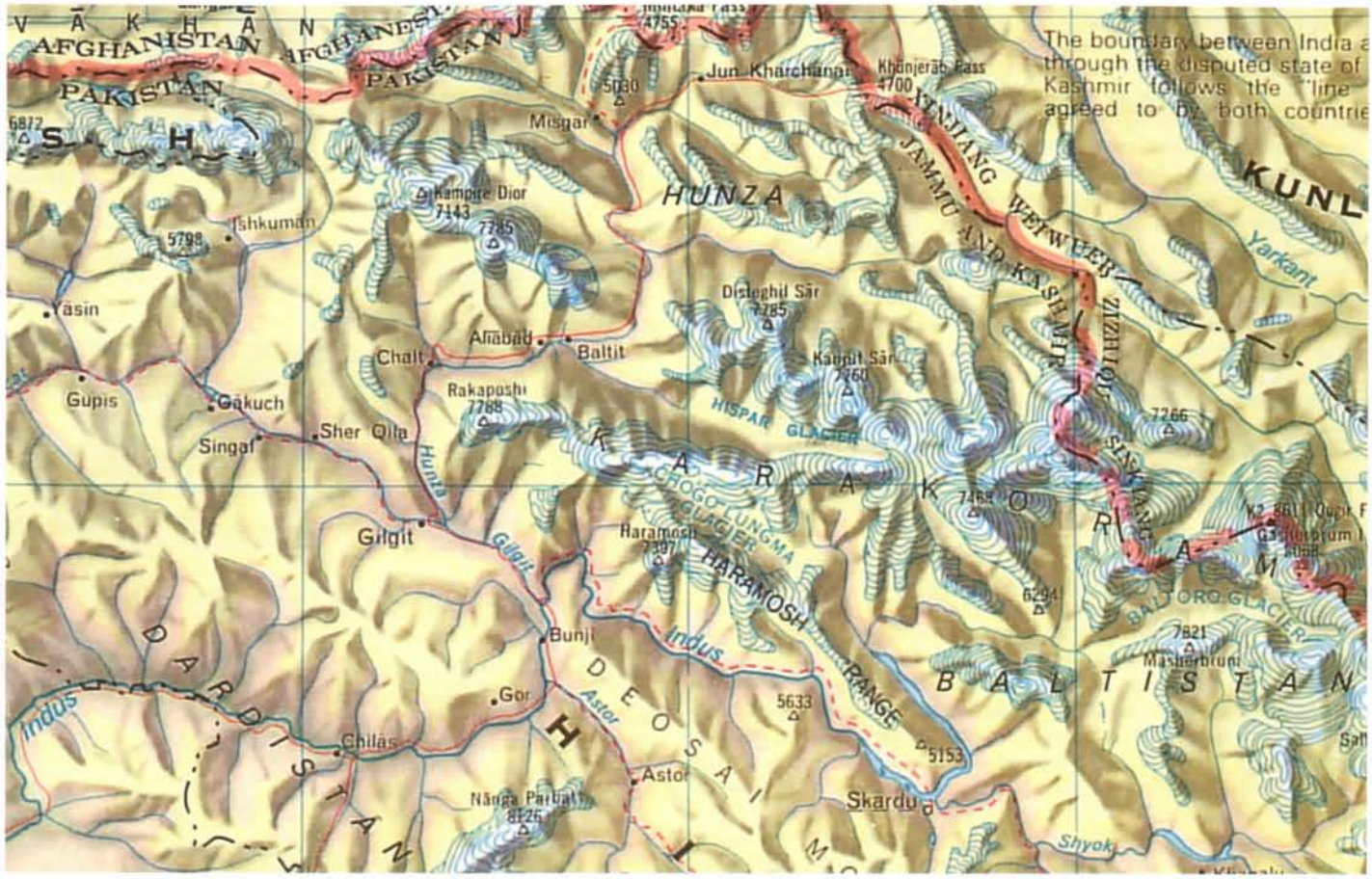
General notes on Hunza butterflies

It is instructive to examine those taxa which were not recorded in Hunza. Of these, four species, *Colias wiskotti, Baltia shawi, Melitaea shandura*, and *Melitaea minerva*, have been recorded elsewhere in Pakistan (Roberts, 2000) near Chitral, at the eastern end of the Hindu Kush, west of Hunza. The center of distribution of each of these lies in the Pamir, and their presence in the Wakhan collection reflects this. What is noteworthy is the sharpness of the distinction between the Karakoram fauna of Hunza and that of Hindu Kush/Pamir. Of the remaining 7 taxa not known from Hunza, *Karanasa alpherakyi* and *Hyponephele pamira* have not previously been recorded from Pakistan, and are again butterflies of the Pamir. Five taxa, *Hesperia comma mixta, Pyrgus alpinus alichurensis, Melitaea chitralensis shugnana, Melitaea fergana maracandica* and *Polyommatus artaxerxes transalaica* represent species recorded from the Hunza region, but from the Wakhan as different subspecies.

