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RESEARCH ARTICLE

Additions to the fauna of Heterocera (Insecta, Lepidoptera) of the Republic of Khakassia and of the South of Krasnoyarsk Region (South Siberia, Russia) with a comparison of the moths flight timing after 100 years of W. Kozhantshikov's research

Roman E. Maksimov[1], Svyatoslav A. Knyazev[2], Alexey Yu. Matov[3], Ilya A. Makhov[3], Sergey M. Lostchev[4], Mikhail A. Ivanov[5]

1 *State Natural Reserve "Khakassky", Karl Marx str. 19, app. 5, Abakan, Republic of Khakassia, 655017, Russia*
2 *Altai State University, Lenina, 61, Barnaul, Russia, 656049, Russia*
3 *Zoological Institute of the Russian Academy of Sciences, Universitetskaya embankment, 1, Saint-Petersburg, 199034, Russia*
4 *"Krasnoyarskie Stolby" National Park, Krasnoyarsk, Russia*
5 *2-nd Khabarovskaya str., 1, app. 36, Krasnoyarsk, 660041, Russia*

Corresponding author: Roman E. Maksimov (riverabakan@mail.ru)

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Abstract

Here we present additional data and the information about new records of Lepidoptera (Geometridae, Sphingidae, Lymantriidae, Erebidae s.str., Noctuidae, Arctiidae) from the Khakassia Republic and the South of Krasnoyarsk region. 45 species are reported for the fauna of both regions for the first time and the 4 species reliably confirmed. In our work, we use research records, collection of personal materials during 1986–2021 (collecting) seasons. As in works before, we acknowledge availability for several species, which were recorded here earlier doubtly. In addition, comparisons of moths flight activity 100 years ago and contemporary are given.

Keywords
Biodiversity, insects, entomology, fauna, Siberia, new finds, moth

Introduction

This list is an addendum to our previous work (Maksimov et al. 2019) made possible as result of the several additional field seasons within the borders of Khakassia Republic and the South of Krasnoyarsk region. On the other hand, a more thorough revision of previously collected material it also gave positive results in the form of the new interesting finds.

In his final work on butterflies and moths of the Minusinsk region W. Kozhantshikov (Kozhantshikov 1928) describes in sufficient details the methods used him for collecting moths. Those data, mostly relating to collecting at light trap and a kind of a wine trap also known as "medovik". It was made W. Kozhantshikov's substance from the mixture of honey and water with the addition of one shot of cheap port. After that, the gauze was soaked with this mixture for use as an aromatic trap. This kind of traps turned out to be very useful and was often used by us. In this regard and also because of collecting moths at light brought us the bulk of interesting finds, we consider it possible a little supplement and detail the factors influencing on within the borders of the Khakassia Republic and the South of the Krasnoyarsk region. Perhaps this information will be helpful for the future researchers of the Lepidoptera of our region.

The main part of their finds W. Kozhantshikov with his research assistants (S.R. Tzygankov, I.W. Kozhantshikov, L.W. Kozhantshikov and A. Gerasimov-Morachinsky) did within a radius of 15 km from the city of Minusinsk (Kozhantshikov 1923). Having broader technical capabilities, we have tried to pay more attention not only to steppe and forest-steppe, but taiga and mountain territories, which Khakassia and the South of the Krasnoyarsk region are abounding with. Collecting moths in the high-altitude and taiga zones lead us to abandon the aromatic traps using honey. That would be an unjustified risk in the usual areas of brown bear residence, which made us focus on using the light trap. That brought the expected results in the form of a significant number of boreal and alpine species, some of them were quite expected.

It should be noted that night catching on classical W. Kozhantshikov's localities, for example, "Grjady" or the surrounding "Maliy Kyzykul" lake area (Kozhantshikov 1923; 1924; 1925; 1926; 1927; 1928), also brought a lot of interesting new finds. Quite possible, it affected our use of more advanced technology, inaccessible to researchers of previous generations, so are the climate changes, what has happened in our region over the current century.

