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## Butterfly Diversity and Protection in Turkey

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**Abstract.** The aim of this paper is to demonstrate the outstanding diversity, the endemic and rare taxa, to present a model of evaluation of sites to be protected and to give some recommendations for the protection of butterflies in Turkey.

**Key words.** Butterfly endemism, rare butterflies, priority sites, protection management.

### 1. INTRODUCTION

What should be protected? – In many countries legal prescriptions exist for the protection of plants and animals. As a rule, all measures taken are directed at the conservation of individuals of a single species. Nine of the butterfly species occurring in Turkey are named in Annex II and Annex IV of the Habitats Directive and the Bern Convention. Background information on these species and their threat situation in Europe is given in VAN HELSDINGEN et al. (1996) and WAGENER (1996). The author presented data on the threat and conservation status for all butterfly species occurring in Turkey in the Red Data Book of European Butterflies (VAN SWAAY & WARREN 1999).

In spite of all efforts, the number of butterfly populations incessantly decreases. This experience is depressing for any lepidopterist working in the field, and asks for new ways.

To protect individuals of mammals and birds with a very low rate of increase surely is worthwhile, but to protect individuals of insects such as butterflies with a generally high maximum rate of fertility is scientifically unjustified and is practically not workable. By nature, insects serve as food for many predators like birds, lizards, and spiders. In an undisturbed ecosystem, a butterfly population usually shows only limited annual undulations in their density, because the population is able to compensate such losses through predators and even through unfavourable weather conditions during their life cycle. But such undisturbed habitats become rare more and more by human activities, in Turkey, and elsewhere in Europe and all over the world. The device must call: Protect the populations and their habitats before the last legally protected species has disappeared! That is in favour not only of butterflies but also of other animals and plants, too.

If one wants to protect a butterfly species one has at first to know if and where it occurs at all. Secondly one must know the biology of the species and their environmental

requirements such as special climatic factors, food plants for the larvae and the butterflies, special habitat and vegetation structure and others. Thirdly, one must know what exactly threatens the existence of the species by man's activities, which disturb the balance of the ecosystem of which the species is a part of (cfr. WARREN 1992).

This paper attempts to answer the first question for Turkey. Satisfying answers to the second and third questions can be given presently for only a very few species. A lot of scientific research work of that kind that TULUHAN (1998, fig. 2) has shown in his "flowchart of an effective environmental management" has still to come for many years. The only effective protection of Turkish butterfly taxa right away is therefore the conservation of the sites in which they are still found today. The Tables and Maps herein show where to look for such sites. "Diversity", "endemisms" and "rarity" demonstrate this each in a somewhat different way but the final result is almost the same related to a certain UTM 10 km square.

### 2. DIVERSITY OF BUTTERFLY TAXA IN TURKEY

Species diversity is generally higher in Turkey than in any other country of Europe or the Near East, in plants as well as in animals, not only in butterflies and moths but also in other orders of insects.

The first butterflies from Turkey were described by CRAMER (1775) and HERBST (1798) in the late eighteenth century. Systematic research started in the early nineteenth century, mainly by Hungarian, Austrian and German collectors. STAUDINGER (1878–1881) already could list 199 butterfly species from about 30 localities. In the last time, especially since 1970, the exploration was strongly intensified by Turkish and European lepidopterists so that today 369 species or, including 79 subspecies, 448 taxa of butterflies are known from more than 2300 localities. In Appendix 1, all recognized species and subspecies of butterflies occurring in Turkey

ascertained up to 2003 are listed and shows the number of UTM 10 km squares in which that taxon occurs. The list mainly is based on HESSELBARTH et al. (1995) and represents through corrections and additions the latest stand of faunistic, taxonomic and nomenclatural knowledge.

The species shared between families of butterflies are shown in Table 1. In Turkey, the family Lycaenidae has the highest number of species and the highest number of endemic species or subspecies. Almost every year new taxa are discovered whilst the number of species and subspecies in the other families now seems to be stable. The taxonomic status and the distribution of some described taxa, especially in the genus *Polyommatus* (subgenus *Agrodiaetus*) is still uncertain. Many data for species of *Agrodiaetus* therefore could not be used in this study. The different forms of *Hyponephele lycaon* are treated here as a single *lycaon*-complex, and also *Lepitidea sinapis* and *L. reali* as a single *sinapis*-complex. To settle these open questions still more research is urgently needed.

**Table 1.** Distribution of species among the families of butterflies in Turkey

Family	Species	Subspecies	Total
Hesperiidae	41	5	46
Papilionidae	12	8	20
Pieridae	36	9	45
Lycaenidae	150	26	176
Nymphalidae	125	28	153
(Satyrinae)	(72)	(23)	(95)
	369 species	79 subspecies	448 taxa

The species *Catopsilia florella* and *Hypolimnys missippus* cannot be deemed as stable elements of the Turkish fauna. They are very rare accidental immigrants from Arabia and are not taken into account in the further considerations.

To demonstrate the extraordinarily high butterfly taxa diversity in Turkey, Map 1 shows the number of species for every UTM 10 km square. The squares are enumerated according to their UTM alphanumerical codes from West to East according to the Tactical Piloting Chart.

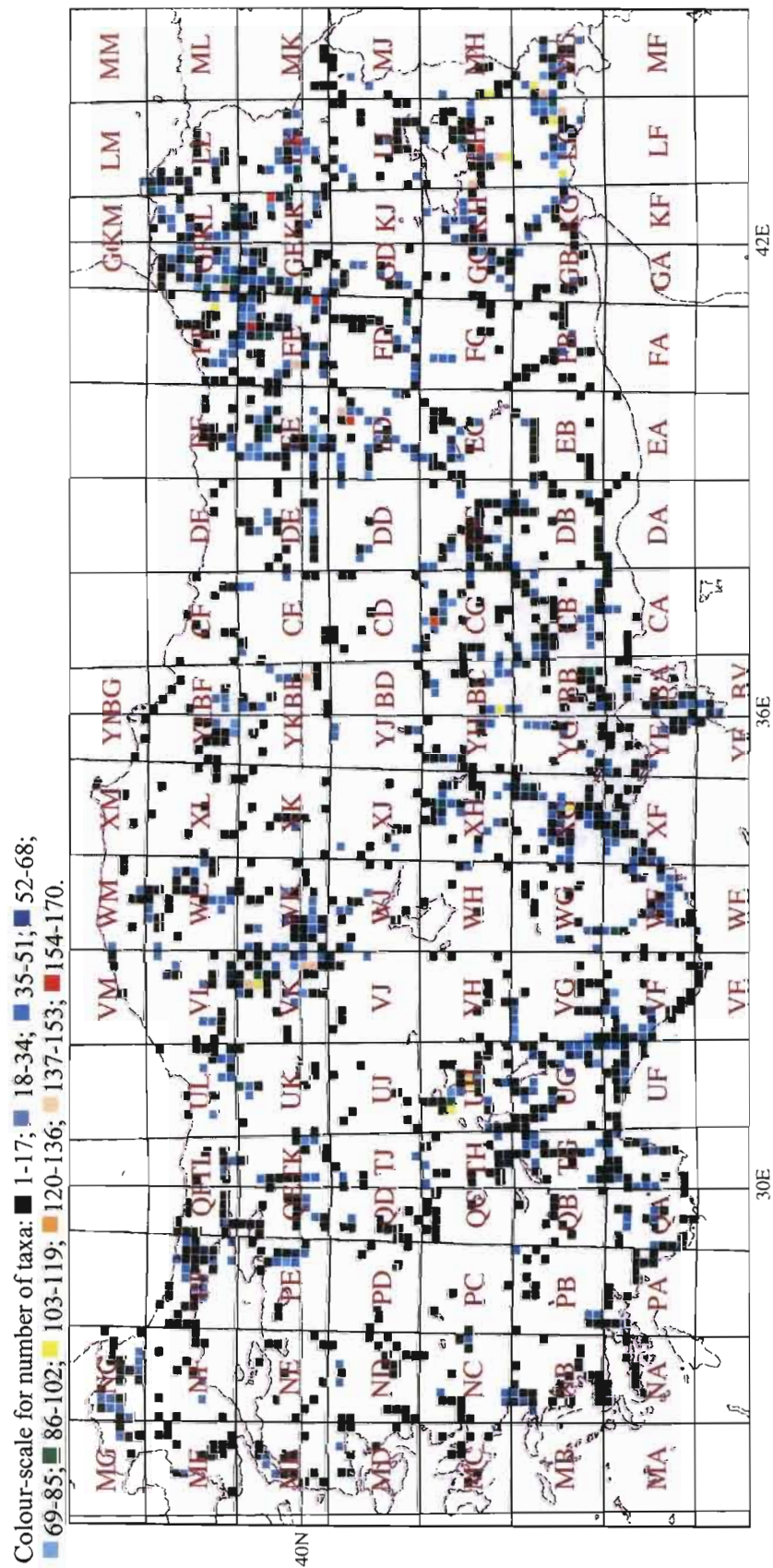
Data for the time between January 1951 and December 2002 were at the author's disposal for 1846 UTM 10 km squares out of 7998 possible ones for Turkey. These data were taken from HESSELBARTH et al. (1995), the data bank for Turkish Butterflies held by Harry van OORSCHOT and publications since 1994 (see references) as well as from a list of observations between 1995 and 2001 sent to the author by Lutz Lehmann.

On the basis of these data the distribution maps in HESSELBARTH et al. (1995) have been made topical. The numbers of taxa per 10 km UTM square have been gained by means of a line list. The resulted numbers from 1 up to 170 taxa/square are given in column 3 of the Appendix 2<sup>1</sup>. To make the map comprehensible the numbers were divided into 10 grades, each of 17 taxa. A certain colour has been assigned to each grade (see "Colour scale for number of taxa" at top of Map 1). White marks squares without any record. By using this scale, the colour grade 1 to 10 can be deemed as a "diversity weight" in favour of the corresponding square.

The squares from which a butterfly taxon is known and the number of taxa observed within one square is not evenly distributed over the country for several reasons:

- The recording level is with 23 % of possible squares moderate. From many squares only one or two species are known, the highest species number in one square is 170 (South side of Ovit Geçidi, Prov. Erzurum).
- The single parts of the country are very different in their natural provision by orography, climate, soil, vegetation, land use and other factors so that only species adjusted to special conditions can survive in certain sites or are, owing to geohistorical processes, restricted geographically to defined regions.
- Large parts of mountainous regions are hardly accessible, others suffer through overgrazing, other parts, formerly steppe land, have been converted into large monotonous wheat fields during the last decades, again other sites became lost through artificial lakes, intensification of agriculture or building especially around the large cities of İstanbul, Bursa, İzmir, Konya, Adana and along the Mediterranean and Marmara coasts. Therefore, large white spots in the map do not necessarily mean that these areas have not been explored. In fact, there are large areas in which one may hardly see any butterfly at all. The number of such sites increases from year to year.
- Usually researchers, going by car, collected butterflies mostly by the wayside, rarely 1 to 2 kilometres from a road. Sites further away, accessible only by walking or riding have been mostly neglected. Many squares have been visited only once and shortly, other places repeatedly and at different times for several days. Success of collecting depends often on the weather and to come across just with the right flying period. Large regions in the Southeast of Anatolia were prohibited to enter by military.