Of the 109 species we recorded from the Hunza region and Deosai, virtually all have described subspecies. Even *Vanessa cardui, Lampides boeticus* and *Aglais urticae* have infraspecific members, though far from Central Asia. *Aricia astorica* seems to be free from subspecies, and *Hyponephele carbonelli* was described too recently to have generated any level of usefulness among taxonomists (it may have done so evolutionarily). It is not possible to cite a meaningful number of taxa without subspecies since the value of described subspecies varies widely. For example, attached to *Metaporia leucodice* are numerous names for subspecies, varieties and forms: Tshikolovets (2000) observes that the species shows "remarkable individual and ecological variability. The taxa mentioned do not reflect geographic variability and are considered . . . as infrasubspecific". This caution should undoubtedly be applied to a few other Central Asian taxa. Probably well below 10% of Hunza/Deosai species have useful subspecies, at least in the Central Asian region. This incidence may be compared with the faunas of the West Indies, where isolation on many islands of widely varying land area has led to a remarkable incidence of subspeciation. There, such wide-ranging species as *Anteos maerula* (Fabricius) (Pieridae), *Marpesia chiron* (Fabricius) (Nymphalidae) or *Eunica monima* (Stoll) (Nymphalidae), have evolved no recognized subspecies. In that area of the Neotropics, about 15% of the 350 species have no infraspecific division (Smith *et al.* 1994). The percentage in the region of Central Asia considered in this account, where isolation is effected by very high mountains and glaciers, appears to be even smaller.

This account has considered only a very small area of Central Asia. Some perspective of the wealth of evolutionary divergence in the region is suggested by the checklist of butterflies recorded from Tajikistan, a country of 140,000km² where, for example, over 20 parnassiine taxa were recorded, 15 *Colias* species and 40 species of *Polyommatus*, with additional subspecies (Tshikolovets, 2003). This meeting place of the world's highest mountain ranges has been an evolutionary workshop.

As with the West Indian fauna, or any other fauna in a topographically complex area, butterfly taxonomy mirrors the extent and quality of field and subsequent museum work. Wyatt and Omoto (1966a,b) worked in the mountains of northeastern Afghanistan (1960, 1963) and described a new *Parnassius actius* subspecies, five subspecies of *Colias* and other pierids, three nymphalines and at least 25 new satyrid species and subspecies. Of these eight: *Parnassius actius, Colias marcopolo, Metaporia leucodice, Nymphalis xanthomelas, Charaza heidenreichi, Pseudocharaza baldiva*, and *Hyponephele hilaris*, are species recorded from Pakistan but occurring in northeast Afghanistan as different subspecies. As in the West Indian faunas, some species are represented in Central Asia by



Map. 6. Hunza and Karakoram region (elevations in meters) (section map from *The New International Atlas: Twenty-Fifth Anniversary Edition*, ©1994 Rand McNally).

a small number of taxonomically decribed races, others by an extensive list of supposedly distinct taxa. In the latter category, *Parnassius charltonius* has over 20 described subspecies (Weiss, 1991), but less than one-fifth the count for *Parnassius apollo,* surely the most taxonomically-challenged lepidopteran reaching Europe. The extreme dissection of the terrain in Central Asia by very high mountains and glaciers, into valleys, some isolated, some confluent, has led to great evolutionary divergence, yielding many related "species" and "subspecies" particularly in the less vagile groups.

Diversity of valley faunas

During our survey, we were able only to sample the butterfly faunas of a few valleys, accessible from the main Hunza route. Map 6 illustrates the extreme complexity of the Karakoram region, and underlines the fact that our work has scarcely touched the surface of the region's potential diversity. It does not seem likely that this will be assessed more fully in the near future: on foot, the challenge is daunting. Helicopter transport into the very many remote valleys would be of incalculable help, but this assistance is at present beyond the financial capabilities of biologists working in Hunza. Eventually, however, such logistic support will be necessary to obtain comparative data from a large number of valleys, with greater or lesser levels of isolation. In parallel with museum-based taxonomic work, which remains of crucial importance, DNA analysis of selected populations will be useful, perhaps adding the time parameter to topographical/isolation considerations.

