https://www.doi.org/10.33910/2686-9519-2023-15-2-325-354
http://zoobank.org/References/912125ED-10E5-4A6C-86E7-548CCD69F364

UDC 595.789

Early summer aspect of butterflies (Lepidoptera: Papilionoidea) of Republic of Khakassia as examined in 2000, with some additional data

O. E. Kosterin

Institute of Cytology & Genetics SB RAS, 10 Academika Lavrentyeva Ave., 630090, Novosibirsk, Russia
Novosibirsk State University, 2 Pirogova Str., 630090, Novosibirsk, Russia

Author
Oleg E. Kosterin
E-mail: kosterin@bionet.nsc.ru
SPIN: 2601-8725
Scopus Author ID: 6603142281
ResearcherID: AAC-6480-2019
ORCID: 0000-0001-5955-4057

Abstract. Data on early summer (1–7 July) aspect of butterflies in Republic of Khakassia and the adjacent Sharypovskiy District of Krasnoyarskiy Region (Central Siberia, Russia) observed on 1–7 July 2000 are presented. They may be used as a starting point for a long-term monitoring to trace temporal trends of butterfly assemblages of this territory along the same route. Observations on an additional short visit to Lake Itkul in May 2021 are also provided. The problem of insufficient and partly misleading representation of the butterfly fauna of the exact territory of Republic of Khakassia in literature is discussed. Some errors in previous publications on butterflies of South Siberia are noted.

Keywords: Lepidoptera, Papioionoidea, butterflies, Russia, Siberia, West Sayan

Раннелетний аспект дневных бабочек (Lepidoptera: Papilionoidea) Республики Хакасия в 2000 г., с некоторыми дополнительными данными

О. Э. Костерин

Институт Цитологии и Генетики СО РАН, ул. Академика Лаврентьева, д. 10, 630090, г. Новосибирск, Россия
Новосибирский Государственный Университет, ул. Пирогова, д. 2, 630090, г. Новосибирск, Россия

Сведения об авторе
Костерин Олег Энгельсович
E-mail: kosterin@bionet.nsc.ru
SPIN-код: 2601-8725
Scopus Author ID: 6603142281
ResearcherID: AAC-6480-2019
ORCID: 0000-0001-5955-4057

Аннотация. Приводятся данные о раннелетнем аспекте дневных бабочек в Республике Хакасия и сопредельном Шарыповском районе Краснодарского Края (Центральная Сибирь, Россия) по наблюдениям 1–7 июля 2000 г. Они могут быть полезны в качестве отправной точки для долговременного мониторинга по тому же маршруту с целью проследить тенденции изменения сообществ бабочек во времени. Приводятся также наблюдения во время кратковременного посещения озера Иткуль в мае 2021 г. Обсуждается проблема недостаточного и неточного отражения в литературе фауны дневных бабочек на территории Хакасии. Отмечены некоторые ошибки в предыдущих публикациях по дневным бабочкам Южной Сибири.

Ключевые слова: Lepidoptera, Papioionoidea, дневные бабочки, Россия, Сибирь, Западный Саян

Introduction

Butterflies are spectacular and popular insects, so their studies not only have theoretical or practical purposes (e.g. investigating butterflies as convenient objects of evolutionary genetics, in the former respect, and as bioindicators of quality of environments and long-term changes of climate, in the latter respect) but also have an intrinsic value of their own. On 1–7 July 2000, that is in the best butterfly season in Siberia, I undertook a week-long trip through the Republic of Khakassia from the north to the south but started in the adjacent Sharypovskiy District of Krasnoyarskiy Kray (one locality, also considered below), aiming to investigate its butterfly fauna and specially focusing on species of the subgenus *Lycaeides* Hübner, [1819] of the genus *Plebejus* Kluk, 1780.

Khakassia occupies the western part of the so-called Nazarovo-Minusinsk Depression, a moderately elevated (see elevations below) area of gentle hills and plains bordered in the west by the Kuznetskoe Alatau Mts, in the south-west by the Abakan Mountain Range, in the south by the West Sayan Mts and in the east by the East Sayan, but open to the West Siberian Lowland to the north. The great Yenisey River flows through this depression from south to north, bordering Khakassia in the east, yet most of the territory of Khakassia belongs to the Ob River basin, as drained by the Belyy Iyus and the Chernyy Iyus Rivers. They descend from the mountains in the west and join to produce the Chulym River, which approaches as closely as just 9 km to the Yenisey River (on a plain!) at Novoselovo Village but does not join it; instead, it inclines to the north-west, to join the Ob some 600 km north-westerly as the crow flies. Because of the rain shadow of the huge mountain mass of the Kuznetskiy Alatau, which catches most of the moisture coming with the Western Transfer, the depression is covered mostly by steppe rather than boreal forests, as could be expected from its latitudes, while the bordering mountains support vast areas of taiga. Khakassia is famous for its numerous and picturesque ancient tumuli (kurgans) adorned with standing flat stones.

The data on occurrence of butterfly species in localities examined during this expedition were briefly mentioned in Tschikolovets et al. (2009), a handbook summarising all published and many unpublished records as well as taxonomic treatments of butterflies of the Altai and the Sayan Mountains and Tuva, existing to the date of its publication. For this reason, this book is the universal source summarising records of butterflies in Khakassia existing to the same year. (At the same time, positions of dots in dot maps therein are not too precise and often misleading, so the maps should be considered with caution.) Also observations of *Erebia kefersteinii* (Eversmann, 1851) during the same expedition were mentioned in a special paper by Kosterin (2008). Besides, some butterfly records at the Sayanskiy Pass, simultaneously referring to both Khakassia and Tuva, were mentioned as first records for Republic of Tuva in Kosterin (2002). Some natural photos of butterflies taken during the expedition were included, with detailed geographic data, as illustrations in Gorbunov & Kosterin (2003; 2007). Nevertheless, the bulk of the data of the 2000 expedition deserves separate publication, at least to facilitate comparison with further data.

In addition, 22 years later, I had an opportunity to examine the SW bank of Lake Itkul, at the visit-centre of the Khakasskiy Nature Reserve, in the morning of 18 May 2022. That super-short examination revealed just three species, but they are worth including as one of those, *Carterocephalus argyrostigma*, was rather interesting (Eversmann, 1851). (No specimens were collected on that day but photographic records were made, for which the numerical ids of iNaturalist (2022; iNaturalist Research-grade Observations 2023) observations are provided in parentheses, so that the relevant links can be obtained by substitution 'id' with an actual number in the following template: https://inaturalist.org/ovservations/id.)

All but one locality examined resided at elevations of 400–800 m a.s.l. and represented

 https://www.doi.org/10.33910/2686-9519-2023-15-2-325-354

landscapes of two types, either steppe or taiga, sometimes alternating in a narrow temporal scale. Yet these types share many butterfly species and are more or less comparable. The exceptional locality was the Sayanskiy Pass through the Saylyg-Khem-Taiga Range of the West Sayan Mts, which serves as the border of the Republics of Khakassia and Tuva. There highland landscapes were examined of mountain tundras, screes and small alpine meadow patches, at elevations above 2,200 m a. s. l. and far above the tree line. The low and high elevations are naturally occupied by two different assemblages of butterfly species, few of those overlapping.

For convenience of possible further comparison, Table 1 indicates conventional abundance of species (based on field notes) at localities 1–4 and 6–13 thoroughly examined in July (locality 5, briefly examined in May, was excluded as incomparable).

The taxonomic treatment follows Gorbunov and Kosterin (2003; 2007), with few exceptions, e.g. that of Polyommatini followed Talavera et al. (2012), the split of *Oeneis* Hübner, [1819] in the traditional sense followed Dubatolov and Lukhtanov (2020), etc. The specimens are kept in the collection of the late Prof. Tomoo Fujioka and of the Siberian Zoological Museum of the Institute of Systematics and Ecology of Animals of the Siberian Division of the Russian Academy of Sciences, Novosibirsk (SZMN ISEA).

The list of localities examined

For brevity and at the same time to avoid confusion by double fidelity, each locality is given altogether a numeral and a brief conventional name, boldfaced in this section, which will be referred to in the annotated list (but only numerals are given in Table 1 and Fig. 1). Fig. 1 shows their geographical disposition.

1\NNE Parnaya: Krasnoyarskiy Kray Province, Sharypovskiy District, 5 km NNE of Parnaya Village, 55°19′N, 89°16′E, 500-600 m a. s. l., meadowy steppe on a southern hill slope with the aspect of *Vicia unijuga* A. Braun and *V. amoena* Fisch., or of *Stipa pennata* L., birch (*Betula pendula* Roth) / larch (*Larix sibirica* Ledeb.) groves at the hill crest and other slopes (Fig. 2), a long fallow land at its foot. 1.07.2000, O. Kosterin leg.

2\NE Kopyovo: Republic of Khakassia, Kopyevo District, 5 km NE of Kopyevo Village, the Kopyovskiy Kupol ('Kopyovo Dome') hilly massif, 55°02′N, 89°55′E, 450-600 m a. s. l., meadow (aspect of *Galium verum* L.) and proper steppes (aspect of *S. pennata*) with rock outcrops, solitary larches and birch groves (Fig. 3). 1.07.2000. O. Kosterin, O. Andreenkov leg.

3\NNE Kopyovo: Republic of Khakassia, Kopyevo District, 12 km NNE of Kopyevo Village, 55°04′N, 89°57′E, 500–700 m a. s. l., meadows (mostly of Poaceae, some with the aspect of *Hedysarum gmelinii* Ledeb., *Dracocephalum ruyschiana* L., or *Filipendula ulmaria* (L.) Maxim) and proper steppe patches with sparse larches among birch groves, some meadows with an aspect of *Onobrychis arenaria* (Kit.) DC, 2.07.2000. O. Kosterin, O. Andreenkov leg.

4\WNW Shira: Republic of Khakassia, Shira District, 11 km WNW of Shira Village, 54°32′N, 89°47′E, 550 m a. s. l., larch open parkland (Fig. 4), in denser areas with the aspect of *V. unijuga* and *F. ulmaria* and bushes of *Spiraea chamaedryfolia* L. 2.07.2000. O. Kosterin, O. Andreenkov leg.

5\Itkul': Republic of Khakassia, Shira District, Lake Itkul NE bank at the visit centre of the Khakasskiy State Nature Reserve: a large freshwater lake with shingle banks rimmed with bush thickets formed by *Hippophae rhamnoides* L. (top layer), *Riber alpinum* L. (middle layer), *Cerasus tomentosus* (Thunb.) Wall., *Ribes nigrum* L. and *Sambucus sibirica* Nakai (low layer) with sparse birch trees, surrounded by steppe, 54°28′N, 90°07′E, 500–800 m a.s.l., 18.05.2022. O. Kosterin.

