

Butterflies (Lepidoptera, Diurna) of the Katunskii Mountain Ridge, Central Altai.

Булавоусые чешуекрылые (Lepidoptera, Diurna) Катунского хребта (Центральный Алтай).

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КЛЮЧЕВЫЕ СЛОВА: дневные бабочки, Горный Алтай, Катунский хребет, биотопическая приуроченность, *Boloria* Moore s.str.

ABSTRACT. Based on the collections and observations made by the author in 1985-1988 in different sites on the Katunskii Mt. Ridge, as well as on the collections of the Zoological Museum of the Biological Institute of the Siberian Division of the Russian Academy of Sciences, Novosibirsk, an annotated list is compiled including 127 butterfly species. In addition, 14 species collected in neighboring areas are regarded as possibly occurring on the range. For each species, all material is presented together with sites and altitudes. For most of the species, their habitat distribution is given, in several cases some other ecological peculiarities are described.

РЕЗЮМЕ. На основании сборов и наблюдений автора, проводившихся в 1985 - 1988 гг. в различных пунктах в пределах хребта Катунские Белки, а также сборов, хранящихся в Зоологическом музее Биологического института Сибирского отделения Российской академии наук, составлен аннотированный список, включающий 127 видов дневных чешуекрылых, отмеченных на данном хребте. Кроме того, 14 видов, собранных в близлежащих пунктах Центрального Алтая, приводятся как возможные. Для каждого вида перечислен весь собранный материал с указанием пунктов сбора и высоты над уровнем моря, для большинства видов по возможности подробно охарактеризована их приуроченность к определенным высотным поясам и растительным сообществам (в ряде случаев упомянуты другие экологические подробности). Русский вариант данной работы депонирован в ВИНТИ: Костерин О.Э. 1993. Дневные чешуекрылые хребта Катунские Белки (Центральный Алтай). Деп. ВИНТИ: 278-В93.

Although the butterfly fauna of the Altai has been studied quite sufficiently [Elwes, 1899; Shtandel, 1957; Korshunov, 1978], data concerning the Central Altai are rather scant. This communication puts on record the observations and collections made by the author while

participating in the work of the Altai Floristic Team of the Central Siberian Botanical Gardens of the USSR Academy of Sciences, Siberian Division, Novosibirsk [ЦСБС СО АН СССР], which explored the range in 1985-1988.

The Katunskii Mt. Ridge [Катунский хребет] (or the "Katunskie Belki" [Катунские Белки] Mt. Ridge) is situated in the most elevated part of the Altai-Sayan Mountain System. It includes the highest summit of Siberia, Mt. Belukha [г. Белуха] (4,506 m a.s.l.), its massif being a powerful center of recent glacier formation. The ridge is characterized by a complete succession of altitudinal vegetation belts of the Altai-Sayan Mountain System, ranging from desertified steppes to the nival zone [Kuminova, 1960; Sedelnikov, 1988]. Since the ridge is latitudinally oriented, the amount of precipitations decreases eastward followed by a certain altitudinal shift in the vegetation cover. For this reason, in the brief description given below, the average altitudes of the respective belts are specified. Vegetation is described according to A.V. Kuminova [1960] and, for the high-mountain zone only, to B.P. Sedelnikov [1988].

The steppe belt is fragmentarily represented by the so-called rocky steppes on southern slopes. Patches of these steppes reach up to 1,500 m and acquire a meadowy nature with altitude. In the lower reaches of the Akkem [Аккем] River overgrazed by sheep, these steppes become desertified. The western and eastern slopes are usually covered by bush thickets, mostly *Caragana arborescens* Lam., *C. pygmaea* (L.) DC., *Spiraea chamaedrifolia* L., *Rosa acicularis* Lindl., *Cotoneaster melanocarpus* Fisch. ex Blytt. Large intermontane kettles adjacent to the range, i.e. Uimonskaya and Katandinskaya [Уймонская и Катандинская котловины] kettles from the north, and Samakha [Самаха] Kettle from the east, were originally also covered by steppes, being now almost completely used for agricultural purposes.

The rivers descending from the northern main slope of the ridge have well developed terrace systems in their

lower flows. These terraces as well as the terraces of the Katun [Кату́нь] River at the northern margin of the range, are covered by meadow or steppe vegetations, from mesophilous meadows on the lower terraces to meadow steppes on the upper ones, sometimes by larch (*Larix sibirica* Ledeb.) parklands with a steppe-like field layer.

The forest belt is well-developed on the northern main slope ranging from the Katun banks (about 900 m alt.) to 2,000 m at the western and 2,200 m at the eastern ends of the ridge. On the southern main slope, the forest belt is narrower or, in the upper reaches of the Katun, it is even fragmentary, with intergrading steppe and subalpine vegetations. Forests cover a typical water erosion relief where numerous streams have narrow gorges and the slopes are very steep. In its lower part, the belt is represented by mixed larch/birch (*Betula pendula* Roth.) forests, with *Spiraea* predominating in a dense understorey. In addition, strips of riparian spruce (*Picea obovata* Ledeb.) forests stretch along river banks and, in the valleys of the Akkem and the Nizhni Kuragan [Нижний Кураган] rivers, patches of aspen woods (*Populus tremula* L.) are present. With altitude, the share of the birch decreases while that of conifers rises. In the lower part of the forest belt, conifers are mostly represented by the larch with participation of the fir (*Abies sibirica* Ledeb.) and the Siberian stone pine (*Pinus sibirica* Du Tour). With altitude, the share of the pine grows, the spruce appears so that at 1,500-1,800 m a.s.l. there are areas of a typical dark-needle taiga, with the spruce predominating. In the Akkem valley, the dark-needle taiga forms a continuous belt. The Siberian stone pine becomes a dominant at 1,800-2,000 m where its pure stands are frequent. *Lonicera altaica* Pall. ex DC. dominates in the undergrowth there, locally *Betula fruticosa* Pall. is also very abundant. Approximately above 1,600 m, large stony screes and stony streams, "kurums" [курумы] become common, with a characteristic set of plant species. At the same altitudes, numerous natural openings appear which are covered with long-forb meadows gradually acquiring a subalpine nature with altitude.

Siberian stone pine or larch subalpine parklands form the upper limits of the forest belt. They alternate with subalpine meadows. These are polydominant or with dominance of either *Anthriscus sylvestris* (L.) Hoffm., *Saussurea latifolia* Ledeb., *Rhaponticum carthamoides* (Willd.) Iljin, *Veratrum lobelianum* Bernh., or *Geranium albiflorum* Ledeb. In the eastern part of the ridge, the subalpine belt is poorly-developed, the alpine type of vegetation contacting the forest belt mostly through larch parklands with dwarf birch (*Betula rotundifolia* Spach.) thickets in the undergrowth layer.

Transition between the subalpine and alpine belts (subalpinotypic and mountain tundra belts, according to V.P. Sedelnikov [1988]) lies at 2,000 m (e.g. at Lake Nizhnee Akkenskoe) to 2,300 m (e.g. at the Katun sources). This usually coincides with a drop in declivity at the bottom of numerous cirques of glacial origin, where long-forb subalpine (subalpinotypic) meadows are replaced by short-forb alpine (alpinotypic) meadows, mainly with dominance of *Aquilegia glandulosa* Fisch. ex Link, *Dracocephalum grandiflorum* L., *Trollius altaicus* C.A.Mey.,

or *Polygonum bistorta* L., while the slopes (mostly northern) are covered by winter snow-levelled dwarf birch tundra. Approximately at the same altitudes, elevated fragments appear of an ancient denudation peneplain which borders the alpine part of the ridge and occupies a substantial area in its eastern and, especially, western parts. These smoothly waved surfaces are covered by dwarf birch tundra with fragmentary alpine meadows. The other tundra types, namely that formed by *Dryas oxyodonta* Juz., as well as grassy, lichen, and detritous tundras, are developed at 2,400-2,600 m. In the eastern part of the ridge, the tundras formed by *Kobresia myosuroides* (Vill.) Fiori et Paol. are frequent. They become very common on the east of the ridge under study. At greater altitudes, the higher plants (e.g. *Rhodiola quadrifida* (Pall.) Fisch. et Mey., *Salix berberifolia* Pall., *Saxifraga sibirica* L. etc.) are very sparse on screes and rocks free of perennial snow.

In the upper reaches of the Katun River, subalpine meadows with dominance of *Anthriscus sylvestris* are developed up to 2,200 m, while the tundra belt is scarcely represented. Transition to the nival zone above 2,700-2,800 m goes thus via chionophilic alpinotypic meadows [Sedelnikov, 1988] with dominance of *Ranunculus altaicus* Laxm., *Sibbaldia procumbens* L., *Callianthemum sajanense* (Regel) Witas.

In the wide and flat valleys of the upper flow of the Katun River, the Belaya Berel [Белая Берель] and, to some extent, the Koku [Коксу] rivers, at 1,600-1,800 m, sedge bogs and tussock wet meadows with more or less dense bushes of *Pentaphylloides fruticosa* (L.) O. Schwarz are developed. In addition, sedge, cottongrass or moss bogs as well as boggy thickets of *Betula rotundifolia* and *Salix glauca* L. are frequent along lake and river banks within the alpine zone.

A more detailed description of the vegetation cover of the Katunskii Ridge as well as a full list of the plant species recorded can be found in Artyomov [1993].

Below, sites are presented where observations and collections have been made. Each site is assigned with a conventional name given in capital letters in brackets. The sites are shown in Fig. 1. In July 1985, the team worked in the valley of the Akkem River: in the alpine zone around Akkem lakes, at 2,000-2,500 m (UPPER AKKEM), and in the valley of the Yarl [Ярлу] Stream, a right confluent of the Akkem River, at 2,050-2,500 m (YARLU); in the dark-needle taiga belt, at ca. 1,600 m (MIDDLE AKKEM); and in the lower part of the Akkem valley 8-10 km upstream of its confluence with the Katun (LOWER AKKEM). In August 1985, the eastern part of the ridge was explored: the sources of the Zaychonok [Зайчонок] River in an elevated ancient peneplain, at 2,000-2,500 m (ZAYCHONOK), and the Katun right bank near the Agafonikha [Агафониха] Stream (AGAFONIKHA). In July 1986, the valley of the Nizhni Kuragan was studied: the environs of the lakes in the upper reaches, at 1,700-2,500 m (UPPER KURAGAN), an old burnt-over area at the confluence of the Nizhni Kuragan and Karairy [Карайры] rivers, at 1,400 m (KARAIRY); a narrow taiga-clad gorge of the Eshtu [Ешту] Stream, at 1,200 m, (ESHTU); the vicinity

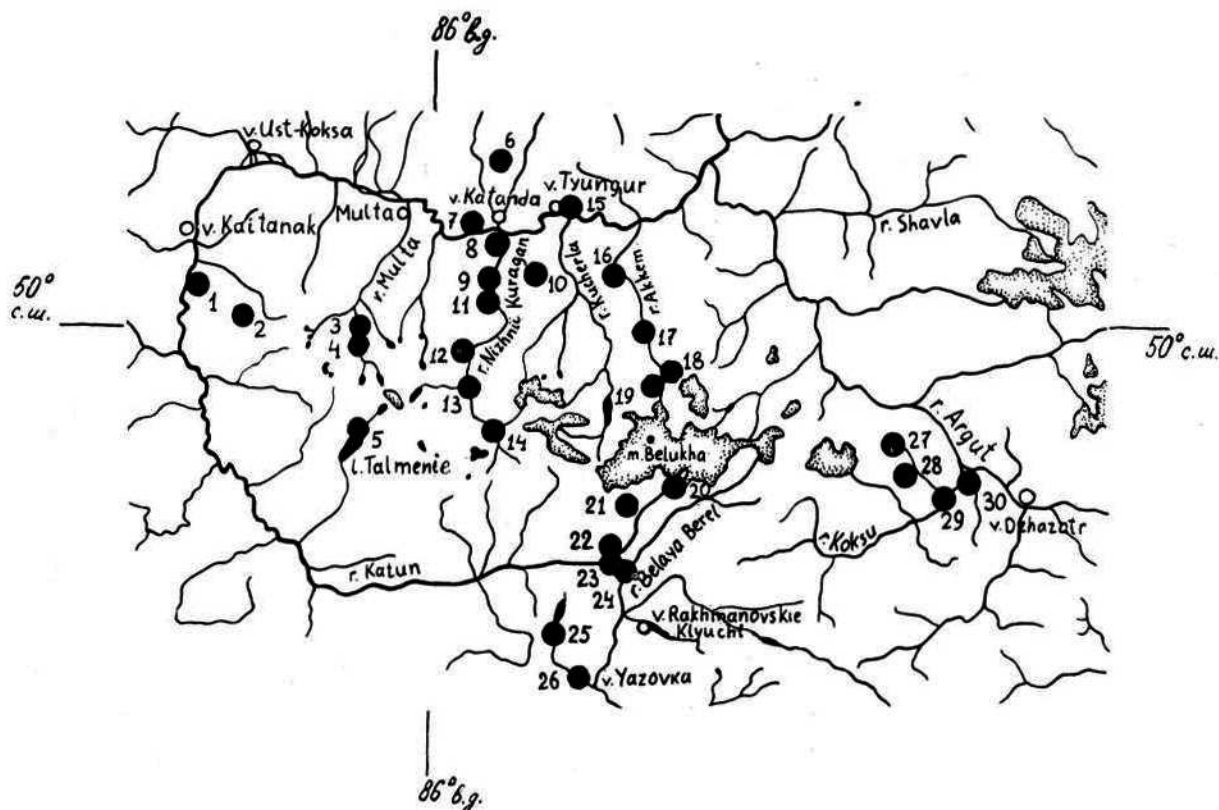


Fig. 1. The map of the studied sites: 1 — Agafonikha; 2 — Zaychonok; 3 — Lower Multa; 4 — Middle Multa; 5 — Talmenie; 6 — 10 km north of Katanda; 7 — 7 km west of Katanda; 8 — Lower Kuragan; 9 — Kuragan; 10 — Bertkem; 11 — Gromotukha; 12 — Eshtu; 13 — Karairy; 14 — Upper Kuragan; 15 — Tyungur; 16 — Lower Akkem; 17 — Middle Akkem; 18 — Yarly; 19 — Upper Akkem; 20 — Katun upper flow; 21 — Kapchal; 22 — Eleshchadyr; 23 — Altyn-Bulak; 24 — Berel; 25 — Waterfall; 26 — Yazovka; 27 — Argem; 28 — confluence of Argem; 29 — Koksuy; 30 — Samakha.

Рис. 1. Карта исследованных местообитаний: 1 — Агафониха; 2 — Зайчонок; 3 — Нижняя Мульта; 4 — Средняя Мульта; 5 — Тальменье; 6 — 10 км С от Катанды; 7 — 7 км З от Катанды; 8 — Нижний Кураган; 9 — Кураган; 10 — Бертекм; 11 — Громотуха; 12 — Ешту; 13 — Карайры; 14 — Верхний Кураган; 15 — Тюнгур; 16 — Нижний Аккем; 17 — Средний Аккем; 18 — Ярлы; 19 — Верхний Аккем; 20 — верховья Катуня; 21 — Капчал; 22 — Елешчадыр; 23 — Алтын-Булак; 24 — Берель; 25 — "водопад"; 26 — Язовка; 27 — Артем; 28 — приток Артема; 29 — Коксу; 30 — Самаха.

of the Gromotukha [Громотуха] Stream where mixed forests alternate with large openings on the Nizhniy Kuragan alluvial plain, at 1,100 m (GROMOTUKHA); stepped and mesophilous meadows on the banks of the Nizhniy Kuragan near its mouth, at 950 m (LOWER KURAGAN). In July 1987, we explored the upper reaches of the Katun and Belaya Berel rivers: the valley of the Kapchal [Капчал] River, at 1,800-2,500 m (KAPCHAL); a subalpine parkland in the low interfluvium of the Katun and Belaya Berel rivers near the Altyn-Bulak [Алтын-Булак] Brook, at 1,700 m (ALTYN-BULAK). The source of the Katun at the Gebler Glacier, at 1,800 m (KATUN SOURCE), the Eleshchadyr [Елешчадыр] Brook at the right bank of the Katun with a larch parkland, 1,700 m (ELESCHADYR), and the valley of Belaya Berel River at the same altitude (BEREL) were also visited. At the junction of the Katunskii and Listvyaga [Листвяга] mt. ranges, in the environs of the waterfall at the Yazovaya [Язовая] River several km south of Lake Yazovoe [Язовое], at 1,600 m, the dark-needle taiga belt (WATERFALL), and the

surroundings of the village Yazovka [Язовка] at the confluence of the Yazovaya and Belaya Berel (YAZOVKA) were also examined. The three latter sites belong to Kazakhstan. In July 1988, the works were carried out in the eastern part of the ridge: in the forest belt at the right bank of the Koksuy [Коксу] River a few km upstream from its confluence with the Argut [Аргут] River, at 1,600 m (KOKSU); and at the highland sources of the Argem [Артем] River (this name is used by the local population while the map gives the name Direntai [Дирентай]), at 2,200-2,500 m (ARGEM), and in the valley of its anonymous right tributary, at 2,200-2,500 m (CONFLUENT OF ARGEM).

Some sites adjacent to the studied range were also visited: in 1985 and 1986, the left Katun bank and the southern foot of the Terektinskii Ridge [Теректинский хребет] near the village Tyungur [Тюнгур], at 900 m (TYUNGUR); and in 1988, the Step Samakha intermontane Kettle at the confluence of the Koksuy and the Argut rivers, at 1,600 m (SAMAKHA)

This paper uses also materials taken in the Katunskii

Ridge by V.V. Dubatolov, his collection being kept at the Zoological Museum of the Biological Institute of the Russian Academy of Sciences, Siberian Division, Novosibirsk (BI), and by I.I. Lyubchanskii, his personal collection.

V.V. Dubatolov collected in the valley of the Nizhnii Kuragan River 7-8 km upstream from its confluence with the Katun, at 1,000 m (KURAGAN), and in the vicinity of the sources of the Bertkem [Берткем] Stream situated between the valleys of the Nizhnii Kuragan and the Kucherla [Кучерла] rivers, 8-10 km SE of the village Katanda [Катанда], at 2,000-2,500 m (BERTKEM). In addition, he thoroughly explored the southern foot of the Terektinskii Ridge, 7 km west of Katanda (see Fig. 1, site 7) where some species appeared to be abundant which were captured on the Katunskii Ridge only by a few specimens. Such cases will be mentioned in the species list. I.I. Lyubchanskii studied the surroundings of the Lake Talmenie [Тальменье озеро], at 1,300 m (TALMENIE); he also visited the lakes Nizhnee Multinskoe [Нижнее Мультинское], at 1,600 m (LOWER MULTA), and Srednee [Среднее] Multinskoe, at 1,700 m (MIDDLE MULTA). In addition, several specimens collected by other persons and preserved in the Museum are also mentioned.