Our work over seven years has served to fill the lacuna of Hunza in the distributional map of Pakistan's butterflies. We can now plot the altitudinal zonation of species within the valley and its neighbors, and we have obtained data on the distribution of the specialized group of butterflies that can only live at great heights — from 14,000ft, some to the snow line. How this last group survives — how the fluctuating climatic conditions from one year to the next — remains an enticing and, as yet, unapproached ecological problem. We now know something of the diversity of species present at the passes to China and Afghanistran west of Khunjerab, and we have some preliminary data on botanical structure of two of these regions, which must play a crucial part in directing the presence or absence of a given species. Unfortunately, the brevity of our times in these localities precluded observations on life history details, but we can list some of the members of the appropriate plant genera found in the two passes surveyed — Khunjerab and Kilik.

As a result of our work, several species, particularly lycaenids, are newly recorded for Pakistan. For others, the known distribution is extended, usually from Chitral, eastwards to the Hunza Valley. We do not suggest that our work has revealed all the butterflies of Hunza, but we believe that the number of unrecorded taxa is very small.

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TABLE 1. Tabulation of all species recorded from the Khunjerab region and the Deosai Plateau of Baltistan
All Khunjerab region localities are listed generally in order of ascending altitude: the numerals 1 through 13 are added to facilitate alignment of columns after the first page (the numbers have no reference to any of the maps or site numbers). Approximate altitudinal limits of each species observed during our work are given after the locality tabulation, to the right of the columns.

	GILGIT	NAGAR	CHAPOT	FAKIR	MUCHUMAR	HUNZA	THARBAI	HUNZA	CHAPCHAL	KHUNJERAB	MINTAKA	IRSHAD	DEOSAI	
	1	2	3	4	5	6	7	8	9	10	11	12	13	Alt x1000 ft
HESPERIIDAE														
Eogenes alcides								•						6
Eogenes leslei				•										8
Erynnis pathan	•													9
Pyrgus alpinus					•		•		•	•	•	•		13-16
Pyrgus cashmirensis													•	13.5-14
Hesperia c. comma					•				•					13.5-14
Hesperia c. shandura													•	13
Taractrocera danna	•													5
PAPILIONIDAE														
Papilio polyctor						•								9
Papilio machaon	•	•	•	•	•		•	•	•		•			6-14.5
Parn. simo ganymedes													•	14-15
Parnassius simo lorimeri											•			16
Parn. simo saserensis										•				16.5
Parn. charltonius dekerty				•	•		•	•						10-13
V *Parn. charltonius ella*													•	14
Parnassius jacquemontii											•	•		14-16
Parnassius epaphus										•			•	13.5-16
Parnassius delphius hunza							•		•		•	•		13-17
Parn. delphius workmani													•	14-15
Parnassius actius catilina										•	•	•		15.5-16.5
Parnassius hardwickii													•	13.5-15
PIERIDAE														
Catopsilia pyranthe	•							•						6-9
Euchloe daphalis								•						6-7.5
Metaporia leucodice	•	•	•	•	•									6.5-11
Pontia callidice			•					•	•	•	•	•	•	9-16
Pontia daplidice	•	•	•					•					•	5-14