6\SE Efremkino: Republic of Khakassia, Shira District, 2 km SE of Efremkino Village, 54°26′N, 89°28′E, 500–800 m a. s. l., a complicated terrain: stony S-exposed slopes clad with meadow steppe (mostly with the aspect of *H. gmelinii, G. verum, Phlomoides tuberosa* (L.) Moench) clad with limestone cliffs (Fig. 5), larch forest edges with tall herbage; floodplain

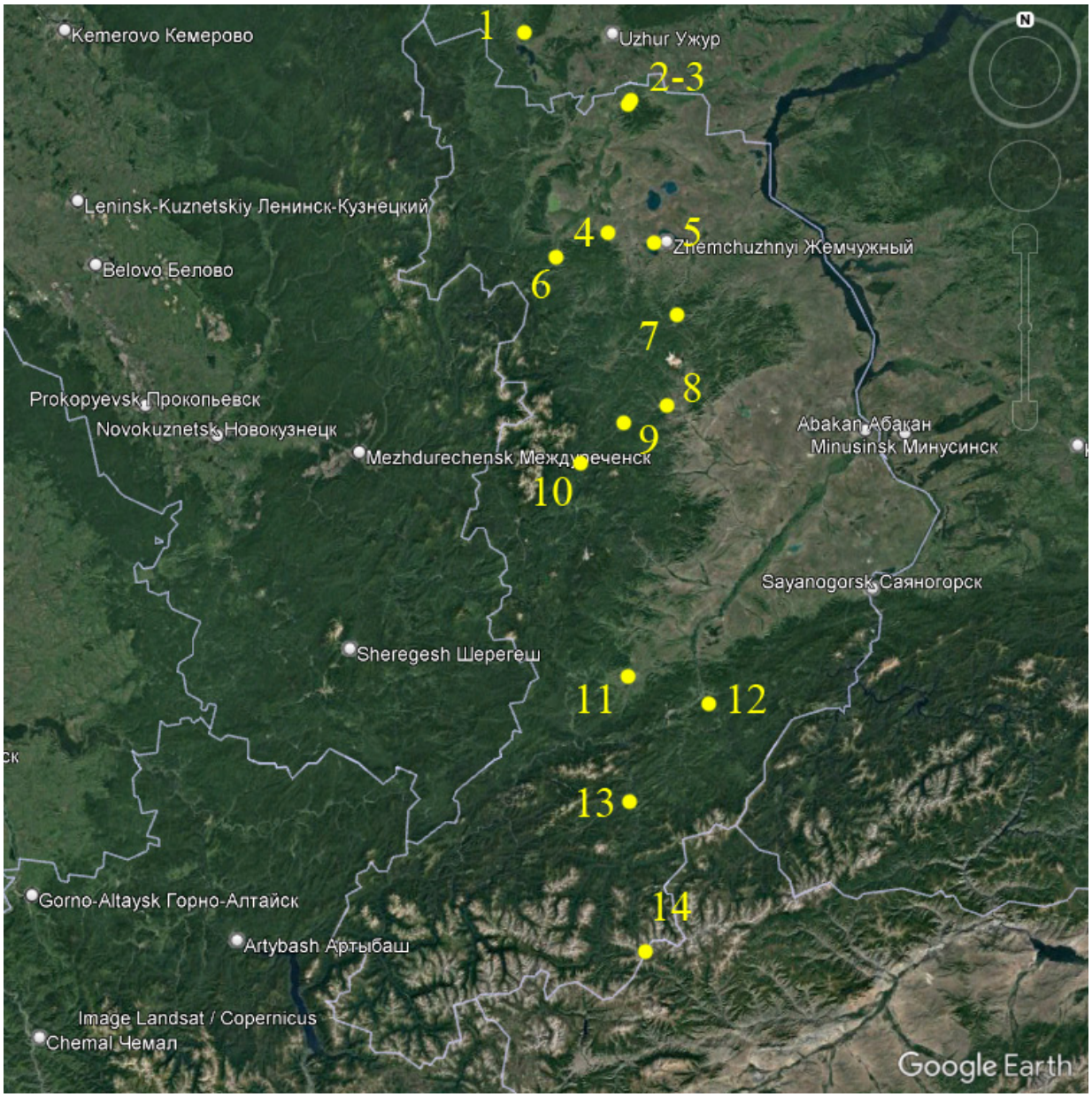

Fig. 1. Geographical disposition of the localities examined. For explanation of numerals see the text

Рис. 1. Географическое расположение обследованных точек. Нумерация объясняется в тексте

meadow patches of *F. ulmaria*. 3–4.07.2000. O. Kosterin, O. Andreenkov, N. Priydak leg.

7\Sonskiy: Republic of Khakassia, Bograd District, at Sonskiy Village, 54°10′N, 90°15′E, 800 m a. s. l., hilly, with broad valleys, forest-steppe of birch and larch, with stony S-exposed slopes covered with meadow steppe with the aspect of *H. gmelinii*. 4.07.2000. O. Kosterin, O. Andreenkov, N. Priydak leg.

8\Uybat: Republic of Khakassia, Ust-Abakan District, 7 km NWW of. Ust-Byur Village, left board of the Uybat River valley, ~53°50′30′′N, 90°10′E, 800 m a. s. l., steppen southern slopes (Fig. 6) with the aspect of *G. verum, Stipa pennata* L. and *Veronica incana* L. and bushes of *Caragana pygmaea* (L.) DC and *Spiraea hypericifolia* L. 5.07.2000. O. Kosterin, O. Andreenkov, N. Priydak leg.

9\Terensug headwaters: Republic of Khakassia, Ust-Abakan District, 28 km WSW of Ust-Byur Village, the very source of the Terensug River W of the pass through the junction of the Abakanskiy and the Batenevskiy Mt. Ranges, 53°46′N, 89°50′E, 900–1000 m a. s. l., tai-

 https://www.doi.org/10.33910/2686-9519-2023-15-2-325-354

Fig. 2. Hilly terrain 5 km NNE of Parnaya Village
Рис. 2. Холмистая местность 5 км ССВ с. Парная

Fig. 3. A view from the Kopyovskiy Kupol hilly massif 5 km NE of Kopyovo Village
Рис. 3. Вид с массива Копьевский Купол 5 км СВ с. Копьево

 https://www.doi.org/10.33910/2686-9519-2023-15-2-325-354

Fig. 4. Larch parkland 11 km WNW of Shira Village
Рис. 4. Парковый лиственничник 11 км ЗСЗ с. Шира

ga composed by (from less to more abundant) *Pinus sibirica* Du Tour*/Betula pendula* Roth./ *Abies sibirica* Ledeb./ *Picea obovata* Ledeb., abundant shrubbery, mostly of *Dasiphora fruticosa* (L.) O. Schwartz, tall herbage, large old logged areas (Fig. 7). 5.07.2000. O. Kosterin leg.

10\Terensug: Republic of Khakassia, Ust-Abakan District, 60 km WWS of Ust-Byur Village, Terensug River valley 5 km upstream of the Assug River mouth, 53°38′N, 89°33′E, 700–800 m a.s.l., meadowy and stony southern slopes with limestone cliffs (one with an impressive grotto), with *Spiraea* shrubbery, surrounded with spruce taiga (Fig. 8). 5.07.2000. O. Kosterin, O. Andreenkov, N. Priydak leg.

11\Tashtyp: Republic of Khakassia, Tashtyp District, right board of the Tashtyp River valley at Tashtyp Village, 52°47′N, 89°53′E, 450–500 m a. s. l., hills clad with meadow steppe. 6.07.2000. O. Kosterin, O. Andreenkov leg.

12\Dzhabash: Republic of Khakassia, Tashtyp District, valleys of the Dzhabash River and its tributary brook, 8 km E of Abaza Town, 52°39′N, 90°13′E, alt. 450–500 m, stone steppen slopes, meadows (with a considerable grasing pressure), birch woods. 6.07.2000. O. Kosterin, O. Andreenkov, N. Priydak leg.

13\Ona: Republic of Khakassia, Tashtyp District, the Ona River left bank at the bridge 4 km S of Kubayka Village, 52°18′N, 89°50′E, alt. 700 m a.s.l., a riparian meadow at spruce taiga margin. 6.07.2000. O. Kosterin leg.

14\Sayanskiy Pass: The border of Khakass and the Tyva Republics, the West Sayans, Sayanskiy Pass through the Sailyg-Khem-Taiga Mountain Range, 51°42′N, 89°52′E, alt. 2200–2400 m, with gentle slopes covered with versions of mountain tundra, mostly mossy-lichen tundra, and vast shale screes (Fig. 9); the dwarf birch tundra is present only as small spots. By remaining snow patches there are small patches of alpine meadow with diverse flowers. 7.07.2000. O. Kosterin leg.

Fig. 5. The Belyy Iyus River 5 km SE of Efremkino Village
Рис. 5. Долина р. Белый Июс 5 км ЮВ с. Ефремкино

Annotated list of collected and observed butterflies

Collected specimens, if any, are enumerated. Subspecific attribution chiefly follows Gorbunov and Kosterin (2003; 2007); subspecies are not indicated for species assumed as monotypic or subspecific subdivision of which remains unclear for the author. Since part of them is not currently available for study, in some cases their sex, and in two cases species, is not indicated. If a species was observed but not collected at a given locality, visual observations were provided with reference to subjective evaluation of abundance; the latter is not mentioned for species represented by voucher specimen but is provided for all species in Table 1.

Carcharodus flocciferus (Zeller, 1847)
Specimens: 10\Terensug, 1 spec.

Syrichtus cribrellum obscurior (Staudinger, 1892)
Specimens: 1\NNE Parnaya, 1 spec.; 2\NE Kopyovo, 2 spec.; 3\NNE Kopyovo, 2 spec.; 6\SE Efremkino, 1 spec.; 11\Tashtyp, 1 spec.
Observations: common in meadow steppes.

Pyrgus sibiricus (Reverdin, 1911)
Specimens: 14\Sayanskiy Pass, 10 spec.
Observations: a highland species found in mountain tundra, where was common; pairs playing in the air were frequently observed.

Thymelicus lineola (Ochsenheimer, 1808)
Specimens: 1\NNE Parnaya, 1 spec.; 2\NE Kopyovo, 1 spec.; 3\NNE Kopyovo, 2 spec.; 10\Terensug, 1 spec.; 11\Tashtyp, 1 spec.
Observations: common in meadows and steppes.

Ochlodes sylvanus (Esper, 1777)
Specimens: 13\Ona, 1♀.
Observations: found by a river flowing through spruce taiga; widespread in meadows by woods and open woods in e.g. Altai and elsewhere in West Siberia but seemingly rare in Khakassia.

Carterocephalus silvicola (Melgen, 1830)
Specimens: 9\Terensug headwaters, 3♂.

Carterocephalus argyrostigma (Eversmann, 1851)
Photographic registrations: 5\Itkul, up to 3 ind. (ids = 139986280, 139989224, 140026366, 140065011, 140070204, 140071832).
Observations: These skippers sipped wet ground of a cutting through riparian shrubbery or rested on bush branches (Fig. 10).

Heteropterus morphaeus (Pallas, 1771)
Specimens: 1\NNE Parnaya, 1 spec.; 2\NE Kopyovo, 2 spec.; 3\NNE Kopyovo, 1 spec.
Visual registrations:12\Dzhabash, 1 ind.

 https://www.doi.org/10.33910/2686-9519-2023-15-2-325-354

Fig. 6. The Uybat River valley
Рис. 6. Долина р. Уйбат

Fig. 7. Landscapes at the Terensug River headwaters
Рис. 7. Ландшафты в верховьях р. Теренсуг

 https://www.doi.org/10.33910/2686-9519-2023-15-2-325-354

Fig. 8. A view of the Terensug River valley from a grotto ca 5 km upstream of the Assug River mouth

Рис. 8. Вид на долину р. Теренсуг из грота, расположенного около 5 км вверх по течению от устья р. Ассуг

Fig. 9. The Sayanskiy Pass environs: mountain tundras and screes

Рис. 9. Окрестности Саянского перевала: горные тундры и осыпи

 https://www.doi.org/10.33910/2686-9519-2023-15-2-325-354

Table 1

Occurrence and subjective abundance of butterfly species in the localities in Republic Khakassia and Sharypovskiy District of Krasnoyarskiy Region examined on 1–7.07.2000

Таблица 1

Встречаемость и субъективная численность видов бабочек в локалитетах Республики Хакасия и Шарыповского района Красноярского края, обследованных 1–7 июля 2000 г.