A list of the butterfly species found on the Katunskii Mt. Ridge followed by a full faunistic account and brief ecological remarks is given below. The absence of a reference to altitude implies that it is specified above in the site list. The author's collection is now also kept at the BI.

The following abbreviations are accepted in the text: F.i. — feeding of imagines was observed on..., V.D.— [collected by] V.V. Dubatolov; I.L. — [collected by] I.I. Lyubchanskii.

List of butterfly species of the Katunskii Mt. Ridge.

1. *Spialia orbifer* (Hübner, 1823).

Several individuals were met with in the lower reaches of the Akkem River on a wet ground near a brook at the edge of a mixed forest.

Material: KURAGAN, steppe slope, 15.VII.1983, 1 specimen, V.D.; LOWER AKKEM, 1,040 m, 21.VII.1985, 1 ♂.

2. *Syrictus tessellum* (Hübner, 1802).

It occurs at low altitudes (up to 1,600 m in the Koks valley) on meadows, including steppe meadows.

Material: KURAGAN, 15.VII.1983, 1 ♂, V.D.; LOWER AKKEM, 1,100 m, 26.VII. 1985, 1 ♂; KOKSU, 1,600 m, 11.VII.1988, 1 ♂; 25.VII.1988, 1 ♀.

3. *Pyrgus malvae* (Linnaeus, 1758).

An individual was observed near the Yazovka village on 1.VII.1987 on a steppe meadow on southern slope, 1,200 m.

4. *Pyrgus alveus* (Hübner, 1830).

The species was found twice: YARLU: a small subalpine meadow in an open Siberian stone pine/ larch forest, at 2,150 m, 7.VII.1985, 1 ♂; KOKSU: a bluff of an overgrazed river terrace, 26.VII.1988, 1 ♂.

5. *Pyrgus centaureae* (Rambur, 1839).



Fig. 2. *Pyrgus centaureae* Rambur, the valley of the right confluent of the Argem River, 2,200 m, 14.VII.1988.

Рис. 2. *Pyrgus centaureae* Rambur, долина правого притока р. Аргем, 2200 м, 14.VII.1988.

Recently [Devyatkin, 1990] (Fig.2) it has been shown that two similar sympatric species inhabit Altai: *P. centaureae* and *P. sibiricus* (Reverdin, 1911). Both species seem to have similar ecological standards, as in several sites they were collected simultaneously. I failed to distinguish between them in the field, so I can only say that the skippers of either of the two species were quite common in the upper reaches of the Katun (in 1987) and Argem (in 1988) rivers, however, in the valleys of the Argem and Kuragan no specimens were met with. The skippers were found in the tundra belt, occurring even near perennial snow above 2,500 m. Most frequently they flew in dwarf birch tundras and chionophilic alpinotypic meadows (either polydominant or with dominance of *Sibbaldia procumbens* or *Ranunculus altaicus*). They were recorded also on alpine meadows with *Aquilegia glandulosa* in the valleys of small springs, but were not found below 2,000 m. These butterflies have a habit of sitting on wet ground or moss at the edges of melting snow patches. F.i.: *Lagotis integrifolia* (Willd.) Schischk.

Material: BERTKEM, tundra, 2,300 m, 13.VII.1983, 1 ♂, V.D.; KAPCHAL, 2,000 m, 11.VII.1985, 1 ♀; CONFLUENT OF ARGEM, 2,100 m, 14.VII.1988, 1 ♂; 2,200 m, 20.VII.1988, 1 ♀.

6. *Pyrgus sibiricus* (Reverdin, 1911) (Fig.3).

Material: ZAYCHONOK, 2,000 m, 10.VIII.1985, 1 ♀; CONFLUENT OF ARGEM, 2,400 m, 12.VII.1988, 1 ♀; 2,400 m, 20.VII.1988, 1 ♂; 2,200 m, 20.VII.1988, 1 ♀.



Fig. 3. *Pyrgus sibiricus* Rev., upper flow of the Zaychonok River, 2,000 m, 10.VIII.1985.

Рис. 3. *Pyrgus sibiricus* Rev., верховья р. Зайчонок, 2000 м, 10.VIII.1985.

7. *Carterocephalus palaemon* (Pallas, 1771).

It is a characteristic species of the forest belt, flying in forest meadows on openings, in open forests and at river banks. It also penetrates to subalpine belt where it was met with twice, in both cases on a brook bank on southern slopes: on a short-forb meadow and on a long-forb subalpine meadow with dominance of *Anthriscus sylvestris*.

Material: YAZOVKA, 1,200 m, 1.VII.1987, 1 ♂; KAPCHAL, 1,800 m, 14.VII.1987, 1 ♂; CONFLUENT OF ARGEM, 2,150 m, 17.VII.1988, 1 ♂.

8. *Carterocephalus silvicolus* (Meigen, 1829).

Like the previous species, this one is common in the forest belt in forest meadows.

Material: KURAGAN, 15.VII.1983, 1 ♂; 24.VII.1983, 1 ♂, V.D.; MIDDLE AKKEM, 1,800 m, 10.VII.1985, 1 ♂; 1,600 m, 16.VII.1985, 2 ♂♂, 1 ♀; YAZOVKA, 1,200 m, 1.VII.1987, 1 ♂; WATERFALL, 1,600 m, 14.VII.1987, 2 ♂♂; LOWER MULTA, 1,630 m, 9.VII.1991, 1 ♂; I.L.; TALMENIE, 1,520 m, 14.VII.1991, 1 ♂, 1 ♀; 16.VII.1991, 1 ♀, I.L.

9. *Thymelicus lineola* (Ochsenheimer, 1802).

This species is very common in steppe meadows and steppes, thus occurring mostly on southern slopes at low levels.

Material: LOWER AKKEM, 26.VII.1985, 1 ♂; AGAFONIKHA, 25.VIII.1985, 1 ♂.

10. *Hesperia comma* (Linnaeus, 1758).

Probably owing to its relatively late flying period,

this species was observed only thrice: on 11.VIII.1985 in an *Aquilegia* alpine meadow (ZAYCHONOK, 2,000 m), on 25.VIII.1985 - on a shingle bank of the Katun River (AGAFONIKHA, 1,000 m), and on 24.VII.1986 in a steppe meadow at the mouth of the Nizhnii Kuragan River (1,000 m, 1 ♀). F.i.: *Solidago dahurica* Kitag., *Crepis tectorum* L.

11. *Ochlodes faunus* (Turati, 1950).

I have observed a single individual in a forest meadow (at 1,600 m) in the Yazovaya valley on 17.VII.1987.

Material: KURAGAN; 6.VII.1983, 1 ♂, G.S.Zolotareenko; TALMENIE, 1,520 m, 18.VII.1991, 1 ♂, I.L.

12. *Parnassius phoebus* (Fabricius, 1793) (Fig.4).

This is the most abundant representative of the genus *Parnassius* in the study region. It is most common at the junction of subalpine and alpine meadows where one can observe large numbers of males flying just above the forb in sunny weather. Along stream valleys, where its larval food plant *Rhodiola rosea* L. grows, *Parnassius phoebus* reaches 2,500 m altitude, but apparently avoids tundra habitats. At the same time, it frequently occurs at much lower altitudes in the forest belt, usually at large rocks accompanied by small meadows, as it was observed in the Nizhnii Kuragan and Yazovaya valleys. In the former valley, these butterflies were also common on old burnt-over areas as low as 1,100 m. At the foot of the Terektinskii Ridge, southern in exposure, several individuals were met with even at steppe slopes at 1,100 m. F.i.: various brightly-flowering plants: *Scorzonera*



Fig. 4 a. *Parnassius phoebus* F., male, the Yarlú valley, 2,500 m, 8.VII.1985.

Рис. 4 а. *Parnassius phoebus* F., самец, долина Ярлу, 2500 м, 8.VII.1985.

Fig. 4 b. *Parnassius phoebus* F., female, the upper part of the basin of the Nizhnii Kuragan River, 2,000 m, 12.VII.1986.

Рис. 4 б. *Parnassius phoebus* F., самка, верхняя часть бассейна р. Нижний Курган, 2000 м, 12.VII.1986.

radiata Fisch. et Ledeb., *Aster alpinus* L., *Ligularia sibirica* (L.) Cass., *Sajania monstrosa* (Willd. ex C.Spreng.) M.Pimen. etc. The latter plant is the most attractive for all butterfly species, so it appears to be almost the only plant visited by butterflies on the alpine meadows where it grows.

In 1985, the first males of *P. phoebus* were observed on July 7-9th. In 1986, when all phenological phenomena took place earlier, the species was already abundant in the beginning of July. At the sources of the Zaychonok, the small apollo flew in great numbers until the end of our observations on 18.VIII.1985. On 19.VII.1988, a caterpillar of this species was found on a plant of *Rhodiola rosea* growing on a rock in the Argem valley, at 2,400 m, while in the same site numerous imagines of the same species were flying. This individual probably was extraordinarily belated.

Material: BERTKEM, 9.VII.1983, 1 ♂, Jukka Jalava (Zoological Museum of the University of Helsinki); YARLU, 2,500 m, 7.VII.1985, 1 ♂; 2,150 m, 8.VIII.1985, 1 ♂; UPPER AKKEM, 2,050 m, 9.VII.1985, 1 ♂; ZAYCHONOK, 2,000 m, 11.VIII.1985, 1 ♂; 1,800 m,





Fig. 5. *Parnassius nomion* F. de W., meadow terrace at the lower flow of the Akkem river, 1,040 m, 22.VII.1985.

Рис. 5. *Parnassius nomion* F. de W., луговая терраса в нижнем течении р. Аккем, 1040 м, 22.VII.1985.

14.VIII.1985, 7 ♂, 1 ♀; 18.VIII.1985, 1♂; TYUNGUR: 1,100 m, 1.VII.1986, 1 ♂, 1 ♀; GROMOTUKHA, 3.VII.1986, 1 ♂; KARAIRY, 6.VII.1986, 1 ♂; UPPER KURAGAN, 2,000 m, 12.VII.1986, 4 ♂♂, 1 ♀; KATUN SOURCE, 1,800 m, 9.VII.1987, 1 ♂; WATERFALL, 1.VII.1986, 1 ♂, 1 ♀; ALTYN-BULAK, 20.VII.1987, 1 ♀; 22.VII.1987, 1 ♂, CONFLUENT OF ARGEM, 2,200 m, 12.VII.1988, 2 ♂♂; 14.VII.1988, 1 ♂; 2,000 m, 20.VII.1988, 1 ♂; ARGEM, 2,500 m, 19.VII.1988, 7 ♂♂, 1 ♀; LOWER MULTA, 1,630 m, 9.VII.1991, 1 ♂, I.L.; a mountain in the surroundings of Lake Talmenie, 1,900 m, 19.VII.1991, 1 ♂, 1 ♀, I.L.

13. *Parnassius nomion* Fischer von Waldheim, 1823 (Fig. 5).

This is a common species of rocky southern slopes. It was also found on a steppe meadow at the mouth of the Nizhnii Kuragan River where, however, *Sedum hybridum* L. grew, being certainly a larval food plant of this species. The flight period starts approximately about July 10th; scarce worn-out individuals were observed at the mouth of the Agafonikha stream until 26.VIII.1985.

Material: LOWER AKKEM, 1,040 m, 21.VII.1985, 1 ♂; 1,200 m, 26.VII.1985, 2 ♂; KOKSU, 25.VII.1988, 1 ♂, 1 ♀.

14. *Parnassius apollo* (Linnaeus, 1758) (Fig.6).

This species resembles the previous one in ecology and abundance but is less strictly confined to southern slopes and more easily penetrates to terrace steppe and mesophilous meadows; it is also common on bushy slopes. These butterflies were observed even in the streets of the Tyungur village. The maximal recorded altitude is 1,600

m (the Yazovaya valley). In 1986, the flight period started in the very beginning of July. F.i. of this and the previous species: plants with large and bright inflorescences: *Crepis sibirica* L., *Achillea millefolium* L., *Filipendula vulgaris* L., *Thymus serpyllum* L. s.l., *Allium nutans* L. etc.

Material: KURAGAN, 24.VII.1983, 1 ♂, V.D.; LOWER AKKEM, 1,040 m, 21.VII.1985, 2 ♂♂, 1 ♀; 1,200 m, 26.VII.1985, 2♂; AGAFONIKHA, 1,000 m, 25.VIII.1985, 1 ♀; LOWER KURAGAN, 23.VII.1986, 1 ♂; KOKSU, 11.VII.1988, 1 ♂; 25.VII.1988, 1 ♂; a mountain in the surroundings of Lake Talmenie, 1,950 m, 16.VII.1991, 1 ♂, 1 ♀, I.L.

15. *Parnassius eversmanni* Ménétrière in Siemaschko, 1850.

It was observed by V.V.Dubatovalov in the beginning of the flight period on July 12-14th, 1983, at 2,400 m on the outer southern slope of the cirque of the source of the Bertkem River. The slope was overgrown by *Juniperus* sp. and *Betula rotundifolia*.

Material: BERTKEM, 2,500 m, 13.VII.1983, 1 ♂, 2 ♀♀, V.D. and J.Jalava.

16. *Parnassius ariadne* Lederer, 1853.

Over the territory of the range, this species was met twice: a male was caught at the steppen south slope above Yazovka, and a female feeding on a flowering *Aquilegia sibirica* Lam. was observed in an old open *Pinus sibirica* forest in the Nizhnii Kuragan valley near the Gromotukha Stream on 3.VII.1986. The latter habitat seems to be unusual for this species, as the observations made on 1.VII.1986 on the southern slope of the Terektinskii



Fig. 6. *Parnassius apollo* L. in copula, the eastern slope of the Akkem valley at 1,200 m, 21.VII.1985.

Рис. 6. *Parnassius apollo* L. in copula, восточный склон долины Аккема, 1200 м, 21.VII.1985.

Ridge (about 1 km E of Tyungur) suggest a different, and a very strict, ecological standard. The butterflies were found there in abundance at 1,300 m at a rather narrow belt of steep steppe slope, of southern exposure, just under a ledge covered by a stripe of open larch forest, almost at its edge. On a neighboring, less stepped south-west slope, no individuals were observed. Butterflies of both sexes flew just above the grass. They sat very rarely and only on the flowers of *Dracocephalum nutans* L. or, less frequently, *D. ruyschiana* L., ignoring other flowers.

Parnassius ariadne was also very abundant 7 km west of Katanda, V.D. The habitat of the species at Yazovka coincided with that described in detail above.

Material: TYUNGUR, 1,300 m, 1.VII.1986, 3 ♂♂, 1 ♀; YAZOVKA, 1,300 m, 1.VII.1987, 1 ♂.

17. *Papilio machaon* (Linnaeus, 1758).

Individuals of this species can be met with in all the altitudinal belts. In highlands, the machaon was observed on 7.VII.1985 on a tundra divide between two right confluents of the Akkem River, at 2,500 m; and on 15.VII.1988 in the valley of the Argem confluent, at 2,200 m. In the forest belt, it can be found in forest meadows on openings and near large rocks disturbing tree canopy. At low altitudes, it is more frequent in meadows and steppen slopes. Sometimes the butterflies are found simultaneously with the caterpillars, this being accounted for the longevity of adults. Four larvae of the last instar were found on 24.VII.1986 on *Anthriscus sylvestris* in a forest meadow in the Nizhnii Kuragan valley, at 1,100 m; one larva of the last instar on 25.VII.1988 on *Seseli condensatum* (L.) Reichenb. fil. on the eastern slope of the Koksuy valley.

Material: BERTKEM, 12.VII.1983, 1♀, A.V.Barkalov;



Fig. 7. *Euchloe ausonia* Hb., the Kapchal valley, 1,800 m, 3.VII.1987.

Рис. 7. *Euchloe ausonia* Hb. в долине Капчала, 1800 м, 3.VII.1987.

CONFLUENT OF ARGEM, 2,200 m, 15.VII.1988, 1 ♀;
TALMENIE, 1,520 m, 19.VII.1991, 3 ♂♂, I.L.

18. *Leptidea morsei* (Fenton, 1881).

Material: WATERFALL, a forest meadow on a glade,
1,600 m, 15.VII.1987, 1 ♂.

19. *Leptidea sinapis* (Linnaeus, 1758).

A common species occurring (probably together with
the previous one) in forest meadows and at brooks in the
forest belt and penetrating into subalpine meadows and
the meadows of southern slopes, river terraces and larch
parklands.

Material: TYUNGUR, 30.VI.1985, 1 ♂; KAPCHAL,
1,800 m, 4.VII.1987, 2 ♂♂; WATERFALL, 1,600 m,
15.VII.1987, 1 ♂, 1 ♀; KOKSU, 11.VII.1988, 2 ♂♂;
TALMENIE, 1,520 m, 14.VII.1991, 2 ♂♂, I.L.

20. *Aporia crataegi* (Linnaeus, 1758).

A mass species of low and moderate altitudes in great
numbers penetrating into the alpine and even tundra
belts.

Material: KURAGAN; 6.VII.1983, 1 ♂, G.S.Zolotarev;
UPPER AKKEM, 1,800 m, 4.VII.1985, 1 ♂; 7.VII.1985, 1 ♂;
TYUNGUR, 30.VI.1986, 1 ♀; KAPCHAL, 1,800 m, 4.VII.1987,
2 ♂♂; KOKSU, 1,600, 11.VII.1988, 1 ♂; TALMENIE, 1,520
m, 14.VII.1991, 1 ♂, I.L.

21. *Anthocharis cardamines* (Linnaeus, 1758).

It resembles *Leptidea* spp. in habitat preference, being
common in the forest belt and meadows of lower

altitudes. It was also abundant in the subalpine belt in the
upper Katun basin in 1987. This butterfly obviously
tends to inhabit river and brook banks.

Material: LOWER AKKEM, 1,100 m, 27.VII.1985, 1 ♂; ESHTU,
3.VII.1986, 1 ♂; KAPCHAL, 1,700 m, 11.VII.1987, 1 ♂.