<sup>1</sup> The complete Appendix 2, containing all primary (total species number) and secondary data (rarity, endemism & other weights) for 1846 UTM 10km squares evaluated can be obtained from the Lepidoptera curator of Museum Koenig.



Map 1: Butterfly taxa diversity in Turkey (taxa/square).

- The best explored areas can be deamed from West to East: The region of İstanbul, the surroundings of Bursa with the Uludağ, Sultan Dağları, North- and South-side of Sertavul Geçidi (provinces İçel/Karaman), the districts of Ayaş, Kızılcahamam and Ankara (province Ankara), the area North of Saimbeyli (province Adana), Ala Dağları (provinces Niğde and Kayseri), the area of Kopdağ (provinces Erzurum/Bayburt) and Palandöken Dağı (province Erzurum), Ovit Geçidi (province Erzurum/Rize), the district of Sarıkamış, the Aras Valley between Karakurt and Tuzluca (provinces Kars and Iğdır) and the district of Posof (province Ardahan).

### 3. ENDEMIC BUTTERFLY TAXA IN TURKEY

Under the aspect "what should be protected", nobody will doubt that a site with high species diversity should have priority. But diversity in itself has no comprehensive significance. One must also ask for the quality of a taxon, i.e. does it occur only in Turkey or also in other countries?

The taxa so far known to be endemic for Turkey are listed in Table 2. No differences have been made between species and subspecies. Both are equally important in terms of evolution. Altogether there are 101 endemic taxa, i.e. 22.5 % of 448 known taxa in Turkey. The number of squares in which the taxon has been found gives an idea about the distribution and commonness of each endemic taxon.

**Table 2.** List of endemic taxa in Turkey and number of squares in which they occur

Endemic taxa	Squares
<i>Pyrgus melotis graecus</i> (Oberthür, 1910)	5
<i>Pyrgus bolkariensis</i> De Prins & van der Poorten, 1995	3
<i>Pyrgus aladaghensis</i> De Prins & van der Poorten, 1995	4
<i>Archon apollinus forsteri</i> Koçak, 1977	1
<i>Parnassius nordmanni thomai</i> de Freina, 1980	3
<i>Parnassius apollo graslini</i> Oberthür, 1891	73
<i>Pieris bryoniae turcica</i> Eitschberger & Hesselbarth, 1977	28
<i>Pieris bryoniae goergneri</i> Eitschberger, 1986	2
<i>Pieris bowdeni</i> Eitschberger, [1984]	13
<i>Lycaena virgaureae aureomicans</i> (Heyne, 1897)	8
<i>Lycaena euphratica</i> Eckweiler, 1989	14
<i>Tomares nogelii obscura</i> (Rühl, [1893])	6
<i>Satyrium marcidum mardinum</i> van Oorschot et al. 1985	1
<i>Satyrium zabni</i> van Oorschot & van den Brink, 1991	65
<i>Satyrium myrtale armenum</i> (Rebel, 1901)	26
<i>Cupido minimus albocilia</i> van Oorschot et al., 1984	8
<i>Pseudophilotes bavius vanicola</i> Koçak, 1977	20
<i>Glaucopsyche astraia astraia</i> (Freyer, [1851])	41
<i>Glaucopsyche astraia eckweileri</i> Koçak, 1979	4
<i>Jolana iolas lessei</i> (Bernardi, 1964)	65
<i>Turanana cytis kurdistanica</i> Eckweiler, 1984	5
<i>Plebeius eumedon aladaghensis</i> (Koçak, 1979)	9
<i>Plebeius teberdinus nahizericus</i> (Eckweiler, 1978)	2
<i>Plebeius hyacinthus</i> (Herrich-Schäffer, [1847])	16
<i>Plebeius torulensis</i> (Hesselbarth & Siepe, 1993)	1
<i>Plebeius isauricus isauricus</i> (Staudinger, 1871)	13
<i>Plebeius isauricus latimargo</i> (Courvoisier, 1913)	12
<i>Polyommatus fatima</i> (Eckweiler & Schurian, 1980)	14
<i>Polyommatus myrrha myrrha</i> (Herrich-Schäffer, [1851])	16
<i>Polyommatus myrrha hakkariensis</i> (Koçak, 1977)	11
<i>Polyommatus aedon myrrhinus</i> (Staudinger, 1901)	66
<i>Polyommatus aedon araxianus</i> (Koçak, 1980)	1
<i>Polyommatus eros molleti</i> Carbonell, [1994]	1
<i>Polyommatus bollandi</i> Dumont, 1998	1
<i>Polyommatus buzulmavi</i> Carbonell, [1992]	9
<i>Polyommatus syriacus burak</i> (Koçak, 1992)	14
<i>Polyommatus dezinus</i> (de Freina & Witt, 1983)	3

Endemic taxa	Squares
<i>Polyommatus ossmar ossmar</i> (Gerhard, [1851])	90
<i>Polyommatus interjectus</i> (de Lesse, 1960)	5
<i>Polyommatus antidolus</i> (Rebel, 1901)	18
<i>Polyommatus kurdistanicus</i> (Forster, 1961)	7
<i>Polyommatus menalcas</i> (Freyer, [1837])	144
<i>Polyommatus hopfferi</i> (Herrich-Schäffer, [1851])	80
<i>Polyommatus poseidon poseidon</i> (Herrich-Schäffer, [1851])	89
<i>Polyommatus putnami</i> Dantchenko & Lukhtanov, 2002	2
<i>Polyommatus dama dama</i> (Staudinger, 1892)	2
<i>Polyommatus maraschi</i> Forster, 1956	1
<i>Polyommatus damocles kanduli</i> Dantchenko & Lukhtanov, 2002	1
<i>Polyommatus cilicius cilicius</i> Carbonell, 1998	2
<i>Polyommatus cilicius bolkarensis</i> Carbonell, 1998	4
<i>Polyommatus sertavulensis</i> (Koçak, 1979) (stat. inc.)	6
<i>Polyommatus ernesti</i> Eckweiler, 1989 (stat. inc.)	3
<i>Polyommatus artvinensis</i> (Carbonell, 1997)	13
<i>Polyommatus bilgini</i> Dantchenko & Lukhtanov, 2002	3
<i>Polyommatus haigi</i> Dantchenko & Lukhtanov, 2002	4
<i>Polyommatus sigberti</i> Olivier et al., 2000	24
<i>Polyommatus lycius</i> (Carbonell, 1996)	4
<i>Polyommatus pierceae</i> Lukhtanov & Dantchenko, 2002	1
<i>Polyommatus erzindjanensis</i> Carbonell, 2002	1
<i>Polyommatus turcicolus</i> (Koçak, 1977)	17
<i>Polyommatus guezelmavi</i> Olivier et al., 1999	1
<i>Polyommatus theresiae</i> Schurian et al., 1992	1
<i>Polyommatus surakovi sekercioglu</i> Dantchenko & Lukhtanov, 2002	1
<i>Polyommatus carmon carmon</i> (Herrich-Schäffer, [1851])	48
<i>Polyommatus carmon munzuricus</i> (Rose, 1978)	2
<i>Polyommatus schuriani</i> (Rose, 1978)	13
<i>Polyommatus anticarmon</i> (Koçak, 1983)	9
<i>Polyommatus huberti</i> (Carbonell, 1993)	39
<i>Polyommatus turcicus</i> (Koçak, 1977)	37
<i>Polyommatus merhaba</i> De Prins et. al., 1991	15
<i>Polyommatus iphicarmon</i> Eckweiler & Rose, 1993	1
<i>Polyommatus tankeri</i> (de Lesse, 1960)	10
<i>Polyommatus baytopi</i> (de Lesse, 1959)	13
<i>Argynnis paphia delila</i> Röber, 1896	14
<i>Argynnis aglaja ottomana</i> Röber, 1896	23
<i>Argynnis adippe taurica</i> Staudinger, 1878	16
<i>Boloria graeca karina</i> van Oorschot & Wagener, 1990	2
<i>Coenonympha leander dierli</i> Koçak, 1977	2
<i>Hyponephele urartua</i> de Freina & Aussem, [1987]	8
<i>Hyponephele naricina naricoides</i> Groß, 1977	17
<i>Hyponephele kocaki kocaki</i> Eckweiler, 1978	4
<i>Hyponephele kocaki melesina</i> Weiss & Skala, 2000	5
<i>Hyponephele cadusia zerneca</i> Skala, 2003	3
<i>Erebia ottomana ottomana</i> Herrich-Schäffer, [1847]	6
<i>Melanargia syriaca syriaca</i> (Oberthür, 1894)	14
<i>Melanargia syriaca kocaki</i> Wagener, 1983	35
<i>Melanargia grumi</i> Standfuss, 1892	60
<i>Melanargia titea wiskotti</i> Röber, 1896	22
<i>Melanargia larissa noacki</i> Wagener, 1983	196
<i>Melanargia larissa massageta</i> Staudinger, 1901	11
<i>Melanargia larissa taurica</i> Röber, 1896	104
<i>Satyrus favonius favonius</i> Staudinger, 1892	57

Endemic taxa	Squares
<i>Chazara egina egina</i> (Staudinger, 1892)	11
<i>Chazara egina aisha</i> Rose, 1986	3
<i>Pseudochazara lydia lydia</i> (Staudinger, 1878)	24
<i>Pseudochazara lydia obscura</i> (Staudinger, 1878)	29
<i>Pseudochazara lydia aurora</i> Eckweiler & Rose, [1989]	32
<i>Pseudochazara mamurra mamurra</i> (Herrich-Schäffer, [1846])	56
<i>Pseudochazara mamurra birgit</i> Groß, 1978	30
<i>Pseudochazara mnischezii mnischezii</i> (Herrich-Schäffer, [1851])	152
<i>Pseudochazara anthelea selcuki</i> van Oorschot et al., 1987	8

In the fifth column "endemisms" of Appendix 2 (see Footnote 1), the number of endemic taxa occurring in the corresponding square is named. The distribution of the endemisms is shown in Map 2 "endemisms/square". Two squares (FE68 southside of Ovit Geçidi, province Erzurum, and LH31 10 km N Çatak, province Van) each bear with 16 taxa the highest number of endemisms. To make the map more impressive, this number has been divided into 10 colour grades as indicated at the top of Map 2. These colour grades are listed in Appendix 2 (see Footnote 1) in column 6 "weight 2".

Map 2 shows the distribution of squares with endemisms over the country. Generally, the number of endemisms per square is higher from West to East. The 101 endemic taxa are spread over Anatolia with concentrations in the Southwest, Northeast and Southeast. These concentrations are the result of processes of repeated glacial displacements and postglacial recolonizations and connected with the fact that the endemisms occur today in or nearby former refuges in which they could survive the different pleistocene glacial periods. In the Mediterranean region these refuges are valleys on the southside of the Taurus mountains and the coastal areas along the Mediterranean Sea southward up to Lebanon and Israel. In Northeast, Anatolia postglacial recolonization has taken place mostly from the kolchic refuge in today's Republic of Georgia and the climatically favoured Çoruh Valley. Many of the here existing taxa are rare Caucasian elements not occurring in other regions of Turkey. In Southeast Anatolia, south of Lake Van, the deep gorges of Botan, Harbur and Zab with her rich vertical structures formed a favourable refuge for numerous Tertiary relicts and elements of the Turk-Iranian Zagros fauna and flora, which do not exist in other Turkish regions.