The last argument is confirmed in the observations of our predecessors. At the beginning of the last century (Kozhantshikov 1923) the first successful fact of the collecting moths was happened near Minusinsk on May 19, 1922. The author clari-

fies that there were still remnants of snow on the surrounding hills at this time. In 2019 we had quite a successful fact of collecting moths much earlier, already on March 30, which is still the earliest recorded moth trapping date in our region. We marked that the trapping locality was in a cooler place, than the Minussinsk town, in the Maliy Kyzykul lake area. Collecting moths in the first and second decades of April in the period from 2015 to 2021 has now become quite an ordinary phenomenon in the steppe and forest-steppe of Khakassia and the South of the Krasnoyarsk region. Thus, over the past last century, we have noted a shift in the spring activity of moths by more than a month, from the beginning of second decade of May to the beginning of April. At the same time, the determining factor for the success of spring or autumn moths trapping at light is the air temperature. It should not fall below +3° C. This temperature is critical, and at lower rates, moths simply stop flying. We should add that a strong wind and a full moon also negatively affect the activity of moths. On the contrary, cloudy weather or rain, even very heavy, not only do they not reduce, but, perhaps, they also strengthen intensity of moths trapping at light. Let's clarify that this pattern works only for the first few hours after the start of precipitation. If the rain drags on for several days, which is quite common in the taiga zone and in the mountains, this noticeably worsens the intensity arrival of moths at light source. Perhaps this is due not only to the wetting of moth wings, but also with the inevitable decline air temperatures, as a result of prolonged precipitation.

As for the earliest dates of high-altitude moths trapping in our region, we note, that a rather successful attempt was carried out by us on May 18, 2020 in West Sayan, Gladenkaya mount, in the high mountain tundra and rocky scree on the a.s.l. 1260 m.

If we take into attention the solar activity factor, we may note the following patterns. As we expected, moths trapping at light began immediately after sunset. In spring (April and May) and in autumn (September and early October) it usually started exactly after dusk, but mostly by midnight moths stopped flying at light completely. Interestingly, this pattern was observed even at a sufficiently high night temperatures +8° or +9° C.

At the same time, in June, July and partly in August the highest peak of moths activities fell on the period from 23 h p.m. to 01-30 a.m. and it could continue until the dawn, which coincides with the data of researchers at the beginning of the 20th century (Kozhantshikov 1923). The latest successful attempt of autumn moths trapping at light was recorded by us in October 18, 2018 in the Minusinsk pine forest.

Material and methods

The main part of the data was obtained from our personal collecting material during the period from 1986 to 2021. All current collection material was gathered by us on the territory of Khakassia and the South of Krasnoyarsk region in 43 locali-

ties with the different habitat characteristics, from the steppe zone to the alpine area of the West Sayan, the Kuznetsky Alatau & foothills East Sayan mountains. Some of the species were caught in the daylight by standard methods, with butterfly net and main part in the night, using the mercury lamp Sylvania (250W), double light screen and inverter generator (1000W). All collected materials preserved and stored in private collections of R.E. Maksimov in Abakan (RMA), M.A. Ivanov in Krasnoyarsk (MIK), S.A. Knyazev in Omsk (SKO) and in private collection of S.M. Lostchev in Krasnoyarsk (LSK).

We are used general classification in the check-list, accepted by 2-nd edition of Catalogue of Lepidoptera of Russia (2019). A list of collecting cites is presented below and supplemented with maps (figs 1, 2).

1. Abakan – Khakassia, West near Abakan town, floodplain meadow on the river Abakan, 53°40′26′′N, 91°27′52′′E, a.s.l. 247 m;
2. Ayan – Khakassia, Askyz district, West Sayan, Abakansky ridge, Ayan mount pass, taiga, subalpine meadow. 53°21′16′′N, 89°36′54′′E, a.s.l. 948 m;
3. Bele lake – Khakassia, Shira district, "Khakassky" state National Reserve, Bele lake area, steppe hills, 54°41′50′′N, 90°11′15′′E, a.s.l. 423 m;
4. Bidja – Khakassia, Ust-Abakan district, near Bidja village, forest-steppe hills, motley grass meadow, pine forest, 54°00′13′′N, 90°59′50′′E, a.s.l. 668 m;
5. Bidja 2 – Khakassia, Ust-Abakan district, near Bidja village, forest-steppe hills, motley grass meadow 54°00′31′′N, 90°52′58′′E, a.s.l. 690 m;
6. Bograd – Khakassia, Bograd district, near Bograd settlement, meadow & forest hills. 54°12′10′′N, 90°54′34′′E, a.s.l. 469 m;

Figure 1. The placement of Khakassia and South of Krasnoyarsk region in Russian Federation, in according to the boundaries marked in the Catalogue of Lepidoptera of Russia (2019).