Locality* / species	1	2	3	4	6	7	8	9	10	11	12	13	14
0	1	2	3	4	6	7	8	9	10	11	12	13	14
C. flocciferus	—	—	—	—	—	—	—	—	1	—	—	—	—
S. cribrellum	1	2	2	—	1	—	—	—	—	1	—	—	—
P. sibiricus	—	—	—	—	—	—	—	—	—	—	—	—	3
T. lineola	—	1	2	—	—	—	—	—	1	2	—	—	—
O. sylvanus	—	—	—	—	—	—	—	—	—	—	—	1	—
C. silvicola	—	—	—	—	—	—	—	2	—	—	—	—	—
H. morphaeus	2	3	1	—	—	—	—	—	—	—	1	—	—
P. machaon	—	1	—	—	—	—	—	—	—	—	—	—	—
P. apollo	—	—	—	—	—	—	—	—	3	—	—	—	—
P. nomion	—	—	—	—	1	—	—	—	—	—	—	—	—
P. phoebus	—	—	—	—	3	—	—	—	1	—	—	—	2
P. eversmanni	—	—	—	—	—	—	—	—	—	—	—	—	4
P. stubbendorffii	—	—	—	—	—	—	—	—	—	—	—	—	2
L. sinapis	—	—	—	—	—	—	—	2	—	—	—	—	—
L. morsei	—	—	—	—	2	—	—	1	—	—	1	—	—
L. amurensis	—	—	—	—	3	—	—	1	—	1	—	—	—
A. crataegi	2	1	—	—	3	—	—	1	3	—	3	2	4
P. rapae	1	—	—	—	—	—	—	3	—	—	—	—	—
P. napi	—	—	—	—	—	—	—	1	—	—	2	—	1
P. daplidice	—	—	—	—	—	—	—	1	1	—	—	—	1
A. cardamines	—	—	—	—	—	—	—	—	1	—	—	—	—
C. palaeno	—	—	—	—	2	—	—	—	—	—	—	—	—
C. hyale	2	1	—	2	2	3	—	1	—	—	2	—	—
C. heos	—	1	2	2	2	2	—	—	—	—	—	—	—
T. alciphron	1	—	—	—	—	—	—	—	—	—	—	—	—
C. argiolus	1	—	—	—	—	—	—	—	—	—	—	—	—
S. orion	1	2	—	—	2	—	2	—	1	—	—	—	—
C. minimus	—	1	—	2	2	—	—	—	—	—	2	—	—
C. osiris	1	—	—	—	2	—	—	—	—	—	—	—	—
E. argiades	2	—	—	2	—	—	—	2	2	2	2	—	—
T. fischeri	2	—	—	—	—	—	—	—	—	—	—	—	—
M. nausithous	—	1	—	—	—	—	—	—	—	—	—	—	—
M. teleius	2	2	1	2	1	—	—	1	—	—	—	2	—
M. kurentzovi	—	1	1	—	—	—	—	—	—	—	—	—	—
M. arion	—	—	—	—	—	2	2	—	—	—	—	—	—
A. artaxerxes	1	3	2	2	1	—	3	—	—	1	2	—	—
E. eumedon	—	1	1	—	1	—	—	—	—	1	2	1	—

Table 1. Continued
Таблица 1. Продолжение

0	1	2	3	4	6	7	8	9	10	11	12	13	14
P. amandus	3	4	1	3	1	1	3	—	1	2	2	—	—
P. thersites	1	—	—	—	—	—	—	—	—	—	—	—	—
A. ripartii	—	—	—	—	—	—	—	—	—	1	—	—	—
A. damone	—	—	—	—	1	3	—	—	—	—	—	—	—
P. icarus	—	2	1	—	1	—	—	—	—	—	1	1	—
P. eros	—	2	2	1	3	2	2	—	1	—	3	—	—
A. optilete	—	—	—	—	—	—	—	—	—	—	2	—	—
G. cyane	3	3	1	—	2	—	2	—	—	—	—	—	—
P. lucifera	1	—	—	—	—	—	—	—	—	—	—	—	—
P. argus	3	4	4	2	4	4	4	2	4	4	2	—	—
P. idas	3	4	4	2	—	3	3	—	1	4	4	—	—
P. argyrognomon	2	—	—	—	—	—	—	—	—	—	—	—	—
A. urticae	—	—	—	—	2	1	—	—	—	—	—	—	2
N. xanthomelas	—	—	—	—	—	—	1	—	—	—	—	—	3
N. rivularis	2	—	1	2	2	—	—	3	—	—	—	—	—
E. aurinia	—	—	—	1	—	—	—	—	—	—	—	—	—
E. iduna	—	—	—	—	—	—	—	—	—	—	—	—	1
M. (Mellicta)	2	3	3	3	3	2	—	1	2	—	2	—	—
M. phoebe	1	—	—	—	—	—	—	—	—	—	2	—	—
M. cinxia	—	—	—	—	—	—	1	—	—	—	—	—	—
M. didyma	2	3	1	?3	1	2	1	—	—	—	—	—	—
M. latonigena	—	—	—	—	—	—	—	—	—	—	2	—	—
M. arcesia	—	—	—	—	—	—	—	—	—	—	—	—	1
A. paphia	—	—	—	—	—	—	—	—	—	—	2	—	—
Fabriciana sp.	1	—	1	1	1	—	—	—	—	—	2	—	—
S. aglaja	—	—	—	—	—	—	—	1	1	—	1	—	—
B. ino	3	3	3	3	—	—	1	—	1	—	—	—	—
C. euphrosyne	1	—	—	—	—	—	—	1	—	—	—	—	—
C. selene	1	—	—	—	—	—	—	1	—	—	1	—	—
C. frigga	—	—	—	—	—	—	—	—	—	—	—	—	1
C. eunomia	—	—	—	—	—	—	—	—	—	—	—	—	2
B. napaea	—	—	—	—	—	—	—	—	—	—	—	—	2
L. maera	2	—	—	—	—	—	—	—	—	—	—	—	—
L. deidamia	—	—	—	—	1	—	—	3	—	—	—	—	—
L. achine	2	1	3	2	2	—	—	3	—	—	2	—	—
M. russiae	4	2	4	3	1	2	3	—	—	2	—	—	—
C. glycerion	4	4	4	3	3	3	2	—	2	1	—	—	—
C. hero	—	—	2	1	—	—	—	3	—	—	—	2	—
C. amaryllis	1	3	2	2	3	3	2	—	—	—	—	—	—
C. oedippus	—	—	—	—	—	—	—	—	—	3	4	—	—
A. hyperantus	1	2	2	3	2	3	—	—	—	—	—	2	—
H. lycaon	—	—	—	—	—	—	—	—	—	—	3	—	—
D. tarpeia	1	—	1	—	—	—	—	—	—	—	—	—	—
H. autonoe	2	1	1	—	—	—	2	—	—	—	—	—	—
O. norna	—	—	—	—	—	—	—	—	—	—	—	—	2

 https://www.doi.org/10.33910/2686-9519-2023-15-2-325-354

Table 1. Continued
Таблица 1. Продолжение

0	1	2	3	4	6	7	8	9	10	11	12	13	14
O. ammon	—	—	—	—	—	—	—	—	—	—	—	—	2
B. parmenio	2	3	4	3	3	2	3	—	—	—	—	—	—
E. ligea	—	—	—	—	1	—	1	4	—	—	2	—	—
E. jeniseiensis	—	—	—	—	—	—	—	3	—	—	—	—	—
E. aethiops	—	—	—	—	—	—	—	—	—	—	1	—	—
E. theano	—	—	—	—	1	—	—	3	3	—	—	—	—
E. kefersteinii	—	—	—	—	—	—	—	3	2	—	—	—	1
E. pandrose	—	—	—	—	—	—	—	—	—	—	—	—	4
E. rossii	—	—	—	—	—	—	—	—	—	—	—	—	2
E. magdalena	—	—	—	—	—	—	—	—	—	—	—	—	2
E. callias	—	—	—	—	—	—	—	—	—	—	—	—	2

* For the locality numbers see the text. Conventional abundance scores refer to the approximate number of individuals (in fact their orders of magnitude) met during several hours of searching (the weather was invariably good): 1 — single; 2 — few (up to 10); 3 — tens; 4 — hundreds

*Номера населенных пунктов см. в тексте. Условные баллы численности относятся к примерному числу (порядку величины) особей, встреченных за несколько часов поисков (при неизменно хорошей погоде): 1 — одиночные; 2 — несколько (до 10); 3 — десятки; 4 — сотни

Observations: common in meadows.

Papilio machaon machaon Linnaeus, 1758
Visual registrations: 2\NE Kopyovo, 1 ind.
Observations: the only individual was observed on a hill top, well illustrating hilltopping as a characteristic feature of the behaviour of this this species.

Parnassius apollo sibiricus (Nordmann, 1851)
Specimens: 10\Terensug, 1♂ (released after examination in hand).
Observations: Found at one locality only, where quite many males flew over a sunny slope with a big limestone cliff.

Parnassius nomion korshunovi Kreuzberg et Pljustsh, 1992
Visual registrations: 6\SE Efremkino, 1 ind.
Observations: the fresh individual found for some reason had its left wings unspread.

Parnassius phoebus phoebus (Fabricius, 1793)
Specimens: 6\SE Efremkino, 2♂, 4♀; 10\Terensug, 1♀; 14\Sayanskiy Pass, 1♂, 1♀ (all released after examination).
Observations: In Siberia, this species is generally more common above the tree line and less at open slopes in the forest belt; yet in Khakassia we had opposite observations. Very few individuals were found on a small tundrous small plateau just above the Sayanskiy Pass, while they were rather common (and already worn out) at limestone rocks of the Belyy Iyus River valley by Efremkino Village, which the males steadily patrolled by flying along.

Parnassius eversmanni eversmanni (Ménétriés, 1850)
Specimens: 14\Sayanskiy Pass, 9♂, 2♀ (all released after examination).
Observations: Curiously, this picturesque species (Fig. 11) was found to be among the most abundant butterflies in the Sayanskiy Pass keeping to flowery SE slopes and avoiding tundras. Many individuals were already worn out.

Parnassius stubbendorffii stubbendorffii (Ménétriés, 1849)
Specimens: 14\Sayanskiy Pass, 2♂.
Observations: This species occurs both in the forest belt in spring and in alpine meadows in mid-summer, as trophically associated there with different species of *Corydalis* (Gorbunov, Korshunov, 2003). As our trip took place in July, we found only its highland version, which was, however, scarce — just a few individuals were found, curiously one at the crest of a local top covered with screes and almost devoid from vegetation. One individualwas observed

Fig. 10. *Carterocephalus argyrostigma* at the Lake Itkul NE bank, 18.05.2022
Рис. 10. *Carterocephalus argyrostigma* у СВ берега оз. Иткуль, 18.05.2022

to landed on stones and disappeared; it was found under stones at the depth of ca 20 cm, carried there by a large spider.

Leptidea sinapis (Linnaeus, 1758)
Specimens: 9\Terensug headwaters, 1♂, 1♀.

Remarks: The male genitalia were not checked for not being of the sibling species ***Leptidea juvernica*** Williams, 1946 (Solovyev et al. 2015), which could be excluded from this area (Gorbunov, Kosterin 2007: sub. *L. reali* Reissinger, 1990).