#### 4. RARE BUTTERFLY TAXA IN TURKEY

With the previous actions only the species diversity has been treated in two different ways. But also the rarity of the taxa must be taken into consideration under the aspect of the protection of sites.

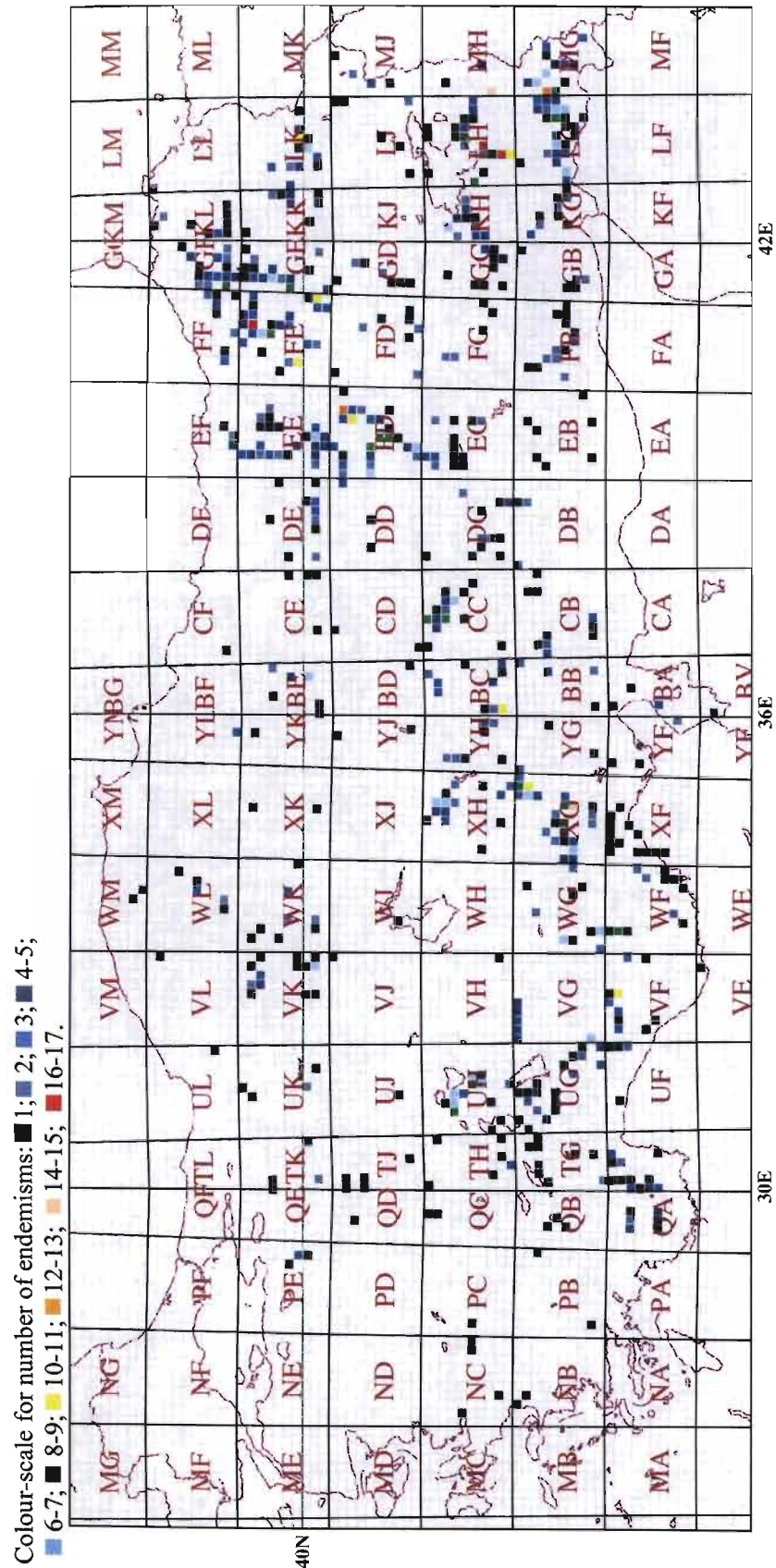
In the list of butterfly taxa occurring in Turkey, there has been said from how many squares the taxon is known. If a butterfly taxon occurs only in up to 50 squares – that are about 10 % of the highest numbers of squares (more than 500) – it can be deemed as rare in Turkey. All taxa with an occurrence in 51 or more squares remain unconsidered, equally valid for endemic as well as non-endemic taxa.

In column seven "rare taxa" of Appendix 2 (see Footnote 1), the number of such rare taxa in the corresponding square is given independently from the number of squares in which the taxa have been found elsewhere. But it is easy to understand that there is quite a difference if a taxon occurs only in one square at all or in fifty squares. Therefore a scale has been used to weight the difference in the occurrence of a taxon in one up to fifty squares through 10 grades of "rarity points" according to the scheme for each taxon (see Table 3).

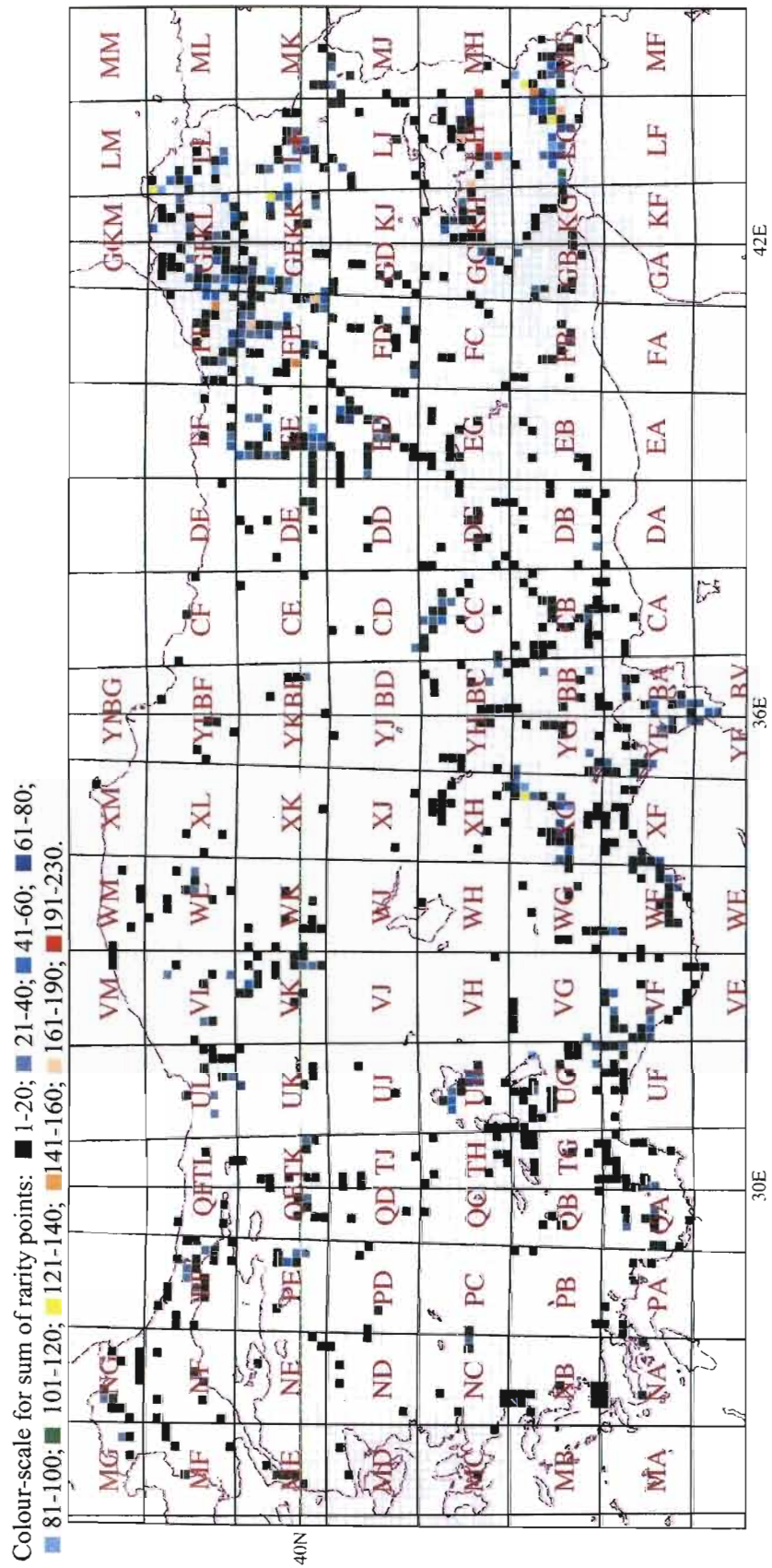
**Table 3.** Scheme for the calculation of "rarity points"

Number of squares / rare taxon	Rarity points	Number of squares / rare taxon	Rarity points
50 – 43	1	20 – 16	6
42 – 36	2	15 – 12	7
35 – 31	3	11 – 8	8
30 – 26	4	7 – 4	9
25 – 21	5	3 – 1	10

If a square holds more than one rare taxon it gains for each taxon the rarity points connected to it. The summarized rarity points for each square are shown to the left in column eight "weight 3" in Appendix 2 (see Footnote 1). For the demonstration of rarity in Map 3, the sum of rarity points has been attributed to 10 colour grades as indicated in the "color scale for sum of rarity points" at top of Map 3. The numbers gained by that way represent the rarity "weight 3" of each square as shown to the right of column eight in Appendix 2 (see Footnote 1).



Map 2: Geographical and numerical distribution of endemic taxa in Turkey (endemisms/ square).



Map 3: Rarity weights/square.

## 5. PRIORITY SITES FOR THE PROTECTION OF BUTTERFLIES IN TURKEY

In a further step, to summarize the results, "weight 1", "weight 2" and "weight 3" of Appendix 2 (see Footnote 1) were added and set to the left in column nine "sum" of Appendix 2. To demonstrate the result in Map 4, the gained values have been attributed to 10 colour grades as indicated in the "Colour scale for sum of weight points" at the top of Map 4. The colour grades 1 to 10 represent the priority of a square for the protection of butterflies in Turkey and are shown to the right in column nine in Appendix 2.

Generally, all squares with high values of more than 5 priority-weight-points (Appendix 2: column "sum", right) can request for priority in the achievement of protection measures. But that level is almost too low for eastern squares and too high for western ones. In western and Central Turkey only a few squares reach such a level of 5 priority points, and endemisms which occur only in one or a few more western squares without a high number of accompanying rare species would not have – on the base of the analysis given above – any chance for protection because they never can stay against squares with a high diversity and a high number of endemisms and rare species in eastern Anatolia. Therefore it is necessary to differentiate in the assessment of the value of protection in the different regions of Turkey. Thus it seems to be appropriate to start from a level of 3 priority points in all western and central provinces of Turkey in choosing sites for protection. In any case, a site with very rare endemism should have priority even if the square inhabited by that endemism does not even reach the level of 3 points. Every such square and endemic taxon occurring in it asks for highest attention by the provincial and local proper authorities concerned with nature protection. Examples for such cases are given below:

*Archon apollinus forsteri* KOCAK, 1977, only occurrence in square WM50, province Kastamonu, Ödemiş south of Küre, priority points: 2;

*Polyommatus dama dama* (STAUDINGER, 1892), only two squares: DC32, province Malatya, south of Yeşilyurt, priority points: 2 (see WAGENER in VAN SWAAY & WARREN 2003), and square DC71, province Adıyaman, north-side of Nemrut Dağı, priority points: 2.