22. *Euchloe ausonia* (Hübner, 1799) (Fig.7).

This species was found only in the upper reaches of
the Katun (including the Kapchal) and in the eastern part
of the range, being quite common there. In the former
region, the butterflies ranged from forest meadows to
alpine ones (from 1,600 to 2,300 m) but they were
especially abundant on subalpine meadows, tending to
inhabit brooks, like the previous species. On the eastern
spurs of the ridge, they were abundant in the subalpine
belt at 2,000-2,200 m. Besides, on 11.VII.1988 several
specimens were found at the bank of the Koks River at
1,600 m in steppe meadows on southeastern slopes where
they flew together with such steppen species as *Colias
chrysotheme* and *Boeberia parmenio*. In the Katun basin,
the species finished flying on July 20ths; in the Koks
basin, they continued flying well over July in highland
but were absent from the Koks banks as early as on
16.VII.1988. F.i.: *Lathyrus gmelinii* Fritsch., *Geranium
albiflorum*.

Material: BERTKEM, 2,300 m, 12.VII.1983, 1 ♂;
13.VII.1983, 1 ♂; 14.VII.1983, 1 ♀, V.D.; KAPCHAL,
1,700 m, 3.VII.1987, 1 ♂, 1 ♀; 2,300 m, 10.VII.1987, 1 ♂;

KATUN SOURCE, 1,800 m, 9.VII.1987, 1 ♀; ALTYN-BULAK, 1,700 m, 13.VII.1987, 2 ♂♂, 1 ♀; KOKSU, 1,600 m, 11.VII.1988, 1 ♂, 2 ♀♀; CONFLUENT OF ARGEM, 2,000 m, 12.VII.1988, 1 ♂; 2,200 m, 14.VII.1988, 2 ♀♀; 21.VII.1988, 1 ♂.

23. *Euchloe creusa* (Doubleday, 1847) ssp. *orientalis* (Bremer, 1844).

The only female was found flying over the road crossing a forest meadow at a large glade near the waterfall at the Yazovaya River, at 1,600 m, on 15.VII.1986. This species was considered to range westward up to the Sayans and has not been yet reported from the Altai Mts. [Korshunov, 1985b; Belyaev, 1986].

24. *Pontia edusa* (Fabricius, 1777) (= *P. daphidice* auct. non Linnaeus, 1758).

P. edusa is most common at low altitudes in the man-affected landscapes (near roads and villages), but flies also on steppe southern slopes. Besides, it was frequent in subalpine parklands at the Altyn-Bulak, and in the Argem confluent valley a specimen was caught in an alpine meadow at 2,200 m, whereas A. Kravchenko has collected a male on the moraine of the Akkem glacier at the altitude of about 2,400 m!

Material: LOWER AKKEM, 3.VII.1985, 1 ♂; AGAFONIKHA, 9.VII.1985, 1 ♂; YAZOVKA, 1,200 m, 1.VII.1987, 1 ♂; WATERFALL 1,600 m, 18.VII.1987, 1 ♂; ALTYN-BULAK, 1,650 m, 21.VII.1987, 1 ♂; 23.VII.1987, 1 ♂, 1 ♀; SAMAKHA, 9.VII.1988, 1 ♀; 10.VII.1988, 1 ♀; KOKSU, 11.VII.1988, 1 ♂, 1 ♀; 21.VII.1988, 1 ♂; 25.VII.1988, 2 ♂♂; CONFLUENT OF ARGEM, 2,200 m, 11.VII.1988, 1 ♂; TALMENIE, 1,520 m, 17.VII.1991, 1 ♂; 19.VII.1991, 1 ♂, I.L.; UPPER AKKEM, the moraine of the Akkem glacier, about 2,400 m, 12.VIII.1993, 1 ♂ (A.Yu. Kravchenko).

25. *Synchlœ callidice* (Hübner, 1805).

Males were observed by V.V. Dubatolov on a southern tundra slope (at 2,500 m) 3 km south of the Bertkem cirque on July 12th and 13th, 1983; a male was caught at the sources of the Nizhnii Kuragan River on an alpine meadow at 2,200 m; several males were observed at the sources of the Kapchal River at 2,500 m. One of them flew over the top of a crest which had just become free of snow. Several minutes after it was captured, another male appeared over this top. Probably the males occupy such relief maxima and exclude other individuals.

Unexpectedly, a female was met with beyond the tundra belt on the forest meadow near the Yazovaya waterfall, at 1,600 m, it fed on the flowers of *Crepis sibirica*.

Material: UPPER KURAGAN, 12.VII.1986, 1 ♂; KAPCHAL, 2,500 m, 11.VII.1987, 1 ♂; WATERFALL, 1,600 m, 15.VII.1987, 1 ♀.

26. *Pieris napi* (Linnaeus, 1758).

This is the most numerous pierid species of both the forest belt and highlands. It flies in terrace meadows,

forest meadows on openings, at river banks, in subalpine (where it is especially abundant) and alpine meadows up to 2,500 m. The specimens collected are very heterogeneous in coloration and might belong to several taxa into which *P. napi* is now being split.

Material: BERTKEM, 2,200 m, 11.VII.1983, 1 ♂; 12.VII.1983, 4 ♂♂, 1 ♀, V.D.; 2,400 m, 12.VII.1983, 1 ♀, A.V. Barkalov; 2,200 m, 13.VII.1983, 2 ♂♂, 4 ♀♀; 14.VII.1983, 1 ♂, V.D.; KURAGAN, 15.VII.1983, 1 ♀; 24.VII.1983, 1 ♂, V.D.; LOWER AKKEM, 21.VII.1985, 2 ♂♂; 28.VII.1985, 1 ♂; ZAYCHONOK, 1,600 m, 18.VIII.1985, 1 ♂; GROMOTUKHA, 21.VII.1986, 1 ♂; YAZOVKA 1,200 m, 1.VII.1987, 1 ♀; KAPCHAL, 1,700 m, 3.VII.1987, 1 ♀; 4.VII.1987, 1 ♂, 1 ♀, 2,100 m, 5.VII.1987, 1 ♂; 2,300 m, 10.VII.1987, 1 ♀; WATERFALL, 1,600 m, 15.VII.1987, 1 ♂; KOKSU, 1,600 m, 11.VII.1988, 3 ♀♀; 25.VII.1988, 1 ♂, 1 ♀; CONFLUENT OF ARGEM, 2,100 m, 12.VII.1988, 2 ♂♂, 1 ♀; 14.VII.1988, 1 ♂; 17.VII.1988, 1 ♂; LOWER MULTA, 1,630 m, 9.VII.1991, 1 ♂, 1 ♀, I.L.; TALMENIE, 1,520 m, 14.VII.1991, 3 ♂♂, 1 ♀, I.L.

27. *Pieris brassicae* (Linnaeus, 1758).

This species rarely occurs at low altitudes.

Material: LOWER AKKEM, 2nd terrace, 1,100 m, 30.VII.1985, 1 ♂; KOKSU, a road in a larch forest, 1,600 m, 11.VII.1988, 1 ♂.

28. *Colias hyale* (Linnaeus, 1758).

This generally synanthropic species is common in the steppe and overgrazed meadows in the lower parts of river valleys. Twice it has been found at about 1,600 m: in Step Samakha and over the road crossing a forest meadow in the Yazovaya valley.

Material: TYUNGUR, 30.VI.1985, 1 ♂; AGAFONIKHA, 25.VIII.1985, 1 ♀; YAZOVKA, 1,200 m, 1.VII.1987, 1 ♂; SAMAKHA, 10.VII.1988, 1 ♂.

29. *Colias palaeno* (Linnaeus, 1758).

C. palaeno was observed only in the Koksuy valley: on a bushy opening in a spruce/larch forest at a brook (1,700 m, 12.VII.1988, 1 ♀); in an open larch forest (1,600 m, 24.VII.1988, 1 ♀); and at the border of a larch forest and a steppen slope (1,600 m, 26.VII.1988, 1 ♂).

30. *Colias chrysotheme* (Esper, 1781).

The species was observed only in the Koksuy valley on July 9th-10th 1988; in Step Samakha in the steppe as well as in irrigated fields, and on southern steppe slopes, often overgrazed, at the same altitude of 1,600 m. It was quite abundant. The males swiftly flew over the ground, females usually got into the air when disturbed. When this region was revisited on 16.VII.1988, these butterflies were already absent. F.i.: *Brassica* sp., *Aster alpinus*.

Material: SAMAKHA, 10.VII.1988, 1 ♂; KOKSU, 11.VII.1988, 1 ♂, 1 ♀.

31. *Colias mongola* Alpheraky, 1897 (Fig.8).

This species was met with once (20.VII.1988), on a crest dividing two sources of the Argem River, as high as at 2,780 m. The detritous tundra covering the crest

Fig. 8. *Colias mongola* Alph., the crest of the cirque at the sources of the Argem River, 2,780 m, 20.VII.1988.

Рис. 8. *Colias mongola* Alph., вершина цирка в верховьях р. Аргем, 2780 м, 20.VII.1988.

Fig. 9. *Colias tycbe* Boeb., the Yarlû valley, 2,500 m, 7.VII.1985.

Рис. 9. *Colias tycbe* Boeb., долина Ярлу, 2500 м, 7.VII.1985.





Fig. 10. *Tongeia fischeri* Ev., southern slope above the Yazovka village, 1,200 m, 1.VII.1987.

Рис. 10. *Tongeia fischeri* Ev., южный склон выше деревни Язовка, 1200 м, 1.VII.1987.

contained very few sparsely growing higher plant species: *Festuca kryloviana* Reverd., *Salix berberifolia*, *Saxifraga sibirica* L., *Dracocephalum discolor* Bunge, *Oxytropis oligantha* Bunge etc., the latter probably could be a larval food plant for *C. mongola*. The day was rainy, but just after the sun had appeared for a short time about a dozen of butterflies of both sexes started flying low above the ground. Sometimes they sat for a while on the lee side of the crest. After the sun disappeared, all of them sat down immovably.

Material: 4 ♂♂, 1 ♀.

32. *Colias tyche* Boeber, 1812 (Fig.9).

C. tyche was found twice: on subalpine meadows in a *Pinus sibirica*/*Larix sibirica* parkland on the southern slope of the Yarlú valley, 2,100 m, and on meadowy slopes on the Koksú left bank, 1,600 m. F.i.: *Ligularia sibirica*.

Material: YARLU, 7.VII.1985, 2 ♂♂, 1 ♀; KOKSU, 11.VII.1988, 2 ♂♂.

33. *Gonepteryx rhamni* (Linnaeus, 1758).

It was observed in the Kapchal valley in subalpine meadows with the last larch trees, 1,700 m.

34. *Nordmannia prunoides* (Staudinger, 1887).

This species occurs at low altitudes, mostly at southern slopes and tends to occur near bushes, as the larvae of this species develop on *Spiraea* (V.V. Dubatolov, personal communication). A specimen was also met with at the bank of the Katun at an edge of a mixed wood.

Material: LOWER AKKEM, 1,200 m, 22.VII.1985, 1 ♂; 26.VII.1985, 1 ♂; AGAFONIKHA, 23.VIII.1985, 1 specimen.

35. *Heodes virgaureae* (Linnaeus, 1758).

It was recorded in meadows on the banks of the Katun (at 900-1,000 m) and on the bank of the Nizhnii Kuragan River near its mouth; from the end of June to the end of August, the species was also found in a wet meadow on the bank of the Koksú at 1,600 m.

Material: TYUNGUR, 30.VI.1985, 1 ♀; AGAFONIKHA, 25.VIII.1985, 1 ♂, 1 ♀.

36. *Heodes hippothoe* (Linnaeus, 1761).

This species was common in alpine and short-forb subalpine meadows at the basins of the sources of the Zaychonok, Nizhnii Kuragan and Katun rivers (in the latter area it also occurred in subalpine parklands), but was not found in the Akkem (probably due to phenological reasons) and Argem (in spite of the thorough search) basins. F.i.: *Saussurea latifolia*.

Material: ZAYCHONOK 11.VIII.1985, 1 ♂; 1,800 m, 14.VIII.1985, 1 ♀; UPPER KURAGAN, 2,200 m, 12.VII.1986, 1 ♂; ALTYN-BULAK; 1,700 m, 22.VII.1987, 1 ♂; subalpine meadow on southern slope to the south of Lake Talmenic, 1,950 m, 19.VII.1991, 1 ♂, I.L.

37. *Heodes alciphron* (Rottemburg, 1775).

A male was collected by V.V. Dubatolov in the Nizhnii Kuragan valley 4 km upstream from its mouth on 9.VII.1983.

38. *Lycena helle* (Denis et Schiffermüller, 1775).

An individual was observed at the bushes on the south-facing rocks in the taiga belt in the Nizhnii Kuragan valley, at 1,300 m, another one at the rock foot in the Katun valley, at 1,700 m.

Material: KURAGAN, long forb forest meadow, 1,300

m, 6.VII.1983, 1 ♀, G.S. Zolotarevko; BERTKEM, 11.VII.1983, 1 ♂, V.D.; KURAGAN, 23.VII.1983, 1 ♀, V.D.; TALMENIE, 1,520 m, 14.VII.1991, 1 ♂, I.L.

39. *Tongeia fischeri* (Eversmann, 1843) (Fig.10).

It occurs on rocky steppes on southern slopes, but never being abundant.

Material: YAZOVKA, 1,300 m, 1.VII.1987, 1 ♀; KOKSU, 1,600 m, 25.VII.1988, 1 ♀; 26.VII.1988, 1 ♀.

40. *Cupido minimus* (Fuessly, 1775).

These butterflies fly in various meadows: valley forb mesophilous meadows, steppe meadows of southern slopes, forest meadows on openings and glades, in the Argem and the Katun valleys they were found on subalpine meadows. A great number of these butterflies was observed on 11.VII.1988 on wet ground in an open several hundred meters from the nearest meadow slope.

Material: TYUNGUR, 30.VI.1985, 1 ♀; KATUN SOURCE, 1,800 m, 9.VII.1987, 1 ♀; WATERFALL, 1,600 m, 14.VII.1987, 1 ♂; 15.VII.1987, 1 ♂; KOKSU, 11.VII.1988, 3 ♂♂, 2 ♀♀; 12.VII.1988, 1 ♂; 25.VII.1988, 2 ♀♀; CONFLUENT OF ARGEM, 2,150 m, 14.VII.1988, 1 ♂; MIDDLE MULTA, 1,650 m, 9.VII.1991, 1 ♂, I.L.

41. *Scolitantides orion* (Pallas, 1771).

This species, as being trophically connected with Crassulaceae, inhabits rocky southern slopes, it is recorded up to 1,650 m (Altyn-Bulak). F.i.: *Geranium pseudosibiricum* J.Mayer, *Sedum ewersii* Ledeb.

Material: KURAGAN, 15.VII.1983, 2 ♂♂, V.D.; LOWER AKKEM, 1,200 m, 26.VII.1985, 1 ♀; KARAIY, 1,400 m, 6.VII.1986, 1 ♂; YAZOVKA, 1,300 m, 1.VII.1987, 1 ♀.

42. *Maculinea arion* (Linnaeus, 1758).

M. arion was found on steppe slopes and in a forest meadow on a glade, at 1,600 m.

Material: LOWER AKKEM, 1,200 m, 26.VII.1985, 1 ♂; YAZOVKA, 1,250 m, 1.VII.1987, 1 ♂; WATERFALL, 1,600 m, 14.VII.1987, 1 ♂.

43. *Maculinea telejus* (Bergsträsser, 1779).

A female was caught on 30.VI.1986 in a larch parkland on the right bank of the Katun near Tyungur.

45. *Plebejus subsolanus* (Eversmann, 1851) (= *P. cleobis* (Bremer, 1861)).

The taxonomic attribution of the blues of the group *Plebejus (idas)* of Altai remains obscure, so our specimens are determined preliminarily. The distinction between *P. subsolanus* and *P. idas* (Linnaeus, 1758) is based on the width of the black margin on the wing upperside in males, which is less than 1 mm in *P. idas* and is much wider in *P. subsolanus*; besides, there are certain differences in the color of wing upperside in the male [Korshunov, 1985a]. According to V.V. Dubatolov's personal communication, these characters exhibit in fact a continuous variation forming a cline in South-West Siberia where the transition between *P. idas* and *P. subsolanus* takes place. The margin width in our specimens is 1.5 mm, the male wing upperside is blue with a slight violet tint.

In the lower part of the Akkem valley, this was the most common *Plebejus* species, being abundant in terrace meadows and meadowy parts of southern slopes. I failed to observe this species in other sites but it should be taken into account that low altitudes in other valleys were examined less thoroughly.

Material: KURAGAN, 9.VII.1983, 1 ♂, V.D.; LOWER AKKEM, 1,040, 21.VII.1985, 1 ♂; 22.VII.1985, 8 ♂♂, 2 ♀♀; 1,100 m, 26.VII.1985, 1 ♂; 27.VII.1985, 2 ♂♂, 2 ♀♀.

46. *Plebejus argyrognomon* (Bergsträsser, 1779).

This species has been found in contrasting habitats. Several individuals were met with in an alpine meadow with dominance of *Hedysarum austrosibiricum* B.Fedtsch. developed on the alluvium of the Yarlú bank, 2,200 m. They were rather small, with the fore wing length of 11 mm in males. Several specimens of the normal size were caught also in a subalpine meadow on the southern slope of the valley of the Argem confluent valley, 2,150 m. At the same time, these butterflies occurred on dry steppes of the hollow of Step Samakha and on the rocky southern slopes of the left bank of the Koksú, 1,600 m.

Material: YARLU, 2,200 m, 8.VII.1985, 1 ♂; SAMAKHA, 1,600 m, 9.VII.1988, 1 ♀; 10.VII.1988, 2 ♂♂, 2 ♀♀; KOKSU, 11.VII.1988, 1 ♂; CONFLUENT OF ARGEM, 14.VII.1988, 1 ♂.

47. *Plebejus pylaon* (Fischer von Waldheim, 1823).

The only female was caught on the steppe southern slope of the left bank of the Koksú at 1,600 m on 11.VII.1988. According to V.V. Dubatolov's personal communication, this species was common in the end of June, 1983, at the southern foot of the Terektinskii Ridge 7 km west of Katanda. Based on the specimens collected there, a new subspecies *Plebejus pylaon katunensis* Balint et Lukhtanov was described [Balint, Lukhtanov, 1990].