Leptidea morsei major (Grund, 1805)
Specimens: 6\SE Efremkino, 2♂; 9\Terensug headwaters, 1♂; 12\Dzhabash, spec.

Leptidea amurensis amurensis (Ménétriés, 1859)
Specimens: 6\SE Efremkino, 7♂; 9\Terensug headwaters, 1♂; 11\Tashtyp, 1♂.
Observations: Fresh butterflies of this species were quite abundant at meadows of the Iyus River valley slopes, seemingly having emerged on the observation day.

Aporia crataegi (Linnaeus, 1758)
Specimens: 1\NNE Parnaya, 2♂; 2\NE Kopyovo, 1♀; 6\SE Efremkino, 1♂, 1♀; 9\Terensug headwaters, 1♂; 14\Sayanskiy Pass, 2♂.
Visual registrations: 10\Terensug, many; 12\Dzhabash, many; 13\Ona, few.
Observations: In general this is the most abundant Siberian butterfly flying mostly in June. During our trip its abundance varied over localities but in general they were already declining at the end of their flight period, with all females already having transparent 'windows' on their forewings where the scales were missed because of repeated but vain attempts of males to mate. Curiously it was the most abundant butterfly in highlands of the Sayanskiy Pass where it was evenly dispersed over slopes, tops and saddles. All over Siberia, *A. crataegi* migrates actively via poorly understood directions (Gorbunov, Kosterin 2003), so there is no doubt that these butterflies reached the highlands in the course of such migration.

Pieris rapae rapae (Linnaeus, 1758)
Specimens: 1\NNE Parnaya, 1♀; 9\Terensug headwaters, 5♀.

Pieris napi napi (Linnaeus, 1758)
Specimens: 9\Terensug headwaters, 1♂; 12\Dzhabash, 1♂, 1♀; 14\Sayanskiy Pass, 1♂.
Remarks: The male from Sayanskiy Pass has an extended dark UNF spot and UNS suffusion as in f. *bryoniae*, which was reported from the Sayans (but not Altai) (Gorbunov & Kosterin, 2003), but, following Gorbunov & Kosterin (2003) and Ivonin et al. (2018), I abstain from assuming it as a subspecies.
Observations: Found in woody habitats, except for the mentioned male, which was found as high as ca. 2,500 m above the Sayanskiy Pass.

Pontia daplidice edusa (Fabricius, 1777)
Specimens: 9\Terensug headwaters, 1♂; 14\Sayanskiy Pass, 1♀.
Visual registrations: 10\Terensug, 1 ind.
Observations: This species mostly prefers ruderal habitats but we met all the three individuals in natural habitats, of which the very worn out female found at 2,300 m a.s.l.

 https://www.doi.org/10.33910/2686-9519-2023-15-2-325-354

Fig. 11. A worn out female of *Parnassius eversmanni eversmanni* in mossy/lichen mountain tundra at the Sayanskiy Pass, 7.07.2000

Рис. 11. Самка *Parnassius eversmanni eversmanni* в мохово-лишаниковой тундре в окрестностях Саянского перевала, 7.07.2000

in mountain tundra above the Sayanskiy Pass was most unexpected.

Antocharis cardamines cardamines (Linnaeus, 1758)
Specimens: 10\Terensug, 1♂.
Observations: A species preferring humid herbage in forest meadows and open forests.

Colias palaeno palaeno (Linnaeus, 1761)
Specimens: 6\SE Efremkino, 1♂, 1♀.
Observations: This species is mostly associated with peaty habitats, such as raised bogs or peaty taiga, but strays, mostly females, can be found everywhere. Our finding of two individuals of both sexes in the Belyy Iyus valley was nevertheless unexpected: there was just an open larch and birch stand rather than humid taiga, on calcareous soils of basic reaction, in contrast to acid soils of the preferred habitats of this species.

Colias hyale hyale (Linnaeus, 1758)
Specimens: 1♂; 4\WNW Shira, 2♂; 6\SE Efremkino, 1♂; 7\Sonskiy, 3♂, 1♀; 9\Terensug headwaters, 1♂.
Visual registrations: 1\NNE Parnaya, many; 2\NE Kopyovo, 1♂; 12\Dzhabash, few 1♂.
Observations: Prefers meadows ruderal vegetation, and we observed the same in Khakassia but this species occurred at natural meadows as well, mostly near hill crests.

Colias heos (Herbst et Jablonsky, 1792)
Specimens: 2\NE Kopyovo, 1♂; 3\NNE Kopyovo, 1♂; 6\SE Efremkino, 1♂, 4♀; 4\WNW Shira, few; 7\Sonskiy, few.
Observations: Throughout its Siberian range this species prefers meadow steppe usually with an open larch stand, exactly as we observed in Khakassia.

Thersamolycaena alciphron (Rottemburg, 1775)
Specimens: 1\NNE Parnaya, 1♂.
Observations: Surprisingly, the only specimen of this meadow species was collected on a long fallow field (at a hill foot).

Celastrina argiolus (Linnaeus, 1758)
Visual registrations: 1\NNE Parnaya, 1 worn out ind.

Observations: This species is common in Siberia, but our trip took place between the flight periods of its two broods.

Scolitantides orion (Pallas, 1771)
Specimens: 1\NNE Parnaya, 1♂; 2\NE Kopyovo, 4♂; 6\SE Efremkino, 2♂; 10\Terensug, 1♀; 8\Uybat, 1♂, 1♀.
Observations: In our area this species develops on *Sedum hybridum* L. (Goubunov, Kosterin 2003) and so was expectedly abundant at rock outcrops where its foodplant grows.

Cupido minimus minimus (Fuessly, 1775)
Specimens: 2\NE Kopyovo, 1♂; 4\WNW Shira, 2♀; 6\SE Efremkino, 1♂.

Cupido osiris (Meigen, 1829)
Specimens: 1\NNE Parnaya, 1♂; 6\SE Efremkino, 2♂, 2♀.

Everes argiades (Pallas, 1771)
Specimens: 1\NNE Parnaya, 2♀; 4\WNW Shira, 1♂, 1♀; 9\Terensug headwaters, 2♂; 11\Tashtyp, 3♀; 12\Dzhabash, 3♂.
Photographic registrations: **5**\Itkul: 1♂ (id=140079149).
Visual registrations: 10\Terensug, few.
Observations: A very common meadow species.

Tongeia fischeri (Eversmann, 1843)
Specimens: 1\NNE Parnaya, 1♂, 1♀.
Observations: In our area the species develops on the petrophyte *Orostachys spinosa* (L.) Sweet (Goubunov, Kosterin 2003) and so was found at a rocky crest.

Maculinea nausithous (Bergsträsser, [1779])
Specimens: 2\NE Kopyovo, 1♂.

Maculinea teleius teleius (Bergsträsser, [1779])
Specimens: 1\NNE Parnaya, 3♂; 2\NE Kopyovo, 1♂, 1♀; 4\WNW Shira, 3♂, 1♀; 6\SE Efremkino, 1♀; 9\Terensug headwaters, 1♂; 13\Ona, 1 ♂, 1♀.

Maculinea kurentzovi Sibatani, Saigusa, Hirowatari, 1994
Specimens: 2\NE Kopyovo, 1♂; 3\NNE Kopyovo, 1♀.
Remarks: This species was rather recently described from the Russian Far East and Transbaikalia, with the diagnostic difference from *M. teleius* being the postdiscal spot in the space between veins Cu1 and Cu2 very strongly shifted basad, so breaking the row. Based on this character Dubatolov and Kosterin (1999) reported a male specimen of *M. kurentzovi* from the Abakan environs, 27 July 1974, in the SZMN ISEA collection. Sergey L. Nikolaev (pers. comm.) kindly shared photos of doubtless male specimens of *M. kurentzovi* in the same museum from two Khakassian localities: 2♂, Khakassia, the Sartaban River valley [near Abaza Town], 16–18.07.1972, Y. Korshunov leg., and 2♂, Khakassia, Tashtyp District, the Sigirtup village environs, 7.07.2004, A. Nikolaev leg.; and, noteworthy, 4♂ and 5♂ of *M. teleius* with the same two labels, respectively. This implies that *M. kurentzovi* is widespread in Khakassia and co-occur with *M. teleius* (the same in the Kopyovo Village environs according to our data). Moreover, a male specimen of *M. kurentzovi* from "Altai, Katun River, Ustyuba, 3.07.1902 (ISEA)" is illustrated (as *M. teleius obscurata*) in Tschikolovets et al. (2008: Plate VIII: 17). This photo may serve as an excellent illustration of *M. kurentzovi* from South Siberia.
This, however, does not exclude ano-ther interpretation, that '*M. kurentzovi*' is in fact just a distinct morph of *M. teleius*, scattered over its Siberian and Far Eastern range. Since neither version, species versus morph, is still proved, I follow the former one as the currently accepted point of view.
Observations: This and two previous species of *Maculinea* were found in meadows, where *Sanguisorba officinalis* L. grows with which their early stage caterpillars are associated (later being transferred to ant nests) (Goubunov, Kosterin 2003). Imagines prefer to rest on its inflorescences as well.

Maculinea arion cyanecula (Eversmann, 1848)
Specimens: 7\Sonskiy, 3♂; 8\Uybat, 2♂.

Aricia artaxerxes artaxerxes (Fabricius, 1793)
Specimens: 1\NNE Parnaya, 1♂; 2\NE Kopyovo, 3♂, 1♀; 3\NNE Kopyovo, 2♂; 4\WNW Shira, 3♂; 6\SE Efremkino, 1♂; 8\Uybat, 5♂; 11\Tashtyp, 1♀; 12\Dzhabash, 2♂.
Observations: A common meadow species associated with *Geranium* spp.

Eumedonia eumedon eumedon (Esper, [1780])
Specimens: 2\NE Kopyovo, 1♂; 3\NNE Kopyovo, 1♂; 6\SE Efremkino, 1♂; 7\Sonskiy,

 https://www.doi.org/10.33910/2686-9519-2023-15-2-325-354

1♂; 11\Tashtyp, 1♀; 12\Dzhabash, 1♂, 2♀; 13\Ona, 1 ♂.
Observations: A common meadow species associated with *Geranium* spp.

Cyaniris semiargus semiargus (Rottemburg, 1775)
Specimens: 1\NNE Parnaya, 1♂; 2\NE Kopyovo, 1♂; 6\SE Efremkino, 1♂; 7\Sonskiy, 2♂, 1♀; 9\Terensug headwaters, 10♂; 8\Uybat, 5♂; 12\Dzhabash, 3♂, 1♀.
Visual registrations: 3\NNE Kopyovo, few; 10\Terensug, few; 11\Tashtyp, few.
Observations: One of the most common meadow species in Siberia.

Polyommatus amandus amandus (Schneider, 1792)
Specimens: 1\NNE Parnaya, 6♂, 3♀; 2\NE Kopyovo, 7♂, 1♀; 3\NNE Kopyovo, 1♂; 4\WNW Shira, 2♂, 1♀; 6\SE Efremkino, 1♂; 7\Sonskiy, 1♂; 10\Terensug, 1♂; 8\Uybat, 3♂; 11\Tashtyp, 1♂, 1♀; 12\Dzhabash, 1♂.
Observations: Perhaps the most common species in meadow steppes and meadows in Siberia, prefers patches with dominance of *Vicia amoena* and *V. unijuga*.

Polyommatus thersites (Cantener, 1834)
Specimens: 1\NNE Parnaya, 1♀.
Observations: Found on a meadow with domination of its larval foodplant *Onobrychis arenaria*, (Gorbunov, Kosterin 2003), which was just flowering.