The sites are mostly not identical with the whole area of a square but only with a part of it. Hence the square code can give only a rough indication that in that square exists one or more sites with a high claim for protection. Therefore, the sites have to be explored and exactly defined before any measures can be taken.

## 6. RECOMMENDATIONS

Each butterfly species is embedded in a special environment to which it is adapted and from which it is more or less strongly dependent. The relations are mostly very complex and different for each species. Most of the butterflies like sheltered open sunny places with a rich structure of edges of forests, coppices, hedgerows, grassland, fields, rides, glades or erosion gullies which offer the opportunity for patrolling, perching or hilltopping and mating. A few prefer the shade of a wood. Not so few need a special foodplant for their larvae, others are more stenophagous or even polyphagous. Many nectar-offering flowers are vitally necessary for the butterflies. The males of most species must have the opportunity to suck minerals on wet soil to raise their fitness and the fertility of the copulating female.

One may assume that the sites in squares with a high species diversity basically still fulfil all these requirements, but one should not overlook the threats and declines of Turkish butterflies, ultimately caused by habitat changes or loss of habitats (see WAGENER in VAN SWAAY & WARREN 1999).

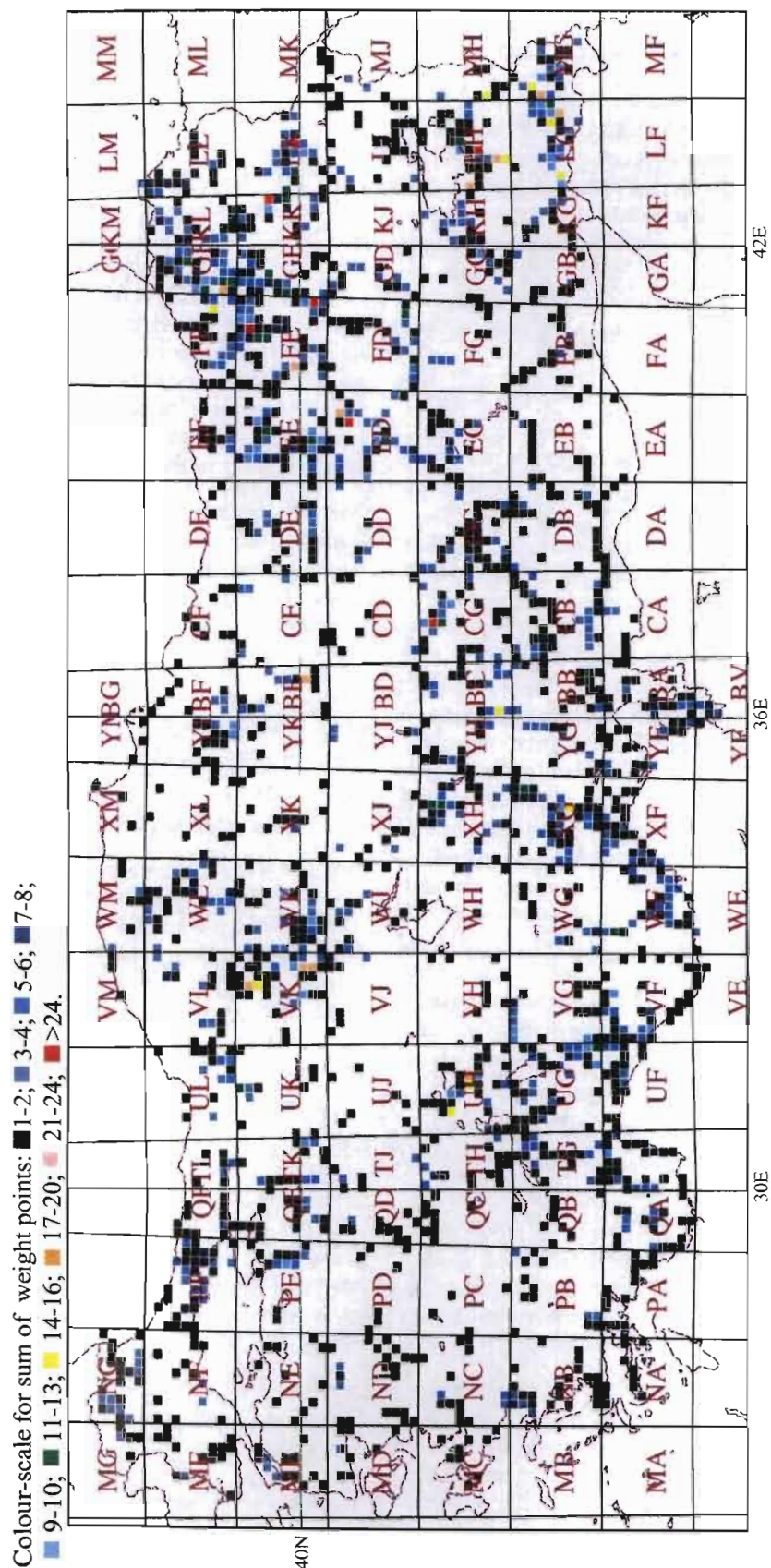
It may be allowed to the author to name some threats and to give some special recommendations on the base of his own observations.

### 6.1. To the address of forestry commissions

Almost every provincial capital in Turkey has today its own "Milli Parkı", a place of woodland, old ones or new afforestations, controlled by the forestry commission. As a rule these National Parks are valuable sites for butterflies but they suffer under a high recreation pressure of the nearby population especially on the weekends of summer months through wild picnicing destroying the low vegetation and leaving behind rubbish.

On the Kayatepe Geçidi on the border of provinces Kastamonu/Çorum between Tosya and İskilip existed in an oakwood an isolated population of *Melanargia larissa lesbina* of particular biogeographic interest. In 1988 this oakwood was found clear-cut and the population through such a radical change of its habitat destroyed. To avoid such unintended threats, the forestry commissions should generally use the selection forest method only.

Experience shows that with the afforestation of an area the low vegetation, before degraded by overgrazing, develops very soon and plentiful which is followed by many butterfly species finding new suitable habitats here. This was observed for example in the new Atatürk Ormanı west of Konya. When the young trees become



Map 4: Priority sites for the protection of butterflies in Turkey.

higher and grow more densely together the low vegetation disappears more and more and, for many butterfly species slowly but surely comes the end of their existence. The forestry commissions should give the threatened butterflies in consequence of the changes in their habitat the chance to survive by not closing small naturally developed clearings and, under circumstances, enlarge such clearings or create some more by taking away some trees. This correlation could be well observed in the Çamlık Milli Parkı, south of the town Yozgat, where within the dense oak and pine wood only very few butterfly species could be found whilst a lot of them could be seen on the top of the hill on open grassy places between single young pines. For the conservation of butterflies this is a very important matter. The *Pinus sylvestris*-wood between Sarıkamış and the Aras valley in the province Kars is only so rich in butterfly species, because there are closed pine-stands always between smaller and larger wet or dry meadows. If the proper forestry commission does not wish to destroy this unique species diversity of 144 taxa it should do without afforestation of the open areas and take care that these meadows be cut once every year not before mid of August. The same should be done to the meadows along the road from Sarıkamış to Handere (Karaorgan) (province Kars), the pine wood north of Hanak (province Ardahan) as well as the pine wood along the road to Kütlü southwest of Gölle (province Erzurum) and in all other similar places all over the country. It is to be seen with respect to Turkish forestry authorities making every effort for culturing existent woods and afforestation in struggle against soil erosion; it would be very appreciative, if they would do the same for the conservation of butterflies and through that of many other animals and plant species.

## 6.2. To the address of the proper authorities for land use and agriculture

Overgrazing by sheep, goats and cattle is a long known problem in Turkey not only because of the destruction of the vegetation and following soil erosion caused by this, but also because of one of the heaviest threats to butterflies and other insects as well as to the soil fauna especially in higher mountains anyway already with sparse vegetation. If one wishes to protect a site for butterflies it is inevitable to reduce overgrazing to extensive grazing. To stop grazing at all would not be desirable in any case as vegetation could grow too high, which is not favourable for numerous butterfly species. This must be considered from place to place and from species to species one wishes to protect.

Where meadows are cut once a year as a traditional way of land use, this should be maintained. The life cycle of the butterflies is adjusted to such a form of land use and

any change would cause heavy damage and loss of species. It is only to take care that cutting of the meadows does not begin before mid August. That's when the butterflies – mostly Blues, Fritillaries and Satyrines – inhabiting such sites have their flying period between 10<sup>th</sup> July and 10<sup>th</sup> August. The butterflies otherwise would not find enough flowers for nectar with the consequence of lower fertility and lower egg-laying rate, if cutting occurs too early.

Thorn-cushion forming species of the plant genus *Onobrychis*, *Astragalus* and *Astracantha* are typical of high mountain steppes and are food plants of some Clouded Yellows (*Colias*) and numerous Blues of the genus *Polyommatus* especially in southeastern Anatolia. In 1985, it could be observed on the northside of Güzeldere Geçidi (province Van) at about 2500 m that a large area of the slope covered with that plant formation had been destroyed through deep ploughing with a tractor not slope-parallel but from top downhill. Such a dangerous behaviour has not only taken away the habitat for the plants and the insects living on them, but has also opened the way for severe soil erosion. The thorn-cushion plant-formation might be useless for agricultural purposes, but they are very important for soil preservation, and vital for many very rare insects in Turkey. This ought to be urgently taken into consideration when areas shall be arranged for the conservation of butterflies.

In valleys of mountainous regions the slopes on either side of a road are very often preferred habitats for numerous plant and insect species. It could be observed several times that with widening out or new constructing of such roads soil material, stones and rocks were taken from the slope above the road and tipped on the other side downward the slope. Through such a procedure the flora and fauna of both sides of the new road were deleted for a long time and along large distances. Already in the planning stage of a new road it should be deliberated how to minimize the damage and to preserve as much as possible of the present vegetation and the animals living thereon. Otherwise many rare species may be lost from that valley even forever. By such a way the populations of the butterfly *Euapatura mirza* living on *Zelkova carpinifolia*, a Tertiary relict, and of the very rare moth *Brahmaea ledereri zaba* whose caterpillars feed on *Fraxinus* in the Zab valley (province Hakkari) have been heavily threatened in connection with the construction of the new road from Hakkari to Çukurca. Rivulets along the roads should be preserved in any case to ensure that male butterflies can supply their needs for water and minerals.

## 6.3. Specific localities or regions

These rather general recommendations can be strengthened by aspects considering individual places or areas:

WAGENER (in VAN SWAAY & WARREN 2003) has identified five areas for eight target-species occurring in Turkey out of 34 in Europe dealt with in the Project "Prime Butterfly Areas in Europe": *Pyrgus cirsii*, *Zerynthia caucasica*, *Parnassius apollo*, *Lycaena ottomanus*, *Maculinea arion*, *Maculinea nausithous*, *Polyommatus dama*, and *Euphydryas aurinia*. The five areas are: a site 10 km SSE of Yeşilyurt, prov. Malatya; Dimçay Valley near Alanya, prov. Antalya; Kopdağı Geçidi, prov. Bayburt and Erzurum; Palandöken, prov. Erzurum; Ovitdağı Geçidi, Prov. Erzurum and Rize. For the last three areas also see below.