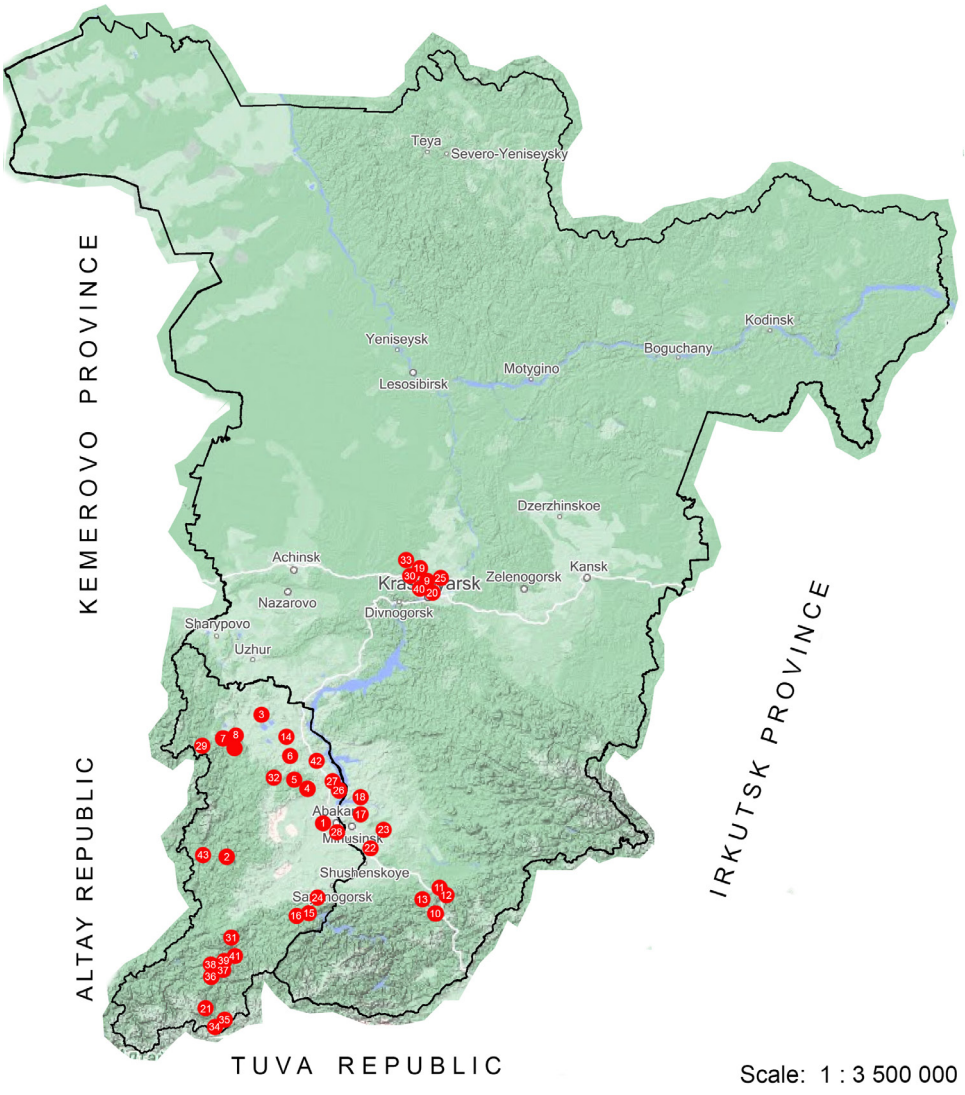

Figure 2. Collecting localities in Khakassia and South of Krasnoyarsk region. The numbers inside the circles respond to the numbers of collection localities in the text.