	1	2	3	4	5	6	7	8	9	10	11	12	13	Alt x1000 ft
Pontia chloridice	●	●	●	●	●	●		●				●		7-12
Pieris krueperi				●										7
Pieris brassicae	●	●	●	●	●	●	●	●	●	●	●	●	●	5-16
Pieris deota								●	●		●	●		10-13
Pieris rapae	●	●	●	●	●	●	●	●				●		5-11
Pieris canidia	●												●	6-13.5
Colias fieldii		●	●	●	●	●	●	●				●	●	5-13.5
Colias erate	●	●	●	●	●	●	●					●	●	5-14
Colias cocandica										●	●	●		15-16
Colias eogene										●	●	●	●	13-16.5
Colias marcopolo											●	●		15-16.5
Gonepteryx rhamni	●			●										7.5-10
Eurema hecabe								●						6
SATYRIDAE														
Lasiommata menava		●	●	●		●			●					7-10
Lasiommata schakra		●		●										7.5
Pseudocharaza baldiva				●	●	●	●	●			●	●		7-12
Pseudocharaza droshica		●												7.5-9
Charaza heydenreichii					●				●					8.5-10
Hyponephele h. hilaris		●	●		●	●							●	9-13.5
Hyponephele h. bori												●	●	14
Hyponephele carbonelli						●								10.5
Hyponephele pulchra			●	●		●			●			●	●	9-14
Hyponephele brevistigma		●				●		●			●	●		9-12
V *Hyponephele dysdora*						●								10
Paralasa mani	●		●		●		●					●		8.5-13.5
Paralasa chitralica											●	●		14-15
Satyrus pimpla					●									13
Aulocera padma			●	●	●	●	●							7-10
Aulocera brahminus				●	●	●								9-10
Aulocera swaha		●					●							8.5-10
Eumenis parisatis	●	●	●	●	●			●						5-10
Karanasa leechi										●				15-16
Karanasa bolorica											●	●		15-16
Karanasa moorei					●									13
Karanasa modesta													●	13.5-14
NYMPHALIDAE														
Melitaea didyma										●	●	●		15-16
Melitaea fergana								●	●		●	●		13-15
Clossiana jerdoni			●		●									13
Clossiana hegemone										●		●		15-16
V *Clossiana franciscana*														?
Boloria sipora hunzaica										●	●	●		15-16
Boloria sipora nitida													●	14
Argynnis aglaja	●				●			●			●			9-13
Argynnis adippe					●	●							●	14
Polygonia interposita				●	●						●		●	8-12
Aglais urticae	●													5
Aglais caschmirensis	●	●	●	●				●			●		●	8-13.5

	1	2	3	4	5	6	7	8	9	10	11	12	13	Alt x1000 ft
Vanessa cardui	•	•	•	•	•	•	•	•	•	•	•	•	•	5-16
Nymphalis xanthomelas				•	•									11-13
Limenitis lepechini	•													8
DANAIDAE														
Danaus chrysippus	•													5
LYCAENIDAE														
Lampides boeticus	•							•						6-9
Zizeeria karsandra	•	•												5-6
Pseudozizeeria maha	•							•						5-7
Celastrina kollari	•													6
Celastrina huegelii		•						•						7.5-10
Pseudophilotes vicrama	•	•		•		•		•						7-9
Everes indica	•							•						5-7.5
Cupido buddhista				•	•									8-12
Iolana gigantea					•									8
Chilades trochilus		•												9
Plebejus samudra	•	•	•	•	•	•		•				•		6-10.5
Agriades jaloka													•	13.5-14
V *Agriades pheretiades*								(•)						?
Albulina asiatica										•	•	•		11.5-16
Albulina galathea				•										12
Albulina chrysopis		•						•		•	•	•		10-15
Albulina omphisa		•	•	•		•								6-10
Aricia agestis	•	•				•								9
Aricia eumedon	•			•		•								7-10
Aricia astorica	•				•									8-13
Plebejus devanica	•	•												8-10
Plebejus bellona						•	•	•	•		•	•		10-15
Plebejus sarta	•										•		•	9-11.5
Polyommatus icarus		•				•								9-11
Polyommatus icadius	•			•				•						6-10
Polyommatus ariana		•	•	•	•	•		•			•	•	•	9-14
Polyommatus stoliczkana					•			•	•					10-14.5
Polyommatus erigone									•		•			15
Polyommatus hunza											•			15-16
Polyommatus pulchella												•		15-16
Heliophorus sena	•	•	•					•						5-7.5
Lycaena phlaeas	•	•	•	•	•			•	•		•		•	5-14.5
Lycaena aditya				•	•		•				•	•		12.5
Lycaena kasyapa					•		•						•	11.5-13
Chaetoprocta odata								•						7.5
Satyrium sassanides	•	•												8-10
RIODINIDAE														
V *Polycaena tamerlana*									(•)					?

V (Verhulst 1999) ; ( ) see text

APPENDIX

Botanical Records (by Muqarrab Shah, PMNH): **Khunjerab Plateau**

Botanical records were made by Dr. Muqarrab Shah (PMNH) during brief visits to Khunjerab in August 2000. The Khunjerab Plateau lies at 15,000-15,500ft and collecting was carried out to *c*16,000ft on adjacent mountain slopes. Approximate altitudinal limits are taken from Roberts *et al.*, 1995) and Polunin and Stainton, 1984). Several species were recorded on the plateau which are listed in the above works with a considerably lower altitudinal limit: for example *Potentilla pamirica, Aster altaicus, Solidago virgo-aurea, Pedicularis pectinata* etc. It is possible that these plants have been accidentally established on the plateau through human agency. However, it seems as or more probable that these species are established naturally on the plateau, extending the known upper limit of their distribution in the Karakoram/Himalaya. Note that the upper limit of some species (e.g. *Arenaria polytrichoides, Potentilla biflora, P. dryadanthoides, Aster heterochaeta* etc.) refer to sites in the great Himalaya at altitudes above the permanent snowline in the Karakoram.