**Belgrad ormanı.** Thanks to the forestry authorities the Belgrad ormanı in today's Greater Istanbul is the only place where nature has still a chance to survive (square PF65 in Appendix 2). But even here some rare butterfly species like *Pyronia cecilia* and *Nemeobius lucina* seem to have become extinct during the last thirty years. The understandable search for recreation of the town's people should be directed and controlled to less vulnerable parts of the wood. Protection should also include the conservation of small grassy open places with only one cut of the meadows in late summer.

**Uludağ near Bursa (2543 m).** It is recommended to enlarge the Milli Parkı to the whole area of the Uludağ comprising the squares PE73, PE74, PE82 and PE83 (see Appendix 2) including Soğukpınar to a nature reserve. To satisfy recreation pressure, the place between the forester's lodge and the sanatorium at about 1550 m NN on the westside, the plateau north of the summit nearby the funicular from Bursa and the sporting centre as well as the immediate surrounding of the hotels at about 2000–2100 m NN should be excepted. From a lepidopterological point of view the closed *Abies* wood is not such a valuable place for butterflies except small clearings for *Parnassius mnemosyne*, but the summit region of Uludağ above treeline with the *Nardus stricta* meadows on the northside and the rocky and stony parts on the southside claim for absolute protection and should be held free from recreation during the snowless time of the year. Here are the habitats of the rare butterfly species, *Pieris bryoniae turcica*, *Plebeius pyrenaicus dardanus*, *Plebeius hyacinthus* (type locality), *Erebia ottomana ottomana* (type locality), *Pseudochazara beroe beroe* (type locality), *Parnassius apollo* and other butterflies. But even the area between Osman Gazi and Soğukpınar (500 – 1400 m) on the westside of Uludağ bears numerous other rare butterfly species and is the only locality in Turkey for *Pseudochazara mnischevii tisiphone*. To save the nature of Uludağ with its unique relict fauna, permission to build more hotels and ski-lifts for winter sports should not be granted.

**Sultan Dağları.** The Sultan Dağları, a mountain up to 2610 m NN situated in the provinces Afyon, Konya and

Isparta between the towns Çay and Doğanhisar offers themselves to the creation of a Nature Reserve. Especially the valleys open to the plain on the north- and eastside and the summit region, including the pass road from Akşehir/Engilli to Bağkonak, are inhabited by a very rich flora and fauna with several endemisms and rare butterfly species (see squares UH26, UH32, UH36, UH45, UH46, UH50, UH53, UH54, UH63, UH64 in Appendix 2). The mountain is nearly unsettled. Settlements, small villages and towns follow the foot of the mountain to the plain of Konya. During summer the zone above treeline serves sheep as pasture. Grazing should be restricted before damage to the vegetation and soil becomes apparent.

**Abant Gölü southwest of Bolu.** Abant Gölü (UK59) and Abant valley (UL60 in Appendix 2) in the province Bolu are two sites, geographically connected with each other, with a number of rare plant and butterfly species. The place is threatened by a high recreational pressure already apparent by an alarming decline of several species like *Zerynthia caucasica*, *Pieris bryoniae turcica*, *Erebia aethiops aethiops* and others. The forestry authorities have done well to concentrate the search for recreation, especially for children, to a restricted area. The danger is that along the valley and around the lake might be set up a lot of small "lokantası" (restaurants) – as has already happened in the Dimçay valley near Alanya (province Antalya) – and that some more hotels might be erected. It would mean the death of the particularly delightful scenery of this area and the extinction of more than one rare plant and animal species. That should be avoided in any way.

**Sertavul Geçidi.** This pass on the road from Karaman to Silifke (border of the provinces Karaman and İçel) (WF28 in Appendix 2) offers habitats for 9 endemic and 12 rare butterfly taxa and claims for protection with priority. Meadows especially on the Karaman side of the pass should by no way be changed into arable land. Extensive grazing or grass cutting once a year in late summer would be enough to preserve this place.

**Pine wood north of Saimbeyli.** About 10 to 15 km north of Saimbeyli (province Adana) a large pine wood extends on both sides of the road to Tufanbeyli, 1400–1550 m NN, which is lepidopterologically already a historical place under the name "Hadjin"; it is still today a valuable habitat for 11 endemic and 15 rare butterfly taxa (see square BC41 in Appendix 2) and the only locality for *Polyommatus thesiae*. The site does not seem to be threatened by maintaining the small open places and present use as selection forest and occasional extensive grazing by sheep. But it is to be assumed that in the course of time recreational pressure will occupy the wood. The forestry authorities should recognize this

threat in good time and direct the pressure to the most southern part of the wood.

**Kopdağ.** The Kopdağ (2963 m NN) on the border between the provinces Bayburt and Erzurum (square FE23 in Appendix 2) gleams through high diversity (10 endemic and 37 rare butterfly taxa). The whole area should get the status of a nature reserve upwards an altitude of about 1750 m NN because it is extraordinary rich in wet and dry ecological structures with different plant associations and insect communities. To preserve this unique place, the traditional land use through grazing by sheep on the southern slopes (prov. Erzurum) and cutting on western slopes (prov. Bayburt) should be maintained, grazing by cattle and the change to arable land should strongly be forbidden. Sheep grazing should not be intensified rather extensified in regard to the present state.

**Ovit geçidi.** The whole valley from Yukarı Özbağ in the Çoruh valley upward to the provincial border of Erzurum recommends itself for nature reserve (squares FE68, FE69, FE59 in Appendix 2). It possesses the highest number of butterfly taxa and endemisms in Turkey with 33 rare species. The slopes are downward from the village Çayırözü so steep that they can hardly be used for any purpose. Settlements are nearly missing, the village Özlüce is situated on a plateau near the upper edge of the valley. Most of the species are concentrated on the slopes near Özlüce. Of another species composition is the butterfly fauna in the pass region (2600 m) already in the province Rize and from the pass downward to Sivrikaya and Dereköy on the northside of the pontic mountain with several alpine Caucasian elements (especially of the genus *Erebia*). This part of the mountain on both sides of the road to Rize should be included into the nature reserve (squares FE59, FE49, FF40 in Appendix 2). Both sides of the pass have a different climate and therefore a different flora and fauna which makes this region a very interesting one under ecological and biogeographical aspects.

The valley on the southside of the pass does not need any management, if the present state will be maintained. The very productive meadows on the northside above Sivrikaya in the province Rize could be cut once a year in late summer. But the yaylası are problematical by too much cattle grazing on the slopes and the settlements of the herdsmen with their families especially if the places are repeatedly changed. That way of land use conducts to fertilizing and in consequence to a commutation in the plant composition of the meadows wherefrom the disappearance of the foodplants of rare butterfly species inevitably follows and finally the disappearance of the butterflies themselves.

**Palandöken Dağları.** Palandöken Dağları (about 3100 m NN) about 10 km south of Erzurum and traversed by

the road from Erzurum to Tekman are mountains different to the Kopdağ and Ovit Geçidi in its natural outfit but also rich in structures. The species composition therefore is not the same but in diversity, number of endemisms and rare species also very high (see squares FE90, FE91 in Appendix 2). There are long- and short-grassy slopes, rocky and stony ones and, in the upper parts, erosion gullies and ridges with well developed thorn-cushion-formations. Most of the butterflies fly between 2200 and 2500 m NN, others only above that line. Threats go out to the butterflies from overgrazing and in the lower parts especially from recreation pressure (picnicing in summer and winter sports). Just in the surroundings of Kayak Tesisleri the number of butterflies 20 years ago was still plentiful, today it has obviously declined. It should be taken into consideration, if it is not possible to reconcile conservation of nature and justified recreation through a sensible planning and management in cooperation with the relevant sections of the University.

**Aras valley.** Between Karakurt (1510 m NN, province Kars) and Tuzluca (1075 m NN, province Iğdır) the river Aras has carved out a deep valley in volcanic layers and created a very impressive landscape. The valley is the area of lowest precipitation within Turkey. But the higher slopes of the numerous side-valleys and the erosion gullies profit from the melting covering of snow and allow a diverse shrub vegetation, whilst the herbaceous steppe vegetation on the ground of the valley already dies by the end of June from the lack of rain. These differences in short distances create a lot of differentiated habitats and allows for very high diversity of endemic and rare butterfly taxa (see square LK53, south of Akcay). Here is the only occurrence of *Lycaena phoenicurus*, *Satyrus hyrcanicus cyri*, *Plebeius christophi transcaucasicus* in Turkey, and the only locality of *Polyommatus aedon araxianus* at all (all Turk-Iranian faunal elements). As the area is almost uninhabited nothing stands in the way to declare the valley with its side-valleys as a nature reserve. However, care should be taken that grazing does not get out of control.

**Region south of Lake Van.** The provinces south of Lake Van (Bitlis, Van, Siirt, Şırnak and Hakkari) may be deemed as the treasure chamber of nature for Turkey. Plateaus between 2000 and 3000 m protruded by mountains up to 4135 m covered from eternal snow, deep ravines of streams tributary to Tigris and populated by a relatively very thin human population. Especially some high passes like Kuzgunkıran (LH04), Kurubaş (LH55), Güzeldere (MH02), Süvarihalil (LG34, LG44, LG45, LG58), Tanintanin (LG14, LG25, LG35) and the deep valleys and ravines are very rich in endemic taxa and rare plants and insects. Most of these squares are traversed by the routes from Bitlis to Van, from Çatak to Van, from Van to Yüksekova – Şemdinli, from Van to

Hakkari – Çukurca and from Şırnak to Hakkari which are the best explored. But without doubt there are many other places with a valuable flora and fauna, only these are not accessible. The whole region is predestined for a large National Park like the big ones in the United States of America. It would not even be needed to resettle people as the small towns and villages could remain and some could be included in a comprising management plan for the whole region, which conserves the present state of nature and gives some of the people an occupation. The small irrigated fields in the surroundings of the settlements are valuable habitats for butterflies and therefore should be preserved but not enlarged. Grazing in defined limits and horse breeding could be carried on in the traditional way. A weak and controlled mountaineering tourism might be of interest to the population to raise their income. But the main aim should be to conserve the unique nature, flora and fauna of the whole region accompanied by scientific exploration and research work – after it has been pacified. Let us hope!