Polyommatus ripartii (Freyer, 1830)
Photographic registrations: Tashtyp, 1♂.

Polyommatus damone altaicus (Elwes, 1899)
Specimens: 6\SE Efremkino, 1♂; 7\Sonskiy, 6♂.
Observations: This species occurred on slopes covered with rocky meadows with dominance of *Hedysarum gmelinii*, which is among its larval foodplants (Gorbunov, Kosterin 2003) and so was remarkably abundant (Fig. 12) at 7\Sonskiy where this plant community was excellently represented.

Polyommatus icarus fuchsi (Scheljuzhko, 1928)
Specimens: 2\NE Kopyovo, 1♂, 1♀; 3\NNE Kopyovo, 1♂; 6\SE Efremkino, 1♀; 12\Dzhabash, 1♀.
Visual registrations: 13\Ona, 1♀.
Observations: The most common species in ruderal habitats and also on meadows; found by us at natural meadows.

Fig. 12. A female (left and centre) and male (right) of *Polyommatus damone sibiricus* at Sonskiy village, 4.07.2000

Рис. 12. Самка (слева и в центре) и самец (справа) *Polyommatus damone sibiricus* в поселке Сонский, 4 июля 2000 г.

Polyommatus eros erotides (Staudinger, 1892)
Specimens: 2\NE Kopyovo, 2♂; 3\NNE Kopyovo, 1♂, 1♀; 4\WNW Shira, 1♂; 6\SE Efremkino, 10♂; 7\Sonskiy, 2♂; 10\Terensug, 1♂; 8\Uybat, 5♂; 12\Dzhabash, 15♂.
Observations: A common steppen species.

Agriades optilete (Knoch, 1781)
Specimens: 12\Dzhabash (at a brook nearby), 3♂.
Observations: A species of peaty habitats and humid taiga, however it was found on a muddy road, trampled by cattle, by meadowy slopes, most probably descending there from taiga patches uphill.

Glabroculus cyane (Eversmann, 1837)
Specimens: 1\NNE Parnaya, 3♂, 1♀; 2\NE Kopyovo, 1♂; 3\NNE Kopyovo, 1♂; 6\SE Efremkino, 1♂, 1♀; 8\Uybat, 3♂, 1♀ (all released after examination).
Visual registrations: 10\Terensug, 1 ind.
Observations: The species is tightly associated with *Goniolimon speciosum* (L.) Boiss. in the larval and even imaginal stage (the adults prefer to keep to large inflorescences of this plant as well and feed on them), so it mostly stony places in meadow steppe or rocky slopes. This plant was abundant in most steppen localities while these butterflies appeared much less numerous than expected.

Plebejus lucifera (Staudinger, 1867)
Specimens: 1\NNE Parnaya, 1♀.

Plebejus argus clarasiatica (Verity, 1931)
Specimens: 1\NNE Parnaya, 4♂, 3♀; 2\NE Kopyovo, 18♂; 3\NNE Kopyovo, 9♂, 3♀; 4\WNW Shira, 2♀; 6\SE Efremkino, 38♂, 29♀; 7\Sonskiy, 21♂, 6♀; 9\Terensug headwaters, 1♂; 10\Terensug, 26♂, 1♀; 8\Uybat, 18♂, 2♀; 11\Tashtyp, 35♂, 14♀; 12\Dzhabash, 2♂.
Observations: One of the most common meadow species. It was found especially abundant in some restricted areas (with no obvious peculiarities) on meadows on steep slopes above limestone cliffs on the right side of the Belyy Iyus River (6\SE Efremkino). In the evening the imagines seemed to congregate, up to several dozens in half a metre, were overnighted preferably on the whitish inflorescences of *Artemisia frigida* Willd.

Plebejus idas subsolanus (Eversmann, 1851)
Specimens: 1\NNE Parnaya, 11♂, 3♀; 2\NE Kopyovo, 18♂, 2♀; 3\NNE Kopyovo, 9♂, 2♀; 4\WNW Shira, 2♂; 7\Sonskiy, 3♂, 2♀; 8\Uybat, 7♂, 1♀; 11\Tashtyp, 25♂, 10♀; 12\Dzhabash, 74♂ (from a large congregation).
Visual registrations: 10\Terensug, 1♂.
Remarks: This species was the main target of our expedition. Most male specimens had the UPS black border occupying not less than half of the wing lengths, so that in extreme cases the deep blue occupies about one third of the UPS total area (Fig. 13), hence well representing the subspecies *P. idas subsolanus* (Churkin, Zhdanko 2003; Gorbunov, Kosterin 2003). Yet that border was variable and in some specimens (e.g. in males from 7\Sonskiy and the only male seen at 10\Terensug) narrowed to 1–2 mm, as in the subspecies *P. idas ongodai* (Tutt, 1909) widespread in the Altai Mts (Gorbunov, Kosterin 2003; Kosterin 2007). (Curiously, the holotype of that taxon had the wings as in *P. idas subsolanus*, being an aberration among males with the black border as narrow as ca 1.5 mm, which predominate overwhelmingly in Altai, see Churkin, Zhdanko (2003)).
The most variable male UPS, with the mentioned versions of the black border development, and intermediates, of comparable frequences, was observed by me in the Central Tuvinian Depression, on sands at Lake Khadyn; that population looked intermediate between subspecies (Kosterin 2009).
Observations: Usually occurs together with the previous species, mostly on meadows with dominance of *Vicia amoena* and *V. unijuga* (but at 11\Tashtyp the imagines seemed to associate with *Lathyrus pratensis* L.), and is locally very abundant but less widespread, as found at fewer localities. For instance, *P. idas* was absent from the Iyus River valley (6\SE Efremkino), where *P. argus* was so abundant. At 12\Dzhabash, 74 males were collected from the same congregation, joint with *Coenonympha oedippus*, on mud, in two attempts: after the first net stroke not less number of those re-gathered again after a while, probably attracted by cattle urine.

 https://www.doi.org/10.33910/2686-9519-2023-15-2-325-354

Fig. 13. A male of *Plebejus idas subsolanus* at Tashtyp Village, 6.07.2000
Рис. 13. Самец *Plebejus idas subsolanus* в окрестностях с. Таштып, 6.07.2000

Plebejus argyrognomon mongolicus Grum-Grshimailo, 1993
Specimens: 1\NNE Parnaya, 3♂.

Remarks: In South Siberia, two types of this species are recognised, — (i) the larger with larger submarginal orange lunules on UNH and clearer blue male UPS and female UPS without blue suffusion, and (ii) the smaller with smaller orange spots, somewhat darker male UPS, usually with dark submarginal spots between veins on UPH, and female UPS often with a blue suffusion. Although in Buryatia they were found to co-occur, to develop on different hostplants (the larger form on *Lathyrus amoena* and the smaller one on *Astragalus laguroides* Lam.) and to have shifted flight periods (Gorbunov, Kosterin 2003), they are currently assumed as subspecies, respectively associated with the names *P. argyrognomon mongolicus* and *A. agryrognomon transbaicalensis* (Kurentzov, 1970) (Gorbunov 2001; Gorbunov, Kosterin 2003; Tschikolovets et al. 2008). Their distribution was outlined incorrectly in Gorbunov (2001) and inadequately (with inner contradiction) in Gorbunov and Kosterin (2003), while Tschikolovets et al. (2008) presented the current notion of their distribution rather well, which is however strange: *P. a. mongolicus* occurs in Altai and in West Buryatia while *P. a. transbaikalensis* in the Nazarovo-Minusinsk Depression and Tuva in between. However, in the cited source, the specimens from the Parnaya Village environs considered here were misidentified as *P. a. transbaikalensis*, most probably just because of their geographical provenance. However, these males were large and with clear UPS and so unequivocally identifiable as *P. a. mongolicus*. On the other hand, it was the small *P. a. transbaikalensis* which was reported for the steppes of Khakassia (Gorbunov, Kosterin 2003). We failed to find them but, taken together, the reported facts suggest that both subspecies (?) occur in the Nazarovo-Minusinsk Depression, as reflected in Sinev (2019).

Observations: Found on meadows at upper part of slopes of the hilly crest where *V. unijuga* and *V. amoena* dominated, thus confirming attribution of these butterflies to *Plebejus argyrognomon mongolicus* according to Gorbunov & Kosterin (2003).

Neptis rivularis magnata Heyne in Rühl, 1895
Specimens: 1\NNE Parnaya, 1♂; 3\NNE Kopyovo, 1 spec.; 6\SE Efremkino, 1 spec.; 9\ Terensug headwaters, 6 spec.

Visual registrations: 4\WNW Shira, 2 ind.
Observations: A tamnophilous species preferring forest margins and open tree stands.

Nymphalis xanthomelas (Esper, [1781])
Specimens: 8\Uybat, 1 spec.; 14\Sayanskiy Pass, 3 spec.
Observations: Most intriguingly, this was among the most abundant butterfly on mountain tops above the Sayanskiy Pass, having got there because of hilltopping behaviour (when the butterflies use local relief maxima as sexual meeting points). Obviously freshly emerged individuals were observed, which would aestivate later.

Aglais urticae urticae (Linnaeus, 1758)
Specimens: 14\Sayanskiy Pass, 1 spec.
Visual registrations: 6\SE Efremkino, 1 ind.; 7\Sonskiy, few.
Observations: Two individuals were met above the Sayanskiy Pass among numerous ones of the previous species. The highland habitats of the Sayanskiy Pass are unfit for development of this species associated with nettle, as well as for the previous species associated with willows, but their well-expressed hilltopping behaviour makes them raise as high as possible, a habit probably bringing about disadvantage in high mountains.

Inachis io io (Linnaeus, 1758),
Photographic registrations: 5\Itkul, 2 ind. (id = 140078052).

Euphydryas aurinia laeta (Christoph, 1893)
Specimens: 4\WNW Shira, 1♂.

Euphydrias iduna sajana Higgins, 1950
Specimens: 14\Sayanskiy Pass, 1♂.
Observations: In South Siberia this is a highland species, a male of which was expectedly found in mountain tundra.

Melitaea (Mellicta) aurelia centralasiae Wnukowsky, 1929
Specimens of Mellitaea (Mellicta) sp.: 1\NNE Parnaya, 3♂, 2♀; 2\NE Kopyovo, 7♂, 3♀; 3\NNE Kopyovo, 1♂, 1♀; 4\WNW Shira, 1♂; 6\SE Efremkino, 4♂; 9\Terensug headwaters, 1♂; 10\Terensug, 1♂, 1♀; 12\Dzhabash, 1♂.
Visual registrations: 7\Sonskiy, few.
Remarks: Unfortunately, the collected specimens of the subgenus *Mellicta* Billberg, 1820 were not identified by the genitalia soon after capture and are unavai-lable at present. No doubt, most of them belonged to *M. aurelia centralasiae* (this taxonomical treatment follows Ivonin et al. 2013), which is most common species in the mea-dow steppe of the mountains of South Siberia, which is the ecological optimum of this taxon. Also most of the butterflies observed in the field had uneven colour of the UPS pale spots and somewhat expanded spots of the postdiscal rows, as usual in this taxon. However, it cannot be excluded that the collected series also contained two other expectable and quite common species, *M. (Mellicta) athalia* (Rottemburg, 1775) and/or *M. (Mellicta) britomartis* (Assmann, 1847), so above I enumerate specimens as not identified to species.