47. *Plebejus argus* (Linnaeus, 1758).

This species was found at low altitudes in the majority of the sites examined, besides, it was recorded in a southern slope subalpine meadow in the Argem basin.

Material: KURAGAN, 15.VII.1983, 1 ♂, V.D.; LOWER AKKEM, 1,200 m, 22.VII.1985, 1 ♂; TYUNGUR, 30.VI.1986, 1 ♂; LOWER KURAGAN, 1,000 m, 23.VII.1986, 1 ♀; 24.VII.1986, 1 ♀; YAZOVKA, 1,200 m, 1.VII.1987, 1 ♂; CONFLUENT OF ARGEM, 2,150 m, 14.VII.1988, 1 ♂; KOKSU, 1,600 m, 11.VII.1988, 2 ♂♂; 26.VII.1988, 1 ♂, 1 ♀.

48. *Plebejus lucifera* (Staudinger, 1867).

P. lucifera was found thrice: KURAGAN, 950 m, a steppen slope, 15.VII.1983, 1 ♂, V.D.; LOWER AKKEM, a steppen rocky western slope, 1,100 m, 26.VII.1985, 1 ♀; SAMAKHA, a forb meadow at the edge of a larch forest, 1,600 m, 10.VII.1988, 1 ♀. This species was also abundant on the southern foot of the Terektinskii Ridge 7 km west of Katanda in late June, 1983, V.D.

49. *Vacciniina optilete* (Knoch, 1781).

It is a characteristic species of dark-needle taiga occurring in forests with spruce at 1,300-1,600 m in the places with open stand of trees: on steep slopes, at rock outcrops, on small openings, at rivers and brooks, but it does not penetrate into forest meadows on large openings. F.i.: *Geranium albiflorum*, *Aegopodium alpestre* Ledeb.

Material: KURAGAN, 14.VII.1983, 1 ♂, V.D.; MIDDLE AKKEM, 1,600 m, 16.VII.1985, 1 ♂; ESHTU, 1,300 m, 20.VII.1986, 1 ♂, 1 ♀; KOKSU, 1,600 m, 25.VII.1988, 1 ♀.

50. *Agriades glandon* (Prunner, de, 1798) ssp. *diodorus* (Bremer, 1864) (= *A. orbitulinus* (Staudinger, 1892)) (Fig.11).



Fig. 11. *Agriades glandon* de Prun., the valley of the right confluent of the Argem River, 2,200 m, 20.VII.1988.

Рис. 11. *Agriades glandon* de Prun., долина правого притока р. Аргем, 2200 м, 20.VII.1988.

The only female was caught on 20.VII.1988 in the Argem right confluent valley in a larch parkland with dwarf birch thickets in the undergrowth, developed on an ancient glacial moraine, at 2,200 m.

51. *Albulina orbitulus* (Prunner, de, 1798) (Fig.12).

It was found at the Yarly valley and at the sources of the Argem River. In the former site it was common in a subalpine southern slope meadow with dominance of *Geranium albiflorum*, at 2,250 m, and in an alpine *Hedysarum austrosibiricum* meadow on bank alluvium. In the latter site, the species was found on a marshy *Carex* and dwarf birch tundra in a glacial cirque, in an alpine meadow on a northern slope, at 2,500 m, and on a detritous tundra on an eastern slope at 2,700 m. It is worth mentioning that in both sites the predominating rock is chlorite, and fine detritous chlorite slopes and alluvial banks (with the characteristic plant species *Saxifraga oppositifolia* L., *Crepis nana* Richards.) are widespread. Besides, only in these sites we found such butterflies as *Melitaea arcesia* and *Clossiana frigga*. However, a male of *A. orbitulus* was caught by I.I. Lyubchanskii in the taiga belt in a forest meadow near a large scree on the western slope at the southern bank of Lake Srednee Multinskoe, whereas G.S.Zolotareno found a male as low as on a road on the steppen Katun terrace at a distance of 7 km west of Katanda (23.VI.1983)!

Material: YARLU, 2,150 m, 7.VII.1985, 2 ♂♂; 2,200 m, 8.VII.1985, 1 ♂; ARGEM, 2,500 m, 19.VII.1988, 2 ♂♂; 2,700 m, 20.VII.1988, 1 ♀; MIDDLE MULTA, 1,650 m, 9.VII.1991, 1 ♂, I.L.

52. *Polyommatus erotides* (Staudinger, 1892).

It is a characteristic species of steppes: it occurs on rocky southern slopes, in the hollow of Step Samakha, in

larch parklands. Unexpectedly, a male was met with at 2,200 m in a larch/dwarf birch parkland in the Argem right confluent valley together with *Agriades glandon*!

Material: TYUNGUR, 29.VI.1985, 1 ♀; 30.VI.1985, 1 ♀; LOWER AKKEM, 1,100 m, 21.VII.1985, 1 ♂; 1,050 m, 27.VII.1985, 2 ♂♂; 28.VII.1985, 2 ♂♂; SAMAKHA, 1,600 m, 10.VII.1988, 1 ♂; KOKSU, 1,600 m, 25.VII.1988, 1 ♂; CONFLUENT OF ARGEM, 2,200 m, 17.VII.1988, 1 ♂.

53. *Polyommatus icarus* (Rottemburg, 1775).

This usually abundant species turned out to be rather uncommon in the study area, occurring at low altitudes in meadows and on steppen slopes, as a rule near settlements. It was abundant only in the vicinity of Tyungur and Yazovka.

Material: TYUNGUR, 29.VI.1985, 1 ♀; 30.VI.1985, 6 ♂♂, 3 ♀♀; 30.VI.1986, 1 ♂; YAZOVKA, 1,200 m, 2 ♂♂, 1 ♀; KOKSU, 11.VII.1988, 1 ♂; 26.VII.1988, 1 ♂, 1 ♀.

54. *Plebicula amanda* (Schneider, 1792).

This is a species of valley meadows at 900-1,100 m. It was the most abundant species of Lycaenidae at the Akkem low reaches and also in forest meadows in the Nizhnii Kuragan valley, at 1,200 m. The highest record is 1,600 m (the Akkem valley).

Material: KURAGAN, 15.VII.1983, 1 ♂, V.D.; TYUNGUR, 30.VI.1985, 1 ♂, 1 ♀; 30.VI.1986, 1 ♀; MIDDLE AKKEM, 1,600 m, 16.VII.1985, 1 ♂; LOWER AKKEM, 1,040 m, 21.VII.1985, 2 ♂♂; 22.VII.1985, 1 ♂, 1 ♀; 26.VII.1985, 1 ♂, 1 ♀; 27.VII.1985, 1 ♂; GROMOTUKHA, 1,100 m, 21.VII.1986, 1 ♂.

55. *Sublysandra cyane* (Eversmann, 1837).

A female was caught at the foot of the steppe western slope of the hollow of Step Samakha. V.V. Dubatolov also

found a male on a steppe slope in the Nizhnii Kuragan valley. In both sites the *Gontiolimon speciosum* (L.) Boiss. was present, which seems to be a larval food plant of the species, since in West Siberia *S. cyane* was recorded only from the plant associations with the participation of *G. speciosum*, the imagines feeding mostly on its flowers (V.V. Dubatolov's personal communication).

Material: KURAGAN, 15.VII.1983, 1♂, V.D.; SAMAKHA, 1,600 m, 9.VII.1988, 1♀.

56. *Argodiaetus damon* (Denis et Schiffermüller, 1775).

It was found only in the lower part of the Akkem valley where it was, together with *Plebicula amanda*, the most abundant species of blues. However, *A. damon* tends mostly to inhabit steppes rather than meadows.

Material: LOWER AKKEM, 1,040 m, 28.VII.1985, 3♂♂, 1♀, 1,200 m, 30.VII.1985, 1♂.

57. *Eumedonia eumedon* (Esper, 1780).

It occurs in mesophilous forb meadows in the lower parts of river valleys, where it is rather common, and in forest meadows. At the same time, it has been found in a *Geranium albiflorum* subalpine meadow on the southern slope of the Yarlú valley, at 2,150 m, and sometimes was met with also on steppe rocky slopes. F.i.: *Geranium albiflorum*, *G. pseudosibiricum*.

I.I. Lyubchanskii has obtained an aberrant male, in which the characteristic stroke on the hind wing underside connecting the medial spot with the margin is not white but black with a narrow white margin.

Material: KURAGAN, 15.VII.1983, 1♂, V.D.; TYUNGUR, 30.VI.1985, 1♂; YARLU, 2,150 m, 7.VII.1985, 1♂; LOWER AKKEM, 1,050 m, 26.VII.1985, 5♂♂; GROMOTUKHA, 3.VII.1986, 1♂; YAZOVKA, 1,300 m, 1.VII.1987, 1♀; WATERFALL, 1,600 m, 15.VII.1987, 1♀; SAMAKHA, 1,600 m, 9.VII.1988, 1♂; KOKSU, 11.VII.1988, 1♀; TALMENIE, 1,520 m, 15.VII.1991, 1♂, I.L.

58. *Aricia allous* (Hübner, 1819).

Several specimens occurred in the lower part of the Akkem valley and on the bank of the Katun River at the Kucherla [Кучерла] village, while on the southern main slope of the Ridge, in 1987, this species appeared to be very abundant in forest meadows and subalpine meadows about the tree-line up to 1,800 m (once it was found even in a larch/dwarf birch parkland). In other sites, the species was not met with, the reason of this being unclear.

Material: KURAGAN, 15.VII.1983, 1♂, V.D.; TYUNGUR, 3.VII.1985, 1♂; KAPCHAL, 1,750 m, 8.VII.1987, 1♀; WATERFALL, 1,600 m, 15.VII.1987, 1♂, 1♀; 18.VII.1987, 1♂; ALTYN-BULAK, 1,650 m, 21.VII.1987, 1♂; 22.VII.1987, 1♂; 25.VII.1987, 1♂; 27.VII.1987, 1♂; TALMENIE, 1,520 m, 14.VII.1991, 4♂♂, I.L.

59. *Aricia nicias* (Meigen, 1830).

Several individuals were observed in mesophilous and steppified meadows in the lower part of the Akkem valley. The species was rather common 7 km west of Katanda in the end of June, 1983, V.D.

Material: LOWER AKKEM, 1,050 m, 21.VII.1985, 1♂; 22.VII.1985, 1♂.

60. *Cyaniris semiargus* (Rottemburg, 1775).

This eurybiont species occurs from the lowest altitudes

to the subalpine belt (e.g. 2,150 m in the valley of the Argem confluent) in various meadows; it penetrates also to steppe slopes.

Material: KURAGAN, 15.VII.1983, 1♂; 24.VII.1983, 1♂, 1♀, V.D.; TYUNGUR, 30.6.1985, 2♂; AGAFONIKHA, 1,000 m, 25.VIII.1985, 2♀; GROMOTUKHA, 1,200 m, 3.VII.1986, 1♂; YAZOVKA, 1.VII.1987, 3♂♂; KAPCHAL, 1,800 m, 3.VII.1987, 1♀; 4.VII.1987, 1♂; KATUN SOURCE, 1,800 m, 9.VII.1987, 1♂, 1♀; WATERFALL, 1,600 m, 14.VII.1987, 5♂♂, 1♀; 16.VII.1987, 2♂♂; ALTYN-BULAK, 1,650 m, 14.VII.1987, 1♂, 1♀; 24.VII.1987, 12♂♂; CONFLUENT OF ARGEM, 2,150 m, 14.VII.1988, 1♂; KOKSU, 25.VII.1988, 1♀; 26.VII.1988, 1♀; TALMENIE, 1,520 m, 15.VII.1991, 4♂♂, 1♀, I.L.

61. *Neptis rivularis* (Scopoli, 1763).

This common species is trophically connected with *Spiraea*, so it occurs mostly near the bushes in forest and in bushy steppe, avoiding both dense forests and large open space and tending to glades, forest edges and bush thickets on western, eastern and southern slopes. It has been found up to 1,600-1,700 m.

Material: LOWER AKKEM, 1,050 m, 22.VII.1985, 1♀; TYUNGUR, 30.VI.1986, 1♂; LOWER KURAGAN, 1,000 m, 3.VII.1986, 1♂; ESHTU, 1,300 m, 16.VII.1986, 1♀; WATERFALL, 1,600 m, 18.VII.1987, 1♂; KOKSU, 1,600 m, 11.VII.1988, 1♂; MIDDLE MULTA, 1,650 m, 9.VII.1991, 1♂, I.L.; TALMENIE, 1,520 m, 15.VII.1991, 1♀, I.L.

62. *Limenitis populi* (Linnaeus, 1758).

It was seldom observed at 1,000-1,100 m in the Akkem and Nizhnii Kuragan valleys, mostly at openings and edges of mixed forest with participation of asp.

Material: GROMOTUKHA, 1,100 m, 22.VII.1986, 1♂.

63. *Polygonia c-album* (Linnaeus, 1758).

A worn-out male was caught in the Yazovaya valley, at 1,600 m, at the foot of large rocks.

64. *Nymphalis vau-album* (Denis et Schiffermüller, 1775).

It was often observed in the end of August, 1985, on glades and edges of mixed forests in the Katun valley (AGAFONIKHA). Probably it was not recorded in other sites owing to its late flight period.

65. *Aglais urticae* (Linnaeus, 1758).

This species was often met with in various habitats at low altitudes, and was equally common in the tundra belt, where these butterflies were observed mostly on large-stone screes.

Material: BERTKEM, 2,200 m, 12.VII.1983, 1♂, A.V. Barkalov; 13.VII.1983, 3♂♂, V.D.; LOWER AKKEM, 1,100 m, 28.VII.1985, 1♂; 30.VII.1985, 1♀; ZAYCHONOK, 2,000 m, 11.VIII.1985, 1♀; TALMENIE, 1,520 m, 14.VII.1991, 1♀, I.L.

66. *Vanessa cardui* (Linnaeus, 1758).

It occurred in steppes and meadows at low altitudes (in the valleys of the Akkem and Agafonikha rivers). At the same time, extremely worn-out individuals were twice observed in dwarf birch tundra at 2,500 m: in the valleys of the Yarlú (7.VII.1985) and the Argem confluent.

Material: AGAFONIKHA, 1,000 m, 27.VIII.1985, 1♂; CONFLUENT OF ARGEM, 2,500 m, 27.VII.1985, 1♂.



Fig. 12. *Albulina orbitulus* de Prun., at the upper flow of the Argem River, 2,500 m, 19.VII.1988.

Рис. 12. *Albulina orbitulus* de Prun., верховья р. Аргем, 2500 м, 19.VII.1988.

67. *Araschnia levana* (Linnaeus, 1758).

This species occurs mostly at river and brook banks within the forest belt. In the study area, only one generation seems to develop, as all specimens, including those caught on August 23th, have the coloration typical of the spring generation.

Material: MIDDLE AKKEM, 1,600 m, 16.VII.1985, 1 ♀; AGAFONIKHA, 1,000 m, 23.VIII.1985, 1 ♀; UPPER KURAGAN, 1,700 m, 12.VII.1986, 1 ♀; YAZOVKA, 1.VII.1987, 1 ♂; WATERFALL, 1,600 m, 17.VII.1987, 1 ♂; TALMENIE, 1,520 m, 14.VII.1991, 1 ♂, I.L.

68. *Euphydryas maturna* (Linnaeus, 1758).

E. maturna occurs in forest openings in the lower part of the forest belt, below 1,200 m (the Akkem, Nizhnii Kuragan and Yazovaya valleys).

Material: LOWER AKKEM, 1,000 m, 3.VII.1985, 1 ♂, 1 ♀; YAZOVKA, 1,200 m, 1.VII.1987, 2 ♀♀.

69. *Euphydryas iduna* (Dalman, 1816).

This arctoalpine species was found in the Kapchal valley at 2,700 m on 5.VII.1987 in a southern slope alpine meadow just beneath a crest with perennial snow on its northern slope. Only *Pyrgus centaureae* or *P. sibiricus* and *Pieris napi* flew together with *Euphydryas iduna*. Another recorded habitat was quite different. It was the Nizhnii Kuragan valley above the lakes, at 1,800 m, in the upper part of the forest belt. Two males were caught there on the very bank in a wet meadow with *Betula rotundifolia* and *Salix glauca* bushes. The specimens differ substantially from those of the Kapchal valley. The latter have the characteristic clear greyish, almost white, ground color of

the wing underside, with only traces of black postdiscal line between the orange marginal band and the central maculum on the hindwing underside. In the butterflies of the Nizhnii Kuragan valley the line is fully expressed on the hind wings and its traces appear on the fore wings. A greyish-yellowish tint appears near it on the ground color, and the dark basal suffusion on the hindwing underside is developed much more strongly than in the Kapchal specimens. Thus, the specimens of the Nizhnii Kuragan deviate much from the typical appearance of *E. iduna*, but nevertheless they differ well from the similar species *E. intermedia*, which was numerous on the same meadow. Most probably, the deviation was the consequence of an environmental modification.

Material: BERTKEM, 2,500 m, 13.VII.1983, 1 ♂, 1 ♀, J. Jalava; 14.VII.1983, 1 ♂, V.D.; UPPER KURAGAN, 1,800 m, 13.VII.1980, 2 ♂♂; KAPCHAL, 2,700 m, 5.VII.1987, 1 ♂.

70. *Euphydryas intermedia* (Ménétrières, 1859).

This is the most numerous butterfly of the forest belt, from the birch forest of low altitudes to larch/dwarf birch parklands, tending to fly around bushes at forest edges and in openings and at river and stream banks. In the Argem basin, this species sometimes occurred also in alpine meadows at brook banks, up to 2,200 m. F.i.: *Anthriscus sylvestris*, *Senecio nemorensis* L., and other plants with large inflorescences.

Material: the western slope of the Nizhnii Kuragan valley 7 km upstream of its mouth, 9.VII.1983, 1 ♂, V.D.; UPPER AKKEM, 1,800 m, 4.VII.1985, 1 ♂; 2,050 m, 7.VII.1985, 2 ♂♂, 1 ♀; TYUNGUR, 30.VI.1986, 1 ♂;



Fig. 13. *Euphydryas aurinia banghaasi* Seitz., the bank of Lake Nizhnee Akkemscoe, 2,050 m, 7.VII.1985.

Рис. 13. *Euphydryas aurinia banghaasi* Seitz., берег озера Нижнее Аккемское, 2050 м, 7.VII.1985.