7. Efremkino (marmoreal career) – Khakassia, Shira district, Kuznetsky Alatau mountains, near Efremkino, marmoreal career over, 54°26′21′′N, 89°26′07′′E, a.s.l. 671 m;
8. Efremkino (Pandora's Box trail) – Khakassia, Shira district, Kuznetsky Alatau mountains, near Efremkino village, the path to the Pandora's Box cave taiga mountain meadow, rocky slopes, 54°25′51′′N, 89°27′34′′E, a.s.l. 524 m;

9. Elita – Krasnoyarsk region, Krasnoyarsk city suburban, country village Elita, floodplain of the Pyatkov River, the edge of the spruce forest, gardens and agrocenoses, 56°05′45′′N, 92°34′07′′E, a.s.l. 301 m;
10. Ergaky (Gornaya Oya) – Krasnoyarsk region, Ermakovskoe district, West Sayan, Ergaky ridge, Gornaya Oya camp, high mount taiga, subalpine meadow 52°48′11′′N, 93°14′54′′E, a.s.l. 1418 m;
11. Ergaky Lokatornaya 1 – Krasnoyarsk region, Ermakovskoe district, West Sayan, Ergaky ridge, Lokatornaya mountain, (N-W exposition slope), subalpine meadow, mount tundra. 52°51′06′′N, 93°16′02′′E, a.s.l. 1557 m;
12. Ergaky Lokatornaya 2 – Krasnoyarsk region, Ermakovskoe district, West Sayan, Ergaky ridge, Lokatornaya mount, mountain tundra. 52°50′48′′N, 93°15′59′′E, a.s.l. 1592 m;
13. Ergaky 3 – Krasnoyarsk region, Ermakovskoe district, West Sayan, Ergaky ridge, mountain taiga, subalpic meadow, 52°48′39′′N, 93°13′52′′E, a.s.l. 1369 m.
14. Galdja - Khakassia, Shira district, near Galdja village, forest-steppe stony hill. 54°22′34′′N, 90°32′45′′E, a.s.l. 616 m;
15. Gladenkaya 1 – Khakassia, Beya district, West Sayan, Gladenkaya mount, mountain taiga and tundra, kurumniky, (N-exposition slope), 52°56′11′′N, 91°22′34′′E, a.s.l. 1231 m;
16. Gladenkaya 2 – Khakassia, Beya district, West Sayan, Gladenkaya mount, mountain taiga and tundra, kurumniky, (W-exposition slope), 52°55′56′′N, 91°22′12′′E, a.s.l. 1261 m;
17. Grjady – Krasnoyarsk region, Minusinsk district, near Bystraya village, Funtikov's mountain, steppe hills (S-exposition slope), 53°44′21′′N, 91°33′38′′E, a.s.l. 358 m;

Note: Following W. Kozhantshikov's instructions, we can only approximately guess which point the author called “Grjady” (Kozhantshikov, 1923; 1924; 1925; 1926; 1928). From several possible and very similar points, we are choose this one, guided mainly by the least influence of the anthropogenic factor on it.

18. Grjady 2 - Krasnoyarsk region, Minusinsk district, near Bystraya village, Funtikov's mountain, steppe hills (S-exposition slope), 53°44′39′′N, 91°34′26′′E, a.s.l. 337 m;
19. Hudonogovo – Krasnoyarsk region, Hudonogovo village, forest-steppe, 56°10′04′′N, 93°13′56′′E, a.s.l. 202 m.
20. Krasnoyarsk – Krasnoyarsk region, near Krasnoyarsk City, forest-steppe, 56°01′51′′N, 92°49′60′′E;
21. Kohosh – Khakassia, Tashtyp district, West Sayan, Kohosh ridge, mountain taiga and tundra, 51°45′25′′N, 89°49′47′′E, a.s.l. 1741 m;
22. Lugavskoye – Krasnoyarsk region, Minusinsk district, near Lugavskoye lake, forest-steppe tall grass meadow. 53°30′19′′N, 91°53′20′′E, a.s.l. 370 m;
23. Maliy Kyzykul – Krasnoyarsk region, Minusinsk district, near Maliy Kyzykul lake, forest meadow, 53°75′72′′N, 92°21′63′′E, a.s.l. 343 m;