Melitaea phoebe phoebe ([Denis et Schiffermüller], 1775)
Specimens: 12\Dzhabash, 2♂.
Visual registrations: 1\NNE Parnaya, 1 ind.

Melitaea cinxia (Linnaeus, 1758)
Visual registrations: 8\Uybat, 1 ind. (very worn out).

Melitaea didyma (Esper, [1779]) ssp.
Specimens: 1\NNE Parnaya, 2♂, 2♀; 2\NE Kopyovo, 3♂, 2♀; 3\NNE Kopyovo, 1♀; 7\Sonskiy, 1♂, 1♀; 8\Uybat, 1♂.
Visual observations: 6\SE Efremkino, 1♂.
Observations: Common in steppes of any kind, seems to prefer stony places.

Melitaea latonigena (Eversmann, 1847)
Specimens: 12\Dzhabash, 1♂, 1♀.
Remarks: This and the previous species are very close but are well recognised by the veins inside the UNH postdiscal orange band distinctly stressed with black scales, and the black borders of that band contacting veins. In Altai, Krasnoyarskiy Region and Khakassia, *M. latonigena* replaces *M. didyma* at higher elevations with in general more wooded environment, yet inhabiting barren open slopes with stony steppe (Gorbunov, Kosterin 2007). It was natural to find the former from the Sayanian side of the Abazinskiy Pass through the Abakan Mountain Range, at the Dzhabash River in the West Sayan foothills

 https://www.doi.org/10.33910/2686-9519-2023-15-2-325-354

Observations: Found at stony steppe slope in a brook valley.

Melitaea arcesia arcesia (Bremer, 1864)
Specimens: 14\Sayanskiy Pass, 1♂.
Observations: One more highland species in South Siberia (but not e. g. in Yakutia where it occurs at forest glades), one male of which was found in a mountain tundra.

Argynnis paphia (Linnaeus, 1758)
Specimens: 12\Dzhabash, 2♂.
Observations: Mostly a forest species which keeps to margins and clearings.

Speyeria aglaja (Linnaeus, 1758)
Specimens: 9\Terensug headwaters, 1♂; 12\Dzhabash, 1♂.
Visual registrations: 10\Terensug, 1 ind.

Fabriciana sp.
Specimens: 4\WNW Shira, 1♂; 6\SE Efremkino, 1♂.
Visual registrations: 3\NNE Kopyovo, 1 ind.; 12\Dzhabash, few.
Remarks: Unfortunately, the two males collected (at the very beginning of the flight period of larger Argynniini) were not identified in time for the two possible options, *Fabriciana adippe* ([Denis et Schiffermüller], 1775) and *F. niobe* (Linnaeus, 1758), and are no longer available. Note that the specific name *coredippe* Leeh, 1893 (as *Argynnis coredippe* (Leeh, 1893) in Tschikolovets et al. (2008) was applied in error to specimens and reports of *F. niobe*. This error was later corrected in the next book by the same authors devoted to the butterflies of Kazakshan (Tschikolovets et al. 2016). The reality of the species *F. coredippe* as such and its occurrence in the mountains of S Siberia are questionable and demand further study. It is claimed to be characterised by presence of a long sex brand on vein Cu_2 and a short one on veing Cu_1, while in *A. niobe* the sex brands are rather indistinct, but so far there is no proof that the expression of androconia in the *niobe*-group is a species specific trait rather than an intra-species polymorphism.

Brenthis ino ino (Rottemburg, 1775)
Specimens: 1\NNE Parnaya, 4♂; 2\NE Kopyovo, 2♂, 1♀; 3\NNE Kopyovo, 4♂; 4\WNW Shira, 1♂; 10\Terensug, 1♂; 8\Uybat, 1♂.
Observations: Common in meadows.

Clossiana euphrosyne euphrosyne (Linnaeus, 1758)
Specimens: 1\NNE Parnaya, 1♂; 9\Terensug headwaters, 1♂.
Clossiana selene selene ([Denis et Schiffermüller], [1775])
Specimens: 1\NNE Parnaya, 1♀; 9\Terensug headwaters, 1♂; 12\Dzhabash, 1♂.

Clossiana frigga alpestris (Elwes, 1899) (1♀)
Specimens: 14\Sayanskiy Pass, 1♀.
Observations: In South Siberia, this species is associated with boggy meadows and bogs above the tree line. In the Sayanskiy Pass just one female was found at an alpine meadow patch.

Clossiana eunomia acidalia (Böber, 1809)
Specimens: 14\Sayanskiy Pass, 1♂.
Observations: Associated with highlands, mostly mountain birch tundras, in Altai, where is very abundant, but with taiga in East Siberia. We found very few individuals in the Sayanskiy Pass; that is in line with the Altai version of its habitat preference but the scarcity of the species there looked unusual.

Boloria napaea altaica (Grum-Grshimailo, 1893)
Specimens: 14\Sayanskiy Pass, 1♂.
Observations: Associated with alpine and, less readily, subalpine meadows and very abundant everywhere above the tree line in the Altai Mts. However, on the Sayanskiy Pass just two individuals were found, a situation paralleled by the previous species.

Lasiommata maera (Linnaeus, 1758)
Visual registrations: 1\NNE Parnaya, 1♂.
Observations: Found in an open pine forest on a hill crest.

Lasiommata deidamia (Eversmann, 1851)
Specimens: 6\SE Efremkino, 1♂; 9\Terensug headwaters, 6♂.
Observations: Mostly a taigous species, found in its regular woody habitat on glades and margins of undisturbed taiga in the Terensug River headwaters, but by larch groves in the Belyy Iyus River valley.

Lopinga achine achine (Scopoli, 1763)
Specimens: 2\NE Kopyovo, 1♂; 3\NNE Kopyovo, 6♂; 4\WNW Shira, 2♂; 6\SE Efrem-

kino, 2 spec.; 9\Terensug headwaters, 6♂; 12\Dzhabash, 1 spec.
Visual registrations: 1\NNE Parnaya, many very worn out ind.
Observations: This is a forest species, hence being abundant at 9\Terensug headwaters, in mostly steppe localities 2–4 and 6 found at birch or larch groves or (in loc. 6) in the shade of cliffs.

Melanargia russiae russiae (Esper, [1784])
Specimens: 1\NNE Parnaya, 3♂, 1♀; 2\NE Kopyovo, 3♂; 4\WNW Shira, 1♂; 6\SE Efremkino, 1♂.
Visual registrations: 3\NNE Kopyovo, many; 7\Sonskiy, few; 8\Uybat, many;
Observations: Common in steppes of any kind, but mostly in meadow steppes.

Coenonympha glycerion iphicles Staudinger, 1892
Specimens: 1\NNE Parnaya, 3♂, 3♀; 2\NE Kopyovo, 4♂, 1♀; 3\NNE Kopyovo, 2♂; 4\WNW Shira, 1♂, 1♀; 6\SE Efremkino, 3♂; 8\Uybat, 2♂; 11\Tashtyp, 1♂.
Visual registrations: 10\Terensug, few.
Observations: A common meadow species.

Coenonympha hero perseis Lederer, 1853
3\NNE Kopyovo, 2♂; 9\Terensug headwaters, 8 ind.; 13\Ona, 1 spec.
Visual registrations: 4\WNW Shira, 1 ind.
Observations: Prefers forest mewdows, hence at home in the Terensug and Ona River valleys but rather unexpected at Kopyovo.

Coenonympha amaryllis amaryllis (Stoll, 1782)
Specimens: 1\NNE Parnaya, 1♂; 2\NE Kopyovo, 2♂, 1♀; 4\WNW Shira, 1♂; 6\SE Efremkino, 2♂.
Visual registrations: 3\NNE Kopyovo, few; 7\Sonskiy, many; 8\Uybat, few.
Observations: A common steppe species.

Coenonympha oedippus magna Heyne, 1895
Specimens: 11\Tashtyp, 4♂, 1♀; 12\Dzhabash, 13♂.
Observations: A species generally preferring meadow steppe. Found in two localities only on 6.07.2000 as represented by fresh individuals, which seemed to have just emerged that day.

Aphantopus hyperantus sibiricus Obraztsov, 1936
Specimens: 1\NNE Parnaya, 1♂; 2\NE Kopyovo, 3♂; 4\WNW Shira, 1♀; 6\SE Efremkino, 5♂, 1♀.
Visual registrations: 3\NNE Kopyovo, few; 13\Ona, 1♀.
Observations: A common species tending to woody habitats.

Hyponephele lycaon catamelas Staudinger, 1886
Specimens: 12\Dzhabash, 5♂.
Observations: A common steppe and meadow species with a flight period mostly later than our trip — individuals found were all very fresh and seemed to emerge on that day.

Davidina tarpeia tarpeia (Pallas, 1771)
Specimens: 1\NNE Parnaya, 1♀; 3\NNE Kopyovo, 1♀.
Observations: A steppe species earlier than the dates of our trip.

Oeneis norna altaica Elwes, 1899 (2♂, 1♀)
Specimens: 14\Sayanskiy Pass, 2♂.
Observations: Just three individuals of this highland species were observed on nearly flat tundra surfaces.

Oeneis ammon ammon Elwes, 1899 (1♂),
Specimens: 14\Sayanskiy Pass, 1♂
Observations: A strictly highland species, few individuals of which were observed on flat tundrous surfaces on the Sayanskiy Pass and on the top surfaces of local relief maxima above it.

Oeneis aktashi ona Korshunov, 1996
Specimens: 14\Sayanskiy Pass, 4♂, 4♀.
Remarks: Sayanskiy Pass is the type locality of this species, so the specimens collected were topotypes.
Observations: A strictly highland species which occurred only on screes on slopes above the pass, with average vegetation cover varying from ca 50% to zero. They flew very fast and for long distances but readily landed exclusively on flat shale stones of which those screes were composed. There they sat mostly in a vertical position, but when the sun hid behind a cloud they almost laid on one side (Fig. 14), seemingly to be oriented perpendicular to the sun

 https://www.doi.org/10.33910/2686-9519-2023-15-2-325-354

Fig. 14. A male of *Oeneis aktashi ona* on a scree at the Sayanskiy Pass, 7.07.2000

Рис. 14. Самец *Oeneis aktashi ona* на осыпи в окрестностях Саянского перевала, 7.07.2000

when it reappears. But if the sun did not reappear soon, they, keeping the same laying position, crawled towards a stone margin and hid between stones. A copulating pair was noticed on top of a local relief maximum.

Hipparchia autonoe sibirica Staudinger, 1861
3\NNE Kopyovo, 1♂.
Visual registrations: 1\NNE Parnaya, at rocky hill crests, few; 2\NE Kopyovo, 1 ind.; 8\Uybat, 2 ind.;
Observations: A steppe species flying mostly later than the time of our trip, so observed by singular specimens, mostly in rocky places.

Boeberia parmenio (Böber, 1809)
Specimens: 1\NNE Parnaya, 3♂, 2♀; 2\NE Kopyovo, 4♀; 4\WNW Shira, 1♀; 6\SE Efremkino, 2♂, 1♀.
Visual registrations: 3\NNE Kopyovo, many; 7\Sonskiy, few; 8\Uybat, many.
Observations: This steppen species, extending to highland 'tundrosteppes' in Altai (Gorbunov, Kosterin 2007), appeared fairly abundant and widespread in the meadow steppes of the Khakassia northern part, but most individuals were already worn out.

Erebia ligea ligea (Linnaeus, 1758)
Specimens: 6\SE Efremkino, 1♂; 9\Terensug headwaters, 14♂; 8\Uybat, 1♂; 12\Dzhabash, 2♂.
Observations: A forest species.