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## APPENDIX 1

List of butterfly taxa occurring in Turkey with the number of 10 km UTM squares in which they have been observed

**Hesperiidae****Pyrginae**

*Erynnis* Schrank, 1801  
*tages tages* (Linnaeus, 1758) 241  
*marloyi marloyi* (Boisduval, [1834]) 122  
*Carcharodus* Hübner, [1819]  
*alceae alceae* (Esper, [1780]) 302  
*lavatherae tauricus* Reverdin, 1915 137  
*flocciferus* (Zeller, 1847) 19  
*orientalis* Reverdin, 1913 205  
*stauderi ambiguus* (Verity, 1925) 27  
*Spialia* Swinhoe [1912]  
*phlomidis* (Herrich-Schäffer, [1845]) 102  
*osthelderi osthelderi* (Pfeiffer, 1932) 3  
*orbifer* (Hübner, [1823]) 426  
*Muschampia* Tutt [1906]  
*proto aragonensis* (De Sagarra, 1924) 22  
*proteides* (Wagner, 1929) 68  
*poggei poggei* (Lederer, 1858) 46  
*plurimacula* (Christoph, 1893) 6  
*tessellum tessellum* (Hübner, [1803]) 87  
*tessellum nomas* (Lederer, 1855) 66  
*tessellum tersa* Evans, 1949 20  
*Pyrgus* Hübner [1819]  
*carthami carthami* (Hübner, [1813]) 1  
*sidae sidae* (Esper, [1784]) 184  
*malvae malvae* (Linnaeus, 1758) 18  
*melotis melotis* (Duponchel, [1834]) 17  
*melotis ponticus* (Reverdin, 1914) 189  
*melotis graecus* (Oberthür, 1910) 5  
*serratae major* (Staudinger, 1878) 164  
*serratae balcanicus* (Warren, 1926) 1  
*cirsii* (Rambur, [1839]) 24  
*cinarae cinarae* (Rambur, [1839]) 38  
*armoricanus persicus* (Reverdin, 1913) 154  
*aleus alveus* (Hübner, [1803]) 40  
*jupei* (Alberti, 1967) 7  
*bolkariensis* De Prins & v. d. Poorten, 1995 3  
*aladaghensis* De Prins & v. d. Poorten, 1995 4

**Heteropterinae**

*Heteropterus* Duméril 1806  
*morpheus* (Pallas, 1771)  
*Carterocephalus* Lederer, 1852  
*palaemon* (Pallas, 1771)

**Hesperiinae**

*Eogenes* Mabilie, [1909]  
*alcides alcides* (Herrich-Schäffer, [1852]) 19  
*lesliei elama* Wiltshire, 1941 2  
*Thymelicus* Hübner, [1819]  
*lineola* (Ochsenheimer, 1808) 236  
*sylvestris syriacus* (Tutt, [1905]) 387

*novus* (Reverdin, 1916) 36  
*acteon acteon* (Rottemburg, 1775) 80  
*hyrax* (Lederer, 1861) 49  
*Hesperia* Fabricius, 1793  
*comma pallida* (Staudinger, 1901) 85  
*Ochlodes* Scudder, 1872  
*sylvanus* (Esper, 1777) 157  
*Gegenes* Hübner, [1819]  
*pumilio* (Hoffmansegg, 1804) 33  
*nostrodomus* (Fabricius, 1793) 19  
*Pelopidas* Walker, 1870  
*thrax* (Hübner, [1821]) 23  
**Papilionidae**  
**Parnassiinae**  
*Zerynthia* Ochsenheimer, 1816  
*polyxena gracilis* Schultz, 1908 17  
*cerisy cerisy* (Godart, 1824) 193  
*cerisy ferdinandi* Stichel, 1907 2  
*deyrollei* (Oberthür, 1869) 240  
*caucasica* (Lederer, 1864) 10  
*Archon* Hübner, 1822  
*apollinus apollinus* (Herbst, 1798) 215  
*apollinus forsteri* Koçak, 1977 1  
*apollinus thracicus* (Buresch, 1915) 2  
*apollinaris* (Staudinger, [1892]) 29  
*Parnassius* Latreille, 1804  
*mnemosyne caucasica* Verity, [1911] 52  
*mnemosyne sheljuzhko* Bryk, 1914 36  
*mnemosyne nubilosus* Christoph, 1873 39  
*nordmanni nordmanni* [Ménétriés], [1850] 1  
*nordmanni thomai* de Freina, 1980 3  
*apollo graslini* Oberthür, 1891 73  
*apollo tirabzonus* Sheljuzhko, 1924 13  
**Papilioninae**  
*Iphiclides* Hübner, [1819]  
*podalirius podalirius* (Linnaeus, 1758) 387  
*Papilio* Linnaeus, 1758  
*machaon syriacus* Eller, 1936 288  
*alexanor eitschbergeri* Bollino & Sala, 1992 62  
*alexanor orientalis* Romanoff, 1884 22  
**Pieridae**  
**Pierinae**  
*Anthocharis* Boisduval et al., [1833]  
*cardamines cardamines* (Linnaeus, 1758) 289  
*cardamines phoenissa* Kalchberg, 1895 25  
*damone eunomia* (Freyer, 1851) 91  
*gruneri gruneri* Herrich-Schäffer, [1851] 78  
*gruneri armeniaca* Christoph, 1893 28  
*Zegris* Boisduval 1836  
*eupheme menestho* (Ménétrés, 1832) 82  
*Euchloe* Hübner, [1819]  
*belemia belemia* (Esper, [1800]) 15  
*ausonia taurica* Röber, [1907] 350  
*Elphinstonia* Klots, 1930  
*penia* (Freyer, 1851) 30  
*Aporia* Hübner, [1819]

<i>crataegi</i> (Linnaeus, 1758)	382	<i>dispar rutila</i> (Werneburg, 1864)	5
<i>Pieris</i> Schrank, 1801		<i>virgaureae virgaureae</i> (Linnaeus, 1758)	125
<i>brassicae brassicae</i> (Linnaeus, 1758)	410	<i>virgaureae aureomicans</i> (Heyne, 1897)	8
<i>krueperi krueperi</i> Staudinger, 1860	61	<i>ottomanus</i> (Lefebvre, 1830)	18
<i>mannii hethaea</i> Pfeiffer, 1931	141	<i>tityrus tityrus</i> (Poda, 1761)	268
<i>rapae rapae</i> (Linnaeus, 1758)	588	<i>alciphron melibaeus</i> (Staudinger, 1878)	289
<i>ergane detersa</i> Verity, [1908]	198	<i>candens candens</i> (Herrich-Schäffer, [1844])	65
<i>napi pseudorapae</i> Verity, [1908]	368	<i>thersamon</i> (Esper, [1784])	351
<i>bryoniae turcica</i> Eitschb. & Hesselbarth, 1977	28	<i>lampon lampon</i> (Lederer, 1870)	6
<i>bryoniae goergneri</i> Eitschberger, 1986	2	<i>thetis thetis</i> Klug, 1834	138
<i>bowdeni</i> Eitschberger, [1984]	13	<i>asabinus</i> (Herrich-Schäffer, [1851])	115
<i>Pontia</i> Fabricius, 1807		<i>ochimus ochimus</i> (Herrich-Schäffer, [1851])	148
<i>callidice chrysidice</i> (Herrich-Schäffer, [1844])	33	<i>phoenicurus</i> (Lederer, 1870)	3
<i>daplidice</i> (Linnaeus, 1758)	2	<i>euphratica</i> Eckweiler, 1989	14
<i>edusa</i> (Fabricius, 1777)	650	<i>Thecla</i> Fabricius, 1807	
<i>chloridice chloridice</i> (Hübner, [1813])	106	<i>betulae betulae</i> (Linnaeus, 1758)	6
<i>Colotis</i> Hübner, [1819]		<i>Neozephyrus</i> Sibatani & Ito, 1942	
<i>fausta fausta</i> (Olivier, [1804])	12	<i>quercus quercus</i> (Linnaeus, 1758)	79
<b>Coliadinae</b>		<i>Tomares</i> Rambur, 1840	
<i>Colias</i> Fabricius in Illiger, 1807		<i>nogelii nogelii</i> (Herrich-Schäffer, [1851])	66
<i>erate erate</i> (Esper, [1805])	5	<i>nogelii obscura</i> (Rühl, [1893])	6
<i>crocea</i> (Fourcroy, 1785)	779	<i>nesimachus</i> (Oberthür, 1893)	68
<i>chlorocoma</i> Christoph, 1888	24	<i>callimachus</i> (Eversmann, 1848)	9
<i>aurorina aurorina</i> Herrich-Schäffer, [1850]	90	<i>romanovi romanovi</i> (Christoph, 1882)	21
<i>caucasica caucasica</i> Staudinger, 1871	6	<i>Callophrys</i> Billberg, 1829	
<i>thisoa thisoa</i> Ménétriés, 1832	13	<i>rubi</i> (Linnaeus, 1758)	238
<i>thisoa shakuhensis</i> Sheljuzhko, 1935	6	<i>chalybeitincta</i> Sovinsky, 1905	3
<i>hyale</i> (Linnaeus, 1758)	15	<i>mystaphia</i> Miller, 1913	26
<i>alfacariensis</i> Ribbe, 1905	255	<i>suaveola</i> (Staudinger, 1881)	17
<i>Catopsilia</i> Hübner, [1819]		<i>Satyrrium</i> Scudder, 1876	
<i>florella</i> (Fabricius, 1775)	1	<i>w-album</i> (Knoch, 1782)	18
<i>Gonepteryx</i> Leach, [1815]		<i>spini</i> (Fabricius, 1787)	222
<i>rhamni rhamni</i> (Linnaeus, 1758)	38	<i>marcidum marcidum</i> (Riley, 1921)	15
<i>rhamni miljanowskii</i> Nekrutenko, 1966	26	<i>marcidum mardinum</i> van Oorschot et al. 1985	1
<i>rhamni transiens</i> Verity, 1913	147	<i>ilicis ilicis</i> (Esper, [1779])	262
<i>rhamni kurdistanica</i> de Freina, 1990	25	<i>zabni</i> van Oorschot & van den Brink	65
<i>farinosa farinosa</i> (Zeller, 1847)	107	<i>acaciae</i> (Fabricius, 1787)	98
<i>farinosa turcirana</i> de Freina, 1983	130	<i>abdominalis</i> (Gerhard, [1850])	196
<i>cleopatra cleopatra</i> (Linnaeus, 1767)	17	<i>myrtale armenum</i> (Rebel, 1901)	26
<i>cleopatra taurica</i> (Staudinger, 1881)	43	<i>ledereri ledereri</i> (Boisduval, 1848)	60
<b>Dismorphiinae</b>		<i>hyrcanicum cyri</i> (Nekrutenko, 1978)	9
<i>Leptidea</i> Billberg, 1820		<i>Lampides</i> Hübner, [1819]	
<i>sinapis sinapis</i> (Linnaeus, 1758)	282	<i>boeticus</i> (Linnaeus, 1767)	245
<i>reali</i> Reissinger, 1989	?	<i>Leptotes</i> Scudder, 1876	
<i>duponcheli lorkovici</i> (Pfeiffer, 1932)	274	<i>pirithous</i> (Linnaeus, 1767)	74
<b>Lycaenidae</b>		<i>Tarucus</i> Moore, [1881]	
<b>Riodininae</b>		<i>balkanicus</i> (Freyer, [1843])	114
<i>Hamearis</i> Hübner, [1819]		<i>Zizeeria</i> Chapman, 1910	
<i>lucina</i> (Linnaeus, 1758)	2	<i>karsandra karsandra</i> (Moore, 1865)	21
<b>Lycaeninae</b>		<i>Cupido</i> Schrank, 1801	
<i>Cigaritis</i> Donzel, 1847		<i>minimus minimus</i> (Fuessly, 1775)	39
<i>acamas acamas</i> (Klug, 1834)	18	<i>minimus albocilia</i> van Oorschot et al., 1984	8
<i>cilissa</i> Lederer, 1861	9	<i>osiris</i> (Meigen, [1829])	281
<i>maxima</i> Staudinger, 1901	25	<i>argiades</i> (Pallas, 1771)	62
<i>Lycaena</i> Fabricius in Illiger, 1807		<i>alcetas</i> (Hoffmansegg, 1804)	20
<i>phlaeas phlaeas</i> (Linnaeus, 1761)	494	<i>decoloratus</i> (Staudinger, 1886)	1