GROMOTUKHA, 1,200 m, 3.VII.1986, 2 ♀♀; KARAIRY, 1,400 m, 6.VII.1986, 2 ♂♂, 1 ♀; UPPER KURAGAN, 1,800 m, 13.VII.1986, 2 ♂♂, 1 ♀; KAPCHAL, 1,750 m, 8.VII.1987, 1 ♀; WATERFALL, 14.VII.1987, 1 ♂, 2 ♀♀; ALTYN-BULAK, 23.VII.1987, 1 ♂; KOKSU, 10.VII.1988, 1 ♀; 11.VII.1988, 1 ♂, 1 ♀; CONFLUENT OF ARGEM, 2,200 m, 14.VII.1988, 1 ♀; 17.VII.1988, 1 ♀; LOWER MULTA, 1,630 m, 9.VII.1991, 3 ♂♂, 1 ♀, I.L.; TALMENIE, 1,520 m, 14.VII.1991, 1 ♂, I.L.

71. *Euphydryas aurinia* (Rottemburg, 1775).

Two specimens close to the typical subspecies were caught at: TYUNGUR, a forb meadow at an edge of a larch forest at the right Katun bank, 900 m, 30.VI.1985, 1 ♂; YAZOVKA, a steep southern slope, 1,300 m, 1.VII.1987, 1 ♀. These butterflies were quite common on the southern foot of the Terektinskii Ridge 7 km west of Katanda (June 1983, V.D.).

E. aurinia banghaasi (Seitz, 1908) (Fig.13).

This alpine subspecies was found only in the Akkem valley where it was very abundant on marshy, with dwarf birch thickets, banks of Lake Nizhnee Akkemscoe.

Material: UPPER AKKEM, 2,050 m, 5.VII.1985, 3 ♂♂. Thus, we face the situation described by L.G. Higgins [1950, p.457]: "Another alpine form, *banghaasi* Seitz, appears in eastern Siberia, in the Sajan and Kentei Mountains, where it flies at about 6000 ft., while the lowland *aurinia laeta* Christoph [this taxon was described

from Yakutia! - O.K.] occurs in the neighbouring valleys". According to this expert in the genus *Euphydryas* Scudder, it would be quite reasonable to assign the rank of species to the alpine and lowland forms of *E. aurinia*, but he abstained from doing this because of the lack of differences in male genitalia. However, it is hard to imagine that the habitats of both subspecies are separated to such an extent that their genofonds remain isolated all along the mountain systems. Therefore, the stability of differences suggests either the species rank of the taxa or their environmental nature.

72. *Mellicta aethalia* (Rottemburg, 1775).

Material: TYUNGUR, 30.VI.1985, 2 ♂♂; UPPER KURAGAN, 2,000 m, 12.VII.1986, 1 ♂, 1 ♀ (in copula); WATERFALL, 1,600 m, 17.VII.1987, 1 ♂; SAMAKHA, 1,600 m, 10.VII.1988, 1 ♂; CONFLUENT OF ARGEM, 2,200 m, 12.VII.1988, 1 ♂.

73. *Mellicta britomartis* (Assman, 1848).

Material: TYUNGUR, 30.VI.1985, 2 ♂♂; LOWER AKKEM, 1,100 m, 22.VII.1985, 2 ♂♂; 23.VII.1985, 1 ♂; 28.VII.1985, 1 ♂; KARAIRY, 1,400 m, 6.VII.1986, 2 ♂♂; KAPCHAL, 1,700 m, 11.VII.1987, 1 ♂; KOKSU, 1,600 m, 11.VII.1988, 1 ♂.

The two latter species in Altai are practically indistinguishable in the field, so it was impossible to trace the peculiarities of their ecology. Obviously, both species exhibit a high ecological plasticity: they



Fig. 14. *Melitaea latonigena* Ev. in copula, southern slope above the Yazovka village, 1,100 m, 1.VII.1987.

Рис. 14. *Melitaea latonigena* Ev. in copula, южный склон над деревней Язовка, 1100 м, 1.VII.1987.

were found in a larch parkland at the Katun bank (*M. athalia* and *M. britomartis*), on steppen southern slopes (*M. britomartis*), on an old burnt-over land (*M. britomartis*), in a long-forb forest meadow (*M. athalia*), in subalpic meadows in the basins of the Nizhnii Kuragan (*M. athalia*) and Kapchal (*M. britomartis*) rivers, in an alpine meadow in the valley of the Argem confluent valley, at 2,200 m (*M. athalia*).

Mellicta sp. (females of the two previous species).

Material: LOWER AKKEM, 1,100 m, 26.VII.1985, 1 ♀; 1,200 m, 26.VII.1985, 1 ♀; YAZOVKA, 1,300 m, 1.VII.1987, 3 ♀♀; ALTYN-BULAK, 1,650 m, 22.VII.1987, 2 ♀♀; CONFLUENT OF ARGEM, 2,200 m, 12.VII.1988, 1 ♀; KOKSU, 1,600 m, 25.VII.1988, 2 ♀♀.

74. *Mellicta menetriesi* (Caradja, 1895) ssp. *centralasiae* (Wnukowsky, 1929).

A male and a female were found in a steppe meadow at the mouth of the Nizhnii Kuragan River. Another male was caught in a larch parkland on the alluvial plain of the Katun River right bank at the Eleshchadyr brook. This specimen has slightly aberrant characters: it is small, the upperside with a very diffuse dark ornament and with small remainders of a very light ground tone contrasting with orange submarginal band.

Material: LOWER KURAGAN, 1,000 m, 23.VII.1986, 1 ♀; 24.VII.1986, 1 ♂; ELESCHADYR, 1,650 m, 3.VII.1987, 1 ♂; TALMENIE, 1,520 m, 14.VII.1991, 1 ♂, I.L.

75. *Melitaea diamina* (Lang, 1789).

Material: TALMENIE, 1,520 m, a dry meadow in open spruce forest, 14.VII.1991, 1 ♂, I.L.

76. *Melitaea latonigena* Eversmann, 1847 (Fig.14).

This is a characteristic and numerous species of steppe slopes. In the Argem confluent valley, it was found also at 2,200 m on a southern slope of an ancient moraine covered by meadow with participation of both alpine and steppen plant species.

Material: KURAGAN, 15.VII.1983, 1 ♂, V.D.; LOWER AKKEM, 1,100 m, 23.VII.1985, 2 ♂♂, 1 ♀; 26.VII.1985, 1 ♂; 30.VII.1985, 2 ♂♂; YAZOVKA, 1,300 m, 1.VII.1987, 4 ♂♂, 5 ♀♀; WATERFALL, 1,650, 16.VII.1985, 1 ♀; SAMAKHA, 1,600 m, 9.VII.1988, 2 ♂♂; KOKSU, 1,600 m, 11.VII.1988, 1 ♂; 25.VII.1988, 1 ♂, 1 ♀; CONFLUENT OF ARGEM, 200 m, 12.VII.1988, 1 ♂.

77. *Melitaea cinxia* (Linnaeus, 1758).

It occurs together with the previous species on southern slopes, and also in meadows, but is much less abundant.

Material: TYUNGUR, 4.VIII.1985, 1 ♂; YAZOVKA, 1,300 m, 1.VII.1987, 1 ♂; SAMAKHA, 10.VII.1988, 1 ♂; KOKSU, 1,600 m, 11.VII.1988, 1 ♀; TALMENIE, 1,520 m, 14.VII.1991, 1 ♂, I.L.

78. *Melitaea arcesia* Bremer, 1864.

This purely alpine species was found only at the sources of the Akkem and Argem rivers, where it flew in marshy dwarf birch tundras with patches of alpine meadow. F.i.: *Scorzonera radiata*.

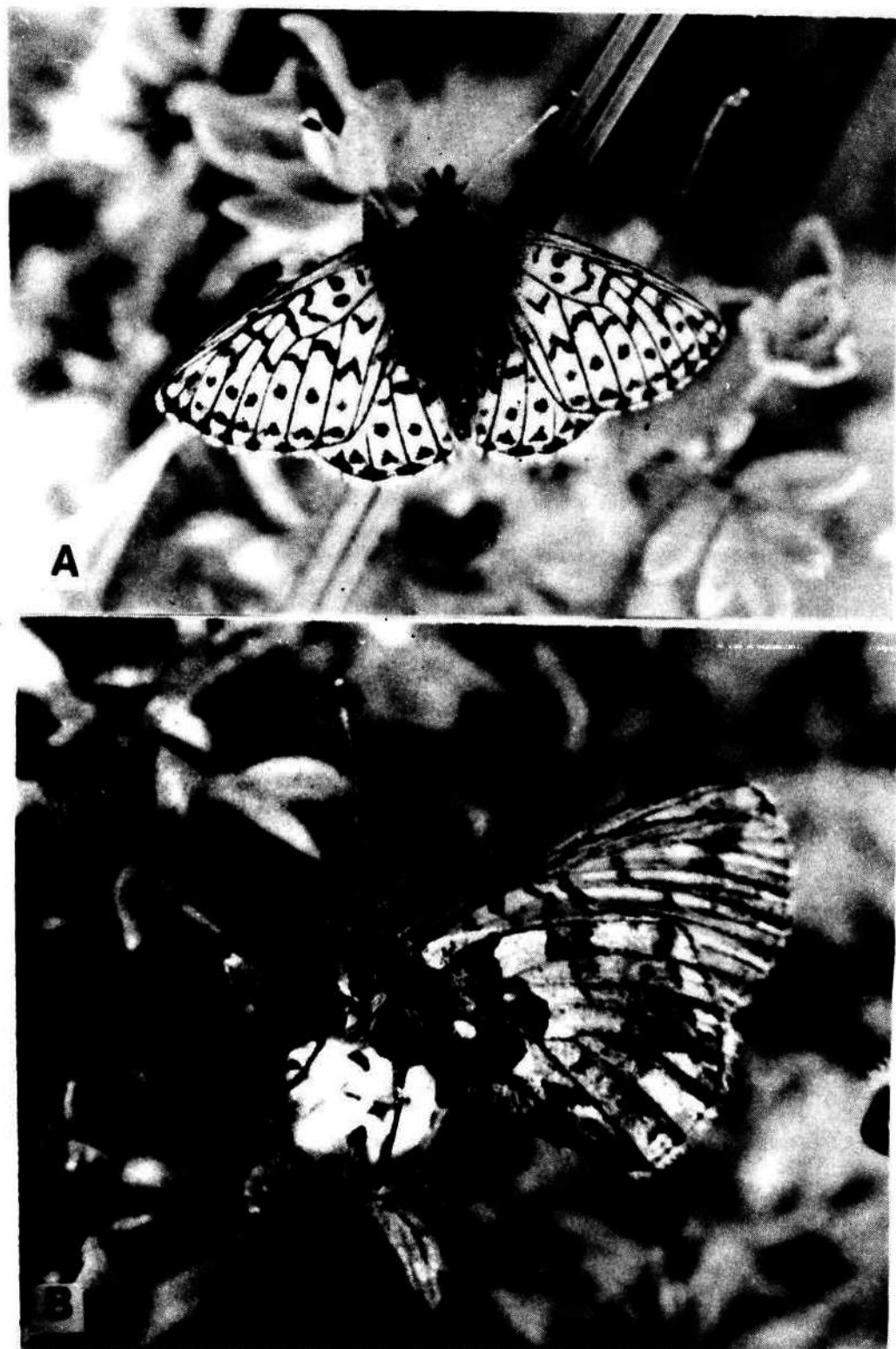


Fig. 15 a, b. *Boloria (pales* Den. et Schiff.) sp., the Belaya Berel valley, 1,750 m, 24.VII.1987.
Рис. 15 а, б. *Boloria (pales* Den. et Schiff.) sp., долина Белой Берели, 1750 м, 24.VII.1987.

Material: BERTKEM, 2,400 m, 13.VII.1983, 2 ♂♂, 2 ♀♀, V.D.; UPPER AKKEM, 2,050 m, 7.VII.1985, 3 ♂♂; ARGEM, 2,500 m, 19.VII.1988, 2 ♂♂.

79. *Melitaea phoebe* (Denis et Schiffermüller, 1775).

This species was found twice on steppen slopes.

Material: LOWER AKKEM, 1,100 m, 28.VII.1985, 1 ♂; KOKSU, 1,600 m, 19.VII.1988, 2 ♀.

80. *Boloria (pales)* (Denis et Schiffermüller, 1775) sp.

In the end of July, 1987, in the upper reaches of the Katun, Belaya Berel and Yazovaya rivers, several butterflies were found of the species aggregate *pales* of the genus *Boloria* Moore, 1900, which can hardly be attributed to any of the known species of this aggregate (or the subspecies of *Boloria (pales)*, if, following Warren [1944], we consider the genus *Boloria* s.str. as having only three true species). The attribution of those specimens to the *B. (pales)* group, based on the structure of male genitalia, is doubtless; in addition, their wing shape structure and the outline of the central band on the hind wing underside are peculiar to this species group. Among the taxa of this group only *B. aquilonaris* (Stichel, 1908), which now is usually regarded as a bona species, have been reported from Altai. This butterfly has a wide Palearctic range but is ecologically confined mostly to moorlands. Our specimens cannot be determined as *B. aquilonaris* because of a very fine black marking of the wing upperside (Fig.15 a) (in *B. aquilonaris* the marking is heavy) and the coloration of the hind wing underside (Fig.15 b): rather light dull red ground color, a well expressed lightening of the ground color between M_3 and Cu_1 distally of the central band (which is weakly expressed in *B. aquilonaris*), and a wide unsuffused central band varying in color from ochre to lemon-yellow. In one female, this yellow coloration is also spread over the ground color of the hind wing underside. According to A. Crosson du Cormier [1982], the character of the central band corresponds well to that of *B. banghaasi* (Seitz, 1909), which is an East-Siberian (ranging westwards to the Sayans) and Mongolian form, given the species rank by the cited author. He also indicated another peculiar character of this form: in the submarginal row on the hind wing upperside, the spot in cell 5 is steadily greater than its counterparts in cells 4 and 6. Only one male specimens from my series meets this criterion, while in others the spots in cells 5 and 6 are of approximately the same size but exceed that in cell 4. However, the very fine marking of wing upperside and also a relatively small size (the fore wing length in the males is 16-17 mm, in females 18 mm) does not allow to attribute our butterflies to *B. banghaasi*. On the other hand, they resemble the Central Asian (described from Amdo) taxon *B. sifanica* (Groum-Grshimailo, 1891), known to me only from literature. Our specimens seemed to be at least a new subspecies, the description and species attribution of which require, however, a critical assessment of Siberian and certain Central Asian representatives of the *B. (pales)* group. This work is forthcoming.

These butterflies were strictly confined to very peculiar habitats: wide and flat river valleys at 1,650-1,700 m covered with wet meadow, sometimes with tussocks or even bogged, with more or less sparse bushes of *Pentaphylloides fruticosus*. It is worth mentioning that

in a neighboring hygrophytic subalpine meadow, with *Allium ledebourianum* Schult. et Schult. fil. as a dominant, there was found *Boloria napaea altaica*, but not the butterflies considered. This points at obvious ecological distinction between these related species.

To the same form I attribute two males caught at 1,800 m at the upper flow of the Nizhnii Kuragan River in wet meadow with dwarf birch thickets which, however, deviated from the described above type towards *B. aquilonaris*. They have more expressed marking of the upper side and the darker coloration of the hind wing underside. It is not excluded that in Altai there exists a cline or any other pattern of geographic and/or ecological transition between *B. aquilonaris*, *B. banghaasi*, and the Central Asian type of the *B. (pales)* group.

Material: UPPER KURAGAN, 1,800 m, 13.VII.1986, 2 ♂♂; BEREL, 1,600 m, 24.VII.1987, 5 ♂♂, 2 ♀♀; The sources of the Yazovaya River, 1,550 m, 27.VII.1987, 1 ♂, 1 ♀.

81. *Boloria napaea* (Hoffmansegg, 1804) ssp. *altaica* (Groum-Grshimailo, 1893).

This is a mass species of highland, inhabiting mostly alpine meadows and penetrating into tundras and short-forb subalpine meadows. In the western part of the range, this species was thrice observed also at moderate altitudes: in a wet meadow almost entirely formed by *Polygonum bistorta* and *Ranunculus* sp., at the bank of the Samakha brook, at 1,600 m, in a wet overgrazed meadow at the Koku left bank, at 1,600 m, and in a forb meadow on a southern slope near a forest edge, at 1,650 m. Probably the wet habitats at the intermediate altitudes fit the ecological standard of this species as well, which was also observed in Europe [Warren, 1944].

In the Akkem upper flow, the first individual was recorded on 7.VII.1985, while in 1987, when all phenological phenomena were late, the only pair of this species was obtained as late as on 22.VII. In the Zaychonok basin, these butterflies flew in abundance until 18.VIII.1985, when the observation was cancelled. F.i.: *Solidago dahurica*, *Senecio turczaninovi* DC., *Scorzonera radiata*, *Allium lineare* L., *Polygonum bistorta*, and others, but at the sources of the Zaychonok River, these butterflies fed exclusively on the flowers of *Sajania monstrosa* (Fig. 16).

At the sources of the Argem River, an aberrant male was caught having cream-white wings with hardly noticeable brick-red (instead of black) traces of the pattern, but the basal dark suffusion of the wings, as well as the body coloration, were normally developed.

Material: Kaitanaskii state farm [Кайтанакский совхоз], 2,200 m, 31.VII.1973, 1 ♂, 1 ♀, L.F.Levina; YARLU, 2,500 m, 7.VII.1985, 1 ♂; ZAYCHONOK, 2,000 m, 10.VIII.1985, 2 ♂♂, 3 ♀♀; 11.VIII.1985, 2 ♀♀; 1,800 m, 14.VIII.1985, 3 ♂♂; 1,700 m, 17.VIII.1985, 3 ♂♂, 2 ♀♀; 18.VIII.1985, 1 ♀; UPPER KURAGAN, 2,000 m, 12.VII.1986, 2 ♂♂; 1,800 m, 13.VII.1986, 1 ♂; ALTYN-BULAK, 1,650 m, 22.VII.1987, 1 ♂, 1 ♀; SAMAKHA, 1,600 m, 9.VII.1988, 1 ♂, 1 ♀; KOKSU, 1,700 m, 2.VII.1988, 1 ♂; 25.VII.1988, 1 ♀; 1,600 m, 26.VII.1988, 1 ♀; CONFLUENT OF ARGEM, 2,200-2,400 m, 12.VII.1988, 2 ♂♂, 5 ♀♀; 14.VII.1988, 1 ♀; 16.VII.1988, 2 ♂♂, 3 ♀♀; 17.VII.1988, 4 ♂♂, 5 ♀♀; ARGEM, 2,500 m, 19.VII.1988, 12 ♂♂, 10 ♀♀.