24. Mayna – Khakassia, Beya district, West Sayan, close Mayna settlement, from Mayna to marble quarry road (6 km), mountain taiga, 52°57′09′′N, 91°24′25′′E, a.s.l. 690 m;
25. Minino – Krasnoyarsk region, Krasnoyarsk vicinities, Minino village, river Pyatkov, 56°04′53′′N, 92°42′59′′E, a.s.l. 294 m;
26. Oglahty 1 – Khakassia, Bograd district, "Khakassky" state National Reserve, Oglahty area, motley grass steppe, rocky hills. 53°59′22′′N, 91°29′31′′E, a.s.l. 336 m;
27. Oglahty 2 – Khakassia, Bograd district, "Khakassky" state National Reserve, Oglahty area, motley grass steppe, rocky hills. 53°59′10′′N, 91°29′56′′E, a.s.l. 290 m;
28. Podsinee – Khakassia, Altay district, near Podsinee village, meadow on the river Enissey, 53°39′59′′N, 91°33′51′′E, a.s.l. 240 m;
29. Podlunnaya 1 – Khakassia, Shira district, Kuznetsky Alatau mountains, close Kommunar mine, Podlunnaya mountain top, subalpine meadow, mount tundra 54°18′47′′N, 89°13′32′′E, a.s.l. 1344 m;
30. Pugatshevo – Krasnoyarsk region, Krasnoyarsk vicinities, Pugatshevo railway staition, 56°02′57′′N, 92°37′38′′E, a.s.l. 305 m;
31. Sabalkias – Khakassia, Tashtyp district, West Sayan, at the confluence of rivers Bolshoy On and Sabalkias, floodplain, 51°53′17′′N, 89°48′32′′E, a.s.l. 1160 m;
32. Salbyksky kurgan – Khakassia, Ust-Abakan district, Kamysakskaya steppe, near Salbyksky kurgan. 53°54′12′′N, 90°45′45′′E, a.s.l. 540 m;
33. Sartachul – Krasnoyarsk region, Sharypovo district, Sartachul village, forest-steppe, 55°14′57′′N, 89°13′25′′E, a.s.l. 420 m;
34. Saylig-Khem-Taiga (Bolshoy On headwater) – Khakassia, Tashtyp district, West Sayan, Saylig-Khem-Taiga ridge, highmountain tundra, 51°42′55′′N, 89°53′09′′E, a.s.l. 2140 m;
35. Saylig-Khem-Taiga (South Border) – Khakassia, Tashtyp district, West Sayans, Saylig-Khem-Taiga ridge, mountain tundra, neval belt, (N-W exposition slope), 51°43′33′′N, 89°54′21′′E, a.s.l. 2555 m;
36. Snow Leopard 1 – Khakassia, Tashtyp district, West Sayan, near "Snow Leopard" camp, highmountain taiga & highmountain tundra, 51°49′57′′N, 89°46′48′′E, a.s.l. 1392 m;
37. Snow Leopard 2 – Khakassia, Tashtyp district, West Sayan, near "Snow Leopard" camp, highmountain taiga & highmountain tundra, 51°49′59′′N, 89°46′41′′E, a.s.l. 1385 m;
38. Snow Leopard (Stoktysh 2) – Khakassia, Tashtyp district, West Sayan, near "Snow Leopard" camp, mountain taiga and tundra on the Stoktysh river, 51°50′26′′N, 89°46′57′′E, a.s.l. 1353 m;
39. Snow Leopard (Stoktysh 1) – Khakassia, Tashtyp district, West Sayan, near "Snow Leopard" camp, highmount. taiga and tundra, a.s.l. 1382 m, 51°49′60′′N, 89°46′42′′E;

40. Stolby – Krasnoyarsk region, Krasnoyarsk vicinities, Stolby nature reserve, cordon Narym, 55°55′03′′N, 92°43′29′′E, a.s.l. 540 m;
41. Stoktysh Bolshoy On – Khakassia, Tashtyp district, West Sayan, confluence of rivers Stoktysh and Bolshoy On, highmountain tayga, 51°50′34′′N, 89°47′22′′E, a.s.l. 1330 m;
42. Troitzkoye – Khakassia, Bograd district, near Troitzkoye village, steppe rocky hills, 54°13′56′′N, 91°13′15′′E, a.s.l. 477 m;
43. Tyoia – Khakassia, Askyz district, West Sayans, Abakansky ridge, near Vershina Tyoya mine, highmount taiga, subalpine meadow, 53°15′25′′N, 89°32′57′′E, a.s.l. 968 m.

Below we present a list of species reported to Khakassia and to the South of Krasnoyarsk territory for the first time. When the taxon was noted in previously published works to our region, but for some reason was not included in the Catalog of Lepidoptera of Russia (2019), the priority of the author and the year of issue of the work were marked by us in round brackets after the Latin name. This concerned only the species confirmed by our own finds.