<i>Celastrina</i> Tutt, 1906		<i>bassoni</i> (Larsen, 1974)	1
<i>argiolus argiolus</i> (Linnaeus, 1758)	309	<i>Polyommatus</i> Latreille, 1804	
<i>Pseudophilotes</i> Beuret, 1958		<i>semiargus bellis</i> (Freyer, [1842])	243
<i>vicrama schiffmuelleri</i> (Hemming, 1929)	252	<i>semiargus antiochenus</i> (Lederer, 1861)	19
<i>bavius egea</i> (Herrich-Schäffer, [1852])	85	<i>coelestinus</i> (Eversmann, 1843)	131
<i>bavius eitschbergeri</i> Koçak, 1975	3	<i>diana</i> (Miller, 1913)	9
<i>bavius vanicola</i> Koçak, 1977	20	<i>fatima</i> (Eckweiler & Schurian, 1980)	14
<i>Scolitantides</i> Hübner, [1819]		<i>escheri</i> (Hübner, [1823])	†
<i>orion orion</i> (Pallas, 1771)	5	<i>dorylas dorylas</i> ([Denis & Schiffmüller], 1775)	42
<i>Glaucopsyche</i> Scudder, 1872			
<i>alexis alexis</i> (Poda, 1761)	366	<i>dorylas armenus</i> (Staudinger, 1871)	21
<i>astraea astraea</i> (Freyer, [1851])	41	<i>amandus amandus</i> (Schneider, 1792)	226
<i>astraea eckweileri</i> Koçak, 1979	4	<i>thersites</i> (Cantener, [1835])	279
<i>Jolana</i> Bethune-Baker, 1914		<i>myrrha myrrha</i> (Herrich-Schäffer, [1851])	16
<i>iolas lessei</i> (Bernardi, 1964)	65	<i>myrrha hakkariensis</i> (Koçak, 1977)	11
<i>Maculinea</i> van Eecke, 1915		<i>aedon myrrhinus</i> (Staudinger, 1901)	66
<i>alcon monticola</i> (Staudinger, 1901)	35	<i>aedon araxianus</i> (Koçak, 1980)	1
<i>arion arion</i> (Linnaeus, 1758)	39	<i>cornelia</i> (Gerhard, [1851])	175
<i>nausithous</i> (Bergsträsser, 1779)	17	<i>eros yildizae</i> Koçak, 1977	16
<i>Lachides</i> Nekrutenko, 1984		<i>eros molleti</i> Carbonell, [1994]	1
<i>galba</i> (Lederer, 1855)	9	<i>eroides eroides</i> (Frivaldszky, 1835)	6
<i>Turanana</i> Bethune-Baker, 1916		<i>ciloicus</i> de Freina & Witt, 1983	3
<i>cytis kurdistan</i> Eckweiler, 1984	5	<i>bollandi</i> Dumont, 1998	1
<i>endymion endymion</i> (Gerhard, [1851])	147	<i>icarus</i> (Rottemburg, 1775)	822
<i>Chilades</i> Moore, [1881]		<i>buzulmavi</i> Carbonell, [1992]	9
<i>trochylus trochylus</i> (Freyer, 1844)	80	<i>daphnis daphnis</i> ([Denis & Schiffmüller], 1775)	7
<i>Plebeius</i> Kluk, 1780			
<i>pylaon sephirus</i> (Frivaldszky, [1835])	320	<i>daphnis versicolor</i> (Heyne, [1895])	286
<i>pylaon turcmenicus</i> (Forster, 1936)	47	<i>daphnis elamita</i> (Le Cerf, 1913)	36
<i>pylaon nichollae</i> (Elwes, 1901)	1	<i>bellargus</i> (Rottemburg, 1775)	340
<i>argus aegidion</i> (Meisner, 1818)	314	<i>syriacus burak</i> (Koçak, 1992)	14
<i>idas baldur</i> (Hemming, 1934)	109	<i>dezinus</i> (de Freina & Witt, 1983)	3
<i>idas altarmenus</i> (Forster, 1936)	5	<i>ossmar olympicus</i> (Lederer, 1852)	†
<i>christophi transcaucasicus</i> (Rebel, 1901)	6	<i>ossmar ossmar</i> (Gerhard, [1851])	90
<i>argyrognomon caspicus</i> (Forster, 1936)	17	<i>corydonius caucasicus</i> (Lederer, 1870)	117
<i>argyrognomon subspecies nova</i> ?	3	<i>coridon coridon</i> (Poda, 1761)	1
<i>alcedo</i> (Christoph, 1877)	48	<i>alcestis alcestis</i> (Zerny, 1932)	78
<i>rosei</i> (Eckweiler, 1989)	1	<i>alcestis karacetinae</i> Lukhtanov & Dantchenko, 2002	1
<i>morgianus morgianus</i> (Kirby, 1871)	2		
<i>loewii loewii</i> (Zeller, 1847)	318	<i>interjectus</i> (de Lesse, 1960) (stat. inc.)	5
<i>eurypilus eurypilus</i> (Freyer, 1851)	315	<i>demavendi</i> (Pfeiffer, 1938)	41
<i>pyrenaicus dardanus</i> (Freyer, [1843])	23	<i>ripartii</i> (Freyer, 1830)	124
<i>eumedon eumedon</i> (Esper, [1780])	53	<i>erivanensis</i> (Forster, 1960)	16
<i>eumedon aladaghensis</i> (Koçak, 1979)	9	<i>admetus</i> (Esper, 1783)	185
<i>eumedon modestus</i> (Nekrutenko, 1972)	16	<i>mithridates</i> (Staudinger, 1878)	60
<i>agestis</i> ([Denis & Schiffmüller], 1775)	488	<i>antidolus</i> (Rebel, 1901)	18
<i>artaxerxes macedonicus</i> (Verity, 1936)	8	<i>kurdistanicus</i> (Forster, 1961)	7
<i>artaxerxes sheljuzhko</i> (Obraztsov, 1935)	17	<i>menalcas</i> (Freyer, [1837])	145
<i>teberdinus nahizericus</i> (Eckweiler, 1978)	2	<i>hopfferi</i> (Herrich-Schäffer, [1851])	80
<i>hyacinthus</i> (Herrich-Schäffer, [1847])	16	<i>poseidon poseidon</i> (Herrich-Schäffer, [1851])	89
<i>torulensis</i> (Hesselbarth & Siepe, 1993)	1	<i>putnami</i> Dantchenko & Lukhtanov, 2002	2
<i>isauricus isauricus</i> (Staudinger, 1871)	13	<i>caeruleus caeruleus</i> (Staudinger, 1871)	†
<i>isauricus dorsumstellae</i> (Graves, 1923)	16	<i>dama dama</i> (Staudinger, 1892)	2
<i>isauricus latimargo</i> (Courvoisier, 1913)	12	<i>wagneri</i> (Forster, 1956)	91
<i>anteros anteros</i> (Freyer, [1838])	121	<i>maraschi</i> Forster, 1956 (stat. inc.)	?
<i>anteros crassipunctus</i> (Christoph, 1893)	45	<i>cilicius cilicius</i> Carbonell, 1998	2

<i>cilicius balkarensis</i> Carbonell, 1998	4	<i>ino schmitzi</i> Wagener, 1983	11
<i>firdussii</i> (Forster, 1956)	66	<i>daphne daphne</i> (Bergsträsser, 1780)	88
<i>artvinensis</i> (Carbonell, 1997)	13	<i>hecate hecate</i> ([Denis & Schiffermüller], 1775)	8
<i>bilgini</i> Dantchenko & Lukhtanov, 2002	3	<i>hecate transcaucasica</i> Wnukowsky, 1929	88
<i>actis</i> (Herrich-Schäffer, [1851])	2	<i>mofidii</i> Wyatt, 1969	13
<i>sigberti</i> Olivier et al., 2000	25	<i>Boloria</i> Moore, [1900]	
<i>pseudactis</i> (Forster, 1960) (stat. inc.)	?	<i>euphrosyne euphrosyne</i> (Linnaeus, 1758)	55
<i>haigi</i> Dantchrenko & Lukhtanov, 2002	4	<i>dia</i> (Linnaeus, 1767)	19
<i>sertavulensis</i> (Koçak, 1979) (stat. inc.)	6	<i>caucasica</i> (Lederer, 1852)	13
<i>ernesti</i> Eckweiler, 1989 (stat. inc.)	3	<i>graeca karina</i> van Oorschot & Wagener, 1990	2
<i>erzindjanensis</i> Carbonell, 2002	1	<b>Nymphalinae</b>	
<i>altivagans altivagans</i> (Forster, 1956)	13	<i>Vanessa</i> Fabricius in Illiger, 1807	
<i>damocles kanduli</i> Dantchenko & Lukhtanov, 2002	1	<i>atalanta atalanta</i> (Linnaeus, 1758)	161
<i>lycius</i> (Carbonell, 1996)	4	<i>cardui</i> (Linnaeus, 1758)	630
<i>pierceae</i> Lukhtanov & Dantchenko, 2002	1	<i>Inachis</i> Hübner, [1819]	
<i>elbursicus</i> (Forster, 1956)	16	<i>io io</i> (Linnaeus, 1758)	53
<i>turcicolus</i> (Koçak, 1977)	17	<i>Aglais</i> Dalman, 1816	
<i>ninae</i> (Forster, 1956)	39	<i>urticae turcica</i> (Staudinger, 1861)	197
<i>aserbeidschanus</i> (Forster, 1956)	9	<i>Polygonia</i> Hübner, [1819]	
<i>guezelmavi</i> Olivier et al., 1999	1	<i>c-album</i> (Linnaeus, 1758)	93
<i>theresia</i> Schurian et al., 1992	1	<i>egea</i> (Cramer, [1775])	154
<i>carmon carmon</i> (Herrich-Schäffer, [1851])	58	<i>Araschnia</i> Hübner, [1819]	
<i>carmon munzuricus</i> (Rose, 1978)	2	<i>levana</i> (Linnaeus, 1758)	1
<i>anticarmon</i> (Koçak, 1983)	9	<i>Nymphalis</i> Kluk, 1780	
<i>schuriani schuriani</i> (Rose, 1978)	13	<i>vaualbum vaualbum</i> ([Denis & Schiff.], 1775)	1
<i>surakovi sekercioghui</i> Dantschenko & Lukhtanov, 2002	3	<i>polychloros polychloros</i> (Linnaeus, 1758)	106
<i>huberti</i> (Carbonell, 1993)	39	<i>xanthomelas ferveescens</i> (Stichel, [1908])	33
<i>turcicus</i> (Koçak, 1977)	37	<i>antiopa antiopa</i> (Linnaeus, 1758)	61
<i>cyaneus cyaneus</i> (Staudinger, 1890)	10	<i>Hypolimnias</i> Hübner, [1819]	
<i>merhaba</i> De Prins et al., 1991	15	<i>misippus</i> (Linnaeus, 1764)	1
<i>iphigenia iphigenia</i> (Herrich-Schäffer, [1847])	84	<b>Apaturinae</b>	
<i>iphicarmon</i> Eckweiler & Rose, 1993	1	<i>Apatura</i> Fabricius in Illiger, 1807	
<i>tankeri</i> (de Lesse, 1960)	11	<i>ilia</i> ([Denis & Schiffermüller], 1775)	1
<i>baytopi</i> (de Lesse, 1959)	13	<i>metis metis</i> Freyer, 1829	12
<i>damon kotshubeji</i> (Sovinsky, [1916])	30	<i>Euapatura</i> Ebert, 1971	
<i>phyllis vanensis</i> (de Lesse, 1957)	36	<i>mirza</i> Ebert, 1971	19
<b>Nymphalidae</b>		<i>Thaleropsis</i> Staudinger, 1871	
<b>Libytheinae</b>		<i>ionia</i> (Eversmann, 1851)	75
<i>Libythea</i> Fabricius in Illiger, 1807		<b>Charaxinae</b>	
<i>celtis</i> (Laicharting, 1782)	100	<i>Charaxes</i> Ochsenheimer, 1816	
<b>Heliconiinae</b>		<i>jasius jasius</i> (Linnaeus, 1767)	16
<i>Argynnis</i> Fabricius in Illiger, 1807		<b>Limenitidinae</b>	
<i>paphia paphia</i> (Linnaeus, 1758)	90	<i>Limenitis</i> Fabricius in Illiger, 1807	
<i>paphia delila</i> Röber, 1896	14	<i>camilla camilla</i> (Linnaeus, 1764)	4
<i>pandora pandora</i> ([Denis & Schiffermüller], 1775)	326	<i>reducta herculeana</i> Stichel, [1908]	241
<i>aglaja aglaja</i> (Linnaeus, 1758)		<i>Neptis</i> Fabricius in Illiger, 1807	
<i>aglaja ottomana</i> Röber, 1896		<i>rivularis rivularis</i> (Scopoli, 1763)	8
<i>adippe adippe</i> ([Denis & Schiffermüller], 1775)	117	<b>Melitaeinae</b>	
<i>adippe taurica</i> Staudinger, 1878	23	<i>Euphydryas</i> Scudder, 1872	
<i>niobe orientalis</i> Alphéraky, 1881	58	<i>iduna inexpectata</i> (Sheljuzhko, 1934)	1
<i>Issoria</i> Hübner, [1819]	16	<i>orientalis</i> (Herrich-Schäffer, [1845])	9
<i>lathonia</i> (Linnaeus, 1758)	238	<i>aurinia bulgarica</i> (Fruhstorfer, 1917)	59
<i>Brenthis</i> Hübner, [1819]	368	<i>Melitaea</i> Fabricius in Illiger, 1807	
		<i>cinxia cinxia</i> (Linnaeus, 1758)	311
		<i>phoebe phoebe</i> ([Denis & Schiffermüller], 1775)	119
		<i>punica telona</i> Fruhstorfer, 1908	216