Fig. 16. *Boloria napaea* Hoffm. feeding on *Sajania monstrosa* (Willd. ex C.Spreng.) M.Pimen., at the upper flow of the Zaychonok River, 2,000 m, 11.VIII.1985.

Рис. 16. *Boloria napaea* Hoffm., питающаяся на *Sajania monstrosa* (Willd. ex C.Spreng.) M.Pimen., в верховьях р. Зайчонок, 2000 м, 11.VIII.1985.

82. *Boloria frigidalis* Warren, 1944.

This taxon, described as a "form" of *Boloria napaea altaica*, distinctly differs from that species by its smaller size and by the dark purple-brown ground color of the hind wing underside [Warren, 1944]. Later it was referred to as a separate species [Forster, 1968]. The lack of intermediate forms and the sympatricity with *B. n. altaica* suggests that *B. frigidalis* is either a phenotype determined by a single gene, which is very improbable, or a distinct species.

I have found this species only at the sources of the Argem River. Several specimens were caught among numerous *B. n. altaica* (these butterflies were easily distinguishable even when flying) on the patches of alpine meadow on the bottom of a cirque at 2,500 m. Besides, a female was found on the crest of this cirque at 2,700, together with *Colias mongola*. It is noteworthy that, in this region, *B. n. altaica* occurred in abundance from the subalpine to tundra belts, while *B. frigidalis* was not met with below 2,500 m. This might indicate that certain ecological differences exist between these taxa,

which would support their species rank.

Material: ARGEM, 2,500 m, 19.VII.1988, 1 ♂, 1 ♀; 2,700 m, 1 ♀.

83. *Proclissiana eunomia* (Esper, 1799).

This species was quite abundant in the highlands of the Akkem and the Argem basins, where it was mostly confined to marshy dwarf birch tundras and occurred also in neighboring alpine meadows. In the upper flow of the Nizhnii Kuragan River, several butterflies were found in the upper part of the taiga belt among bushes growing along the lateral streams of the river, at 1,800 m. Besides, a female was caught at 1,600 m in a boggy meadow at the bank of the Samakha brook, flowing across the hollow of Step Samakha, i.e. already within the steppe belt. The inclination of the species to wet habitats is obvious; nevertheless, a male was found at the middle flow of the Akkem River, which lacks such habitats owing to the steepness of slopes. F.I.: *Scorzonera radiata*, *Polygonum bistorta* etc.

An aberrant male was caught at the sources of the Argem River with a reddish-white wing ground tone and



Fig. 17. *Clossiana freja* Thunb., the valley of the right confluent of the Argem River, 2,200 m, 16.VII.1988.

Рис. 17. *Clossiana freja* Thunb., долина правого притока р. Аргем, 2200 м, 16.VII.1988.

a reduced dark marking on the upperside of both wings and on the underside of the fore wings. On the hind wing underside a heavy brown suffusion is present along the veins, through which the dark outer margin of the central band and the very diffuse marginal spots can be traced.

Material: BERTKEM, 2,200 m, 10.VII.1983, 1 ♂; 2,400 m, 11.VII.1983, 1 ♂; 13.VII.1983, 3 ♂♂, V.D.; MIDDLE AKKEM, 1,600 m, 4.VII.1985, 1 ♂, 1 ♀; UPPER AKKEM, 2,050 m, 5.VII.1985, 3 ♂♂; 7.VII.1985, 3 ♂♂; 8.VII.1985, 1 ♂; UPPER KURAGAN, 1,800 m, 13.VII.1986, 1 ♂ 1 ♀; SAMAKHA, 1,600 m, 10.VII.1988, 1 ♀; KOKSU, 1,600 m, 26.VII.1988, 1 ♀; CONFLUENT OF ARGEM, 2,200 m, 17.VII.1988, 1 ♀; ARGEM, 19.VII.1988, 8 ♂♂, 4 ♀♀.

84. *Clossiana selenis* (Eversmann, 1837).

This species was seldom found in the taiga belt of the Nizhnii Kuragan and Yazovaya valleys on glades and openings. In larch and larch/spruce forests along the Koksus banks, these butterflies appeared to be abundant in 1988, but only until the middle of July.

Material: GROMOTUKHA, 1,200 m, 3.VII.1986, 1 ♂; ESHTU, 1,300 m, 22.VII.1986, 1 ♀; KARAIRY 1,400 m, 6.VII.1986, 1 ♂; KOKSU, 1,600 m, 10.VII.1988, 3 ♂♂;



Fig. 18. *Clossiana titania* Esp., at the waterfall at the Yazovaya River, 1,600 m, 17.VII.1987.

Рис. 18. *Clossiana titania* Esp., возле водопада на р. Язовая, 1600 м, 17.VII.1987.

11.VII.1988, 3 ♂♂, 2 ♀♀; 25.VII.1988, 1 ♂; LOWER MULTA, 1,630 m, 9.VII.1991, 1 ♂, I.L.

85. *Clossiana selene* (Denis et Schiffermüller, 1775).

C. selene is also confined to the forest belt, mostly to its upper part, occurring in forest meadows. On the southern main slope of the ridge, i.e. in the Katun and the Yazovaya valleys, it was very abundant.

Material: UPPER KURAGAN, 1,800 m, 13.VII.1986, 1 ♂; YAZOVKA, 1,200 m, 1.VII.1987, 1 ♂; KAPCHAL, 1,750 m, 8.VII.1987, 1 ♂; ALTYN-BULAK, 13.VII.1987, 3 ♂♂; 21.VII.1987, 2 ♂♂; 22.VII.1987, 1 ♂, 2 ♀♀; FLESHCHADYR, 1,660 m, 3.VII.1987, 1 ♂; WATERFALL, 1,600 m, 14.VII.1987, 3 ♂♂; 17.VII.1987, 1 ♂; KOKSU, 1,600 m, 11.VII.1988, 1 ♂; LOWER MULTA, 1,630 m, 9.VII.1991, 1 ♀, I.L.; TALMENIE, 1,520 m, 14.VII.1991, 1 ♀, I.L.

86. *Clossiana euphrosyne* (Linnaeus, 1758).

C. euphrosyne is a quite abundant species with a wide range of habitats. It occurs on the forestless slopes at low altitudes, in forest meadows in the forest belt, in subalpine meadows, and penetrates into the alpine belt: at the sources of the Argem River it was recorded at 2,500 m. Like the previous species, this one was numerous on the southern main slope of the ridge in 1987, the ecological

differences between them being clearly expressed. Although both species occurred from the lower part of the forest belt to the subalpine belt, *Clossiana selene* was especially abundant in forest meadows at about 1,600 m, while *C. euphrosyne* in the subalpine zone near the tree-line (1,700-1,800 m), mostly at stream banks.

Material: BERTKEM, 2,200 m, 11.VII.1983, 3 ♂♂, 1 ♀, V.D. and A.V. Barkalov; 13.VII.1983, 8 ♂♂, 1 ♀; 14.VII.1983, 3 ♂♂, V.D.; LOWER AKKEM, 1,200 m, 26.VII.1985, 1 ♂; KARAIRY, 1,400 m, 6.VII.1986, 1 ♂; YAZOVKA, 1,200 m, 1.VII.1987, 4 ♂♂; WATERFALL, 1,600 m, 17.VII.1987, 1 ♀; 18.VII.1987, 1 ♀; 22.VII.1987, 1 ♀; ELESCHADYR, 1,660 m, 3.VII.1987, 1 ♂; 4.VII.1987, 1 ♂; KAPCHAL, 1,800 m, 9.VII.1987, 3 ♂♂, 1 ♀; 10.VII.1987, 1 ♀; KOKSU, 11.VII.1988, 2 ♂♂, 1 ♀; 26.VII.1988, 1 ♀; CONFLUENT OF ARGEM, 2,200 m, 12.VII.1988, 1 ♂; 14.VII.1988, 1 ♂, 1 ♀; 17.VII.1988, 1 ♂; ARGEM, 2,300 m, 19.VII.1988, 1 ♂, 2,500 m, 1 ♂.

87. *Clossiana freja* (Thunberg, 1791) (Fig.17).

It was met with by me only in the Argem basin, where it was rather abundant in dwarf birch tundra on north-exposed gentle slopes and occurred rarely in the neighboring *Aquilegia* alpine meadows at brook banks. These butterflies have a habit of sitting on wet mossy ground.

Material: BERTKEM, 2,300 m, 10.VII.1983, 1 ♀; 11.VII.1983, 1 ♂; 13.VII.1983, 1 ♂, V.D.; CONFLUENT OF ARGEM, 2,200 m, 14.VII.1988, 1 ♂, 1 ♀; 16.VII.1988, 2 ♀♀; ARGEM, 2,500 m, 19.VII.1988, 2 ♀♀.

88. *Clossiana frigga* (Thunberg, 1791).

This species, as well as *Melitaea arcesia*, was found only in the vicinity of Lake Nizhnee Akkemskae and at the sources of the Argem River (only in the cirque of one of the sources, at 2,500 m, and not in the valley of the right confluent, which was thoroughly examined). In both points, it was found only on marshy dwarf birch thickets. In the first case, they were the thickets of the subalpine zone (not levelled by winter snow), in the second the levelled mossy dwarf birch tundra. F.i.: *Lagotis integrifolia*.

Material: UPPER AKKEM, 2,050 m, 5.VII.1985, 1 ♂; 7.VII.1985, 1 ♂, 1 ♀; ARGEM, 2,500 m, 19.VII.1988, 3 ♂♂, 2 ♀♀.

89. *Clossiana dia* (Linnaeus, 1767).

At the eastern end of the range, this species occurred in 1988 in larch/dwarf birch parklands and in dwarf birch tundras, together with *C. freja*, and was found also in alpine meadows. Beyond this site, *C. dia* was met with once in a meadow with sparse *Pentaphylloides fruticosa* bushes in the Katun valley at the Eleshchadyr Brook, at 1,660 m.

Material: ELESCHADYR, 1,660 m, 13.VII.1987, 1 ♂; CONFLUENT OF ARGEM, 2,200 m, 16.VII.1988, 1 ♂; 20.VII.1988, 1 ♀; ARGEM, 2,500 m, 19.VII.1988, 4 ♂♂.

90. *Clossiana thore* (Hübner, 1803).

It was recorded only in the Yazovaya valley, where it flew in long-forb meadows and often in wet meadows with *Filipendula ulmaria* (L.) Maxim. and in openings in spruce forests at 1,600 m. F.i.: *Ligularia sibirica*, *Senecio praticola* Schischk. ex Serg. etc.

Material: WATERFALL, 1,600 m, 14.VII.1987, 1 ♂, 1 ♀; 17.VII.1987, 2 ♂♂.

91. *Clossiana titania* (Esper, 1793) (Fig.18).

C. titania, together with the previous species, flew at 1,600-1,700 m in the Yazovaya valley in long-forb forest meadows, in glades and openings. A male was also caught in a wet meadow with *Polygonum bistorta* as a dominant at the bank of the Samakha brook. The impression arises that this species occurs in the places with the presence of *Betula fruticosa*.

Material: WATERFALL, 1,600 m, 17.VII.1987, 1 ♂; 18.VII.1987, 1 ♂; ALTYN-BULAK, 1,700 m, 23.VII.1987, 1 ♂, 1 ♀; 25.VII.1987, 1 ♂; SAMAKHA, 1,600 m, 10.VII.1988, 1 ♂; TALMENIE, 1,520 m, 14.VII.1991, 1 ♂; 18.VII.1991, 1 ♀, I.L.

92. *Brenthis ino* (Rottemburg, 1775).

This is one of the most numerous butterflies of various meadows: steppe, terrace and forest ones. On the southern main slope of the ridge, it was abundant also in subalpine Siberian stone pine and larch parklands at 1,700 m, and a caterpillar of this species was found on *Rubus saxatilis* L. in the Kapchal valley in a subalpine meadow at 1,800 m.

Material: KURAGAN, 15.VII.1983, 1 ♂, V.D.; TYUNGUR, 30.VI.1985, 1 ♂; 30.VI.1986, 2 ♂♂, 1 ♀; LOWER AKKEM, 1,050 m, 20.VII.1985, 1 ♂; 21.VII.1985, 1 ♂; 22.VII.1985, 1 ♂; 30.VII.1985, 1 ♂; AGAFONIKHA, 25.VIII.1985, 1 ♂; 27.VIII.1985, 1 ♂; WATERFALL, 18.VII.1987, 1 ♂; ALTYN-BULAK, 1,700 m, 22.VII.1987, 3 ♂♂; SAMAKHA, 9.VII.1988, 1 ♂; KOKSU, 1,700 m, 26.VII.1988, 1 ♀; TALMENIE, 1,520 m, 14.VII.1991, 1 ♂, I.L.

93. *Issoria eugenia* (Eversmann, 1847).

It is confined to the alpine and subalpine belts, being most common in alpine meadows in stream valleys, but sometimes is observed in the upper part of the forest belt. These butterflies exhibit a highly expressed territorialism, they try to chase out any appearing butterfly, even *Parnassius apollo*. In 1987, the flight of this species began about July 20th. F.i.: *Solidago dahurica*.

Material: ZAYCHONOK, 2,000 m, 11.VIII.1985, 1 ♂; 14.VIII.1985, 3 ♂♂; 1,900 m, 14.VIII.1985, 1 ♂; 18.VIII.1985, 2 ♂♂, 1 ♀; UPPER KURAGAN, 1,800 m, 13.VIII.1986, 1 ♂; WATERFALL, 1,600 m, 18.VII.1987, 1 ♂; ALTYN-BULAK, 1,700 m, 23.VII.1987, 1 ♀; CONFLUENT OF ARGEM, 2,200 m, 17.VII.1988, 1 ♂; ARGEM, 2,500 m, 19.VII.1988, 1 ♂.

94. *Issoria lathonia* (Linnaeus, 1758).

This species was observed at the Altyn-Bulak brook and around Lake Yazovoe on the roads (this is a characteristic feature of its behavior) in subalpine parklands.

Material: ALTYN-BULAK, 1,700 m, 23.VII.1987, 1 ♂; the bank of Lake Yazovoe, 1,600 m, 27.VII.1987, 1 ♂; TALMENIE, 1,520 m, 15.VII.1991, 1 ♂, I.L.

95. *Fabriciana niobe* (Linnaeus, 1758).

It flies in valley meadows at low altitudes, in forest meadows, occurs in the subalpine belt and penetrates into alpine meadows (up to 2,200 m).

Material: ZAYCHONOK, 1,800 m, 18.VIII.1985, 2 ♀♀; ALTYN-BULAK, 1,700 m, 23.VII.1987, 1 ♂; the bank of Lake Yazovoe, 1,600 m, 17.VII.1987, 1 ♀; SAMAKHA, 9.VII.1988, 2 ♀♀; KOKSU, 1,600 m, 11.VII.1988, 1 ♂; CONFLUENT OF ARGEM, 2,200 m, 12.VII.1988, 1 ♀; 14.VII.1988, 1 ♀.



Fig. 19. *Erebia jennisseiensis* Tryb., the Nizhnii Kuragan upper flow, 1,800 m, 8.VII.1986.

Рис. 19. *Erebia jennisseiensis* Tryb., верхнее течение Нижнего Курагана, 1800 м, 8.VII.1986.

96. *Fabriciana adippe* (Rottemburg, 1775).

It was seldom met with at low altitudes.

Material: LOWER AKKEM, 27.VII.1985, 1 ♂; 28.VII.1985, 1 ♂; AGAFONIKHA, 1,000 m, 28.VIII.1985, 1 ♂, 1 ♀.

97. *Mesoacidalia aglaja* (Linnaeus, 1758).

This species is quite common on steppe slopes, in meadows, and in the forest belt, penetrates into highland: in the Argem basin it occurred in larch/dwarf birch parklands and in alpine meadows even at 2,200 m. This species appeared to be especially abundant on steppe slopes above Yazovka.

Material: KURAGAN, 15.VII.1983, 1 ♂, V.D.; MIDDLE AKKEM, 1,600 m, 16.VII.1985, 1 ♀; ESHTU, 1,300 m, 19.VII.1986, 1 ♀; YAZOVKA, 1,200 m, 20.VII.1987, 1 ♀; CONFLUENT OF ARGEM, 2,200 m, 17.VII.1988, 1 ♂; TALMENIE, 1,520 m, 15.VII.1991, 1 ♂, I.L.

98. *Argynnis paphia* (Linnaeus, 1758).

A. paphia occurs in the end of July and in August in birch and mixed forests at low altitudes.

Material: AGAFONIKHA, 27.VIII.1985, 1 ♂; GROMOTUKHA, 1,100 m, 23.VII.1986, 1 ♂; TALMENIE, 1,520 m, 15.VII.1991, 1 ♂, I.L.

99. *Lopinga achine* (Scopoli, 1763).

This species was met with in the lower part of the forest belt in a larch parkland and at the edge of a mixed forest.

Material: KURAGAN; 6.VII.1983, 1 ♂, G.S. Zolotarevko; 24.VII.1983, 1 ♀, V.D.; TYUNGUR, 30.VI.1986, 1 ♂; GROMOTUKHA, 1,100 m, 22.VII.1986, 1 ♂.

100. *Crebeta deidamia* (Eversmann, 1851).

It was found only in the Nizhnii Kuragan valley in the taiga belt: in open stands of trees, in glades and old burnt-over areas.

Material: KURAGAN, 24.VII.1983, 1 ♂, V.D.; KARAIRY, 1,400 m, 6.VII.1986, 1 ♂; ESHTU, 1,300 m, 17.VII.1986, 1 ♂.

101. *Lasiommata petropolitana* (Fabricius, 1787).

Material: BERTKEM, 2,000 m, 12.VII.1983, 1 ♂, V.D.; LOWER AKKEM, the edge of a birch forest, 26.VII.1985, 1 ♂; MIDDLE MULTA, forest, 1640 m, 9.VII.1991, 1 ♂, I.L.; TALMENIE, 1,520 m, wet forb meadow, 17.VII.1991, 1 ♂, I.L.

102. *Coenonympha tullia* (Müller, 1764).