Results

Family Geometridae

Glacies coracina (Esper, 1805) – Saylig-Khem-Taiga (South Border), 08.VII.2020, 8♂, 3♀, 12.VII.2021, 4♂, 2♀, R. Maksimov (RMA).

Charissa turfosaria (Vojnits, 1975) – Efremkino (Pandora's Box trail), 16.VI.2018, 2♂, at light; Efremkino (marmoreal career), 08.VI.2019, 2♂, at light, R. Maksimov (RMA).

Aspitates mongolicus (Vojnits, 1975) – Troitzkoye, 22.V.2016, 3♂, 1♀; Grjady, 26.V.2019, 3♂, 2♀, R. Maksimov (RMA).

Erannis jacobsoni (Djakonov, 1926) – Pugatshevo, 09.IX.2017, 6♂, 2♀, at light, M. Ivanov (MIK); Bograd, 30.IX.2021, 5♂, 1♀, at light, R. Maksimov (RMA).

Acasis appensata (Eversmann, 1842) – (Jakobson, 1901; Djakonov, 1926); Stolby, 19.V.2020, 1 specimen, at light, S. Lostchev (LSK).

Acasis viretata (Hübner, 1799) – Abakan, 22.V.2018, 1♂, 1♀, at light. R. Maksimov (RMA); Stolby, 25.V.2020, 2 specimens, at light, S. Lostchev (LSK); Minino, 25.V.2020, 1 specimen, at light, M. Ivanov (MIK).

Xanthorhoe majorata (Heydemann, 1936) – Saylig-Khem-Taiga (Bolshoy On headwater), 29.VI.2017, 1♂, at light. R. Maksimov (RMA);

Entephria olgae Vasilenko, 1990 – Ergaky Lokatornaya 1, 10.VII.2016, 1♀, R. Maksimov (RMA).

Hydriomena impluviata ([Denis et Schiffermüller], 1775) – Gladenkaya 1, 28.VII.2018, 5♂, 2♀, at light; Snow Leopard 1, 09.VII.2020, 2♂, 1♀, at light. R. Maksimov (RMA).

Hydriomena ruberata (Freyer, 1831) – Gladenkaya 2, 18.V.2020, 1♀, at light. R. Maksimov (RMA).

Perizoma blandiata ([Denis et Schiffermüller.], 1775) – (Jakobson 1901; Djakonov 1926); Stoktysh Bolshoy On, 08.VII.2020, 1♂, R. Maksimov (RMA).

Eupithecia conterminata (Lienig & Zeller, 1846) – Ergaky 3, 1♂, at light. R. Maksimov (RMA).

Eupithecia innotata (Hufnagel, 1767) – (Djakonov 1926); Minino, 08.VI.2016, 2♂, 3♀, at light, M. Ivanov (MIK); Oglahty 1, 05.V.2019, 2♂, 1♀, at light; Mayna, 25.V.2019, 2♂, 2♀, at light, R. Maksimov (RMA).

Horisme aemulata (Hübner, 1813) – Saylig-Khem-Taiga (Bolshoy On headwater), 29.VI.2017, 1♂, at light. R. Maksimov (RMA).

Family Arctiidae

Pelosia muscerda (Hufnagel, 1766) – Maliy Kyzykul, 10.VIII.2019, 5♂, 1♀, at light. R. Maksimov (RMA).

Dodia diaphana (Eversmann, 1848) – Saylig-Khem-Taiga (Bolshoy On headwater), at light, 29.VI.2019, 4♂, 1♀; Saylig-Khem-Taiga 2, at light, 11.VII.2020, 2♂; Kohosh, 10.VII.2021, 1♂, 1♀, at light, R. Maksimov (RMA).

Family Sphingidae

Hyles euphorbiae (Linnaeus, 1758) – Grjady, 11.VIII.2020, 1♂, at light, R. Maksimov (RMA).

Proserpinus proserpina (Pallas, 1772) – Elita, 17.V.2020, 1♂, at light, S. Lostchev (LSK).

Family Lymantriidae

Gynaephora angelus (Tschetverikov, 1904) – (Kozhantshikov 1923): *Dasychira angelus* (Tschetverikov, 1904); Oglahty1, 07.VIII.2020, 4♂, at light; Efremkino (Pandora's Box), 24.VII.2021, 2♂, 1♀, at light, R. Maksimov (RMA).