Erebia jeniseiensis (Trybom, 1877)
Specimens: 9\Terensug headwaters, 9♂, 3♀.
Observations: A forest species, the only butterfly occurring under the tagia shade canopy (at the Terensug River headwaters).

Erebia aethiops (Esper, [1777])
Specimens: 12\Dzhabash, 1♂.

Fig. 15. A male of *Erebia rossii ero* at the Sayanskiy Pass, 7.07.2000
Рис. 15. Самец *Erebia rossii ero* на осыпи в окрестностях Саянского перевала, 7.07.2000

Erebia theano approximata Warren, 1831
Specimens: 7\Sonskiy, 1♂; 9\Terensug headwaters, 5♂; 10\Terensug, 1♂, 1♀.
Observations: In Khakassia this is a forest species, expected to extend to subalpine zone, not examined by us.

Erebia kefersteinii (Eversmann, 1851)
Specimens: 9\Terensug headwaters, 10♂, 3♀; 10\Terensug, 2♂; 14\Sayanskiy Pass, 1♂.
Remarks: Isolation of subspecies in this species is not so convincing; for the eastern principle slope of the Kusnetskoe Alatau Mts, where the Terensug River flows, the subspecies *E. kefersteinii otteni* Murzin et Sinjaev, 2003 was reported (Gorbunov, Kosterin 2007).
Observations: Kosterin (2007) discussed occurrence of this species in the forest belt in this area but mostly above the tree line in Altai. On our expedition we observed the species in both environments, but at the Sayanskiy Pass only one individual was found, at a flowery patch by melting snow.

Erebia callias altajana Staudinger, 1901
Specimens: 14\Sayanskiy Pass, 7♂.
Observations: A strictly highland species; it was restricted to tundra-clad local relief maxima above the Sayanskiy Pass.

Erebia magdalena erinnyn Warren, 1932
Specimens: 14\Sayanskiy Pass, 1♂, 1♀.
Observations: A strictly highland species. The female was found on a crest clad with a mix of tundra, barren stone areas and alpine meadow patches, the male on a barren scree of its southern slope clad with barren screes.

Erebia rossii ero Bremer, 1851
Specimens: 14\Sayanskiy Pass, 5♂.
Observations: A strictly highland species (Fig. 15); the butterfly occurred at barren

 https://www.doi.org/10.33910/2686-9519-2023-15-2-325-354

patches of shale, onto which they readily landed for rest, and fed on alpine flowers.

Erebia pandrose yernikensis Korshunov, 1995
Specimens: 14\Sayanskiy Pass, 17♂, 7♀.
Observations: A highland species as a rule living above the tree line but also occurring on tundrous openings in the upper part of the taiga belt (R. Maximov, pers. comm.). This species predominated overwhelmingly over other satyrines in the mountain tundras of the Sayanskiy Pass. The state of the wings varied greatly among individuals, from fresh to badly worn out. These butterflies readily landed to rest on stones but were very cautious.

Discussion

For just the first week of July 2000, Khakassia was examined thoroughly by us from the north to the south in 14 localities, with 90 butterfly species revealed. This is as much as ~70% of 128 species so far reported for Republic of Khakassia according to a count based on Tschikolovets et al. (2008) (but see below), with *M. kurentzovi* added based on Dubatolov and Kosterin (1999) and *Apatura iris* (Linnaeus, 1758) added later by Dragan (2018). Seven more species (*T. alciphron, C. argiolus, T. fischeri, P. thersites, P. lucifera, P. argyrognomon,* and *L. maera*) were found only in the locality 1\NNW Parnaya (Table 1), which is very close to but still beyond Khakassia. It is, however, natural in their series as residing in the same landscape of hills clad with lush meadows and meadow steppe, which predominates in the northern Khakassia. Besides, there in the low elevations of Khakassia were as many as 18 more species recorded in just one lowland locality only (not counting 16 species found in the unique highland locality 14\Sayanskiy Pass) (Table 1). This only in part may be ascribed to rarity of some of them or some specific habitats (e.g. continuous taiga in the locality 9\Terensug headwaters). At the same time it should be taken into account that the greater is a locality number, the more southerly it resides and at the later date it was visited, that is the localities with greater numbers were more advanced phenologically when examined. And indeed, some species in some localities visited at later dates were represented by very fresh individuals and looked as first emerged on the day of observation, like *P. nomion, L. amurensis, P. eros* in 6\Efremkino, *C. oedippus* in 11\Tashtyp and 12\Dzhabash, *H. lycaon* in 12\Dzhabash. If so, their absence in localities visited before was due to phenological reasons. Also some widespread species which fly somewhat later were not at all registered, such as e.g. *Limenitis populi* (Linnaeus, 1758), *Polyommatus damon* ([Denis et Schiffermüller], 1775) or *Minois dryas* (Scopoli, 1763). This is why I had to refer to the early summer butterfly aspect in the paper title. Of course it would be useful to extend the expedition for one or two more weeks to complete the entire summer aspect. Nevertheless, our route looks very representative for butterfly habitats in different parts of Khakassia and may be recommended for a long term monitoring of butterfly diversity and abundance (that is why mostly habitats rather than butterflies are illustrated here). So the here presented data could serve as a starting point.

The locality of the Sayanskiy Pass stands apart as situated far above the tree line. Of 21 species registered there only six (~29%, *P. phoebus, A. crataegi, P. napi, N. xanthomelas, A. urticae,* and *E. kefersteini*) were found also at low elevations, one (*P. stubbendorffii*) most probably occurs there in spring, while 15 were highland species.

The above mentioned count of butterfly species so far reported for Khakassia was complicated by a systematic error resulting in many false reports: a misleading way of citing by Tschikolovets et al. (2008) of the first edition of Catalogue of Lepidoptera of Russia (Sinev 2008). That catalogue used numbered regions explained in page 8. They included region 22, explained as 'Krasnoyarsk region: the south of Krasnoyarskiy Region, Republic of Khakassia', and a species was indicated as present in region 22 if reported from either. However Tschikolovets et al. (2008) expanded those regions to verbal descriptions and listed both regions for all species indicated for region 22 by Sinev et al. (2008) (but naturally did not add any dots on their dot maps). So, an

explicit toponym 'Khakassia' appeared for as many as 43 species which actually had never been reported from the territory of Republic of Khakassia, as follows from the bulk of other literature thoroughly referred to for each species by the same Tschikolovets et al. (2008). These are: *Erynnis tages* (Linnaeus, 1758), *Pyrgus malvae* (Linnaeus, 1758), *Cartetocephalus argyrostigma*, *C. palaemon* (Pallas, 1771), *O. sylvanus*, *Hesperia comma* (Linnaeus, 1758), *Pieris brassicae* (Linnaeus, 1758), *Pontia chloridice* (Hübner, [1813]), *P. callidice* (Hübner, [1800]), *Euchloe ochracea* (Linnaeus, 1758), *E. creusa* (Doubleday, [1847]), *Colias tyche* (Böber, 1812), *Thecla betulae* (Linnaeus, 1758), *Ahlbergia frivaldszkyi* (Lederer, 1855), *Callophrys rubi* (Linnaeus, 1758), *Lycaena phlaeas* (Linnaeus, 1761), *Thersamolycaena dispar* (Haworth, 1803), *T. alciphron, C. argiolus, Everes alcetas* (Hoffmannsegg, 1804), *Glaucopsyche alexis* (Poda, 1761), *Pseudophylotes vicrama* (Moore, 1864), *P. lucifera, Agriades orbitulus* (de Prunner, 1798), *L. populi, Nymphalis antiopa* (Linnaeus, 1758), *Vanessa cardui* (Linnaeus, 1758), *I. io, Araschnia levana* (Linnaeus, 1758), *Euphydryas maturna* (Linnaeus, 1758), *Melitaea plotina* Bremer, 1861, *M. diamina* (Lang, 1879), *M. cinxia* (Linnaeus, 1758), *Damora sagana* (Doubleday, 1847), *Fabriciana adippe*, *F. niobe*, *Issoria lathonia* (Linnaeus, 1758), *Clossiana selenis* (Eversmann, 1837), *C. oscarus* (Eversmann, 1844), *C. titania* (Böber, 1812), *C. angarensis* (Erschoff, 1870), *C. dia* (Linnaeus, 1767), *Triphysa nervosa* Motschulsky, 1866, *Erebia embla* (Thunberg, 1791), *E. edda* Ménétriés, 1851. (A report for region 22 in Sinev (2008) of one more such species, *Pyrgus maculatus* (Bremer et Grey, 1852), was missed by Tschikolovets at al. (2008)). Many of these species were most probably mentioned in a manuscript of the Ph. D. thesis (candidate of science dissertation) by the prominent expert in Siberian butterflies, Y.P. Korshunov, devoted to the butterflies of Khakassia; however, not only this thesis has never been published but it has not even been defended, so no extended abstract 'printed on the rights of a manuscript' was issued.

I did not count the above listed 43 species in the above given figure of 128 species reported for Khakassia. Neither did I count species reported for Minusinsk, or Tagarskiy Island on the Yenisey at Minusinsk, since formally these records refer to the Yenisey River right bank which is already in the Krasnoyarskiy Region, not in Khakassia. There is no doubt that an overwhelming majority of these species do occur in Khakassia but their precise reports from there seem to be still missing.

From this point of view, the here reported findings of such species as *C. argyrostigma, O. sylvanus, I. io* and *M. cinxia* can be formally considered as their first explicit reports for Khakassia. *C. argyrostigma* was missed from region 22 in the Catalogue first edition (Sinev 2008) but was included into its second edition (Sinev 2019), based on its reports from Minusinsk vicinities (Suschkin, Tschetverikov 1907) and, specifically, Tagarskiy Island (Tschikolovets et al. 2008). It may also be noted that our findings of *P. sibiricus, O. ammon, M. arcesia, C. eunomia, E. rossi,* and *E. magdalena* on the Sayanskiy Pass in 2000, which is exactly on the border of Khakassia, were chronologically the first for this territory. They were earlier published (except for *M. arcesia*) in either Gorbunov (2001), Kosterin (2002), Gorbunov and Kosterin (2003), or Tshikolovets et al. (2008). (It should be noted that the dot maps of *P. machaon* and *P. rapae* in Tschikolovets et al. (2008) missed dots for Khakassian localities of these species referred to in the text, Lake Shira for both and the Son River for the latter, so the Khakassian reports of these species were not shown visually but still can be inferred from the text.)