<i>collina collina</i> Lederer, 1861	34	<i>lycaon bugrai</i> Koçak, 1989 (stat. inc.)	2
<i>collina lokmani</i> van Oorschot & v. d. Brink, 1994	7	<i>lycaon</i> (Gürün-Form, stat. inc., nom. inc.)	8
<i>arduinna</i> (Esper, [1783])	68	<i>lupina intermedia</i> (Staudinger, 1886)	387
<i>trivia trivia</i> ([Denis & Schiffermüller], 1775)	295	<i>Proterebia</i> Roos & Arnscheid, 1980	
<i>didyma didyma</i> (Esper, [1778])	411	<i>afra afra</i> (Fabricius, 1787)	35
<i>persea persea</i> Kollar, 1849	91	<i>Erebia</i> Dalman, 1816	
<i>interrupta interrupta</i> Kolenati, 1846	32	<i>aethiops aethiops</i> (Esper, [1777])	16
<i>diamina diamina</i> (Lang, 1789)	11	<i>aethiops melusina</i> Herrich-Schäffer, [1847]	66
<i>aurelia ciscaucasica</i> Rjabov, 1926	12	<i>medusa euphrasia</i> Fruhstorfer, 1917	33
<i>caucasogenita</i> Verity, 1930	6	<i>hewitsonii</i> Lederer, 1864	14
<i>athalia athalia</i> (Rottemburg 1775)	94	<i>ottomana ottomana</i> Herrich-Schäffer, [1847]	6
<b>Danainae</b>		<i>graucasica transcaucasica</i> Warren, 1950	10
<i>Danaus</i> Kluk, 1780		<i>iranica dromulus</i> Staudinger, 1901	†
<i>chrysippus chrysippus</i> (Linnaeus, 1758)	15	<i>melancholica</i> Herrich-Schäffer, [1846]	11
<b>Satyrinae</b>		<i>Melanargia</i> Meigen, 1828	
<i>Kirinia</i> Moore, 1893		<i>rusciae rusciae</i> (Esper, [1783])	23
<i>roxelana</i> (Kramer, [1777])	199	<i>galathea satnia</i> Fruhstorfer, 1917	108
<i>Esperarge</i> Nekrutenko, 1988		<i>syriaca syriaca</i> (Oberthür, 1894)	14
<i>climene valentinae</i> (Miller, 1923)	148	<i>syriaca kocaki</i> Wagener, 1983	35
<i>Pararge</i> Hübner, [1819]		<i>syriaca karabagi</i> Koçak, 1976	33
<i>aegeria aegeria</i> (Linnaeus, 1758)	80	<i>hylata hylata</i> (Ménétriés, 1832)	40
<i>aegeria tircis</i> (Godart, 1821)	76	<i>grumi</i> Standfuss, 1892	60
<i>Lasiommata</i> Westwood, 1841		<i>titea titania</i> Calberla, 1891	4
<i>megera transcaspica</i> (Staudinger, 1901)	307	<i>titea standfussi</i> Wagener, 1983	38
<i>petropolitana petrolitana</i> (Fabricius, 1787)	14	<i>titea wiskotti</i> Röber, 1896	22
<i>maera</i> (Linnaeus, 1758)	290	<i>larissa lesbina</i> Wagener, 1976	36
<i>menava</i> Moore, 1865	4	<i>larissa astanda</i> (Boisduval, 1848)	34
<i>Ypthima</i> Hübner, 1818		<i>larissa noacki</i> Wagener, 1983	231
<i>asterope asterope</i> (Klug, 1832)	30	<i>larissa massageta</i> Staudinger, 1901	11
<i>Coenonympha</i> Hübner, [1819]		<i>larissa taurica</i> Röber, 1896	105
<i>arcania</i> (Linnaeus, 1761)	66	<i>Satyrus</i> Latreille, 1810	
<i>glycerion glycerion</i> (Borkhausen, 1788)	22	<i>favonius favonius</i> Staudinger, 1892	57
<i>leander leander</i> (Esper, [1784])	57	<i>parthicus</i> Lederer, 1869	13
<i>leander dierli</i> Koçak, 1977	2	<i>ferula</i> (Fabricius, 1793)	23
<i>saadi mesopotamica</i> Heyne, [1894]	107	<i>amasinus amasinus</i> Staudinger, 1861	69
<i>symphyta</i> Lederer, 1870	13	<i>amasinus iranicus</i> Schwingenschuss, 1939	10
<i>pamphilus</i> (Linnaeus, 1758)	506	<i>Minois</i> Hübner, [1819]	
<i>Triphysa</i> Zeller, 1850		<i>dryas dryas</i> (Scopoli, 1763)	8
<i>phryne phryne</i> (Pallas, 1771)	1	<i>Hipparchia</i> Fabricius in Illiger, 1807	
<i>Pyronia</i> Hübner, [1819]		<i>syriaca syriaca</i> (Staudinger, 1871)	176
<i>tithonus</i> (Linnaeus, 1767)	23	<i>senhes</i> (Fruhstorfer, 1908)	105
<i>cecilia</i> (Vallantin, 1894)	1	<i>volgensis delattini</i> Kudrna, 19775	3
<i>Maniola</i> Schrank, 1801		<i>pellucida pellucida</i> (Stauder, 1924)	91
<i>jurtina (janira) phormia</i> (Fruhstorfer, 1909)	436	<i>mersina</i> (Staudinger, 1871)	86
<i>megala</i> (Oberthür, 1909)	18	<i>statilinus</i> (Hufnagel, 1766)	94
<i>telmessia</i> (Zeller, 1847)	263	<i>fatua fatua</i> Freyer, [1843]	123
<i>halicarnassus</i> Thomson, 1990	6	<i>parisatis</i> (Kollar, 1849)	46
<i>Hyponephele</i> Muschamp, 1915		<i>Arethusana</i> de Lesse, 1851	
<i>wagneri wagneri</i> (Herrich-Schäffer, [1846])	70	<i>arethusana</i> ([Denis & Schiffermüller], 1775)	141
<i>urartua</i> de Freina & Aussem, [1987]	8	<i>Brintesia</i> Fruhstorfer, [1911]	
<i>naricina naricoides</i> Groß, 1977	17	<i>circe</i> (Fabricius, 1775)	136
<i>cadusia zerneca</i> Skala, 2003	3	<i>Chazara</i> Moore, 1893	
<i>kocaki kocaki</i> Eckweiler, 1978	4	<i>briseis meridionalis</i> (Staudinger, 1886)	373
<i>kocaki melesina</i> Weiss & Skala, 2000	5	<i>persephone transiens</i> (Zerny, 1932)	179
<i>lycaon ?collina</i> (Röber, 1897) (stat. inc. nom. inc.)	206	<i>bischoffii</i> (Herrich-Schäffer, [1846])	125
<i>?lycaon</i> (?species nova, nom. inc.)	134	<i>egina egina</i> (Staudinger, 1892)	11

<i>egina aisha</i> Rose, 1986	3	<i>mniszechii caucasica</i> (Lederer, 1864)	31
<i>Pseudochazara</i> de Lesse, 1951		<i>mniszechii tisiphone</i> Brown, 1980	1
<i>beroe beroe</i> (Freyer, 1843)	73	<i>anthelea anthelea</i> (Hübner, [1824])	273
<i>lydia lydia</i> (Staudinger, 1878)	24	<i>anthelea selcuki</i> van Oorschot et al., 1987	8
<i>lydia obscura</i> (Staudinger, 1878)	29	<i>thelephassa</i> (Geyer, 1827)	81
<i>lydia aurora</i> Eckweiler & Rose, [1989]	32		
<i>geyeri</i> (Herrich-Schäffer, [1846])	92	The sign “†” with four taxa ( <i>Polyommatus escheri</i> ,	
<i>mamurra mamurra</i> (Herrich-Schäffer, [1846])	56	<i>Polyommatus ossmar olympicus</i> , <i>Polyommatus caeruleus</i>	
<i>mamurra birgit</i> Groß, 1978	30	<i>caeruleus</i> , <i>Erebia iranica dromulus</i> ) symbolizes their	
<i>mamurra schahrudensis</i> (Staudinger, 1881)	13	extinction in Turkey, because they could no more be ob-	
<i>schahkuhensis brandti</i> (Holik, 1949)	1	served during the last fifty years. “?” for taxa whose	
<i>pelopea persica</i> (Christoph, 1877)	186	taxonomic status and distribution is not fully under-	
<i>mniszechii mniszechii</i> (Herrich-Schäffer, [1851])	154	stood.	