Family Erebidae s.str.

Eublemma purpurina ([Denis et Schiffermüller], 1775) – Grjady, 11.VIII.2020, 3♂, at light, R. Maksimov (RMA).

Euclidia dentata Staudinger, 1871 – (Kozhantshikov 1923): *Gonospileia dentata* Staudinger, 1871; Podsinee - 14.VI.2020, 1♂, 12.VI.2021, 2♂, R. Maksimov (RMA).

Family Noctuidae

Syngrapha diasema (Boisduval, 1829) – (Kozhantshikov 1923); Ergaky (Gornaya Oya), 19.VII.2019, 3♂, 1♀, at light, R. Maksimov (RMA).

Aedia funesta (Esper, 1786) – Elita, 08.VII.2020, 1♂, at light, S. Lostchev (LSK).

Acronicta intermedia Warren, 1909 – Oglahty1, 03.VII.2018, 2♂, at light, R. Maksimov (RMA).

Cucullia mixta Freyer, 1841 – (Kozhantshikov 1925); Oglahty 2, 29.V.2019, 1♂, at light; Bidja, 11.V.2020, 1♂, at light; Grjady 2, 24.IV.2020, 1♀, at light, R. Maksimov (RMA).

Cucullia papoka G. Ronkay et L. Ronkay, 1986 – Bidja, 11.V.2020, 2 specimens, at light; Oglahty 2, 04.VI.2021, 1 specimen, at light; Oglahty 1, 17.VI.2021, 1 specimen, at light; R. Maksimov (RMA).

Cucullia praecana Eversmann, 1843 – Bidja 2, 26.VI.2018, 1♂, R. Maksimov (RMA); Krasnoyarsk, 18.VII.2020, 2 specimens, at light, M. Ivanov (MIK).

Cucullia tristis Boursin, 1934 – Lugavskoye, 19.VI.2018, 1♀, at light; Bidja 2, 26.VI.2018, 1♂, at light, R. Maksimov (RMA).

Amphipyra tetra (Fabricius, 1787) – (Kozhantshikov 1925); Pugatshevo, 08.VIII.2015, 1 specimen, at light, M. Ivanov (MIK); Bele lake, 19.VII.2020, 1♀, at light, R. Maksimov (RMA).

Heliothis adaucta Butler, 1878 – Minino, 02.VII.2015, 1 specimen, at light, M. Ivanov (MIK); Salbyksky kurgan, 18.VII.2018, 2♂,1♀, at light; Oglahty 1, 03.VII.2018, 2♂, at light. R. Maksimov (RMA).

Auchmis mongolica (Staudinger, 1896) – Sabalkias, 20.VII.2020, 1 specimen, at light, S. Lostchev (LSK).

Apamea exstincta (Staudinger, 1889) – Snow Leopard (Stoktysh 1), 09.VII.2020, 1♂, at light; Kohosh, 10.VII.2021, 2♂1♀, at light; Snow Leopard (Stoktysh 2), 12.VII.2021, 2♂2♀, at light, R. Maksimov (RMA).

Sunira circellaris (Hufnagel, 1766) – Hudonogovo, 06.IX.2006, 1♀, at light, V. Golovizin (LSK).

Hadena confusa (Hufnagel, 1766) – (Kozhantshikov 1923; Lostchev 2015): *Harmodia nana* (Rott); Efremkino (Pandora's Box trail), 14.VII.2018, 1♂, at light; Oglahty 1, 07.VIII.2018, 1♀, at light, R. Maksimov (RMA).

Hadena filograna (Esper, 1788) – Sartachul, 23.VIII.1988, 1♂, at light, S. Lostchev (LSK); Elita, 14.VII.2019, 1♀, at light, M. Ivanov (MIK).

Mythimna andereggii (Boisduval, 1840) – Efremkino (marmoreal career), 16.VI.2018, 1 specimen, R. Maksimov (RMA).

Lasionycta buraetica Kononenko, 1988 – Saylig-Khem-Taiga (Bolshoy On headwater), 29.VI.2019, 6♂, 3♀, at light, R. Maksimov (RMA).

Lasionycta dovrensis (Wocke, 1864) – (Kozhantshikov 1923): *Lasiestra dovrensis var. altaica* Staudinger, 1892; Efremkino (marmoreal career), 16.VI.2018, 1♀, at light; 08.VI.2019, 1♂, at light R. Maksimov (RMA).