It is confined to alpine and short-forb subalpine meadows, it was also found in the Yarlü valley in a subalpine parkland on a southern slope with *Geranium albiflorum* predominating in the forb layer.

Material: YARLU, 2,100 m, 7.VII.1985, 2 ♂♂; ZAYCHONOK, 2,000 m, 11.VIII.1985, 1 ♂; UPPER KURAGAN, 2,200 m, 12.VI.1986, 2 ♂♂; CONFLUENT OF ARGEM, 2,200 m, 13.VII.1988, 1 ♂; 2,150 m, 17.VII.1988, 2 ♂♂; 20.VII.1988, 1 ♂; ARGEM, 2,500 m, 19.VII.1988, 1 ♂.

103. *Coenonympha glycerion* (Borkhausen, 1788).

This is a mass species of meadows and steppes at low altitudes, sometimes being found also in forest openings. In 1985 the flight period began in the middle of July.

Material: LOWER AKKEM, 1,040 m, 21.VII.1985, 2 ♂♂; 26.VII.1985, 1 ♂; AGAFONIKHA, 1,000 m, 25.VIII.1985, 1 ♂; GROMOTUKHA, 1,200 m, 16.VII.1986,

1 ♂; KOKSU, 1,600 m, 11.VII.1988, 2 ♂♂; 25.VII.1988, 1 ♀; 26.VII.1988, 2 ♂♂.

104. *Coenonympha amaryllis* (Stoll, 1782).

This is a characteristic species of rocky steppes on southern slopes, penetrating into terrace meadows.

Material: TYUNGUR, 29.VI.1935, 1 ♂; 30.VI.1985, 2 ♂♂; LOWER AKKEM, 1,000 m, 26.VII.1985, 2 ♂♂.

105. *Coenonympha hero* (Linnaeus, 1751).

C. hero is most common in forest meadows and also occurs in river terrace meadows, in larch parklands and on southern slopes. In the Akkem valley, it was found in an open Siberian stone pine forest at 1,800 m.

Material: KURAGAN, 6.VII.1983, 1 ♀, G.S. Zolotarev; TYUNGUR, 30.VI.1985, 2 ♂♂; 30.VI.1986, 1 ♂; UPPER AKKEM, 1,800 m, 4.VII.1985, 2 ♂♂; MIDDLE AKKEM, 1,600 m, 16.VII.1985, 1 ♂; WATERFALL, 1,600, 15.VII.1987, 1 ♂; LOWER MULTA, 9.VII.1991, 1 ♂, I.L.

106. *Erebia ligea* (Linnaeus, 1758).

It is confined to the forest zone, being more abundant in its lower part in mixed forests with *Spiraea* forming the undergrowth. This species occurs in open forests but avoids large open space. In 1986 it was one of the most numerous species of the forest belt, it was quite common in 1987, and again appeared in mass quantities in 1988, but in 1985 these butterflies were very rare. Maybe these abundance fluctuations were due to the biennial generation cycle of the species [Ivanov et al., 1987]. F.l.: *Solidago virgaurea* L., *Crepis sibirica*, *Saussurea latifolia* etc.

Material: AGAFONIKHA, 1,000 m, 9.VIII.1985, 1 ♀; ZAYCHONOK, 1,700 m, 18.VIII.1985, 1 ♂; ESHTU, 1,300 m, 5.VII.1986, 1 ♀; 16.VII.1986, 1 ♀; KARAIRY, 1,400 m, 6.VII.1986, 1 ♂; WATERFALL, 1,600 m, 17.VII.1987, 1 ♂; ALTYN-BULAK, 1,700 m, 22.VII.1987, 1 ♂; KOKSU, 1,600 m, 10.VII.1988, 1 ♂; 11.VII.1988, 1 ♂; 23.VII.1988, 1 ♂; 25.VII.1988, 5 ♂♂, LOWER MULTA, 1,630 m, 9.VII.1991, 1 ♂, 1 ♀, I.L.; TALMENIE, 1,520 m, 16.VII.1991, 1 ♂; at the top of a mountain, 2,400 m, 18.VII.1991, 1 ♀, I.L.

107. *Erebia jennisieensis* Trybom, 1877 (Fig.19).

This was invariably the most numerous species of the taiga belt, flying under the canopy and at forest edges, avoiding open space and missing from birch forests. In open *Pinus sibirica* stands with *Lonicera altaica* in the undergrowth, it was practically the only common butterfly species. Following parklands at the tree-line, it penetrates into the subalpine and alpine zones, being recorded in the Argem basin at 2,200 m. In the lower part of the forest belt, this species was less numerous than *Erebia ligea* (in the seasons when the latter was abundant), but prevailed in the upper part.

Material: BERTKEM, 2,300 m, 11.VII.1983, 1 ♂; 13.VII.1983, 2 ♂♂; 14.VII.1983, 2 ♂♂, V.D.; KURAGAN; 24.VII.1983, 1 ♂, V.D.; MIDDLE AKKEM, 1,600 m, 4.VII.1985, 1 ♂; UPPER AKKEM, 1,800 m, 4.VII.1985, 6 ♂, 2 ♀♀; 2,050 m, 5.VII.1985, 1 ♂; 8.VII.1985, 1 ♂; 9.VII.1985, 1 ♂; YARLU, 2,150 m, 7.VII.1985, 1 ♀; GROMOTUKHA, 1,200 m, 3.VII.1986, 1 ♀; ESHTU, 1,300 m, 5.VII.1986, 1 ♂; UPPER KURAGAN, 1,800 m, 10.VII.1986, 1 ♂; 14.VII.1986, 1 ♀; WATERFALL, 14.VII.1987, 1 ♀; 17.VII.1987, 1 ♀; ALTYN-BULAK,

1,700 m, 13.VII.1987, 1 ♀; 23.VII.1987, 1 ♂, 1 ♀; KOKSU, 1,600, 11.VII.1988, 1 ♂; CONFLUENT OF ARGEM, 2,200 m, 13.VII.1988, 1 ♂; 19.VII.1988, 1 ♂; LOWER MULTA, 1,630 m, 9.VII.1991, 1 ♂, 2 ♀♀, I.L.; TALMENIE, 1,520 m, 14.VII.1991, 1 ♀, I.L.

108. *Erebia asthiops* (Esper, 1777).

Several specimens were found in the Yazovaya valley in an open spruce forest and at thickets of *Spiraea* at the foot of a cliff.

Material: WATERFALL, 1,600 m, 16.VII.1987, 1 ♂; 18.VII.1987, 1 ♂.

109. *Erebia neriene* (Boeber, 1809).

This is a very abundant species on steppe southern slopes, in valley meadows and in openings in the lower part of the forest belt. In 1985 in the Akkem valley, numerous fresh butterflies appeared on July 25-27th. However, before this, on July 21th, several worn-out specimens were found. This might indicate an unsynchronized flight period, since the development in two generation seems highly improbable.

Material: KURAGAN, 23.VII.1983, 1 ♂; 24.VII.1983, 2 ♂♂; 25.VII.1983, 1 ♂, V.D.; TYUNGUR, 24.VII.1985, 1 ♂; 2.VIII.1985, 1 ♂, 1 ♀; LOWER AKKEM, 1,040 m, 27.VII.1985, 1 ♂, 30.VII.1985, 1 ♂; AGAFONIKHA, 1,000 m, 8.VIII.1985, 1 ♂; ESHTU 1,300 m, 20.VII.1986, 1 ♂.

110. *Erebia rossi* Curtis, 1834.

It was observed by V.V. Dubatolov in relatively great amount in the Bertkem cirque where it was confined to screes and detritous crests.

Material: BERTKEM, 2,500 m, 12.VII.1983, 4 ♂♂; 13.VII.1983, 1 ♂; 14.VII.1983, 1 ♂, 1 ♀; 17.VII.1983, 1 ♀, V.D.

111. *Erebia cyclopius* (Eversmann, 1844).

This species was found in dark-needle taiga at 1,600 m in the Akkem and Yazovaya valleys. In the former site, the butterflies were rather numerous in the beginning of July, but disappeared in the middle of this month.

Material: the Multa village, 19.VI.1983, 1 ♂, V.D.; KURAGAN, 6.VII.1983, 2 ♂♂, G.S. Zolotarev; MIDDLE AKKEM, 1,600 m, 4.VII.1985, 1 ♂; WATERFALL, 1,600 m, 16.VII.1987, 1 ♀.

112. *Erebia kefersteini* Eversmann, 1844 (Fig.20).

E. kefersteini was found only in the upper part of the Nizhnii Kuragan basin in dwarf birch or *Dryas oxydonta* tundras at 2,100-2,200 m. The butterflies tend to sit on lichen-clad stones.

Material: UPPER KURAGAN, 2,200 m, 12.VII.1986, 1 ♂; 14.VII.1987, 1 ♂.

113. *Erebia kindermanni* Staudinger, 1811 (Fig.21).

This local species with strictly Altai-Sayan distribution range was observed only near the eastern and western ends of the ridge, where it turned out to be very numerous. Both sites resemble each other by large areas of gentle surfaces of the ancient peneplain in the alpine zone. The butterflies inhabit alpine meadows and penetrate into the upper part of the subalpine zone and into dwarf birch tundras. F.l.: *Tripleurospermum ambiguum* (Ledeb.) Fr. et Sav., *Senecio turczaninovii*, *Polygonum bistorta*. Our specimens vary in the degree of expression of the black dots in yellow spots of the marginal band, from total vanishing to strong expression, even on the hind wing underside.

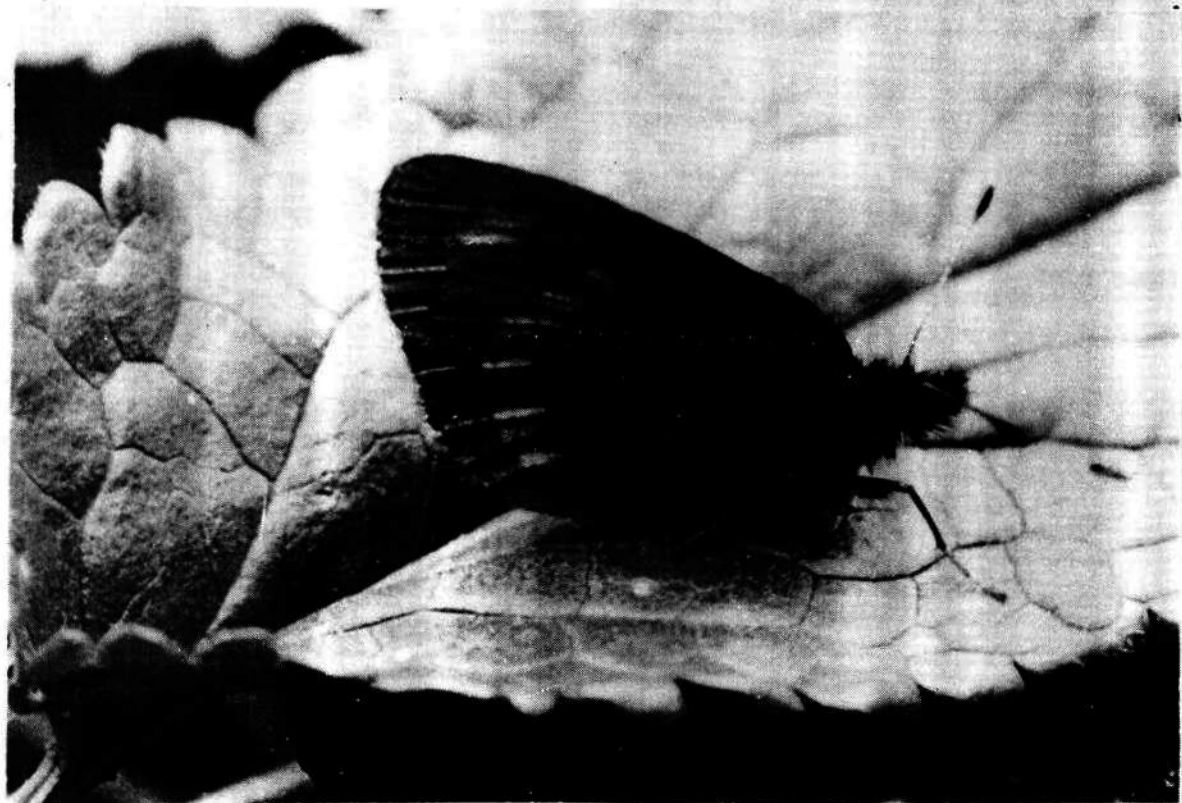


Fig. 20. *Erebia kefersteini* Ev., the basin of the Nizhnii Kuragan River, 2,200 m, 12.VII.1986.

Рис. 20. *Erebia kefersteini* Ev., бассейн р. Нижний Кураган, 2200 м, 12.VII.1986.

Fig. 21. *Erebia kindermanni* Stgr., the basin of the Zaychonok River, 2,000 m, 11.VIII.1985.

Рис. 21. *Erebia kindermanni* Stgr., бассейн р. Зайчонок, 2000 м, 11.VIII.1985.



Fig. 22. *Erebia theano* Tauscher, the Akkem valley, 1,800 m, 16.VII.1985.

Рис. 22. *Erebia theano* Tauscher, долина Аккема, 1800 м, 16.VII.1985.

Fig. 23. *Erebia callias* Edw., the valley of the right confluent of the Argem River, 2,200 m, 16.VII.1988.

Рис. 23. *Erebia callias* Edw., долина правого притока р. Аргема, 2200 м, 16.VII.1988.

Material: ZAYCHONOK, 2,000 m, 11.VIII.1985, 3 ♂♂; 14.VIII.1985, 1 ♀; CONFLUENT OF ARGEM, 2,200 m, 13.VII.1988, 2 ♂♂; 14.VII.1988, 1 ♂; 17.VII.1988, 1 ♂; 20.VII.1988, 3 ♂♂, 1 ♀; 21.VII.1988, 6 ♂♂, 1 ♀; 2,400 m, 16.VII.1988, 1 ♀; ARGEM, 2,500 m, 19.VII.1988, 4 ♂♂, 1 ♀.

114. *Erebia brimo* (Boeber, 1809) (= *Erebia maurisius* (Esper, 1803))

This species is abundant on subalpine larch/Siberian stone birch parklands at the southern slope of the Yarlū valley. In addition, a female was caught in an alpine meadow at the sources of the Zaychonok River. This species was not observed in other sites.

Material: YARLU, 2,150 m, 7.VII.1985, 2 ♂♂, 1 ♀; 8.VII.1985, 1 ♂; ZAYCHONOK, 2,000 m, 10.VIII.1985, 1 ♀.

115. *Erebia theano* (Tauscher, 1806) (Fig.22).

This is the most numerous butterfly of the subalpine belt, being also abundant in the taiga belt. It was especially abundant in 1987 on the southern slope of the ridge, at 1,600-1,800 m. In much lower quantities these butterflies can be found in alpine meadows, as well as in the non-stepped-forb meadows on southern slopes as low as at 1,200 m. This species differs from equally abundant *Erebia jenisseiensis* by tending to inhabit open space of glades and subalpine parkland. In 1987, the mass appearance of this species was observed on July 15th, but in other years this took place earlier.

Material: Kaitanak, 2,000 m, 26.VII.1973, 2 ♂♂, L.F. Levina; KURAGAN, 15.VII.1983, 1 ♂, 1 ♀, V.D.; UPPER AKKEM, 1,770 m, 15.VII.1985, 1 ♂; LOWER AKKEM, 1,300 m, 22.VII.1985, 1 ♂, 2 ♀♀; 26.VII.1985, 1 ♀; ZAYCHONOK, 1,700 m, 17.VIII.1985, 1 ♀; 18.VIII.1985, 3 ♂♂, 1 ♀; TYUNGUR, 1,300 m, 1.VII.1986, 1 ♀; KARAIRY, 1,400 m, 6.VII.1986, 1 ♂; 1,700 m; UPPER KURAGAN, 1,750 m, 9.VII.1986, 2 ♂♂; 10.VII.1986, 1 ♀; 2,000 m, 12.VII.1986, 1 ♂; ELESCHADYR, 1,700 m, 13.VII.1987, 1 ♂; WATERFALL, 1,600 m, 14.VII.1987, 1 ♂; ALTYN-BULAK, 1,650 m, 21.VII.1987, 2 ♀♀; SAMAKHA, 1,600 m, 10.VII.1988, 1 ♂; KOKSU, 1,600 m, 11.VII.1988, 2 ♂♂; CONFLUENT OF ARGEM, 2,500 m, 16.VII.1988, 1 ♂; 2,200 m, 17.VII.1988, 4 ♂♂, 1 ♀; 19.VII.1988, 1 ♂, 1 ♀; 21.VII.1988, 1 ♂; TALMENIE, 1,520 m, 14.VII.1991, 1 ♂; 15.VII.1991, 1 ♂, I.L.

116. *Erebia callias* Edwards, 1871 ssp. *altajana* Staudinger, 1901 (Fig.23).

A single specimen was observed in the upper part of the Nizhnii Kuragan basin on a scree surrounded by dwarf birch tundra at 2,200 m on 14.VII.86. In the Argem basin highlands, the species was abundant at 2,200-2,500 m, mostly keeping to the patches of *Kobresia myosuroides* tundra and to the rocks on cirque-dividing crests, and being rarely found in other habitats. The butterflies usually sit on rocks and stones.

Material: CONFLUENT OF ARGEM, 2,200 m, 14.VII.1988, 1 ♂; 2,500 m, 16.VII.1988, 4 ♂♂; ARGEM, 2,500 m, 19.VII.1988, 2 ♂♂, 1 ♀; 20.VII.1988, 3 ♂♂, 1 ♀.

117. *Erebia pandrose* (Borkhausen, 1788) (Fig.24).

It was found by me in the highlands of Nizhnii Kuragan, Katun, and Argem basins, by V.V. Dubatolov in the Bertkem cirque, and by I.I. Lyubchanskii in the surroundings of Lake Talmenie, everywhere above 2,200 m. In the first of the sites mentioned, it occurred on *Dryas*

oxyodonta tundras, in the second at rock outcrops overgrown mostly by *Bergenia crassifolia* (L.) Fritsch and *Vaccinium myrtillus* L. (above 2,500 m). In the Argem basin, this species was especially abundant and occurred in different habitats: in alpine meadows and in dwarf birch, *Dryas oxyodonta*, or *Kobresia myosuroides* tundras, preferring the latter, similarly to the previous species. F.i: *Calliarthemum sajanense*.