Anyway, the here reported data do not provide any findings not expectable in Khakassia. On the other hand, it would be reasonable to compile a registry or a database of all butterfly reports in literature specifically for the Republic of Khakassia, which would contain precise geographical locations. As follows from the above, currently too many even common species have never been precisely reported from this territory. Hereby I draw attention to this circumstance in a hope to encourage people

 https://www.doi.org/10.33910/2686-9519-2023-15-2-325-354

who used to collect butterflies in Khakassia to report them soon. At this stage it would be too premature to compile a current checklist of the butterflies of the Republic of Khakassia based on literature reports. Nevertheless such a checklist can be obtained by taking the above annotated list of our records, removing three species, *P. alciphron, C. argiolus* and *P. lucifera*, which were found in Sharypovskiy Disrict but not yet reported for the territory of Khakassia, and adding *A. iris* reported by Dragan (2018) and the following 37 species reported for specific localities in Khakassia in literature (summarised by Tschikolovets et al. 2008) but not met by us: *Syrichtus tessellum* (Hübner, [1803]), *Pyrgus centaureae* (Rambur, [1839]), *Pyrgus alveus* (Hübner, [1803]), *Colias chrysotheme* (Esper, [1871]), *Gonepteryx rhamni* (Linnaeus, 1758), *Satyrium pruni* (Linnaeus, 1758), *S. prunoides* (Staudinger, 1887), *Lycaena helle* ([Denis et Schiffermüller], 1775), *Heodes virgaureae* (Linnaues, 1758), *Paleochrysophanus hippothoe* (Linnaeus, 1761), *Glaucopsyche lycormas* (Butler, 186), *Maculinea alcon* ([Denis et Schiffermüller], 1775), *Aricia chinensis* (Murray, 1874), *A. nicias* (Melgen, 1830), *P. damon*, *Nymphalis vau-album* ([Denis et Schiffermüller], 1775), *Polygonia c-album* (Linnaeus, 1758), *Vanessa atalanta* (Linnaeus, 1758), *Melitaea athalia, M. britomartis, Brenthis hecate* ([Denis et Schiffermüller], 1775), *Clossiana thore* (Hübner, [1803]), *Boloria frigidalis* Warren, 1844, *Lasiommata petropolitana* (Fabricius, 1787), *Coenonympha pamphilus* (Linnaeus, 1758), *C. tullia* (Müller, 1764), *Hyponephele lupina* (Costa, [1836]), *Davidina sculda* (Eversmann, 1851), *D. urda* (Eversmann, 1847), *Oeneis jutta* (Hübner, [1806]), *O. magna* Graser, 1888, *M. dryas, Erebia neriene* (Böber, 1809), *E. medusa* ([Denis et Schiffermüller], 1775), *E. cyclopius* (Eversmann, 1844), *E. fletcheri* Elwes, 1899, and *E. stubbendorfii* (Eversmann, 1851). With the formally new species findings in Khakassia reported here, this checklist would include 132 species, while the expected number of butterfly species occurring in Khakassia would be ca. 170–180.

Both the terrain and butterfly assemblage of Khakassia resembles the Altai Mountains, so popular among butterfly lovers. The main difference of the terrain is much broader valleys and gentler mountains, that of the butterfly fauna is abundance and omnipresence in open landscapes of a large and peculiar eastern species *B. parmenio*, which occurs in Altai mostly in its south-eastern regions, and maybe also scarcity of some species common in Altai, e.g. *O. sylvanus*. A strongly differing subspecies of *P. idas*, with restricted blue in the male UPS, is another peculiarity.

Acknowledgements

I express my gratitude to late Prof. Tomoo Fujioka for inspiration to investigate the butterflies of Khakassia, to Oleg and Vladimir Andreenkov, Olga and Lyudmila Andreekova, Natalya Priydak and Tatyana Kolesnikova for the great help in the field in 2000 and Elena Shayder for that in 2022, to Sergey Nikolaev for sharing information on *M. kurentzovi* in Khakassia, to Roman Maximov for sharing information on habitats of *E. pandrose* in Khakassia, and to Natalya for kindly transcribing my audio recorded field diary. The work was partly supported by scientific program FWNR-2022-0019.

References

Churkin, S. V., Zhdanko, A. B. (2003) A review of the *Plebejus idas-subsolanus* complex of the Asian part of Russia and Mongolia, with the description of new taxa (Lepidoptera, Lycaenidae). In: *Helios. Collection of lepidopterological articles. Vol. 4*. Moscow: Chronos-Press, pp. 37–74. (In English)

Dragan, S. V. (2018) First record of *Apatura iris* (Linnaeus, 1758) (Lepidoptera: Nymphalidae) from the Republic of Khakassia (South Siberia). *Acta Biologica Sibirica*, vol. 4, no. 4, pp. 114–115. (In English)

Dubatolov, V. V., Kosterin, O. E. (1999) Dnevnye cheshuekrylye (Lepidoptera, Hesperioidea, Papilionoidea) mezhdunarodnogo zapovednika "Dauriya" [Butterflies (Lepidoptera, Hesperioidea, Papilionoidea) of the Dauria international natural reserve]. In: V. V. Dubatolov (ed.). *Nasekomye Daurii i sopredel'nykh territorij. Vyp. II [Insects of Dauria and Adjacent Territories. Vol. II]*. Novosibirsk: Daurskij State Nature Reserve Publ., pp. 195–221. (In Russian)

Gorbunov, P. Y., Kosterin, O. E. (2003) *The butterflies (Hesperioidea and Papilionoidea) of North Asia (Asian part of Russia) in nature. Vol. 1.* Moscow: Rodina & Fodio Publ., 392 p. (In English)

Gorbunov, P. Y., Kosterin, O. E. (2007) *The Butterflies (Hesperioidea and Papilionoidea) of North Asia (Asian part of Russia) in nature. Vol. 2.* Moscow: Rodina & Fodio Publ., 408 p. (In English)

iNaturalist. (2022) [Online]. Available at: https://www.inaturalist.org (accessed 12.12.2022). (In Russian)

iNaturalist Research-grade Observations. (2022) *Global Biodiversity Information Facility*. [Online]. Available at: https://doi.org/10.15468/ab3s5x (accessed 12.12.2022). (In English)

Ivonin, V. V., Kosterin, O. E., Nikolaev, S. L. (2013) Dnevnye cheshuekrylye (Lepidoptera, Diurna) Novosibirskoj oblasti. 3. Nymphalidae (bez Satyrinae [Butterflies (Lepidoptera, Diurna) of Novosibirskaya Oblast, Russia. 3. Nymphalidae (without Satyrinae)]. *Evraziatskij Entomologicheskij Zhurnal — Euroasian Entomological Journal*, vol. 12, no. 2, pp. 177–199. (In Russian)

Ivonin, V. V., Kosterin, O. E., Nikolaev, S. L. (2018) Dnevnye cheshuekrylye (Lepidoptera, Diurna) Novosibirskoj oblasti. 5. Dopolneniya i obshchee obsuzhdenie [Butterflies (Lepidoptera, Diurna) of Novosibirskaya Oblast, Russia. 5. Updates and general discussion]. *Evraziatskij Entomologicheskij Zhurnal — Euroasian Entomological Journal*, vol. 17, no. 1, pp. 25–52. https://doi.org/10.15298/euroasentj.17.1.04 (In Russian)

Kosterin, O. E. (2002) New records of butterflies (Lepidoptera, Diurna) for the Tyva Republic [Tuva]. III. Hitherto not reported species and some considerations about the *Erebia magdalena* (Strecker, 1880) and *Polyommatus icarus* (Rottemburg, 1775) groups. *Atalanta*, vol. 33, no. 1-2, pp. 177–187. (In English)

Kosterin, O. E. (2007) New data on butterfly fauna (Lepidoptera, Diurna) of the Katunskii mountain range (Central Altai). *Altaiskij Zoologicheskij Zhurnal — Altai Zoological Journal*, vol. 1, pp. 24–34. (In English)

Kosterin, O. E. (2008) *Erebia kefersteinii* (Satyridae, Lepidoptera) v srednegor'e Zapadnogo Altaya i Kuznetskogo Alatau [Records of *Erebia kefersteinii* (Satyridae, Lepidoptera) at moderate elevations in West Altai and Kuznetskii Alatau]. *Altajskij Zoologicheskij Zhurnal — Altai Zoological Journal*, vol. 2, pp. 95–97. (In Russian)

Kosterin, O. E. (2009) Materialy ekspeditsij 1999 and 2000 gg. po faune dnevnykh babochek (Lepidoptera, Diurna) Ubsunurskoj kotloviny v predelakh Respubliki Tyva [Data of 1990 and 2000 expeditions on butterfly (Lepidoptera, Diurna) fauna of the Ubsu-Nur intermontane hollow within Tyva Republic]. In: *Priroda zapovednika "Ubsubnurskaya Kotlovina". Trudy gosudarstvennogo prirodnogo biosfernogo zapovednika "Ubsunurskaya Kotlovina". Vyp. 1 [Nature of Ubsu-Nur Hollow Nature Reserve. Transactions of "Ubsunur Hollow" State Biosphere Nature Reserve. Vol. 1]*. Krasnoyarsk: Darma Press, pp. 212–225 (In Russian)

Lukhtanov, V. A., Dubatolov, V. V. (2020) Phylogenetic position and taxonomic rearrangement of *Davidina* (Lepidoptera: Nymphalidae), an enigmatic butterfly genus new for Europe and America. *Zoological Journal of the Linnean Society*, vol. 190, no. 3, pp. 1036–1053. https://doi.org/10.1093/zoolinnean/zlaa104 (In Russian)

Sinev, S. Y. (ed.). (2008) *Katalog cheshuekrylykh [Lepidoptera] Rossii [Catalogue of the Lepidoptera of Russia]*. Moscow; Saint Petersburg: KMK Scientific Press, 424 p. (In Russian)

Sinev, S. Y. (ed.). (2019) *Katalog cheshuekrylykh [Lepidoptera] Rossii [Catalogue of the Lepidoptera of Russia]*. 2nd ed. Saint Petersburg: Zoological Institute of the Russian Academy of Sciences Publ., 448 p. (In Russian)

Solovyev, V. I., Ilinsky, Y., Kosterin, O. E. (2015) Genetic integrity of four species of *Leptidea* (Pieridae, Lepidoptera) as sampled in sympatry in West Siberia. *Comparative Cytogenetics*, vol. 9, no. 3, pp. 299–324. https://doi.org/10.3897/CompCytogen.v9i3.4636 (In English)

Suschkin, P. P., Tshetverikov, S. S. (1907) Lepidoptera Minusinskogo uezda, Zapadnogo Sayana i zapadnoj chasti Uryankhajskoj stepi [Lepidoptera of Minusinsk Uezd, Western Sayan and the western part of Uryankhaj steppe]. *Horae Societas entomologica Rossica*, vol. 38, no. 3, pp. 3–31. (In Russian)

Talavera, G., Lukhtanov, V. A., Pierce, N. E., Vila, R. (2013) Establishing criteria for higher-level classification using molecular data: the systematics of *Polyommatus* blue butterflies (Lepidoptera, Lycaenidae). *Cladistics*, vol. 29, no. 2, pp. 166–192. https://doi.org/10.1111/j.1096-0031.2012.00421.x (In English)

Tshikolovets, V. V, Yakovlev, R. V., Kosterin, O. E. (2009) *The Butterflies of Altai, Sayans and Tuva*. Pardubice: Tshikolovets Publ., 374 p. (In English)

Tshikolovets, V., Kosterin,O., Gorbunov, P., Yakovlev, R. (2016) The Butterflies of Kazakhstan (Lepidoptera, Rhopalocera). Pardubice: Tshikolovets Publ., 379 p. (In English)

For citation: Kosterin, O. E. (2023) Early summer aspect of butterflies (Lepidoptera: Papilionoidea) of Republic of Khakassia as examined in 2000, with some additional data. *Amurian Zoological Journal*, vol. XV, no. 2, pp. 325–354. https://www.doi.org/10.33910/2686-9519-2023-15-2-325-354

Received 28 March 2023; reviewed 16 April 2023; accepted 3 June 2023.

Для цитирования: Костерин, О. Э. (2023) Раннелетний аспект дневных бабочек (Lepidoptera: Papilionoidea) Республики Хакасия в 2000 г., с некоторыми дополнительными данными. *Амурский зоологический журнал*, т. XV, № 2, с. 325–354. https://www.doi.org/10.33910/2686-9519-2023-15-2-325-354

Получена 28 марта 2023; прошла рецензирование 16 апреля 2023; принята 3 июня 2023.