Figures 3–10. 3 – *Gynaephora angelus*, male, Oglahty1; **4** – *Cucullia papoka*, female, Bidja; **5**, **6** – *Aspitates mongolicus*, male & female, Grjady; **7** – *Entephria olgae*, female, Ergaky; **8** – *Lasionycta buraetica*, male, Saylig-Khem-Taiga; **9** – *Lasionycta dovrensis*, female, Efremkino; **10** – *Xestia alexis*, male, Saylig-Khem-Taiga.

Lasionycta secedens (Walker, [1858]) – Snow Leopard (Stoktysh 1), 30.VI.2019, 1 specimen, at light; Kohosh, 10.VII.2021, 2 specimens, at light; Snow Leopard (Stoktysh 2), 12.VII.2021, 2 specimens, at light, R. Maksimov (RMA).

Lasionycta skraelingia (Herrich-Schäffer, 1852) – Ergaky Lokatornaya 2, 06.VII.2019, 3♂, 1♀, at light, R. Maksimov (RMA).

Lasionhada orientalis (Alphéraky, 1882) – Podlunnaya 1, 27.VII.2019, 1♂, at light, R. Maksimov (RMA).

Chersotis andereggii (Boisduval, 1832) – Bele lake, 19.VII.2020, 1♂, at light; Galdja, 31.VII.2021, 2♂, at light, R. Maksimov (RMA).

Xestia alexis (Kozhantschikov, 1928) – Saylig-Khem-Taiga (South Border), 09.VII.2020, 1♂, at light, R. Maksimov (RMA).

Xestia borealis (Nordström, 1933) – Tyoia, 22.VI.2019, 1♂, at light; Kohosh, 10.VII.2021, 4♂2♀, at light; R. Maksimov (RMA).

Xestia gelida (Sparre-Schneider, 1883) – (Kozhantshikov 1925): *Rhyacia* (?) *sublima* spec. nov.; Ergaky Lokatornaya 2, 06.VII.2019, 1♀, at light; Snow Leopard 2, 10.VII.2020, 3♂, 2♀, at light; Kohosh, 10.VII.2021, 2♂, at light; Snow Leopard (Stoktysh 2), 12.VII.2021, 3♂1♀, at light, R. Maksimov (RMA).

Xestia laetabilis (Zetterstedt, [1839]) – Gladenkaya 1, 07.VIII.2019, 1♀, at light; Saylig-Khem-Taiga (Bolshoy On headwater), 08.VII.2020, 1♂, at light, R. Maksimov (RMA).

Xestia senescens (Staudinger, 1881) – Gladenkaya 1, 28.VII.2018, 1♂, at light, R. Maksimov (RMA).

Xestia tecta (Hübner, [1808]) – Saylig-Khem-Taiga 3, 28.VII.2016, 1♀, Saylig-Khem-Taiga (Bolshoy On headwater), 08.VII.2020, 6♂, at light, R. Maksimov (RMA); 19.VII.2020, 4♂, 2♀, at light, S. Lostchev (LSK).

Pseudohermonassa ononensis (Bremer, 1861) – Sartachul, 10.VIII.1988, 1♀, at light, S. Lostchev (LSK); Kohosh, 10.VII.2021, 2♂ 1♀, at light, R. Maksimov (RMA).

Discussion

Thus, we have revealed 45 species from Khakassia and South of Krasnoyarsk territory for the first time and additionally confirmed the presence in the region of 4 species whose habitation was considered doubtful. A part of them were published in different articles earlier, however they were not included in 22nd region in Catalogue (2019). All entomological material was collected during the period from 1986 to 2021. Unlike our previous publication (Maksimov et al. 2019) that is a significant part of the reported species were quite ordinary and sometimes gathered in large numbers, this list has mostly brought interesting and rare finds. It should be added, that the regional list of Heterocera of Khakassia and the nearby of the South of the Krasnoyarsk territory needs further details and more in-depth study. We are forced to state, that the biology of many Heterocera species has been studied extremely poorly or did not studied at all. In this regard, we have plans to continue our re-

search during the future collecting seasons. The most part of the specimens mentioned in the text are presented on the web-site "The Nature of South Siberia" by the following link: ermak24.com/animalia-insecta.html.

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