Material: BERTKEM, 14.VII.1983, 2 ♂♂, V.D. and J. Jalava; UPPER KURAGAN, 1,700 m, 10.VII.1986, 1 ♀; 2,200 m, 12.VII.1986, 1 ♀; 2,300 m, 14.VII.1986, 1 ♂; KAPCHAL, 2,100 m, 5.VII.1987, 1 ♂; 2,300 m, 10.VII.1987, 1 ♂; 2,600 m, 11.VII.1987, 1 ♀; CONFLUENT OF ARGEM, 2,200 m, 12.VII.1988, 2 ♂♂; 21.VII.1988, 1 ♂; 2,500 m, 16.VII.1988, 1 ♂; 20.VII.1988, 2 ♂♂, 2 ♀ ARGEM, 19.VII.1988, 3 ♂♂, 2 ♀♀; the mountain top at Lake Talmenie, 2,400 m, 18.VII.1991, 2 ♂♂, I.L.

118. *Boeberia parmenio* (Boeber, 1809).

This species occurred on steppe southern slopes and dry open larch forest at the Koksū banks and in the hollow of Step Samakha.

Material: SAMAKHA, 1,600 m, 10.VII.1988, 2 ♀♀; KOKSU, 1,600 m, 10.VII.1988, 2 ♀♀; 1,600 m, 11.VII.1988, 1 ♂.

119. *Aphantopus hyperantus* (Linnaeus, 1758).

It abounds in terrace meadows, forest openings and in larch parklands at low altitudes.

Material: KURAGAN, 6.VII.1983, 2 ♂♂, G.S. Zolotarev; TYUNGUR, 30.VI.1985, 1 ♀; 30.VI.1986, 1 ♂.

120. *Hyponephele lycaon* (Kühn, 1777).

H. lycaon is a characteristic species of steppe meadows and rocky steppes of southern slopes.

Material: LOWER AKKEM, 1,050 m, 26.VII.1985, 1 ♂; KOKSU, 1,600 m, 11.VII.1988, 1 ♂; 23.VII.1988, 1 ♂; 25.VII.1988, 1 ♀.

121. *Oeneis (norma) (Thunberg, 1791) altaica* Elwes, 1899 (Fig.25).

This is a quite common species of the alpine, subalpine, and the upper part of the forest belts, tending to inhabit wet habitats. It was very abundant at the banks of Lake Nizhnee Akkemscoe in larch/dwarf birch parklands, on boggy dwarf birch thickets, and in alpine meadows. In the Nizhnii Kuragan, the Yazovaya and the Koksū valleys, this species was met with at river banks and in wet taiga openings overgrown with *Pentaphylloides fruticosa* bushes, at 1,600-1,800 m. Besides, in the upper flow of the Nizhnii Kuragan River, a specimen was observed on a scree within the tundra belt at 2,200 m. The butterflies were observed also at the banks of the Akkem and the Katun rivers in a close vicinity of the termini of their source glaciers.

These butterflies occupy any perches: prominent branches, stones, or spots of naked ground, and chase out any butterflies appearing nearby.

Material: Lake Nizhnee Akkemscoe, 20.VII.-10.VIII.1975, 1 ♂, N.V. Revyakina; BERTKEM, 2,500 m, 12.VII.1983, 1 ♂, A.V. Barkalov; 13.VII.1983, 1 ♂, 1 ♀; 14.VII.1983, 3 ♂♂, 2 ♀♀, V.D.; UPPER AKKEM, 2,050 m, 5.VII.1985, 4 ♂♂; 7.VII.1985, 1 ♂; UPPER KURAGAN, 1,800 m, 13.VII.1986, 1 ♂ (2,200 m, 14.VII.1986, 1 ♂; ESHTU, 1,300 m, 18.VII.1986, 2 ♀♀; KATUN SOURCE, 1,800 m, 9.VII.1987, 1 ♂; WATERFALL, 1,600 m,

Oe. magna dubia

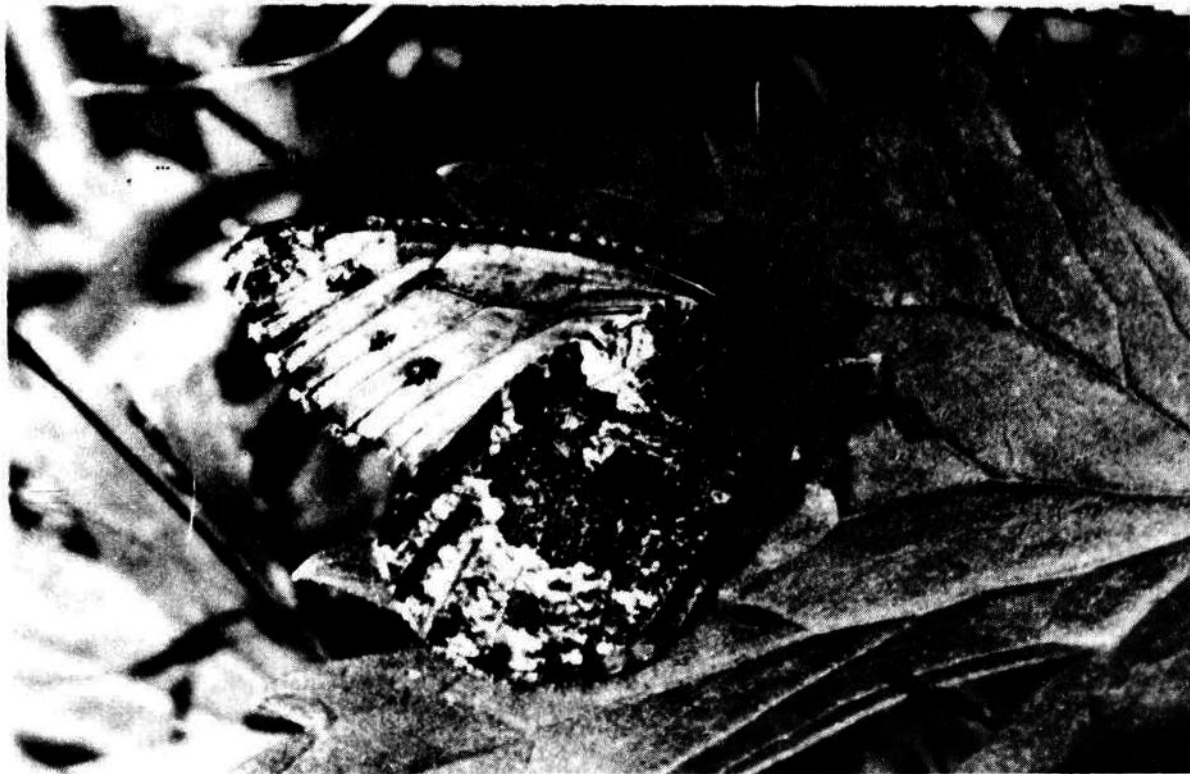


Fig. 24. *Erebia pandrose* Bork. at the upper flow of the Argem River, 2,500 m, 19.VII.1988.

Рис. 24. *Erebia pandrose* Bork. в верховьях р. Артем, 2500 м, 19.VII.1988.

Fig. 25. *Oeneis altaica* Elw., the bank of Lake Nizhnee Akkenskoe, 2,050 m, 7.VII.1985.

Рис. 25. *Oeneis altaica* Elw., берег озера Нижнее Аккемское, 2050 м, 7.VII.1985.

17.VII.1987, 1 ♀; KOKSU, 1,600 m, (11.VII.1988, 1 ♂;
12.VII.1988, 1 ♂); 23.VII.1988, 1 ♀; TALMENIE;
16.VII.1991, 1 ♂, l.l.

122. *Oeneis aktashi* Lukhtanov, 1984.

Material: the left bank of Lake Nizhnee Akkemscoe, 20.VII.-10.VIII.1975, N.V. Revyakina.

123. *Oeneis tarpeja* (Pallas, 1771).

This species occurred in Step Samakha in various steppe habitats and in open larch forests. It was quite common in the 20s of July on the steppe slopes of the southern foot of the Terektinskii Ridge 7 km west of Katanda.

Material: SAMAKHA, 1,600 m, 9.VII.1988, 1 ♂; 10.VII.1988, 2 ♂♂.

124. *Oeneis scudla* (Eversmann, 1851).

A female was caught at the sources of the Argem River in a flat patch of *Kobresia* tundra at 2,500 m on 19.VII.1988. Besides, according to the communication of V.V. Dubatolov, a specimen was caught by J. Jalava on 14.VII.1983 on a southern slope in the vicinity of the Bertkem cirque.

125. *Minois dryas* (Scopoli, 1763).

It is common on steppe slopes and in valley meadows at low altitudes.

Material: LOWER AKKEM, 1,100 m, 22.VII.1985, 1 ♀; 26.VII.1985, 1 ♂; AGAFONIKHA, 1,000 m, 26.VIII.1985, 1 ♂.

126. *Hipparchia autonoe* (Esper, 1784).

H. autonoe is abundant on rocky steppes of southern slopes, including desertified ones, the maximal recorded altitude being 1,600 m at the Koksus left bank, in great numbers.

Material: KOKSU, 1,600 m, 25.VII.1988, 4 ♂♂.

127. *Chazara briseis* (Linnaeus, 1764).

It was found in the lower part of the Akkem valley on southern slopes covered by rocky steppe or even desertified.

Material: LOWER AKKEM, 1,000 m, 30.VII.1985, 1 ♂.

As a matter of fact, the butterfly fauna of the Katunskii Ridge is not entirely embraced by this list. In particular, the Zoological Museum of BI possesses rich material collected at the surroundings of the Katanda Village, which is separated from the ridge only by the Katun River. These material include species not found yet within the territory of the Katunskii Ridge. These are *Parnassius stubbendorffii* Ménétriès, 1849 ("Katanda"), collected by E.G. Rodd in 1900, and *Syrictus cribrellum* (Eversmann, 1841), *Pyrgus serratulae* (Rambur, 1839), *Pieris rapae* (Linnaeus, 1758), *Fixsenia pruni* (Linnaeus, 1758), *Callophrys rubi* (Linnaeus, 1758), *Cupido osiris* (Meigen, 1829), *Glaucopteryx alexis* (Poda, 1761), *Clossiana oscarus* (Eversmann, 1844), *Brenthis hecate* (Denis et Schiffermüller, 1775), and *Lasiommata maera* (Linnaeus, 1758), collected by V.V. Dubatolov 7 km west of Katanda on the southern foot of the Terektinskii Ridge. Besides, at the bank of the Chendek [Чендек] River in the hollow of Uimonskaya Step, 2 km NW of the Nizhnii Uimon Village, on 26.VI.1983, he collected *Pseudophylotes vicrama* (Moore, 1865). No doubt that not only these twelve but also other species known from the adjacent territories of Central Altai will be found on the ridge. They are, for instance, *Argodiaetus sibiricus* (Staudinger, 1899) (= *A. damone* auct. non Eversmann,

1841) collected by V.V. Dubatolov near the Sugash [Cyrau] village (the Ust-Koksa district) and *Oeneis ammon* Elwes, 1899 found by V.V. Dubatolov and J. Jalava in the highlands of the Terektinskii Ridge (10 km north of Katanda, the Soptan [Соптан] minor ridge (see Fig. 1, site 6), 2,400 m, 20-22.VII.1983. It should be noted that in this site *Parnassius evermanni* and *Oeneis aktashi* were abundant which never have been observed in great numbers on the Katunskii Ridge).

The data reported could make an impression that the studied sites much differ in the local butterfly faunas and in the relative abundance of species. However, it must be taken into account that these sites were visited in different years, so much of the observed difference could result from the annual fluctuations of species abundance.

Below is an attempt to describe the distribution of butterflies in different vegetation belts in July (when imagines of the majority of butterfly species of the Altai Mts. are present).

The set of species flying in low altitude meadows is rather typical for the moderate climatic zone of West Siberia. It is characterized by relative richness, many species attaining very large quantities, namely *Plebejus subsolanus*, *P. amanda*, *Cyaniris semiargus*, *Pieris napi*, *Brenthis ino*, *Fabriciana* spp., *Mellicta* spp., *Coenonympha hero*, *C. glycerion*, *Minois dryas*, *Aphantopus hyperantus*, *Erebia neriene*. Among them *Brenthis ino*, *Coenonympha glycerion*, *Aphantopus hyperantus* (and *Agrodiaetus damon* in the Akkem valley) were mass species. The areas affected by human activity are characterized by the presence of *Pontia edusa*, *Colias hyale*, *Polyommatus icarus*.

All these species are also common in steppe habitats, but a number of characteristic steppe species are added: *Thymelicus lineola*, *Agrodiaetus damon*, *Polyommatus erotides*, *Melitaea latonigena*, *Coenonympha amaryllis*, *Hipparchia autonoe*, and, in the eastern part of the ridge, *Boeberia parmenio*. On southern slopes with rocks, *Parnassius apollo*, *Parnassius nomion*, *Scolitantides orion* are common, while *Maculinea arion*, *Tongeia fischeri*, which are also confined to rocky slopes, are much less abundant. On the overgrazed and, hence, desertified slopes, one can find *Agrodiaetus damon*, *Hipparchia autonoe*, and *Chazara briseis*.

In spite of the preference of meadow or steppe habitats, the majority of the species mentioned occur on both, which is conditioned by the biotopic mosaicism and the existence of various intermediate habitats and ecological plasticity of many species. Thus, *Parnassius* spp., *Hyponphele lycaon* and *Thymelicus lineola* penetrate into terrace meadows, and *Minois dryas*, *Coenonympha glycerion*, *Erebia neriene* into steppe slopes. Where the forest belt does not separate lowland and highland open habitats, as on the southern main slope of the ridge, many of these species (e.g. *Brenthis ino*) remain common up to the subalpine zone.

Butterflies of the low altitude birch and mixed forests form even more fuzzy ecological groups, as they can be found also in meadows at low as well as high altitudes. *Leptidea sinapis*, *Pieris napi*, *Anthocharis cardamines*, *Limenitis populi*, *Neptis rivularis*, *Nymphalis vaualbum*,

Araschnia levana, *Argynnis paphia*, *Lopinga achine*, *Erebia ligea* can be mentioned. Among them, *Leptidea sinapis*, *Pieris napi*, *Neptis rivularis*, and *Erebia ligea* are very numerous. *Aporia crataegi*, which is abundant almost in all the belts, should be attributed here too.

In the taiga belt, *Carterocephalus sibiricus*, *C. palaemon*, *Vaciniina optilete*, *Erebia jensseiensis*, *Erebia intermedia*, *Clossiana selene*, *C. selenis* determine the make-up of butterfly fauna, *Erebia jensseiensis* and *Euphydryas intermedia* being mass species. It is the taiga belt where these species, occurring from the lowest altitudes to highland, become dominants. *Clossiana titania*, *C. thore*, *Crebeta deidamia*, *Erebia cyclopius*, *E. aethiops* are also confined to the taiga belt, but they are rather scarce and were not found in all the sites examined.

The most numerous and characteristic species of the subalpine belt is *Erebia theano*, which abounds in large subalpine openings and parklands in the upper part of the forest belt, whereas *E. jensseiensis* dominates under the canopy. It is difficult to indicate another species confined to the subalpine belt, which is mostly inhabited by the immigrants from the beneath and above situated belts. The most abundant species here are *Aricia allous*, *Eumedonia eumedon*, *Euchloe ausonia*, *Mellicta* spp., *Clossiana euphrosyne*.

The material collected in highlands is highly variable in the species composition from site to site, which can be accounted for the diversity of highland landscapes and probably does not result solely from the annual fluctuation of species abundance. The most numerous butterfly of alpine meadows is *Boloria napaea*. *Parnassius phoebus*, *Heodes hippothoe*, *Issoria eugenia*, *Coenonympha tullia* are characteristic species as well, although they are less abundant. Besides, in the alpine zone of the western and eastern ends of the ridge, *Erebia kindermanni* was numerous, *E. maurisius* was common in the Akkem valley, while *E. kefersteini* in the Nizhnii Kuragan valley, each of these minor species of *Erebia* missing from the sites occupied by any other species (excluding one female of *E. maurisius* found at the sources of the Zaychonok River). This might indicate a narrow ecological standard of these species confined to certain peculiarities of their habitats.

The same butterfly species penetrate into tundras, but a number of species can be regarded as specific to them. They are *Pyrgus centaureae*, *P. sibiricus*, *Synchlora callidice*, *Clossiana freja*, *C. dia*, *Erebia pandrose*, and *E. callias*, the two latter species tending mostly to inhabit tundras formed by *Kobresia myosuroides*. Three species, *Albulina orbitulus*, *Melitaea arcesia* and *Clossiana frigga*, were found at the sources of the Akkem and the Argem Rivers at cirque bottoms (together with such plant species as *Saxifraga oppositifolia* and *Crepis nana*) and were undoubtedly missing from the neighboring narrow valleys. Two of them, namely *Melitaea arcesia* and *Clossiana frigga*, were not observed anywhere else. This might suggest that there are some ecological features of those cirques, which are required for these three species. Superficially, these cirques are characterized by the presence of fine detritous chlorite slopes and alluvial banks.

Three species should be indicated as tending to inhabit wet environments: *Oeneis altaica*, *Proclissiana*

eunomia, and *Boloria (pales)* sp., the latter species predominating in wet meadows with *Pentaphylloides fruticosa* in the flat upper parts of the Katun, the Belaya Berel, and the Yazovaya valleys.

From the faunistic point of view, two findings are especially interesting: *Euchloe creusa orientalis* and *Boloria (pales)* sp. The latter resembles the Central Asian forms of the genus, its closer study could be helpful for solving the systematic problems with the *pales* group. Three species should also be mentioned here, namely *Colias mongola*, *Agriades glandon*, and *Boeberia parmenio*, which were found only near the eastern end of the ridge. At the same time, they (and also *Oeneis sculda*) are very abundant in the South-East of Russian Altai, for example, at the Chikhachev Ridge [хр. Чихачева] (S. Bogachev's personal communication). That part of the Altai Mts. is characterized by low precipitation and a poor development of the forest belt allowing intergradation of steppe and tundra. On the wet and woody Katunskii Ridge such landscapes are scarce, being confined mostly to its south-eastern part. In particular, only in this part the mountain tundras formed by *Kobresia* are widely spread. The three butterfly species considered seem to meet their western boundary in this part of the Katunskii Ridge, or they become very rare to the west.

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