		Altitude (x1000ft)
Ranunculaceae:	*Ranunculus pulchellus*	10-17
Papaveraceae:	*Papaver nudicaule*	12-16
Cruciferae:	*Phaeonychium parryoides*	12-14.5
	Arabidopsis himalaica	10-14
Caryophyllaceae:	*Silene gonosperma*	11-16.5
	Arenaria polytrichoides	14-18
	Oxytropis microphylla	10-15,5
Leguminosae:	*Astragulus himalayanus*	8-15
Rosaceae:	*Potentilla biflora*	13-19
	P. salesoviana	10.5-14
	P. dryadanthoides	10-18
	P. pamirica	11-14
	P. multifida	10-16.5
Saxifragaceae:	*Saxifraga hirculoides*	14-16.5
	S. pulvinaria	14-17
Crassulaceae:	*Rhodiola himalensis*	12-16
	Sedum ewersii	9-15
Compositae:	*Chrysanthemum pyrethroides*	10-16
	Leontopodium monocephalum	10-18
	Aster altaicus	9-13
	A. heterochaeta (flaccidus)	11.5-20
	Erigeron multiradiatus	5-14
	Tanecetum falconeri	10.5-15
	Saussurea simpsonianum	14.5-18.5
	Waldheimia stoliczkai	10-15
	Solidago virga-aurea	6-12.5
Primulaceae:	*Primula denticulata*	5-15
	P. macrophylla	10-16
	Androsace mucronifolia	10-15.5
Gentianaceae	*Swertia speciosa*	8-13
Scrophulariaceae:	*Pedicularis pectinata*	8-13
	P. punctata	9-15
	P. pyraminata	9-16.5
Labiatae:	*Mentha longifolia*	5-12.5
	Nepeta floccosa	9-13
Polygoniaceae:	*Bistorta affinis*	10-16

Botanical records: Kilik Pass and approach

Plant species were recorded along the entire track from Misgar to Kilik. Listed below are species found at approximately the same altitude as the edge of Khunjerab Plateau and higher (15,000-16,000ft). The remarks introducing the Kilik list apply equally to high altitude plants of the Kilik region.

Ranunculaceae:	*Delphinium vestitum*	9-13
Papaveraceae:	*Papaver nudicaule*	10-20
	Corydalis governiana	8-16
Cruciferae:	*Draba altaica*	13-16.5
	D. afghanica	13-15
	D. stenocarpa	8-13
	Chorispora sabulosa	11-16.5
	C. sibirica	11-16
Caryophyllaceae:	*Arenaria polytrichoides*	14-18
	Cerastium cerastiodes	10-16
	Silene gonosperma	11-16.5
Leguminosae:	*Oxytropis microphylla*	10-15.5
Rosaceae:	*Potentilla multifida*	10-16.5
	P. dryanthoides	11.5-16.5
	P. pamiro-alaica	10-14
	P. ochreata	10-16.5
	P. grisea	12-16
	P. gelida	10-15
Saxifragaceae:	*Saxifraga stenophylla*	12-16.5
	S. pulvinaria	14-17
Parnassiaceae:	*Parnassia palustris*	10-14
Crassulaceae:	*Rhodiola himalensis*	12-16
	Sedum ewersii	9-15
Onagraceae:	*Epilobium angustifolium*	10-14
Compositae:	*Saussurea simpsonianum*	14.5-18.5
	Tanecetum tomentosum	11-15
	T. falconeri	10.5-15
	Waldheimia stoliczkai	10-18
	Solidago virga-aurea	6-13.5
	Senecio desfontanei	8-15
	Anaphalis nubigena	13-16.5
	Aster flaccidus	12-17
	A. falconeri	10-14
	Chrysanthemum pyrethroides	7.5-16
	Cremanthodium decaisnei	12-17
	Leontopodium leontopodium	10-17
Plumbaginaceae:	*Acantholimon lycopodiodes*	11.5-19
Primulaceae:	*Androsace mucronifolia*	11-14
Gentianaceae:	*Swertia speciosa*	8-13
Boraginaceae:	*Myosotis sylvatica*	6-13
Scrophulariaceae	*P. punctata*	9-15
	P. pyramidata	7-16.5
Labiatae:	*Nepeta floccosa*	9-14.5